Fiber to the Home(FTTH) Scope of Work for Kabul

Afghan Telecom Corporation

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Contents

Afghan Telecom Introduction:

Afghan Telecom Corporation is the government owned company and was incorporated in 24 September 2005 under the stewardship of Ministry of Communication & Information Technology, which provides different services on fixed line, IMS, Payphone, wireless, fiber, PABX, VCN, DSL Internet, WIMAX and mobile services. Afghan telecom also provides broadband services (internet) through its fiber to the ISPs, enterprises and other mobile operators. 25 provinces are connected through Afghan Telecom fiber optic network. Afghan Telecom has regional connectivity with almost all neighboring countries Pakistan, Iran, Tajikistan, Turkmenistan, Uzbekistan, and Kirgizstan via Tajikistan.

1. FTTH Sites

The FTTH sites and the proposed coverage is given below. There could be minor modifications of the covered area that will only depend on the result of the detailed survey.

The sites are listed in the following table 1.

Item	Province	Site Name
1	Kabul	Qasaba-Emirates Blocks
2	Kabul	Qoway Markaz Towers
2	Kabul	Khushal Khan Blocks

Table 1. List of sites

1.1. Site details

The details are given below according to the province and the location.

1.1.1. Kabul

In Kabul the Qasaba- Emirate Towers, Qoway Markaz and khushal khan will be covered

1.1.1.1. Qasaba – Emirates Blocks

The equipment shall be located inside the Emirates tower in a provided shelter. The contractor shall prepare the new shelter that will also include the required cooling and the power system (2 generators) for the project. The area to be considers for the project is shown on Fig 1 below as a layout to be modified after detailed survey as and when necessary.

Fig 1 Kabul Emirates Blocks area proposed to be covered by the project

1.1.1.2. Qoway Markaz Towers

There is available space, power, cooling system in Shahre Naw site for equipment installation and the space shall be reserved as required. The actual amount of Space shall be as per the design requirement from the contractor.

The area to be considered for the project is shown on Fig 2 below as a layout to be modified after detailed survey as and when necessary.

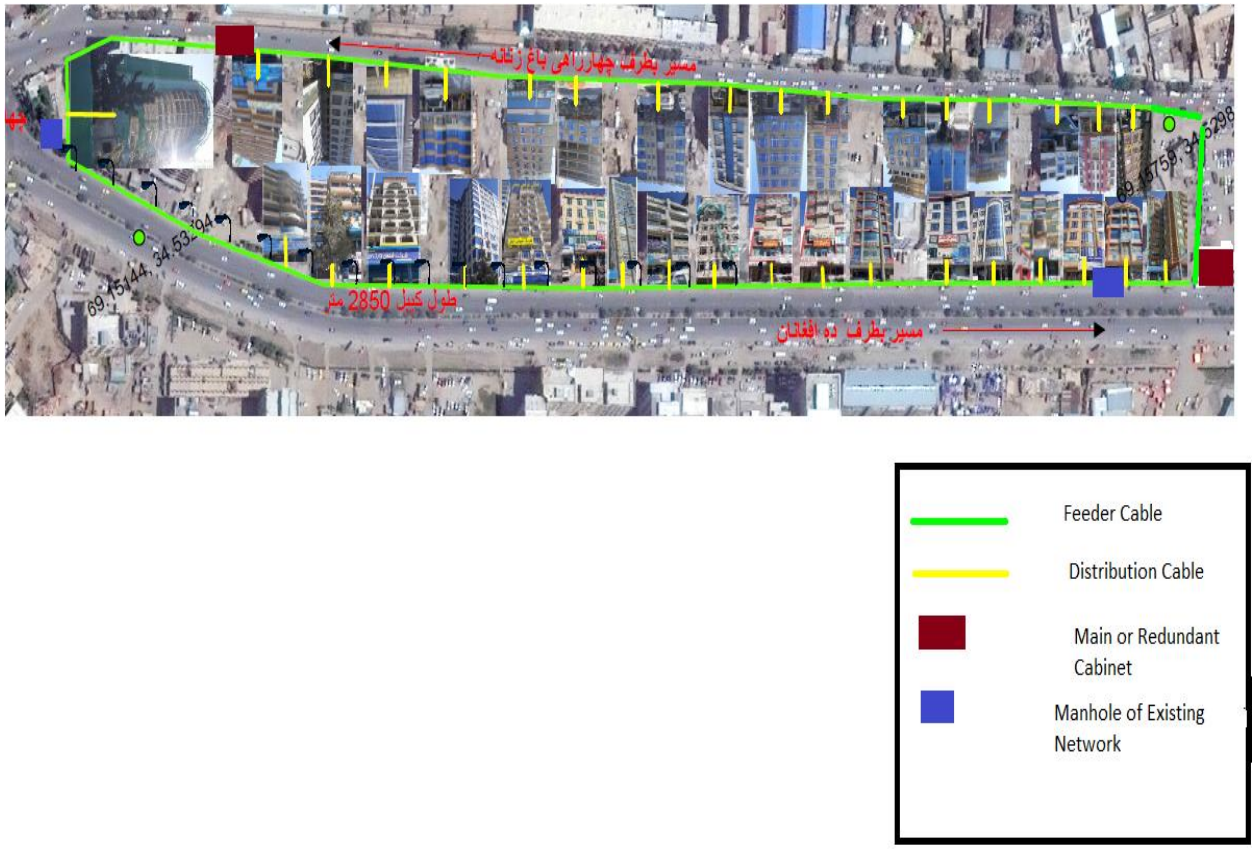


Fig 2 Kabul Qoway Markaz Towers area proposed to be covered by the project

1.1.1.3. Khushal Khan Blocks

There is available space, power, cooling system in khushal khan site for equipment installation and the space shall be reserved as required. The actual amount of Space shall be as per the design requirement from the contractor.

The area to be considered for the project is shown on Fig 2 below as a layout to be modified after detailed survey as and when necessary.

Fig 3 Kabul khushal Khan Blocks area proposed to be covered by the project

2. Passive Optical Network

This section describes the technical specifications for Passive Optical Network system which is the access network constructed in the Project area in Afghanistan.
(1) The Contractor shall provide the Passive Optical Network Subsystem equipment designed according to G-PON (Gigabit Passive Optical Network) system standard.
(2) The Contractor shall install the Passive Optical Network Subsystem equipment to the sites mentioned in the section 1 FTTH Sites

2.1. The System Configuration

The G-PON system shall provide Ethernet First Mile (EFM) standards compliant Gigabit Passive Optical Network technology to multiplex any mix of voice, video or data in the central office (CO) onto a single fiber that is terminated at the subscriber's premises. Each G-PON line shall support 2.5 Gbps downstream and 1.25 Gbps upstream. In addition, G-PON lines shall be capable of extending up to approximately 20 km with 32 subscribers per PON, or up to approximately 12.5km with 64 subscribers per PON. The split ratio of 64 shall be applied in the Project.

As the foundation of a cost-effective all-IP optical access network, the required Passive Optical Network Subsystem based on G-PON system shall support next-generation voice, data, and video services over lP using Ethernet interfaces while maintaining support for legacy services, such as plain old telephone service (POTS).

The required Passive Optical Network Subsystem configuration is shown in Figure 4

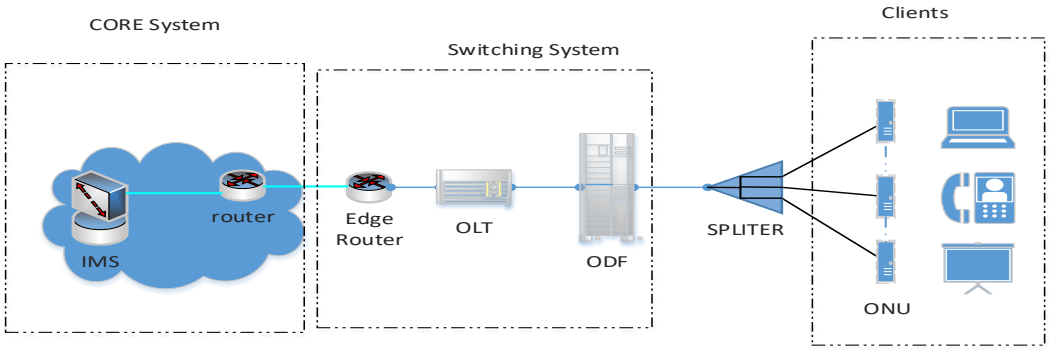


Figure 4 Layout GPON Network system

2.2. Responsibilities

2.2.1. AFTEL Responsibilities

(1) The equipment installation space shall be provided by AFTEL in room spaces in the existing building or outdoor open spaces in case of no indoor space unavailable at the switching stations.

(2) The IMS, IP Core Network, which interconnects with IP Edge Router and the Passive Optical Network Subsystem already exist and will be used, the connectivity to the IMS and ISP is as per the Figure 5 below.

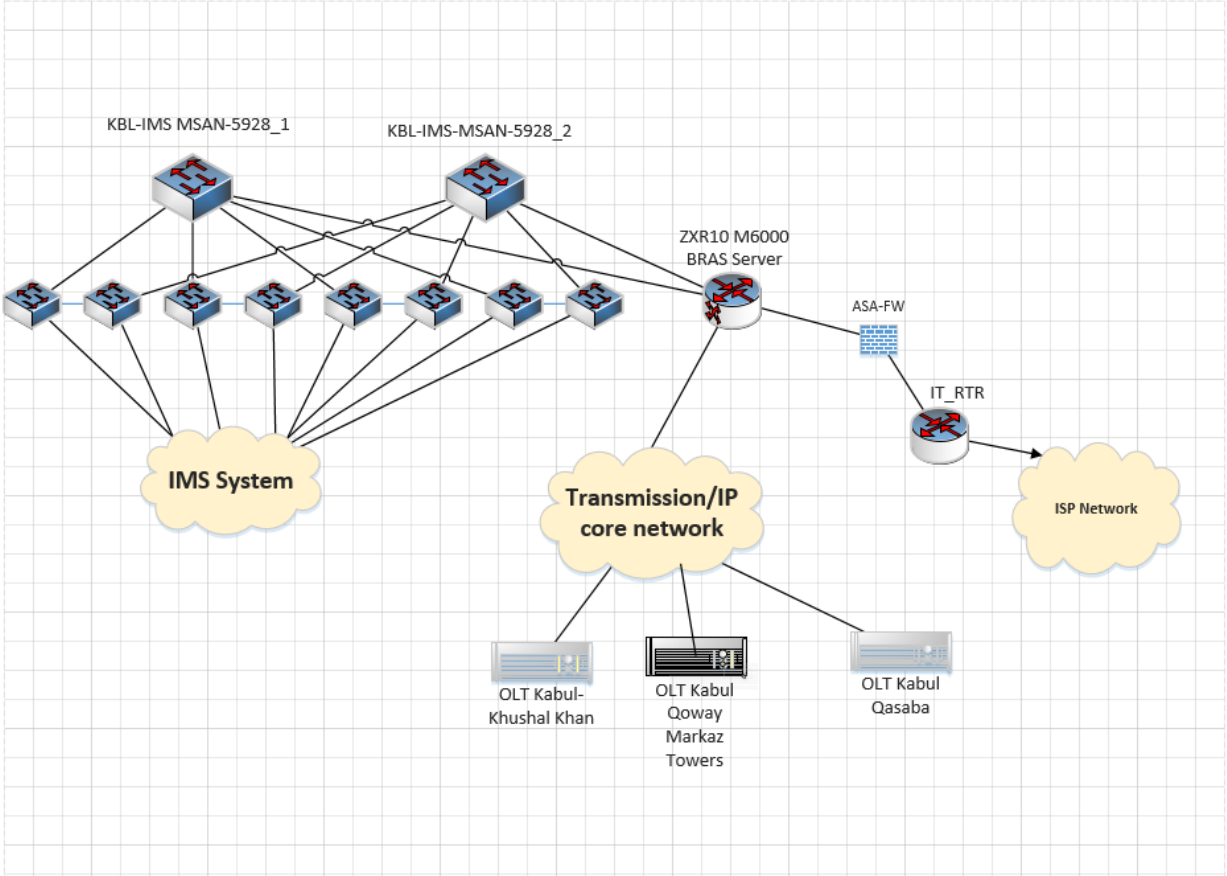


Figure 5. IMS and ISP connection layout

(3) The grounding position to connect Passive Optical Network Subsystem equipment shall be provided by AFTEL.

2.2.2. Contractor's Responsibilities

The Contractor shall be responsible for detailed design, manufacturing, supply and install of Passive Optical Network Subsystem,IP Edge Router and relevant equipment.
The shelter and other ancillary facilities, which are to be required for accommodating the equipment in case of installation in outdoor open spaces, shall be supplied and constructed by the Contractor.
The contractor shall make a design that the services are integrated to the existing

a) IMS for voice services

2.3. List of Required Equipment (Active and Passive) for Passive Optical Network Subsystem

The Contractor shall provide the devices for Passive Optical Network Subsystem and other relevant equipment. Detailed equipment list Shall satisfy the capacity required as in table 2 below. Boundaries of the project is clearly marked in Figure 1 and 2.

Province	Item	Site Name	Required Lines
Kabul	1	Qasaba-Emirates Blocks	3500
Kabul	2	Qoway Markaz Towers	1150
Kabul	3	Khushal Khan Blocks	350

Table 2 Site and required number of lines.

Actual configuration and quantities of equipment should be dependent on the Contractor's product design and implementation, and shall be proposed by the Bidder according to the Employer's requirement.

[Basic Design Assumption]

Province	Site Name	OLTs Per Site	ONUs with accessories Per Site
Kabul	Qasaba-Emirates Blocks	1	3500
Kabul	Qoway Markaz Towers	1	1150
Kabul	Khushal Khan Blocks	1	350

i) 1 OLT line card is to be equipped with minimum of 2 ports for optical fiber line and each port is to accommodate up to 64 subscribers.
ii) fiber lines need to be connected with 1-line card, even though each of fiber may not necessarily accommodate full subscriber lines of 64.
iii) 1 Shelf serves with 2,048 ONUs and 1 rack is equipped with 5 shelves.

iv) 5% of spare equipment to be added.

3. Technical Requirements GPON

3.1. Overall Requirements

The Passive Optical Network system

(1) Shall be offering for at a minimum 1 Gbit/s speed services, such as residential or business data, voice, and multiple video channels.
(2) application use optical fiber to transport broadband data transport.
(3) shall comply with ITU-T G.983 and G.984 standards, based on the recommendations of the Full-Service Access Network (FSAN) committee
(4) shall be equipped with the capability to extend up to 25 km per subscriber with 32 subscribers or up to 15 km with 64 subscribers per PON
(5) shall be able to share with maximum 64 users in one (1) optical fiber cable core
(6) shelf shall be efficient accommodation with maximum number of lines per one OLT Unit
(7) shall be equipped with scalability as a feature that is to be proposed by the Bidder
(8) shall support SIP-based IP telephony service.
(9) shall support the advanced triple play functionality, such as High-Speed Internet access, Video on Demand (VOD) and broadcast TV.
(10) shall be designed for safety against high temperature, voltage, etc
(11) shall be equipped with Monitoring and Control Management system of various management methods, such as local graphical or console port, Web-based configuration, Telnet, ssh and SNMP.

3.2. Optical Line Terminal (OLT) Equipment.

The OLT shall support the following functions and characteristics.

1) The Network Interface: 1 or 10 Gigabit Ethernet selectable.
2) Redundancy configuration Redundancy configuration shall be implemented based on ITU-T G.984.1 standard Type-B.
3) Load sharing configuration
4) Multicast capability
5) Forward Error Correction
6) GPON Encapsulation Mode (GEM)
7) Advanced Encryption Standard (AES)
8) GPON framing
9) VLAN, stacked VLAN, untagged, QTAG
10) DHCP / PPPoE Relay agent
11) L2/L3 Bridging / switching / forwarding
12) IGMP Snooping
13) QoS Control (Filtering, Coloring and Metering)
14) The line Interface shall have the following characteristics
    i. Maximum reach: approximately 25km at the split ratio of 32,
    ii. Maximum reach: approximately 15km at the split ratio of 64
    iii. Optical Loss Budget: 32 dB (G.984 class C+) or 29dB (Class B+)
    iv. Wavelength: 1490 nm ± 10 nm; 1310nm ± 20 nm,
    b. Speed of Line (Up link: 1.25Gbps / Down link: 2.5Gbps)

15) Number of PON port/package: To be provided by contractor
16) The OAM (Operation and Management system) shall be equipped with the function of remote monitor and control management.
17) OLT shall be equipped with the function of remote monitor and control management.
18) The OAM (Operation and Management system) shall be equipped with the function of remote monitor and control management.
19) OLT shall be equipped with the function of remote monitor and control management.
20) Input voltage: -48V or AC 220V (2 route)
21) Power Consumption: To be stated clearly.
22) Environmental conditions shall be as follows;
    a. Operating Temperature: 0 to 45 degree C
    b. Storage Temperature : -20 to 70 degree C
    c. Operating Humidity : 20 % to 80%
23) The Passive Optical Network System Shelf shall be mounted in 19 inch rack size
24) The Bidder shall have Certificate of the Passive Optical Network System for the following items; (a) EMC/ESD (b) Safety (c) Reliability

3.3. Optical Network Unit (ONU) [FTTH]

The ONT shall support the following functions and characteristics;

1) Type: indoor
2) Dynamic Bandwidth Allocation (DBA)
3) Quality of Service (QoS)
4) Ethernet (10Mbps/100Mbps/1000Mbps) /RJ-45 : Minimum 4 ports
5) IEEE802.1p
6) IEEE802.1q Tunneling (Q in Q), VLAN translation
7) AES(Encryption)
8) IPTV(IGMP v2/v3)
9) H.248/SIP VoIP
10) AC 200-240V/ DC12V
11) Power Consumption: To be stated clearly.
12) Environmental conditions shall be as follows;
    a. Operating Temperature: 0 to 40 degree C
    b. Storage Temperature: -20 to 70 degree C
    c. Operating Humidity: 30 % to 80%
13) The Bidder shall state certificate of the Passive Optical Network System in the following items; (a) EMC/ESD (b) Safety (c) Reliability
14) Wi-Fi Access Point Functionality based on the latest technical standards
15) Optical Network Terminal (ONT) shall also have connectivity with the combined wire/wireless network with robust guaranteed throughput delivering for freely to play multiple simultaneous bandwidth consuming and interrupt sensitive applications such streaming HD video, VoIP, online gaming and sharing large files
16) Optical Network Terminal (ONT) shall support POTS connectivity with at least two (2) ports with RJ11 connector.

4. Requirements for IP Edge Router

(l) The IP Edge Router shall provide high reliabilities of service Router performance, such as non-stop routing, non-stop services and graceful restart helper mode for services.

(2) The IP Edge Router shall support the latest technical trend of IP/MPLS services.

(3) The IP Edge Router shall be designed to minimize troubleshooting time, in which accompanied with an administration and maintenance tools, which provide GUT interfaces illustrating at least physical network view and service view.

(4) The IP Edge Router shall be equipped with the tools function to enable the Employer to test video, data and VoiP traffic flow in both directions, verify service connectivity and service-tunnel operation, and view end-user traffic from a remote location without the need for an external network analyzer.

(5) The IP Edge Router shall provide the excellent packet-processing capabilities.

(6) The IP Edge Router shall be equipped with a 3-tier service-aware hierarchical quality of service (H-QoS) to support the various service infrastructure, which is required for the delivery of higher-margin value-added services on all physical ports.

(7) The IP Edge Router shall be equipped with the service infrastructure that provides more bandwidth, delivered flexibly and reliably to enable to increase Employer's service level.

(8) The IP Edge Router shall provide the service continuity of triple play, virtual private LAN service (VPLS), virtual private wire service (VPWS), frame relay, ATM, IP virtual private network (IP-VPN), TOM circuit emulation and enhanced Internet services (IES) across an IP/MPLS network.

(9) The IP Edge Router shall provide the data services, such as multiservice transit applications using pseudo wires (PWs) over a variety of access methods (frame relay [FR], asynchronous transfer mode [ATM], Ethernet, high-level data link control [HDLC]/point-to-point protocol [PPP], etc.).

(10) The IP Edge Router shall be designed to minimize the overall technological risks over the next seven to ten years.

(11) The IP Edge Router shall be designed a flexibility that ensures that new features can be soft-loaded.

(12) The IP Edge Router shall be designed on a fully redundant platform with no single point of failure, and implement a real-time, modular operating system that has been field proven.

(13) The JP. Edge Router shall provide a point-to-point and multipoint IP/MPLS services. The services to bee enabled are pseudo wires for multiservice transit over IP/MPLS, VPLS, corporate Internet access, IP-VPNs.

(14) The IP Edge Router shall be equipped with the fully programmable network processor-based architecture or equivalent.

(15) The lP Edge Router shall be equipped with the simple in-service downloads function, without requiring expensive and lengthy hardware upgrades.

(16) The IP Edge Router shall be equipped with the Service-Based Filtering, such as to define and apply complex filters without performance impact, providing high levels of security and troubleshooting on a per-service basis, even at 10 Gb/s speeds or equivalent.

(17) The IP Edge Router shall be interconnected with the existing equipment at the Project sites with proper interfaces.

(18) The IP Edge Router shall be equipped with BNG (Broadband Network Gateway) functionality.

4.1. Functional Requirements for IP Edge Router

(1) The IP Edge Router shall be equipped basically with conventional port, media dependent adapter (MDA), and a new combination GE/10GE Ethernet MDA or equivalent. The Bidder shall propose and state the MDA summary connectivity according to the proposed configuration for the IP Communication System in the project area.

(2) The IP Edge Router shall be interconnected in redundancy configuration with the existing transport equipment at the Project sites and be equipped with the following interfaces for directly connecting to the equipment.

(3) The IP Edge Router shall provide the following Service capabilities or equivalent;
(a) High-availability support for non-stop routing, such as RSVP-TE, OSPFv3 on lPv6 and IGMP snooping.
(b) Bidirectional forwarding detection (BFD) for IES
(c) Ethernet in the first mile (EFM) OAM

(4) The IP Edge Router shall support the following Triple play service capabilities or equivalent;
(a) Multi-chassis link aggregation (LAG) solution for dual homing to a Digital subscriber line access multiplexer (DSLAM), cable modem termination system (CMTS) or multiservice access node (MSAN)
(b) Routed central office (CO) enhancements, including a dynamic whole-sale model for Layer 3 CO or regional head-end, with group interface mode support for virtual private routing networks (VPRNs)
(c) Multicast connection admission contra} (CAC) across VPLS to ensure broadcast television (BTV) channels doesn't exceed link bandwidth capacity.
(d) The System shall be able to terminate PPPoE sessions. The System shall be able to terminate and rely DHCP sessions.
(e) The System shall be capable to provide video caching capability for better user experience.

(5) The IP Edge Router shall support the following VPN service capabilities or equivalent;
(a) H-QoS on network ports to enable bandwidth allocation based on resources at the egress port level
(b) IGMP support on the link from customer edge (CE) to provider edge (PE)
(c) Simplified hub-and-spoke IP-VPN support
(d) The system shall be able to terminate IP-sec tunnels and provide L-4 to L-7 Deep Packet Inspection function within the L2/L3 VPN service.

(6) The IP Edge Router shall support the following 1Pv6 service capabilities or equivalent;
(a) PE routing functionality, supporting IPv6 over MPLS (6PE)
(b) IPv6 Layer 3 filter on Layer 2 services

(7) The JP Edge Router shall support the following service capabilities or equivalent;
(a) Pseudo wire switching that removes the need for a fully meshed network to increase the scalability of VPWS and VPLS over a multi-area network.
(b) LDP over RSVP-TE, allowing LDP tunnels to inherit key fast reroute and traffic engineering capabilities of RSVP-TE.
(c) Class-based forwarding to ensure the required traffic engineering and protection for each service

(8) The IP Edge Router shall support the BNG functionality as follows;
(a) Interaction with peripheral devices (like CPE) and servers (like AAA and DHCP), in order to provide broadband connectivity to subscribers and manage subscriber sessions.
(b) Communication function with authentication, authorization, and accounting (AAA) server to perform session management and billing functions.
(c) Customization of network service package for ‘subscribers based on their needs.

4.2. Technical Requirements

4.2.1. Technical Requirement for the IP Edge Router

The IP Edge Router shall provide the following functions;
(1) The IP Edge Router shall support the Class 4 and the Class 5 quality services.

(2) The IP Edge Router shall equipped the necessary functions for router flexibility, scalability and system characteristics in order to respond to the demand for high-performance voice, video and managed data services continues to grow of Afghanistan telecommunications field.

4.2.2. Hardware Components

(I) The IP Edge Router shall be equipped with the following capacity/bandwidth.
(a) More than 200Gb/s (full duplex, 1+1 redundant) fabric/system capacity
(b) 50 Gb/s I/0 slots, or more (full duplex)

(2) The IP Edge Router shall be equipped with the following I/O Slots/MDAs
(a) I/0 slots shall be equipped with 10 carrier I/O slots or more than or equivalent.
(b) MDA shall be equipped with at least 2 interface adaptor slots of 10 GE or more than or equivalent.
The bidder shall propose the actual number of the I/0 Slots/MDAs.
(c) No of concurrent users sessions should be minimum 15,000.

(3) The IP Edge Router shall be equipped with the following Input Output Module (IOM)
(a) With integrated switch fabric and CPU (1Gbyte)

The bidder shall propose the actual specification of the IOM.

(4) The IP Edge Router shall be equipped with the power device with functions complying the following power source.
(b) -40 V DC to -72 V DC (nominal)

4.2.3. Recovery and Redundancy

(1) During a repairing work and a replacing work of the damaged unit, the system recovery procedure shall not interrupt the actual traffic.
(2) In such a case, if the IP Edge Router System detects the preliminary to set criterion of high traffic condition, the IP Edge Router System shall restrict the handling traffic in order to avoid an overload condition and/or a total system down.
(3) The IP Edge Router System shall be composed in a redundancy configuration (1:1) so that, one chain is on-line mode and the other chain is reserved for standby mode. If there is any damage to be caused in the on-line chain, it shall be switched over to the standby chain automatically. During this switchover process, the traffic should not be interrupted.
(4) The redundant power units shall be employed for the IP Edge Router System in order to improve the system reliability.
(5) The redundant power shelf boards shall be employed for the corresponding IP Edge Router shelf in order to improve the system reliability.
(6) The IP Edge Router System shall be equipped with 1:1 Switch Fabric/Control Plane Module (SF/CPM) redundancy.

(7) The JP Edge Router System shall be equipped in 1:1 redundancy on all common system elements, such as power supplies, cooling, clock generator,etc.
(8) The IP Edge Router System shall be equipped with 1:1 redundancy on power devices.

4.2.4. IP Edge Router Software Components

5.2.4.1 Software Support

The IP Edge Router shall be equipped with the following software components:
(l) Protocol Support
Protocol function shall support following protocols:

(a) Unicast routing protocols: BGP-4, TS-TS, OSPF, RIPvl, RIPv2

(b) Multicast routing protocols: IGMPvl, IGMPv2, IGMPv3, PIM-SM, PIM-SSM
(c) Dual protocol stack support for IPv4 and IPv6 addressing schemes
(d) MPLS: LSR and LER, RSVP-IE, LOP, LOP over RSVP, FRR with sub-50 ms failover
(e) ECMP routing (up to 16 paths)
(f) VRRP
(g) Extensive route policy support
(h) Layer 2 and Layer 3 ACL filtering
(i) Proxy ARP, DHCP relay, DHCP proxy
j) Multi-chassis LAG
(k) PPPoE
(l) PPPoE over IEEE802.1 q and 802.1 ad
(m) L2TP LAC,LTS and LNS
(n) PPPoE/LNS host address assignmnent

(2) Service function

(a) Direct Internet access
(b) VPWS point-to-point Layer 2 VPN
(c) VPLS multipoint Layer 2 VPN
(d) IP-VPN (RFC 4364, formerly RFC 2547bis) or equivalent
(e) IP multicast support with VPRN
(f) PWE3 using draft Ma11ini encapsulation
(g) GRE encapsulation
(h) TOM circuit emulation

(3) Service Quality

(a) Per-service queuing, shaping and policing with more than 8,000 ingress and egress queues per interface slot
(b) Hierarchical queuing and scheduling
(c) Ingress and egress buffering (up to 200 ms at LO Gb/s)
(d) CJR, PIR, and MBS queue parameters .
(e) Premium, assured and best-effort forwarding classes
(f) IEEE 802.1 p filtering/marking/re-marking
(g) IETF DSCP filtering/marking/re-marking
(h) WRED on ingress and egress

(4) Software Standards

(a) IEEE 802.1d Bridging
(b) IEEE 802.1 p/Q VLAN Tagging
(c) IEEE 802.1s Multiple Spanning Tree
(d) IEEE 802.1 w Rapid Spanning Tree Protocol
(e) IEEE 802.1 x Port Based Network Access Control
(f) IEEE 802.3 10BaseT
(g) IEEE 802.3ad Link Aggregation
(h) IEEE 802.3ae 10Gbps Ethernet
(i) IEEE 802.3ah Ethernet OAM
U) IEEE 802.3u 100BaseTX
(k) IEEE 802.3x Flow Control
(l) IEEE 802.3z 1000BaseSX/LX

5.2.4.2 RFC Protocol Support

The IP Edge Router shall support the following RFC (Request for Comments) protocols, which are specified in the Internet Engineering Task Force (IETF):
(1) OSPF (Open shortest path first) routing protocol
(a) RFC 1765 OSPF Database Overflow
(b) RFC 2328 OSPF Version 2
(c) RFC 23 70 Opaque LSA Support
(d) RFC 3IOI OSPF NSSA Option
(e) RFC 3 13 7 OSPF Stub Router Advettisement
(f) RFC 3630 Traffic Engineering (TE) Extensions to OSPF Version 2
(g) RFC 2740 OSPF for IPv6 (OSPFv3) draft-ietfospf- ospfv3-update-14.txt
(h) RFC 4203-Shared Risk Link Group (SRLG) sub-TLV
(2) BGP (Border Gateway Protocol)
(a) RFC 1397 BGP Default Route Advertisement
(b) RFC 1772 Application ofBGP in the Internet
(c) RFC 1965 Confederations for BGP
(d) RFC 1997 BGP Communities Attribute

(e) RFC 2385 Protection ofBGP Sessions via MD5
(f) RFC 2439 BGP Route Flap Dampening
(g) RFC 2547bis BGP/MPLS VPNs
(h) RFC 3065 Confederations for BGP
(i) RFC 4456 BGP Route Reflection: Alternative to Full-mesh IBGP
(previously RFC 1966 and RFC 2796)
j) RFC 4724 Graceful Restart Mechanism for BGP- GR Helper

(3) BGP4 (Border Gateway Protocol4)
(a) RFC 2918 Route Refresh Capability for BGP-4
(b) RFC 3107 Carrying Label Information in BGP-4
(c) RFC 3392 Capabilities Advertisement with BGP-4
(d) RFC 4271 BGP-4 (previously RFC 1771)
(e) RFC 4360 BGP Extended Communities Attribute
(f) RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs)(previouslyRFC 2547bis BGP/MPLS VPNs)
(g) RFC 4760 Multi-protocol Extensions for BGP (previously RFC 2858)

(4) IS-IS (Intermediate System to Intermediate System)

(a) RFC 1142 OS£ IS-IS Intra-domain Routing Protocol (ISO 10589)
(b) RFC 1195 Use ofOSI IS-IS for routing in TCP/IP & dual environments
(c) RFC 2763 Dynamic Hostname Exchange for IS-IS
(d) RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
(e) RFC 2973 IS-IS Mesh Groups
(f) RFC 3373 Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies
(g) RFC 3567 Intermediate System to Intermediate System (JSIS) Cryptographic Authentication
(h) RFC 3 719 Recommendations for Interoperable Networks using IS-IS
(i) RFC 3784 Intermediate System to Inter mediate System (IS-IS) Extensions for Traffic Engineering (TE)
U) RFC 3787 Recommendations for Interoperable IP Networks
(k) RFC 4205 for Shared Risk Link Group (SRLG) TLV draft-ietf-isisigp-p2p-over-lan-05.txt
(l) RFC 5309 Point-to-Point Operation over LAN in Link State Routing Protocols

(5) LDP (Label Distribution Protocol)
(a) RFC 3036 LDP Specification
(b) RFC 3037 LDP Applicability

(6) IPV6

(a) RFC 1981 Path MTU Discovery for IPv6
(b) RFC 2460 Internet Protocol, Version 6 (1Pv6) Specification
(c) RFC 2461 Neighbor Discovery for JPv6
(d) RFC 2462 IPv6 Stateless Address Auto configuration
(e) RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 Specification
(f) RFC 2464 Transmission of IPv6 Packets over Ethernet Networks
(g) RFC 24 72 IPv6 over PPP
(h) RFC 2529 Transmission of 1Pv6 over IPv4 Domains without Explicit Tunnels
(i) RFC 2545 Use of BGP-4 Multi protocol Extension for IPv6 Inter-Domain Routing .
j) RFC 2740 OSPF for IPv6
(k) RFC 3587 IPv6 Global Unicast Address Format
(l) RFC 4007 IPv6 Scoped Address Architecture
(m) RFC 4193 Unique Local 1Pv6 Unicast Addresses
(n) RFC 4291 IPv6 Addressing Architecture
(o) RFC 4364 IPv6 in BGPIMPLS VPNs
(p) RFC 4 798 6PE
(q) RFC 4861 NDP
(r) RFC 4862 SLAAC

(7) Multicast

(a) RFC 1112 Host Extensions for IP Multicasting (Snooping)
(b) RFC 223.6 Internet Group Management Protocol, (Snooping)
(c) RFC 3376 Internet Group Management Protocol, Version 3 (Snooping)
(d) RFC 2362 Protocol Independent Multicast- Sparse Mode (PTMSM)

(e) RFC 3618 Multicast Source Discovery Protocol (MSDP)
(f) RFC 3446 Anycast Rendevous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)
(g) RFC 4604 and 4607 Protocol Independent Multicast - Source Specific Multicast Groups (PIM-SSM)

(8) MPLS (Multi-Protocol Label Switching)

(a) RFC 2702 Requirements for Traffic Engineering over MPLS
(b) RFC 3031 MPLS Architecture
(c) RFC 3032 MPLS Label Stack Encoding (REV3443)
(d) RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures

(e) RFC 4182 Removing a Restriction on the use of MPLS Explicit NULL

(9) RIP (Routing Information Protocol)

(a) RFC 1058 RIP Version 1
(b) RFC 2082 RIP-2 MD5 Authentication
(c) RFC 2453 RIP Version 2

(10) RSVP-TE (Resource Reservation Protocol-TE)
(a) RFC 2430 A Provider Architecture DiffServ & TE
(b) RFC 3209 Extensions to RSVP for Tunnels
(c) RFC 4090 Fast reroute Extensions to RSVP-TE for LSP Tunnels

(11) Differentiated Services

(a) RFC 2474 Definition of the DS Field the IPv4 and IPv6 Headers (Rev)
(b) RFC 2597 Assured Forwarding PHB Group (rev3260)
(c) RFC 2598 An Expedited Forwarding PHB
(d) RFC 3140 Per-Hop Behavior Identification Codes

(12) TCP/IP

(a) RFC 768 User Datagram Protocol (UDP)

(b) RFC 1350 The TFTP Protocol
(c) RFC 791 Internet Protocol (IP)
(d) RFC 792 Internet Control Message Protocol (TCMP)
(e) RFC 793 Transmission Control Protocol (TCP)
(f) RFC 826 Ethernet Address Resolution Protocol (ARP)
(g) RFC 854 Telnet
(h) RFC 951 Bootstrap Protocol (BootP)
(i) RFC 1519 Classless Inter-Domain Routing (CIDR)
(j) RFC 1542 Clarifications and Extensions for the Bootstrap Protocol
(k) RFC 1812 Requirements for 1Pv4 Routers
(I) RFC 2401 Security Architecture for Internet Protocol
(13) VRRP (Virtual Router Redundancy Protocol)
(a) RFC 2787 Definitions of Managed Objects for the Virtual Router Redundancy Protocol
(b) RFC 3768 Virtual Router Redundancy Protocol
(14) PPP (Point-to-Point Protocol)
(a) RFC 1332 PPP IPCP
(b) RFC 1377 PPP OSINLCP
(c) RFC 1638/2878PPP BCP
(d) RFC 1661 PPP (rev RFC2l51)
(e) RFC 1662 PPP in HDLC-Iike Framing

(f) RFC 1989 PPP Link Quality Monitoring
(g) RFC 2516 PPPoE termination
(h) RFC 2615 PPP over SONET/SDH

(i) RFC 1990 The PPP Multi! ink Protocol (MP)
(j) RFC 4679

(15) A TM (Asynchronous Transfer Mode)
(a) RFC 1626 Default IP MTU for use over A TM AAL5
(b) RFC 2514 Definitions of Textual Conventions and
OBJECT_ IDENTITIES for A TM Management
(c) RFC 2515 Definition of Managed Objects for ATM Management RFC 2684 Multiprotocol Encapsulation over ATM Adaptation Layer 5
(d) AF-TM-0121.000 Traffic Management Specification Version 4.1
(e) ITU-T Recommendation 1.610 - B-ISON Operation and Maintenance Principles and Functions version 11/95
(f) ITU-T Recommendation 1.432.1 - BISON user network interface -
Physical layer specification: General characteristics
(g) GR-1248-CORE - Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3
(h) GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue I
(i) AF-ILMI-0065.000 Integrated Local Management Interface (ILMI) Version 4.0
(j) AF-TM-0150.00 Addendum to Traffic Management v4. I optional minimum desired cell rate indication for UBR

(16) DHCP

(a) RFC 2131 Dynamic Host Configuration Protocol (REV)
(b) RFC 3046 DHCP Relay Agent Information Option (Option 82)
(c) RFC 1534 Interoperation between DHCP and BOOTP

(17) VPLS (Virtual Private Line Service)

(a) RFC 4762 Virtual Private LAN Services Using LOP

(18) PSEUDO-WIRE

(a) RFC 3985 Pseudo Wire Emulation Edge-to-Edge (PWE3)
(b) RFC 4385 Pseudo Wire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN
(c) RFC 3916 Requirements for Pseudo- Wire Emulation Edge-to-Edge (PWE3)
(d) RFC 4 717 Encapsulation Methods for Transport A TM over MPLS Networks (draft.,.ietf-pwe3-atmencap-l O.txt)
(e) RFC 4816 PWE3 A TM Transparent Cell Transport Service
(f) RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks
(g) RFC 4619 Encapsulation Methods for Transport of Frame Relay over MPLS Networks
(h) RFC 4447 Pseudowire Setup and Maintenance Using LDP
(i) RFC 4446 lANA Allocations for PWE3
(j) draft-ietf-pwe3-ms-pw-arch-02.txt
(k) draft-ietf-pwe3-segmented-pw-04.txt
(l) MFA Forum 9.0.0 The Use of Virtual trunks for ATM/MPLS Control Plane Interworking
(m) MFA Forum 12.0.0 Multiservice Interworking -Ethernet over MPLS
(n) MFA forum 13.0.0 - Fault Management for Multiservice ·Jnterworking vl.0
(o) MFA Forum 16.0.0- Multiservice Interworking -IP over MPLS

(19) ANCP/L2CP

(a) draft-ietf-ancp-framework-0 l.txt
(b) draft-ietf-ancp-protocol-00. Tx

(20) SONET/SDH

(a) GR-253-CORE SONET Transport Systems: Common Generic Criteria. Issue 3, September 2000
(b) ITU-G.84 t Telecommunication Standardization Section of ITU, Types and Characteristics of SDH Networks Protection Architecture, issued in October 1998 and as augmented by Corrigendum 1 issued in July 2002
(c) GR-253-CORE- SONET Transport Systems: Common Generic Criteria.Issue 3,September 2000

(21) RADIUS
(a) RFC 2865 Remote Authentication Dial In User Service
(b) RFC 2866 RADIUS Accounting
(c) RFC 3576 RADIUS-CoA
(d) RFC 4006 Diameter based prepaid accounting
(22) SSH (The Secure Shell)
(a) draft-ietf-secsh-architecture.txtSSH Protocol Architecture
(b) draft-ietf-secsh-userauth.txt SSH Authentication Protocol
(c) draft-ietf-secsh-transport.txt SSH Transport Layer Protocol

(d) draft-ietf-secsh-connection.txt SSH Connection Protocol
(e) draft-ietf-secsh- newmodes.txt SSH Transport Layer Encryption Modes

(23) TACACS (Terminal Access Controller Access Control System)

(a) draft-grant-tacacs-02.txt

(24) Network Management (1/2)

(a) ITU-T X.721: Information technology-OSI Structure of Management Information
(b) ITU-T X.734: Information technology-OSI Systems Management: Event Report Management Function
(c) J:v1.31 00/3120 Equipment and Connection Models
(d) TMF 509/613 Network Connectivity Model
(e) RFC 1157 SNMPv1
(f) RFC 1657 BGP4-MIB (MIB:Management Information Base)
'(g) RFC 1724 RIPv2-MIB
(h) RFC 1850 OSPF-MIB
(i) RFC 1907 SNMPv2-MIB
U) RFC 2011 IP-MIB
(k) RFC 2012 TCP-MIB
(l) RFC 2013 UDP-MIB
(m) RFC 2096 IP-FORWARD-MIB
(n) RFC 2138 RADIUS

(o) RFC 2206 RSVP-MIB
(p) RFC 2452 1Pv6 Management Information Base for the Transmission Control Protocol
(q) RFC 2454 1Pv6 Management Information Base for the User Datagram Protocol
(r) RFC 2465 Management Information Base for IPv6: Textual Conventions and General Group
(s) RFC 2558 SONET-MIB
(t) RFC 2571 SNMP-FRAMEWORKMIB
(u) RFC 2572 SNMP-MPD-MIB

(25) Network Management (2/2)

(a) RFC 2573 SNMP-TARGET-&-NOTJFICATION-MTB
(b) RFC 2574 SNMP-USER-BASED-SMMJB
(c) RFC 2575 SNMP-VIEW-BASEDACM-MIB

(d) RFC 2576 SNMP-COMMUNITY-MTB
(e) RFC 2665 Ether Like-MTB (Definitions of Managed Objects for the Ethernet-like Interface Types in MTB)
(f) RFC 2819 RMON-MIB
(g) RFC 2863 IF-MIB
(h) RFC 2864 INVERTED-STACK-MTB
(i) RFC 2987 VRRP-MIB
(j) RFC 3014 NOTIFICATION-LOGMTB
(k) RFC 3273 HCRMON-MTB
(l) TANA-IFType-MIB (lANA is abbreviation oflnternet Assigned Numbers Authority)
(m) TEEE8023-LAG-MIB
(n) Support for an extensive array of proprietary MTBs

4.2.5. Other Requirements

(1) All Services on All Interfaces
The IP Edge Router shall be equipped with service features devices, such as QoS, deep buffering, rate shaping, traffic marking and bi lling are available on all interfaces or sub-interfaces.
(2) Provisioning function
The IP Edge Router shall provide the capabilities, so that the Employer can provision access ports and JP or MPLS tunnels on any physical interface, without any additional specialized hardware required.
(3) Service-Based Filtering function
The IP Edge Router ~hall be equipped with the filtering functions to define and apply complex filters without performance impact, providing high levels of security and troubleshooting on a per-service basis.
(4) Operational Management function
(a) The IP Edge Router shall be equipped with the management functions that allow efficient operation, administration, maintenance and provisioning (OAM&P) of IP/MPLS networks and, more importantly, services.
(b) The IP Edge Router shall support a variety of protocols and custom-designed tools to assist operation on a per-service basis and troubleshoot individual services should an issue arise, without the need for complex scripting and command line debugging of individual routers.

4.2.6. Service-Based Accounting

(1) The IP Edge Router shall be equipped with service features to keep statistics on service basis, such as providing accurate measurement of each user's traffic and each individual service's conformity to the offered Service Level Agreement between the Employer and users.
(2) The IP Edge Router shall be billed on a service basis, providing accurate measurement of each user's traffic and each individual service's conformance to the offered Service Level Agreement between the Employer and users.
(3) The IP Edge Router shall be equipped with a billing device and line Interface or equivalent function.

4.2.7. Operational Maintenance Functions

The IP Edge Router shall provide the following operational and maintenance functions and device interfaces.
(1) The TP Edge Router shall be equipped with operational maintenance tools that perform an efficient operation, administration, maintenance and provisioning of JP/MPLS networks and services.
(2) The IP Edge Router shall support a variety of protocols and custom-designed tools to assist the Employer's operation on a per-service basis and troubleshoot individual services should an issue arise, without the need for complex scripting and command line debugging of individual routers or equivalent functions.
(3) The IP Edge Router shall be equipped with diagnostic tools, such as to support a kind of mirroring function that mirrors traffic on a per-service or sub-interface basis, and re-encapsulates the mirrored data for transport through the Edge network or equivalent functions.

(4) The lP Edge Router shall be equipped with the monitor functions to see the actual traffic from any the Employer's service at a central network operations center, reducing truck rolls and the amount of operations equipment required or equivalent functions ..
(5) The IP Edge Router shall be equipped with the monitor functions to assist the Employer's trouble shooting or equivalent monitor functions.

4.2.8. IP Edge Router Service Management System

The lP Edge Router shall provide the following management functions and device interfaces. In addition, IP Edge Router System shall be composed with the following Service Management System.
(1) The IP Edge Router shall be equipped with Service Aware Manager (SAM) device which is a tightly integrated suite of management applications that simplify the process of provisioning, monitoring and troubleshooting services on the IP Edge Router.
(2) The IP Edge Router shall provide IP network resource and service management solution with the Bidder's proposed Service Management System.
(3) Service Management System shall be proposed by the Bidder with its management functions, in accordance with the requirement in this Section
(4) Control and Monitoring equipment for Service Management System shall be installed at the local location and remote location as instructed by Afghan Telecom. The each location shall be decided during the site survey by the Contractor.

5. Operation and Management (OAM) System for Passive Optical Network System

5.1. General requirements

1) The Contractor shall provide the Operation and Management (OAM) system.
2) The Operation and Management (OAM) system shall be able to remotely monitor and control all the Passive Optical Network System equipment at the place which is connected to the IP network.
3) English language shall be used in Operation and Management (OAM) system.
4) Typical NBIs (Northbound Interfaces) (Extensible Markup Language (XML), Transaction Language 1 (TL1), File Transfer Protocol (FTP), Simple Network Management Protocol (SNMP), etc) shall be proposed and implemented in preparation for future integration into OSS.

6. Technical Specifications for Local Access Network

6.1. GENERAL REQUIREMENTS

The specifications set forth herein are to specify the minimum requirements and conditions related to the Local Access Network.

1) The Bidder and the Contractor respond with a detailed network design and detailed Bill of Quantity ("BOQ") based on the requirements below shall comply closely with the whole requirements on tendering, engineering, manufacturing, shipping, installation, construction, acceptance tests, commissioning, and any other matters which are not specified herein but may be

required for the successful implementation of the Project. In case of any doubts or difficulties, the Bidder and the Contractor shall seek clarifications and make inquiries from the Afghan Telecoms.

Any departure or change shall be only with the approval of the Afghan Telecoms.

2) All technical items and/or materials proposed by the Bidder shall be stated in detail in his Bid, and adequate technical documentation shall be furnished. In case the Bidder wants to propose different techniques and/or materials, he may only subject to Afghan Telecoms approval. The Bidder shall give reasons for the deviation in his Bid, while maintaining the same or better quality as indicated in these technical specifications.

6.2. Scope of Local Access Network

The scope of work shall involve all activities that are required to build a local access network to support GPON services.

It shall cover survey to determine material required for Manholes / Handholes. MHs and HHs Installation. Underground Conduit such as:

- HDPE duct
- HDPE duct connectors
- Galvanized Iron Ducts
- PVC Ducts
- Sub ducts

Material for Redundant cabinet and Main Cabinet where applicable
Material for Distribution cabinet or Distribution poles where applicable.

The civil work will cover activities on the local access network such as

- Cabinet and Pole installation
- Excavation
- Duct Laying
- Conduit Joining and Termination at MHs/HHs
- Backfilling
- Restoration of Roads and Footways

The local access includes the civil works and optical fiber network and other related works to be summarized as viewed in the figure 6 below

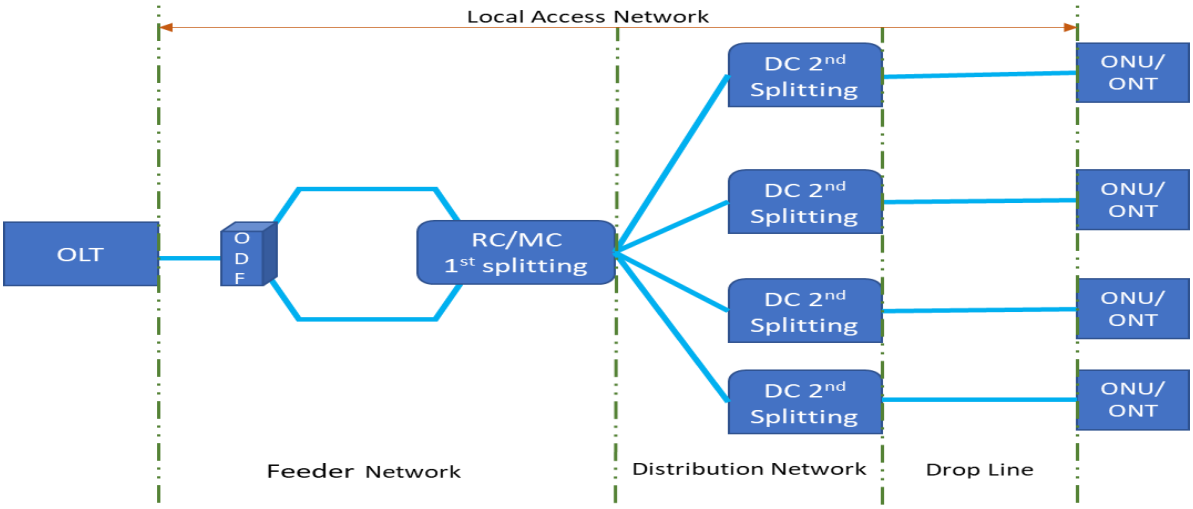


Figure 6: Local access network

7. Detailed Site Survey

7.1. General

A site survey shall be done to cover all the 5350 subscribers in different areas. The methodology and tools used shall give high precision on the result of the survey.

7.2. Purpose of the survey.

For a reliable network design the survey shall give.

1) Good information which Afghan telecom shall use for scalability /future projects
2) Exhaustive records on existing legal and illegal structures
3) A dependable GIS data which is usable for future requirements of Afghan telecom
4) Mark on maps the existing and the new design routes

7.3. Requirements of Survey

The accurate survey requirement that would be carried out by the Bidder shall cover 10,000 subscriber lines that are distributed 3 cities to include the following:

1) Number and/or location of flats/apartments in every residential block
2) Number and/or location of house dwelling units
3) Number and/or location of business units
4) Number and/or location of commercial units
5) Clutter categorization which are
   - Schools
   - Universities/colleges
   - Number of floors of each building which is higher than 3 stories and its location
   - Open areas
   - canals/rivers/reservoirs
   - Sport /social clubs
   - Governmental departments / ministry HQs
   - Banks
   - Shopping centers/malls
   - Hospitals
   - Health centers
   - Police stations
   - Fires stations
6) Line density per switch
7) Street and pavement dimensions
8) Conditions of Footways/pavements
9) Route position on the roads (left- and right-hand sides of the road according to the
10) direction of the survey
11) Determine the pavement and street surface type (material)
12) Type and location of illegal obstacles
    - Electricity generators
    - Blocked roads
    - Concrete blocks
    - Caravans *I* security caravans
    - Illegally extended gardens/fences
    - Illegally extended garages/houses
    - Artificial barriers

The survey should start from the Central office stopped after finishing the designated number of subscribers.

7.4. Expected Survey results

The survey shall include necessary works to build a GIS map/database in target areas , these maps would be utilized for the detailed design purpose. The survey work will be carried out in accordance with a work sequence below.

1) All necessary security permissions shall duly be applied for by the Bidder ,AFTEL will provide legal support
2) The Bidder will purchase the satellite images of the targeted areas in order to update and capture all of latest geographical data. Satellite images are expected to be not older than a month from starting the actual survey.
3) The Bidder will generate the maps for the survey based upon the latest information/data captured by satellite image. The maps will be produced by GIS engine and can be transformed to CAD files.
4) The field survey and data collection works will be commenced starting from the center of each switch/CO of the designated. The field survey and data collection works shall cover all of survey items mentioned above
5) A GIS map of each target district will be built based upon the information collected by the site.
6) The Bidder after concluding the survey job will provide the following outputs.
    - GIS maps in GIS format and CAD format
    - Survey Report.

7.5. FTTH Network Design Requirement

1) The system should deliver services to, potentially, 5000 subscriber lines distributed over Kabul.
2) The system should efficiently capture and deliver VoIP, data, and video services to end users: Most of end users are normal domestic ones. Business and commercial users are well expected in many areas, this is subject to survey results.
3) Subscriber line distribution must consider following priority needs
    a. Ministry sites if exists in the area
    b. Government department
    c. Shopping center or mall
    d. Police center
    e. University or collage
    f. School primary or secondary
    g. Hospital
    h. Bank
    i. Fire station
    j. Health center
    k. Sports clubs
    l. Social clubs
    m. house holds
    n. business units

4) The network design should consider the future expansion without the need of digging new routes.: A reserve or spare duct should be deployed between the ODF and every redundant or main closure/cabinet.
5) The network design should consider the future expansion by also providing the fiber cables with twice as much cores as required for the current designed and surveyed capacity.
6) The system must utilize the passive FTTH access method in the designated areas: A passive FTTH access technology must be used
7) Handholes: Must be located at each DP/DC and street corners
8) Distance between any two MHs: 250m (depending on location and topology)
9) MHs! HHs covers: Must be firmly fixed and undetachable for easy access.
10) Splitters: 2:4 (1st level) for redundant system or 1:4 for non-redundant system, 1:16 (second level)
11) In protected configuration the system should provide a full protection to all feeder rings up to the redundant closure/cabinet: Each feeder must be fully and reliably protected by two routes, primary and back-up.

The number, of 1:16 splitter (second level) to be accommodated on each DP/DC. The distance between DP and ONU must not exceed 120m

8. TECHNICAL SPECIFICATIONS FOR PASSIVE NETWORK

8.1. General

The optical fibers cables for this project shall be either in ducts, areal or direct buried as follows.

a) Duct cable as for the connections from the ODF to Main or redundancy cabinet.
b) Duct cables as for the connection from Main or Redundancy cables to the Distribution Cabinet/pole (DC/DP)
c) Direct buried from the DC to the subscriber premises (option from survey results)
d) Areal cable to subscriber premises (option from survey results)

8.2. General Specifications for Optical Fibre Cable Work

a) The fiber cable is expected to have a life span of at least 30 years
b) For high fiber count the Ribbon type fiber cable is preferred to be deployed and the bidder shall supply the relevant splicing equipment.
c) Material used should be free and protected from corrosion.
d) The measuring equipment and other tools used in the project shall be supplied by the contractor.
e) The bidder shall list and specify country of origin for the any material or equipment used. Afghan Telecoms reserves the right to reject or accept without stating the reason.
f) The offer equipment should be in compliant with the specifications below or better. If not specified, the equipment or material shall comply to latest international standards.

8.3. Optical Fibre Cable Specifications:

The optical fibre is based on subcategory G.652.D in the ITU-T recommendation G.652 November 2009, and subcategory G.657.A1 in the ITU-T recommendation G.657 October 2012

The optical fibre shall comply with the characteristics and performances that are stated in Tables 4 and Table 5 below

Item		Performance
Attenuation	at 1310 nm	≤0.40 dB/km
	at 1550 nm	≤0.25 dB/km
	at 1625 nm	≤0.30 dB/km
Chromatic dispersion	at 1310 nm	≤ 3.5 ps/nm·km
	at 1550 nm	≤ 18 ps/nm·km
Zero dispersion wavelength		1300 - 1324 nm
Zero dispersion slope		≤0.092 ps/nm2·km

Table 4. Optical fiber Transmission Characteristics

Item		Value
Permissible tensile strength	Installation	1100N
	Operation	400N
Permissible bending radius	During operation	20x Cable Diameter
	During installation	10x Cable Diameter
Temperature range	Operation	-30 to +70°C
	Storage	-40 to +70°C
	Installation	-10 to +60°C
Water penetration	No Water at the unsealed end (at 3m sample, 1m height of water, 24 hours) IEC 60794-1-2-F5B	

Table 5. Mechanical and environmental Characteristics.

1) The cables shall have anti-rodent structure.
2) The optical fibre shall be designed, manufactured, and distributed under the latest version of ISO 9001: quality management system and compliant with RoHS 2011/65/EU.
3) Cable packaging:
    a. The reels of the fiber shall be of 4km length for feeder cable and 2 km for distribution cables
    b. Identification marks of including Gross and net weight, Cable type and number of cores, length and Afghan telecoms logo and name.

8.4. Terminations at subscriber premises.

1) Cable shall be terminated on a terminal box which will protect the optical fiber
2) Termination details shall be stated by the bidder

8.5. Optical Drop Cable

1) The drop fiber shall withstand ambient temperature of -10 to +55oC
2) Overhead drop. - The structure of the fiber should have supporting wire, strength member and optical fiber , sheath (polyethylene) or a good and highly reliable alternative
3) Underground drop - - The structure of the fiber should have strength member and optical fiber , sheath (polyethylene) or a good and highly reliable alternative.
4) The material use should be UV, moisture, chemical and fungus resistance as well as low flame and smoke retardant polymer compound.

8.6. Central Office ODFs

The optical fibre distribution frame (ODF) for terminating optical fibre cables and patch cord.

(1) It should meet the following features

(a) Standard 19" installation provided fully enclosed structure
(b) Fu front operation; can be installed against wall, side-by-side or back-to-hack Complete cable routing design with fibre bend radius over 40mm
(c) Inlet/outlet cables should run from top or bottom
(d) Optimal arrangement for patch cords with fibre storage units
(e) Suitable for ribbon and non-ribbon optical fibers

(2) The distribution frame should include the metallic casing, adapter plate, splice tray, and other necessary materials for the termination of optical fibre cable. Therefore, it should be designed properly for the fibre splicing and distribution.
(3) The ODF shall be of corrosion resistance and robust construction; and shall allow both top or bottom entry for access to the splice trays.
(4) The ODF shall be installed according to the international standard (ETSI 19") equipment rack or cabinet rack.
(5) The ODF frame shall completely restore the sheath integrity of the cables and provide secure storage for the fibre splices.
(6) The ODF shall include all necessary components to protect and store the spliced fibre and provide sheath continuity.
(7) The distribution frame shall be designed with enough spare capacity for fibre splices and shall allow for the cable minimum bending radius.
(8) The splice protector shall restore the mechanical integrity of the fibre and shall not create any residual forces in the fibre.
(9) The ODF rack shall be bounded to the grounding system.
(10) The mounting bracket should be used to secure the fibre distribution frame to the 19" equipment rack or cabinet rack
(11) The materials of the fibre distribution frame shall be compatible with all cable components and splicing materials.
(12) All components of the frame shall be high quality design, workmanship, and finish.
All components shall be free of pinholes, cracks, -sharp edges or other defects which may detract from the service requirements of the frame. The components of the fibre distribution frame and its accessories shall not contain any hazardous or toxic materials.
(13) All the metal components shall be stainless steel and/or with an equivalent corrosion resistant material.
(14) ODF should have test certificates for:(a) Temperature and humidity test (b) Vibration test and (c) Shock test
(15) SC connectors should be used.
(16) The supplier shall take in 'his design all cable entries and air conditioning cablings and ducting into consideration in such a way- all cables and ducting alignment should not block the ways.

8.7. Optical Splitters

To reach 64 subscribers per port splitters shall be deployed in as

a. In the redundant /Main Cabinet
   2:4 as first level splitters in a feeder protected configuration.
   1:4 as first level in a not protected feeder configuration
b. In the Distribution Pole or cabinet
   1:16 as second level splitter

The splitter characteristic shall be of

1) Single mode and compact size
2) Light weight
3) Wideband performance (1260-1360 , 1450-1650 nm)
4) Bend insensitive fibre ITU-T G.657 A compliant
5) SC connectors
6) Directivity:> 50 dB
7) Return loss: > 50 dB
8) Low insertion loss
9) Low back reflection
10) Low PDL (Polarization Dependent Loss)
11) Low WDL (Wavelength Dependent Loss)
12) Low TDL (Temperature Dependent Loss)
13) High output uniformity
14) Stable optical performance
15) Insertion loss, uniformity and PDL performances are as shown in table 6 below

Split Ratio	Insertion loss (dB)	Uniformity (dB)	PDL (dB)
1:4	<7.6	<0.8	<0.3
2:4	<7.8	<1	<0.4
1:16	<14.1	<1.5	<0.3

Table 6: Splitters optical characteristics.

8.8. Cabinets/Closures

8.9. Cabinet

Outdoor application types shall have protection of the extreme out door adverse environment, protection level IP65 or better. They shall comply with EN 60950-1, ETSI 300019-2-2, ETS 300019-2 international standards.

It shall be capable of the following.

1) Roof shall be water proof and run off type
2) Moisture and dust proof foam in place and gasket sealed doors
3) Completely operated both Front and Back with strong locking mechanism
4) Shall accommodate splicing tray, 2:4 Splitters, 1:4 splitters fiber terminating ports
5) When open for maintenance doors shall have wind latch mechanism

8.10. Feeder and Distribution Joint Closures

The Splice closures shall:

1) be suitable for the installation in manhole/Handhole.
2) consist of anti-corrosive materials, resistant to acids, oil and pollutants, etc
3) have mechanical strength to withstand tensile, compressive bending and torsion stresses expected in normal condition
4) be waterproof type (IP65) or better
5) applied for both- splicing types between optical fibre cables and optical fibre cable and termination optical fibre cable
6) consist of anti-corrosive materials, resistant to acids, oil and pollutants, etc.

8.11. Distribution Panel (DP)

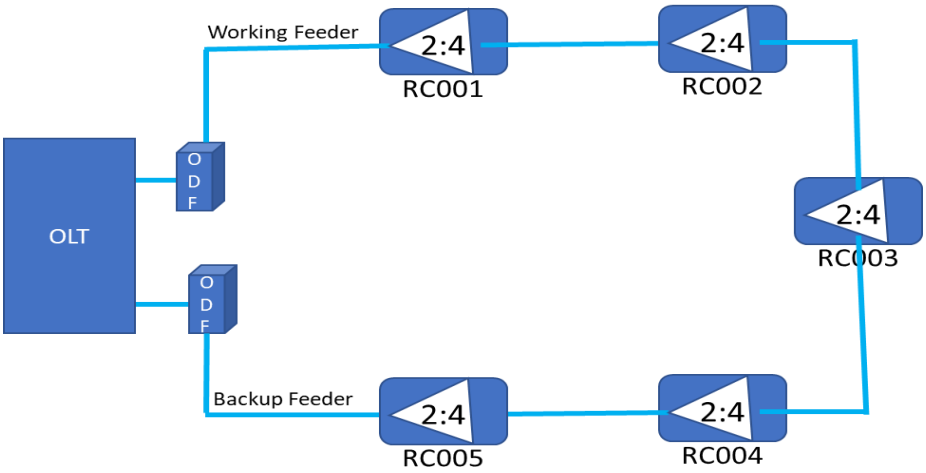
The offered optical DP shall have the following features:

1) should be able to accommodate the splitter and the splicing tray.
2) Suitable for outdoor application and must have rubber seal to prevent entry of water and dust (Protection grade of IP55)
3) Convenient for wall and pole mounted installation and convenient for repeated opening and closing cycles
4) The splice closure shall be made of 'light weight material and consist of anti-corrosive materials, resistant to atmospheric conditions, acids, oil and pollutants,
5) etc.
6) The splice closure shall have mechanical strength to withstand tensile, compressive bending and torsion stresses expected in normal condition.
7) The splice closure shall be waterproof type. It should comply with EN 60950-1, JEC60529 standards

8.12. Redundant /Protection System

In areas where the survey shows applicability of a feeder protection viability then the following protection system shall be implemented.

The redundant System is the feeder fiber cable and OLT linked to increase the reliability of the FTTH Network and connected on the figure 7 below.



RC – Redundant Cabinet

Figure 7: FTTH Feeder Redundancy System

The system shall be cable to operate automatically or manually to change between the working and backup route.

The Bidder must propose the technical design and drawings to Afghan Telecoms for their approval.

8.13. OLT to ONU Optical Link Budget

The Bidder shall do a survey that should determine that the ONU distance from the OLT.

1) This distance shall be that it meets the minimum sensitivity of the ONU after factoring all other loses (Splitter, splicing, connector, etc.
2) The Bidder shall provide all route components in such a way that the total attenuation value between OLT and ONU along the route is minimum and can meet the ONU sensitivity requirement
3) If the route turned out to be longer than the link budget requirement then the
4) following measures should be considered by the Contractor:
    a) Proposing an OLT- with higher output power -
    b) Providing an ONU with better sensitivity requirement

8.14. Measurement, Test and Installation material.

The bidder shall propose all necessary equipment that are required to put the FTTH network into service such as:

1) Optical fibre tester
2) Fusion Splicing Machine
3) Optical Time Domain Reflectometer (OTDR) with Built-in Printer
4) Optical telephone measurement
5) Power meter
6) Optical Light Source

8.15. Conduit Installation and Trenching

The contractor to install 2 HDPE pipes in main feeder duct. Hardware includes, but not limited to HDPE Pipes, spacers, connectors, sweeps, slip joints, adhesives, clean backfill, pull string, warning tape, and plugs. Install includes digging the trench, shoring as required, placing the conduits, placing clean fill in layers around the condition and tamping, placing the warning tape and restoring the surface to original condition. Includes hand digging around all known obstructions along the work path. The ducts shall have at least 24" of cover above the encasement. After the installation each duct shall be cleaned with a mandrel and a pull string placed in each duct and the duct plugged if cable is to be pulled rather than blown.

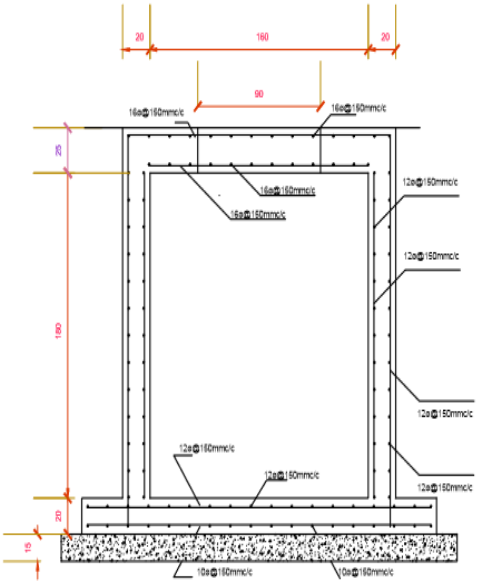
- The duct system should provide sufficient duct capacity to avoid costly repetitive civil work.
- The duct system should avoid nuisance and disruption to public arising from repetitive pr remedial civil works.
- The duct system should provide for safe and reliable long term operation of both the installed telecom infrastructure and other services infrastructure.
- The location of the ducts should be laid under a suitable verge. Where no verge is provided, the ducts should be laid under the pavement or footway, and if this is not possible, under the roadway.
- Manholes and hand holes shall be placed along the route, at street crossing, near cabinets, or otherwise at a maximum spacing of 248 meters on a straight cable run except cross connection road which distance can be fix after survey .

The trench will contain buried at a sufficient depth to provide reasonable protection against vandalism and erosion.

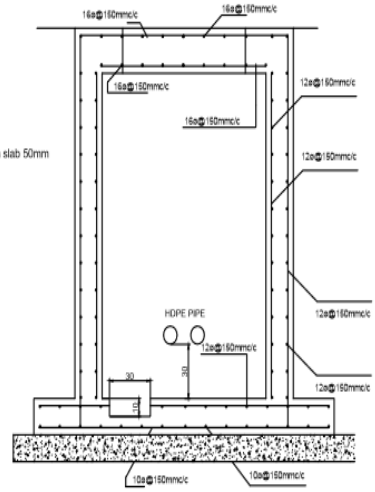
Trenches shall be dug in such a way that the minimum cover over the uppermost layer of 1.60m and 1.80m. The bottom of the trench shall be level, covered with sand free from stones and rubbish, or other objects, which may damage the cable and compacted to a thickness of each 25cm three times .

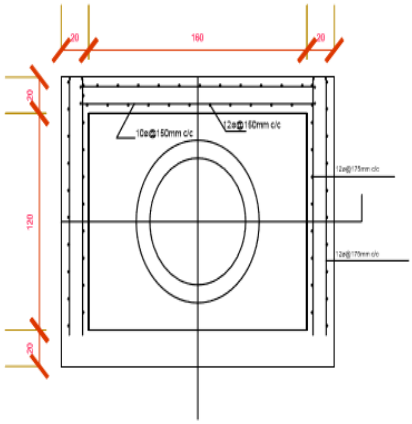
The trench shall be properly marked for maintenance and repair purposes.
A warning tape shall be laid along the whole length of the trench to prevent accidental damage to the cable.
Trenched area should be re build as a original conditions.

8.16. Manhole

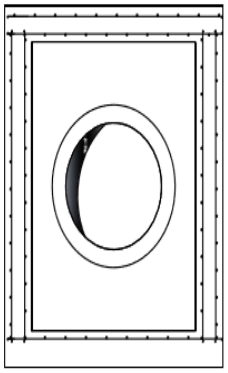


Note:
1. All Dimensions are in cm
2. Concrete -fc=20 MPa (28 days cylinder strength)
3. Steel - Grade 60 (fy=420 MPa)
4. Clear Cover to reinforcement in wall shall be 25mm and in slab 50mm
5. Read figure dimention only
6. Angle of repose of slab soil= 32
7. Standard unit weight 17kg/m3
8. Unit weight of water = 9.81 KN/M3

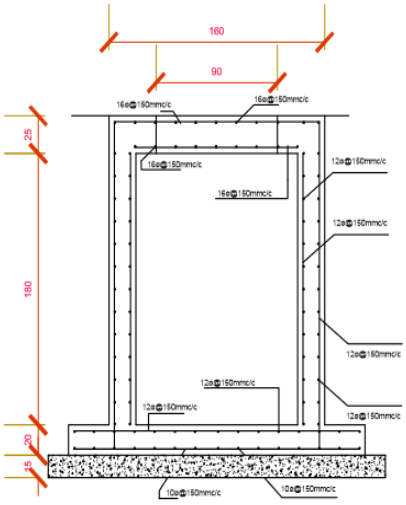




Note:
1. Deformed steel bars will be used.
2. Generally Speaking the steel bars should not be connected.
3. When the connection is necessary, the overlap distance should be more than 150mm.



8.17. Hand hole



Note:
1. All Dimensions are in cm
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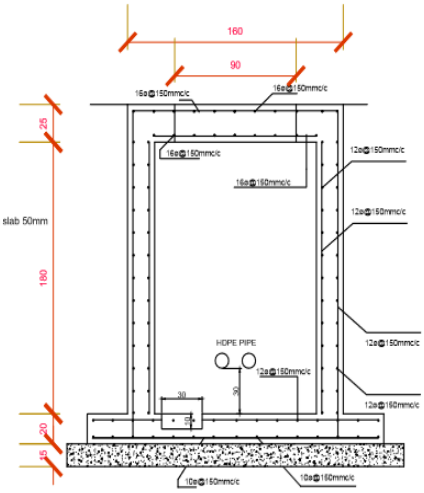
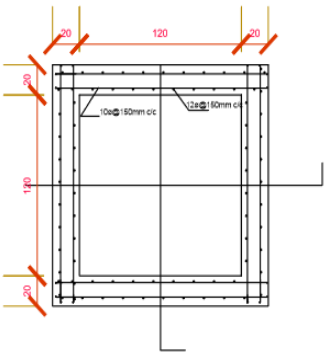
3. Steel - Grade 60 (fy=420 MPa)
4. Clear Cover to reinforcement in wall shall be 25mm and in slab 50mm
5. Read figure dimention only
6. Angle of repose of slab soil= 32
7. Standard unit weight 17kg/m3
8. Unit weight of water = 9.81 KN/M3





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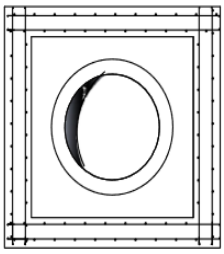

9. Hardware Useful life

The contractor shall guarantee that the system active hardware will run without major technical Hazard for at least ten (10) years and passive equipment for 30 years from signing the Operational Acceptance Certificate.

10. Experience

The bidder should have experience of FTTC, FTTH or legacy Fixed Line Network installation and implementation or any other similar project. MAF must be provided by the Vendor.

11. Training

The company will provide basic training for 4 Engineers before PAC and advanced training for 4 engineers after PAC in the country of production of GPON equipment. The winner company will bear all the costs which includes Tickets, visa, stay, food transportation etc.

12. Project Duration

The project duration will be four Months.

13. Terms of Payment

The Terms of payment to be made to the Supplier under this Contract shall be as follows:

1- 20 % of total contract value as advance payment will be paid to the supplier against bank guarantee.
2- 60% of total contract value will be paid to the supplier after project is implemented in Kabul.
3- 10 % of total contract value will be paid to the supplier against completion of installation & integration of services & PAC
4- 10% of total contract value will be paid to the supplier after FAC.

1- ATP: ATP or Acceptance Test Procedure will be done after equipment installation & integration. AFTEL team will test the quality of installation, e capacity, physical and stability condition of hardware part, software part, check the alarms, and all the monitoring parameters. ATP will be done by AFTEL team
2- PAC: Preliminary Acceptance Certificate refers to network equipment acceptance certificate signed by the customer. After equipment installation & integration, both AFTEL and supplier team will do the ATP, if there be non-service affecting issues during ATP then AFTEL will sign the PAC.
3- **FAC:** Final Acceptance Certificate (FAC) is a certificate that documents Provider's equipment or services have satisfied the final acceptance criteria and process as stated in a contract. If there be no issue during ATP, or contractor solved all the issues, FAC will be done after three months of PAC certificate issuance date, for the FAC there must no problems or issues related to Provider / contractor.