

# **Bid Addendum Report**

## **Nepal Telecommunications Authority**

Nepal Telecommunications Authority  
Kathmandu  
Kathmandu  
Nepal

**Addendum No: null**

**Published On: 27-10-2019 00:00**

**Invitation No: 03/NTA/WIFI/2076/77**

**Dated On: 27-09-2019 17:00**

## Following changes are made in the bid document

### Chapter: General Information

Sl. No.	Relavant Clause No / Name	Existing Clause	Modified Clause
1	Clarification Submission Date	Not Provided in Bid Document	2019-10-27 00:00:00
2	Bid Submission DeadLine	2019-11-05 15:00:00	2019-11-12 15:00:00
3	Bid Opening Date	2019-11-05 16:00:00	2019-11-12 15:30:00

**NEPAL TELECOMMUNICATIONS AUTHORITY (NTA)**

Kamaladi, Kathmandu, Nepal

**ADDENDUM No. 1**

**Implementation of Wi-Fi Religious and Tourism Places of Nepal (Contract No. IFA  
No.03/NTA/WIFI/2076/77)**

**(Date of issue of Addendum No 1: 27<sup>th</sup> October, 2019)**

Pursuant to Clause No. 10 of ITA of RFA document, all prospective applicants are hereby informed that following are the amendment made in the RFA Documents for above said contract:

Reference	Original Provision	Amended Version
ITA 22.1 of data sheet	The deadline for Application submission is: Date: 5th November, 2019 Time:15:00 Hr	The deadline for Application submission is: Date: 12th November, 2019 Time:15:00 Hr
ITA 24.b of data sheet	The deadline for withdrawal, or modification of Applications: Date: 5 th November, 2019 Time:15:00 Hr Place: Nepal Telecommunications Authority Kamaladi, Kathmandu, Nepal	The deadline for withdrawal, or modification of Applications: Date: 12th November, 2019 Time:15:00 Hr
ITA 25.1 of data	The Application opening shall take place at: Date:5 th November, 2019 Time:16:00 Hr Place: Nepal Telecommunications Authority Kamaladi, Kathmandu, Nepal	The Application opening shall take place at: Date:5 th November, 2019 Time:15:30 Hr Place: Nepal Telecommunications Authority Kamaladi, Kathmandu, Nepal
Clause 3 Network Roll- Out Requirements of Section IV : Terms of Reference	a) 50% of work : Within 4 months from the date of signing of the contract b) Remaining 50% of work: within 6 months from the date of signing of the contract	a) 50% of work : Within 5 months from the date of signing of the contract b) Remaining 50% of work: within 8 months from the date of signing of the contract

**NEPAL TELECOMMUNICATIONS AUTHORITY (NTA)**

Kamaladi, Kathmandu, Nepal

**Clarrification No. 1**

**Implementation of Wi-Fi Religious and Tourism Places of Nepal (Contract No. IFA No.03/NTA/WIFI/2076/77)**

**(Date of issue of Clarrification No 1: 27<sup>th</sup> October, 2019)**

Pursuant to Clause No. 9 of ITA of RFA document, all prospective applicants are hereby informed that following are the amendment made in the RFA Documents for above said contract:

Query	Clarification
Scope of Work for the Provided Quantity of optical Fiber for each package	Tentative Quantity of each package is as APPLICANT'S FINANCIAL APPLICATION FORM of Section 3 of RFA. If quantity varies then final contract price will be commutated on basis of unit price.
Do not make any restrictions as how the sites are connected (by Microwave or Fiber)	Network and sites connection should be by Fiber. Difficult to maintain Microwave Network.
Bid Submission Process	<p>Bidders submit their bids electronically, the electronic bidding submission procedures shall be: Bidders submitting Bids electronically shall follow the electronic bid submission procedure specified in this clause.</p> <ol style="list-style-type: none"><li>i. The bidder is required to register in the e-GP system <a href="https://www.bolpatra.gov.np/egp">https://www.bolpatra.gov.np/egp</a> following the procedure specified in e-GP guideline.</li><li>ii. Interested bidders may either purchase the bidding document from the Purchaser's office as specified in the Invitation for Bid (IFB) or bidders may download the IFB and bidding document from e-GP system.</li><li>iii. The registered bidders need to maintain their profile data required during preparation of bids.</li><li>iv. In order to submit their bids the cost of the bidding document can be deposited as specified in IFB. In addition, electronic scanned copy (.pdf format) of the bank deposit voucher/cash receipt should also be submitted along with the technical bid.</li><li>v. The bidder can prepare their bids using data and documents maintained in bidder's profile and forms/format provided in bidding document by Purchaser. The bidder may submit bids as a single entity or as a joint venture. The bidder submitting bid in joint venture shall have to upload joint venture agreement along with partner(s) Bolpatra ID provided during bidder's registration.</li><li>vi. In case of bid submission in JV, the consent of the partners shall be obtained through the</li></ol>

confirmation link sent to the registered email address and the partners shall have to acknowledge their confirmation.

**The required forms and documents shall be part of bids.**

No.	Document	Requirement	Remarks
1.	Letter of Bid	Mandatory	PDF
2.	Bid Security	Mandatory	PDF
3.	Company registration	Mandatory	PDF
4.	VAT registration	Mandatory for domestic bidders	PDF
5.	Business Registration Certificate	if required, Mandatory	PDF
6.	Tax clearances certificate or evidence of tax return submission or extension of time	Mandatory for domestic bidders	PDF
7.	Power of Attorney of Bid signatory	Mandatory	PDF
8.	Bank Voucher for cost of bid document	Mandatory	PDF
9.	Completed Price Schedule	Mandatory	PDF or Web Forms
10.	Qualification Documents	Mandatory	PDF
11.	Technical specifications	Mandatory	PDF or Web Forms
12.	Delivery and Completion Schedule	Mandatory	PDF or Web Forms

13.	Additional Documents	If applicable	PDF
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- vii. For verifying the authentic user, the system will send one time password (OTP) in the registered e-mail address of the bidder. System will validate the OTP and allow bidder to submit their bid.
  - viii. Electronically submitted bids can be modified and/or withdrawn through system. The bidder may modify their bids multiple times online within bid submission date and time specified in e-GP system. Once a Bid is withdrawn, bidder won't be able to submit another bid response for the same bid.
  - ix. The Bidder / Bid shall meet the following requirements and conditions for e-submission of bids;
    - aa) The e-submitted bids must be readable through PDF reader.
    - bb) The facility for submission of bid electronically through e-submission is to promote transparency, non-discrimination, equality of access, and open competition in the bidding process. The Bidders are fully responsible to use the e- submission facility properly in e-GP system as per specified procedures and in no case the Purchaser shall be held liable for Bidder's inability to use this facility.
- When a bidder submits electronic bid through the PPMO e-GP portal, it is assumed that the bidder has prepared the bid by studying and examining the complete set of the Bidding documents including specifications, drawings and conditions of contract.

## **Technology and Standards**

### **I. Wi-Fi**

Wi-Fi stands for a trademarked phrase which means IEEE 802.11x, and is a short-range wireless transmission technology. Wi-Fi is a technology using wireless means to interconnect personal computers, hand-held devices (such as PDA, smart phone etc.) and other terminals. It is a brand of wireless network communication technology which is held by the WiFi Alliance. The purpose is to improve the interoperability between wireless network products based on the IEEE 802.11 standards. IEEE 802.11 standards have a big family, including about 22 types of standards. In the past ten years, 802.11b, 802.11g, 802.11n, 802.11a and 802.11ac are utilized widely. However now the popular usage is for combination of 802.11g, 802.11n and 802.11ac standards that operate in the 2.4GHz and 5.8 GHz bands, with high speeds.

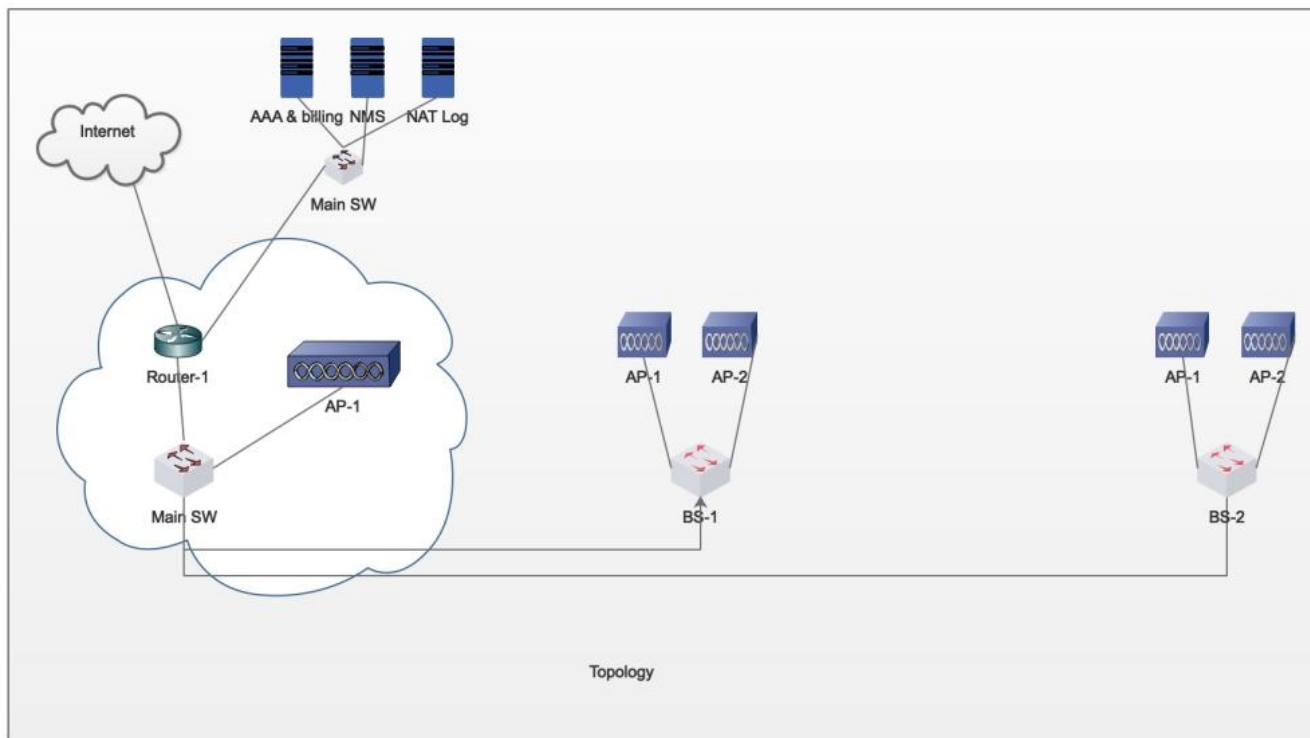
## **Technical Design**

### **I. Technical Design**

MAXTECH proposes wireless on captive portal technology that provides internet access to subscribers and offers a wide range of telecommunication services and applications.

### **II. System Architecture**

The system is designed to cover a wide area which has been broken down into specific segments, connecting all the clients with a main server that has full control of the system. The overall system architecture is composed by different access points connected to each other. This approach allows creating a scalable net which is able to cover a vast area, connecting the main server with all the clients within range of any of the APs deployed.



Proposed architecture is conceptually organized into three levels, which are: The management level (main server), The network connection level (Backbone Net), and the user level.

- Management Level: The top level of the system composed by a server that controls user authentication. This level is based on a web server to interact with the subscribers, a database used to store system information and a control unit that converts management decisions into traffic rules. Besides, the server has a high-speed connection to the internet, along with a wireless or an ethernet connection to link it with the backbone net level.
- Backbone Net level: The propose of this level is to work as bridge, connections subscribe to the main server. Group of nodes are distributed in wide area and connected to the main server and to other nodes through either lease services form third parties or own services. Connecting media could be optical fiber or radio link or both.
- User level: At the lowest level, we have the actual subscribers. These can connect directly to the wireless infrastructure using their own Wi-Fi enabled computing devices. Such devices can be quite heterogeneous e.g., cell phones, PDAs, laptops etc. The only restrictions are these devices must include both a Wi-Fi interface and a web browser.



The proposed system should interact with clients through Captive Portal technology. When a user first connects to WiFi and opens a web browser, he/she should automatically be redirected to the main page of the portal; this process should be transparent to the user. The server should control user access depending on whether he/she is a register/valid user or not. Depending on the user's access level, different services should be provided.

The first time a user access the system he/she should be asked to register himself/herself with the Captive Portal. After a login process, the user can use any of the freely available internet access or can purchases different package of internet. System should allow each client to choose among multiple connection speeds, making the price variance accordingly.

### **Core Elements**

When an user connects to wireless system, he/she usually does not know any connection information or URL. System should automatically re-direct all the unregistered user access to landing page by typing any URL and trying to access internet. The most appropriate solution for this task is to develop a captive portal.

- Enables Authentication, authorization and accounting (AAA) for tracking user activities on an IP-based network and controlling their access to network resources.
- Required logs, Nat log, browsing information and user identification should be managed as per legal provision of government of Nepal.
- Offers prepaid billing and postpaid billing functions with single invoice facility for multiple services.
- Provides operators and service providers to implement bandwidth restriction based on subscribers and data usage in addition to quotas on individual or shared basis as well on services like video.
- Subscriber management system facilitates service providers to manage unlimited number of users in a dynamic network with user addition/updation/deletion management functions, user migration facilities and user authentication process.
- Offers free access for specific web server.

## Technical Specifications

The problems/limitations that the project faced can be enumerated as follows:

i. Tower

The towers shall be four legged and able to support the loading of the antennas as per the site. It shall be operational and able to withstand the wind velocity corresponding to wind 180 Km/Hr of IS: 875 (Part 3) (1987). All the parts are to be hot dip galvanized as per IS: 4759 (1996). Zinc for galvanizing should conform to IS: 13229- 1991 or IS: 209 (1992).

Tower can be setup Ground Based Towers (GBT), Roof Top Towers (RTT) as per the requirement of site. Other Standard of tower should build as per the government standard.

ii. Server

**Server AAA billing**

Features	Minimum Technical Specification
Form Factor	Rack/Tower
Processor	Xeon Processor, Quad Core
Memory	8 GB
Storage	1TB SSD
Controller	Internal Raid Controller
Power Supply	Redundant Power Supplies
USB Ports	4
Remote Management	Yes
Others	ECC memory, hot-plug hard drives, hot-plug redundant cooling, hot-plug redundant power, tool-less chassis, support for virtualization

**NMS Server**

<b>Features</b>	<b>Minimum Technical Specification</b>
Form Factor	Rack/Tower
Processor	Xeon Processor, Quad Core
Memory	8 GB
Storage	1TB SSD
Controller	Internal Raid Controller
Power Supply	Redundant Power Supplies
USB Ports	4
Remote Management	Yes
Others	ECC memory, hot-plug hard drives, hot-plug redundant cooling, hot-plug redundant power, tool-less chassis, support for virtualization

**NAT log**

<b>Features</b>	<b>Minimum Technical Specification</b>
Form Factor	Rack/Tower
Processor	Xeon Processor, Quad Core
Memory	8 GB
Storage	6TB SSD

Controller	Internal Raid controller
Power Supply	Redundant Power Supplies
USB Ports	4
Remote Management	Yes
Others	ECC memory, hot-plug hard drives, hot-plug redundant cooling, hot-plug redundant power, tool-less chassis, support for virtualization

iii. Application

Features	Minimum Technical Specifications
RADIUS Server	PAP or CHAP support
	Supports MySQL or Oracle Database
Authentication	Login through mobile app/ web-based
	Device based auto-login
	MAC Based Auto Login
Authorization	Based on MAC and IP address
	Re-Authorization Functionality
Accounting	On hours, days, data transfer
Bandwidth Management	Tiered Bandwidth Management
	Committed and Burstable Bandwidth

	Individual and Shared Bandwidth Quota
	Bandwidth Scheduling & Fair Usage Policy
	Restrict Users Based on Data and Bandwidth
User Management	Complete User Life Cycle Management
	Account ID based User Credentials
	Demographic Field Option
	Create   Activate   Suspend   Renew   Archive Users
	User Management Based Reports
	User My Account
Package Management	Prepaid & Post-paid packages
	Create hourly and Day based plans
	Registration & Renewal packages
	Facility to Carry-Forward Quota
	Facilitates Top-up for prepaid plans
Internet Billing	Time Quota Based Billing
	Peak & Off-peak Billing
	Pulse Based Rating
	Pre-paid and Post-paid Billing
	Customizable Invoice Template

	Tax and Discount Facility
Coupon Management	Branding & Customizable Coupon Templates
	Create Package & Area wise Coupons
	Facilitates Online Coupon Purchase
	Instant coupon generation in printable formats
	System generated username & passwords
	Pin Aging - Coupons with expiry date
Captive Portal Capabilities	Create Customizable Login Pages (HTTP enabled)
	Device Based Login Pages (Mobile/Laptop)
	Create Page for SMS OTP based login
	User Self Registration
	Promotions and Branding options
Administration	Role Based Multiple Level Administration (ACL) For Admin GUI & Console
	Change Password Options
	Syslog Configurations
	Data Backup and Restore
	Network Management Options
	Multi-functionality Dashboard Facility
	Ease of Admin Interface

	Quick Configuration Options
Reporting	Admin GUI Usage Log - Audit Reports
	Syslog Integration
	Reports in CSV/ Printable/ Graphical/ PDF
	Diagnostic and System Health Check Tools
	MIS & BI Reports
Area Management	Create Multiple Area In Network
	Create Single or Multiple Area
	Area Based: Package   Vouchers   Invoice   MIS Reports
	Area Based Payment Tracking
Payment Gateway	Facilitates Online Payment Receivables
	Flexible to Integrate with any Payment Gateway
Third Party Integrations	CRM Integration
	Third Party Access Controller & Authentication System
	Attribute Mapping
Alert Management	Email Based Alerts
	Event based Customizable Email Templates
	Schedule Alerts for Renewal/Package Expiry
SMS Based Alerts	Click-n-Configure SMS Gateway

	Manage, Try and Create Facility
	Facilitates Different Message Templates
	Send Message at Different Events & Register/ Renew/ Login/ Logout
	Offers Complete log of SMS Sent
	SMPP Support
	Alert Users in-case of Login/ Logout/ Package Expiry etc.
Pop-up window for Live Users	Pop-up Live Message for Network or Technical Problems
	Bill Payment and Promotional Message

iv. Switch

Features	Minimum Technical Specifications
Ports	24 RJ-45 Connectors for 10BASE-T/100BASE-TX/1000BASE-T with Minimum 4 SFP Either Combo or separate
	Auto Medium Dependent Interface (MDI) and MDI Crossover (MDI-X)
	Auto Negotiate/Manual Setting
Minimum Switching capacity	32 Gbps, Nonblocking
MAC table size(minimum)	8000
Minimum Number of VLANs	256 active VLANs (4096 range)
Layer 3 options	Static Routing
	CIDR (Classless Interdomain Routing)



	128 Static Routes
	IPv4
	Forwarding in Silicon Wire-speed Forwarding of Layer 3 Traffic
IPv6	Dual IPv6/IPv4 Stack
IPv6 ACL	Drop or Rate Limit IPv6 packets
IPv6 QoS	Prioritize IPv6 packets in hardware
Web User Interface	Built-in Web User Interface for Easy Browser-based Configuration (HTTP/HTTPS)
SNMP	SNMP Versions 1, 2c, and 3 with Support for Traps
Port mirroring	Traffic on a Port Can be Mirrored to Another Port for Analysis with a Network Analyzer
Other management	Traceroute
	Single IP Management
	SSL Security for Web User Interface
	SSH
	RADIUS
	Port Mirroring
	TFTP Upgrade
	Dynamic Host Configuration Protocol (DHCP) Client
	BOOTP
	Simple Network Management Protocol (SNMP)

	Xmodem upgrade
	Cable diagnostics
	Ping
	Syslog
	Telnet client (SSH secure support)
IEEE 802.1X	802.1X – RADIUS authentication; MD5 hash
	Guest VLAN
	Single/multiple host mode
Access Control	<p>ACLs – drop or rate limit based on:</p> <ul style="list-style-type: none"> <li>• Source and Destination MAC-based</li> <li>• Source and Destination IP address</li> <li>• Protocol</li> <li>• Port</li> </ul>
	VLAN
	Differentiated Services Code Point (DSCP)/IP Precedence
	TCP/ User Datagram Protocol (UDP) Source and Destination Ports
	802.1p Priority
	Ethernet Type
	Internet Control Message Protocol (ICMP) Packets

	Internet Group Management Protocol (IGMP) Packets
	Up to 1018 Rules
Link Aggregation	Link Aggregation using IEEE 802.3ad LACP
	Up to 8 ports in up to 8 groups
Storm Control	Broadcast and Multicast Storm Protection
DoS Prevention	DoS Attack Prevention
Spanning Tree	IEEE 802.1D Spanning Tree
	IEEE 802.1w Rapid Spanning Tree
	IEEE 802.1s Multiple Spanning Tree, Fast Linkover
IGMP Snooping	IGMP (versions 1 and 2) Snooping Limits Bandwidth-intensive Video Traffic to Only the Requestors
Priority Levels	4 Hardware Queues
Scheduling	Priority Queuing and Weighted Round-robin (WRR)
Class of Service	Port based
	802.1p VLAN Priority based
	IPv4 IP Precedence/ ToS/ DSCP based
	DiffServ
	Classification and Re-marking ACLs
Rate limiting	Ingress Policer
	Egress Rate Control

Operating Temperature	32° to 104°F (0° to 40°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Operating Humidity	10% to 90% Relative Humidity, Noncondensing
Storage Humidity	10% to 95% Relative Humidity, Noncondensing
Acoustic Noise	55 dB Max.
Power	100–240V AC, 50–60 Hz; Should be Equipped with Redundant power Supply
Warranty	At least of one year warranty on hardware

v. Router

<b>Features</b>	<b>Minimum Technical Specifications</b>
Minimum Throughput	500 Mbps
Minimum WAN or LAN (10/100/1000Mbps)	4
Minimum DRAM (data plane)	2GB
Minimum DRAM (Control/ Services Plane)	2GB
Minimum Flash Memory	1GB
Power Supply	AC
Redundant Power Supply	Yes

Protocols	IPv4, IPv6, static routes, Routing Information Protocol Versions 1 and 2 (RIP and RIPv2), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), BGP Router Reflector, Intermediate System-to-Intermediate System (IS-IS), Multicast Internet Group Management Protocol Version 3 (IGMPv3), Protocol Independent Multicast Sparse Mode (PIM SM), PIM Source Specific Multicast (SSM), RSVP, IPSLA, Call Home, EEM, IKE, ACL, EVC, DHCP, FR, DNS, LISP, OTV[6], HSRP, RADIUS, AAA, AVC, Distance Vector Multicast Routing Protocol (DVMRP), IPv4-to-IPv6 Multicast, MPLS, Layer 2 and Layer 3 VPN, IP sec, Layer 2 Tunneling Protocol Version 3 (L2TPv3), Bidirectional Forwarding Detection (BFD), IEEE802.1ag, and IEEE 802.3ah
Encapsulations	Generic routing encapsulation (GRE), Ethernet, 802.1q VLAN, Point-to-Point Protocol (PPP) and PPP over Ethernet (PPPoE)
Traffic Management	QoS, Class-Based Weighted Fair Queuing (CBWFQ), Weighted Random Early Detection (WRED), Hierarchical QoS, Policy-Based Routing (PBR), Performance Routing, and NBAR.
Cryptographic Algorithms	Encryption: DES, 3DES, AES-128 or AES-256 (in CBC and GCM modes); Authentication: RSA (748/1024/2048 bit), ECDSA (256/384 bit); Integrity: MD5, SHA, SHA-256, SHA-384, SHA-512
Warranty	At least of one year warranty on hardware

vi. Ethernet Cable

Ethernet cable should be as per ANSI/TIA-568A/ TIA-568A Category 6 specification

vii. Optical Fiber

Fibers inside the cable must not contain any factory splices. Further, fibers of different manufacturers must not be used in the same cable. The fiber coating shall be strippable for splicing and termination.

Features	Minimum Technical Specification
Mode Field Diameter ( $\mu\text{m}$ ) at 1310 nm	9~10 $\pm$ 10 % (ITU-T rec.G652D)
Cladding Diameter ( $\mu\text{m}$ )	125 $\pm$ 1
Maximum Core Concentricity Error ( $\mu\text{m}$ )	0.6
Coating Diameter ( $\mu\text{m}$ )	245 $\pm$ 5
Maximum Cladding Non-circularity	1%
Maximum Cut-off Wavelength (nm)	1260
Maximum Chromatic Dispersion at 1310 nm	3.5 ps/nm.km
Maximum attenuation range dB/km at 1310/1550 nm	0.36/0.22
Macro bend Loss	@ 1310 nm (75 $\pm$ 2 mm dia Mandrel), 100 turns; Attenuation Rise $\leq$ 0.05 dB  @ 1550 nm (30 $\pm$ 1 mm radius Mandrel), 100 turns; Attenuation Rise $\leq$ 0.05 dB
Zero Dispersion Slope	$\leq 0.092 \text{ ps/nm}^2 \times \text{km Polarization}$
Mode Dispersion Coefficient	$\leq 0.2 \text{ ps/km}^{1/2}$

Standards	ITU-T G.652
Others	The loss increase of 100 turns of fiber, loosely wound with a 37.5 mm radius shall be less than 0.05 dB at wavelengths of 1310 nm.

viii. Rack

Features	Minimum Technical Specification
Power Socket	Inclusive of Power Socket
Fan	Inclusive of Fan
Mount	Standing Rack or Easy Wall Mount Provision
Warranty	One Year on Both Parts and Service

ix. Access Point

Features	Minimum Technical Specification
Standards	IEEE 802.11a/b/g/n/ac/wave-2 Modulation: BPSK, QPSK, CCK, 16/64/256-QAM Radio modes : DSSS, OFDM
Frequency Bands	2.400 to 2.2484 GHz, 5.725 to 5.850 GHz (Country-specific limits apply, some bands require DFS)  (As provisioned by NTA)
MIMO, Streams	2x2:2 MIMO

Channel Width	20MHz, 40MHz, 80MHz
Minimum Transmit Power	2.4GHz : 25dBm 5GHz : 28dBm
Minimum Antenna Gain	2.4GHz : 8dBi 5GHz : 8dBi
Ethernet Ports	Two auto-sensing auto MDIX Gigabit Ethernet (10/100/1000 Mbps) RJ45 Ports
Radio Features	Maximum ratio combining (MRC) Cyclic delay/shift diversity (CDD/CSD) Space-time blocking coding (STBC); Low-density parity check (LDPC) Packet Aggregation: A-MPDU, A-MSDU
Wi-Fi Alliance	Wi-Fi certified a,b,g,n,ac WPA2 – Enterprise, Personal WMM, Passpoint
Environment Rating	IP67
Power Supply	802.3af PoE Injector or PoE switch. 802.3at or PoE+ if using PoE-Out Aux port
Operating Temperature	-30°C to +60°C (-22°F to +140°F)
Operating Humidity	Up to 95% Non-condensing
Management Modes	Standalone with AP GUI (http/https), CLI (Telnet/SSH)
Wireless Security	WPA-TKIP, WPA2-AES, 802.11i WPA-PSK, WPA2-PSK, WPA2-Enterprise 802.1x Authentication with Various EAP Types (EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0/EAPMSCHAPv2, PEAPv1/EAP-GTC, EAP-SIM, EAPAKA, EAP-AKA', EAP-FAST



RF Management	AutoRF Automatically Manages Channel and Power
Guest Access Captive Portal	WLAN Controller Portal Integrates with 3rd Party Guest Access Portals Built-in Portal on AP LDAP & RADIUS authentication Walled Garden with DNS Whitelist Wireless as well as Wired Devices Supported
Rate Limiting	Per-client, Per-WLAN Static and Dynamic Rate Limiting
Airtime Mgmt	Airtime Fairness, Band Steering, Band Balancing
AAA Support	RADIUS Authentication, Accounting, Dynamic Authorization (CoA, DM). Server Failover, Load-balancing
QoS	802.11e/WMM QoS. DSCP/ToS Mapping
Ethernet (L2) Services	802.1p/802.q,VLAN per SSID LLDP. IGMP Snooping (v1/v2/v3)
Mesh	WDS Mesh with Single and Multiple Radio Hops
Network Services	NAT, DHCP Server
Warranty	At least of one year in hardware and software

x. Solar PV

Features	Minimum Technical Specification
Cell type	Mono or Poly Crystalline
Performance Guarantee (First Year)	≥ 97% of Standard Test Condition
Performance Guarantee (10 Years)	≥ 90% of Standard Test Condition

Others	The Mounting Structure must be made of Aluminium Light-weight rust-proof sections/ angles/ channels
Warranty	At least of five years of warranty

xi. UPS

Features	Minimum Technical Specification
AC Voltage Output	Pure Sine wave 220VAC
Output Voltage Regulation	220V+/-2%
AC Input Voltage Range	170V ~ 260V
AC Input Frequency Range	50Hz+/- 1Hz
Warranty	At Least of One Year Replacement Warranty

xii. Battery

Features	Minimum Technical Specification
Battery Type	Gel
Battery Voltage	12 Volt Cell
Cycle Life at 25°C	1200 cycles @ 80% and 5000 cycle @ 20% Depth of Discharge (DoD)
Self-discharge	<3% per Month at 25°C
Operating Temperature	-10°C to 45°C with Temperature Coefficient Data

Charging Efficiency	AH Efficiency Above 90%, WH Efficiency: Above 80%
Certification	ISO 9001 and ISO 14001; RETS & PIT Pass Certificates
Warranty	Full 4 Years replacement warranty

xiii. Earthing

- The solar PV system shall be provided with Equipment Earthing and Lighting Protection System (LPS).
- Separate earthing shall be done for both LPS and equipment.
- The earthing plate/ rod/ strip must be of copper type with required backfill compound.
- The resulting earthing resistance must be less than 5 ohm. However, in dry and rocky area up to 10 ohm may be acceptable.

xiv. Accessories

Should be used commonly used standard accessories.