

## Section 7. Technical Specifications

### 7.1 MSPP

#### 7.1.1 INTRODUCTION

7.1.1.1 The Specifications in this chapter covers the technical requirements of Multi Service Provisioning Platform (hereinafter “MSPP”) on single mode optical fibers conforming to ITU Rec. G. 652 at 1550 nm and 1310 nm.

7.1.1.2 The MSPP equipment/system shall conform to the following ITU-T and IEEE recommendations. The latest version of ITU-T recommendations at date of contract signature will also be applicable.

G.702 ‘Digital hierarchy bit rates’

G.703 ‘Physical/electrical characteristics of hierarchical digital interfaces’

G.704 ‘Synchronous frame structures used at 1544, 6312, 2048, 8488 and 44736 Kbps hierarchical levels’

G.707/Y.1322 ‘Network node interface for the synchronous digital hierarchy (SDH)’

G.781 ‘Synchronization layer functions’

G.783 ‘Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks’

G.784 ‘Synchronous Digital Hierarchy (SDH) management’ (06/99)

G.798 ‘Characteristics of optical transport network hierarchy equipment functional blocks’

G.813 ‘Timing characteristics of SDH equipment slave clocks (SEC)’

G.823 ‘The control of jitter and wander within digital networks which are based on the 2,048 Kbps hierarchy’

G.825 ‘The control of jitter and wander within digital networks which are based on the Synchronous Digital Hierarchy (SDH)’

G.841 ‘Types and characteristics of SDH network protection architecture’

G.957 ‘Optical interfaces for equipments and systems relating to the SDH’

G.7041/Y.1303 ‘Generic framing procedure (GFP)’

G.7041/Y.1303 ‘Amendment 1’

G.7042/Y.1305 ‘Link capacity adjustment scheme for virtual concatenated signals’

G.7042/Y.1305 ‘Corrigendum 1’

G.7042/Y.1305 ‘Corrigendum 2’

IEEE 802.1q ‘Virtual Bridged Local Area Networks. 2003 edition’

G.8031 .for Ethernet Linear protection switching

G.8032 for Ethernet Ring protection

Y.1731 for performance monitoring

IEEE 802.3 ‘Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications. 2002 edition’

Any deviation of clause 7.1.1.2 shall be considered as “**Major Deviation**”.

7.1.1.3 The following interfaces shall be supported in the offered MSPP transmission system:

- 1) E1 at 2,048 Kbps, 75 ohm
- 2) STM-1 (including STM-1 POS) at 155,520 Kbps
- 3) STM-16 (including STM-16 POS) at 2,448,320 Kbps
- 4) Fast Ethernet (L1 and L2 Type)
- 5) Gigabit Ethernet (L2 Type)

Any disagreement or deviation of the clause 7.1.1.3 and its sub-clauses will be considered as “**Critical deviation**”.

7.1.1.4 The supply shall consist of the required MSPP equipment associated, Batteries, Rectifiers and Network Management System. The MSPP equipment, Batteries and Rectifiers will install at 23 stations of Bangladesh Betar.

Any disagreement or deviation of the clause 7.1.1.4 will be considered as “**Change of Substance**”.

## 7.1.2 NETWORK CONFIGURATION

The MSPP system supplied by Bidder/Manufacturer shall support the following network configurations;

- 1) Linear add/drop multiplexing (ADM)
- 2) Multi-Ring
- 3) SDH sub-Network Connection Protection Ring (SNCP Ring)
- 4) Multiplexer Section Shared Protection Ring (MS-SPRing)
- 5) Subtending Ring
- 6) Point-to-point with or without 1+1 MSP.

Any disagreement or deviation of the clause 7.1.2 and its sub-clauses will be considered as “**Critical deviation**”.

## 7.1.3 ADD/DROP MULTIPLEXER EQUIPMENT

7.1.3.1 The equipment shall provide the ability to access VC's from STM-N signal. A mixture of VC's {E1, STM-1, STM-16, VC4-4C, VC4-16C, shall be possible.

7.1.3.2 Tributary and Remote loopback functionality shall be provided for test purpose.

7.1.3.3 The MSPP equipment shall terminate and originate both the Multiplexer Section Overhead (MSOH) and Regenerator Section Overhead (RSOH).

- 1) Automatic Protection Switchover for STM-N signals shall be available on tributary interfaces.

- 2) The equipment shall offer the following network protection: linear multiplex network protection (MSP), sub-network connection protection and MS-SPRing.

Any deviation of clause 7.1.3 shall be considered as “**Major Deviation**”.

#### 7.1.4 SWITCHING CAPACITY AND PROTECTION

##### 7.1.4.1 Switching and/or cross connect matrix

- 1) Switching matrix shall be non-blocking at VC12, VC3 and VC4 level for STM-16 and STM-1, VC4-4C, VC4-16C.
- 2) Grooming at the VC-12 level shall be supported for STM-1, STM-4, STM-16 , VC4-4C, VC4-16C.
- 3) Switch matrix protection and Optical TPS (Tributary Processing Board) shall be supported.

##### 7.1.4.2 Bidder/Manufacturer shall provide the switching capacity at High Order (HO) & Low Order (LO) from a single shelf as follows;

###### a. For MSPP

- 1) Higher order: 80G or more
- 2) Lower order: 40G or more

Any disagreement or deviation of the clause 7.1.4.1 and/or 7.1.4.2 and their sub-clauses will be considered as “**Change of Substance**”.

##### 7.1.4.3 Hardware protection and redundancy

- 1) Bidder/Manufacturer shall describe whether the cards are protected or not and its type such as 1+1 or N+1
- 2) Cross connection matrix & timing card, power supply card and aggregation signal cards shall be supported by 1+1 protection.

Any disagreement or deviation of the clause 7.1.4.3 and its sub-clauses will be considered as “**Change of Substance**”.

##### 7.1.4.4 Traffic protection

- 1) Path protection (SDH sub-Network Connection Protection Ring (SNCP Ring) protection shall be supported.
- 2) MSP linear 1+1 and Multiplexer Section Shared Protection Ring (MS-SPRing) protections shall be supported. If the optical ports are not configured as 1+1 MSP then they shall independently.
- 3) Sub-50ms packet services protection on single ring shall be supported as per ITU G.8032
- 4) At least one kind of path protection is mandatory.
- 5) Any variation shall be indicated in the offer.

Any disagreement or deviation of the clause 7.1.4.4 and its sub-clauses will be considered as “**Critical deviation**”.

## 7.1.5 OPTICAL INTERFACES FOR SYSTEM

7.1.5.1 Optical interfaces for system shall be according to ITU-T Rec. G.957 and G.691.

7.1.5.2 The MSPP system offered by Bidder/Manufacturer shall provide the following interfaces and wavelength.

- 1) Digital Signal: STM-1, STM-4, STM-16 according to Rec. G.707/Y.1322, G.783 and G.798.
- 2) Operating wavelength range: 1530~1570nm and 1293-1334nm (Except for SX SFP of GE)
- 2) STM-1=20Km, STM-4=10Km, STM-16=40/80Km, STM-64=80Km, GE=10Km or higher.

7.1.5.3 MSPP system interfaces

- 1) STM-1, STM-4, STM-16 interfaces shall be compliant with ITU-T Recommendation G.957.
- 2) E1 interface shall be compliant with ITU-T Recommendation G.703.
- 3) Parameters and STM-1, STM-4, STM-16 optical interfaces will be as per relevant ITU-T Recommendations, G.707, G.783 and G.798. Bidder/Manufacturer should indicate any deviation/ elaboration of the ITU Recommendation.
- 4) 2 Mbps tributaries shall be 75 ohm.
- 5) Management interfaces applied to this MSPP equipment shall be compliant to ITU-T Recommendation G.703. Bidder/Manufacturer may indicate other management interfaces of their system.
- 6) External synchronization shall be a 2048 Kbps interface as defined by ITU-T Recommendation G.703, Section 9. The impedance of 75 ohm should be supported.

Any deviation of clause 7.1.5 shall be considered as “**Major Deviation**”.

7.1.5.4 Ethernet interfaces

The proposed MSPP system shall support the following.

- 1) The Ethernet signals may be 100Base-FX, 100Base-TX and 1000Base-SX/LX.
- 2) The proposed MSPP system shall support Ethernet over SDH (EoS) functionality as follows;
  - a) Low order virtual concatenation (VC-12-Xv) and high order virtual concatenation (VC-3/4-Xv)

- b) EoS frame format process by Frame Mapped Generic Framing Procedure (GFP-F)
  - c) EoS bandwidth adjustment by Link Capacity Adjustment Scheme (LCAS) (ITU-T G.7042)
  - d) Both copper Fast Ethernet (FE) and optical Gigabit Ethernet (GbE) ports will support auto-negotiation capabilities as per IEEE 802.3 standards. Auto-negotiation feature shall be user-configurable
  - e) Jumbo frames with a maximum MTU of 9216 bytes on each port
  - f) IEEE802.3x Flow Control and Back-pressure.
  - g) Ethernet cards shall support minimum 48msec differential delay compensation.
  - h) It should be possible to map upto 48 VC-12s per 10/100 Mbps Ethernet port. The maximum bandwidth available for all Ethernet interfaces combined should be 63 VC-12s(One STM-1)
  - i) It should be possible to map at least 7 VC-4s per 1000 Mbps Gigabit Ethernet port.
- 3) Any other latest features as available at the time of delivery of the system shall also be provided.

Any disagreement or deviation of the clause 7.1.5.4 and its sub-clauses will be considered as “**Major deviation**”.

#### 7.1.5.5 LAYER-2 Switching Functionality

For Ethernet interface the MSPP system (for both type-1 and type-2) must have provision to support layer-2 switching functionality (in addition to above mentioned in clause 4.1.5.4) as follows;

- 1) The card shall support flow control with full bandwidth mapping of 10BaseT/100BaseTX/1000BaseSX or GigE clients into SDH containers. It shall be possible to support 100% of the achievable (possible within the frame size and overhead constraints) throughput for all packet sizes □ 64-bytes. Maximum Transport Unit is configurable up to 9600 bytes.
- 2) Traffic control (IEEE 802.3) by pause framing. If the local link partner of the port does not act on received PAUSE frames (stop sending client packets for specified time) then Ethernet packets received by the tributary card will be discarded if necessary, until the rate of transmission of client traffic falls below the available SDH bandwidth. Errored frames received at the Ethernet interface shall be counted and discarded.
- 3) L2 address table shall at least support 32 K entries.
- 4) It shall support L2 multicasting with at least 256 entries
- 5) The card shall support static configuration of VLANs ranging from 2 to 4094. Shall support configuration of VLAN ID (PVID) on per port basis. PVID is used to tag incoming frames, which are untagged or priority tagged. The range of PVID is from 1 to 4094.

- 6) It shall support VLAN stacking (Q-in-Q) as per 802.1ad. When Q-in-Q mode is enabled on a port, it shall be possible to configure a new tag, called a Service Provider VLAN (SPVLAN), which comprises of VLAN ID and Priority. The possible range for the new VLAN ID shall be from 1 to 4094. The range for Priority shall be from 0 to 7.
- 7) It shall provide services like EPL, EVPL, EPLAN, and EVPLAN. Shall process Ethernet supported IPv4 and IPv6 traffic.
- 8) It Shall Support Link Aggregation as per IEEE 802.3ad. It shall be possible to configure/bundle more than 2 customer facing ports in a link aggregation group (LAG).
- 9) Point-to-point, Point-to-Multipoint and Multipoint-to-Multipoint VLAN tunneling shall be supported.
- 10) Spanning Tree Protocol (STP, IEEE 802.1d) or rapid STP (IEEE 802.1w), VLAN tagging and classification (IEEE 802.1Q), Per VLAN STP (IEEE 802.1s)
- 11) The total uplink bandwidth from Ethernet card shall be STM-8 (8 numbers of STM-1).
- 12) 8 Class of Service (CoS) per port. Shall be possible to classify packets into traffic classes based on the priority bits in the IEEE 802.1Q header, referred to as the IEEE 802.1p bits, at minimum. Shall be possible to set Port based CoS and Service Tagged based CoS.
- 13) Up to 2000 Ethernet services. The services supported can be a mix of E-Line and E-LAN as defined in MEF 6, MEF 9 and MEF 10 specification documents.
- 14) Sub-50ms packet services protection on single ring and dual-ring interconnect topologies with ERP as per ITU G.8032.
- 15) IEEE 802.1ag messages
  - LTM Messages
  - CCM Messages
  - LBM Messages
  - DMM Frames

Any disagreement or deviation of the clause 7.1.5.5 and its sub-clauses will be considered as “**Major deviation**”.

#### 7.1.5.6 Minimum capacity for MSPP

##### MSPP at Aggregation

Name of Mux	No of STM-1 Card (8 port)	No of STM-4 Card (4 port)	No of FE port (4 port)	No of GE port (4 port)	No of E1 Card	Aggregate East and West	Total MuX
STM-16	1+1	1+1	3+1	2+1	3	1+1	1
STM-4	1+1		1+1	1+1	1	1+1	5

STM-1			1+1		1	1+1	18
-------	--	--	-----	--	---	-----	----

Note: The Ethernet interfaces of MSPP shall be of L2 type.

Any disagreement or deviation of the clause 7.1.5.6 and its sub-clauses will be considered as “**Change of Substance**”.

#### 7.1.6 DATA CHANNELS

7.1.6.1 Transfer of bi-directional data between line terminals and regenerators shall be provided using SOH bytes according to ITU-T Rec. G.707/Y.1322.

7.1.6.2 Two data channels using data bits D1 to D12 shall be used for Network Management.

Data communication shall be carried on the SDH Section Overhead Byte. The RS port shall use the D1-D3 and the MS port shall use the OH bytes D4-D12.

Any deviation of clause 7.1.6 shall be considered as “**Major Deviation**”.

#### 7.1.7 OVERALL PERFORMANCE REQUIREMENTS

7.1.7.1 General characteristics of Synchronous Line System shall conform to ITU-T Rec. G.783 and G.798.

7.1.7.2 Error performance

- 1) The SDH shall meet the relevant performance objectives of ITU-T Rec. G.821 & G.921 and any other ITU-T relevant new recommendations at the tie of supply under the worst environmental condition.
- 2) Long term Bit Error Ratio (BER) in each direction shall be less than  $10E-10$  over a period of 14 days.
- 3) The percentage of Error Seconds (ES) shall be measured at 2 Mbps level over a period of 14 days.
- 4) The percentage of severely Error Seconds shall be measured at 2 Mbps level over a period of 14 days.
- 5) The bringing into service limits for any multiplex section BER shall be measured during 4 days on a 2 Mbps port.

Any deviation of clause 7.1.7 shall be considered as “**Major Deviation**”.

#### 7.1.8 JITTER AND WANDER

7.1.8.1 Jitter and wander tolerance for STM-N input ports shall comply with ITU-T Rec. G.825.

7.1.8.2 The output jitter requirement shall comply with ITU-T Rec. G.813.

- 7.1.8.3 Jitter transfer requirements shall be according to ITU-T Rec. G.783, G.813 and G.825.
- 7.1.8.4 The SDH jitter requirements for DS-1E shall be according to ITU-T Rec. G.783.
- 7.1.8.5 Jitter parameters and limit present on STM-N shall be compliant to ITU-T Rec. G.783.

Any deviation of clause 7.1.8 shall be considered as “**Major Deviation**”.

#### 7.1.9 **SYNCHRONIZATION**

- 7.1.9.1 The Synchronization shall be according to ITU-T Rec. G. 783 and Multiplexer Timing Source function shall be provided according to ITU-T Rec. G. 783.
- 7.1.9.2 The External Synchronization Interface shall be 2048 Kbps or 2048 Khz interface as defined in ITU-T Rec. G.703.
- 7.1.9.3 The system shall be able to be synchronized on the following sources:
- 1) 2048 Kbps or 2048 Khz interface by G. 703
  - 2) STM-N aggregate or clock
  - 3) From an internal oscillator with accuracy and stability in accordance
  - 4) With ITU-T recommendations G.813
- 7.1.9.4 The fall back priority for selection of these timing sources and their priority must be selectable by software either by Craft Interface Terminal (CIT) or by the Elements Management System(EMS). Bidder/Manufacturer shall indicate the priority used.
- 7.1.9.5 In case of failure of the active signal source the system shall switch automatically to another predefined source according to the priority setting. The switching process shall not interrupt the carrying traffic.
- 7.1.9.6 The timing selectors and internal oscillator shall comply with G.813 in general.
- 7.1.9.7 The clock reference shall have 4 modes of operation: External, loop-time, free-run, and holdover.
- 7.1.9.8 In the holdover mode, the frequency of the last valid referenced shall be held with a maximum drift of 1 ppm/ day.
- 7.1.9.9 The accuracy of the local oscillator shall be better than + 4.6 ppm.
- 7.1.9.10 Loss of Synchronization
- 1) Restoration to higher priority timing references from lower priority timing references or restoration from self-timing operation, shall be automatic, with an inhibit feature provided.
  - 2) Automatic recovery time shall be 10 to 20 seconds, when valid timing is available and must be hitless.
  - 3) The following conditions shall be regarded as loss of synchronization:
    - a) Loss of main signal
    - b) Receiver AIS



Other criteria for loss of synchronization shall be stated by Bidder/Manufacturer, if any.

Any disagreement or deviation of the clause 7.1.9 and its sub-clauses will be considered as “**Major Deviation**”.

#### 7.1.10 TIMING INTERFACE

7.1.10.1 Physical/electrical characteristics of the external timing signal input of the Network Element (NE) shall be in accordance with G.703.

7.1.10.2 The Network Element (NE) shall provide at least two independent external timing signal input ports.

7.1.10.3 The network Element (NE) shall provide one or more timing output ports with the Physical/electrical characteristics according to G.703.

7.1.10.4 The ports shall be disabled if the system is synchronized to a low-quality timing source.

7.1.10.5 Each network component except regenerators shall have the following external, non-traffic, synchronization ports;  
Input ports for 2048 KHz or 2048 Kbps external timing.

Any disagreement or deviation of the clause 7.1.10 will be considered as “**Major deviation**”.

#### 7.1.11 ALARMS

7.1.11.1 In general all NE shall collect the information generated in each of the functional blocks as defined by ITU-T Rec.G.783 for events as alarms, errors and diagnostic information.

7.1.11.2 The following alarm indications shall be provided but not limited to:

- 1) LOS (Loss of Signal)
- 2) EBER (Excessive Bit Error Ratio)
- 3) SD (Signal Degrade)
- 4) LOP (Loss of Pointer)
- 5) LOF (Loss of Frame)
- 6) MIS (Mismatch path trace ID/signal label)
- 7) LOM (Loss of Multiframe)
- 8) AIS (Alarm Indication Signal).

7.1.11.3 The Alarms from the External Devices such as rectifiers and SMPS can be integrated with the MSPP elements for monitoring.

Any disagreement or deviation of this 7.1.11 will be treated as “**Major deviation**”.

### 7.1.12 TRANSMISSION DELAY

7.1.12.1 The delay time for a transmission signal from its input to its output for Regenerators/OA/pass through ADM shall be less than 10 ms.

7.1.12.2 The delay time for a transmission signal from its input to its output for all other network components shall be less than 125 micro-seconds.

Any deviation of clause 7.1.12 shall be considered as “**Major Deviation**”.

### 7.1.13 Present interface and other requirements of MSPP

7.1.13.1 Type 1 and Type 2 MSPP: Please refer to Annexure – 1

7.1.13.2 Type 3 MSPP: Please refer to Annexure-2

Any disagreement of clause 7.1.13.1 and/or clause 7.1.13.2 will be treated as “**Change of Substance**”. The said penalty is not applicable for any shortage of quantity in the BoQ only if the offered MSPP shelf/sub-rack can accommodate the short quantity. In case of such shortage of quantity in BoQ, the relevant clauses of Chapter 7 will be applicable.

### 7.1.14 OPTICAL SAFETY (AUTOMATIC-LASER SHUTDOWN) REQUIREMENTS

- a. Generally if the section is interrupted (e.g. if a fiber breaks), then measures shall be implemented to ensure that no risk is caused by laser light escaping uninterruptedly.
- b. In the event of an optical signal fail at the incoming port with a duration of < 500 ms, and certainly within 600 ms, the laser in the opposite direction is switched off by the receiver within 0.85 seconds, and the affected segment will be thus shutdown. It shall not be possible to activate the forced facility during error-free operation.

Any disagreement of clause 7.1.14 shall be considered as “**Critical Deviation**”.

### 7.1.16 NETWORK ELEMENT SOFTWARE AND HARDWARE SPECIFIC REQUIREMENTS

#### 7.1.16.1 Interface Terminal

A Interface Terminal enables the maintenance staff at every location to directly access the NE’s management functions via the PC/Laptop interface. It has the ability to operate each type of equipment belonging to the network.

7.1.16.2 Normal operation of the transmission equipment should not require use of the NES functions. The use of terminal shall be reserved for special operational needs requiring direct intervention on the equipment (installation, preparation

for start of service, maintenance and repair, operation in the event of unavailability of the NES.

7.1.16.3 The failure of the management system shall not have any immediate consequences on the function of the telecommunication systems being managed. If there is a failure in the power supply, all data concerning parameter values, network configuration, passwords and user groups shall be retained. After the return of the power supply, the data referred to above shall be reloaded automatically without any mutilation of the data and /or hardware.

7.1.16.4 Bidder/Manufacturer shall provide portable Computer (Notebook PC) of renowned brand and of latest configuration (at least Intel Core I5 processor, 4 GB RAM, 300 GB HDD, DVD Read/Write Combo drive, WiFi facility etc.) for NES function as per the requirement mentioned in the concerned BoQ Form. . After sale service must be available for the offered Notebook PC in Bangladesh.

Any disagreement or deviation of clause 7.1.16 and its sub-clauses will be treated as “**Major deviation**”.

#### 7.1.17 Network Element Software (NES) Features and Facilities

7.1.17.1 NES shall support Graphical User Interface (GUI).

7.1.17.2 Alarms shall be displayed on NES screen in colours representing the severity (critical, major and minor) and the state of the alarm. The operator shall be able to acknowledge and investigate the cause of the alarm.

7.1.17.3 Appropriate network element control system is to be available.

7.1.17.4 NES shall be connected to the proposed node equipment via IP interface.

7.1.17.5 Since the operator has facilities to monitor and control in real-time, the NES shall provide facilities to access logged data and to analyze them.

Any disagreement or deviation of clause 7.1.17 and its sub-clauses will be treated as “**Major deviation**”.

#### 7.1.18 SECURITY MANAGEMENT

The architecture and design proposed for the MSPP shall incorporate features to ensure the security of the network management. This includes access security and data security.

##### 7.1.18.1 Access Security

Facilities shall be provided to ensure that only authorized users are allowed to access all or a certain parts of the system. These include comprehensive log-in operator identities and password facilities.

#### 7.1.18.2 Data Security

Adequate arrangement to protect data and to recover data lost due to stoppage or failure of the EMS hardware or communication system is to be provided.

Any disagreement or deviation of the clause 7.1.18 will be considered as “**Major deviation**”.

#### 7.1.19 ALARM AND EVENT MANAGEMENT

7.1.19.1 Alarms and events shall be reported

7.1.19.2 Adequate arrangement for display and logging shall be provided if there is any event received at the NES.

7.1.19.3 All alarms received at the NES shall cause a change of colour of the appropriate object on screen. There shall be also a visible indication on screen that there is an alarm somewhere in the system.

7.1.19.4 In addition to the displays, alarm details may be displayed in tabular format.

Any disagreement or deviation of the clause 7.1.19 will be treated as “**Major Deviation**”.

#### 7.1.20 PERFORMANCE MANAGEMENT

7.1.20.1 Node performance data shall be collected as defined by standard.

7.1.20.2 The network element shall monitor the performance parameters and records the data for current interval, 15 minutes and previous day.

7.1.20.3 Facilities should be available to backup stored log data and other data

Any disagreement or deviation of the clause 7.1.20 will be considered as “**Major deviation**”.

#### 7.1.21 CONFIGURATION MANAGEMENT

7.1.21.1 MPS/APS groups shall be configured

7.1.21.2 GUI for easy management

7.1.21.3 Creating and deleting cross connects

7.1.21.4 Operator shall be able to manage all proposed MSPP equipment and other related accessories.

Any disagreement or deviation of the clause 7.1.21 will be considered as “**Major deviation**”.

#### 7.1.22 DATA ANALYSIS REPORT

Analysis facilities shall be provided to show how the system has performed over a period of time and to enable identification of trends indicating potential future failures. Data from current logs or historical data may be analyzed.

Results of data analysis can be presented in graphical or tubular format.  
Any disagreement or deviation of clause 7.1.22 will be treated as “**Major deviation**”.

## **7.1.22 NETWORK MANAGEMENT SYSTEM**

### **Network Management System**

Bidder/Manufacturer may upgrade BTCL’s existing NMS system for this project. Or Bidder/Manufacturer shall propose a Network Management System (NMS) for the proposed MSPP. The NMS may be dedicated for MSPPs only or it may be common for both MSPP and MSPP equipment. The proposed NMS system shall consist of one server and there will be at least 1 numbers of clients located at Moghbazar/SBN. The NMS shall be connected to the Internet via Firewall (hardware) Technical specifications of the NMS server and clients are as follows:

#### **NMS Server Specifications:**

Technical Parameter Processor:2\*Xeon E5-2630v3 8Core 2.4GHz;  
Memory:2\*8GB DDR4 RDIMM;  
Hard disk:8\* 2.5Inch HDD Bays;  
others:4\*Qual Port 1Gb Server Adapter/3\*PCIE expansion slots/DVD-ROM/Redundant PSU,1100W DC/Rack kit/3 year7\*24server (International Warranty Service );

Equivalent or better

#### **Client Specifications:**

Technical Parameter CPU:Intel Xeon I5-4590 G3250(3.2GHz/3M Cache);  
Memory:4GB RAM;  
Hard Disk:1\*300GB hard disc  
Optical Disk Drive: Super Multi ODD;  
Operating System:win10 pro 32bits(English Edition);

Equivalent or better

### **User Interface**

The NMS system shall be provided with user-friendly interfaces based on windows/Linux. Icons menus and mouse to accomplish those management functions that need user interventions. The NMS start up and shut down shall be user friendly and shall provide on line help. The NMS shall be able to provide an on screen Nested geographical view of the managed network in the management domain of the manufacturer.

It shall be possible to access any managed NE from the whole network in the managed domain. The NMS shall be able to depict the failure state of each link and node in the

displayed network. Further, it shall be possible from the NMS system to get the details of status of an individual managed NE, such as equipment presence, settings, alarm status etc. It shall be possible to segregate the entire network geographically into multiple domains. A user in a particular domain shall be able to look into his domain only. It shall also be possible to configure security, access and administration permissions on domain basis. It shall be possible to add/ delete/ configure/ modify a NE in any domain by point & click feature and necessary user-friendly editor shall be in built into the NMS system. Addition of NE or deletion of NE (w/o traffic) shall not require any customer support service from the vendor and shall be configurable from the user terminal by operator.

The NMS shall be installed at Moghbazar/SBN,Dhaka. All the proposed network elements (MSPP) under this tender have to be integrated with the NMS. But the Bidder/Manufacturer is responsible for necessary integration including supply of all hardware and accessories.

### **General Management Functions**

The equipment shall provide the general management functions described in ITU-T Rec. G. 784. The Filters for performance and fault management shall be as per ITU-T Rec. G.784.

### **The user documentation for all equipment and interfaces/cards shall be provided.**

All functions available through the NMS shall also be available through a programmatic access and interface. In addition all functions that can be performed by the Craft Interface (IT), if any, shall also be available from the NMS, ie. The NMS needs to support all functions we are able to support via the Craft Interface (with console port of equipment).The CIT functionality shall be available via a secure web browser interface. The vendor is requested to provide all pertinent details.

History Information such as PM counts and routing reconfiguration shall be maintained in the NMS or NE for a month time to allow a higher level system to retrieve this information. The vendor shall state how long data is kept and if required can be exported to the external drive NMS Auto discovery and viewing/query of Network configuration, Network equipment status, and Link Status shall be supported.

The ENM/NMS shall support a user view of the utilization on any given circuit, VLAN, or CoS, along with the complete corresponding route or paths.

### **Configuration Management**

It shall be possible to configure the equipment for various operations like gathering inventory details of the local station and remote station at card level basis.

To partition the network as defined in ITU-T Rec. G.803 on request and control in full or limited network resources. Network Element creation in the NE Management domain. Programming of a multiple interface unit. To create, update, delete and retrieve the managed network topology data. Assigning the protection to a unit within the equipment Selection of protection switching within the managed network.Error defect thresholds. Network Element configuration. Remote Software Download for Network Elements.

## **Security Management**

This functionality shall provide necessary security to the data as well as access to the network. The equipment shall support the access to the TMN system. Low level protection for read only access to faults and performance information. Medium level protection for access to configuration status and features. High level protection for control of access to afore said clauses and to change in the configuration and control parameters. All the Log in and Log out attempts shall be logged in the security Log File of the NMS system. The NMS shall be able to back up and restore the data base to and from external storage media or internal storage media.

## **Alarm and Fault Management**

The systems shall support at least the Fault management Functions described in the ITU-T Rec. G. 784. The equipment management function shall, within the network element, perform a persistency check on the fault cause before it shall declare a fault and the time taken to declare the fault shall be as per ITU-T rec. G.784.

Each failure and clearance shall be time stamped. The equipment shall support the alarm surveillance of detection and reporting of relevant events and conditions that lead to the generation of alarm.

The TMN system shall support the alarm history as per ITU-T Rec. G. 784. Path alarm notification to be generated and recorded, the Alarm notification shall include the : type, occurrence, severity, probable cause and clearing .Path alarm shall be graphically shown by the NMS. Alarm and status display. Fault Localization. Fault correction control. Storing and processing of current alarm information. Storing and processing of historical alarm information. The NMS shall provide the on-line logging capability for historical alarms and events with sufficient information such as managed resources, alarm/event type, alarm severity, day and time of occurrence etc. The retrieving functions with filtering capabilities for historical alarms and events shall be provided as well. Assigning alarm severity i.e. Critical, Major, Minor.

The EMS/NMS system should support path tracing.

## **Performance Management**

The management functionality shall provide the information regarding degradation of the Optical paths. Configuration of threshold concerning the error counters. Performance monitoring by BIP check. Performance reporting and monitoring. Performance History (data logging);The functionality shall store the performance data of the system, The NE name, the data and the time shall be the sum of different parameters that shall be stored. Prints out of the statistics and Histograms. The collection of the performance counters will have to be performed at pre assigned rate as per ITU-T G.784. Shall be in compliance with the UNI-N functions/protocols/messages/ procedures specified in MEF. Shall support sending continuity messages at the interval of 3.3ms. Intervals Shall be selectable as per values defined in Y.1731. Shall support remote loopback options on the network ports (for the entire port).

## **Inventory Management**

It shall indicate the presence and absence of any physical module in hardware elements. It shall also indicate the usage of module i.e., how many ports are use which interface is in use and which are free to be used. The NMS shall be able to discover and keep the device information. The NMS shall able to keep track on any changes in the network inventory reported chronologically. The EMS shall provide the inventory information to the network management layer (NML) / Service Management layer (SML) so that SML is able to create base activate a service to the customer automatically. This shall also assist SML in providing the network inventory to which the SML shall add the customer identification and maintain this information is its data base. The EML shall be able to show inventory based on the available device inventory in terms of circuit utilization and inter connecting links.

### **NES and NMS Software**

The NES software shall be based on /Linux and/or WINDOWS based operating system.

The NES shall be a multi –task and multi-user system.

The offered software architecture shall be open and configurable to enable future extensions.

Software license shall be quoted for life time of all proposed MSPP equipment under this purchase.

**All the features at clauses and sub clauses are Mandatory. Any deviation will treat as rejection of bid.**

### **NMS Hardware Installation and Commissioning**

The NMS Hardware will be thoroughly tested during and after installation. Detailed testing methods are specified by Bidder/Manufacturer.

### **Hardware and Software Maintenance**

Bidder/Manufacturer shall maintain all hardware and software until the end of guarantee period. After the performance guarantee period, a maintenance Contract may be signed with the supplier/manufacturer.

Bidder/Manufacturer must give a complete list of hardware supplied and the software used in the EMS System.

Original Software must be supplied in CD as per list above.

External drive / Backup media shall be quoted for NMS to save configurable data base & software separately

Restore/Recovery & maintenance procedure shall be clearly documented in sequential order.

Good quality document (i.e., easily understandable by operator) shall be quoted both for hardware and software in CD ROM (2 set).

#### 7.1.23.8 Software Download



Remote Software Download via The Management System shall be possible, including the means of identification of software module versions. No loss of data/loss of connection map shall be take place during the software down loading process.

#### 7.1.23.9 NMS

Network Management System should have the capability to generate alerts through SMS and Emails for alarms defined by the user.

Any deviation of clause 7.1.23 shall be considered as “**Major Deviation**”.

#### 7.1.24 NES and NMS SOFTWARE

7.1.24.1 The NES software shall be based on UNIX/Linux and/or WINDOWS based operating system.

7.1.24.2 The NES shall be a multi –task and multi-user system.

7.1.24.3 The offered software architecture shall be open and configurable to enable future extensions.

7.1.24.4 Software license shall be quoted for life time of all proposed MSPP equipment under this purchase.

Any deviation of clause 7.1.24 shall be considered as “**Major Deviation**”.

#### 7.1.25 NMS HARDWARE INSTALLATION AND COMMISSIONING

The NMS Hardware will be thoroughly tested during and after installation. Detailed testing methods are specified by Bidder/Manufacturer.

Any disagreement or deviation of this 4.1.25 will be treated as “**Major Deviation**”.

#### 7.1.26 HARDWARE AND SOFTWARE MAINTENANCE

7.1.26.1 Bidder/Manufacturer shall maintain all hardware and software until the end of guarantee period. After the performance guarantee period, a maintenance Contract may be signed with the supplier/manufacturer.

7.1.26.2 Bidder/Manufacturer must give a complete list of hardware supplied and the software used in the EMS System.

7.1.26.3 Original Software must be supplied in CD as per list above.

7.1.26.4 Backup media shall be quoted for NMS to save configurable data base & software.

7.1.26.5 Restore/Recovery & maintenance procedure shall be clearly documented in sequential order.

7.1.26.6 Good quality document (i.e., easily understandable by operator) shall be quoted both for hardware and software in CD ROM (2 set).

Any disagreement of clause 7.1.26 will be treated as “**Major Deviation**”.

#### 7.1.27 ENVIRONMENTAL REQUIREMENTS

The equipment shall satisfy the following environmental conditions

7.1.27.1 Guaranteed continuous performance

- 1) Ambient temperature: 0°C to 50°C
- 2) Relative humidity: Up to 90% at non-condensing

7.1.27.2 Storage and transportation in packages

- 1) Ambient temperature: -30°C to 70°C
- 2) Relative humidity: Up to 95% at non-condensing.

Any disagreement or deviation of clause 7.1.27.1 will be treated as “**Critical deviation**”.

#### 7.1.28 EQUIPMENT DESIGN REQUIREMENTS

7.1.28.1 The supplier shall guarantee trouble-free operational performance of the equipment in the electromagnetic environment as well as electrostatic discharge.

7.1.28.2 It should be possible to expand the system on modular add-on basis and not by replacement of shelves and racks.

7.1.28.3 Up gradation/expansion of software shall be without interruption.

7.1.28.4 Tributary addition/up gradation shall be made in-service without causing bit errors on the tributaries in use.

7.1.28.5 One standard 2.2 meter rack shall be provided with each MSPP Shelf.

7.1.28.6 It should be possible to house a mixture of different type of sub-shelves in the same rack.

Any disagreement or deviation of any sub-clause of the clause 7.1.28 will be considered as “**Minor deviation**”.

### **7.1.29 OPTICAL FIBER ATTENUATORS**

- 7.1.29.1 For looping (during line-up measurements) and for short line sections optical attenuators with connectors both at the input and output port may be used.
- 7.1.29.2 The attenuation value, operating wavelength region, and type of fiber shall be clearly marked on the optical attenuator.
- 7.1.29.3 The connector at the input and output ports shall be compatible with the offered equipment and shall be indicated by Bidder/Manufacturer.
- 7.1.29.4 The variable attenuator shall be provided with calibrated dial/scale, so it can be used as tool for testing and other purposes.

### **7.1.30 INPUT VOLTAGE FOR MSPP EQUIPMENT**

For the MSPP system equipment, the input voltage will be -48 VDC (-43.5 ~ -54).

Any disagreement of clause 7.1.30 will be considered as “Change of substance”.

### **7.1.31 DIGITAL DISTRIBUTION FRAME (DDF)**

7.1.31.1 Bidder/Manufacturer shall supply and install necessary number of Digital Distribution Frames (DDF) for all E1 interfaces of the system. The relevant frame for connectivity at E1 level shall be separate and shall have the following characteristics;

- 1) The DDF shall be housed in the same rack with the MSPP equipment or in separate rack and shall have the facility to be accessed from all sides.
- 2) Nominal Impedance of termination: 75 ohms on co-axial pair.
- 3) Connector: BNC or 1.5/5.4 coaxial connector (2.5mm in case of inside and 3.0mm in case of outside).
- 4) The incoming cables from switching (or any other user) and transmission sides (from MSPP) shall be connected on the back-side on the base connectors and connection will be made between the transmission and user side by U-link in the front side.
- 5) Each DDF shall be fully-equipped with connectors for the E1 capacity provided in the MSPP.
- 6) The DDF shall be generally located inside the transmission room of BTCL, but it can also be shifted to any other room (in case of type 1 MSPP only) on mutual agreement.

7.1.31.2 Bidder/Manufacturer shall provide necessary co-axial cable, connectors etc between new DDF and MSPP. And Bidder/Manufacturer shall provide connector and co-axial cable between new DDF and existing Switching DDF of BTCL as mentioned in Chapter Two. The nominal impedance of the cable shall be 75 ohms, the cable must comply with relevant ITU-T recommendation.

7.1.31.3 DDF shall be installed at all new MSPP nodes and the port quantity for each node shall include E1 ports suggested.

7.1.31.4 Bidder/Manufacturer shall quote prices for such works and failure to quote for any of these works shall mean that Bidder/Manufacturer shall provide DDF including related service “free of charge to BTCL as per BTCL’s requirement.

Any disagreement of clause 7.1.31 (including sub-clauses) shall be treated as “**Major deviation**”.

## **7.2 Overall Performance Requirements**

7.2.1 General characteristics of Synchronous Line System shall conform to ITU-T Rec.G.783 and G.798.

7.2.2 Error performance

- 6) The SDH shall meet the relevant performance objectives of ITU-T Rec. G. 821 & G.921 and any other ITU-T relevant new recommendations at the tie of supply under the worst environmental condition.
- 7) Long term Bit Error Ratio (BER) in each direction shall be less than 10E-10 over a period of 14 days.
- 8) The percentage of Errored Seconds (ES) shall be measured at 2 Mbps level over a period of 14 days.
- 9) The percentage of severely Errored Seconds shall be measured at 2 Mbps level over a period of 14 days.
- 10) The bringing into service limits for any multiplex section BER shall be measured during 4 days on a 2 Mbps port.

## **7.3 Requirements of Performance Certificates**

The offered MSPP/MSPP equipment shall fulfil the internationally recognized standard performance requirements. The Bidder/Manufacturer shall submit certificates of satisfactory operational performance for the offered MSPP/MSPP equipment from at least two users; one of such user must be from a country outside the country of manufacture of the offered MSPP/MSPP equipment.

## **7.4 Jitter and Wander**

7.4.1 Jitter and wander tolerance for STM-N input ports shall comply with ITU-T Rec. G.825.

7.4.2 The output jitter requirement shall comply with ITU-T Rec. G.813.

7.4.3 Jitter transfer requirements shall be according to ITU-T Rec. G.783, G.813 and G.825.

7.4.4 The SDH jitter requirements for DS-1E shall be according to ITU-T Rec. G.783.

7.4.5 Jitter parameters and limit present on STM-N shall be compliant to ITU-T Rec. G.783.

## **7.5 Synchronization**

- 7.5.1 The Synchronization shall be according to ITU-T Rec. G. 783 and Multiplexer Timing Source function shall be provided according to ITU-T Rec. G. 783.
- 7.5.2 The External Synchronization Interface shall be 2048 Kbps or 2048 Khz interface as defined in ITU-T Rec. G.703.
- 7.5.3 The system shall be able to be synchronized on the following sources:
- 5) 2048 Kbps or 2048 Khz interface by G. 703
  - 6) STM-N aggregate or clock
  - 7) From an internal oscillator with accuracy and stability in accordance with ITU-T recommendations G.813
- 7.5.4 The fall back priority for selection of these timing sources and their priority must be selectable by software either by Craft Interface Terminal (CIT) or by the Elements Management System(EMS). Bidder/Manufacturer shall indicate the priority used.
- 7.5.5 In case of failure of the active signal source the system shall switch automatically to another predefined source according to the priority setting. The switching process shall not interrupt the carrying traffic.
- 7.5.6 The timing selectors and internal oscillator shall comply with G.813 in general.
- 7.5.7 The clock reference shall have 4 modes of operation: External, loop-time, free-run, and holdover.
- 7.5.8 In the holdover mode, the frequency of the last valid referenced shall be held with a maximum drift of 1 ppm/ day.
- 7.5.9 The accuracy of the local oscillator shall be better than  $\pm 4.6$  ppm.
- 7.5.10 Loss of Synchronization
- 4) Restoration to higher priority timing references from lower priority timing references or restoration from self-timing operation, shall be automatic, with an inhibit feature provided.
  - 5) Automatic recovery time shall be 10 to 20 seconds, when valid timing is available and must be hitless.
  - 6) The following conditions shall be regarded as loss of synchronization:
    - c) Loss of main signal
    - d) Receiver AIS
- Other criteria for loss of synchronization shall be stated by Bidder/Manufacturer, if any.

## **7.6 Timing Interface**

- 7.6.1 Physical/electrical characteristics of the external timing signal input of the Network Element (NE) shall be in accordance with G.703.
- 7.6.2 The Network Element (NE) shall provide at least two independent external timing signal input ports.

- 7.6.3 The network Element (NE) shall provide one or more timing output ports with the Physical/electrical characteristics according to G.703.
- 7.6.4 The ports shall be disabled if the system is synchronized to a low-quality timing source.
- 7.6.5 Each network component except regenerators shall have the following external, non-traffic, synchronization ports;  
Input ports for 2048 KHz or 2048 Kbps external timing.

## **7.7 Alarms**

- 7.7.1 In general all NE shall collect the information generated in each of the functional blocks as defined by ITU-T Rec.G.783 for events as alarms, errors and diagnostic information.
- 7.7.2 The following alarm indications shall be provided but not limited to:
  - 9) LOS (Loss of Signal)
  - 10) EBER (Excessive Bit Error Ratio)
  - 11) SD (Signal Degrade)
  - 12) LOP (Loss of Pointer)
  - 13) LOF (Loss of Frame)
  - 14) MIS (Mismatch path trace ID/signal label)
  - 15) LOM (Loss of Multiframe)
  - 16) AIS (Alarm Indication Signal).
- 7.7.3 The Alarms from the External Devices such as rectifiers and SMPS can be integrated with the MSPP/MSPP elements for monitoring.

## **7.8 Transmission Delay**

- 7.8.1 The delay time for a transmission signal from its input to its output for Regenerators/OA/pass through ADM shall be less than 10 ms.
- 7.8.2 The delay time for a transmission signal from its input to its output for all other network components shall be less than 125 micro-seconds.

## **7.9 Optical safety (AUTOMATIC-LASER SHUTDOWN) Requirements**

- a. Generally if the section is interrupted (e.g. if a fiber breaks), then measures shall be implemented to ensure that no risk is caused by laser light escaping uninterruptedly.
- b. In the event of an optical signal fail at the incoming port with a duration of < 500 ms, and certainly within 600 ms, the laser in the opposite direction is switched off by the receiver within 0.85 seconds, and the affected segment will be thus shutdown. It shall not be possible to activate the forced facility during error-free operation.

## **7.10 Network Element Software and Hardware Specific Requirements**

#### 7.10.1 Interface Terminal

A Interface Terminal enables the maintenance staff at every location to directly access the NE's management functions via the PC/Laptop interface. It has the ability to operate each type of equipment belonging to the network.

7.10.2 Normal operation of the transmission equipment should not require use of the NES functions. The use of terminal shall be reserved for special operational needs requiring direct intervention on the equipment (installation, preparation for start of service, maintenance and repair, operation in the event of unavailability of the NES.

7.10.3 The failure of the management system shall not have any immediate consequences on the function of the telecommunication systems being managed. If there is a failure in the power supply, all data concerning parameter values, network configuration, passwords and user groups shall be retained. After the return of the power supply, the data referred to above shall be reloaded automatically without any mutilation of the data and /or hardware.

### **7.11 Environmental Requirements**

The equipment shall satisfy the following environmental conditions

#### 7.11.1 Guaranteed continuous performance

- 3) Ambient temperature: 0°C to 45°C for the MSPP.
- 4) Relative humidity: Up to 90% at non-condensing for the MSPP.

#### 7.11.2 Storage and transportation in packages

- 3) Ambient temperature: -30°C to 60°C
- 4) Relative humidity: Up to 95% at non-condensing.

### **7.12 Equipment Design Requirements**

7.12.1 The supplier shall guarantee trouble-free operational performance of the equipment in the electromagnetic environment as well as electrostatic discharge.

7.12.2 It should be possible to expand the system on modular add-on basis and not by replacement of shelves and racks.

7.12.3 Up gradation/expansion of software shall be without interruption.

7.12.4 Tributary addition/up gradation shall be made in-service without causing bit errors on the tributaries in use.

7.12.5 One standard 2.2 meter rack shall be provided with each MSPP Shelf.

7.12.6 It should be possible to house a mixture of different type of sub-shelves in the same rack.

### **7.13 Input Voltage for MSPP/MSPP Equipment**

For the MSPP system equipment, the input voltage will be -48 VDC (-43.5 ~ -54).

### **7.14 Digital Distribution Frame (DDF)**

7.14.1 Bidder/Manufacturer shall supply and install necessary number of Digital Distribution Frames (DDF) for all E1 interfaces of the system. The relevant frame for connectivity at E1 level shall be separate and shall have the following characteristics;

- 1) The DDF shall be housed in the same rack with the equipment or in separate rack and shall have the facility to be accessed from all sides.
- 2) Nominal Impedance of termination: 75 ohms on co-axial pair.
- 3) Connector: BNC or L9 coaxial connector.
- 4) The incoming cables from switching (or any other user) and transmission sides (from MSPP) shall be connected on the back-side on the base connectors and connection will be made between the transmission and user side by U-link in the front side.
- 5) Each DDF shall be fully-equipped with connectors for the E1 capacity provided in the MSPP.
- 6) The DDF shall be generally located inside the transmission room of BTCL, but it can also be shifted to any other room on mutual agreement.

7.14.2 Bidder/Manufacturer shall provide necessary co-axial cable, connectors etc between new DDF and MSPP. The nominal impedance of the cable shall be 75 ohms, the cable must comply with relevant ITU-T recommendation.

7.14.3 DDF shall be installed at all new MSPP nodes and the port quantity for each node shall include E1 ports suggested.



### Compliance Schedule

**For MSPP Facilities (Fill the form and attached with Tender forms, failure of submitting this form, tender will be rejected and tender will treat as technically no responsive.) Contractor must fill up the Form PG3-5 also.**

<b>SI No</b>	<b>Description of work and services</b>	<b>Mandatory</b>	<b>Compliance</b>
--------------	---	------------------	-------------------

	<p><b>The following interfaces shall be supported in the offered transmission equipment system:</b></p> <ul style="list-style-type: none"> <li>E1 at 2,048 Kbps, 75 ohm</li> <li>STM-1 (including STM-1 POS) at 155,520 Kbps</li> <li>STM-4 (including STM-4 POS) at 622,080 Kbps</li> <li>STM-16 (including STM-16 POS) at 2,448,320 Kbps</li> <li>Fast Ethernet (L1 ,L2 and L3 Type)</li> <li>Gigabit Ethernet (L2/L3 Type)</li> </ul>	<p>All are Mandatory</p>	
--	--	--------------------------	--

	<p>The MSPP system supplied by Bidder/Manufacturer shall support the following network configurations;</p> <ol style="list-style-type: none"> <li>1) Linear add/drop multiplexing (ADM)</li> <li>2) Multi-Ring</li> <li>3) SDH sub-Network Connection Protection Ring (SNCP Ring)</li> <li>4) Multiplexer Section Shared Protection Ring (MS-SPRing)</li> <li>5) Point-to-point with or without 1+1 MSP.</li> </ol>	All are Mandatory	
	<p>The equipment shall provide the ability to access VC's from STM-N signal. A mixture of VC's {E1, STM-1, STM-4, STM-16 shall be possible at 23 Betar stations.</p>	All are Mandatory	
	<p>Automatic Protection Switchover for STM-N signals shall be available on tributary interfaces.</p> <p>The equipment shall offer the following network protection: linear multiplex network protection (MSP), sub-network connection protection and MS-SPRing, SNCP) Sub network Connection Protection).</p>	All are Mandatory	
	<p>Switching matrix shall be non-blocking at VC12, VC3 and VC4 level for STM-4, STM-16 .</p> <p>Grooming at the VC-12&amp;VC3 level shall be supported for STM-1, STM-4, STM-16.</p> <p>Switch matrix protection 1+1 is required and Optical TPS (Tributary Processing Board/System) protection is also required.</p>	All are Mandatory	

	<p>Cross connection matrix &amp; timing card, power supply card and aggregation signal cards must be supported by 1+1 protection.</p> <p>For up gradation of MSPP mux to MSPP provide 1+1 control card. Necessary cards such as mux/Dmux/Amplifier/Line Card will procure in future if necessary. Present mux must have the capability to carry MSPP traffic.</p>	All are Mandatory	
	<p>Digital Signal: STM-1, STM-4, STM-16 according to Rec. G.707/Y.1322, G.783 and G.798.</p> <p>Operating wavelength range: 1530~1570nm and 1293-1334nm (Except for SX SFPof GE)</p> <p><b>OTN equipment system interfaces</b></p> <p>STM-1, STM-4, STM-16 interfaces shall be complaint with ITU-T Recommendation G.957.</p> <p>E1 interface shall be complaint with ITU-T Recommendation G.703.</p> <p>Parameters and STM-1, STM-4, STM-16 optical interfaces will be as per relevant ITU-T Recommendations, G.707, G.783 and G.798. Bidder/Manufacturer should indicate any deviation/elaboration of the ITU Recommendation.</p> <p>2 Mbps tributaries shall be 75 ohm.</p> <p>Management interfaces applied to this MSPP equipment shall be complaint to ITU-T Recommendation G.703. Bidder/Manufacturer may indicate other management interfaces of their system.</p> <p>External synchronization shall be a 2048 Kbps interface as defined by ITU-T Recommendation G.703, Section 9. The impedance of 75 ohm should be supported.</p>	All are Mandatory	

	<p>The proposed MSPP system shall support the following.</p> <ul style="list-style-type: none"> <li>4) The Ethernet signals may be 100Base-FX, 100Base-TX and 1000Base-SX/LX.</li> <li>5) The proposed MSPP system shall support Ethernet over SDH (EoS) functionality as follows; <ul style="list-style-type: none"> <li>j) Low order virtual concatenation (VC-12-Xv) and high order virtual concatenation (VC-3/4-Xv)</li> <li>k) EoS frame format process by Frame Mapped Generic Framing Procedure (GFP-F)</li> <li>l) EoS bandwidth adjustment by Link Capacity Adjustment Scheme (LCAS) (ITU-T G.7042)</li> <li>m) Both copper Fast Ethernet (FE) and optical Gigabit Ethernet (GbE) ports will support auto-negotiation capabilities as per IEEE 802.3 standards. Auto-negotiation feature shall be user-configurable</li> <li>n) Jumbo frames with a maximum MTU of 9216 bytes on each port</li> </ul> </li> </ul> <p>Ethernet cards shall support minimum 48msec differential layer</p> <ul style="list-style-type: none"> <li>o) It should be possible to map up to 48 VC-12s per 10/100 Mbps Ethernet port.</li> <li>p) It should be possible to map at least 7 VC-4s per 1000 Mbps Gigabit Ethernet port.</li> </ul> <ul style="list-style-type: none"> <li>6) Any other latest features as available at the time of delivery of the system shall also be provided.</li> </ul> <p>7) <b>LAYER-2 Switching Functionality</b></p> <p>For Ethernet interface the MSPP system must have provision to support layer-2 switching functionality (in addition to above mentioned in clause 4.5.4) as follows;</p> <ul style="list-style-type: none"> <li>16) The card shall support flow control with full</li> </ul>	All are Mandatory	
PG3 of Bangladesh Betar	bandwidth mapping of 10BaseT/100BaseTX/1000BaseSX or GigE clients into SDH containers. It shall be		28

	<p>For Ethernet interface the MSPP system must have provision to support layer-2 switching functionality (in addition to above mentioned in clause 4.5.4) as follows;</p> <p>The card shall support flow control with full bandwidth mapping of 10BaseT/100BaseTX/1000BaseSX or GigE clients into SDH containers. It shall be possible to support 100% of the achievable (possible within the frame size and overhead constraints) throughput for all packet sizes □ 64-bytes. Maximum Transport Unit is configurable up to 9600 bytes.</p> <p>Traffic control (IEEE 802.3) by pause framing. If the local link partner of the port does not act on received PAUSE frames (stop sending client packets for specified time) then Ethernet packets received by the tributary card will be discarded if necessary, until the rate of transmission of client traffic falls below the available SDH bandwidth. Errored frames received at the Ethernet interface shall be counted and discarded.</p> <p>L2 address table shall at least support 16 K entries.</p> <p>It shall support L2 multicasting with at least 128 entries</p> <p>The card shall support static configuration of VLANs ranging from 2 to 4094. Shall support configuration of VLAN ID (PVID) on per port basis.</p> <p>It shall support VLAN stacking (Q-in-Q) as per 802.1ad.</p> <p>It shall provide services like EPL, EVPL, EPLAN, and EVPLAN. Shall process Ethernet supported IPv4 and IPv6 traffic.</p> <p>26) It Shall Support Link Aggregation as per IEEE 802.3ad.It shall be possible to configure/bundle more than 2 customer facing ports in a link aggregation group (LAG).</p> <p>27) Point-to-point, Point-to-Multipoint and Multitpoint-to-Multipoint VLAN tunneling shall be supported.</p> <p>28) The total uplink bandwidth from Ethernet card shall be STM-8 (8 numbers of STM-1)</p>	All are Mandatory	
--	--	-------------------	--

	<p>And IPv-6</p> <p>It Shall Support Link Aggregation as per IEEE 802.3ad.It shall be possible to configure/bundle more than 2 customer facing ports in a link aggregation group (LAG).</p> <p>Point-to-point, Point-to-Multipoint and Multipoint-to-Multipoint VLAN tunneling shall be supported.</p> <p>The total uplink bandwidth from Ethernet card shall be STM-8 (8 numbers of STM-1)</p>	All are Mandatory	
	<p>The SDH shall meet the relevant performance objectives of ITU-T Rec. G. 821 &amp; G.921 and any other ITU-T relevant new recommendations at the tie of supply under the worst environmental condition.</p> <p>Long term Bit Error Ratio (BER) in each direction shall be less than <math>10E-10</math> over a period of 14 days.</p> <p>The percentage of Errored Seconds (ES) shall be measured at 2 Mbps level over a period of 14 days.</p> <p>The percentage of severely Errored Seconds shall be measured at 2 Mbps level over a period of 14 days.</p> <p>The bringing into service limits for any multiplex section BER shall be measured during 4 days on a 2 Mbps port.</p>	All are Mandatory	

	<p><b>Jitter and Wander</b></p> <p>Jitter and wander tolerance for STM-N input ports shall comply with ITU-T Rec. G.825.</p> <p>The output jitter requirement shall comply with ITU-T Rec. G.813.</p> <p>Jitter transfer requirements shall be according to ITU-T Rec. G.783, G.813 and G.825.</p> <p>The SDH jitter requirements for DS-1E shall be according to ITU-T Rec. G.783.</p> <p>Jitter parameters and limit present on STM-N shall be compliant to ITU-T Rec. G.783.</p> <p><b>Synchronization</b></p> <p>The Synchronization shall be according to ITU-T Rec. G. 783 and Multiplexer Timing Source function shall be provided according to ITU-T Rec. G. 783.</p> <p>The External Synchronization Interface shall be 2048 Kbps or 2048 Khz interface as defined in ITU-T Rec. G.703.</p> <p>The system shall be able to be synchronized on the following sources:</p> <p>2048 Kbps or 2048 Khz interface by G. 703</p> <p>STM-N aggregate or clock</p> <p>From an internal oscillator with accuracy and stability in accordance with ITU-T recommendations G.813</p>	<p>All are Mandatory</p>	
--	--	--------------------------	--

	<p>The fall back priority for selection of these timing sources and their priority must be selectable by software either by Craft Interface Terminal (CIT) or by the Elements Management System(EMS). Bidder/Manufacturer shall indicate the priority used.</p> <p>In case of failure of the active signal source the system shall switch automatically to another predefined source according to the priority setting. The switching process shall not interrupt the carrying traffic.</p> <p>The timing selectors and internal oscillator shall comply with G.813 in general.</p> <p>The clock reference shall have 4 modes of operation: External, loop-time, free-run, and holdover.</p> <p>In the holdover mode, the frequency of the last valid referenced shall be held with a maximum drift of 1 ppm/ day.</p> <p>The accuracy of the local oscillator shall be better than <math>\pm 4.6</math> ppm.</p> <p>Loss of Synchronization</p> <p>7) Restoration to higher priority timing references from lower priority timing references or restoration from self-timing operation, shall be automatic, with an inhibit feature provided.</p>	<p>All are Mandatory</p>	
--	--	--------------------------	--



	<p>Automatic recovery time shall be 10 to 20 seconds, when valid timing is available and must be hitless.</p> <p>The following conditions shall be regarded as loss of synchronization:</p> <ul style="list-style-type: none"> <li>e) Loss of main signal</li> <li>f) Receiver AIS</li> </ul> <p>Other criteria for loss of synchronization shall be stated by Bidder/Manufacturer, if any.</p> <p><b>Timing Interface</b></p> <p>Physical/electrical characteristics of the external timing signal input of the Network Element (NE) shall be in accordance with G.703.</p> <p>The Network Element (NE) shall provide at least two independent external timing signal input ports.</p> <p>The network Element (NE) shall provide one or more timing output ports with the Physical/electrical characteristics according to G.703.</p> <p>The ports shall be disabled if the system is synchronized to a low-quality timing source.</p> <p>Each network component except regenerators shall have the following external, non-traffic, synchronization ports;</p> <ul style="list-style-type: none"> <li>Input ports for 2048 KHz or 2048 Kbps external timing.</li> </ul>	<p>All are Mandatory</p>	
--	---	--------------------------	--

	<p><b>Alarms</b></p> <p>In general all NE shall collect the information generated in each of the functional blocks as defined by ITU-T Rec.G.783 for events as alarms, errors and diagnostic information.</p> <p>The following alarm indications shall be provided but not limited to:</p> <p>LOS (Loss of Signal)  EBER (Excessive Bit Error Ratio)  SD (Signal Degrade)  LOP (Loss of Pointer)  LOF (Loss of Frame)  MIS (Mismatch path trace ID/signal label)</p> <p style="padding-left: 40px;">17) LOM (Loss of Multiframe)  18) AIS (Alarm Indication Signal).</p> <p>The Alarms form the External Devices such as rectifiers and SMPS can be integrated with the MSPP/MSPP elements for monitoring.</p> <p><b>Transmission Delay</b></p> <p>The delay time for a transmission signal from its input to its output for Regenerators/OA/pass through ADM shall be less than 10 ms.</p> <p>The delay time for a transmission signal from its input to its output for all other network components shall be less than 125 micro-seconds.</p>	<p>All are Mandatory</p>	
<p>PG3 of</p>	<p>Bangladesh Betar</p>		<p>34</p>

	<p>The equipment shall satisfy the following environmental conditions</p> <p>Guaranteed continuous performance</p> <ul style="list-style-type: none"> <li>5) Ambient temperature: 0°C to 45°C for the MSPP/DWDM.</li> <li>6) Relative humidity: Up to 90% at non-condensing for the MSPP/MSPP.</li> </ul> <p>Storage and transportation in packages</p> <ul style="list-style-type: none"> <li>5) Ambient temperature: -30°C to 60°C</li> <li>6) Relative humidity: Up to 95% at non-condensing.</li> </ul>	All are Mandatory	
--	---	-------------------	--

## **7.15 REQUIREMENTS FOR DC POWER PLANT**

### **7.15.1 General**

23 sets of DC power plant (-48 Volt) equipment are required for several Bangladesh Betar sites included in the scope of works of the tender. The DC power plant will consist of the Rectifier, the Battery and the associated power distribution panels. The Contractor shall make necessary DC wiring from the assigned DC PDB to the MSPP equipment. The bidder shall also quote for an Inverter for feeding uninterruptible power to the NMS of the proposed optical transmission system. Detail specifications of the Rectifier, Battery and Inverter are given below:

### **7.15.2 Rectifier**

The offer shall include necessary rectifier (modular type) to provide DC power source to run the system and to charge the back-up batteries. The charging current for the back-up batteries considered at 10 hrs charging rate. The minimum capacity requirement of the rectifier set will be as follows.

Necessary equipped DC output capacity: 150A

Number of Rectifier modules to be supplied =  $N+1$ , where

$N = \text{Present equipped DC output capacity} \div \text{DC output Capacity of each module}$

(If  $N$  becomes a fraction then the next integer will be considered)

The Contractor shall give the details for rectifier dimensioning. The size of the rectifier rack shall be such that there is enough gap (at least 60 cm) between floor and the rectifier modules. Failure to give detail breakdown shall be treated as non-compliance.

The Rectifiers shall be electronic switch-mode type with automatic redundancy control and charging control functions. The control panel shall provide visual and audible alarm facilities and required provision for alarm loops for connection to the remote monitoring system. The display in the control panel shall have the facility to show all types of alarm and other necessary data such as input voltage and current of each phase, output voltage and current, battery current etc.

There shall be provision for over-voltage, under-voltage, over-current and over temperature protection, low voltage cut-off to save the battery from deep discharge and the rectifier shall be equipped with necessary surge protector.

The rectifier shall be provided with circuit-breakers (both in AC & DC side) of adequate capacity and shall allow full isolation from the source and the load.

The Rectifier Rack (or Frame) shall be provided with AC and DC power distribution panel with necessary circuit-breakers (both in AC & DC side) of adequate capacity and shall allow

full isolation from the source and the load. If all of the rectifier modules are taken-out of service, provisions shall be there for automatic diversion of the load to the battery.

The rectifier rack shall contain one or more DC distribution panel consisting of circuit-breakers of 10A, 16A, 32A and 63A capacity (at least two numbers of each capacity).

There shall be provision in the rectifier for connecting at least two sets of Battery. There shall be fuse of adequate capacity for each set of Battery and the fuse should be easily to disconnect (Knife type fuse is preferable).

Any deviation of clause 8.1.1 shall be considered as “**Major Deviation**”.

### **7.15.3 Technical Specifications of the Rectifier**

i)A/C input voltage	:	160 V ~ 260V
ii) Frequency	:	45 Hz ~ 55 Hz
iii) Efficiency	:	90% or more
iv)Protection	:	Input Over Voltage, Input Under voltage, Output over voltage, Over load, short circuit, Over Temperature, Surge and transient
Output voltage	:	-48 Volt nominal (43 ~ 54 or better)
Outpur current/module	:	Bidder shall mention
Static voltage regulation	:	± 0.5%
Ripple and Noise	:	<300 mV p-p, <2 mV rms
Cooling	:	Forced cooling with internal fan
Operating Temperature	:	0°C ~ 50°C
Operating Humidity	:	Maximum 80% non-condensing

Any deviation of clause 7.4.2 shall be considered as “**Major Deviation**”.

### **7.15.4 Battery**

The offer shall include necessary battery sets to provide back-up DC power source to run the system during AC mains failure. The minimum capacity requirement of the each battery set will be as follows:

Capacity of Battery set at each site: 2X200 AH

The Batteries shall be of -48 Volts, 2 Volt each unit. The Batteries shall be sealed and maintenance free (VRLA) Gel type.

The minimum guaranteed life-cycle of the batteries must be at least 5 (Five) years or at least 1200 cycles of discharge at 80% discharge depth.

Both of the battery sets shall be connected to the rectifier through Fuses of adequate capacity which will allow complete disconnection of both of the battery sets during any required O&M function.

In order to protect the exchange equipment as well as the battery in case of dropping of the DC voltage below a certain level, the rectifier connection to the battery sets must be provided with a device for disconnecting the battery sets as soon as such levels arrive.

All of the exposed parts of the terminals in each cell of the battery-sets will be provided with adequate oxidation-proof covers.

The charging-current at 10hrs charging rate for the battery sets, as supplied shall be carried-over to calculation for rectifier requirement.

The proposed battery shall be capable of operating at non-air conditioned environment i.e. 0°C ~ 40°C room temperature and at maximum of 95% humidity (non-condensing).

Any deviation of clause 7.4.3 shall be considered as “**Major Deviation**”.

## LOT-B

### 7.16 SCOPE OF WORKS

Bangladesh Telecommunication Company Ltd (BTCL) intends to connect 23 Betarstations . The scope of works under this tender is to supply, installation, testing and commissioning of optical fibre cable network with necessary accessories in 23 Betar stations of Bangladesh on turnkey basis.

#### 7.16.1 Works to be done:

This Tender intends to procure the following works, major goods and related services:-

Description	Scope
Route Survey, Route Planning	Route Survey, Design and finalizing BoQ
Laying of underground OFC.	As per BoQ
Pulling of overhead OFC.	As per BoQ
Supply of HDPE Duct, GI Pipes, DWC Pipes, PVC pipes, Pig-tails etc	As mentioned in the BoQ
Use of OFC for the network.	OFC will be supplied by BTCL through Bangladesh Cable ShilpaSangstha Ltd. (BCSL), Shiromoni, Khulna. The Contractor shall receive OFC from BCSL and shall carry the OFC from BCSL store up to the sites of the concerned lot at their own cost and risk.

<b>Description</b>	<b>Scope</b>
Use of Joint Closure& ODF for the networks (for jointing/splicing, termination).	As per BoQ (Section-6)
Transportation	All related goods to be used in the works shall be transported to the sites by the Contractor at his own cost and risk.
Testing (PAT and FAT)	These tests shall be performed as per Section-8: Particular Specifications.
Handover	After successful completion of PAT the works will be handed over to BTCL

**7.16.2** The Contractor shall not execute any work or use any of the facilities of the establishment beyond the scope of the Contract Agreement. The Contractor shall not install any duct or cable in the BTCL trench for any other agency/company/service provider till the project is handed over to BTCL.

**7.16.3 Route Survey Report/ Network Diagram**  
**List of OFC Link**

<b>S/L</b>	<b>Radio Station</b>	<b>Nearest BTCL Point</b>	<b>Distance (meter)</b>
1	Agargaon	AgargaonBetar H/H	240
2	Kalyanpur	Kalyanpur BTCL H/H	540
3	Savar	SavarBetar H/H	420
4	Kabirpur	Kabirpur BTCL H/H	720
5	Dhamrai	Dhamrai BTCL H/H	720
6	Agrabad, Chittagong	Agrabad Exchange	720
7	Pahartoli, Chittagong	Pahartali BTCL H/H	240
8	Kalurghat, Chittagong	Kalurghat BTCL H/H	720
9	Rangamati	Rangamati Exchange	960
10	Bandarban	Bandarban Exchange	660
11	Cox'sBazar	Cox'sBazar Exchange	1,020
12	Nurnagar, Khulna	Fire Brigade Office	840
13	Noapara, Jessore	Betar Office H/H	960
14	Kazihata, Rajshahi	Rajpara Thana	720
15	Motiher, Rajshahi	Rajshahi University	600
16	Kahalu, Bogra	Bogra MW Station	120
17	Dhap, Rangpur	Bangladesh Bank Mor	720
18	Uttam, Rangpur	Uttam BTCL 115 H/H	900

19	Chy. Hat, Thakurgaon	Thakurgaon TV Station	600
20	Lalmal, Comilla	Lalmal BTCL H/H	600
21	Mirermoydan, Sylhet	Subidbazar BTCL H/H	1,200
22	Rupatoli, Barishal	Barishal RAB 8 H/H	360
23	Tilagar, Sylhet	Tilagar BTCL H/H	480
24	Additional work		4940
Total			20,000

The probable Link Diagram will be as follows.





#### 7.16.4 As-Built Drawings

Based on survey and the actual works done, the Contractor shall prepare the “As-Built” drawing (site wise) after completion of the works (but 7 days before starting of PAT).

The length of OFC actually laid, quantities of the materials used and all other works done will be measured during PAT and shall be included in this documentation which shall have to be handed over to BTCL during PAT.

#### 7.16.5 Maintenance Support

##### 7.16.5.1 Maintenance Support up to the end of the Guarantee Period

The Contractor at his own cost shall keep sufficient number of technical personnel to provide full maintenance support for OSP works at all sites under this purchase and provide all necessary maintenance support during the Guarantee Period, also termed as the Defect Liability Period. The Defect Liability Period shall commence from the date of successful completion of PAT of any Section and last for further 01 (one) year for that Section. For maintenance purpose during the Guarantee Period, the Contractor will do all the rectification works at his own cost. But if any fault occurs due to natural calamity, theft of OFC, etc. which is beyond the control of the Contractor, then BTCL will supply the OFC and related accessories and the Contractor will do the physical rectification works.

#### 7.17 TECHNICAL SPECIFICATIONS OF OUTSIDE PLANT (OSP) MATERIALS

##### HDPE Pipe specifications

HDPE Pipes shall be of the following minimum standards and specifications:-

- (a) The manufacturer of the HDPE duct must have valid ISO 9001 or similar BSTI certification.
- (b) Specifications of 40 mm permanently lubricated HDPE telecom duct-

No	Item	Unit	Value	Test Standard
1	Material Density	930 to 958 kg/ m <sup>2</sup> at 27 <sup>0</sup> C		ASTM D1238
2	Heat Reversion	Dimension shall not change by more than 3%		ISO2505/ ASTM D1238
3	Crash Resistance	Deflection with load not greater than 10%		ASTM D2412
4	<b>Tensile strength</b>	Newton/mm <sup>2</sup>	Min. 20	ASTM F2160/ BS 2782
5	<b>Elongation at break</b>	%	Min. 350	ASTM F2160/ BS 2782
6	Environmental Stress Cracking Resistance (ESCR)	Duct shall not crack or split		ASTM D1693
7	Impact Strength	No crack or split		D2444
8	Hydro Static Pressure Test	No swelling, leakage or bursting		ISO1167
9	Coefficient of friction	<0.1		
10	Type of HDPE duct	Permanently lubricated plain inner surface		

No	Item	Unit	Value	Test Standard
11	Lubricated Layer	Must have solid lubricant, clearly visible and white in color, uniform layer		
12	Lubricated Layer thickness	Should be minimum 10% of wall thickness		
13	Duct size (nominal)	40 /33 mm		
13a.	Outer Diameter	40 ± 0.5 mm		
13b.	Wall thickness	3.5 ± 0.25 mm		
13c.	Minimum coil length	500 meter		
14	Colour of HDPE Duct and marking	Any (Blue preferred). HDPE pipe shall be marked “BTCL” at every 1.5m		

(c) Appropriate non-metallic couplers will be used to join two pieces of HDPE duct for a locked and air sealed assembly and will be suitable for direct buried application. Couplers will be push-fit type and no other tools or heating will be required to use these couplers.

#### 7.17.1 Pre-Tests:

Prior to using in these works, all the **HDPE ducts** shall be pre-tested. This will be ensured in two phases- Factory Tests and Performance Tests.

#### 7.17.2 Factory Test Certificate:

The Bidder shall submit a copy of the Factory Test Certificate(s) of the goods to the Project Office. If the Factory test Certificate conforms to the Technical Specifications of Clause 7.2.1 & 7.2.2, the Project Director will allow the Contractor to proceed for Performance Tests.

#### 7.17.3 Performance Tests:

For foreign goods/materials, the Bidder shall perform the tests from BUET through the Project Office and such performance test certificate(s) of the goods will be issued by BUET stating that the goods meet the specifications of Clauses 7.2.1 & 7.2.2. In case of locally manufactured goods, the Bidder shall arrange factory test(s) of those goods/materials in the manufacturing premises in presence of for BTCL Engineers not exceeding 03 (three) in numbers, and the BTCL Engineer(s) will issue Performance Test Certificate(s) of them. The Contractor shall arrange travelling of the BTCL Engineers during the office hours to the factory premises, free accommodation & fooding and shall pay per-diem charges @Tk 1000 per day per person.

#### 7.17.4 Technical specification of 75mmPVC pipe

##### 7.17.4.1 Material

- (1) The pipe and coupler shall be manufactured by an extrusion process from material composed of polyvinyl chloride polymer to which suitable additives are added.
- (2) No constituent material which will adversely affect long term mechanical strength, creep, fabrication, solvent-welding and weathering properties of the PVC, shall be used.

- (3) PVC raw material must include 92%-95% of pure resin. The tolerated adjuncts (in the limits of 5%-8%) as stabilizers, filler, colorings, anti-oxidizers, etc, must be free from any plasticizer or volatile components.
- (4) All constituents shall be uniformly and fully dispersed.
- (5) The color of pipes shall be any color.
- (6) PVC compound shall contain stabilizer, lubricant, filler and pigment consisting of standard polymers.
- (7) The pipes and couplers must have resistance to acid, alkalis, oxidizing and reducing agent, weather and rust.
- (8) The pipes and couplers must remain unaffected by fungus, bacteria and termites.

#### **7.17.4.2 Requirement**

- 1) The pipe and couplers shall have smooth outside and inside surface and also smooth at the edges and shall be free from injurious flaws streaks, cracks, twists and other defects.
- 2) The pipe shall be practically straight in form.
- 3) Both end of the pipe shall be cut exactly perpendicular to the pipe axis and shall be free from chips and edges.

#### **7.17.4.3 Dimensions**

The detailed dimensions of 75mm PVC pipe are as shown in the following table;

<b>SL No</b>	<b>Item</b>	<b>Specific value</b>
1.	Outside diameter	75mm
2.	Tolerance for mean outside diameter	±0.6mm
3.	Length (including socket)	6 meter
4.	Tolerance for length	± 10mm
5.	Wall thickness	3.0mm
6.	Tolerance for wall thickness	± 0.25mm

### **7.18 REQUIREMENTS FOR CIVIL WORKS**

#### **7.18.1 Common criteria**

- a) Generally 1 x 40mm HDPE duct shall be laid on a 10-cm thick bed of sand in a 1.2 m ± 0.1 m deep trench. For the sand back filling and brick protection, the Bidder shall refer to the detailed drawings of Standard Trench Section Diagrams in Section-9.0. The bricks will be laid lengthwise along the route.

- b) In exceptional circumstances (rocky areas, due to other utility services etc.) where digging up to the required depth is not possible, the duct may be laid with appropriate protection at a lesser depth with the prior permission of the Project Director.

### 7.18.3 Hand Holes

- i) Hand Holes to secure splice closures and excess cable length as well as for the ease of drawing of the OFC. All Cable splicing and branching should be invariably done in Hand Holes.
- ii) Hand Holes shall be constructed as per Drawing 9.1.2 of Section-9, and in the following way:-  
Reinforced concrete Hand Holes placed on a concrete or gravel foundation are to be used to prevent their sinking in the soil.

The nominal dimensions of the Hand Hole shall be as follows:

Length (inside)	-	100 cm
Width (inside)	-	90 cm
Depth (inside)	-	90 cm
Wall & floor thickness	-	12.0 cm
Cover slab thickness	-	16.0 cm

The dimensions shall have the following tolerances:

- a) Inside Dimensions

Length	:	$\pm 2.5$ cm
Width	:	$\pm 1.5$ cm
Height	:	$\pm 1.5$ cm

- b) Composition of concrete:

Stone chips (20 mm downgraded): sand (Sylhet): Portland cement = 3:1.5:1

- iii) All unused duct must be sealed by end cap and live duct having cable may be sealed by simple plug.
- iv) Outside city/town areas, the Hand Holes will be at 1km interval for straight road section and at the points of splicing, while on the zigzag road section, the Hand Hole span may be shorter considering OFC pulling tension of 2000 Newton. Also in case of long bridges (30 m or more) there will be two Hand Holes at the two ends of the bridge. All these Hand Holes shall be covered with easily removable reinforced concrete Hand Hole cover. The Hand Hole and Hand Hole cover shall withstand a load of 20 tons. Hand Hole cover will be made of 2 part reinforced concrete pieces for easy opening. The top surface of Hand Hole cover shall have "BTCL" mark on the cover centre. Galvanized rack structures (2 nos. of I shape rack) of proper size have to be provided for each Hand Hole.
- v) Tentative numbers of Hand Hole are given in the respective BoQ forms.

### 7.18.4 Excavation for Hand-Hole and / or conduit.

- 1) All excavation works shall be done in a thorough and workmanlike manner in accordance with the detailed drawings and the specifications under the directions of BTCL and subject to the approval and acceptance by BTCL.

- 2) The Contractor will assist BTCL for obtaining road-cutting permissions from relevant authorities. The relevant authorities may include Municipal Authorities, R&H Dept., LGED, Union Parishad, Rail way Dept., Electricity, Water, Sewerage, Gas, etc. Necessary correspondences to the respective authorities will be made by BTCL.
- 3) The Contractor has to refill the trench with sufficient sand and excavated soil, and a good compaction has to be done for good repairing of the road without any additional cost to BTCL.
- 4) The Contractor shall obtain all pertinent records from the electric company, water supply, gas Supply Company and sewerage authority and other underground utilities organization in order to conduct his work and safe-guard of other utilities.
- 5) The Contractor shall take all precautions necessary for safety of general public and for protective and preserving all temporary or permanents utilities.
- 6) If during the execution of the construction and installation, existing underground facilities are inevitably interrupted, or any part thereof is disturbed, the Contractor shall immediately notify the facts to BTCL and owner of the utility.
- 7) The Contractor will be directly responsible for all damages to existing utilities including telecommunication facilities and shall restore these damages immediately at his own expense.
- 8) If the presence of underground facility is apprehended or when required by BTCL, the Contractor shall excavate test pits at his own expense at the location of question.
- 9) If any obstructions which interfere with excavation of Hand Hole site or conduit trench are encountered, the Contractor shall consult with the Project Director about necessary Modifications of the drawing.
- 10) The Contractor shall dispose off all excavated materials except what to be used for backfilling.
- 11) The Contractor shall at all times adequately protect the sides of the excavation against cave-in. Sheeting and shoring/ supporting works shall be applied wherever required by BTCL, and/ or considered to be necessary at the Contractor's own cost.
- 12) The Contractor shall confer with the proper road administrative authority and ensure that the proposed depth of Hand Holes, conduits conform to the final grades of carriageways and footways.
- 13) The Contractor shall excavate insofar as possible complying with the trench width requirements as detailed in the drawings given in Section 10. Any excess in this width, unless specifically authorized by BTCL, shall be at his own expense. This includes extra restoration expenses of pavements, macadams and /or tiles.
- 14) Upon completion of trenching and Hand Hole which will contain metallic sheath cable, it shall be earthed as illustrated in the drawings given in Section 10. The trench shall be so arranged as to avoid any dip profile of conduit and be arranged with smoothly and gradually descending grade so as to terminate conduits at the specified location of the Hand Hole as shown in "outside plant construction drawings" which will be provided by Contractor and approved by BTCL.
- 15) The Contractor shall at his own expense protect and support any type of utility services like pipe, conduit, cable, wire or any other item of telephone and other services that are visibly exposed or encountered during excavation. The Contractor is obligated to restore these services to their original conditions and to the satisfaction of BTCL and the owners of such

plants.

### 7.18.5 Installation procedures for underground conduits

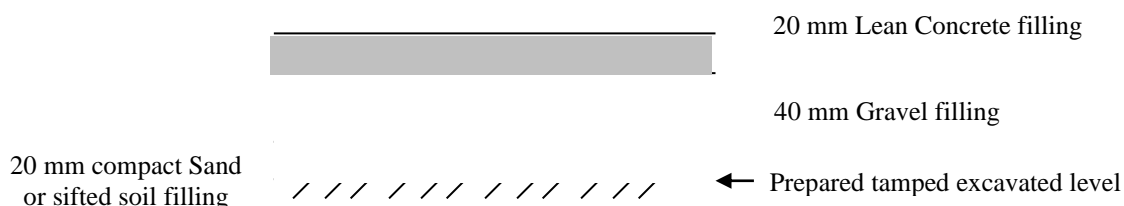
In addition to the general procedural requirements stated above, the Contractor shall have to conduct all installation works related to underground conduits abiding by the following specific procedures. Any deviation from these procedures shall have to be pre-approved by the Project Director.

- 1) Trench walls shall be vertical. Width of the trenches for HDPE duct shall be the minimum required to install HDPE ducts and protective bricks. In case of underground HDPE duct, the widths of the trenches are max 30 cm for both bottom and top for 1-way duct. Unnecessary disturbance of the surrounding earth shall be avoided wherever possible.
- 2) The excavated trench shall be straight horizontally at its height level. Zigzag trench will not be allowed.
- 3) After proper excavation, the bottom of the trench bed shall be properly tamped down, carefully leveled, compacted and dried.
- 4) The Contractor shall ensure that there are no sharp materials or leftover garbage inside the trench.
- 5) For all major roads, railway and waterway crossings, Hand Holes shall be constructed at either side of such crossings as per instruction of BTCL.
- 6) Duct Integrity Test shall be performed with 10 Bar air pressure for 100% of the 1-way HDPE duct route before laying of OFC through the duct. There shall not be any drop of Air pressure within a pressurization duration of 5 (five) minutes during the test.
- 7) 40 mm HDPE 1-way Horizontal Directional Drilling (HDD) will have to be done for crossing road /Rail way (UC-CB-1) or along the road at the depth of minimum 1.85 meter. And operational pit should have the same depth.

### 7.18.6 Installation procedures for hand Holes

Contractor shall have to conduct all installation works related to hand Holes abiding by the following specific procedures. Any deviation from these procedures shall have to be pre-approved by the Project Director.

- 1) After proper excavation, the bottom of the structure shall be properly tamped down, carefully leveled, compacted and dried.
- 2) The foundation for Hand Holes shall be prepared as follows:



- 3) Metal forms, with error free surfaces and proper attachments shall be used for all structures.
- 4) All RCC & CC works shall be constructed by ready mixed or site-mixed concrete.

- 5) The Contractor shall confirm that before start of the concrete deposition the bed of the structure is completely dry.
- 6) For other working procedures of concrete work such as concrete mixing, placing, curing, form removing and protections, the Contractor shall refer to 7.4.1 “Common Criteria”
- 7) BTCL may order three (3) test specimens (cylindrical type) from each of the structures. Whenever such test specimens are ordered, they shall be properly marked with paint showing the date of making, proportion of mix and the name of the structure for which the specimen will be taken for inspections tests as required. The Contractor, at its own cost, shall arrange for testing of those specimens either from Bangladesh University of Engineering and technology or Bangladesh standard testing institution. (as per decision given by BTCL at the relevant time).

### **7.18.6 Concrete Marker Post Installation**

Concrete Marker Posts shall be installed at each Hand Hole location with the feature illustrated in the drawings given in Section 9. The marker will be situated at a location not to interfere the traffic flow and the exact location is subject to approval of BTCL.

## **7.19 REQUIREMENTS OF OFC INSTALLATION**

### **7.19.1 Common criteria**

- 1) The OFC shall be installed in a new HDPE sub-duct or in new HDPE duct depending upon actual site condition.
- 2) Fiber optic cables in bridges and culverts etc. should be placed in 40mm HDPE and the HDPE duct itself will be placed inside a 90mm DWC pipe.
- 3) The Contractor shall lay the OFC alongside the roads and highways keeping distance as maximum as possible from the edge to protect it from damage during expansion of the road, with the following minimum conditions:-
  - a) 90mm DWC pipe duct will be fixed to bridge /culvert using galvanized clamps with royal bolts at each 1m distance where the bridge/culvert authorities do not permit to place the duct at the inner side of the bridge/culvert. But where possible 90mm DWC pipe duct should be placed on the footway of the bridge/culvert. 90mm DWC pipe should be covered with cc.
  - b) Cable splicing on bridges shall be avoided.
  - c) In bridges, having high vibration risk or excessive bending risk (section linking bridges and steep banks), cables should be adequately secured by means of protective pipe, elastic padding or flexible mounting.
  - d) HDPE Duct shall be used all through the route.
- 4) As the cable will be along roads, crossing the water surface will be through bridges or culverts. In cases where crossing of bridges is difficult due to weak construction of the bridge or if the crossing along the bridge is not permitted by the relevant authority, Water Course Crossing (such as HDD, Open Cut, Cable Aroundetc) will have to done in consultation with BTCL.

\*\*For crossing of bridge/culverts by Cable Around (CA) method, 75mm PVC pipe to be installed in the bed of the Canal/Drain at proper depth (not less than 90 cm) and concrete casting to be done over the PVC pipe. The minimum dimension of the concrete casting shall be of 20cm (W) X 20cm(H). Composition of concrete shall be Brick chips (First class) :Sand :Cement =

4 :2 :1

- 5) **At every cable joint, the steel tape of in and out bound cable end shall be electrically bonded and earthed through connecting to H.H earthing lead wire.**

#### **7.19.2 Cable length and Marking**

##### 1) Excess cables

- a) Excess cable coils of 15 m should be placed along OFC lines at every splice Hand Hole.
- b) Excess cable at a splice should be coiled up and properly tied up and secured against mechanical damage.

##### 2) Marking

- a) Cable runs should be identified by means of marker posts according to BTCL requirement and standard.
- b) “CAUTION: BTCL/BETAR OPTICAL FIBER CABLE BELLOW” caution marks in English and Bangla should be printed in every two meter of the yellow warning tape to be placed in the cable trench (10cm width and 0.10 mm thickness).

#### **7.19.3 Cable laying and splicing**

- 1) OFC blown into ducts must not be exposed to excessive tensile or bending stress. Bending radius must not be less than 20 times the cable outer diameter. However, if tensile stress affects a cable, the acceptable bending radius must not be less than 25 times the cable diameters.
- 2) The minimum splice distance between splices shall be not less than 2 km. The average splice distance should be stated on the As-Built document.
- 3) Cable pulling, Cable splicing in route, splicing with pig tail, installation of ODF, termination in ODF etc. should be done in proper way.

#### **7.19.4 Installation documentation**

- 1) Installation drawings (As-Built drawing of a Section) should be supplied (in hard & soft copy) by the Contractor upon completion of the works of that Section. The drawing should be supported by accurate data of the following: Route drawing with actual distance (both route distance and OFC distance) between joints, Hand-Hole, direction change, bridge/culvert/water crossing etc.
  - a) Location of each Hand-Hole showing correct Latitude and Longitude
  - b) Location of excess cable length
  - c) Location of each splice
  - d) Latitude & Longitude of each turning point in the route
- 2) The Documentation should also include the result of all tests, including the following;
  - a) Reflectometric graph, tested bi-directionally from both ends of regeneration section.



- b) Optical path loss after installation and before installation.

## 7.20 TESTS AND MEASUREMENTS

### 9.5.1 Tests during Optical Line construction:

- 1) The Contractor shall test the continuity of each fiber and measure the attenuation loss db/km of each OFC drum before taking delivery from BTCL/BCS. The Contractor must submit a copy of the test report to the project office. If any discontinuity of fiber and/or any abnormal attenuation loss dm/km (i.e more than the specified value of the OFC) of any fiber in any cable drum is found, the Contractor shall not use that OFC without the permission of the Engineer in charge.
- 2) Following cable installation but prior to fiber splicing, all fibers have to be uni-directionally tested by means reflectometer to verify fiber continuity.
- 3) During fiber assembly, tests are to be performed by means of special “Splicing Test Sets” included in the fiber bond equipment (LID and PAS methods).
  - a) LID (Local Injection & Detection) method - consists of aligning fiber cores in a splice by injecting light through the splice and measuring the amount of light lost.
  - b) PAS (Profile Alignment System) - consists of observing fiber cores in a splice by means of an Optical Camera.
- 4) After all splices are installed, bi-directional reflectometric measurement has to be done for all Optical Fibers, in order to obtain reflectometric graph. All faulty splices must be detected and, having adjusted them, the lines with new characteristic need to be entered into a chart and field.
- 5) Tests and inspections performed during installation also comprise quality control of construction work, installed equipment and material used and compliance of construction with the contract provisions.

#### 7.20.1 OFC Test

- 1) Prior to the site installation work, the Contractor shall submit the test results of OFC to be used to the project office as per instruction mentioned in clause 7.5.1 and also as per the following table.

Sl no.	Identification of Cable Drum	Delivery length of OFC	No. of cores of OFC	Core	Continuity Test result of fibers		Optical loss db/km	Remarks
					If Ok marked as '√'	If not Ok marked as 'X'		
				1				
				2				
				3				
				4				
				5				
				6				
				7				
				8				
				9				

				10				

2) This test should be performed on all fibers between Optical Cable Terminal (OCT) of each section by means of an Optical Power Meter set using table below;

Test item	Testing at	Test Method	Performance	Remark
Continuity test, post placement	1310±20nm 1550±29nm	Back Scattering	1310nm: 1550nm:	To verify any error during cable blowing/pulling
Post splicing test		Back Scattering	1310nm: 1550nm:	To justify the integrity of splicing
Total attenuation		Cut Back	1310nm: 1550nm:	Quality inspection prior to termination
Final Acceptance Test		Intersection	1310nm: 1550nm:	For acceptance after completion of a Section/entire work

## 7.21 Particular Specifications

For LOT A

### 7.21.1 Acceptance Tests:

Acceptance tests will be divided into three parts. Factory Premises Acceptance Test (FPAT), Provisional Acceptance Test (PAT) and Final Acceptance Test (FAT).

### 7.21.2 Factory Premises Acceptance Test (FPAT)

Testing at manufacturer's premises, to be termed as "Factory Premises Acceptance Test (FPAT)", shall be carried out (on random sampling basis) for all MSPP equipment to be supplied under this purchase. The FPAT shall include all tests as per relevant ITU-T and/or other relevant recommendations. The purchaser shall send its' Representative for equipment to be shipped by the successful Bidder/Manufacturer. Detail of the FPAT for first lot of equipment is as follows:

- a) For all type of MSPP equipment and NMS.
  - i) No. of BTCL engineers (not below the level of Divisional Engineer/DGM): 1 (one) and 2(two) from Bangladesh Betar.
  - ii) No. of working days: 5 (Five)
  - iii) Per diem charge for the BTCL inspectors: US\$ 100 (one hundred) per person per calendar day

Other facilities: Both way air ticket, Comfortable Accommodation including breakfast, local transportation, and medical facility (if required).

### **7.21.3 Provisional Acceptance Test (PAT):**

7.21.3.1 Before acceptance of the installed MSPP network system, BTCL PAT team shall carry PAT of the equipment. The PAT team will also check whether the work has been performed as per the specifications mentioned in the tender document. Such tests and checking shall be termed as “Provisional Acceptance Test (PAT)”. Prior to the commencement of such tests, the Contractor shall submit a proposed procedure for the PAT to be subsequently passed by BTCL. PAT team will be formed with the approval of the Managing Director, BTCL. The PAT will be done by the PAT team of BTCL and Contractor’s Engineers jointly.

7.21.3.2 On completion of supply, installation and commissioning and self-testing of any equipment, the Bidder/Manufacturer shall submit 3(three) copies of self-test results to BTCL and will offer PAT for that Section/ complete works. BTCL shall start such tests within one month after receipt of the request. The Bidder/Manufacturer may, upon agreement by both parties, offer PAT for any part or parts of the total system. BTCL may also ask the Bidder/Manufacturer for partial PAT.

7.21.3.3 The Bidder/Manufacturer shall be totally responsible for arrangement of all equipment, consumables, test gears and measuring equipment required for the PAT. All costs for this service shall be quoted.

Whereas the Bidder/Manufacturer’s Engineer shall be liable to make necessary arrangement to complete any kind of possible tests for asserting the specifications during the PAT.

7.21.4 During these Tests, the Bidder/Manufacturer has to provide per diem allowance to PAT Engineers as follows:

Number of BTCL’s PAT Engineers : total 1 (one) teams, maximum 3 (Three) persons and one person from Bangladesh Betar.

Number of days allowed for per diem charge: 5 (Five) working days.

Per diem charge to PAT members : Taka 2000 (Two thousand)per person per day

Other facilities : Other facility related to PAT

However, the Bidder/Manufacturer shall note that, if necessary, any or all PAT can continue for more than the above scheduled period; but, in such case, the Bidder/Manufacturer shall not be liable to pay per diem for more than 7(Seven) man-day.

7.21.5 After satisfactory completion of PAT of any Section, payment for the works of that Section may be made to the Contractor according to the payment terms & conditions of this tender. Based on the recommendation of the PAT team, the Project Director may issue PAC for that Section.

---

### **7.22 Final Acceptance Test (FAT):**

After completion of the PAT, the Engineers of the Bidder/Manufacturer will take prompt necessary steps to remove all types of defects/faults of the work and replace all types of faulty goods/materials at the Contractor’s own cost. At the end of the Performance Guarantee Period, the overall performance of the works and related supplied goods/materials will be reviewed and this review shall be termed as “Final Acceptance Test (FAT)”. FAT team will be formed by General Manager (Maintenance and Operation), BTCL.

The review shall include (but not limited to) the required working reliability and performance standards of the goods/materials to meet the tender specifications. The Contractor’s responsibility is to resolve all shortcomings mentioned in PAT reports and to remove of all pending & outstanding faults or shortages encountered during the Performance Guarantee

Period. When this FAT becomes due, the Contractor shall make an official request to BTCL for starting the FAT and BTCL shall start the FAT within one month of receiving the request from.

The Contractor shall be responsible for arrangement of all equipment, consumables, test gears and measuring equipment required (if any) for such review tests. All costs for materials and service (if any) shall be quoted. Based on the recommendation of the FAT team, the General Manager (Development & Coordination) may issue FAC.

### **7.23 Payments:**

All payments shall be made through irrevocable and transferrable Letter of Credit (L/C).

#### **A. Payment of Equipment Price**

- 1) An amount of 30% (Thirty percent) of the invoice amount shall be paid by the bank upon submission by the contractor of relevant shipping invoices, copies of the “Factory Test Certificate” (if any) and other documentations to support the claim.
- 2) An amount of 10% (Ten percent) of the invoice amount shall be paid by the bank upon submission of an “Arrival of Goods and Materials Certificate” by the contractor to support his claim. Such certificate(s) shall be issued by the Project Director upon arrival of relevant goods and materials on site or in store (as applicable).
- 3) An amount of 40% (Forty percent) shall be paid by the bank upon submission of a “Provisional Acceptance Certificate (PAC)” by the contractor to support his claim. Such a PAC shall be issued by General Manager (Development Co-ordination) of BTCL upon completion of relevant contractual liabilities by the contractor.
- 4) The remaining 10% (Ten percent) shall be paid by the bank upon submission of a “Final Acceptance Certificate (FAC)” by the Bidder/Manufacturer to support his claim. Such a FAC shall be issued by General Manager (Development Co-ordination) of BTCL upon completion of relevant contractual liabilities by the Bidder/Manufacturer.

#### **B. Payment for Service Price**

- 1) an amount of 30% (Thirty percent) of the whole contract amount for Installation, Testing & Commissioning and Project Implementation administrative services & Inter-working/Connection services shall be paid by the bank upon submission of a “Certificate of Commencement of Work” by the contractor to support his claim. Such a commencement certificate shall be issued by the Project Director upon commencement of implementation works by the Bidder/Manufacturer.
- 2) an amount of 60% (Sixty percent) of the concerned contract amount for Installation, Testing & Commissioning and Project Implementation administrative services & Inter-working/Connection services shall be paid by the bank upon submission of a “Provisional Acceptance Certificate (PAC)” by the contractor to support his claim. Such a PAC shall be issued by General Manager (Development Co-ordination) of BTCL upon completion of relevant contractual liabilities by the Bidder/Manufacturer.
- 3) the remaining 10% (Ten percent) of the concerned contract amount for Installation, Testing & Commissioning and Project Implementation services & Inter-working/Connection services shall be paid by the bank upon submission of a “Final Acceptance Certificate (FAC)” by the contractor to support his claim. Such a FAC shall be issued by General Manager (Development Co-ordination) of BTCL upon completion of relevant contractual liabilities by the Bidder/Manufacturer

**C. Payment for factory Test**

100% (One hundred percent) of the whole contract price for factory test shall be paid by the bank upon submission by the contractor the “Factory Test Certificate” to support his claim. Such Factory Test Certificate shall be signed by BTCL engineer(s) attending the factory test upon successful completion of the Factory Testing at test site of manufacturer’s premises.

**D. Payment for Survey, Planning and Network Design Services**

100% (One hundred percent) of the whole contract price for Survey, Planning and Network Design Services shall be paid by the bank upon submission by the contractor a “Successful Completion of Survey, Planning and Network Design Services Certificate” to support its claim. Such a certificate shall be issued by the Project Director upon completion of contractor’s contractual obligations for such services.

**E. Payment for PAT & FAT Services**

100% (one hundred percent) of the PAT and FAT services of the contract price of concerned sites shall be paid by the bank upon submission by the Contractor a “PAC” and “FAC” respectively to support his claim.

**F. Release of FAC payment against Bank Guarantee**

Payment(s) against FAC shall be released by the bank upon submission of a Bank Guarantee of the same amount by the contractor after issuance of PAC. The bank guarantee shall be returned to the contractor after issuance of FAC.

**7.24 Title of Ownership of the Equipment**

---

For all equipment covered by this purchase, the title of ownership shall be deemed to have been vested upon BTCL after such equipment have been loaded on board of any vessel for subsequent shipment to any port of entry in Bangladesh. BTCL will support BCC with those equipment and BTCL is liable to support telecommunication services to BCC through those equipment.

**7.25 Storage of Materials**

---

The Contractor shall be responsible for storage of all materials at his own cost and risk until successful completion of PAT. The Contractor may avail the storage spaces, if available, at different sites free of charge; but in all such cases the security responsibilities for the store and risks shall vest upon the Contractor.

**7.26 Cut-over of the systems**

---

The systems shall, generally, be put into commercial service after successful completion of the PAT. But BTCL shall reserve the right to put any or all portion of any or all systems to commercial service, under special circumstances, even if such portion(s) have not successfully passed the PAT. Under such circumstances, the Contractor shall not be relieved of his responsibilities of successful completion of the PAT for the relevant portion(s).

**7.27 Documentation**

The Contractor shall supply at least (but not limited to) the following documents before PAT of each station. All cost for those documents shall be quoted

- i) As-built drawings for all relevant Equipment and technical details documentations: 2 sets per site

## **7.28 Installation Material**

The Bidder/Manufacturer shall quote for all installation material for equipment. The material shall include all type of local material necessary to be used during installation, self-testing and PAT functions All costs for materials shall be quoted and failure to quote shall be considered that the Bidder/Manufacturer proposes to provide these material totally "*free of charge*" to BTCL.

## **7.29 Installation and Commissioning Services**

The Contractor shall be responsible to provide all services related to installation, commissioning.

## **FOR LOT B**

### **7.30 Acceptance Tests:**

Acceptance tests will be divided into two parts. One is Provisional Acceptance Test (PAT) and another is Final Acceptance Test (FAT).

#### **7.30.1 Provisional Acceptance Test (PAT):**

**7.30.1.1** Before acceptance of the installed OFC network system, BTCL PAT team shall carry out, on site, detail tests of the finished works and related supplied goods such as HDPE duct, DWC duct, Hand-Hole etc. to ascertain their technical and other specifications, inventory checking of the work, section by section testing of laid OFC etc. The PAT team will also check whether the work has been performed as per the specifications mentioned in the tender document. Such tests and checking shall be termed as "Provisional Acceptance Test (PAT)". Prior to the commencement of such tests, the Contractor shall submit a proposed procedure for the PAT to be subsequently passed by BTCL. PAT team will be formed with the approval of the Managing Director, BTCL. The PAT will be done by the PAT team of BTCL and Contractor's Engineers jointly.

**7.30.2** On completion of installation and self-testing of any Section or complete OSP work, the Bidder shall submit 3(three) copies of self-test results to BTCL and will offer PAT for that Section/ complete works. BTCL shall start such tests within one month after receipt of the request. The Bidder may, upon agreement by both parties, offer PAT for any part or parts of the total system. BTCL may also ask the Bidder for partial PAT

**7.30.3** The Bidder shall be totally responsible for arrangement of all equipment, consumables, test gears and measuring equipment required for the PAT. All costs for this service shall be quoted.

The Bidder's Engineer shall be liable to make necessary arrangement to complete any kind of possible tests for asserting the specifications during the PAT.

**7.30.4** During these Tests, the Bidder has to provide per diem allowance to PAT Engineers as follows for each lot:

- a) Number of BTCL's PAT Engineers : total 2 (two) teams, each team consisting of 3 (three) persons from BTCL and 1(One) person from Bangladesh Betar..
- b) Number of days allowed for per diem charge: 5 (Five) working days per team.
- c) Per Diem charge to BTCL's PAT Engineers: Taka 1000 (One Thousand) per person per day.
- d) Other facilities: Transportation to each site & any other facilities related to PAT.

However, if PAT needs to be continued for more than the above scheduled period, the Bidder shall not have to pay per diem for more those additional days.

**7.30.5** After satisfactory completion of PAT of any Section, payment for the works of that Section may be made to the Contractor according to the payment terms & conditions of this tender. Based on the recommendation of the PAT team, the Project Director may issue PAC for that Section.

### **7.31 Final Acceptance Test (FAT):**

**7.31.1** After completion of the PAT, the Engineers of the Bidder will take prompt necessary steps to remove all types of defects/faults of the work and replace all types of faulty goods/materials at the Contractor's own cost. At the end of the Performance Guarantee Period, the overall performance of the works and related supplied goods/materials will be reviewed and this review shall be termed as "Final Acceptance Test (FAT)". FAT team will be formed by Director (Maintenance and Operation), BTCL.

**7.31.2** The review shall include (but not limited to) the required working reliability and performance standards of the goods/materials to meet the tender specifications. The Contractor's responsibility is to resolve all shortcomings mentioned in PAT reports and to remove of all pending & outstanding faults or shortages encountered during the Performance Guarantee Period. When this FAT becomes due, the Contractor shall make an official request to BTCL for starting the FAT and BTCL shall start the FAT within one month of receiving the request from.

**7.31.3** The Contractor shall be responsible for arrangement of all equipment, consumables, test gears and measuring equipment required (if any) for such review tests. All costs for materials and service (if any) shall be quoted. Based on the recommendation of the FAT team, the Director (Development & Coordination) may issue FAC.

### **7.32 Payments:**

All payments shall be made through irrevocable Letter of Credit (L/C) or through A/C payee cheque. As per Clause GCC-66, the Project Director shall pay the Contractor the amounts certified by the Project Manager within twenty-eight (28) days of the date of each certificate. The maximum amount to be certified by the Project Manager in different stages for satisfactory progress of the work will be as follows:

- i. 50% of the total amount of the price of material used for the works completed as per BoQ.
- ii. 50% of the total amount of the price of OSP service works, excluding miscellaneous items completed as per BoQ.
- iii. After issuing PAC of each Section, payment of remaining 40% of the total amount of price of material and service works (except miscellaneous items) of that Section will be made. In case the PAC cannot be issued due to some unavoidable circumstances for which the

Contractor is not liable; the Project Director may make a part payment, maximum 50% of the completed materials and service works for which PAC could not be issued.

- iv. 100% of the payment for Maintenance Support Service during Guarantee Period will be made after issuance of each FAC.
- v. Security Deposit (10% of total payment as per PCC and GCC 70) shall be returned to the Contractor after issuance of each FAC.

### **7.33 Title of Ownership of the Equipment**

---

For all OSP covered by this purchase, the title of ownership shall be deemed to have been vested upon BTCL after such equipment have been loaded on board of any vessel for subsequent shipment to any port of entry in Bangladesh.

### **7.34 Storage of Materials**

---

The Contractor shall be responsible for storage of all materials at his own cost and risk until successful completion of PAT. The Contractor may avail the storage spaces, if available, at different sites free of charge; but in all such cases the security responsibilities for the store and risks shall vest upon the Contractor.

### **7.35 Cut-over of the systems**

---

The systems shall, generally, be put into commercial service after successful completion of the PAT. But BTCL shall reserve the right to put any or all portion of any or all systems to commercial service, under special circumstances, even if such portion(s) have not successfully passed the PAT. Under such circumstances, the Contractor shall not be relieved of his responsibilities of successful completion of the PAT for the relevant portion(s).

### **7.36 Documentation**

The Contractor shall supply at least (but not limited to) the following documents before PAT of each station. All cost for those documents shall be quoted

- i) As-built drawings for all relevant Termination Box : 2 sets per site
- ii) OFC Route map : 2 sets per site

### **7.37 Installation Material**

The Bidder shall quote for all installation material for all of the OSP covered by this purchase. The material shall include all type of local material necessary to be used during installation, self-testing and PAT functions All costs for materials shall be quoted and failure to quote shall be considered that the Bidder proposes to provide these material totally "*free of charge*" to BTCL.

### **7.38 Installation and Commissioning Services**

The Contractor shall be responsible to provide all services related to installation, commissioning and cut-over services for all OSP covered by this purchase.





## **7.41 Requirements of user certificate for equipment and experience for Bidder/Manufacturer**

### **For LOT A**

7.41.1 The Bidder/Manufacturer will be required to submit User's Certificate for Optical Transmission Equipment of proposed equipment, Batteries and Rectifiers.

7.41.2 Quantitative and Qualitative aspects of user's certificates

1. User's Certificates of satisfactory working record of the equipment (MSPP STM-1/STM-4/STM-16), for at least 3(Three) years in at least 3(Three) countries excluding the Country of origin of the equipment.
2. Factory tests, Provisional Acceptance test, Laboratory Test and/or Pilot Project Test Certificates are not acceptable as user certificate.
3. All this certificate must contain the issue date, period of satisfactory operation (it should be sufficient to fulfill the requirement stated in Clause 2.2.1 and Clause 2.2.2), name and contact number of the issuing authority which will be in the letter head pad.
4. The certificate issuing authority must be a Telecom Operator/Carrier of the respective Country. If a telecom operator/carrier operates telecom networks in more than one Country, then they may issue different user certificates from different countries where they operates.
5. Such User Certificates shall be in English or originally in any other language accompanied by "legally authorized translation in English". Certificates in any other language, but not accompanied by such translation, shall be disregarded.

### **7.41.3 Experience Requirement of the Bidder/Manufacturer/Manufacturer**

The Bidder/Manufacturer/Manufacturer must have experience for completion of at least 3(Three) years in at least 3(Three) countries excluding the Country of origin of the equipment of supply, installation and commissioning of optical transmission equipment on turn-key basis or a composite project which includes supply, installation and commissioning of MSPP optical transmission equipment on turn-key basis,. Where Turn-key completion of the work means "a complete completion of supply, installation, testing & commissioning of equipment/materials included in the work under a purchase contract". The Bidder/Manufacturer must provide Certificate from the relevant Operator/Carrier in support of such experience. if it is not clear that the project includes any optical transmission system and the project has been completed on turn-key basis the certificate will not be acceptable to BTCL.

7.41.4 BTCL shall have the right to examine the authenticity of issuance and contents of all those certificates. BTCL shall have the right to choose methods, timings and procedures of examining such authenticity. The procedure may include (but not limited to) among others, making direct contacts to relevant persons or gathering information from other sources like web sites, other web publishes, technical journals, newsletters of industry, professional or trade organizations etc.

7.41.5 BTCL shall have the authority to contact the persons/ organizations issuing those certificates to ascertain the authenticity of any or all submitted certificates. The Bidder/Manufacturer shall keep informed the relevant contact persons about the possible contact by BTCL.

7.41.6 If for any Bidder/Manufacturer, either the content or the source of any of the supplied certificate is found to be unauthentic BTCL may declare the Bidder/Manufacturer and manufacturer blacklisted for all future procurements of BTCL, or if the issuing organization/person refuse to certify the authenticity of any certificate, BTCL shall consider the bid to be "**Substantially Non-Responsive**" and shall not continue with further evaluation of the bid. If the submitted certificates do not meet the requirements of Clauses 2.2 (including sub-clauses) and 2.3 then the bid will be considered having "**Change of Substance**".

7.41.7 If the Bidder/Manufacturer has been identified as submitting any unauthentic certificate or document, that Bidder/Manufacturer may be declared by BTCL, as "**not eligible**" for participation in any subsequent procurement procedures of BTCL, either indefinitely or for a stated period of time.

7.41.8 The Bidder/Manufacturer shall co-operate with BTCL for the works related to examination of the certificates. If proper co-operation is not obtained from the Bidder/Manufacturer, BTCL shall have the right to make its own conclusion.

7.41.9 Ban on quoting of product of Black Listed Bidder/Manufacturer/Manufacturer: Bidder/Manufacturer shall not quote any equipment or product of any Bidder/Manufacturer/Manufacturer which is Black listed by BTCL(erstwhile BTTB) for any reasons irrespective of their Head Quarter/Divisional Head Quarter/Business Head Quarter/Country of origin etc.

Any disagreement will be treated as "**Change of substance**".

## **7.42 CRITERIA AND PROCESS OF EVALUATION**

7.42.1 Notwithstanding whatever is stated in other clauses of the tender documents, the criteria for evaluation of substantial responsiveness of the received bids of this tender shall be according to clauses described in this chapter of the tender document. If any Bidder/Manufacturer refuses to agree to any of the clauses of this chapter, his bid shall automatically be considered as "**substantially non responsive**".

7.42.2 However, relevant clause(s) stated elsewhere in this document shall also be applicable if such clause(s) do(es) not contradict any clause(s) of this chapter.

### **7.42.3 Evaluation Process**

The process of evaluation shall be in the following order:

7.42.3.1 Preliminary Examination - determination of Eligibility of the Bids.

7.42.3.2 Technical Examination and Responsiveness

Financial Evaluation of Technically Responsive Bids

7.42.3. 4 Selection of successful Bidder/Manufacturer

7.44.. Technical and Financial Documents

7.44.1 The Bidder/Manufacturers "Technical & Financial Documents" shall contain the following documents in each set:

1. User's Certificates regarding the equipment as described in Clause 10.2.

2. Experience Certificate of the Bidder/Manufacturer as described in Clause 10.3.
3. Brochure/ Catalog and Technical documents of the Manufacturer, showing model name and number, specifications and capacities, Hardware description etc., for the equipment which Bidder/Manufacturer has proposed in Form-F.
4. Summary price and Detail Bill of Quantity (BoQ) of all equipment, goods (up to the most detailed level desired by the Bidder/Manufacturer) and services as per formats shown in “Form-A”, "Form B"s, “Form C”s and “Form-D”.
5. Basic Functional and Operational Block Diagrams (for both hardware & software) of the MSPP equipment, showing all major systems.
6. Method of expansion of the equipment from its present capacity to final capacity.
7. The Bidder/Manufacturer must submit Type-wise Face lay-out view of actual configured MSPP equipment proposed at different sites. These lay-out view drawings shall include all the quoted Racks/Sub-racks/chassis of that specific site, clearly showing all the slots on each equipment (Whether equipped or not). Different Cards (minor items need not be shown) quoted in BOQ shall be shown on these Racks/Sub-racks/chassis on specific slot number where these cards are to be inserted for a configured equipment to satisfy technical requirements.
8. Functional description, in brief, and abbreviated name (if any) of all major hardware for the system (up to the level listed in the BoQs).
9. The “Compliance Schedule” to all the clauses and its sub-clauses of the Tender Document. The schedule shall be prepared as per format shown in Annex-G of this document.
10. The Tender document duly signed (in original) and stamped in every page by an authorized representative of the Bidder/Manufacturer.

#### 7.44.2 Guidelines for submitting Technical and Financial documents

1. Among the documents listed above, Type-wise Face lay-out of the proposed MSPP equipment system must be provided separately in a separate chapter of the technical document. Other documents listed above shall preferably be provided separately in separate chapters of the technical document. But co-related items may be merged together or included in one single chapter. All the chapters must be marked and numbered clearly and a list of contents must be provided on top of each books/volumes of the documents.
2. If for any Bidder/Manufacturer, its bid does not contain the documents asked in clauses 9.4.1(1), 9.4.1(2), 9.4.1(4), 1.12.1(7) and 9.4.1(9) for the offered MSPP equipment, BTCL shall declare the bid to be "**Substantially Non-Responsive**" and shall not continue with further evaluation of that bid.
3. If it does not contain the information asked in clause 9.4.1(8) above, BTCL shall consider the bid having "**Major Deviation**".
4. If for any Bidder/Manufacturer, its bid does not contain any of the required documents listed in 9.4.1 (3), 9.4.1(5), 9.4.1(6) or 9.4.1(10) the bid shall earn penalty point's equivalent to a "**Critical Deviation**" for each of such absent document

#### 7.45 Special information for the Bidder/Manufacturers

**7.45.1** The Bidder/Manufacturer shall note that, during submission of the bid, if he does not comply and/ or disagree to any or many specifications, terms and/ or conditions set forth in this document and/ or proposes any alternate specification, terms and/or conditions; such non-compliance and/ or disagreement and/or alternate specification, terms and/or conditions shall not be binding upon BTCL until and unless such non-compliance and/ or disagreement and/or alternate specifications and/or terms and/or conditions have been accepted by BTCL and has been incorporated in writing in the Purchase Contract and/ or any other document which has been declared as part of the contract.

**7.45.2** In case of any disagreement of Clause 9.5.1 above by any Bidder/Manufacturer, BTCL shall consider the bid as "**Substantially Non-Responsive**" and shall not continue with further evaluation of the bid.

#### 7.46 Preliminary Examination – determination of Eligibility of the Bids

1) The TEC will first examine the contents of all “Mandatory Documents” of each Bid as per Clause 8.5.

2) Bidder/Manufacturer who will not properly give any of the required documents as mentioned in “Mandatory Documents”, the TEC of BTCL shall treated that Bid as “**not eligible**” and will reject the concerned Bid.

3) The Bids of only those Bidder/Manufacturers, whose Bids have not been treated as "**not eligible**" by the TEC of BTCL shall automatically be considered as “**Eligible**” and shall be considered for further evaluation.

4) Any Bid, declared by TEC of BTCL to be “**not eligible**”, cannot be declared “**Eligible**” later on.

#### 7.47 Technical Examination and Responsiveness

1) The TEC shall then examine **detail Technical and Financial documents** as per clause 9.4 to check conformity of the offer with the relevant Technical Specifications of different equipment and systems mentioned in chapters 2, 3, 4 and 5.

2) Any Bid found to be “**Substantially Non-Responsive**”, the TEC will not continue with further evaluation of the Bid.

3) During evaluation, TEC shall consider Bidder/Manufacturers’ compliances to various clauses and sub-clauses of this tender; but for the interest of BTCL, TEC shall have the authority to conclude its own decision about such compliances.

4) The Bidder/Manufacturer does not give any statement to its compliance to any of the tender clauses or sub-clauses or drops any clause or sub-clause in the “**Schedule of Compliance**”, its' compliance to that clause/ sub-clause (as applicable) shall be treated as “**not complied**” to that particular clause/ sub-clause.

5) If the Bidder/Manufacturer puts any condition to his compliance to any of the tender clauses and/ or sub-clauses, its' compliance shall be treated as “**not complied**” to that particular clause and/ or sub-clause.

6) TEC shall also consider the contents of various attached documents. If any content of the attached documents contradicts the compliance statement of the Bidder/Manufacturer to any of the clauses and/ or sub-clauses, the Bidder/Manufacturer shall be treated as “**not complied**” to that particular clause and/ or sub-clause. In all of such cases, BTCL’s decision shall be final.

7) If any equipment/goods of the offered system is already working in BTCL network, for conclusion about compliance to any clause/sub-clause, BTCL's practical field experience shall be given priority over Bidder/Manufacturer's statement regarding the relevant

capabilities, performance, working reliability in field, operation & maintenance aspects, user's satisfaction etc. of all those equipment/goods. BTCL shall have the authority to draw its own conclusion regarding this aspect.

8) If, the Bidder/Manufacturer provides any clarifications to its Bid against any query of TEC, the TEC shall consider those clarifications. However, if such clarifications contradict the relevant statements given in his original offer, the offered clarification(s) shall be disregarded.

9) If the compliance of a Bidder/Manufacturer for a particular clause of the tender document is very close to the requirements of that clause but does not totally met the requirements of the clause

, then the members of the evaluation committee may, by applying their judgment, accept such incomplete compliance of the Bidder/Manufacturer against that particular clause, if it does not materially affect the performance of the equipment and may relieve the Bidder/Manufacturer from the penalty for non-compliance of that particular clause.

**7.47** In case of two (2) or more Bidder/Manufacturers bid having the same total Evaluated Bid Price, the Successful Bidder/Manufacturer shall be selected in the following order; Bidder/Manufacturer who achieved the lowest penalty points in the Technical Bid Evaluation. Bidder/Manufacturer who achieved the few numbers of serious penalty.

7.48 The following deviations of any offer will be treated as “minor deviation” of the bid:

1. Any deviation which has already been termed as “minor deviation” in this tender document.
2. The non-compliant of any clause/sub clause of this tender document having no weight as minor deviation or major deviation or change of substance or critical deviation shall be considered as minor deviation.
3. Every item of “minor deviation” shall earn a score of 1(one) “penalty point”.

7.49 The following deviations of any offer will be treated as “major deviation” of the bid:

1. Any deviation which has already been termed as “major deviation” in this tender document.
2. If the bid BoQ has any shortage of quantity in any of the required hardware and/or software (for each of such short-quoted quantity) unless otherwise specified in the tender.
3. Any item of “major deviation” shall earn a score of 5(five) “penalty points”.

7.50 The following deviations of any offer will be treated as “**critical deviation**” of the bid:

1. Any deviation which has already been termed as “critical deviation” in this tender document.
2. If the Bidder/Manufacturer made a major changed either the language or format of any of the different forms attached with this document.
3. Any item of “critical deviation” shall earn a score of 25 (twenty five) “penalty points”.

7.51 The following deviations of any offer will be treated as “**change of substance**” of the bid:

1. Any deviation which has already been termed as “change of substance” in this tender document.
2. If the Bidder/Manufacturer refuses to provide answers to any requested clarification(s).
3. If any Certificate or any other document attached as part of the bid is found to be false or unauthentic.
4. If the Bidder/Manufacturer has put any condition in the prices set forth in the BoQ.
5. If, for any Bidder/Manufacturer, the bid does not contain all the required prescribed filled up BoQ forms [if any Bidder/Manufacturer leaves few items ( $\leq 20\%$ ) of a BoQ form unpriced, it will not mean that the Bidder/Manufacturer did not fill up the concerned BoQ Form, in such case clause 9.15 (7) or/and 9.15 (10) or/and 9.15 (13) will be applied].
6. If in the bid BoQ, individual components are not uniquely identified which creates ambiguity about the price and capacity of components (for example, STM-1 interface card of the Media Gateway, Transmission Equipment and Routers and E1 interface card of the Media Gateway, Transmission Equipment and Routers should be described clearly about their port availability in each type of card.)
7. A bid containing any item of “change of substance” shall be treated as “**Substantially Non- Responsive**”.

7. The penalty points earned by each bid will be added to get total penalty points. The bid of any Bidder/Manufacturer which has earned more than 50 (Fifty) penalty points in Total, shall be treated as “**Substantially Non-Responsive**”.

7.52 BTCL’s decision to treat any bid as “**Substantially Non-Responsive**” shall be final.

7.52.1 A bid, not treated by BTCL as “**Substantially Non-Responsive**”, shall automatically be considered as “**Responsive**” and the process for evaluating financially shall begin.

7.52.2 However, in order to protect the interest of the purchaser, the Tender Evaluation Committee of BTCL shall have the right to give any suitable explanation on any discrepancy or inadvertency detected either in the tender document or in the bid proposal.

If a Bidder/Manufacturer wishes to raise a complaint regarding the Evaluation or any other decision of BTCL, he can do it referring the contents of his own bid documents. If a Bidder/Manufacturer raises a complaint referring to any specific content (which is/are not publicly available) of the bid documents of other Bidder/Manufacturer(s) then it will mean that the Bidder/Manufacturer has been illegally possessing the bid documents of other Bidder/Manufacturers. In such case the bid of the complainant Bidder/Manufacturer will be declared “**Substantially Non-Responsive**” and the Bidder/Manufacturer will be Black listed by BTCL for his above mentioned illegal activity.

### 7.53 Financial Evaluation and Price Comparison

1) The total price quoted by the Bidder/Manufacturer in the bid i.e., “**The Quoted Total Price**” shall not be the criteria for selection of the “Successful Bidder/Manufacturer”.

- 2) All of the “**Responsive**” bids will be further evaluated to calculate the “**Evaluated Total Price**” of the bid. The process of calculation of the “Evaluated Total Price” shall be in accordance with the clauses described in this chapter.
- 3) BTCL shall evaluate the contents of all of the Prescribed Forms submitted with the bid.
- 4) During such evaluation, the unit prices and discount (if any) quoted by the Bidder/Manufacturer shall be considered as final. Change of unit prices during evaluation stages shall not be allowed.
- 5) There shall be full conformity between the summary or total prices and their related breakups of unit prices. If any discrepancy is found, the relevant unit price shall be considered as a reference price for evaluation purpose.
- 6) The Bidder/Manufacturer shall quote for all items which is necessary for turn-key completion of all scopes of works described in this tender. No subsequent addition of any new item(s) in the BoQ will be allowed with new unit price during BoQ finalization.
- 7) The Bidder/Manufacturer shall quote for all items as per the schedule of requirements (BoQ). For any item listed in the Schedule of Requirements (BoQ), but shown un-priced in the Price column of BoQ, it shall be assumed that the price is included in the prices of other items. No bid will be declared as non-responsive for leaving few items of BoQ as un-priced.
- 8) BTCL shall correct arithmetic errors and errors made during transfer of data from one Form to Other that are identified during the evaluation of tenders. BTCL shall give prompt notice of any such correction to the respective Bidder/Manufacturer. If Bidder/Manufacturer does not accept such correction as arithmetic error, it will be considered as change of substance.
- 9) If the Bidder/Manufacturer has quoted the price for any item as “free” or “zero”, it shall be understood that the price would be same (i.e. free or zero) for any subsequent expansion up to the minimum final capacity of the system.
- 10) If, during evaluation, it is found that the Bidder/Manufacturer has not quoted any mandatory item(s), it shall be considered that the Bidder/Manufacturer proposes to supply the non-quoted items of required quantities “free of charge” to BTCL. If any Bidder/Manufacturer refuses to provide any item or part of any item and/or the system offered by the Bidder/Manufacturer does not support any item or part of it then the bid shall be treated as “Substantially Non-Responsive”.



- 11) If, during evaluation, it is found that the Bidder/Manufacturer has quoted for less quantity of any mandatory item, it shall be considered that the Bidder/Manufacturer proposes to supply the shortfall quantity “free of charge” to BTCL. If any Bidder/Manufacturer refuses to provide the short quoted quantity “free of charge” to BTCL then the bid of that Bidder/Manufacturer shall be treated as “Substantially Non-Responsive”.
- 12) The Bidder/Manufacturer shall not quote different unit price for same equipment/card/spare/accessory in different forms. If Bidder/Manufacturer quote different unit price for same equipment/card /spare/accessory in different forms, the lowest unit price of respective equipment/card/ spare/accessory shall be considered for evaluation considering arithmetic correction. It shall be understood that such lowest price shall remain same for the contract and for any subsequent expansion up to the final capacity of the system.
- 13) The Bidder/Manufacturer shall be responsible for turn-key implementation of the project and during execution of the contract if any shortfall of quantity of any item is detected; it shall be considered that the Contractor will supply required quantities of respective item without any additional charges to BTCL under this purchase and BTCL will not provide any CD VAT or any other duties for such type of goods.
- 14) In case of any item, other than mandatory has been quoted as additional/optional and if BTCL decided to purchase such item(s), its price shall be considered for evaluation and the unit price shall be taken from the Bidder/Manufacturer’s own quotation.
- 15) If the Bidder/Manufacturer wishes to give any discount in its financial offer, it shall be given after the “Total Price” of the bid, either as a lump sum or as a percentage. If the bid contains any irregular discount, the bid shall be treated as “Change of Substance” and the bid will not be evaluated further. If the Bidder/Manufacturer has given any regular discount in the bid, such discount shall be treated in percentage of the total bid price and each of the unit prices of the bid shall be re-fixed by reduction with the same percentage [i.e., new unit price = (discounted total price ÷ total price before discount) x quoted unit price]. Such re-fixed unit prices shall be regarded as the final unit prices for that relevant item of the bid. Such re-fixed unit prices shall be valid for any subsequent purchases up to the entire life-time of the project, i.e., 8 (Eight) years from the date of issuance of FAC.
- 16) If the “The Quoted Total Price” of the “successful Bidder/Manufacturer” is found to be higher or lower than the “Evaluated Total Price” of the bid, then “Evaluated Total Price” shall be considered as bid price.

- 17) For each of the “responsive” bids, BTCL shall calculate the “Evaluated Total Price” after making the relevant and necessary corrections as stated in this chapter.
- 18) Only the bids, found “responsive” will be listed in chronology of the “Evaluated Total Price”. The bid with the lowest value of the “Evaluated Total Price” shall be on top of the list; the Bidder/Manufacturer with the next higher value of the “Evaluated Total Price” shall be on second place and so on.

#### 7.54 Selection of Successful Bidder/Manufacturer

- 1) The Bidder/Manufacturer with the lowest value of the “Evaluated Total price” shall be considered as the “**Successful Bidder/Manufacturer**” for this bid.