

## **Request for Proposal (RFP)**

**For**

**Supply of Optical Fiber Cables (OFC) and HDPE Telecom Duct**

**RFP No.: BHN/PROC/OFC-DUCT/2026-08**

**Issue Date: 25 August 2026**

**BAHON Limited**  
(An NTTN Licensee, Bangladesh)

**REQUEST FOR PROPOSAL (RFP)**

**Supply of Optical Fiber Cable (OFC) and HDPE Duct for OFC Laying**

**RFP Ref no.:** BHN/PROC/OFC-DUCT/2026-08 | Date: 25 August 2026

**1. Introduction**

Bahon Ltd., a Nationwide Telecommunication Transmission Network (NTTN) licensee in Bangladesh, invites proposals from competent and experienced national and international suppliers/manufacturers for the supply of Optical Fiber Cable (OFC) and HDPE Telecom Duct for its network expansion program, as detailed below. Bahon Ltd. welcomes suppliers' technical inputs and value-adding proposals in addition to firm pricing.

**2. Scope of Supply**

Suppliers may submit a proposal for either or both of the following categories:

| Category | Item                                                | Indicative Qty |
|----------|-----------------------------------------------------|----------------|
| A        | Optical Fiber Cable (various core counts/types)     | 2,000 km       |
| B        | 40/33 mm HDPE Duct for underground cable deployment | 1,000 km       |

*Detailed technical specifications, core-count break-up, and duct sub-types are provided in **Annex-1**.*

**3. Minimum Eligibility Criteria**

- a. Minimum 5 years' experience in manufacturing/supplying telecom-grade OFC and/or HDPE duct.
- b. Proven track record of supply to NTTN/telecom operators; minimum 3 reference supply contracts of comparable scale in the last 5 years, with client contact details.
- c. OFC must comply with ITU-T G.652D standards; duct must comply with relevant HDPE pipe standards (e.g., ASTM/DIN/BIS equivalent) for telecom duct application.
- d. Valid trade license and/or manufacturing licenses.
- e. ISO 9001 (quality) certification; ISO 14001 and OHSAS 18001/ISO 45001 are preferred.
- f. Sufficient production/supply capacity to deliver the indicative quantities within the required timeline, evidenced by production capacity statement.
- g. Financially sound: audited financial statements for the last 2 years; minimum annual turnover threshold should be at least BDT 150 million [Equivalent to USD 1.22 million where 1USD=BDT123].
- h. Not blacklisted by any regulatory body, operator, or government agency in Bangladesh or abroad (self-declaration required).
- i. Willingness to provide product test certificates/type-test reports from an accredited laboratory.

## 4. Commercial Terms & Conditions

### 4.1 National / Local Supplier

- a. Commercial proposal to be quoted in Bangladeshi Taka (BDT), inclusive of all costs and applicable taxes and exclusive of VAT.
- b. Price Basis: Delivered at Bahon Ltd.'s designated warehouse(s) in Bangladesh.
- c. Inspection & Acceptance: Bahon Ltd.'s inspection team will inspect the goods and Bahon will issue acceptance letter based on inspection team report.
- d. Payment terms: Payment will be made after 60 days of proper invoice submission. Payment will be made through bank transfer/cheque.

### 4.2 Foreign / International Suppliers or Manufacturers

- a. Commercial proposal to be quoted on CFR (Cost & Freight) Chittagong Port, Bangladesh basis, in USD only.
- b. Payment terms: through Irrevocable Letter of Credit (L/C), terms to be finalized at the purchase order/contract stage.

### 4.3 Common Commercial Conditions

- a. Price validity: minimum 90 days from the RFP submission deadline.
- b. Delivery schedule/lead time from date of purchase order: The delivery shall be completed within 15 (fifteen) days for locally supplied goods (Partial Delivery is Allowed), and within 45 (forty-five) days for imported goods (Partial Delivery is Allowed – Minimum quantity 150 KM), whether supplied by an international supplier or a local supplier importing the goods.
- c. Warranty: minimum 1 year for the cable and 1 year for the HDPE duct against manufacturing defects.
- d. Liquidated Damages (LD) for delayed delivery **@2%** of undelivered value for each week delay will be imposed. LD will not be more than **10%** of the total contract price. In case the delivery delay exceeds more than 5 weeks, purchaser may cancel the relevant PO.
- e. Partial/staggered delivery and quantities may be considered at Bahon Ltd.'s discretion.
- f. Performance Security: The successful supplier(s) shall furnish a Performance Security in the form of an unconditional/irrevocable Bank Guarantee equivalent to **10%** of the awarded contract value — issued by any scheduled bank of Bangladesh for national suppliers, or by a bank in the supplier's own country for foreign suppliers/manufacturers — within the timeframe specified in the definitive contract.
- g. The Performance Security shall remain valid through a Defect Liability Period (DLP) of **6 (six) months** from the date of delivery/acceptance, and shall be released to the supplier upon satisfactory completion of the DLP.
- h. Bahon Ltd. reserves the right to recover, by encashment of the Performance Security (in part or in full), any liquidated damages for delayed delivery, and any costs arising from manufacturing defects or damage to goods during shipment/transportation; the remaining balance, if any, shall be returned to the supplier.

## 5. Proposal Submission Requirements

### 5.1 Proposal Forwarding Letter

Each proposal must be accompanied by a Proposal Forwarding Letter, addressed to the Inviting Officer of Bahon Ltd., on the supplier's official letterhead, signed by an authorized representative. The letter must include a brief Executive Summary covering: the category/categories being proposed (A and/or B), a summary of technical compliance, headline commercial terms, and confirmation of proposal validity period.

### 5.2 Supporting Documents

- Company profile, incorporation/trade license, and relevant certifications (ISO, type-test reports).
- Technical proposal with detailed specification compliance statement against **Annex-1**.
- Technical/commercial proposal, including price schedule, as per Section 4.
- List of reference clients/projects with contact details.
- Audited financial statements (last 2 years).
- Manufacturer's authorization letter, if the bidder is a distributor/agent.

## 6. Evaluation Criteria

| Criteria                                             | Weight |
|------------------------------------------------------|--------|
| Technical compliance & product quality/certification | 35%    |
| Commercial price competitiveness                     | 35%    |
| Experience, track record & reference projects        | 15%    |
| Delivery capability & lead time                      | 15%    |

### 6.1 Negotiation & Selection Process

Proposals will first be evaluated on technical and commercial merit as per the criteria above. Where the Evaluation Committee determines there is reasonable scope to obtain more favorable terms, Bahon Ltd. reserves the right to negotiate with one or more shortlisted suppliers on price and/or on commercial and technical terms, prior to final award. Following such negotiation (if any), the Evaluation Committee shall recommend the best-evaluated supplier(s) for contract award. Bahon Ltd.'s decision in this regard shall be final.

## 7. Contract Awarding Process

Upon finalization of the evaluated/negotiated supplier(s), the contract shall be awarded through the following sequential steps:

- Letter of Intent (LoI): Bahon Ltd. will issue a Letter of Intent to the successful supplier, stating the evaluated/finally negotiated price and agreed commercial and technical terms.
- Consent & Performance Security: The supplier shall submit written consent against the LoI, along with the Performance Security in the form of a Bank Guarantee (where required under the LoI), within 10 (ten) calendar days of receipt of the LoI.

- c. Contract Signing: Upon receipt of consent and Performance Security, the contract will be signed between Bahon Ltd. and the supplier within next 7 (seven) days.
- d. Purchase Order: Following contract execution, Bahon Ltd. will issue one or multiple Purchase Order(s) under the contract mutually, upon which delivery obligations shall commence.

## 8. Submission Instructions

- a. Interested suppliers/manufacturers will submit their proposal according to the RFP document including **Annex-1** (technical specifications) and **Annex-2** (price schedule format).
- b. The proposal along with all necessary documents (technical and commercial proposals) will be submitted through email to **procurement@bahon.com** by the deadline specified in the RFP notice. The attachment size of each email should not be more than 30 MB, If required, attached through multiple emails with marking.
- c. Bahon Ltd. reserves the right to accept or reject any or all proposals, in part or in full, without assigning any reason.

## 9. Contact for Inquire

Procurement Department, Bahon Ltd.

Email: [procurement@bahon.com](mailto:procurement@bahon.com) | Phone: +880-09606200990

Address: Bahon Limited, Star Center, 2nd Floor, House No- 2, Block- SE(C), Road No- 138, Gulshan-1, Dhaka- 1212, Bangladesh.

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*This RFP is an invitation to offer and does not constitute a binding obligation on Bahon Ltd. Detailed specifications and definitive terms will govern the final contract.*

## Annex 1

# TECHNICAL SPECIFICATIONS

## A.1: Optical fiber cable – 12 core Fig-8

### 1. General

#### 1.1 Scope

This Specification covers the design requirements and performance standard for the supply of optical fiber cable in the industry. ensures a stable quality control system for our cable products through several programs including ISO 9001.

| <b>Cable type</b>        | <b>Application</b>  |
|--------------------------|---------------------|
| 12F Unitube Aerial Armd. | Aerial installation |

#### 1.2 Reference

The cable are designed, manufactured and tested according to the standards as follows:

|                |                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------|
| ITU-T G.652    | Characteristics of a Single Mode Optical Fiber Cable                                                                       |
| IEC 60794-1-1  | Optical Fiber Cables-Part 1-1: Generic Specification- General                                                              |
| IEC 60794-1-2  | Optical Fiber Cables-Part 1-2: Generic Specification- Basic Optical Cable Test Procedure                                   |
| IEC 60794-3    | Optical Fiber Cables-Part 3: Sectional Specification- Outdoor Cables                                                       |
| IEC 60794-3-20 | Optical Fiber Cables-Part 3-20: Outdoor Cable Family specification for optical self-supporting aerial communication cables |
| ICEA-640       | Standard for Optical Fiber Outside Plant Communication                                                                     |
| EIA TIA 455    | Standard Test Procedures for Fiber Optic Cables                                                                            |
| EIA TIA 458    | Standard Optical Fiber Materials Classes and Preferred Sizes                                                               |
| EIA TIA 598B   | Color Coding for Fiber Optic Cables                                                                                        |
| EN 50288       | Multi-Element Metallic Cables used in Analog & Digital Communication and Control                                           |
| EN 50289       | Communication Cables - Specification for Electrical Test Methods                                                           |
| IEC 60793-1    | Optical Fibers. Part-1, General Specification                                                                              |
| IEC 60794      | Optical Fiber Cables, Part-1, Genetic Specification                                                                        |
| IEC 60874      | Connections for Optical Fibers and Cables                                                                                  |
| ITU-T L.10     | Optical Fiber for DUCT and Tunnel Application                                                                              |

#### 1.3 Life Time

Optical fiber cables supplied in compliance with this specifications is capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

## 1.4 Application

| Item                   | Value                       |
|------------------------|-----------------------------|
| Operation temperature  | -40 °C~+70 °C               |
| Storage temperature    | -40 °C~+70 °C               |
| Static bending radius  | 10 times the cable diameter |
| Dynamic bending radius | 20 times the cable diameter |

## 2. Optical Fiber

Optical Fibers supplied in this specification meet the requirements of ITU-T G.652D

| Parameter                                                       | Specification                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Standard                                                        | ITU-T G.652D                                                                            |
| MFD (1310 nm)                                                   | $9.2 \pm 0.5 \mu\text{m}$                                                               |
| MFD (1550 nm)                                                   | $10.4 \pm 0.5 \mu\text{m}$                                                              |
| Chromatic Dispersion (max)                                      | 3.5 ps/(nm.km) (1310 nm)<br>17 ps/(nm.km) (1550 nm)                                     |
| Cladding diameter                                               | $125 \pm 1.0 \mu\text{m}$                                                               |
| Fiber diameter                                                  | $245 \pm 7 \mu\text{m}$ , with UV coating, and<br>colored to : $250 \pm 15 \mu\text{m}$ |
| Core/cladding concentricity error (max)                         | $0.8 \mu\text{m}$                                                                       |
| Coating/cladding concentricity error                            | $\leq 12.0 \mu\text{m}$                                                                 |
| Cladding non circularity                                        | 2.0 %                                                                                   |
| Cut off wavelength                                              | $\lambda_{cc} \leq 1260 \text{ nm}$                                                     |
| Attenuation coefficient                                         | 1310 nm: 0.350 dB/km max after cabling<br>1550 nm: 0.210 dB/km max after cabling        |
| Bending-loss performance of optical fiber<br>@1310 nm & 1550 nm | $\leq 0.05 \text{ dB}$ (100 turns around a mandrel of 50mm diameter)                    |
| Polarization mode dispersion maximum<br>individual fiber        | $\leq 0.2 \text{ ps}/\sqrt{\text{km}}$                                                  |
| Polarization mode dispersion link value                         | $\leq 0.10 \text{ ps}/\sqrt{\text{km}}$                                                 |
| Zero-dispersion wavelength                                      | $1312 \pm 12 \text{ nm}$                                                                |
| Zero-dispersion slope                                           | $\leq 0.091 \text{ ps}/\text{nm}^2 \cdot \text{km}$                                     |

### 3. Optical Cable

#### 3.1 Technical Characteristics

- The unique second coating and stranding technology provide the fibers with enough space and bending endurance, which ensure good optical property of the fibers in the cable
- Accurate process control ensures good mechanical and temperature performance
- High quality raw material guarantees the long service life of cable

#### 3.2 Cross Section of Cable

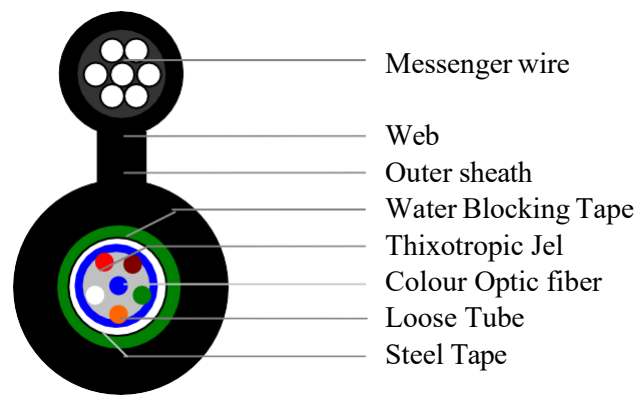


Figure: 6/12 Fiber Unitube Aerial Armored (Fig-8).

#### 3.3 Fiber Identification

The color code of fibers will be identification in accordance with the following color sequence, other sequence also is available.

|            | 1    | 2      | 3      | 4      | 5    | 6     |
|------------|------|--------|--------|--------|------|-------|
| Color Code | Blue | Orange | Green  | Brown  | Grey | White |
|            | 7    | 8      | 9      | 10     | 11   | 12    |
|            | Red  | Black  | Yellow | Violet | Pink | Aqua  |

### 3.4 Dimensions and Descriptions

The standard structure of cable is shown in the following table, other structure and fiber count are also available according to customer requirements.

| Item                         | Contents            | Value<br>12F Figure-8                                  |
|------------------------------|---------------------|--------------------------------------------------------|
| Loose tube                   | Outer diameter (mm) | 2.1                                                    |
|                              | Color               | Natural                                                |
| Water Blocking               | Material            | Water blocking tape                                    |
| Aarmor                       | Material            | Steel tape                                             |
| Cable core part sheath       | Material            | HDPE                                                   |
|                              | Color               | Black                                                  |
|                              | Thickness (mm)      | Nominal: 1.5                                           |
| Messenger part sheath        | Material            | HDPE                                                   |
|                              | Color               | Black                                                  |
|                              | Thickness (mm)      | Nominal: 1.0                                           |
| Messenger wire               | Material            | 7*n mm steel stranding wire<br>n=dia of each steelwire |
| Cable diameter (mm) Approx.  |                     | $5.5 \times 8.0$                                       |
| Cable weight (kg/km) Approx. |                     | < 90                                                   |

### 3.5 Main Mechanical and Environmental Performance

#### Main mechanical performance

| Item | Tension (N) | Crush (N/100mm) |           |
|------|-------------|-----------------|-----------|
|      |             | Short term      | Long term |
| 12 F | 1500        | 1500            | 750       |

#### Environmental and installation condition

| Max. wind speed | Max. ice thickness | Initial Installation sag | Temperature   |
|-----------------|--------------------|--------------------------|---------------|
| 25 m/s          | 0                  | 1.0%                     | -40 °C~+70 °C |

## 4 Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performances of the cable are in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1310 nm & 1550 nm.

| Items                      | Test Method                                                                                                                                                                             | Requirements                                                                                            |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Tension</b>             | <b>IEC 60794-1-2-E1</b><br>Load: According to Clause 3.5<br>Sample length: Not less than 50m.<br>Duration time: 1min.                                                                   | Additional attenuation: $\leq 0.05\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Crush</b>               | <b>IEC 60794-1-2-E3</b><br>Load: According to Clause 3.5<br>Duration of load: 1min                                                                                                      | Additional attenuation: $\leq 0.05\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Impact</b>              | <b>IEC 60794-1-2-E4</b><br>Radius: 300 mm<br>Impact energy: 10 J<br>Impact number: 1<br>Impact points: 3                                                                                | Additional attenuation: $\leq 0.1\text{dB}$<br>No damage to outer jacket and inner elements             |
| <b>Repeated bending</b>    | <b>IEC 60794-1-2-E6</b><br>Bending radius: $25 \times D$<br>Cycles: 25<br>Load: 150N                                                                                                    | Additional attenuation: $\leq 0.05\text{dB}$<br>No damage to outer jacket and inner elements            |
| <b>Torsion</b>             | <b>IEC 60794-1-2-E7</b><br>Cycles: 10<br>Length under test: 1m<br>Turns: $\pm 180^\circ$<br>Load: 150N                                                                                  | Additional attenuation: $\leq 0.1\text{dB}$<br>No damage to outer jacket and inner elements             |
| <b>Water Penetration</b>   | <b>IEC 60794-1-2-F5B</b><br>Time : 24 hours<br>Sample length : 3m<br>Water height : 1m                                                                                                  | No water leakage, except for the messenger part..                                                       |
| <b>Temperature cycling</b> | <b>IEC 60794-1-2-F1</b><br>Sample length: at least 1000m<br>Temperature range: $-40^\circ\text{C} \sim +70^\circ\text{C}$<br>Cycles: 2<br>Temperature cycling test dwell time: 12 hours | The change in attenuation coefficient shall be less than 0.05 dB/km.                                    |

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## **5 Packaging and Drum**

### **5.1 Cable Sheath Marking**

Unless otherwise specified, the cable sheath marking shall be as follows:

- Color: white (ambush)
- Contents: Production Company and Procuring entity name, the year of manufacture, type of cable, cable ID, fiber standard, length marking
- Interval:  $1 \pm 0.2\%$  m
- Example (XXX - BAHON LTD. 2026 Armd. 12F 0007 SM-G.652D 0000 )

### **5.2 Drum Length**

Standard Drum length: 3 km/drum

### **5.3 Cable Drum**

The cables are packed in fumigated wooden drums.

### **5.4 Cable Packing**

Both ends of the cable will be sealed with suitable plastic caps to prevent the entry of moisture during shipping, handling and storage. The inner end is available for testing.

## A.2: Optical fiber cable – 24 core Fig-8

### 1. General

#### 1.1 Scope

This Specification covers the design requirements and performance standard for the supply of optical fiber cable in the industry. ensures a stable quality control system for our cable products through several programs including ISO 9001.

| Cable type                 | Application         |
|----------------------------|---------------------|
| 24F Dual Tube Aerial Armd. | Aerial installation |

#### 1.2 Reference

The cable are designed, manufactured and tested according to the standards as follows:

|                |                                                                                                                            |
|----------------|----------------------------------------------------------------------------------------------------------------------------|
| ITU-T G.652    | Characteristics of a Single Mode Optical Fiber Cable                                                                       |
| IEC 60794-1-1  | Optical Fiber Cables-Part 1-1: Generic Specification- General                                                              |
| IEC 60794-1-2  | Optical Fiber Cables-Part 1-2: Generic Specification- Basic Optical Cable Test Procedure                                   |
| IEC 60794-3    | Optical Fiber Cables-Part 3: Sectional Specification- Outdoor Cables                                                       |
| IEC 60794-3-20 | Optical Fiber Cables-Part 3-20: Outdoor Cable Family specification for optical self-supporting aerial communication cables |
| ICEA-640       | Standard for Optical Fiber Outside Plant Communication                                                                     |
| EIA TIA 455    | Standard Test Procedures for Fiber Optic Cables                                                                            |
| EIA TIA 458    | Standard Optical Fiber Materials Classes and Preferred Sizes                                                               |
| EIA TIA 598B   | Color Coding for Fiber Optic Cables                                                                                        |
| EN 50288       | Multi-Element Metallic Cables used in Analog & Digital Communication and Control                                           |
| EN 50289       | Communication Cables - Specification for Electrical Test Methods                                                           |
| IEC 60793-1    | Optical Fibers. Part-1, General Specification                                                                              |
| IEC 60794      | Optical Fiber Cables, Part-1, Genetic Specification                                                                        |
| IEC 60874      | Connections for Optical Fibers and Cables                                                                                  |
| ITU-T L.10     | Optical Fiber for DUCT and Tunnel Application                                                                              |

#### 1.3 Life Time

Optical fiber cables supplied in compliance with this specifications is capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

## 1.4 Application

| Item                   | Value                       |
|------------------------|-----------------------------|
| Operation temperature  | -40 °C ~ +70 °C             |
| Storage temperature    | -40 °C ~ +70 °C             |
| Static bending radius  | 10 times the cable diameter |
| Dynamic bending radius | 20 times the cable diameter |

## 2. Optical Fiber

Optical Fibers supplied in this specification meet the requirements of ITU-T G.652D

| Parameter                                                       | Specification                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Standard                                                        | ITU-T G.652D                                                                            |
| MFD (1310 nm)                                                   | $9.2 \pm 0.5 \mu\text{m}$                                                               |
| MFD (1550 nm)                                                   | $10.4 \pm 0.5 \mu\text{m}$                                                              |
| Chromatic Dispersion (max)                                      | 3.5 ps/(nm.km) (1310 nm)<br>17 ps/(nm.km) (1550 nm)                                     |
| Cladding diameter                                               | $125 \pm 1.0 \mu\text{m}$                                                               |
| Fiber diameter                                                  | $245 \pm 7 \mu\text{m}$ , with UV coating, and<br>colored to : $250 \pm 15 \mu\text{m}$ |
| Core/cladding concentricity error (max)                         | $0.8 \mu\text{m}$                                                                       |
| Coating/cladding concentricity error                            | $\leq 12.0 \mu\text{m}$                                                                 |
| Cladding non circularity                                        | 2.0 %                                                                                   |
| Cut off wavelength                                              | $\lambda_{cc} \leq 1260 \text{ nm}$                                                     |
| Attenuation coefficient                                         | 1310 nm: 0.350 dB/km max after cabling<br>1550 nm: 0.210 dB/km max after cabling        |
| Bending-loss performance of optical fiber<br>@1310 nm & 1550 nm | $\leq 0.05 \text{ dB}$ (100 turns around a mandrel of 50mm diameter)                    |
| Polarization mode dispersion maximum<br>individual fiber        | $\leq 0.2 \text{ ps}/\sqrt{\text{km}}$                                                  |
| Polarization mode dispersion link value                         | $\leq 0.10 \text{ ps}/\sqrt{\text{km}}$                                                 |
| Zero-dispersion wavelength                                      | $1312 \pm 12 \text{ nm}$                                                                |
| Zero-dispersion slope                                           | $\leq 0.091 \text{ ps}/\text{nm}^2 \cdot \text{km}$                                     |

### 3. Optical Cable

#### 3.1 Technical Characteristics

- The unique second coating and stranding technology provide the fibers with enough space and bending endurance, which ensure good optical property of the fibers in the cable
- Accurate process control ensures good mechanical and temperature performance
- High quality raw material guarantees the long service life of cable

#### 3.2 Cross Section of Cable

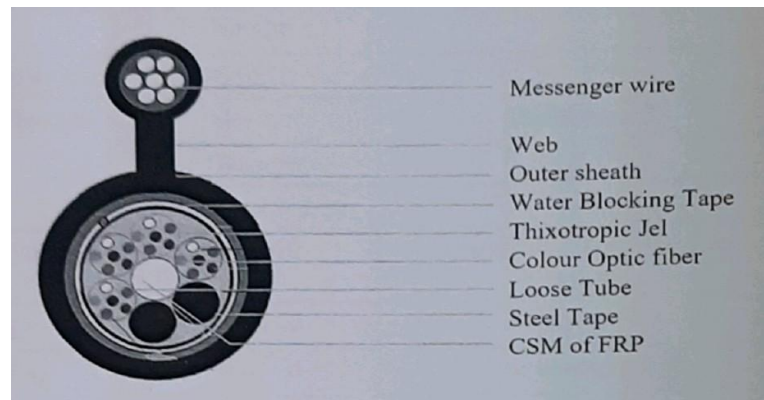


Figure: 24 Fiber Dual tube (Per tube 12F) Aerial Armored (Fig-8).

#### 3.3 Fiber Identification

The color code of fibers will be identification in accordance with the following color sequence, other sequence also is available.

|            | 1    | 2      | 3      | 4      | 5    | 6     |
|------------|------|--------|--------|--------|------|-------|
| Color Code | Blue | Orange | Green  | Brown  | Grey | White |
|            | 7    | 8      | 9      | 10     | 11   | 12    |
|            | Red  | Black  | Yellow | Violet | Pink | Aqua  |

### 3.4 Dimensions and Descriptions

The standard structure of cable is shown in the following table, other structure and fiber count are also available according to customer requirements.

| Item                         | Contents            | Value<br>12F Figure-8                               |
|------------------------------|---------------------|-----------------------------------------------------|
| Loose tube                   | Outer diameter (mm) | 2.1                                                 |
|                              | Color               | Natural                                             |
| Water Blocking               | Material            | Water blocking tape                                 |
| Armor                        | Material            | Steel tape                                          |
| Cable core part sheath       | Material            | HDPE                                                |
|                              | Color               | Black                                               |
|                              | Thickness (mm)      | Nominal: 1.5                                        |
| Messenger part sheath        | Material            | HDPE                                                |
|                              | Color               | Black                                               |
|                              | Thickness (mm)      | Nominal: 1.0                                        |
| Messenger wire               | Material            | 7*n mm steel stranding wire<br>n- Dia of steel wire |
| Cable diameter (mm) Approx.  |                     | $5.5 \times 11.0$                                   |
| Cable weight (kg/km) Approx. |                     | < 100                                               |

### 3.5 Main Mechanical and Environmental Performance

#### Main mechanical performance

| Item | Tension (N) | Crush (N/100mm) |           |
|------|-------------|-----------------|-----------|
|      |             | Short term      | Long term |
| 24 F | 1500        | 1500            | 750       |

#### Environmental and installation condition

| Max. wind speed | Max. ice thickness | Initial Installation sag | Temperature     |
|-----------------|--------------------|--------------------------|-----------------|
| 25 m/s          | 0                  | 1.0%                     | -40 °C ~ +70 °C |

## 4 Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performances of the cable are in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1310 nm & 1550 nm.

| Items                      | Test Method                                                                                                                                                                             | Requirements                                                                                            |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Tension</b>             | <b>IEC 60794-1-2-E1</b><br>Load: According to Clause 3.5<br>Sample length: Not less than 50m.<br>Duration time: 1min.                                                                   | Additional attenuation: $\leq 0.05\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Crush</b>               | <b>IEC 60794-1-2-E3</b><br>Load: According to Clause 3.5<br>Duration of load: 1min                                                                                                      | Additional attenuation: $\leq 0.05\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Impact</b>              | <b>IEC 60794-1-2-E4</b><br>Radius: 300 mm<br>Impact energy: 10 J<br>Impact number: 1<br>Impact points: 3                                                                                | Additional attenuation: $\leq 0.1\text{dB}$<br>No damage to outer jacket and inner elements             |
| <b>Repeated bending</b>    | <b>IEC 60794-1-2-E6</b><br>Bending radius: $25 \times D$<br>Cycles: 25<br>Load: 150N                                                                                                    | Additional attenuation: $\leq 0.05\text{dB}$<br>No damage to outer jacket and inner elements            |
| <b>Torsion</b>             | <b>IEC 60794-1-2-E7</b><br>Cycles: 10<br>Length under test: 1m<br>Turns: $\pm 180^\circ$<br>Load: 150N                                                                                  | Additional attenuation: $\leq 0.1\text{dB}$<br>No damage to outer jacket and inner elements             |
| <b>Water Penetration</b>   | <b>IEC 60794-1-2-F5B</b><br>Time : 24 hours<br>Sample length : 3m<br>Water height : 1m                                                                                                  | No water leakage, except for the messenger part..                                                       |
| <b>Temperature cycling</b> | <b>IEC 60794-1-2-F1</b><br>Sample length: at least 1000m<br>Temperature range: $-40^\circ\text{C} \sim +70^\circ\text{C}$<br>Cycles: 2<br>Temperature cycling test dwell time: 12 hours | The change in attenuation coefficient shall be less than 0.05 dB/km.                                    |

## 5 Packaging and Drum

Follow the instructions of A.1: Optical fiber cable – 12 core Fig-8 (5)

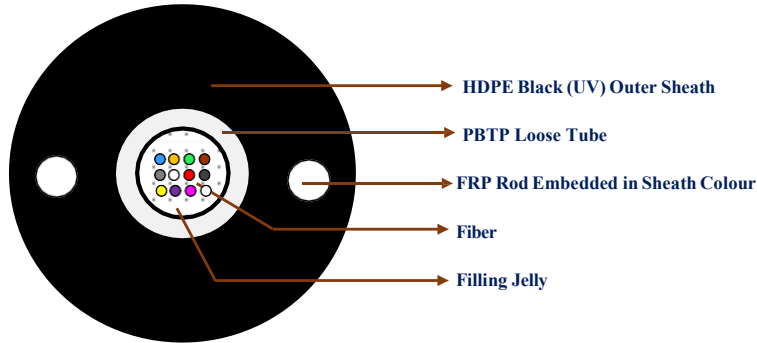
# TECHNICAL SPECIFICATION

## For

### A.3: Optical fiber cable – 12F NON-ARMOURED

#### Technical Data Sheet for 12F UT-SM Single Sheath Unarmoured OF Cable

#### CONSTRUCTIONAL DETAILS



Typical Construction Diagram - Not To Scale

#### PRODUCT INFORMATION

##### **Fiber**

|                           |                                                                                             |
|---------------------------|---------------------------------------------------------------------------------------------|
| Single Mode Optical Fibre | : Fiber ITU.T - G.652 D                                                                     |
| Fiber colour              | : Blue, Orange, Green, Brown, Slate, White, Red, Black, Yellow, Violet, Pink & Aqua/Natural |

##### **Loose Tube**

|               |                                                            |
|---------------|------------------------------------------------------------|
| Filling Jelly | : Thixotropic jelly to prevent water ingress in loose tube |
| Fiber in Tube | : 12 No                                                    |
| Tube          | : Thermoplastic Material (PBTP) - 1 No                     |
| Tube Colour   | : Natural Or any colour                                    |

##### **Cable**

|                 |                                                                            |
|-----------------|----------------------------------------------------------------------------|
| Strength Member | : Fiber Reinforced Plastic (FRP) Embedded in Outer Sheath - 2 Nos (1.0 mm) |
| Outer Sheathing | : High Density Polyethylene (UV) - Black Colour                            |

#### OPTICAL FIBER CHARACTERISTICS (Single Mode G.652D)

|                                      |                     |                       |                                          |                |                                  |
|--------------------------------------|---------------------|-----------------------|------------------------------------------|----------------|----------------------------------|
| <b>Attenuation : Before Cablling</b> |                     | <b>After Cablling</b> | <b>Dispersion</b>                        | 1285 - 1330 nm | : ≤ 3.5 ps/nm.km                 |
| (dB/Km)                              | @ 1310 nm : ≤ 0.330 | @ 1310 nm : ≤ 0.350   |                                          | 1270 - 1340 nm | : ≤ 5.3 ps/nm.km                 |
|                                      | @ 1550 nm : ≤ 0.215 | @ 1550 nm : ≤ 0.220   |                                          | 1550 nm        | : ≤ 18 ps/nm.km                  |
| Fiber cut-off wavelength             | : ≤ 1320 nm         |                       | Zero Dispersion wavelength               |                | : 1300-1324 nm                   |
| Cable cut-off wavelength             | : ≤ 1260 nm         |                       | Zero Dispersion Slope                    |                | : ≤ 0.092 ps/nm <sup>2</sup> .km |
| Mode Field Diameter @1310 nm         | : 9.2 ± 0.4 μm      |                       | PMD Co-efficient(1310nm & 1550nm) Cabled |                |                                  |
| Mode Field Diameter @1550 nm         | : 10.4 ± 0.5 μm     |                       | Uncabled Fiber                           |                | : ≤ 0.2 ps/sqrt.km               |
|                                      |                     |                       | Cabled Fiber                             |                | : ≤ 0.3 ps/sqrt.km               |
| <b>Fiber Geometry</b>                |                     |                       | Coating/Cladding concentricity           |                | : ≤ 12 μm                        |
| Coating Diameter - Natural           | : 245 ± 10 μm       |                       | Cladding Non-Circularity                 |                | : ≤ 1 %                          |
| Cladding Diameter                    | : 125 ± 1 μm        |                       | Mode Field Concentricity error           |                | : ≤ 0.6 μm                       |
| Fiber Curl                           | : ≥ 4m radius Curv. |                       |                                          |                |                                  |

#### OPTICAL FIBRE CABLE PERFORMANCE

| MECHANICAL                   |         |                  |                 | ENVIRONMENTAL            |                   |
|------------------------------|---------|------------------|-----------------|--------------------------|-------------------|
| Tensile Strength             | :       |                  |                 | <b>Temp. Performance</b> |                   |
| - Long Term                  | : 150 N | Crush Resistance | : 300 N/100mm   | Installation             | : - 10°C to +60°C |
| - Short Term                 | : 250 N | Impact strength  | : 10 N.m, 1 Nos | Service                  | : - 20°C to +70°C |
| Min Bending Radius (Dynamic) | : 20 D  | Torsion          | : ±180°         | Storage                  | : - 30°C to +70°C |
| Min Bending Radius(Static)   | : 10 D  | Kink Resistance  | : 10 D          |                          |                   |

All tests shall be carried out as per IEC Standard. Change in attenuation shall be ≤ 0.05 dB/Km.

#### PHYSICAL PARAMETERS

|                        |          |                                    |                   |              |
|------------------------|----------|------------------------------------|-------------------|--------------|
| Diameter (mm, Approx.) | : 7.0 mm | Cable Weight (Kg/Km) :38 (Approx.) | Cable Length/Drum | : 3 km ± 10% |
|------------------------|----------|------------------------------------|-------------------|--------------|

#### PRINTING DETAILS

|                                           |                                                                         |
|-------------------------------------------|-------------------------------------------------------------------------|
| <b>Cable Printing details</b><br>(White): | Follow the instructions of A.1: Optical fiber cable – 12 core Fig-8 (5) |
|-------------------------------------------|-------------------------------------------------------------------------|

## A.4: Optical fiber cable – 24 Core Armored

### 1. General

#### 1.1 Scope

This Specification covers the design requirements and performance standard for the supply of optical fiber cable in the industry. ensures a stable quality control system for our cable products through several programs including ISO 9001.

#### Cable type

#### Application

24F Loose Tube Single Sheath Armourd, Under Ground installation

#### 1.2 Reference

The cable are designed, manufactured and tested according to the standards as follows:

|               |                                                                                         |
|---------------|-----------------------------------------------------------------------------------------|
| ITU-T G.652D  | Characteristics of a single-mode optical fiber                                          |
| ICEA-640      | Standard for Optical Fiber Outside Plant Communication                                  |
| IEC 60794-1-1 | Optical fiber cables-part 1-1: Generic specification-General                            |
| EIA TIA 458   | Standard Optical Fiber Materials Classes and Preferred Sizes                            |
| IEC 60794-1-2 | Optical fiber cables-part 1-2: Generic specification-Basic optical cable test procedure |
| IEC 60794-3   | Optical fiber cables-part 3: Sectional specification-Outdoor cables                     |
| ITU-T L.10    | Optical Fiber for DUCT and Tunnel Application                                           |
| ITU L43       | Optical Fiber for Buried Application                                                    |

#### 1.3 Life Time

Optical fiber cables supplied in compliance with this specifications is capable to withstand the typical service condition for a period of twenty-five (25) years without detriment to the operation characteristics of the cable.

#### 1.4 Application

| Item                   | Value                       |
|------------------------|-----------------------------|
| Operation temperature  | -40 °C□+10 °C               |
| Storage temperature    | -40 °C□+10 °C               |
| Static bending radius  | 10 times the cable diameter |
| Dynamic bending radius | 20 times the cable diameter |

## 2. Optical Fiber

Optical Fibers supplied in this specification meet the requirements of ITU-T G.652D

| Parameter                                                       | Specification                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Standard                                                        | ITU-TG652D                                                                              |
| MFD (1310 nm)                                                   | $9.2 \pm 0.5 \mu\text{m}$                                                               |
| MFD (1550 nm)                                                   | $10.4 \pm 0.5 \mu\text{m}$                                                              |
| Chromatic Dispersion (max)                                      | 3.5 ps/(nm.km) (1310 nm)<br>17 ps/(nm.km) (1550 nm)                                     |
| Cladding diameter                                               | $125 \pm 1.0 \mu\text{m}$                                                               |
| Fiber diameter                                                  | $245 \pm 7 \mu\text{m}$ , with UV coating, and<br>colored to : $250 \pm 15 \mu\text{m}$ |
| Core/cladding concentricity error (max)                         | $0.8 \mu\text{m}$                                                                       |
| Coating/cladding concentricity error                            | :S $12.0 \mu\text{m}$                                                                   |
| Cladding non circularity                                        | 2.0%                                                                                    |
| Cut off wavelength                                              | A.cc :S 1260 nm                                                                         |
| Attenuation coefficient                                         | 1310 nm: 0.350 dB/km max after cabling<br>1550 nm: 0.210 dB/km max after cabling        |
| Bending-loss performance of optical fiber<br>@1310 nm & 1550 nm | :S 0.05 dB (100 turns around a mandrel of 50mm diameter)                                |
| Polarization mode dispersion maximum<br>individual fiber        | :S 0.2 ps/--/km                                                                         |
| Polarization mode dispersion link value                         | :S 0.10 ps/--/km                                                                        |
| Zero-dispersion wavelength                                      | $1312 \pm 12 \text{nm}$                                                                 |
| Zero-dispersion slope                                           | $\square 0.091 \text{ps/nm}^2 \cdot \text{km}$                                          |

### 3. Optical Cable

#### 3.1 Technical Characteristics

- ).>- The unique second coating and stranding technology provide the fibers with enough space and bending endurance, which ensure good optical property of the fibers in the cable
- ).>- Accurate process control ensures good mechanical and temperature performance
- ).>- High quality raw material guarantees the long service life of cable

#### 3.2 Cross Section of Cable

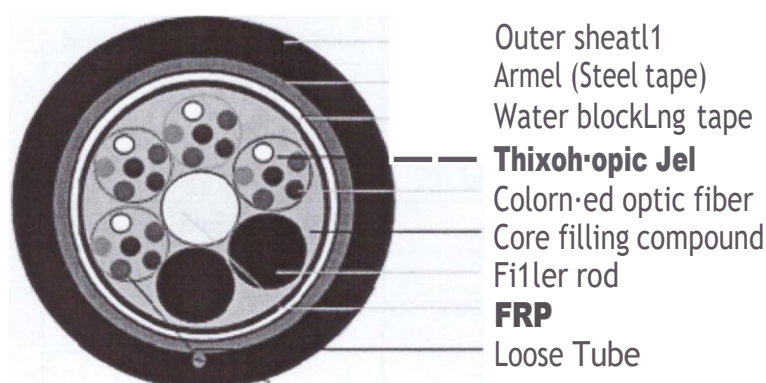


Figure 2-1 Fiber Loose Tubes Silanded, Jelly Filled, Single Armored, Single Sheath, CSM of FRP.

Figure: 24 Fiber Loose Tube Armored Single Sheath & CSM of FRP

#### 3.3 Fiber and Tube Identification

The color code for fiber and tube will be identification in accordance with following color sequence:

- a. For Fiber (Standard up to 12 core):

| Color Code | 1    | 2      | 3      | 4      | 5    | 6     |
|------------|------|--------|--------|--------|------|-------|
|            | Blue | Orange | Green  | Brown  | Grey | White |
|            | 7    | 8      | 9      | 10     | 11   | 12    |
|            | Red  | Black  | Yellow | Violet | Pink | Aqua  |

- a. b. For Tube (Standard up to 12 tube):

| 1    | 2      | 3      | 4      | 5    | 6     |
|------|--------|--------|--------|------|-------|
| Blue | Orange | Green  | Brown  | Grey | White |
| 7    | 8      | 9      | 10     | 11   | 12    |
| Red  | Black  | Yellow | Violet | Pink | Aqua  |

### 3.4 Dimensions and Descriptions

The standard structure of cable is shown in the following table, other structure and fiber count are also available according to customer requirements.

| Item                         | Contents            | Value<br>24F      |
|------------------------------|---------------------|-------------------|
| Loose tube                   | Number              | 4                 |
|                              | Outer diameter (mm) | 1.9               |
| Tube Filling Compound        | Material            | Thixotropic Jelly |
| Filler Rod                   | Number              | 0                 |
| Max Fiber counts per tube    | G.652D              | 6                 |
| Center Strength Member       | Material            | Dielectric FRP    |
|                              | Diameter            | 1.8               |
|                              | PE Layer Diameter   | -                 |
| Core Filling Compound        | Material            | Petroleum Jelly   |
| Wrapping                     | Material            | Polyester Tape    |
| Aarmor                       | Material            | Steel tape        |
| Outer Sheath                 | Material            | HDPE              |
|                              | Color               | Black             |
|                              | Thickness (mm)      | Nominal: 1.5      |
| Ripcord                      | Number              | 1                 |
| Cable diameter (mm) Approx.  |                     | 11.0              |
| Cable weight (kg/km) Approx. |                     | 105               |

### 3.5 Mechanical and Environmental Performance

| Item                        | Value                       |
|-----------------------------|-----------------------------|
| 1. Tensile Performance (N)  | 1500                        |
| 2. Crush (N/100 mm)         | 440                         |
| 3. Static Bending Radius    | 10 Times the cable diameter |
| 4. Dynamic Bending Radius   | 20 Times the cable diameter |
| 5. Operation Temperature    | -40°C - +80°C               |
| 6. Installation Temperature | -40°C - +80°C               |
| 7. Storage Temperature      | -40°C - +80°C               |

#### 4 Mechanical, Physical and Environmental Test Characteristics

The mechanical and environmental performances of the cable are in accordance with the following table. Unless otherwise specified, all attenuation measurements required in this section shall be performed at 1310 nm & 1550 nm.

| Items                      | Test Method                                                                                                                                                                     | Requirements                                                                                              |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Tension</b>             | IEC 60794-1-2-E1<br>Load: According to Clause 3.5<br>Sample length: Not less than 50m.<br>Duration time: 1min.                                                                  | Additional attenuation: $\Delta 0.05\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Crush</b>               | IEC 60794-1-2-E3<br>Load: According to Clause 3.5<br>Duration of load: 1 min                                                                                                    | Additional attenuation: $\Delta 0.05\text{dB}$ after test<br>No damage to outer jacket and inner elements |
| <b>Impact</b>              | IEC 60794-1-2-E4<br>Radius: 300 mm<br>Impact energy: 10 J<br>Impact number: 1<br>Impact points: 3                                                                               | Additional attenuation: $\Delta 0.1\text{dB}$<br>No damage to outer jacket and inner elements             |
| <b>Repeated bending</b>    | IEC 60794-1-2-E6<br>Bending radius: $20 \times 0$<br>Cycles: 25<br>Load: ISON                                                                                                   | Additional attenuation: $\Delta 0.05\text{dB}$<br>No damage to outer jacket and inner elements            |
| <b>Torsion</b>             | IEC 60794-1-2-E7<br>Cycles: 10<br>Length under test: 1m<br>Turns: $\pm 180^\circ$<br>Load: ISON                                                                                 | Additional attenuation: $\Delta 0.1\text{dB}$<br>No damage to outer jacket and inner elements             |
| <b>Water Penetration</b>   | IEC 60794-1-2-FSB<br>Time : 24 hours<br>Sample length : 1m<br>Water height : 1m                                                                                                 | No water leakage, except for the messenger part..                                                         |
| <b>Temperature cycling</b> | IEC 60794-1-2-F1<br>Sample length: at least 1000m<br>Temperature range: $-40^\circ\text{C}$ - $+80^\circ\text{C}$<br>Cycles: 2<br>Temperature cycling test dwell time: 12 hours | The change in attenuation coefficient shall be less than $0.05\text{ dB/km}$ .                            |

#### 5 Packaging and Drum

Follow the instructions of A.1: Optical fiber cable – 12 core Fig-8 (5)

## B: HDPE Telecom Duct, 40/33 mm

| No   | Item                                            | Unit                                                                         | Value                | Test Standard          | Comply |
|------|-------------------------------------------------|------------------------------------------------------------------------------|----------------------|------------------------|--------|
| 1    | Material Density                                | 930 to 958 kg/m <sup>3</sup>                                                 | at 27 <sup>0</sup> C | ASTM D1238             |        |
| 2    | Heat Reversion                                  | Dimension shall not change by more than 3%                                   |                      | ISO2505/<br>ASTM D1238 |        |
| 3    | Crash Resistance                                | Deflection with load not greater than 10%                                    |                      | ASTM D2412             |        |
| 4    | Tensile strength                                | Newton/mm <sup>2</sup>                                                       | Min. 20              | ASTM F2160/ BS 2782    |        |
| 5    | Elongation at break                             | %                                                                            | 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                         | <0.15                                                                        |                      |                        |        |
| 10   | Type of HDPE duct                               | Permanently lubricated plain inner surface                                   |                      |                        |        |
| 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 ± 0.30 mm                                                                |                      |                        |        |
| 13c. | Minimum coil length                             | 500 meter                                                                    |                      |                        |        |
| 14   | Colour of HDPE Duct and marking                 | Any and HDPE pipe shall be marked at every 1 m                               |                      |                        |        |

### Price Schedule Format

#### i) For National supplier:

| Item Category | Item Description                          | Unit | Qty      | Unit Price (BDT)<br>(Note-1) | Total Price without<br>VAT (BDT) | VAT (%) | VAT (BDT) | Total Price with<br>VAT (BDT) |
|---------------|-------------------------------------------|------|----------|------------------------------|----------------------------------|---------|-----------|-------------------------------|
| <b>A</b>      | <b>Optical Fiber Cables</b>               |      |          |                              |                                  |         |           | -                             |
| A.1           | Optical fiber cable – 12 core Fig-8       | km   | 405.00   |                              | -                                |         | -         | -                             |
| A.2           | Optical fiber cable – 24 core Fig-8       | km   | 195.00   |                              | -                                |         | -         | -                             |
| A.3           | Optical fiber cable – 12 Core Non armored | km   | 500.00   |                              | -                                |         | -         | -                             |
| A.4           | Optical fiber cable – 24 Core Armored     | km   | 900.00   |                              | -                                |         | -         | -                             |
|               | <b>Total of (A)</b>                       | km   | 2,000.00 |                              | -                                |         | -         | -                             |
| <b>B</b>      | HDPE Telecom Duct, 40/33 mm               | km   | 1,000.00 |                              | -                                |         | -         | -                             |
|               | <b>Gross Total (A+B)</b>                  |      |          |                              | -                                |         | -         | -                             |

Note-1: Unit price include all costs i.e. supply, transportation, duties, all types TAX as per prevailing government rule but exclude VAT. Please mention the percentage of VAT in the VAT % Column

#### ii) For International supplier:

| Item Category | Item Description                          | Unit | Qty      | Unit Price (USD<br>in CFR) | Total Price (USD) |
|---------------|-------------------------------------------|------|----------|----------------------------|-------------------|
| <b>A</b>      | <b>Optical Fiber Cables</b>               |      |          |                            |                   |
| A.1           | Optical fiber cable – 12 core Fig-8       | km   | 405.00   |                            | -                 |
| A.2           | Optical fiber cable – 24 core Fig-8       | km   | 195.00   |                            | -                 |
| A.3           | Optical fiber cable – 12 Core Non armored | km   | 500.00   |                            | -                 |
| A.4           | Optical fiber cable – 24 Core Armored     | km   | 900.00   |                            | -                 |
|               | <b>Total of (A)</b>                       | km   | 2,000.00 |                            | -                 |
| <b>B</b>      | HDPE Telecom Duct, 40/33 mm               | km   | 1,000.00 |                            | -                 |
|               | <b>Gross Total (A+B)</b>                  |      |          |                            |                   |