



::GUJARAT HIRA BOURSE::

Gem & Jewellery Park, Ichchhapore, Surat.

TENDER DOCUMENTS FOR

**DESIGN, CONSTRUCTION, TESTING AND COMMISSIONING OF
OPTIC FIBER CABLE (PASSIVE) NETWORK AT GEM AND
JEWELLERY SEZ PARK AT VILLAGE ICHCHHAPORE, TALUKA:
CHORYASI, DIST: SURAT ON ITEM RATE BASIS.**

Volume-II

Contents:

- | | |
|----------------|---|
| 1. Chapter I | Scope of Work |
| 2. Chapter II | Design Specification |
| 3. Chapter III | Optic Fiber Cable Construction Specifications |
| 4. Chapter IV | Important Instruction for OFC cable pulling and splicing. |
| 5. Chapter V | General Technical Specification for the schedule. |

CHAPTER - I

SCOPE OF WORK

1. GENERAL :-

Gujarat Hira Bourse (GHB) Surat has come up with upcoming SEZ Gem & Jewellery Park at Ichchhapore nr. Surat in approximately 97 Hectare of land. The Park has a 74 Hectare SEZ Notified Area and 23 Hectare DTA-I & II Areas. Basic infrastructure viz CC Roads, Water Distribution Network and Sewage Disposal Network, Elevated Water Reservoir, Storm Water Drain, HT Electrical Under Ground Network with 66 kv Switchyard & Control Room, Street Light Facilities etc. are established in the Park.

The Park have 370 nos. of plots with sizes varying from 500 sq.yd to 50,000 sq.yds.

A 4 storey Administrative Building is constructed in SEZ Non-Process Area. Some space may be spared for Communication Main Control Room.

GHB intends to establish communication OFC Passive Network to avail facilities to its member plot holders as well as for future surveillance & other usages by GHB Developer.

2. DETAILED SPECIFICATIONS FOR NETWORK FACILITY:-

Gujarat Hira Bourse intends to establish communication network considering the latest available technology, which will meet the current requirement and the future demand. The topology includes optical fiber connectivity to institute backbone network, to all fixed and mobile endpoints. This network will have **10/100/1000 Mbps/(GPON)** wired access link, and overlaid indoors Wi-fi network, which will be integrated with wireless success controller of the company. Provision shall also be accounted to meet future value added services like Digital signage, Parking management system, Visitor management system, Access control system etc.

The solution will be ready to integrate audio, data, video-stream over IP network. This will be capable of integrating video conferencing facilities, IP telephony and all data centric applications. In addition to this the facilities under the National Knowledge Network, may also be extended to proposed location.

OFC communication need includes Voice, Data Connectivity from production house to Branch/ho locations, Internet services, Video surveillance, Video Conference and various IP enabled services with fiber as media.

SCOPE OF WORK IN PHASE- 1

- Designing & implementing in campus underground OFC Network with redundancy.
- Conduiting and fiber capacity has to be planned considering that each member plot holder can avail communication services (voice, data, video....) from 4-5 different service providers

- (BSNL, Airtel, Tata Commu., Reliance etc.)
- Fiber connectivity should be available from central location (main control point) till a junction/fiber DP near plots and underground conduiting/ducting should be done upto each plot. Whenever the plot owner requires fiber connectivity from service provider, a fiber cable shall be provided from the nearest junction/fiber D.P.
 - Liaisoning with Service Provider to acquaint him with the OFC Network and enable member plot holders to avail required services.
 - Proposal to include one time infrastructure executions and subsequently a 3 year (O&M) contract including services to plot member holders.
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 - The Scope for work in Phase 2 shall be Passive Components and is to be adopted at stage the Service Providers interect with End users for rendering services.
 - It is recommended to propose OFC and allied accessories to various standards as under:
 - **Optical Fibers as per ITU-T G.652 B**
 - **FTT Cables as per TEC Spectifications**
 - **Armoured OFC cables as per TEC and RDSO Specifications**
 - **Enviromental Specifications - TEC**

3. PREPARATION OF SITE :

The site is free from obstacles like trees, old structures or such items. Preliminary cleaning, removing, shrubs etc shall be in Contractor's Scope.

4. TERMINAL POINTS :

- Various size OFC cables from main control point up to junction/fiber D.P.
- Bidder to work out formation of zones/subzones/to account best coverage vis a vis redundancy.
- Each zones can have loop continuity for redundancy.
- Connectivity with zones for redundancy as well as better services.
- OFC cable from junction/fiber D.P up to member plot holder on need basis during 3 years O&M period. However conduit laying to include in the scope of work.

5. SUBMISSIONS BY BIDDER:

- Planning general layout to the scale of (suitable) complete OFC Passive Network in hard copy drawings as well as in Autocad CDs. This is a Route Survey activity.
- The entire land is GHB Project Site and no way leave permissions are required from any other authorities like R&B, Telecom, ONGC etc.
- Trenching, ducting & backfilling with cleaning the ducts thro' air compressors.
- Cable pulling/blowing thro rope pulling or air blow technique with testings.
- In either method, aspects to provide joint chambers shall be elaborated.
- Splicing with best practice & testings.
- Dist Box/ Junctioning.
- OFC cable testing.

- At RCC road crossing, GHB have provided RCC pipes for laying ducts & OFC cables. In its absence, bidder shall execute HDD method without damaging RCC roads. Bidder shall submit detailed drawings.

6. M/s .Gujarat Hira Bourse 's Engineer in Charge, it's authorized inspecting agency(TPI) reserves the right to inspect the work of the contractor and satisfy himself about the quality of materials used for the work.

7. Safety :

All the safety and factory rules shall be strictly followed. The contractor is fully responsible for the safety of his staff and workmen and must equip them with safety appliances and tools.

8. Time Schedule :

8.1. The work shall be executed strictly as per the time schedule/bar chart submitted and as agreed upon along with offer. The entire project has to be completed within a period of 6 (Six) months from the date of commencement of order. The time period of completion shall be reckoned from the date of notification of award of work. The bidder shall have to submit a detailed PERT/BAR chart network, with the time frame consisting adequate number of contractual activities covering key phases of the works such as design, drawing approval procurement, manufacturing, testing, construction and field erection activities.

8.2. Penalty for delay :

The Contractor is bound to complete the work as per the sanctioned schedule of work/bar chart. The contractor shall have to submit the progress report with physical and financial achievement at every first of calendar month. If the contractor fails to complete the whole project by the stipulated completion date then penalty shall be applicable against late completion at a rate of half percent per week subject to maximum of 10% of the Contract Value.

9. Scope of Supply of Material :

a] Supply of Material :

All materials testing appliances, tools tackles & spares etc. necessary (for the successful execution & completion and till ofc cable network handing over to .Gujarat Hira Bourse)shall be procured and provided by the tenderer. No material will be supplied by the Developer **except cement, steel and HDPE PLB ducts.**

Cost of usage of cement and steel is to be accounted in the price bid offer but cost of PLB HDPE duct is not to be included in price bid offer.

Bidder shall give specifications and quantity of PLB HDPE ducts for procurements.

As the bidder quotes SEZ notified area work rates excluding excise duties, and other taxes, GHB shall assist in procurements to avail excise duties and other tax exemptions.

b] Water :

Contractor shall have to make his own arrangement for water required for construction, testing and for his labour/employees too.

c] Power :

Electrical power for construction purpose shall be in Tenderer's scope.

Electrical power of adequate capacity for operation & maintenance at a single point shall be in Developer's scope including energy consumptions.

d] Cement :

Cement required for the construction, erection works shall be purchased by the Developer. As per site datas, PPC cement confirming to IS 1489:1991 PI is approved of Ambuja or Ultratech make. A wastage of 3% (max) shall be allowed. Wastage exceeding the above limit, bidder shall be charged as per GC-58.

e] Steel :

All reinforcement and structural/mild steel required for construction, erection and other allied job shall be purchased by the Developer. A wastage of 5% (max) wastage shall be allowed. Scrap steel shall be deposited with Developer at reconciliation stages.

Contractor should quote the rates as per price mentioned for cement & steel as per GC-58.

10. Construction of Stores and Site Office :

Suitable vacant areas will be allocated by M/s. Gujarat Hira Bourse to the Contractor to build storages for storing his equipments, materials etc. and also to build his site offices. The contractor will be solely responsible for watching and guarding of his stores, offices etc. The contractor shall cover all his equipments and materials at site with requisite insurance against theft, larceny, dacoit, fire tempest, flood, earthquake etc. It will be the contractor's responsibility till handing over the plant after satisfactory completion of trial run. Even if part/ full payment is released against supply/installation /commissioning. On completion of the works undertaken by the contractor, he shall remove all temporary works erected by him and have the site cleaned as directed by the Engineer. M/s. Gujarat Hira Bourse reserves the right to ask the contractor any time during the tendency of the Contract to vacate the land by giving 7 day's notice on security reasons or on national interest or otherwise.

11. Labour and Supervisory Camps :

Open land will be provided by M/s. Gujarat Hira Bourse to the Contractor for accomodating his labour and supervisory camps and other service facility. Contractor shall make his own arrangements with all sanitation facilities etc.

12. Construction Equipment :

The Contractor shall make his own arrangement to procure all constructional plant and equipments for his own. He shall also state the type and number of different equipments with

their capacities in good working conditions which he will use on the site to ensure completion of the work in the specified time. All materials, construction plants and equipments once brought by the contractor to the site are not to be removed from there without the written permission of the Engineer-in-charge. Also, the Contractor shall have adequate stock of spare parts for the equipment on the site and work shall not be delayed on this account. Similarly all temporary works built by the Contractor for the main construction undertaken by him, are not to be dismantled and removed without the written authority of the Engineer-in-charge.

13. Co-operation with other Contractors :

The contractor shall execute his work in phased manner as directed by the Engineer from time to time so as not to obstruct or retard the work being executed simultaneously by other agencies.

14. Safety :

14.1. The Contractor shall be responsible for provision of safety arrangements & protective clothing for all persons/employees on the site whether or not engaged in actual operation or supervision. The Contractor shall also be responsible for safety arrangements of all equipment used for construction and shall employ trained workmen conversant with safety regulation. The contractor shall use only tested equipment and tools and shall periodically renew tests to the satisfaction of the

Engineer. All test certificates shall be made available to the Engineer at the site of the work. If at any time, in the opinion of the Engineer, this provision is not complied with, the contractor shall forthwith replace such equipment and tools.

14.2. The contractor shall display notices and arrange proper fencing at such places where hazardous work is being carried out. The contractor shall provide at his own expense on the works to the satisfaction of the Engineer at such places, proper and sufficient fire fighting, first aid appliances etc. which shall at all times be available for use.

15. Coverage of Contractor :

The Contract for the work is a complete one for labour, material and workmanship with contractor's overhead and profit including all temporary works and the provision and use of all construction equipments, tools, tackles, etc.

The contractor shall make his own arrangements for all the materials and equipments required for the due performance of the contract. Except where it is explicitly provided that the cost will be borne by M/s. Gujarat Hira Bourse, the various obligations of the contractor under contract shall be at the cost of the contractor.

16. OFC Cable network Guarantee/Warranty :

The contractor shall guarantee the performance of the complete OFC cable network as per the scheme.(including labour +maintenance + spares) . The equipments supplied under this

tender **shall be guaranteed for a period of 48 months** from the date of successful completion and commissioning and performance against defects in civil, electrical & instrumentation with regard to design, materials and workmanship. Any defects found within the guarantee period shall be made good by the Contractor at his cost immediately on receipt of intimation from M/s. Gujarat Hira Bourse in writing.

For the OFC and related items the OEM's warranty period shall apply and the OEM shall give this alongwith the supply.

The repairing/rectifications if any on the items under warranty must be done at site only.

The bidder should submit along with the technical bid, the detailed plan for providing installation and warranty services at site.

17. Mechanical Guarantee :

Mechanical Guarantee for the entire equipment part shall be for the period as stipulated above.

a] In the event of failure of any particular part of the equipment ,gudgets etc more than two times during the guarantee period, it shall not be repaired but the complete part shall be replaced by the tenderer and the guarantee for the particular part shall be extended by one year from the date of last replacement.

b] In case it is found that above mentioned failure is due to some connected part of the equipment, that part shall also be rectified or replaced by the tenderer to avoid such failure in future and similar guarantee shall be offered by the tenderer for this also. c] In the event of failure of any particular equipment which fails more than two times during the guarantee period, the tenderer shall have to replace this equipment with another equivalent make as approved by the M/s. Gujarat Hira Bourse and manufacturer's guarantee shall be kept valid.

18. Performance Guarantee :

The tenderer shall give a guarantee for a period of **four (1 year defect liability plus 3 years o & m period)** years from the date of successful completion of commissioning of the OFC cable network against defective materials and or workmanship. Any defects found in the workmanship or materials used and/or supplied by the tenderer will be rectified by the contractor at his own expenses, within the time specified by the Engineer-in-charge.

The tenderer shall prove that the OFC cable network is giving satisfactory service and desired performance continuously. During this period, the tenderer shall also have to give guarantee for the standard quality of communication services to meet all the applicable requirements given in the tender documents.

19 Comprehensive Operation and Maintenance Contract

The Contractor shall, during **3 year Comprehensive Operation & Maintenance** period, submit a fresh Performance Guarantee of 25% of initial PBG. This shall be valid till satisfactory

completion of the operation & maintenance period. The service support shall be 24*7 onsite within maximum 4 hour response time.

It is mandatory for the contractor to support GHB for all the supplied components & whole system/network a comprehensive O&M Contract . Without this the offer will be considered invalid & summarily rejected. The Comprehensive O& M offer amount will be reckoned for commercial evaluation of the bid.

The CO&M rate for 3 years shall be split year wise in the following % for payment of annual C O&M charges:

Year 1: 33.33 % of C O&M offer Amount

Year 2: 33.33 % of “ “ “ “

Year 3: 33.34 % of “ “ “ “

In case GHB decides to extend C O&M beyond the 3rd year, the C O&M amount for the 4th year shall not exceed more than 10% of previous year's amount. C O&M shall include cost of all spares,equipment,and services (preventive and breakdown) for maintenance during the O&M period. Bidder's service engineer shall check & service each components and its accessories and maintain them in good working condition.The bidder shall also maintain minimum spares at site for this.

2 Nos of normal visits and any no of emergency visits (as and when required) per year per location shall be included in the scope of C O&M contract.In case failure to attendand resolve any reported malfunctioning within 48 hrs of telephonic/email/fax message ,GHB reserves the right to deduct Rs 500/-per day of default and get the defects attended thro alternate agency at bidder's risk and costs.

3 During the 3 year o & m period the contractor shall liaison with the service providers to enable the plot holders to avail services from service providers.

Payment of the Comprehensive O&M charges for each year shall be made in 2 equal installments after completion of half yearly visits including emergency visits.

20. Inspection :

a] All fabrication, manufactured items, equipments ,pigtaills, patch cords ,jack panels, dbs, opds etc etc. shall be subjected to inspection and tests as per the relevant standard at the manufacturer's works before dispatch. Tenderer shall give notice of two weeks to the Engineer-in-charge who may depute his representatives at his option to witness such tests. It shall however, be the tenderer's responsibility to supply all materials as per specifications, standards mentioned herein.

b] All tests as required by the Engineer-in-charge either at site or at outside laboratories concerning the execution of the work and supply of materials shall be carried out by the tenderer at his own cost.

c] Tenderer shall ensure that all facilities are extended for inspection of works by the Engineer-in-charge or his representatives at any time during the period of execution of the

works. The tenderer shall carry out all instructions given by the Engineer-in-charge or his representative to the entire satisfaction of the Engineer-in-charge.

d] All materials to be used by the tenderer shall be of approved quality and make. The tenderer shall submit the list and makes of materials he intends to use, unless otherwise specified and obtain the prior approval of the Engineer-in-charge. Any material found to be of inferior quality/make other than approved make or unsuitable for the purpose will be rejected by the Engineer-in-charge and the tenderer shall replace at his own cost, the decision of Engineer-in-charge in such event shall be final and binding.

e] Inspection and acceptance by the Engineer-in-charge shall not relieve the tenderer from any of the responsibilities/obligations under the contract.

22. Royalties :

Royalties for the construction materials i.e. Sand, Stone, aggregates, Rubble, murrum, gravel as specified from time to time by the State Government shall be paid by the contractor. All ruling regulations have to be strictly adhered to.

23. Guidelines to be followed at work site :

23.1. All the items occurring in the work and as found necessary during actual execution shall be carried out in the best engineering manner/practice as per specifications and as directed by the Engineer-in-charge.

23.2. Extra claim in respect of extra work shall be allowed only if such work is ordered to be carried out in writing by the Engineer-in-charge.

23.3. The Contractor shall engage qualified Engineer for the execution of work who will remain present for all the times on site and will receive instructions and orders from the Engineer-in-charge or his authorized representatives. The instructions and orders given to the contractor's representative on site shall be considered as if given to the contractor himself.

23.4. A work order book as prescribed shall be maintained on the site of the work by the contractor and the contractor shall sign the orders given by the inspecting officers and shall carry them out promptly.

23.5. Figured dimensions of drawings shall supersede measurements by scale. Special dimensions or directions in the specifications shall supersede all other dimensions.

23.6. All levels on drawings are for general guidance and the contractor shall be responsible to take regularly levels at the site before actually starting the work. The level shall be connected to the G.T.S. levels and shall be got approved from the Engineer-in-charge.

23.7. If the arrangement for temporary drainage is required to be made during any work of

this contract, this shall be made by the contractor without claiming any extra cost.

24. Testings and Records :

The bidder shall give records of testings and test results of each item/equipment in 4 copies to GHB .

GENERAL MANAGER (TECH & ADMN)
M/S.GUJARAT HIRA BOURSE

Signature and seal of Contractor :-

Name :-

Address:-

Date :-

CHAPTER-II

DESIGN SPECIFICATION

1.0 Design Basis

1. Bidder shall consider the layout plan of GHB area and shall illustrate and elaborate in detail Stage wise Zones/subzone wise Optic Fiber Cable Network designs. Autocad Layout Plan is appended with the Tender Documents.
2. The design shall consist of usage of Single Mode OFC Armoured cables meeting ITU Standards as applicable-Armouring shall be of corrugated steel tape. The network design shall account 10/100/1000 Mbps (GPON) capabilities.
3. Bidder shall work out capacity of cables with numbers at each stage / zones and elaborate the capacity wise OFC cable quantities with other equipments, accessories required to establish the network.
4. Bidder shall specify the locations of Main Control point/room along with the zone and subzone locations with space required at each level in sq. meters. Bidder shall take into account Fiber connectivity from main control point/Telco/Service provider room till a zone/sub zone/ junction/fiber DP near plots as the case be with underground conduiting / ducting till each plot. Whenever the plot owner requires fiber connectivity from Telco room, a fiber should be pulled from nearest junction/fiber dp.
5. Bidder shall examine the available civil facilities and its use in housing the communication panels, distribution boxes and other accessories. GHB Developer shall get interiors, furniture, flooring ,fire fighting and other civil amenities at its own cost as required with the successful bidder.
6. Alternatively bidder shall propose new civil structures with specifications and costs.
7. Bidder shall give Technical data sheets / literature and specifications of every materials which are proposed in the design.
8. Bidder shall give numbers with locations of chambers, manholes with drawings and specifications required in the design.
9. Bidder shall include Route Indicators on OFC cable routes at every 200 running meters.
10. On road crossings, the route indicators shall be at a span of 50 meters from the center line of the roads.

11. Bidder shall give zone wise layers/bunch of PLB HDPE ducts required to be laid in trench. The duct specifications and quantity shall also be given.
12. The end member plot holder shall be offered options to have at least 3 OFC /communication service providers viz voice ,data video conferencing, and more. This aspect has to be accounted in the design concepts.
13. Bidder shall account the TRAI Regulations in sharing OFC cable to more than one service provider – whether sharing individual cables or common cables.
14. GHB shall enter into mutual agree mental terms with the service providers at o&m period/ stage to allow use of its communication network infrastructures.
15. In event the bidder is also a service provider, GHB can with mutual understanding decide for allowing percentage of the cable cores and the bidder should clarify for this in the proposal.
16. The Passive approved components/ materials shall be of

AVAYA /MOLEX / TYCO Brand strictly.

Bidder shall not include brands other than the above. Inclusion of brand/make of other equipments shall render the bid a disqualified one.

17. Use of Riser cables (Copper) is not appreciated in the backbone network. However the unit holders may require it for telephone connections. The bidder should elaborate and account this aspect in designing.
18. Bidder shall follow and adopt all regulations related to the communication network and shall avail all related permissions from relevant Authorities during the 3 year o & m period.
19. Bidder shall follow all telecom norms in designing the communication network scheme.
20. Bidder shall include & elaborate nature of tests at all stages of executions.
21. Bidder shall avail services to member plot holders during the execution periods also (if any plot holder has completed civil executions and insists for services prior to 3 year (O&M) period).

CHAPTER –III

Specifications for civil construction works

General

The Optical cable is planned considering the following objectives of the scheme/design:

- i. Minimum possible route length vis-à-vis route having maximum numbers of plots with potential telecom growth.
- ii. Linking of telecom dps by leading in ofc vis-à-vis routing main cables itself via such dps.
- iii. After deciding above ,a detailed measurement of lengths of cable route along with details in survey register. The probable locations of joints ,terminations etc may also be decided and marked on the route map.
- iv. The OFC is laid straight as far as possible along the road near boundaries, away from the burrow pits. The OFC is laid along the roads at a minimum distance of 15 meters from the centre line of the road or as decided by the engineer in charge. As the OFC would carry high traffic and planned for 40 years of life, it is imperative that the cable is laid with due care.
- v. In special cases where it may be necessary to avoid burrow pits or low lying areas, the cables may run beneath the shoulders at a distance of 0.6 meters from the outer edge of the road embankment
- vi. All construction and installation shall be performed in thorough and workman like manner in accordance with approved standards and shall be subject to inspection and testing during construction and also final acceptance testing before take over by the Developer.

WORK SPECIFICATIONS - Trenches

1.The trench excavation shall be carried out by the contractor on the prescribed route as per the route plan approved by Engineer in charge.

The minimum depth at which the duct is to be laid through trenching shall be 1.0 meter.

Contractor may take up any detour by site conditions after approval from the engineer in charge .

Due to any unavoidable circumstances, if the duct is laid at depth less than specified depth due to site conditions, then contractor giving due justification and proposing extra protection measure has to obtain the prior permission from engineer in charge and the work is to be executed in accordance with approval by EIC. The EIC shall also decide to account reduced rates for less depth excavations in such deviations. If the less depth is unacceptable to the EIC, the contractor shall rework the depth as per tender/EIC instructions..

In park area there is no hard rock and lesser trench depth does not raise.

Special care should be taken to avoid twist or kink of duct while laying Duct.

All pipelines or road crossing should be crossed by horizontal boring/augur unless & until it is conventionally not possible .A suitable piping or equivalent DWC pipe should be used for laying of hdpe ducts. For adopting any other method the contractor shall avail permission from EIC.

GHB have provided RCC pipes at road crossings and can be useful.

The backfilling and compacting of trench in layers of 200 mm shall be done after completion of the laying work.

Testing of laid duct shall be carried out as per the Duct Integrity Test procedure section wise .

Testing of complete section shall be done to the satisfaction of EIC.

Supply and fixing of OFC cable route marker shall be provided at an interval of 200 meters on

straight route, and at suitable intervals for bends as per EICs instructions.

Dewatering

The contractor shall be responsible for all necessary arrangements to remove or pump out water from trench. The contractor shall survey the soil condition encountering the section for which he is trenching and make his own assessment about dewatering arrangements. No extra payments shall be admissible for this.

The contractor should provide sufficient width of the trench and all such places where it is likely to cave in due to soil conditions and for this no extra payments will be made.

A minimum clearance of 150 mm should be maintained above or below any existing lines(any nature) crossing the trench. No extra payment shall be done for this.

Trench Excavation and backfilling

The contractor shall carry out excavation and backfilling of trenches in all kind of strata for laying PLB HDPE pipes, DWC pipes and GI pipes. In addition the contractor shall also make suitable arrangements for laying pipes at all type of crossings such as pavements, roads etc.

Excavation

The cable trenches shall be dug as per route plan and detailed trench drawings approved by the EIC. The contractor shall take due care and precaution to avoid possible damage to other underground facilities. The contractor shall make good the damages at his cost.

Depth of trench shall be at least **1000 mm** in normal soil. The width of trench at the top and bottom shall be adequate for proper installation of nos of PLB HDPE pipes, DWC pipes and GI pipes as per design criteria. The width of trench is approx. 450 mm. The trench depth shall be measured from the bottom of the trench. Trench shall be located at the lowest point of the lower area if possible. Trench shall not be constructed at field boundary or any upheep.

GHB engineer in charge shall be the authority to decide the trench length for measurement purposes. Width of trench shall not be in measurement norms.

Backfilling

The backfilling operation shall follow after properly laying the pipes with joints, etc .The backfilling operation shall follow as closely as practicable. The backfilling shall be performed in such a manner as to provide firm support under and above the pipes and to avoid deformation of the pipes, when the pipes gets loaded with the backfilled earth. No debries shall be allowed in backfill at any time.

The backfilling shall be maintained by the contractor against washout settlement below original levels and rotting until final completion of the works and until reinstated to the original surface conditions as acceptable to the EIC.

Placement of duct into an open trench:

When placing the duct into an open trench, the bottom of the trench must be reasonably flat, free from horizontal and vertical bends, and free of stones and debries.

If surrounding soil contains sharp stones or other materials, the duct should be insulated with protective layer of fine sand(appro 50 to 100 mm under and above the duct).

The duct shall be laid as straight as possible. In case of any directional changes, the bending radius shall be as large as possible .A minimum bending radius which is 12 times the OD of the duct shall be maintained.

Coupling of Duct sections and installation of end plugs:

The length of the permanently lubricated ducts should be at least 500 meters..The HDPE couplers should be installed along with the laying of duct. In case the couplers cannot be installed to prevent entry of extraneous materials the end plugs shall be installed immediately

after the duct is laid.

Backfilling shall not be a separate item and its costs shall be included in the excavation item by the tenderer.

Duct laying Methodology:

Manual laying

The method is effectively used when installing single duct in an open trench ,steps in manual laying are;

Place the Jack stand along the sides of the trench

Observe correct drum position ie duct should be uncoiled from the bottom not from the top of the drum.

Driven the reel slowly to avoid over spinning of reel when you are pulling HDPE duct installation.

Unroll the duct to the length spacing the workers after every 15-20 meters.

When encountering an obstruction, utility crossing the bore, pull the HDPE duct beyond the obstruction until you have enough duct to maneuver it through or under the obstruction and then repull the duct.

Duct can be placed into an open trench either directly from a drum or temporally laid along the side of trench and placed later on.

Placement of duct into an open trench:

When placing the duct into an open trench, the bottom of the trench must be reasonably flat, free of horizontal and vertical bends, and free of stones and debries.

If surrounding soil contains sharp stones or other materials, the duct should be insulated with a protective layer of fine sand (appro 5 to 10 cm under and above the duct).

Place the duct as straight as possible.

Pump out water, if any, from the trench before placement of duct.

Place the duct as you walk along the trench as straight as possible.

Tightly close the ends of the ducts with self tightening End Plug so that no dirt, dust or moisture into the duct.

The pipes will be laid in a bunched form or layered structure as per the decision of EIC. Wherever necessary , the pipes should be laid in the trench in layered structure (nest formation) using spacers at intervals of 5 meters. In case of layered structure, the nest formation will normally be a) 4 pipes*2 layers of 40mm pipes or b) 3 pipes*2 layers of 40mm pipes or c) 5 pipes*2 layers of 40mm pipes.

In case no spacer are used , the duct pipes should be tied together with cable tie at an interval **of 5 meters** positively so as to keep them together.

Cut the duct at the place where they overlap. Cutting should be done in such a way that the duct end matches with each other perfectly because it is very important for the coupling joints to be airtight. Do not use a hacksaw to cut the duct.

Tighten the plastic coupler with C spanner.

End plug: Close the ends of duct with end plugs so that moisture, dirt and dust do not enter into the duct.

It seals the duct ends completely and prevents as above.

Simple Plug: When the cable is already installed inside the duct, seal the duct with Simple Plug.

Tests required after placement:

Duct cleaning (sponge test)

Crush and deformity test

Pressure test

FIXING OF ROUTE INDICATOR

The RCC route indicator as per specification given should be fixed in route line to indicate position of Telecom Duct. Each route indicator will be 1250 mm long and bottom cross section of 150mm*200mm will taper to 75mm*125 mm at the top. Route indicator should be placed 950mm in the ground and remaining 300 mm should be visible.

The route indicator shall be made of RCC(1:2:4) strength.

SPECIFICATION OF MANHOLE

General: The manhole should be sufficiently spacious for large numbers of ducts and should meet EIA/TIA guidelines.

It may house joints or any monitoring equipments if so desired.

It should have enough space to house cable bends.

It should have enough space for additional cable(Service loops) and joint support.

Design: The manhole should be pre cast RCC(1:2:4) concrete ring of 1.2 meter diameter with 50 mm thickness and 1000mm depth with 4 to 6 suitable entry holes for duct pipes installed in the jointing pit to serve as a jointing chamber in such a way that every hole should be 200 mm from bottom.

The manhole shall be made by spun concreting method and shall include 8mm steel reinforcement. The base of manhole should be minimum 25mm thick 1:2:4 concrete. The cover shall be precast RCC, minimum thickness 50mm with diameter suitable for manhole. The cover shall include 2 permanently fixed iron holes for reopening purpose.

The jointing pit shall be 1500*1500mm & depth 1500 mm. At the bottom of the pit a PCC slab of minimum 1.2meter dia and 50mm thick shall be laid. Over this slab a pre cast RCC concrete

ring of 1.1m dia with 50mm thickness and 1000 mm depth with 4 suitable entry hole for duct pipe should be installed.

16. NATURE OF SOIL

The nature of soil strata from the standpoint of excavation is categorized as under:-

16.1 Non-rocky soil (soft soil)

This will include all types of soils-soft soil/hard soil/murum, i.e any strata, such as sand, gravel, loam, clay, mud, black cotton murum, single, river or nullah bed boulders, soiling of roads, paths etc. and hard core, macadam surface of any description (water bound, grouted tarmac etc.) line concrete, mud concrete and their mixtures for excavation of which need application of picks, shovels, scarifiers, ripper and other manual digging implements.

17 SAFETY CONSIDERATIONS

17.1 Precautions while working on roads

Bidder shall take all preventive measures to ensure safety to people, vehicles etc. while executions.

17.2 All warnings, in these should have a red background and should be clearly visible and legible. All warning lamps should exhibit a red light, but white lights may be used in addition to facilitate working at night.

17.3 Wherever required, a passage for pedestrians with footbridge should be provided.

17.4 At excavations, cable drums, tools and all materials likely to offer obstructions should be properly folded around and protected. This applies to jointer's tents as well. Leads, hoses etc stretched and across the carriage way should be guarded adequately for their own protection and also that of the public.

17.5 Where a road or footpath is to be opened up in the course of work, special care should be taken to see that proper protection is provided to prevent any accidents from occurring. Excavation work should be done in such a manner that it would not unduly cause inconvenience to pedestrians or occupants of buildings or obstruct road traffic. Suitable bridges over open trenches should be so planned that these are required for the minimum possible time.

17.6 Working in excavations close to electric cables

Before undertaking the work, full information should be obtained from EIC regarding any electric cables which are known or suspected to exist near the proposed excavation.

17.7 No electric cables shall be moved or altered without the consent of the EIC and they should be contracted to do the needful. If an electric cable is damaged even slightly, it should be reported to the EIC and any warning bricks disturbed during excavation should be replaced while back filling the trench.

17.8 Electric shock-action and treatment:

Free the victim from the contact as quickly as possible. He should be jerked away from the live conductors by dry timber, dry rope or dry clothing. Care should be taken not to touch with bare hands as his body may be energized while in contact. Artificial respiration should begin immediately to restore breathing even if life appears to be extinct. Every moment of delay is serious, so, in the meanwhile, a doctor should be called for.

17.9 Danger from failing materials

Care should be taken to see that apparatus, tools or other excavating implements or excavated materials are not left in a dangerous or insecure position so as to fall or be knocked into trench thereby injuring any workman who may be working inside the trench.

18 Polypropylene Rope (for cable pulling)

6mm PP rope is drawn through the HDPE Pipes/Coils and safety tied to the end caps at either ends with hooks to facilitate pulling of the OF Cables at a later stage. The PP rope used is 3 strands Polypropylene Para Pro rope having yellow colour and shall be of 6mm diameter and it should have a minimum breaking strength of 550 kg. The length of each coil of rope should be 205 meters and it should conform to (i) BS4928 Part-II of 1974, (ii) IS 5175 of 1982, (iii) It should be of special grade and should have ISI certificate mark (iv) It should be manufactured out of industrial quality Polypropylene.

CHAPTER IV

Important instructions for OFC Cable Installation and Splicing Guidelines

The existing 6mm PP rope shall be replaced by with PP rope of 8mm between the two consecutive manholes. This is to ensure that the PLPHDPE pipes are cleaned for pulling the cable without exerting under tension on the OFC cable. While cleaning, excessive pressure should not be put which may result in breaking of PP rope and this requires opening of additional manholes. However, in case the cleaning rope gets stuck up during pulling, the location of dodging of the PLP/HDPE pipe should be measured and located accurately. The trench at that location should be opened and the PLP/ HDPE pipe should be cleaned properly or if not possible it should be changed by a clean new PLP/HDPE pipe to facilitate easy cable pulling at a later stage without any breakage. If dogging of plp pipe is in the location where the pipes are protected either by RCC pipe or by concreting and the protection is broken for cleaning/changing the plp/hdpe pipe, the protection thus removed should be brought back to normal by the contractor at his cost. However plp/hdpe pipes required for this purpose will be supplied by GHB.

The optical Fiber Cables are available in drum lengths of appro. 2 km. The cables shall be mutually pulled through already laid plp/hdpe pipes by using the 8mm pp rope. This work should be carried out under the strict supervision of site in charge. At a time, maximum 3 persons at every manhole should be deployed to pull the cable as more tension to cable may lead to breaking of fibers. Cost of such damages will be recovered from the contractor.

- **Fiber Cable Installation Guidelines.**

The critical installation parameters which may adversely affect the Optical Fiber Cables are :

Maximum Tensile Force

Minimum Bending Radius

To ensure the above aspects, following points need to be kept in mind during the Installation.

1) Careful planning of the cable Route & Choice of the Pathways

2) Careful planning of the Installation Process

A Good rule of thumb for minimum bending radius shall be noted.

- Greater than **10 times the cable diameter** for an unstressed cable
- Greater than **20 times the cable diameter** for a stressed cable

Cable Compression :

- Avoid crushing the cable by stepping on it or having it out in the open where man or machine may trample it.
- It is advisable that after Pulling the Fiber cable in the Excavated Trench, the back filling should be done in such a way that it does not cause any damage to the laid Fiber Cable. For that a Good Stone / RCC hume covering is advisable for the safety purpose.

Direct – Buried service should follow natural line of sight such as property lines, sidewalks and driveways.

Points to account for Fiber cable Pulling / Laying :

Running fiber-optic cable overhead between buildings requires fastening the cable to the buildings or stringing between poles. Whichever way you choose, you must install something to take the strain off the cable. Stringing a messenger cable between the buildings or poles and lashing the cable to it is one option.

Be careful not to cinch the cable too tightly, and you have to cut the free tab off to prevent over tightening. The rule for tie wraps is "use them, but don't over tighten them."

Installing fiber-optic cable in an inner duct can prevent future damage ...If you're using cable tray, you must place fiber-optic cables away from power cables and in a flexible, nonmetallic inner duct. If you're running the cable in a vertical tray, you must support it evenly.

If you're pulling fiber-optic cable through ducts between manholes, you'll need to plan ahead: *

- * First, rod the duct to clean out any dirt, bits of cement, empty bottles, etc. A variety of devices that clean the duct, remove any sandy dirt, and add lubricant are readily available.
- * Second, verify the maximum tension you can place on the cable. You can monitor your pulling tension in several ways. One is the use of breakaway swivels (shown in Fig. 2), which attach to the cable. They're designed to break at a pre-set tension. Another is the use of a slip-clutch capstan. Many installers use a chart recorder to record the amount of applied tension when they're guaranteeing the installation. Still another method is to install a gauge in the pulling line.
- * Make sure you have enough manpower for the pull because you'll be spreading large Figure 8s at the manholes. Also handle the cable carefully and protect it from sharp bends while it's out of the manhole.

Fiber Cable Route Markers are to be installed at Specified Location to Identify Cable Path post the Installation. It shall be documented as well for the future reference.

Fiber Cable installation

These sections outline proper installation of optical cable. The first requirement is "all fiber-optic cables should be installed in accordance with their listings and manufacturers' instructions." Although this seems obvious, one section details how cables must be supported:

All optical cables shall be securely supported, and shall have the supports spaced closely enough that there will be no excessive force placed on the cable. In general, horizontal indoor cables shall be supported at intervals not exceeding 3 ft (91 cm). Supports may be placed up to 5 ft (1.52 m) apart for armored cables, or cables over 1/2 in. (1.3 cm) in diameter. Cables directly buried require no additional support. Cables in raceways are considered to be adequately supported by the raceway.

All straps or supports placed on fiber-optic cables shall be tight enough to hold the cable securely, but shall not be tight enough to substantially deform the shape of the cable. When optical cables are squeezed out of shape, unacceptable forces are placed on the fibers, which frequently result in microbends, microcracking, or even broken fibers. Where possible, rounded or padded supports shall be used. Cable ties shall not be cinched too tightly, and shall have the free tab cut off, to prevent over tightening in the future.

The standard also lists general rules to be followed when pulling cables into place. After mentioning that manufacturer's instructions take pre-eminence, the following rules are given:

- When pulling optical cables into conduits, cable trays, or raceways, the strength member(s) of the cable shall bear all or nearly all of the pulling force. Cable jackets shall not be directly pulled unless designed for the purpose, or unless the run is very short and requires a minimal pulling force. Optical cables shall not be pulled into place by applying tension directly to the fibers (pulling the fibers).
- Optical cables shall be attached to a pulling line only by methods recommended by the manufacturer of the cable.
- Unless stated otherwise by the cable manufacturer, the maximum pulling tensions used for optical cables shall be 300 lb. (136 kG) for multi-fiber indoor cable and 600 lb. (273 kG) for outdoor cable. The pulling force shall be uniform and consistent; cables shall not be jerked.
- Cable pulling shall be done by hand, except when tension meters, tension-controlled, or breakaway swivels are employed.
- Continuous cable pulls shall be used whenever possible, avoiding splice points.
- A length of free cable shall be provided at each end of a cable pull. Loops of cable (commonly called service loops) shall be provided at all intermediate pulling points, such as in manholes and pull boxes. The cables' minimum bending radii shall not be violated.

Safety precautions. :

With two primary safety hazards associated with optical fiber systems, the more commonly talked about hazard is retina damage; due to looking into the ends of live fibers. In real life, however, this is a rare situation.

Few fiber systems have power enough to cause eye damage (cable TV systems being the exception), and most broken fiber ends will diffuse the light passing through them anyway. Nonetheless, this is a legitimate concern.

The second concern, however, is far more serious. This is the hazard posed by broken pieces of fiber. These are essentially small glass needles, and can be quite dangerous: Painful when stuck in the skin as a splinter, they are potentially life-threatening if ingested. Hence the safety requirements of this section of the standard:

- Live optical fiber ends (live fibers are those with signals being sent through them) shall not be inspected by technicians; fibers shall be dark (no signal being transmitted) when inspected. Care shall be taken in verifying that the fibers are not live, since the light used in the majority of optical systems is not visible to the human eye.
- If there is a risk of fibers being inspected live; especially when the system light source is a laser, all technicians working on the system shall wear protective glasses, which have infrared filtering.
- Fiber-optic work areas shall be clean, organized, well lit, and shall be equipped with a bottle or other suitable container for broken or stray fiber pieces.
- No food, drink, or smoking shall be allowed in areas where fiber-optic cables are spliced or terminated, or in any area where bare fibers are being handled.
- Technicians making fiber terminations or splices or working with bare fiber shall be supplied with double-sided tape, or some other effective means, for picking up broken or stray pieces of fiber. All work areas where bare fiber may exist shall be repeatedly and consistently cleared of all bare fiber pieces. All bare fiber pieces shall be disposed of so that they cannot escape and cause a hazard. (For example, bare fibers should be sealed in some type of bottle or container before being dumped into a wastebasket.)
- All technicians working on bare fiber shall thoroughly wash their hands immediately when leaving the work area. They shall also check their clothing, and pat themselves with clean tape to remove any stray pieces of bare fiber.

OFC Cable Pulling

- OFC shall be pulled gently, by using nylon rope, which in turn is connected to cable grip/pulling eye to the end of the cable. The tension in the cable during the pulling should not exceed the tensile strength of OFC.
- The stacking of OFC during the pulling shall be in figure of Eight, having the minimum diameter of 1 meter.
- The loss/attenuation should be 0.17 to 0.25 db/km at 1550nm and 0.28 to 0.35 db/km at 1310nm.

After pulling of the drum is completed, both ends of the plb/ hdpe pipes in each manhole should be sealed by hard rodent resistant rubber bush to avoid rodent/mud into plb/ hdpe pipes.

Tools and Plants:

The contractor shall provide at his own cost all tools, plant appliances ,implements etc required for proper execution of works. The contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of setting out works, counting, weighing and assisting the measurements for examination at any time and from time to time. The contractor shall be responsible to make all arrangements, at his own cost. Failing the contractor's doing the same may be provided by the EIC at the expense of the contractor.

Preliminary Inspection:

Before offering completed works for acceptance testing to EIC, the contractor shall complete all checks and tests as required and submit report.

The EIC and officers of GHB will inspect the work from time to time during the course of splicing. The EIC will also conduct a preliminary inspection before offering for acceptance testing and any defect pointed out shall be rectified forthwith at contractor's expence.

In case the completed cable splicing do not pass the final acceptance testing or checks as required, the contractor shall bear all costs in this regard and reoffer works after rectification for preliminary inspection of EIC.

Final Inspection:

The EIC after his satisfactory preliminary inspection shall offer the works for final inspection to the Acceptance Testing Unit. The ATU will check fiber losses and position of cable splicing.

The inspection resulting in defect in cable splicing as inspected/tested above shall be termed as final inspection. After completion of final inspection, the acceptance –testing unit shall issue the completion and testing reports in prescribed proforma. The report shall normally be released within 30 days from receipt of offer from EIC. No work shall be treated as complete until acceptance testing and quality control checks are completed and found satisfactory.

All the defects pointed out by the ATU and/or EIC shall be rectified and got retested by the contractor before the work is treated as completed. The responsibility of non-clearing the defects and thus non-completion of work shall always rest with the contractor

Brief description of splicing:

The OFC cable drum is usually of 2 kms in length. Hence OFC fiber joints will be approxi. At every 2 kms. The 6/12/24 fibers are to be spliced at every 2 kms and at the both end(terminations) in the equipment room as directed by the EIC. The OFC are to be spliced at every 2 kms distance directly to other cable or to be patched to other cable by means of T joint involving more than two cables and at the both ends(terminations) as directed by the EIC. The infrastructure required for cable splicing shall be available with the contractor. Viz.:

Splicing machine

OTDR 1310/1550 nm band

Optic power meter 1310/1550 nm band

Optic Talk set

Tool kit

Splicing of Fibres shall be done by fusion splicing only.

Splicing loss in each fibre in the joint should be better than 0.1 db at 1310nm/1550 nm by OTDR, however mechanical splice loss, as shown in the splicing machine should not be more than 0.02 db.

15-meter OFC coil form should be kept at both ends of splice/joint point.

All jointing location shall be marked with proper identification marker.

During OFC splicing utmost care is to be taken by the contractors so that the existing underground cables or any other utility services are not damaged or cut. In case of damage/cut is done to the existing cables of GHB the contractor shall make good this at his cost.

Splicing is to be done in a very organized manner ie opening of manholes or duct chambers and preparing the cable ends ready for splicing and executing the splicing. After splicing completed the FDMS closer should be fitted and sealed and properly kept or fitted to the walls and re fixing the cover of the manholes.

The contractor shall be fully responsible for arranging and obtaining all necessary equipments, permits etc . If the OFC cable splicing and associated works alters the contours of the ground around the road, the contractor shall take all precautionary measures required.

During OFC cable splicing all the accessories required for the works including generator or battery should be borne by the contractor. The contractor should make his own arrangements for sufficient light at the cable splicing spot.

OFC Testings

- a) As with UTP testing, all requirements defined under testing telecommunications cabling must be met.
- b) Verify the accuracy of labeling on all cables and connectors.

- c) Visually inspect optical connectors at a minimal magnification of 200X to ensure that no physical damage has occurred during installation. If any defect (e.g. scratched or pits on the core or cladding) can't be rectified with polishing, replace the connector.
- d) Test all fiber optic cable with a power meter and light source using the one-jumper test procedure outlined in ANSI/TIA/EIA-526.

For single mode fiber, test at both 1310 nm & 1550nm

- e) Each fiber link must meet performance criteria defined in ANSI/TIA/EIA-568-C.3.
- f) Measure insertion loss of each connector in one directions. Maximum insertion loss across each mated connector pair must not exceed 0.75 dB.
- g) Measure insertion loss of each fusion splice in both directions. Maximum insertion loss across each fusion splice must not exceed 0.3 dB.
- h) Any element whose testing shows an excessive insertion loss coefficient, a sudden step in attenuation coefficient (> 0.2 dB), back scatter losses due to micro-or macro-bending, or any other fault must be re-worked or replaced until passing results are obtained.
- i) Confirm length of the fiber by either OTDR test or optical length test measurement device and verify with the sequential marking on the cable jacket.
- j) Record the length and loss of each mated connector pair on the test results schedule Any failures-including any terminations showing excessive loss-must be recorded along with the results of testing after the fault has been rectified.
- k) Loss measurement should be done by Light Source and Power meter which can record the results and the results should be downloaded to computers directly. OTDRs should not be used in place of a power meter/light source to measure system attenuation. Preferably this should done using DTX-1800 with respective fiber modules.
- l) Bi-directional testing of optical fiber is required and is mandatory.

CHAPTER V

General Technical Specifications for the Schedule:

- 1 The Bidder shall give Technical Specifications for the passive items with bill of materials viz:
 - 1 Unshielded Twisted Pair Cable Cat 6
 - 2 6 Core Single Mode OFC Armoured Cables
 - 3 12 Core to 144 Core OFC Armoured Cables
 - 4 Pigtail Single mode 1.5 meter length
 - 5 Patch Cords SC - SC Single Mode 3 meter length
 - 6 Jack Panels RJ45 suitable for Cat6 24 port unloaded
 - 7 Splice Trays for Rack Mount Enclosures for __ cores
 - 8 Splice Protector
 - 9 Mount Racks with details
 - 10 Universal racks
 - 11 FIST gel sealed generic closer organizer
 - 12 Generic Patch/Splice shelf
 - 13 All other items required in the executions work.

Specifications for civil items for

RCC chambers
Foundations for mounting panels or such equipments
Roure Markers
RCC pipes if any
GI pipes if any
Any other cement works

2 Documentation

A complete cabling system (as installed),including cable routing, telecom closets and telecom outlet connector designations. The layout shall detail locations of all equipments and indicate all wiring pathways.

Manufacturer's Technical Documentations on all devices used in the system.

Manufacturer supplied end user manuals for active equipment and configuration details thereof.

GENERAL MANAGER (TECH & ADMN)
M/S.GUJARAT HIRA BOURSE

Signature and seal of Contractor :-

Name :-

Address :-

Date :-

