TECHINICAL SPECIFICATIONS

FOR

ANNUAL MAINTENANCE CONTRACT/LAST MILE CONTRACT FOR POWERGRID'S UNDERGROUND OFC NETWORK ON

..... ROUTES OF

(APPROX. ..... KMS)

IN

O&M PACKAGE- .....

BIDDING DOCUMENT

VOLUME-II

NIT No:

Power Grid Corporation of India Limited

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TECHNICAL SPECIFICATION

1. Introduction

a. Power Grid Corporation of India Limited is a "Nav-Ratna" CPSU under the Ministry of Power, Govt. of India. POWERGRID is the Central Transmission Utility of Country has installed a dedicated Optic Fibre communication Network across the country for Real Time operation of the National Grid.

b. POWERGRID diversified into Telecom business in 2001, leveraging its country wide transmission infrastructure. POWERGRID has already installed about 36,563 Kms of Telecom Network (backbone as well as last mile) and has presence at about 595 locations including all metros, major cities & towns mainly through the Optical Ground Wire (OPGW) laid on its power transmission lines. POWERGRID is also in the process of expanding its telecom network for another 30,000 Kms.

c. POWERGRID holds IP-1, ISP & NLD licenses from DoT & has deployed multivendor Dense Wavelength Division Multiplexing (DWDM) system & Multivendor SDH system to provide high capacity NLD links. POWERGRID has also deployed MPLS network for providing various VPN & IP services to its customers.

d. POWERGRID is planning to deploy separate internet network in near future for complete segregation of MPLS-VPN & Internet services.

e. The OFC network of POWERGRID has a layered architecture with mesh/ring topology to support route redundancy. The aggregation layer is supported on multiple rings of STM-64/16 system, and the Core network on high-capacity DWDM system. The network provides bandwidth options of various granularities going up to n x 10G.

f. POWERGRID's services extend to major Telecom Operators, Internet Service Providers, MSOs, MNCs, Enterprises, Defense & Strategic organizations, Banks, Government Institutions/ Departments, Educational Institutions/ Universities etc.

g. The rich and varied experience of POWERGRID in Telecom domain is much in demand is selected for implementation of key Government projects viz, National Knowledge Network (NKN) & National Optical Fiber Network (NOFN).

h. POWERGRID Telecom has its Regional Telecom Control Centers (RTCC) at Delhi, Mumbai, Kolkata & Bangalore.

2. Description of OFC laid

2.1 POWERGRID has installed OFC with varying fibre count ranging from 6 to 48 fibres. However, mostly the cable installed is of 24 fibres. Underground OFC has been laid adjacent to national/state highways, and also in intracity generally at a depth of 1.65 mtr from the ground level in normal soil, 1 mtr in soft rock and 0.8 mtr in hard rock areas. However, in certain sections due to various constraints, the ducts have been laid in depths lesser than the specified depth with PCC / RCC pipes / GI protections. The OFC is laid inside 40mm PLB HDPE duct. Generally, two nos. of HDPE ducts (one green/ blue and one orange) have been installed along the route. OFC has been blown normally in orange duct with the second green/ blue duct being spare. The rivers and nallahs are crossed either over bridge by GI pipe or through river bed using RCC pipes. Route markers/ warning tapes were provided above the ducts at regular intervals to identify the route during initial installation of OFC. Presently, due to various construction activities/ road widening works undergoing at various stretches along OFC route, OFC at various places have also been hung over bamboos/poles or other supports as a temporary arrangement.

2.2 POWERGRID has also installed Underground OFC and Overhead OFC (Temporarily laid) up to Customer premises for providing Connectivity in various cities, and this Last Mile OFC may keep on changing as per actual Customer Connectivity requirement. The details of the links to be maintained along with U/G & O/H section lengths & diagram is enclosed at Annexure-I. The length has been calculated by OTDR reading / Route length. Generally total kms given in all applicable BoQ items shall remain fixed during the tenure of the contract for intercity links. However, in case of any major changes of intercity and intracity links due to change in the route or due to addition/ deletion of customer connectivity, the length of route shall be calculated based on OTDR reading/ Route length. If it is not possible to finalise route length based on OTDR reading, due to some specific reasons, the route length shall be physically measured. The links to be maintained by O&M Contractor are considered to be from FODP to FODP unless otherwise brought out. However, in addition to link maintenance, between FODP to FODP, Contractor shall be required to check / change patch cords and/or connectors (installed/ supplied by POWERGRID).

2.3 In line with the international standards, POWERGRID needs to maintain a very high traffic availability of **99.99%** for its communication link. With an intention to achieve this target, POWERGRID wishes to utilize following external services:

3. Brief Scope

This specification defines the scope of AMC and LMC works. The AMC/LMC works mainly includes the following:

- AMC Works: Patrolling, breakdown maintenance and OFC laying for preventive maintenance to achieve the SLA.
- LMC Works: OFC laying for customer connectivity.

This specification is broadly divided into following parts:

- Part-A : TS for Patrolling, Breakdown and Preventive maintenance
- Part-B: TS for OFC laying for preventive works and LMC

The contractor shall deploy only Indian Citizen as manpower for all requirements under the proposed contract.

4. Part-A: TS for Patrolling, Breakdown and Preventive Maintenance

a. Patrolling/ keeping in touch with local authorities and keeping vigil on construction works along OFC route by deploying adequate number of patrollers to take all preventive measures to avoid any link failure.
b. Breakdown Maintenance.
c. Preventive Maintenance.
d. Provision of splicing gangs for above maintenance

The detailed scope of contract is brought out here under:

4.1 Patrolling:

The O&M Contractor shall deploy minimum Patrollers as per the Annexure-II fully equipped with Motor Cycle & Mobile phone in such a manner so that patrolling is done in an efficient manner for the entire route length for the package discretion so as to keep link outage to a minimum to cover following:

(a) To notice, and prevent damage to OFC/ Duct due to Construction/ Road widening activities/ Other Service Provider's works etc. and to submit a "Daily Report" to Engineer-In-Charge on the same.

(b) To maintain a liaison with local authorities enroute.

(c) To report to the concerned POWERGRID's representative/ Supervisor of the O&M Contractor

(d) Depending upon the activities enroute, the Patrolling timing shall be managed.

(e) Providing services such as collecting Electricity bills/ ROW Letters/ Demand Notes from the concerned authorities, & deposition of relevant documents, and handing over of DD's etc. to the concerned authority.

(f) Ensuring 24*7 availability on mobile

The above requirement of Patrollers is minimum and mandatory, however the Contractor may deploy more Patrollers **without any extra cost to POWERGRID** in a view to reduce number of cuts and in turn to avoid penalty.

A single rate for Patrolling and Breakdown maintenance as per BoQ shall be quoted on per KM basis, and shall cover all the activities/ Manpower mentioned above along with items covered under Breakdown maintenance as listed below.

4.2 Breakdown Maintenance:

The single **rate per km** quoted for Patrolling and Breakdown Maintenance shall consist of but not limited to following items:

(a) No separate payment shall be made for patrollers, which will be deemed to be covered in single per KM rate quoted for patrolling and Breakdown maintenance.

(b) There is single rate for both U/G as well as O/H section OFC

(c) Taking OTDR reading in spare fibres on monthly basis and submit the report and also as and when advised by Site Engineer for checking healthiness of the fibres.

(d) Fault identification after receipt of information/ intimation from RTCC/ NTCC/ concerned POWERGRID Site In charge/ Patrollers etc.

(e) Rectification of fault by splicing all the fibres in OFC in Joint Closure.

(f) Supply & Installation of Joint Closure (of POWERGRID approved make) during permanent restoration of the fault, however, for Temporary restoration at the time of fault, installation of joint box with lower fibre count may be acceptable. Present list of approved makes are given in **Annexure-III**. Bidder may also propose any other reputed vendor for including in the approved vendor list by submitting relevant documents to POWERGRID.

(g) Supply & Installation of Manhole (FRP/RCC/Brick), wherever possible. After installation of new joint box, manhole of suitable construction as per POWERGRID specifications shall be supplied and installed.

(h) All other material (except OFC and duct) required for restoration of links shall be provided by the contractor.

(i) Replacement of duct, and associated Excavation/ Backfilling activities, wherever required.

(j) Shifting/ Raising of Manhole, wherever required/ feasible.

(k) Temporary restoration of the link by swapping fibres from Manhole/ Repeater**.**

(l) In the event of a breakdown, if the O&M contractor is required to temporarily lay OFC on overhead (irrespective of the length of the OFC) / on bamboos/

poles/ trees/ buildings or is required to replace the OFC in the same / other duct, the same shall be done at no additional cost to POWERGRID. No other associated payments like splicing etc shall be payable and the entire work shall be considered as part of breakdown maintenance and hence NOT PAYABLE separately. Only at a future date when such Temporary arrangement are actually made permanent (U/G), payments as per preventive maintenance BOQ rates shall be applicable.

(m) Taking photographs of the fault during restoration with board, clearly showing the Fault No. provided by RTCC. Soft copies to be submitted to concerned POWERGRID Site-In-Charge.

(n) Submission of Fault Rectification Report in the prescribed format **(Annexure-IV).**

(o) It may be noted that for attending the Breakdown fault, no separate payment towards splicing / jointing / OFC laying etc. shall be paid for any type of fault, and all such works shall be carried out within the fixed rate per km quoted by the party.

(p) OFC up to the customer premises is included in the scope of work for breakdown maintenance. At a few places, in Last Mile, POWERGRID has temporarily laid an overhead OFC for few meters / kms up to Customer premises from the nearest UG OFC point. All such OFC's are in the scope of breakdown maintenance in this contract till the permanent underground laying of all such section(s). However, since special permissions, etc may be required to execute such breakdowns, no penalties shall be applicable on the contractor.

(q) Contractor will be responsible for any theft case and has to bear the loss. It is their duty for lodging FIR and to resolve any such issues.

(r) Any expenditure towards sundry items like transportation of material, settling of disputes with local people, liaisoning expenses for getting permissions to carry out breakdown/ preventive maintenance works etc. shall be in the scope of the Contractor. However, all **GST** payments towards "OFC and duct transportation" shall be paid by POWERGRID

(s) Contractor has to readily maintain materials like duct, OFC etc in their own stores at strategic locations, sufficient for maintenance of links for at least 1 month. The contractor will replenish the material by taking it from POWERGRID time to time, whenever any material is reduced in their store. Contractor shall submit material reconciliation statement every month for the materials along with their bill.

(t) As Coupler and Joint boxes, which are to be supplied by Contractor, are critical items, Contractor shall ensure enough stock of these items and keep POWERGRID update

4.3 Preventive Maintenance of OFC

The BOQ mentioned under preventive maintenance schedule shall be executed for:

(i) Making **existing** (at the time of award) O/H OFC sections permanent (U/G)

(ii) Bypassing the vulnerable UGOFC section, as preventive measure to avoid multiple cuts OR any other required proactive measures to avoid link failure.

Payments shall be made as per the unit rates quoted in the Preventive maintenance BOQ and the detailed TS of OFC laying is given in **Part-B** of this document. The scope of work includes the following:

(a) All Overhead OFC's wherever feasible to be made Underground by Trenching/ HDD, and other associated activities related to UG OFC laying

(b) Supply and Installation of Manhole

(c) Excavation and Backfilling

(d) Laying of GI Pipes/ Duct/ OFC/ RCC Pipe etc.

(e) Supply and installation of insulated GI wire in the intracity

(f) Supply & Installation of Joint Box (POWERGRID approved make)

(g) Installation of FODP

(h) Taking OTDR traces and optical Power measurement (for OPGW only). No separate payment shall be made for taking OTDR traces as per advice of Site-In-Charge in the UG network.

(i) PCC for protection of Ducts/ GI Pipes

(j) Supply of GI pipes/ RCC pipes.

(k) Manual boring in small length of few meters

(l) Replacement/ Re-laying of high loss section/ Multiple Joint sections/ deteriorated/ inaccessible OFC/ Road widening sections wherever feasible, by permanent laying of UG OFC.

(m) Installation of Manhole cover

(n) Sand filling in the Manhole

(o) Shifting of existing permanent manhole to suitable location to avoid burying inside road due to road widening/ construction.

All efforts shall be made to lay the ducts as per Tech. Specs. However, in exceptional situations, the Site-in-Charge may allow relaxation in technical specifications (to be recorded and signed jointly) with protective measures like PCC/ RCC pipe/ GI pipe (payable extra as per BoQ items). The contractor has to lay 1 or 2 nos of the ducts as per existing nos. of the ducts/ instructions of the Site-In-charge.

As road widening /pipe laying/ electricity cabling works etc. are in part sections, agency shall closely liaison with such executing agencies / municipal authorities / local administration to restore ducts / chambers along with construction works. They shall also obtain required ROW from concerned authorities, if required. All statutory payments in this regard shall be made by POWERGRID.

All attempts shall be made to retrieve OFC from damaged/road widening stretches for using the same as spare for breakdown maintenance works. For de-blowing purpose, the rate of OFC laying as per BoQ shall be paid for retrieval of OFC from such sections. Only 20 % of the total retrieved OFC length shall be considered as permissible wastage during de-blowing operations, and remaining OFC will be taken into stock by the O&M contractor. In case, wastage is above 20 %, certification from Site-In-Charge shall be required.

Joint closures recovered from retrieved OFC shall generally not be re-used, and can be allowed to be used only for splicing works during temporary restoration works of breakdown faults/ temporary bypassing of vulnerable UG OFC section.
The contractor has to dispose off scrap wooden empty OFC drums and other waste materials properly.

4.3.1 OPGW REPEATERS / ROUTES: OPGW links shall be maintained on case to case basis. OPGW route exists in various sections. The details of OPGW section is specified in **Annexure – VI**. The OPGW routes are very sturdy and unlikely to break. However, occasionally, the OPGW cable may break along the transmission line or in Approach Cable (small U/G section from Tower to Repeater) near repeater stations or the attenuation in some of the fibres may increase. The O&M contractor shall be asked to attend to such faults by moving one of the existing gangs from the location nearest to the fault. Such occasions are very rare but very critical. Therefore, the fault in OPGW shall be attended in minimum possible time through nearest available maintenance team. The method adopted for OPGW fault rectification will be as under:

(a) Payment towards Transportation and other Sundry expenses of splicing Team shall be made at the rate quoted in the bid for actual distance traveled (To & Fro), after certification of concerned POWERGRID Site Engineer.

(b) In case, the fault is diagnosed to be at any of the joint boxes, POWERGRID's team from the nearby substation shall be mobilized to site for bringing down the joint box at ground level.

(c) The O&M contractor shall thereafter undertake repair of the fibre fault, by splicing in existing joint closure or by installing a new joint closure (to be supplied by POWERGRID), as per site requirement.

(d) After repairs, POWERGRID team shall re-install the joint box at the original/ suitable height on the tower.

(e) In case of major fault in the line, such as tower collapse etc., the O&M contractor shall install a temporary divert route by installing aerial/ U/G OFC between the nearest joint boxes. Cable for this purpose shall be provided by POWERGRID from its store (As Annexure-VII) and shall be transported by the contractor. OPGW/ Normal OFC splicing shall be under the scope of BOQ of splicing gang item, without any extra payment to the Contractor. As a special case, for temporary OFC laying the rates of OFC laying as per Preventive Maintenance BOQ shall be applicable.

(f) Similar process is to be adopted for any fault in OFC between the tower joint box and FODP in repeaters/ in FODPs in OPGW section.

(g) Taking OTDR traces, Power meter measurement, FODP/ pigtail splicing time to time in OPGW Repeater/ link within the region shall be under the scope of BOQ of splicing gang item, without any extra payment to the Contractor. However, per KM travelling rate and night halt charges as specified above shall be applicable.

(h) Additional team mobilization for Preventive Maintenance, if required, to be done by the contractor at no additional cost to employer.

4.4 Provisioning of Splicing teams for Breakdown and Preventive maintenance

The contractor's Splicing Team for Breakdown and Preventive Maintenance tentatively shall be located as mentioned in **Annexure-V.** The above locations are tentative, and the location may be changed as per requirement of POWERGRID. The splicing teams shall consist of but not limited to following items:

- Four wheeler vehicle
- Supervisor
- Skilled splicer with one No. helper
- 2 Nos. labours
- Protection gears (i.e. Electrical insulation gloves, safety helmet, safety harness, safety shoes etc.) for Team
- Splicing machine
- OTDR
- Fiber spool
- Power meter
- Cleaver & Stripper
- Laser source
- Digital camera
- Mobile Phone
- Duct Tracer

The scope of Splicing team involves the following:

(a) All Breakdown/ Preventive Maintenance and other associated works

(b) Removal of losses, as and when noticed and informed to them

(c) Taking photographs during fault restoration of each Breakdown fault

(d) Preparation & Submission of fiber routing details of Junction Joint Closures, mainly in Intracity Networks

(e) Other Services such as taking OTDR traces, Diversion/ Re-routing of fibres in existing Joint closures/ Manholes, Splicing/ Patch cord routing in Customer premises in FODP or RSTB/ in Repeaters/ POPs, OFC Drum testing etc. from time to time as per requirement at no additional cost to POWERGRID under the scope of this contract.

(f) Technical support like Testing or connecting of fibre, as directed by RTCC/ NTCC by physically moving to customer locations, during exigencies.

(g) Safety & Security of the deployed manpower while execution of work shall be the sole responsibility of 'Supervisor'. He shall also ensure compliance of all necessary processes/ procedures for the safety & security of other common infrastructure (i.e. Electric Distribution Lines, Water pipelines, Gas pipe lines, Drains, Road etc) during execution of work. All the works must be executed under his presence & supervision/ administration.

4.5 PENALTIES for not meeting SLA requirement:

Contractor will provide adequate infrastructure in terms of manpower, office, locations, tools, standby machines etc. to achieve the committed service norms & specified SLA.

A. FAULT CLASSIFICATION:

Various types of faults are defined below. The actual type of fault shall be decided by the Site-In-Charge.

(a) **FORCE MAJURE FAULTS**: Situation when it is not possible to work like law and order problem, riots, curfew or flood, fire, earthquake etc.

(b) **SPECIAL FAULTS**: Rodent cuts, Electric cable (short circuit or failure in adjacent cables) Faults and HDD portion in longer length (>50m)

(c) **NORMAL FAULTS**: Cable cut due to Road widening works, Ant/insect cut inside manholes/ Joint box, theft of OFC/joint box, other JCB operations, miscreants, and all faults not covered under (a) & (b) above.

(d) **Scheduled outage**: Permission has to be taken from Site-In-Charge/ RTCC/ NTCC.

(e) Condition of multiple cuts: If link does not come up in between the faults, multiple cuts will be considered as single cut.

B. LINK DETAILS:

The links for the package are classified as per the Annexure-I along with UG and OH sections length and diagrams**.** In the backbone, links are from repeater (equipment) to repeater and in intracity, name of stretches passing through one or more customers & PoPs.

C. LINK FAILURE EVENT:

The total time duration between downtime of the link to Uptime will be called one LINK FAILURE EVENT. LINK FAILURE due to High losses/ Errors will also be considered for this purpose. The LINK FAILURE EVENT will be declared by RTCC/ NTCC, and will be final, irrespective of multiple OFC faults in the particular link for any event. The contractor shall not enjoy the availability due to protection path.

D. APPLICABILITY OF PENALTY:

POWERGRID's focus is to **maintain the link availability and not to impose penalty**. However, in case of delays by contractor in rectifying the faults, Site-in-charge will decide the penalties based on the following guidelines. Deduction under this section shall be made on Breakdown Maintenance, Patrolling and Splicing team part of the BoQ: (A+B)

(a) In case of Force Majure faults: no penalty up to Force Majure period. After the condition becomes workable, it will be treated as Normal or special faults and accordingly penalty shall be applicable.

(b) In case of special faults: a penalty of Rs. 2,000/- per hour shall be put after 8 hrs, for each additional hour (or part thereof up to on half hourly basis) for delay, up to next 10 hrs with fine of Rs. 20,000/- for each link failure event, for that link and after reaching the 10 hrs limit, further penalty of Rs 1000/- per hr shall be levied.

(c) In case of normal faults: a penalty of Rs. 2,000/- per hour shall be put after 4 hrs. After 10 hrs, penalty shall be as per given in above Para "4.5 D (b)".

(d) In case of scheduled outage: a penalty of Rs. 2,000/- per hour shall start after the time allowed for scheduled outage. After next 10 hrs penalty shall be as per given in above Para "4.5 D (b)".

(e) In all of the above cases: for not submitting photographs a lump-sum penalty of Rs 500/- per fault shall be enforced.

(f) Penalty for not patrolling and not submitting "Daily Report" (proof of patrolling) by patroller, Rs. 500/- per day per Patroller shall be deducted.

E. MONTHLY CEILING:

For all above faults in one month for a link (as described in BoQ)The **MONTHLY CEILING** for any link, for the penalty clauses mentioned above at "a" to "f" will be 50 % monthly payable charges of item "A for that link + gangs pertaining to the link of B" of the Part-I of the BoQ (the breakdown maintenance) and will be calculated as per the formula: Monthly ceiling for a Link = 0.5 * monthly amount for item of BoQ of(A for that link + gangs of B pertaining to the link)

F. EXEMPTIONS FROM PENALTY:

(a) Any planned/ schedule outages, after confirmation from RTCC/ NTCC, will be excluded from penalty clauses, however, such outages shall be completed within the time limit granted by the NTCC/RTCC. The time over & above the permitted period of scheduled outage shall be considered for penalty.

(b) In the case, where special permission may be required in some small particular portions (say some private buildings not allowing to enter in the night) of O/H cable to execute such breakdowns, no penalties shall be applicable on the contractor for genuine reason. Similarly, fault in patch cord/ connector is also exempted from penalty.

(c) Similarly time taken to get permission from owner of the premise for rectification for HDD section shall not be counted for penalty. Cable cut during HDD works or due to delay in permissions from customer end/ other premises shall be exempted for penalty. However the Contractor shall make all his efforts to reduce the above permission time.

(d) In case of emergency movement of existing splicing team from any nearest point to OPGW section, as per instruction of POWERGRID, faults occurring in section from where team has moved will be relaxed from penalty.

For all such exemptions approval of Site-in-charge is required.

G. Penalty & Withholding on account of balance breakdown related works or incomplete/ substandard work:

a. **Non-splicing of all fibres in Joint closure:** All the fibres in OFC cable shall be spliced during breakdown maintenance, and submit the Fault Rectification Report as per the format enclosed at **Annexure-**

IV, an amount of Rs. 2000/- per joint location shall be withheld from the billing amount for that particular month. This withhold amount will be released without interest only after completion of pending splicing works duly certified by POWERGRID representative.

b. Similarly, in case materials/ works being not as per POWERGRID's specifications in case of Joint closure (make), Manhole installation, and all associated activities of Breakdown fault, wherever feasible, an amount as per the respective rates in the BOQ of Preventive Maintenance works shall be withheld from the billing amount for that particular month, and in case the J/C is not of POWERGRID approved make, an amount of Rs. 3000/- per joint made shall be withheld from the billing amount for that particular month. This withhold amount will be released without interest only after completion of pending works duly certified by POWERGRID representative.

c. After any fault and its restoration by temporary overhead fibre laying, the payment for that overhead section will be continued as per rate quoted in the BoQ under Breakdown Maintenance. Permanent restoration shall be completed within 3 months of the occurrence of the fault, unless otherwise certified by the Site In-charge, that the work cannot be taken up due to site constraints. Otherwise if Site-In-Charge does not certify for any constraints and the party does not complete such works within 3 months, permanent deduction shall be effected in the next running bill, as per differential amount of 'prevailing market rate & LOA rates', with additional 15 % as POWERGRID supervision charges.

d. Sometimes existing permanent manhole gets buried under road and becomes unavailable for maintenance purpose. The contractor shall take preventive measures like shifting of manhole to suitable location. A penalty of Rs 10,000/- shall be levied, if a permanent manhole is lost inside the road due to road construction/ widening.

H. Clarification regarding Penalties

All link outages, cable cuts, faults, heavy losses, errors and other events are continuously monitored and recorded centrally at RTCC/ NTCC on 24 X 7 basis through Network Management System (NMS). All data like exact time, duration nature of fault are reported at NMS very accurately. Therefore all events shall be declared by NTCC based on NMS.

(a) In case of any Technical problem related to temporary accessibility problem of equipment etc., the actual downtime may not be immediately noticeable at RTCC/ NTCC control room. In such cases, after the equipment are properly accessed, RTCC/ NTCC shall find out the actual duration of outage / continuation of outage and the same shall be taken as the fault clearance times.

(b) Link shall be declared as OUT by RTCC/ NTCC whenever errors are observed in the equipment monitoring logs. Such an outage may be due to excessive fiber losses / bent fiber / etc. Such an outage shall be taken as a normal outage (irrespective of whether road widening sections are involved in the link or not) and appropriate penalties shall be applicable in such cases. Similarly, after rectification of a fiber cut by the splicer, if the link shows errors due to high losses, the link will continue to be shown as OUT until the errors become zero.

5. Part-B: TS for OFC laying for preventive maintenance works and LMC

5.1 Survey

The choice of route is most important aspect in planning an underground cable system. The correct choice is essential to reduce the cost of laying pipes, keeping the pipes safe from damage and to attain their maximum utilisation when they have been laid.

The survey shall be conducted for underground fibre optic cable routes within the cities as described below to finalise the route and paths for the underground fibre optic cable. For underground fibre optic cable links within cities, location of prospective customers such as: Telecom service providers (DoT/BSNL, other basic operator, Cellular, Pager, ISPs etc), Major business centres, Bulk data users (Corporate Houses, universities, colleges etc) shall be identified by the Contractor and submitted to Owner by suitably marking the locations on a city map of proper scale.

In certain cases there will be routes where the Owner has finalised the route for the installation of PLB HDPE pipe vis-à-vis the underground OFC, or PLB HDPE pipe is already installed by POWERGRID or other agency. In such cases, the Owner shall provide the details of the finalised route or existing PLB HDPE pipes routes to the extent possible. However, to carry out the fibre optic cable installation, the Contractor shall carry out the required survey of the routes and shall submit the survey report for finalisation by the Owner.

5.1.1 Identification of underground fibre cable route

The Contractor shall propose preferably most suitable route for each link keeping in views the following broad criteria:

(a) The route shall be as straight and as short as possible.

(b) The route shall have minimum obstacles in order to minimise reinstatement cost.

(c) Clearances required from other authorities / bodies are minimum and that the clearances can be obtained expeditiously.

(d) Wet or unstable ground shall be avoided to the extent possible.

(e) The route for the pipes shall be away from the carriage-way of the road to the extent possible.

(f) The route shall be suitable for placing manholes wherever required.

(g) Future expansion of roads shall be taken into consideration.

(h) Road, rail, river, nallah crossings, horizontal direction drilling shall be minimum.

(i) As far as possible underground fibre optic cable route shall be on the opposite side of the existing cables laid by DOT/BSNL or other utilities. Wherever both routes fall on the same side of the road, a spacing of about 2.0 m be maintained, to the extent possible subjected to ROW clearance.

5.1.2 Survey Report

The Contractor shall submit the survey report with the most suitable route for all the fibre optic links along with details described above before implementation. The final survey report shall include the following (as applicable):-

(a) A drawing of the proposed route indicating all details of the route including relevant details of soil strata, bridges, culverts, causeways, rail over/under bridges, defence area, underground gas / oil / water pipe line, power and communication cables routes, other important landmarks etc.

(b) The distance of the fibre optic cable route from the centre of the road / rail / river / bridge / culvert etc. shall be indicated on the route maps as well as documented in tables.

(c) Sections of the links where Horizontal Direction drilling, Rock drilling, Moling and manual auguring may be required.

(d) Sections where GI, DWC or RCC Hume pipe may be required.

(e) Location and number of permanent and temporary manholes with type of Manholes (i.e. Brick, Pre-cast RCC , FRP etc.)

(f) Location of all turns, bends and major landmarks.

(g) Type, quantity and location of all the joint boxes. Care must be taken to minimise the number of splicing and joint boxes.

(h) Section lengths of the underground fibre optic cable, total length of each link and drum scheduling for the entire link.

(i) List of authorities from which clearance shall be required to be obtained for each relevant section.

(j) Estimated cost of reinstatement to be provided by the Owner to the concerned authorities.

The requisite clearances (as indicated in para below) need to be obtained before the cable installation work is commenced.

For the routes where the Owner has finalised the route for installation of PLB HDPE pipe vis-à-vis the underground OFC or where PLB HDPE pipe is already installed by the Owner or other agency, the Contractor will survey the route to facilitate installation of optical fibre cable, and submit the final survey report as per above description

The scope of survey shall also include the route and tentative Bill of Materials (PLB HDPE Pipes, couplers, manholes, G.I. pipes, DWC pipes, RCC pipes, Joint box, conduits, bends, trays etc.) for the interconnection of optical fibre cable from the nearest manhole (identified location) to the fibre termination box (FDMS / FMS / FODP) in the PoP / Customer premises. It may be noted that routing of optical fibre cable inside the building may require installation on the walls and floors using suitable pipes, conduits, bends, trays etc. and minor civil works (e.g. making holes on the walls, cutting grooves on walls / floor and making good etc.). The Contractor will also indicate sections where the OFC may be required to be temporarily installed overhead using poles / other supports and guide wires, because of non-feasibility in installation underground or lack/ delay of clearance from authorities.

5.1.3 Payment

The BoQ in the appendix indicates the actual route length (final) to be surveyed by the Contractor as per detailed above. The Contractor may be required to conduct additional surveys as per para of Clearances, such survey shall not entitle the Contractor to any additional payment from the Owner. The payment for the survey shall be made after final survey report is submitted & approved by the Owner on per link basis based on the actual route length of fibre optic links.

5.2 Clearances

The Contractor shall be responsible for obtaining necessary clearances for excavation work from the concerned authorities on behalf of the Owner and provide requisite copies of information, maps, survey report etc. to the authorities. The Owner shall assist the Contractor in obtaining such clearances by providing the authority letter or any other relevant document. The Contractor shall make an all out effort with the concerned authority to get clearances expeditiously and to negotiate the least cost to the Owner. The Owner shall furnish all required bank guarantees and make payments to the concerned authorities directly based on the demand letter obtained by the Contractor from the concerned authorities. The Contractor shall

ensure quick and speedy clearances in order to implement the project within stipulated schedule. In case the authorities have some objections on certain sections of routes proposed and are unwilling to provide clearances, the Contractor shall propose an alternate route, promptly carry out the survey and submit specific survey report for that and reapply for clearance after taking into account the comments / objections of the authority.

For arranging statutory / ROW clearance, if any refundable security deposit is to be made, the contractor shall also assist POWERGRID in getting the security deposit refunded from the concerned agency. Since some authorities keep the security deposit for a period of one year from the date of completion of job, to ascertain that no damage is done to the excavated stretch, the Contractor shall undertake to complete all such modifications/restorations without any additional liability on POWERGRID, (having arisen due to poor workmanship of the Contractor), as may be required by the RoW authority, during the said period. In order to ensure the same, Contractor shall extend its CPG for an additional period, covering the Security Release requirement.

5.3 Excavation of Trenches and Backfilling

The Contractor shall carry out excavation and backfilling of trenches in all kinds of soil strata for laying PLB HDPE pipe, RCC Hume pipe, DWC pipe and GI pipe. In addition, the Contractor shall also make suitable arrangements (except trench less digging, which is identified separately) for laying PLB HDPE pipes, RCC hume pipes and GI pipes, DWC pipes at all type of crossings such as pavements, all types of roads, bridges, rivers, nallah, rail track etc. The Contractor shall quote the charges as per items specified in BoQ.

(a) Excavation

The cable trenches shall be dug as per route plan approved by the Owner. The depth of the trench from top of the surface shall not be less than 165 cms.

In case of single (1) & two (2) PLB HDPE pipe installation methods, the dimensional views (indicative only) of trenches with other details are shown in Figure 1 & 2 respectively. (Actual dimensions may vary depending on site conditions / constraints.)

Jackhammers can also be used for the excavation. (In case Jack hammer is required to be deployed, depending on actual usage, payment shall be made as per unit rates quoted by the contractor.) The width of trench at the top and bottom shall be adequate for proper installation of PLB HDPE pipes, RCC Hume pipes, DWC pipes, GI pipes, Warning Brick / Stone Slab, Warning tape etc. The trench depth shall be measured from the bottom of the trench. Trench shall not be constructed at field boundary or any up-heap.

When trenches are excavated in slopes, uneven ground, inclined portion, the lower edge shall be treated, as top surface of land and depth of trench will be

measured accordingly. In certain locations, such as uneven ground, hilly areas and all other Places, due to any reason whatsoever it can be ordered to excavate beyond standard minimum depth (165 cms) to keep the bed of the trench as smooth as possible and provide suitable gradient in the trench. For additional depth in excess of 165 cms, no additional payment shall be applicable.

The line-up of the trench must be such that PLB HDPE pipe shall be laid in a straight line except at locations where it has to necessarily take a bend because of change in the alignment or gradient of the trench.

The Contractor shall make all efforts in order to achieve the requisite depth as stipulated above. However, under exceptional conditions, as may be decided by the Owner's Engineer-in-Charge, the excavation to a lesser depth may be acceptable. Under such circumstances, the reasons for non-achievement of depth as per specification are to be recorded jointly by the Contractor and the Owner's site representatives and to be approved by Engineer-in-Charge.

During the construction of trenches, the Contractor shall be responsible for shoring and strutting the walls of the trench on either side by using suitable means such as wooden planks to avoid subsidence of soil. The Contractor shall also be responsible for supporting the exposed plant / facilities of other utilities such as water, gas and oil pipes, electric, telephone or fibre optic cables etc to avoid any possible damage. The Contractor shall also be responsible for any dewatering of the trench during digging and installation of pipes.

The Contractor shall take due care and precaution during excavation to avoid possible damage of other underground plants / facilities in the proposed underground fibre optic cable route and shall indemnify the Owner for all damages and shall be solely responsible for all the damages and losses. The Owner shall not be liable for any damages/losses.

In case it is necessary to get around a large obstacle such as a boulder or an underground plant/facility, which has not been anticipated earlier the trench may be given a gentle bend within permissible radius or by construction of a manhole. Wherever possible, it is preferable to avoid additional manholes.

Necessary barricades, night lamps, warning boards/flags etc. and required watchman shall be provided by the Contractor to prevent any accident to pedestrians or vehicles.

(b) Backfilling

After installation of PLB HDPE pipes, RCC hume pipes, DWC pipes or GI pipes, the backfilling of the trench shall be done. The PLB HDPE pipes shall be sandwiched with sand as per the Figure-1 or 2. The back filling shall be performed in such a manner to avoid bend or deformation of the PLB HDPE pipe when the pipe gets loaded with back filled earth.

Backfilling shall normally be done with the excavated soil, unless it consists of large boulders / stone in which case the boulders / stone shall have to be broken to a maximum size of 80mm dia. The backfilling should be clean and free from organic matter or other foreign material. The earth filling is done with a suitable mount to allow for any shrinking of soil at the later date.

In case of regular footpath, temporary reinstatement shall be done after backfilling. The left out earth if any has to be disposed by the Contractor to a suitable location as indicated by authorities at his own cost. It is advisable to start backfilling of the trench from one end or after padding of the pipe to avoid uplifting.

The backfilling of the remaining portion shall be done as stipulated for normal soil. In lieu of PCC of 1:2:4, the Contractor may use RCC semi-circular split pipe sections (50 mm nominal inner radius of curvature, with minimum thickness of 20 mm) from top to cover the PLB HDPE pipes as a substitute and this will be treated at par with PCC of 1:2:4 for payment basis.

Under exceptional conditions, where the Owner agrees and approves excavation of trench to a depth lesser than 1650mm, as stated above, the backfilling along with additional protection shall be done as per following guidelines:

Description	Additional protection of HDPE pipe
Excavation of 1650mm to 1000mm	No additional protection in addition to Warning Brick/Stone Slab, Warning Tape etc.
Excavation of less than 1000mm to 500mm	Either PCC 1:2:4, over the layer of sand or RCC semi-circular split pipe sections (50mm nominal inner radius of curvature) from top to cover the PLB HDPE pipes. 1:2:4 PCC in case of- Single pipe- 100mm (depth) x 100mm (width) Two pipe - 100mm (depth) x 200mm (width)
Excavation of less than 500 mm	Additional protection using DWC pipes encased in 1:2:4 PCC. GI pipe encased in 1:2:4 PCC may be use in exceptional cases with approval from Engineer-in-Charge. 1:2:4 PCC size in case of using : 50mm GI: 100mm (depth) x 100mm (width) 100mm GI: 100mm (depth) x 200mm (width) 75mm DWC: 100mm (depth) x 100mm (width) 120mm DWC: 100mm (depth) x 200mm (width)

(c) Warning Bricks

Standard Bricks, as locally available, shall be laid breadth-wise in case of two (2) PLB HDPE pipe installation and length-wise in case of single PLB HDPE pipe installation as shown in Figure -1 & 2 respectively (average 8 & 4 bricks per metre respectively) immediately above the sand layer in which PLB HDPE pipe is installed in case of normal depth (1650mm)/upto depth of 1000mm.Warning bricks shall be supplied by the Contractor. In lieu of warning brick, the Contractor can use suitable Stone slabs of 200mm (Width) x 25mm (Thick) as a substitute. However for last mile connectivity of length less than 500 meters, the brick laying may be dispensed with.

(d) Warning Tape

A warning tape, made of HDPE or LDPE (Low Density Poly Ethylene) or other suitable inert material, containing printed warning message, (Width: (min) 10 cm, shall also be laid over the pipe, throughout the cable route at a depth of 1000mm (the depth of Warning Tape in less -depth stretches shall be proposed by the Contractor and approved by the Owner), for warning the person who will be excavating the trench in future. The Owners may provide the warning tape to the Contractor for installation. The Contractor will carry the Warning Tape from the Owner's designated store (as per Annexure-VII) upto the place of installation at his own cost, in case the Warning Tape is supplied by Owner.

(e) Payment

The unit rate quoted by the Bidder shall be irrespective of soil type such as normal soil, soft rock, hard rock and crossings such as pavements, all types of roads, rivers, nallah, bridges, culverts, rail track etc. encountered during the actual installation. The Contractor shall be required to carry out excavation and back filling in accordance with this specification and provide all additional items required at its own cost for proper installation not limited to those described in this specifications.

Unit rate for excavation and backfilling shall inter alia include all related works / activities such as excavation, blasting of rocks and backfilling of trench, fixing of gradient of trench, excavation of trial pits if required, clearing of bushes, roots of trees along the trenches, cutting of bushes, trees, shoring, dewatering, excavation and backfilling of any temporary manhole, support of the existing facilities / plant, removal of left out material, breaking of pavement, clearing of obstacles, temporary reinstatement of footpath wherever required, providing and backfilling with sand, suitable structures / techniques material for crossings (road, rail, culvert, bridge, river etc) for installation of PLB HDPE pipes, RCC Hume pipes, DWC pipes or GI pipes. The payment shall be made on pro rata on actual route length where excavation and backfilling has been executed.

In the event of excavation to a lesser depth, under exceptional conditions with the approval of the Owner's Project Manager / Engineer-in-Charge as stated above, the payment for such route lengths shall be made in the proportion of depth of excavation & backfilling w.r.t. the minimum stipulated depth of 1650 mm (e.g. if the excavation and backfilling is done upto a depth of 1000mm (say), and the unit rate for excavation & backfilling per route km is Rs. A (say), then the payment shall be made at the rate of B = Rs. (1000/1650) x A). Payment shall be made for PCC for encasing pipes in the event of excavation to a lesser depth as approved by the Owner. Also payment of GI/DWC pipe where ever required as per this specification required shall be made extra as per actual. Payment for Warning bricks and Stone Slab shall be based on actual quantity executed.

5.4 Installation of PLB HDPE Pipe

Generally one PLB HDPE pipes shall be laid. However, in some exceptional cases, two PLB pipe (one spare for future use) shall be laid based on approved survey report by Owner. Two PLB HDPE pipes shall be laid side by side (in case of two PLB HDPE duct installation) at bottom of the trench after making the surface smooth and providing 80 mm of sieved, stone free sand bedding. There will be no change in the installation methodology whether one or two PLB HDPE pipes are laid. After laying the pipe additional sieved sand shall be added to increase the height of the sand layer to a total of 200 mm hence positioning the PLB HDPE pipe in the middle of the layer. Other important steps are described as under:

1. PLB HDPE Pipe shall be laid in a flat bottom trench free from stones, sharp edged debris.
2. Contractor ensures those ducts are not subjected to any damage or strain.
3. The Pipe shall be placed in trenches as straight as possible. Minimum bending radius of pipe and fibre optic cable shall always to be taken into account.
4. The pipes shall be joined tightly & properly through plastic couplers and the joint shall be smooth and free from steps. The joints shall be made properly so that it passes the duct integrity test.
5. Coupler shall not be placed along the bend portion of the pipe.
6. PLB HDPE pipes shall be installed in a manner that fibre optic cable can be pulled, blown, de-blown without damaging the fibre optic cable due to stresses.
7. The Contractor will carry the PLB HDPE Pipe from the Owner's designated store in the same town / city upto the place of installation at his own cost.
8. Water present in the trench at the time of laying of duct shall be pumped out by contractor before laying of pipes in the trenches to ensure that no mud or water gets into the pipes thus chocking it. No extra payment shall be admissible for this.

The Contractor shall get all joints inspected before carrying out the backfilling, by a representative of Owner. Joints shall be visually inspected and checked for tightness.

(a) Allowable Wastage

The Owners will provide the PLB HDPE pipe and other pipe accessories (except couplers) to the Contractor for installation. The Contractor is expected to make no wastage of the PLB HDPE pipe provided, however in order to take care of exigencies, wastage upto (5 %) of the material provided may be allowed during installation (except for HDD stretches, where maximum wastage allowed shall be upto (10 %). For the purpose of re-conciliation, all pipe lengths less than 50 meters shall be considered in the allowable wastage and shall not be taken over by the Owner.

(b) Payment

Unit rate for installation of PLB HDPE pipes shall interalia include all related works / activities including installation of all accessories / hardware. The BoQ in the appendices indicates the total route length where PLB HDPE pipe shall be installed. Accordingly the unit rate quoted shall include all wastages (beyond permissible limit), working length etc. and all other items / works required for PLB HDPE pipe installation. The Owner shall not entertain any claims or payment towards installation of hardware / accessories, installation of additional lengths of PLB HDPE pipe required to be taken for working lengths and wastages (beyond permissible limit) etc. However, payments shall be made on pro rata based on actual route length executed (except where trench less digging is used for installation).

5.5 Manholes

Manholes shall be provided at every proposed and future joint location to house Joint Box and extra length of Optical Fibre cable (service loops) for maintenance purpose. The location for Joint boxes shall be decided during survey.

There can be three types of construction of manholes depending upon the location of the manhole. Each type of construction of manhole can be of two sizes (heights) depending upon the utility. Where the manholes are placed on the footpath or where heavy vehicular movement is not expected, cast in situ manholes or brick masonry manhole can be constructed. The base of the manhole shall be minimum 80mm thick PCC 1:5:10 (1: cement, 5: coarse sand, 10: graded stone aggregate of 40mm nominal size) Wall of brick chamber should be constructed on this base having wall thickness min. 225mm using cement motor mix of 1:5 (1: cement, 5: coarse sand). The Manhole should have internal dimensions of 1000mm X1000mm square and height of minimum 400mm (for service loop location) & 1100mm (for joint location). The bricks to be used for this purpose should be standard size and the best quality available. Pre cast RCC slab with thickness of 50mm used to cover the

manhole. The manhole should be plastered on all internal surfaces and top edges with cement mortar of 1:3 (1: cement, 3: coarse sand) of 12mm thick.

However, in case the manhole is required to be constructed at the middle of the road or where heavy vehicular movement is expected, the manhole shall necessarily be of RCC construction. Such manholes shall be precast RCC cylindrical pipe (spun concrete). Pre cast RCC manhole shall consist of three parts (i) Round base plate of minimum internal diameter of 1200mm with minimum thickness of 80mm (ii) full round RCC manhole with diameter of 1000mm and minimum wall thickness of 80 mm and height of minimum 400mm (for service loop location) & 1100mm (for joint location) and shall include 8mm or more steel reinforcement (iii) round top cover with diameter of 1200mm with minimum thickness of 50mm.

Alternatively, the Contractor may propose double walled "Annular ring shaped conical manholes" meeting all the requirements of the manholes specified above. The assembly of conical manhole shall be made by using Pre-cast steel (rod or wire-mesh) reinforced Concrete elements, which consists of annular rings of different height and diameters (within permissible diameter range of conventional manhole as specified above) placed over each other. FRP manholes suitable for housing joint box/service loops may also be used as per site requirement/availability. Consent of site In-charge may be taken before deployment of FRP manholes at site.

However, for easy handling purpose, the cover is to be constructed with suitable arrangement for lifting and the word 'POWERGRID' engraved on it. The top of manhole should be flushed with the ground level.

Manholes type approved by the Owner only shall be acceptable. The manhole shall have suitable holes for PLB HDPE pipe entries and exits. The contractor shall carry out the required excavation for the construction of the manhole. The manhole is filled with clean sand before closing. Back filling of manholes pit with excavated soil shall be carried out in the end. All PLB HDPE pipe entries including spare HDPE pipes, cable entries and spare holes shall be properly sealed.

For installation of PLB HDPE pipe or trench less digging or blowing of OFC, at times there might be requirement of providing temporary manholes or hand holes. No separate payment shall be admissible for such manholes or hand holes and shall be deemed to be inclusive in the overall scope of work by the Contractor.

If required, as per the advice of the Owner, manholes shall also be installed along the existing installed PLB HDPE pipe routes to house joint boxes and cable service loops. Due care is to be taken so that the existing PLB HDPE pipe and OFC does not get damaged while placement of new manhole.

Party shall procure manholes at the start of AMC and material shall be jointly verified by POWERGRID and payment for the same shall be made by POWERGRID to the party. Material will be stored by the party, at its store. After completion of AMC period, balance material shall be handed over to

POWERGRID store (Same may be issued to next AMC contractor). Quantity shall be decided at the beginning of AMC by Engineer In-charge.

(a) Payment

Unit rate for the manholes shall interalia include all related works / activities including RCC cylindrical pipe, Brick masonry work, PCC base, pre cast cover, excavation, backfilling, supply, transportation and installation of all material & accessories required for construction of manhole as per specification. Provisional quantity for all types of manholes (viz. manholes for service loops and for Joint box, RCC and Brick Masonry construction) have been identified in the appendices, payment shall be made based on actual quantities executed.

5.6 Fixing of Route Indicators / Joint Indicators

Route /Joint Indicator (RCC/ stone) shall be provided at distance of 500 mm to 1000 cm from the centre of trench and away from the road, at an average of 200m, at every Manhole and Jointing chamber or as per instruction of Engineer-in-Charge. In addition, Route Indicators are also required to be placed where O.F. Cable changes directions like road crossing etc. The marking shall face the road.

The pits for fixing the indicator shall be dug for a size of 60 cms. x 60 cms. and 75 cms. (depth).The indicator shall be secured in upright position by ramming with stone and murrum upto a depth of 60 cms. and concreting in the ratio of 1:2:4 (1: cement, 2: coarse sand, 4 stone aggregate 20 mm nominal size) for the remaining portion of 15 cms. Necessary curing shall be carried out for the concreted structure with sufficient amount of water for reasonable time to harden the structure.

The word **'POWERGRID OFC'** should be engraved on the Route/Joint indicators. The font size shall be as per approval of owner.

Enamel paints of reputed brand should be used for painting and sign writing of route as well joint indicators.

The route and joint indicator shall be painted with primer before painting with oil paint. The material used should bear ISI mark. The colours of painting and sign writing is as under :

- For Joint Indicator: Grey colour
- For Route Indicator: Blue colour
- For "POWERGRID OFC": White colour .

(a) RCC/Pre cast Route Indicators

The route /joint indicator made of pre-cast RCC should have the following dimensions (see **Figure '3')**

Base - 250 mm x 150 mm
Top - 200 mm x 75 mm
Height - 1250 mm

(b) Stone based Route Indicators

The route /joint indicators made of Sand/lime Stone should have the following specifications.

a. Stone to be used (Sand/lime Stone)

b. Indicator Top surface to be rounded

c. Base 155 mm × 100 mm

d. Upper 500 mm length to be Tapered width wise as shown in the drawing and homogeneously finished.

e. Height 650mm (Straight) + 400 mm (Tapered)

f. Length 3.5 Ft., top 4"x4" dressed 1Ft. from top & tapered.

(See Figure '4' for details of Stone Route Indicators)

(c) Payment

Unit rate for the Route Indicators shall interalia include all related works / activities including excavation, backfilling, supply, transportation and installation of all material & accessories required for construction as per specification. Provisional quantity for all types of Route Indicators (RCC/ Stone) have been identified in the appendices, payment shall be made based on actual quantities executed.

5.7 Reinstatement

The contractor shall be required to carry out reinstatement of the excavated area. Reinstatement shall include all works necessary (such as reconstruction of metalled / asphalt road, footpath etc.) to restore the excavated area to original quality and shape. Temporary reinstatement of footpath (stipulated in para 5.3(b) Backfilling) shall be carried out as a part of backfilling and shall not be considered for payment toward reinstatement executed. Payment shall be made based on actual quantity executed. The unit rate quoted shall take into account complete reinstatement work irrespective of area or type of reinstatement.

5.8 Installation of DWC/ GI Pipe

Normal duty DWC pipes (Grey colour) / GI pipe shall be used for reinforcement at critical sections e.g. wherever road crossings, bridge crossings, railway crossings are encountered on the route as well as on wall / floor crossings in a building with prior approval of Engineer in-charge. The use of GI pipes shall be generally avoided. However, in case it is felt that GI pipe is unavoidable in certain circumstances e.g. major roads, railway, culvert crossing where big vehicle load is expected, this should be done with the prior approval of Engineer in-charge.

DWC pipe shall conform to TEC GR no. GR/DWC-34/01 Sep2007 with latest amendment. The DWC pipe shall be of nominal size 120 mm (in case of 2 (two) HDPE ducts) and 75 mm'(in case of 1 (one) HDPE duct) .

The GI pipe shall be of nominal bore of minimum 100 mm (ID) (in case of two (2) PLB HDPE duct) / 50 mm (ID) (in case of one (1) PLB HDPE duct). The GI pipe shall conform to at least medium class and conform to IS: 1239 (Part –I).

Up to two PLB HDPE pipes shall be inserted into one GI pipe of 100 mm bore/ DWC pipe of 120 mm bore. In regard to bridge and culvert crossing, DWC/GI pipe may be installed by concreting the DWC/GI pipe along the bridge or by using supporting brackets or by laying underneath the existing footpath etc. The PLB HDPE pipes shall be installed through this DWC/GI pipe. Wherever underground fibre optic cable is required to be spliced to overhead fibre optic cable using the outdoor FODP / Joint Boxes installed on towers, DWC/GI pipes shall be used to protect the portion of the cable / duct up to a height of about (3) to (5) meters and shall be extended in the ground up to suitable depth of the trench so that minimum bending radius of the cable is maintained. The DWC/GI pipe shall be properly clamped / fixed on the tower leg. The Contractor shall supply and install all necessary accessories as part of the installation work.

For implementation of crossings, following guidelines shall be followed:

- The DWC/GI pipe shall be extended at least (1) meters on each side of crossing subject to availability of space and approval of the Owner.
- Two DWC/GI pipes shall be joined using proper tools, sockets and accessories etc.
- Minimum bending radius of optical fibre cable shall always be taken into consideration.
- 1:2:4 concrete shall be used for encasing of the DWC/GI pipe at both end, wherever required.
- The DWC/GI pipes shall be supplied in standard lengths of 6m or as approved by Owner.

(a) Payment

The quoted unit rate for the supply of DWC/GI pipe shall interalia includes all required accessories (sockets, joints, brackets, clamps etc) and material (cement, sand, chips etc). The quoted unit rate for the installation of DWC/GI pipe shall interalia include all related works / activities including installation of hardware and accessories (sockets, joints, brackets, clamps etc), fixing arrangement and concreting required for DWC/GI Pipe installation at road crossings, bridge crossing, railway crossing encountered on the route as well as on wall / floor crossings in a building and also for protection of fibre optic cable at tower / pole mounted Joint Boxes.

The BoQ given in the appendices indicate the total fibre optic route length where PLB HDPE Pipe shall be laid in the DWC/GI pipe, accordingly the quoted unit price shall take into account working lengths and wastages. The Owner shall not entertain any claims or payments towards installation hardware,

accessories, concreting, cementing, working length and wastage etc. The Payment shall be made based on actual route length executed inside DWC/GI pipe.

5.9 Installation of RCC Hume Pipe

Minimum inside diameter 80 mm (for single PLB HDPE pipe) & 100 mm (two PLB HDPE pipe) with thickness of 25mm, NP3 RCC Hume pipe shall be laid wherever river, nallah crossing encountered on the route. The RCC pipe shall conform to IS: 458. Both PLB HDPE pipes shall be inserted into RCC Hume pipe, and taking into consideration the following guidelines shall be observed.

- The RCC Hume pipe shall be extended at least 1 meter on each side of river, nallah, crossing subject to availability of space and approval of the Owner. Two RCC Hume pipes shall be suitably joined and properly cemented.
- Minimum bending radius of optical fibre cable shall always be taken into consideration.
- The RCC Hume pipes shall be supplied in standard lengths of 2m or as approved by Owner's Project Manager.
- The RCC Hume pipe shall be sealed at both ends.

(a) Payment

The quoted unit rate for the supply of RCC Hume pipe shall interalia includes all required accessories (collars, clamps etc) and material (cement, sand, chips etc). The quoted unit rate for the installation of RCC Hume pipe shall interalia include all related works / activities including installation of accessories and other hardware, fixing arrangement, concreting required for RCC Hume pipe installation.

The BoQ given in the appendices indicate the total fibre optic route length where PLB HDPE Pipe shall be laid in the RCC Hume pipe, accordingly the quoted unit price shall take into account working lengths and wastages etc. The Owner shall not entertain any claims or payments towards installation hardware, accessories, concreting, cementing, working length and wastage. The Payment shall be made based on actual fibre optic route length executed inside RCC.

5.10 Underground Fibre Optic Cable Installation

The cable shall be installed inside one of the 40mm diameter PLB HDPE pipes along the route(s). Generally the cable shall be installed by compressed air blowing technique. However, for short spans, the Contractor can use pulling method for installation of OFC in HDPE pipe. If any temporary manhole or hand hole is required for installation of OFC, the same will be done by the Contractor without any additional cost implication, subject to approval of the Engineer-in-charge /

Project Manager. Contractor shall take into consideration the following guidelines, for installation of OFC:

1. The Optical Fibre Cable Drums shall be handled with utmost care. The drum shall not be subjected to shocks by dropping etc. They shall not be normally rolled along the ground for long distance and when rolled, shall in the direction indicated by the arrow. The battens shall be removed only at the time of actual laying.
2. A blowing machine in association with an appropriate compressor shall be used for blowing.
3. Temporary blowing chambers (if required) shall be constructed and then backfilled after blowing operation is completed.
4. Locations along the route, which provide easy access points for blowing machine and compressor, shall be determined.
5. Before starting the cable blowing, both PLB HDPE pipes shall be checked for obstacles or damage.
6. Always blow downhill wherever possible.
7. Testing of cable continuity and attenuation before installation and reporting to Owner in case of any problem

While installing the cable, excess length of min 10 meters shall be stored at each joint location for each side. However, exact excess lengths and manhole locations shall be as per advice of the Engineer-in-charge / Project Manager depending upon site requirement.

(a) Allowable Wastage

The Owners will provide the underground optical fibre cable to the Contractor for installation. The Contractor is expected to make no wastage of the same provided by the Owner, however in order to take care of exigencies, wastage upto 2% of the material provided may be allowed during installation. However for re-conciliation, OFC lengths of less than 50 meters shall be treated in the allowable wastage and shall not be taken over by the owner.

(b) Payment

Unit rate for installation of fibre optic cable shall interalia include all related works / activities including associated accessories, tools & tackles, machinery etc. The BoQ in the appendices indicates the total fibre optic route length where fibre optic cable shall be installed. Accordingly unit rate shall include all working allowances and wastages, hardware and accessories required for installation of optical fibre cable. The payment shall be made on pro-rata based on actual fibre optic route length executed excluding cable service loops / excess cable as stipulated above.

5.11 Trench less Digging

It is envisaged that trench less digging shall be used in short section for crossing National highways, important road or rail crossings etc. Trench less digging shall be used where the concerned authorities do not permit open cut method and it is essentially required to carry out for installation of HDPE pipes. The Owner may, at his discretion, may consider installation of PLB HDPE pipe by trench less digging if it is found that overall cost of installation including RoW cost in case of open trenching is more than that in trench less digging and / or there is urgency to implement the link(s) within definite time schedule which is possible through trench less digging.

The required size of entry and exit pits shall be prepared by the Contractor for each site where trench less digging and installation of manhole are required to be carried out.

The Contractor shall carry out excavation and backfilling for the entry and exit pits in all kinds of soil strata i.e. irrespective of the soil characteristics at all required installation sites for laying PLB HDPE pipe by trench less digging.

The excavation of pits shall be done at such places and times so that the obstruction to pedestrian and vehicular traffic is minimum and as per the regulations by various administrative authorities. The Contractor shall take due care and precaution during excavation to avoid possible damage of other underground plants / facilities in the route and shall indemnify the Owner for all damages and the Contractor shall be solely responsible for all the damages and losses. The Owner shall not be liable for any damages / losses. The positions of the entry / exit pits shall be matched with the required manhole locations for easy installation of manholes and easy termination of PLB HDPE pipes inside the manhole. The entry and exit depth of PLB HDPE pipes shall be about 1.5 m.

After installation of PLB HDPE pipes and manholes, the backfilling of the entry and exit pits shall be done .Final inspection of the backfilling shall jointly be done by the Contractor and Owner after the backfilling is completed and the Contractor shall rectify the defects, if any, without any cost to the Owner.

The Contractor shall use the suitable trench less digging method depending on the actual site conditions, locations, soil characteristics, length of the digging etc. to complete all digging requirement. The trench less digging shall be carried out at a depth not less than 1.20 m irrespective of the soil characteristics encountered at each site / route however, in case of uneven surface the depth may still be higher. The Contractor may use the following trench less digging methods for installation of PLB HDPE pipes:

1. Manual / hand auguring (recommended up to 10 meter between manholes)
2. Impact Moling (recommended for 10-30 meter between manholes)
3. Horizontal Directional Drilling (HDD) (recommended above 30 meter between manholes)
4. Rock Drilling

Rock Drilling shall be undertaken where installation of PLB HDPE pipe by using trench less method is not successful due to presence of hard rock and permission of open cut is denied by concerned ROW authority. In all cases contractor shall first try to lay PLB HDPE pipe by using trench less method mentioned above at (i), (ii) & (iii). If unsuccessful, rock drilling machine shall be deployed after approval from Owner.

The BOQ does not specifically indicate the method of trench less digging to be adopted; instead the BOQ indicates various spans for which the Bidder may quote different rates depending upon the method of trench less digging to be adopted.

The final bore size of digging shall be sufficient enough to directly install single or two (2) nos. (as approved by Owner) of 40 mm PLB HDPE pipes easily and without any problem.

Generally, the trench less digging shall be carried out continuously along the approved routes from manhole to manhole; however, long installation lengths can be achieved by dividing the working length into shorter sections depending upon characteristics of machines, soil / site conditions and permissions granted by the statutory authorities. **However, the prior approval from Owner should be taken for Maximum Length of HDD keeping in view the future maintenance requirement.**

If any existing utilities pipes are detected at the digging depth, the Contractor shall carry out the trench less digging at higher and adequate depth to avoid the damage of such existing utilities and no extra payment shall be payable for digging at higher depths. Further, in case the contractor is required to make repeat attempts due to obstructions encountered, no additional payments shall be released for aborted attempts.

The required dewatering shall also be carried out by the Contractor at required installation sites for proper installation of PLB HDPE pipes and the manholes, wherever required. The Contractor shall ensure minimum inconvenience to public during dewatering.

The installation of PLB HDPE pipes shall be done as linear as possible in order to achieve smooth blowing/pulling of optical fibre cables through them. Bends, wherever unavoidable, shall be smooth and shall not be exceed 20 degrees.

(a) Payment

The quoted unit rate for trench less digging shall interalia includes all related works / activities (listed in above para) including supply and installation of accessories and other hardware required. The BOQ given in the appendices indicate the total fibre optic route length where various methods of trench less digging shall be used for laying PLB HDPE Pipe. The BOQ indicated in the appendices is tentative and shall be finalised during detail engineering. For PLB HDPE pipe installed using trench less digging, separate payment for installing

PLB HDPE pipe shall not be made. The Owner shall not entertain any claims or payments towards any installation hardware, accessories etc. The Payment shall be made based on actual quantity executed for different spans of trench less digging and shall be restricted to the direct linear distance between man hole.

Irrespective of the method actually adopted for trench less digging (other than Rock Drilling), payment shall be restricted to the method applicable for that span.

5.12 Optical fibre termination and Splicing

Termination and splicing of optical fibre cables is described in following para.

Fibre Optic Distribution panels / Fibre Distribution Management System / Fibre Management system

At each location requiring the termination of at least one fibre within a cable, all fibres within that cable shall be connectorised and terminated in FODP / FMS / FDMS in a manner consistent with the following:

- All fibre optic terminations shall be housed using FODP / FMS / FDMS provisioned with splice organisers and splice trays. All fibres within a cable shall be fusion spliced to pre-connectorised pigtails. The pigtails and the fibres shall be stored and dressed neatly in the provided trays and holders. The pigtails / fibres shall be numbered using suitable ferrules.
- Ground lugs shall be provided on all FODP / FMS / FDMS and the contractor shall properly ground all FODPS. The FODPS shall be properly fixed / grouted to the floor and or with wall with better support.
- The location of FODP / FMS / FDMS rack shall be finalised by the contractor, with the Owner's approval.
- FMS / FDMS shall be installed on the wall. FODP shall be grouted firmly on the ground. Necessary installation materials for fixing the FMS / FDMS on wall or FODP on the ground shall be provided by the Contractor.

5.13 Joint Box

The joint box shall be properly installed, assembled and sealed. Installation and sealing of Joint box shall be done according to the instruction manual provided with joint box. The following general criteria must be fulfilled:

- Fibre loose tubes shall be placed safely inside the joint box and routed properly.
- Sheath shall be fully inside the joint box and FRP shall be properly fixed.
- Silica Gel shall be placed inside the joint box before closing the box.
- The sealing portion of the cable and joint box shall be filed before placing heat shrinkable sleeves. Rubber gaskets may be placed according to the instruction manual, if any.
- The heat shrinkable sleeves shall be sealed with very low flame of hot gun till sealing liquid properly melts and grips. The cable entry ports being used for

cable entry into the joint box shall be sealed by heat shrinkable sleeves only for ease of installation and re-entry. The length of the sleeve shall cover the full length of the cable entry port.

(a) Optical Fibre Splices

Splicing of fibres shall be done in existing/ New Joint box, FDMS/FMS as per approved splicing plan. Splicing of the optical fibre cabling shall be minimized through careful planning. It is important that all splicing work be done under clean conditions all required splices shall be planned to occur at Joint location / manhole. All optical fibre splicing shall comply with the following:

- All fibre splices shall be accomplished through fusion splicing.
- Each fibre splice shall be fitted with a splice protection sheath fitted over the final splice.
- All splices and bare fibre shall be neatly installed in covered splice trays.
- Average bi-directional splice loss at any particular splice shall not exceed 0.1dB but total bi-directional average of all splices in a link shall not exceed 0.05dB**.**
- Fibre optic cable service loops as indicated in Para 5.14 Service Loops shall be provided.

5.14 Service Loops

For purposes of this specification, cable and fibre service loops are defined as slack (excess) cable and fibre provided for facilitating the installation, maintenance and repair of the optical fibre cable system.

(a) Outdoor Cable Service Loops: At manhole chambers splices are installed with sufficient fibre optic cable service loops (as provided in para 5.5) such that the recommended minimum bend radius is maintained while allowing for installation or maintenance of the cable to be performed in a controlled environment at ground level. Optical cable service loops (excess cable) shall also be provided at all crossings in manholes.

(b) Indoor Cable Service Loops: At FODP Contractor shall provide at least three (3) metres of cable service loop. Service loops shall be neatly secured and stored, coiled such that the minimum recommended bend radius is maintained.

(c) Pigtail Service Loops: Connectorised pigtails spliced to bare fibres shall provide at least 0.5 metre of service loop installed in the FODP / FMS / FDMS fibre organizer and at least one (1) metre of service loop to the couplings neatly stored behind the FODP coupling panels.

(d) Fibre Service Loops: At least 0.5 metre of bare fibre service loop shall be provided on each side of all fibre splices. The bare fibre service loops shall be neatly and safely installed inside covered splice trays.

5.15 Site Acceptance Testing (SAT)

The tests shall be exhaustive and shall demonstrate that the overall performance of the contract works satisfies every requirement specified. During the course of installation, the Owner shall have full access for inspection and verification of the progress of the work. During installation, the Contractor shall maintain proper record of measurements in Measurement Book (MB) and which shall be submitted to the Owner (along with as Built Drawing of the route) for cross checking during SAT.

The Contractor shall provide necessary support and co-ordination for inspection of OFC works during/after installation by Owner's authorised personnel.

(a) SAT for Excavation, Backfilling, Installation of Pipes, Manholes.

The tests shall include but shall not be limited to the following:

1. **Depth Check:** Contractor shall prepare (min 1 sample pit per 500 meter length) at locations identified by the Owner at no extra cost. Measurement of various items e.g. excavation depth, warning tape, no. of warning bricks, pipes, cable, etc shall be taken as average of the measurements taken in such sample pits for the specific stretch.
2. **Crossing:** 10% of each type, visual inspection for checking conformance with drawings, RCC Hume Pipe, DWC pipe and GI pipe.
3. **Manholes:** As per para 5.5.

After inspection the Contractor shall backfill and carry out other restoration work at no additional cost to the Owner.

Should any inspections or tests indicate that specific item does not meet specification requirements, the appropriate item shall be replaced or added by the Contractor as necessary to correct the noted deficiencies at no cost to the Owner.

(b) Underground Fibre Optic Cable

SAT for optical fibre cable shall be carried out link by link on newly laid fibre and from FODP / FMS / FDMS to FODP / FMS / FDMS for fibres spliced in the FMS / FODP (as per Table – A, B & C).

At the time issuance of OFC by POWERGRID, the contractor shall carry out OTDR testing of the cable to ensure its healthiness. Subsequently, any damage during handling/laying or otherwise shall be to the Contractors account.

Table –A

Fibre Optic Cable Pre-Installation Testing

Item	Description	Acceptance Criteria
1	Physical Inspection of the cable for damage on 100% drum	No Damage
2	Optical Fibre Continuity and fibre attenuation of new OFC with OTDR at 1310nm OR at 1550nm on 100% fibre	Attenuation ≤ 0.35 db per KM at 1310nm ≤ 0.21 db per KM at 1550nm

Table – B

Fibre Optic Cable Splice Testing

Item	Description	Acceptance Criteria
1.	Physical inspection of Joint Box for proper fibre routing techniques	As per para 5.13
2.	Physical inspection of sealing & weatherproofing, etc	As per para 5.13

Table – C

Fibre Optic Cable Splice Testing

Item	Description:	Acceptance Criteria
1.	Fibre continuity and link attenuation (bi-directional) of newly laid OFC for each fibre at 1310nm OR at 1550nm by OTDR and Power Meter & Laser Source (where ever feasible).	Attenuation ≤ 0.35 dB per KM at 1310nm < 0.21 db per KM at 1550nm
2.	Fibre continuity and link attenuation (bi-directional) OFC (including newly laid & existing fibre i.e. from POP Location to Customer Location or Customer Location to Customer Location)for each fibre at 1310 nm OR at 1550nm by OTDR and Power Meter & Laser Source (where ever feasible).	The measured attenuation for the links shall be submitted to the Owner.

(c) SAT for Joint Box

All the joint boxes newly installed by the Contractor shall be physically inspected (visual) for tightness checking of clamps and bolts, heat shrink sleeves and proper installation in the manholes. In case the Owner finds the workmanship of the installation of joint box to be poor, the Contractor shall make good the same. Consumables, if any e.g. Joint box sealing, heat shrink sleeves, required for rectification work shall be provided by the Contractor at no extra cost to POWERGRID.

(d) SAT for PLB HDPE pipe

For PLB HDPE pipe, duct integrity tests (DIT) shall be carried out as described below. The Duct cleaning (Sponge test) test shall be carried out only on the spare ducts as well as on existing duct between two consecutive manholes on the PLB HDPE pipes.

i. Duct cleaning (Sponge test)

Compressed air should be blown through the PLB HDPE pipe in order to remove dirt and water, if any, with the help of suitable Air Compressor. Sponge shall be blown through the duct to thoroughly clean the duct from inside.

ii. Continuity test (deformity & damage)

Place a shuttle of length <15cm and O.D. 80% of the inner diameter of the PLB HDPE pipe. Connect the compressor pipe with a suitable flexible wire grip at the other end to catch the shuttle and start blowing operation to the pipe and check if shuttle reaches at the other end. If shuttle gets stuck the Contractor shall adopt suitable arrangement at site to locate the deformity/damage in the HDPE pipe, repair the pipe and ensure end-to-end continuity of the duct in sound condition.

(e) Payment

No payment shall be made against DIT for SAT of PLB HDPE pipe installed under last mile contract. However payment on unit rate basis shall be made to the Contractor if DIT is carried out in existing / already laid PLB HDPE pipe.

5.16 Interconnection with existing UGOFC/OPGW

The Contractor shall also interconnect their Fibre Optic Cable system at both ends with existing underground Fibre Optic and OPGW system through splicing in Joint boxes or through connection by patch cords at FODP, as required. The exact method of interconnection shall be finalised during project execution.

5.17 Miscellaneous jobs

In order to provide end-to-end fibre connectivity and connecting to customer interfaces, it may be required to execute some miscellaneous jobs as detailed below.

(a) Routing of Cables inside building

In order to route the OFC from the underground trench to the FODP / FMS / FDMS, it may be necessary to install the cable on walls inside PLB HDPE pipe or inside flexible PVC conduit over the existing cable tray / raceways inside the building in consultation with customer / owner of building.

(b) Installation of PLB HDPE pipe (along with OFC) on walls

The PLB HDPE pipe may be required to be installed on the wall (for laying of OFC) using steel or G.I. clamps. The Contractor will provide the required clamps and other consumables sufficient for such installation. The Contractor will take care of aesthetics while installation. The OFC will be pulled through the PLB HDPE pipe with due care as described in relevant para of this specification.

(c) Installation of flexible PVC conduit (along with OFC)

In some of the installation, there will be requirement of installation of flexible PVC conduit to facilitate installation of OFC. The flexible conduit will be supplied & installed on wall surface or inside panels or on cable trays / raceways. While the flexible conduits are installed on wall surface, suitable steel or G.I. clamps shall be used. For installation of flexible conduits on cable race ways or trays, suitable binders shall be used. The Contractor will provide the required pipes, clamps and other consumables sufficient for such installation. The OFC will be pulled through the flexible conduit with due care as described in relevant para of this specification.

5.18 Inspection of existing Manholes

In some of the cities/towns, POWERGRID and its associates are having existing OFC network in PLB HDPE pipes and have existing manholes. In order to augment the network or checking of joint box, the manholes may be required to be inspected. Inspection of manhole shall include cordoning the area with suitable danger plate/warning tape, removal of the manhole cover, clearing the debris/sand inside the manhole and clear access to the joint box. Contractor should take a precaution during inter-connection or inspection of existing manhole, existing traffic running through existing joint box/ manhole should not be affected. Payments for opening of existing manholes, from where connectivity has to be given, shall be made only once. Hence re-opening of such existing manholes, if required, in case of jointing/ splicing/ other issues shall not be payable.

5.19 Excavation and backfilling of check pits

Under some circumstances, it may be required to excavate the route of the optical fibre network upto the full depth of the existing trench to locate the duct and other accessories. These pits are called check pits. After the inspection or after the requirement is over, the check pit will be backfilled. Backfilling shall normally be done with the excavated soil The earth filling is done with a suitable mount to allow for any shrinking of soil at the later date.

In case of regular footpath, temporary reinstatement shall be done after backfilling. The left out earth if any has to be disposed by the Contractor to a suitable location as indicated by authorities at his own cost. No payment will be admissible for check pits excavation and backfilling for the purpose of Site Acceptance Testing (as described in para 15.0 and its associated sub-para).

5.20 Supply & Installation of Aerial OFC

Generally the optical fibre cable is installed underground. However, under exceptional circumstances, it may be required to temporarily install Self Supporting Metal Free Aerial OFC over short spans, between suitable structures (viz. temporary structures, trees etc.). Aerial Optic fibre cable shall be light weight supporting 500N tensile, suitable for installation on 70 m span. Typical diagram given at Figure-5 at the end. Owner's approval shall be required for OFC colour, No. of fibre before supply of cable.

The optical fibre cable shall be temporarily installed / suspended using 4 mm G.I. wires to guide and support the cable, where ever required depending upon span and safe working condition (i.e. away from any electricl lines, pole, etc). The optical fibre cable shall be tied with the G.I. guide wire with suitable clamps / binding wire, such that it does not damage the cable. The design and construction of optic fibre cable shall be inherently robust and rigid under all conditions of operation, adjustment, replacement, storage and transport

The OFC for overhead purpose shall be supplied by Contractor from reputed vendor.

5.21 Mobilization time for LMC

For execution and implementation of each connectivity, one week shall be allowed for mobilizing resources required for execution of connectivity and for each route kilometre or part thereof, additional one week execution time shall be allowed to the contractor. If permission from any statutory authority for laying of OFC is required, three weeks time shall be allowed. In such cases, separate mobilization time of one week shall not be allowed. The start date shall be the date of issue of work order.

The above time-lines shall hold good for OFC laying for preventive works also. However, there will not be any mobilization time in case of preventive works.

6. Safety Precautions

Supervisor shall be solely responsible for the Safety & Security of the deployed manpower while execution of work (AMC/ LMC). He shall also ensure compliance of all necessary processes/ procedures for the safety & security of the manpower as well as other common infrastructure (i.e. Electric Distribution Lines, Water pipelines, Gas pipe

lines, Drains, Road etc) during execution of work (AMC/ LMC) at site. All the works must be executed under his presence & supervision/ administration.

Supervisor shall ensure availability of necessary protection gears (i.e. Electrical insulation gloves, safety helmet, safety harness, safety shoes etc.) for team wherever required. All members of team must be given time to time training on 'work place safety processes' and use of protection gears.

6.1 Safety Precautions when excavating or working in excavations close to electric cables

The Engineer- in-charge of the work should get full information from Electricity undertaking regarding any electric cables, which are known or suspected to exist near the proposed excavation and unless this is done, excavation should not be carried out in the section concerned. The electricity undertaking should be asked to send a representative and work should be preceded with close consultation with them.

Only wooden handled hand tools should be used until the electric cables have been completely exposed. Power Cables, not laid in conduits, are usually protected from above by a cover slab of concrete, brick or stone. They may or may not be protected on the sides. It is safer, therefore, always to drive the point of the pickaxe downwards then uncovering a cable, so that there is less chance of missing such warning slabs. No workman should be permitted to work alone where there are electric cables involved. At least one more man should be working nearby so that help can be given quickly in case of an accident. If disconnection of power could be arranged in that section it will be better. No electric cables shall be moved or altered without the consent of the Electric Authority and they should be contacted to do the needful. If an electric cable is damaged even slightly, it should be reported to the Electric Authority and any warning bricks disturbed during excavation should be replaced while back filling the trench. Before driving a spike into the ground, the presence of other underground properties should be checked. Information on plans regarding the location of power cables need not to be assumed as wholly accurate. Full precautions should be taken in the vicinity until the power cable is uncovered. All electric cables should be regarded as being live and consequently dangerous. Any power is generally dangerous, even low voltage proving fatal in several cases.

6.2 Safety Precautions while working in Public Street and along railway lines

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 will 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. Where bridges are constructed to accommodate vehicular traffic and is done near or on railway property, it should be with the full consent and knowledge of the competent railway authorities.

6.3 Danger from falling material

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 the trench thereby injuring any workman who may be working inside the trench.

6.4 Care when working in Excavations

Jumping into a trench is dangerous. If it is deep, workmen should be encouraged to lower themselves. Workers should work at safe distance so as to avoid striking each other accidentally with tools. If the walls of the trench contain glass bits, corroded wire or sharp objects they should be removed carefully. If an obstruction is encountered, it should be carefully uncovered and protected if necessary. Care must be taken to see that excavated material is not left in such a position that it is likely to cause any accident or obstruction to a roadway or waterway. If possible the excavated material should be put between the workmen and the traffic without encroaching too much on the road.

6.5 Danger of cave in

When working in deep trenches in loose soil, timbering up/shoring the sides will prevent soil subsidence. The excavated material should be kept at sufficient distance from the edge of the trench or pit. Vehicles or heavy equipment must not be permitted to approach too close to the excavation.

When making tunneled opening, it should be ensured that the soil is compact enough to prevent cave in even under adverse conditions of traffic. Extra care should be taken while excavating near the foundations of buildings or retaining walls. In such cases, excavation should be done gradually and as far as possible in the presence of the owners of the property.

6.6 Protection of Excavations

Excavations in populated areas, which are not likely to be filled up on the same day should be protected by barriers or other effective means of preventing accidents and the location of all such openings must in any event be indicated by red flags or other suitable warning signs. During the hours from dusk to dawn, adequate number of red warning lamps should be displayed. Supervisory officers should ensure that all excavations are adequately protected in this manner as serious risk and responsibility is involved. Notwithstanding adoption of the above mentioned precautions, works involving excavations should be so arranged as to keep the extent of opened ground and the time to open it to a minimum.

6.7 Precautions while working on roads

The period between half an hour after sun-set and half an hour before sunrise, and any period of fog or abnormal darkness may also be considered as night for the purpose of these instructions, for the purpose of providing the warning signs. Excavation liable to cause danger to vehicles or the public must at all times be protected with fencing of rope tied to strong uprights or bamboo poles at a suitable height or by some other effective means. Any such temporary erection which is likely to cause obstructions and which is not readily visible should be marked by posts carrying red flags or boards with a red background by day and by continuously lighted lamps at night.

The flags and the lamps should be placed in conspicuous positions so as to indicate the pedestrians and drivers of vehicles the full expanse i.e. both width and length of the obstruction. The distance between lamps or between floors should not generally exceed 1.25 m along the width and 6m along length of the obstruction in non-congested areas, but 4 meters along the length in congested areas.

If the excavation is extensive, sufficient notice to give adequate warning of the danger, should be displayed consciously not less than 1.25 m above the ground and close to the excavation. Where any excavation is not clearly visible for a distance of 25m to traffic approaching from any direction or any part of the carriage way of the road in which the excavation exists, a warning notice should be placed on the kerb or edge of all such roads from which the excavation or as near the distance as is practicable but not less than 10 m from the junction of an entering or intersecting road in which the excavation exists. 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. Wherever required a passage for pedestrians with footbridge should be provided. At excavations, cable drums, tools and all materials likely to offer obstructions should be properly folded round and protected. This applies to jointer's tents as well. Leads, hoses etc. stretched and across the carriageway should be guarded adequately for their own protection and also that of the public.

6.8 Traffic Control

The police authorities are normally responsible for the control of traffic and may require the setting up of traffic controls to reduce the inconvenience occasioned by establishment of a single line of traffic due to restriction in road width or any other form of obstruction caused by the work. As far as possible, such arrangements should be settled in advance. If there are any specific regulations imposed by the local authorities, these should be followed.

6.9 Work along Railway Lines

Normally all works at Railway crossing is to be done under supervision of the railway authorities concerned, but it is to be borne in mind that use of white, red or green flags by the Departmental staff is positively forbidden to be used when

working along a railway line as this practice may cause an accident through engine drivers mistaking them for railway signals. When working along a double line of railway, the men should be warned to keep a sharp look on both the "UP" and 'DOWN" lines to avoid the possibility of any accident when trains pass or happen to cross one another near the work spot.

7. BILLING:

After end of each month contractor shall submit the bill with the following documents:

a. Taking photographs of the fault during restoration with sign board, clearly showing the fault no. provided by RTCC/ NTCC. (soft copies have to be submitted to concerned POWERGRID Site-in-Charge).

b. Submission of fault rectification report in the prescribed format (Annexure-IV).

c. Submission of material reconciliation report as per Para 8.0 (j)

d. Pending links for rectification, Monthly status as per Para 8.0 (h)

e. Daily Patrolling report

f. LMC/Preventive works billing shall be as per BoQ and TS.

8. OTHER REQUIREMENTS:

(a) The overall co-ordination of the contract shall be done by a **Project Manager** . The Project manager shall be the single point of contact for POWERGRID and manage all manpower (patroller, splicing team, supervisors etc.) deployed under the contract for smooth execution of work. He will be responsible to take all decisions in respect of all circumstances and eventualities, and for day-to-day co-ordination and follow-ups. Safety & Security of the all deployed manpower including supervisors while execution of work, shall be his sole responsibility and shall ensure compliance of all necessary processes/ procedures for the safety & security as applicable . Contractor has to officially designate a Project Manager and inform to POWERGRID after award of contract/ LOA/ NOA.

(b) If required, the contractor, at his discretion, may provide additional patrollers / gangs / T&P / Supervisor/ manpower / watch and ward / etc at no extra cost to POWERGRID to reduce / control the downtime to avoid the penalties and in tern to meet specified SLA parameters.

(c) It may be noted that the quantities mentioned in BOQ for preventive maintenance/LMC works are tentative and may vary as per actual site conditions, any new requirement, fault in OPGW section and actual work progress of Road development authorities. The payment will be made only for the quantities actually

executed.

(d) The contractor shall have to submit a certified copy of Invoice, as well as Calibration Certificates of Equipments & tools (with serial Nos.) at the time of deployment, as a proof of availability of the same.

(e) The contractor should note that all equipment/materials procured/being procured by them are from the reputed manufacturers and are of proven design.

(f) The contractor should note that 24 X 7 maintenance services are to be provided and therefore in the event of any emergencies, he should have sufficient crew to attend to such works. In this regard it may be noted that the contractor shall have sufficient leave reserve to ensure required manpower availability for Patrolling / Breakdown maintenance/ Splicing. No separate overtime compensation will be payable by POWERGRID and the contractor should estimate all such costs while quoting their price.

(g) The scope of the work is not limited to the requirement indicated in this specification only, any other works, which are necessarily required for completions of the described scope are also deemed to be included in the scope.

(h) Monthly status of all the links shall be intimated as per the format given by POWERGRID regarding overhead existing, new overhead done, overhead fibre made underground permanently and no. of joints etc.

(i) Arranging required statutory clearances and to settle objections if any from the ROW agencies/ private landowners for maintenance works, would be the responsibility of the Contractor. POWERGRID's involvement in obtaining clearances will be limited to issuing official letters required if any, which would be handed over to the contractor's representative. However, in case any payments are required to be made to statutory authorities, then the contractor shall arrange for demand notes and payments shall be arranged by POWERGRID to be handed over to the authorities by the contractor and to for arranging for permission.

(j) For every monthly bill, reconciliation of material issued and consumed shall have to be submitted by the contractor, failing which bills shall not be processed for payment.

9. CONTRACT PRICE

The price quoted by the Contractor for the above scope of works shall include the following:

(a) Contract price shall include all the expenditure towards Patrolling and attending of fault / breakdown maintenance. No separate payment shall be made towards fault repairs etc which has to be included in the **per km rate** for Patrolling and breakdown maintenance item.

(b) The contract price shall include all expenses for the Contractor's personnel such as salaries, including applicable over time compensation, housing, travel etc.

(c) The contract price shall include all statutory payments such as POWRGRIDs liability cover, insurance, statutory medical cover/ facilities, terminal benefits, PF, labour licences fees, etc. as necessary for the employment of his personnel and the Contractor shall indemnify Owner of any claims in this regard from any source(s).

(d) The contractor shall provide his permanent employees for PF, pension, insurance etc as per the statuary rules.

(e) The contractor should include all applicable taxes and duties as may be from time to time levied including Service tax.

(f) Mobilization charges shall be paid one time per connectivity for Last Mile connectivity to be executed. It will be fixed amount per connectivity.

(g) All rates quoted in the contract price shall remain fixed.

10. Issuance of Owner Supplied material

Materials like OFC, PLB HDPE Duct, Joint Closure etc. shall be issued from POWERGRID designated stores as per Annexure-VII. No additional payment shall be made for transport of above material to site. However, if the materials are issued from any other store, payment against transport of materials shall be made on submission of bill/documentary evidence.

11. GENERAL TERMS AND CONDITIONS:

The following general terms and conditions of contract shall supplement the other parts of this document. Whenever, there is a conflict, the provisions herein shall prevail over those appearing elsewhere in the contract

(a) The bidders are required to quote for complete OFC routes and utilities indicated in Annexure-I.

(b) Contractor has to issue Photo Identity cards to manpower engaged by him for said job under the Contract.

(c) The Contractor shall not sublet any portion of the work/ contract without prior approval of POWERGRID.

(d) The Contractor/ his Manpower shall not cause or permit any nuisance any time in the premises of the POWERGRID/ stores/ POP's / Repeaters/ the building or do anything, which shall cause unnecessary disturbance, or inconvenience to POWERGRID's employees, as well as residents.

(e) The Contractor has to maintain information as may be required under the Labour laws & Contract Labour (Regulation & Abolition Act 1970, minimum & Provident Fund Act) as amended from time to time.

(f) The contractor shall have to take all necessary precautions and ensure use of safety equipments in carrying out working, in order to avoid any kind of mishap. All the T&P/ protective Equipments used shall be arranged by the Contractor himself, at his own cost.

(g) It is recommended that prior to quoting the prospective contractors make themselves fully conversant with the locations, OFC routes and types of jobs in details to be carried out therein as per the contract requirement, so that they clearly understand the scope of work and assess the requirement of resources to complete the work in scheduled time. The Contractor is deemed to have understood the conditions of existing OFC route like terrains, various crossings, access details, en-route POWERGRID Repeaters, Road widening works by authorities etc., by visiting the sites and collecting first hand information before submission of the offer. In case of any doubt, clarification may be sought from POWERGRID before submission of the offer. The Contractor shall not be eligible for any adjustment in Price/ cost and time, on account of any lack of data regarding above, subsequent to submission of offer.

(h) The material used & workmanship shall satisfy the applicable standard specifications.

(i) Contractor shall be fully responsible for all test equipment calibration & functionality, which shall be duly certified by the authorized agency.

(j) Contractor shall provide safety appliances like dust masks, safety belt, safety shoes, helmet, hand gloves, safety goggles, rain gears etc. to their personnel.

(k) During any construction work in public places, all precautionary caution boards and barricading sheets as per standard laws & rules shall be used by the Contractor.

i. During the course of execution of the work, if any discrepancy or inconsistency, error or omission in any of the provision of the contract is discovered which needs to be clarified, the mater shall be referred to POWERGRID who shall give his decision in the matter and his decision shall be final and conclusive.

ii. Contractor shall submit along with the offer the organisation chart (with detailed task sheet for each position) listing the number of personnel who will be available permanently for the maintenance works of various activities already explained. This should include details of technical qualification & minimum experience.

iii. The work is subjected to inspection at all times by the Site –in charge/ POWERGRID representative. The Contractor shall carry out all instructions given by him or his representatives during inspection.

iv. Any work not confirming to the execution plans, applicable standards or established engineering practices shall be rejected forthwith and the Contractor shall carry out the rectification at his own cost without any liability to POWERGRID.

v. Inspection and acceptance of the work shall not relieve the Contractor from any of his responsibilities under this contract.

(l) The contractor shall agree to maintain the secrecy of all documents/information/drawings etc. provided by POWERGRID during the period of contract and shall handover all the documents back immediately after the termination of the contract.

i. In case if Site-in-charge feels that the contractor is not able to execute the work to the satisfaction of POWERGRID, Site-in-charge at his own discretion can engage other agencies to ensure the smooth execution of the job solely at the Risk & Cost of the Contractor.

ii. Within POWERGRID's premises, the representatives of the Contractor shall take due care not to unnecessarily tamper with GRID's installed equipment.

iii. All faults shall be intimated to the Contractor's supervisor/authorized person by either POWERGRID's network management centre or the Site-in-charge as indicated through telephonic communication / SMS/ MAIL or through fax. For this, the Contractor shall provide POWERGRID with the contact numbers (both land line and Mobile) within 7 days from the award of the contract. Fault will be reported to the contractor's manager and the concerned splicer on telephone (and/ OR on SMS) by RTCC/ NTCC control room. It will be the duty of the contractor's manager to further coordinate the fault. Restoration time of the fault will be as recorded in the NMS of the RTCC/ NTCC control room. Restoration shall be considered to be complete only when no errors are observed in the link.

iv. During execution of the maintenance contract, any penalties imposed against any damage caused to the infrastructure of POWERGRID & other parties shall be borne by the Contractor.

v. Bidders are advised to submit their offers based strictly on the terms, conditions, and specifications as brought out in this document. However, in case any deviation(s) become unavoidable, the bidders should bring out the same explicitly in their offer. POWERGRID reserves the right to evaluate offers containing deviations having financial implications after adding cost of such deviations as determined by POWERGRID.

vi. POWERGRID reserves the right to offload part or total quantum of job, depending upon exigencies.

vii. The contractor shall maintain a consumables / purchase / stock register and enter all the material purchased by him like joint boxes, etc to substantiate the amount of work / quality of work carried out by him.

12. CONTRACTOR'S DEFAULT

The following events shall be construed as Contractor's defaults in addition to the other agreed to in the contract.

- The Contractor's failure to meet statutory requirements related to performing his obligation under this contract.
- Any link is down for more than 2 days.
- The link is available less than 95% in any month.
- The Contractor fails to meet SLA parameters for consequently for 3 months.
- Loss or damage to POWERGRID's property/ special tools due to acts of the contractor's personnel.
- In the event POWERGRID receives notice from any statutory authorities or from external agencies on account of loss/damage to their property due to the acts of Contractor.
- Contractor does not respond to POWERGRID communication over phone/mobile or mail for continuously 24 hours.
- For attending fault in OPGW section, the contractor does not provide maintenance team and takes unreasonable time.
- Contractor shall be liable for the above defaults even if the owner has taken insurance policies to cover some of the events.
- Contractor fails to mobilize teams and execute the works as per para 5.21 above.

13. The Employer Responsibilities and Obligations

The Employer shall provide the following items and services as part of the contract:

- Optic Fibre Cable, PLB HDPE duct, Joint Box, FMS/FDMS.
- Approval of Route details for installation of PLB HDPE duct alongwith the underground OFC, with Bill of Materials (Manhole, G.I pipes, DWC pipes, RCC pipes, Joint Box, HDD etc) and approved plan for interconnection of optical fibre cable (if applicable).
- Assistance in obtaining statutory clearances, payment of restoration charges and furnishing of the bank guarantees to the concerned authorities based on the documents obtained by the contractor.
- Approval of Engineering Documents/Drawings.
- Inspection of works.
- Witness of Site Acceptance Tests (SAT).

- Overall management of the project.

14. CONDITIONS FOR TERMINATION:

If, during contract period, the Contractor is at default more than three times or the defaulting case of the Contractor is severe, then POWERGRID has the right to terminate the contract. In case of termination, POWERGRID has the right to get the work done at RISK AND COST of the Contractor. Appropriate notice shall be issued to the Contractor for getting the job done at his RISK AND COST.

15. EXTENSION OF TIME PERIOD:

The contract period shall be for three (3) years. No further extension shall be granted. Variation may be kept as + 30% over LOA Value with individual item can vary at any extent depending on site condition and requirements.

16. Annexures

a) Annexure-I: O/H and U/G Link details

b) Annexure-II: Details of minimum Nos. of Patrollers

c) Annexure-III: List of Approved Vendors

d) Annexure-IV: Fault Rectification Format (Breakdown Maintenance)

e) Annexure-V: Tentative locations of Splicing Team

f) Annexure-VI: OPGW Link details

g) Annexure-VII: Store location for issue of OSM

Annexure-I

Link Details

The Links for the Package-_____ are classified as below:

1. Intercity Links

a) Location A_____- Location B_____
U/G section in km=……..; Overhead section in km=…….

b) Location C_____- Location D_____
U/G section in km=……..; Overhead section in km=…….

c)……

Schematic map of above Links to be maintained

2. Intracity Links

a) Name of City A
   i. Link 1: _____
   U/G section in km=……..; Overhead section in km=…….
   ii. Link 2:_____
   U/G section in km=……..; Overhead section in km=…….
   iii. ……..

Schematic map of above Links to be maintained

b) Name of City B…

   i. Link 1: _____
   U/G section in km=……..; Overhead section in km=…….
   ii. Link 2:_____
   U/G section in km=……..; Overhead section in km=…….
   iii. ……..

Schematic map of above Links to be maintained

Annexure-II

Patrollers as below:

1. Intercity Links

c) Location A_____- Location B_____
U/G section in km=……..; Overhead section in km=…….

d) Location C_____- Location D_____
U/G section in km=……..; Overhead section in km=…….

c)……

……

……

2. Intracity Links

c) Name of City A
   i. Link 1: _____
   ii. Link 2:_____
   iii. ……..

d) Name of City B…

   i. Link 1: _____
   ii. Link 2:_____
   iii. ……..

……..

……

Approved Vendors List as per TEC GR — Annexure-III

GR No. TEC/GR/TX/OJC-002/03 APR 2010				
S.No.	Manufacturer Name & Address	Product	Issued On	Validity
1.	Micro Engineers Plot No. 104, Udyog Kendra Extn-1, Greater Noida (UP)	Splice Closure for Optical Fibre Cables (suitable for Non Ribbon Fibre Splicing) Model No.: ME/OSC/TEC-03	29.05.2014	31.05.2017
2.	T E Connectivity India Pvt. Ltd. Plot No. 2, Survey # 36, H. No. 15,Unique Industrial Estate,Dhumal Nagar,Waliv Village, Vasai East, Thane,Dist.-Mumbai 401208	Splice Closure for OFC suitable for Non-Ribbon Fibre Splicing) Model NoRAY-MECH-001	30.01.2015	31.12.2016
3.	Nav Fibro Plastics Survey No. 15 / A2, J3(Unit-N1, N2, N3)Sinhagad Road, Nanded Phata,Pune - 411041	Optical Fibre Splice Closure Model No.NFP/OJC/001	20.08.2015	31.08.2018
4.	BSNL Telecom Factory ,SionTrombay Road,Deonar, Mumbai-400 088	Optical Fibre Splice Closure Model No.TFM-OJC-01	21.08.2015	31.10.2018
5.	Ampson Engineering Pvt. Ltd. Plot No.26,Tarapur MIDC,Boisar, Thane-401 506	Optical Fibre Splice Closure Model No.AMP-OJC-01	15.06.2016	30.06.2019
GR No. GR/OFC-03/03 JUNE 2005				
S.No.	Manufacturer Name & Address	Product	Issued On	Validity
1.	Polycab Wires Pvt. Ltd. (UH-3) ,Plot No. 13, 15, 16A, 16B,Halol-Vadodara Road,Taluka: Halol, Dist.: Panchmahal-389350 (Gujarat)	6F & 12F Self Supporting Metal Free Aerial Optical Fibre Cable (For Hilly & Rural Areas) (G.652D Fibre) Model No.: POLYCAB/6F/LT-SM/G652D/2016 & POLYCAB/12F/LT-SM/G652D/2015	15.06.2016	30.06.2019
2.	Birla Ericsson Optical Ltd. Udyog Vihar, P.O. Chorhata,Rewa - 486006, MP	12 F Self Supporting Metal Free Aerial Optical Fibre Cable (For Hilly and Rural Areas) Model No.: BE 12 SS D	21.01.2015	31.01.2018
3.	Tamilnadu Telecommunications Limited, E 18B-E24, CMDA Industrial Complex, Maraimalainagar-603209,Kancheepuram District, Tamilnadu	12 F Self Supporting Metal Free Aerial Optical Fibre Cable (For Hilly and Rural Areas) Model No.: LT SM 12F G652D	27.01.2015	31.12.2017
4.	Aksh Optifibre Limited, F-1080, Phase-III, RIICO Industrial Area,Bhiwadi-301019 (Rajasthan)	12 F Self Supporting Metal Free Aerial Optical Fibre Cable (For Hilly and Rural Areas) Model No.: AKSH/ BSNL/ 12F/ AERIAL/ 01	19.05.2015	30.06.2018
5.	Himachal Futuristic Communications Ltd., L-35, 36,37, Industrial Area, Phase-II, Verna Electronic City, Salcete, Goa-403722	12 F Self Supporting Metal Free Aerial Optical Fibre Cable (For Hilly and Rural Areas) Model No.: 12F ADSS OFC	01.08.2015	31.07.2018
6.	Apar Industries Ltd., Uniflex Cables,Sl. No. 82/2, P1, 88, 861/1, 862/1, 863/1,Manekpur Road, Khatalvada,Taluka Umbergaon-396171, Dist. Valsad,Gujarat	12 F Self Supporting Metal Free Aerial Optical Fibre Cable (For Hilly and Rural Areas) Model No.: 12F LT-SM/G-652D/ADSS/2014	07.12.2015	31.12.2018
7.	Sudarshan Telecom,Plot No.386 & 387,KIADB Electronic City,Hebbal Indl. Area,Mysore-570 016	12 F Self Supporting Metal Free Aerial Optical Fibre Cable (For Hilly and Rural Areas) Model No.: 12F/Aerial/986/2009	16.03.2016	31.03.2019

Annexure-IV

FAULT RECTIFICATION INTIMATION TO POWERGRID

Date:……...

1	Name Of Splicer: …….. Base Location: …….. Section: ……	
2	Name Of Link	
3	PGCIL's Fault Ref. Code	
4	Fault Notice Receipt	Date: …… Time:…….. Informed By Powergrid's: ……..
5	Fault Rectification	Date: …… Time:…….. Confirmed To Powergrid's: ……..
6	Fault Location/ Landmark	Location:…… M.S. …….. Landmark: ……..
7	Customer Affected or not	
8	Action Taken By AMC Contractor	1. Opening Existing Manhole/ Joint Closure: ……. Nos.
		2. Trenching: …….. Mtrs
		3. Ducting: …….. Mtrs
		4. Cable Laying U/G: ……... Mtrs
		5. Aerial Done: …… Mtrs
		6. Splicing: ……. (Nos. of Fiber in each J/C) ……. (Nos. of Joints made)
		7. Joint Box: New ……..Nos. Existing ……... Nos.
		8. Joint Box: Ordinary Make/ Approved Make
		9. Manhole Installation: …… Nos.
		10. Manhole Cover: Provided/ Not provided …… Nos.
		11. PCC: …….. mtrs
		12. OFC Cable at Fault Location: UG/ Aerial/ Inside Manhole/ In Joint Closure
		13. OFC Cable at Fault Location: 6F / 8F/ 12F/ 24F/ 48F
9	Remarks	Cause Of Cable Cut: JCB/ Road Widening/ Miscreant/ Theft/ Rat/ Fire/ Flood/ Insect/ If Any other, pls specify
10	Rectification Notice issued by	FOR AMC Contractor

ACKNOWLEDGEMENT RECEIPT FROM POWERGRID TO AMC CONTRACTOR

1	Contractor's Fault Ref. Code	
2	Materials Consumed	1. OFC: …….. Mtrs 2. Duct: …….. Mtrs 3. Joint Box: …….. Nos 4. Chamber Installed: …….. Nos
3	Balance Works	
4	Remarks/ Comments	
5	Fault Rectified	Date:……. Time: ……
6	Receipt Issued By	FOR POWERGRID

Annexure - V

Tentative locations of splicing team

1. ….
2. ….
3. ….

…….
…….

Annexure - VI

List of OPGW Links & details (Route, Repeater Locations and distances)

1. ….
2. ….
3. ….

…….
…….

Annexure - VII

List of Stores for issuance of Owner Supplied Materials:

1. ….
2. ….
3. ….

…….
…….

Figure-1 Indicative Trench layout for 2 PLB HDPE pipes (Not To Scale)

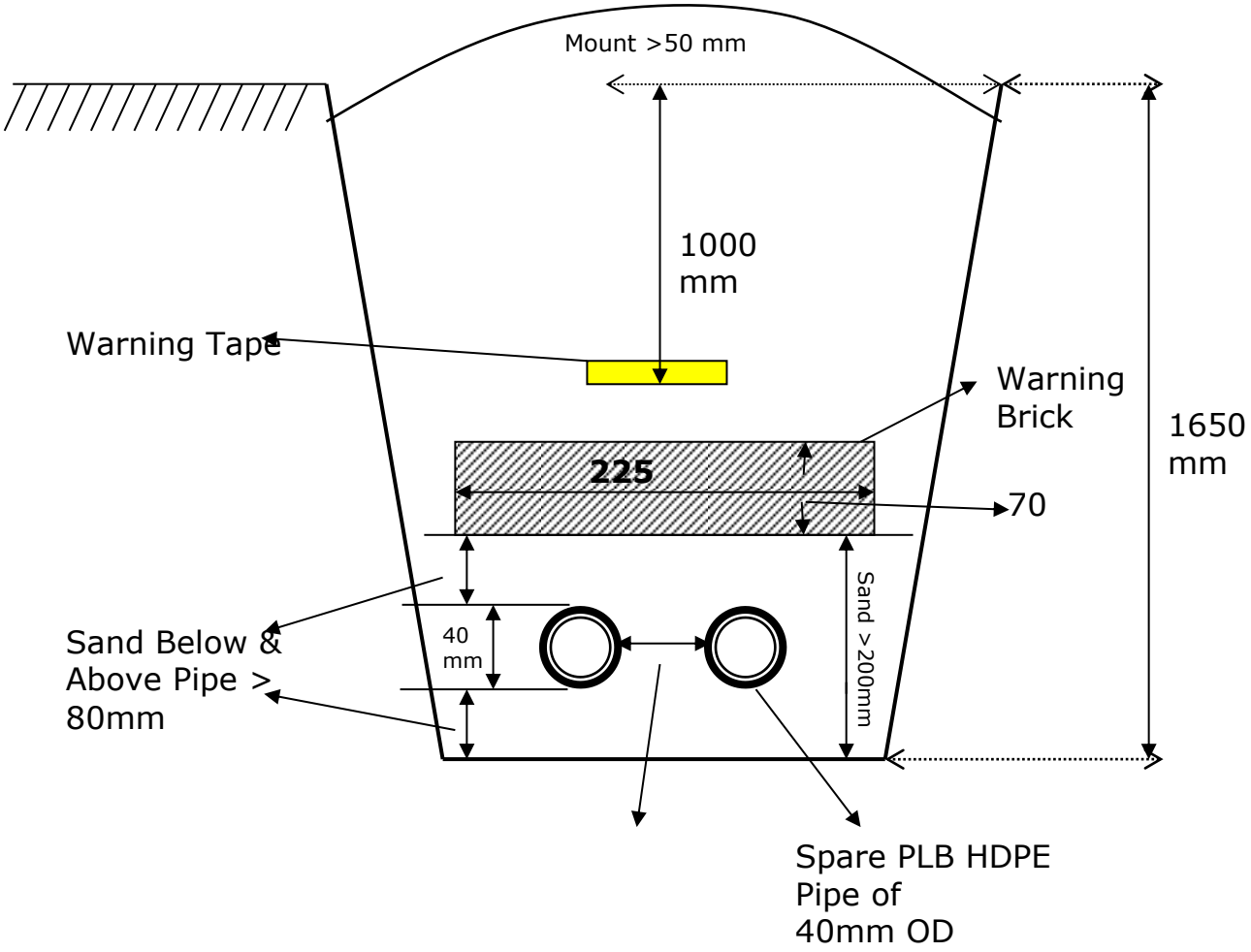


Figure-2 Indicative Trench layout for Single PLB HDPE pipe (Not To Scale)

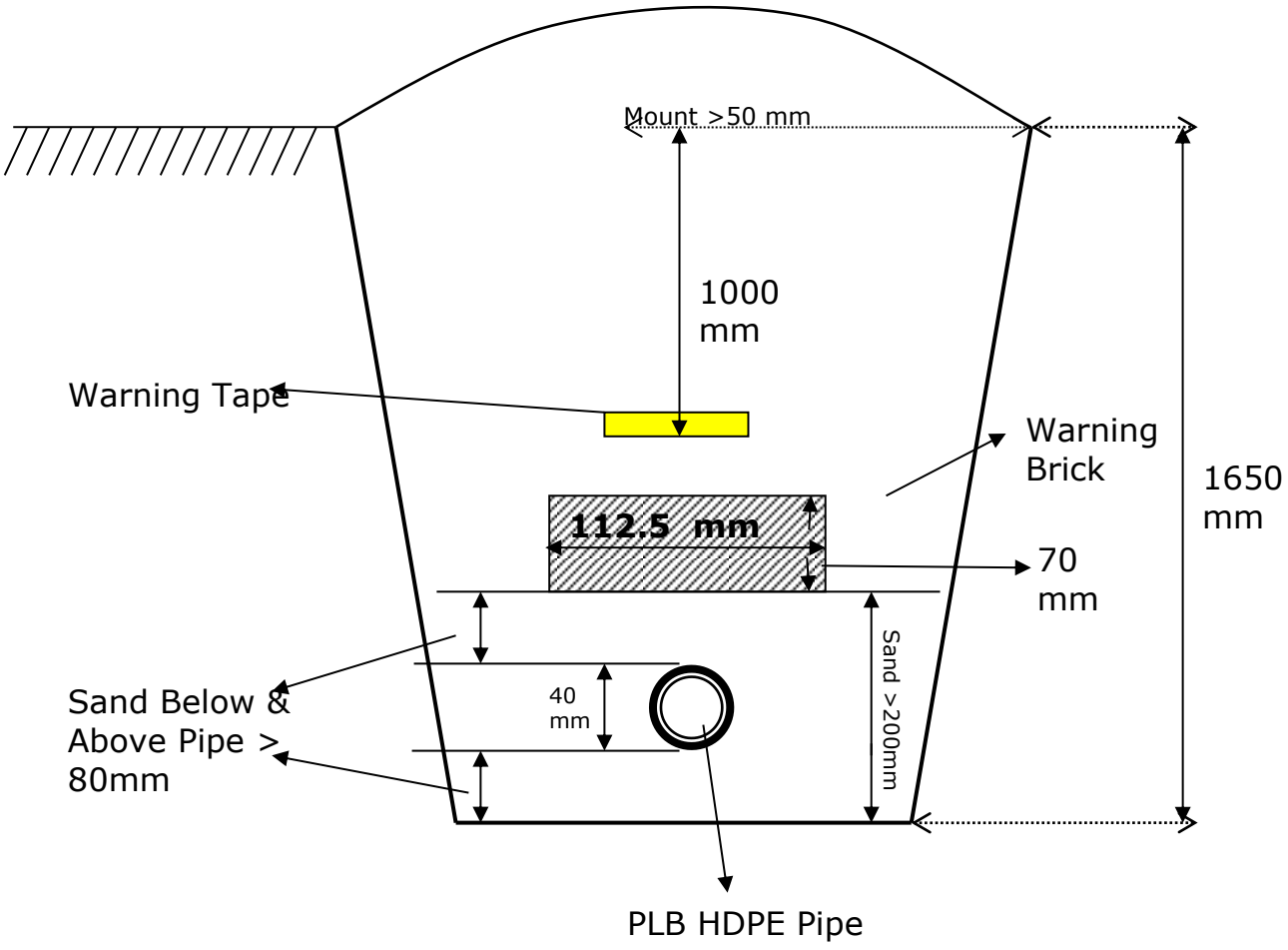


Figure 3: RCC Route Indicator (Not To Scale)

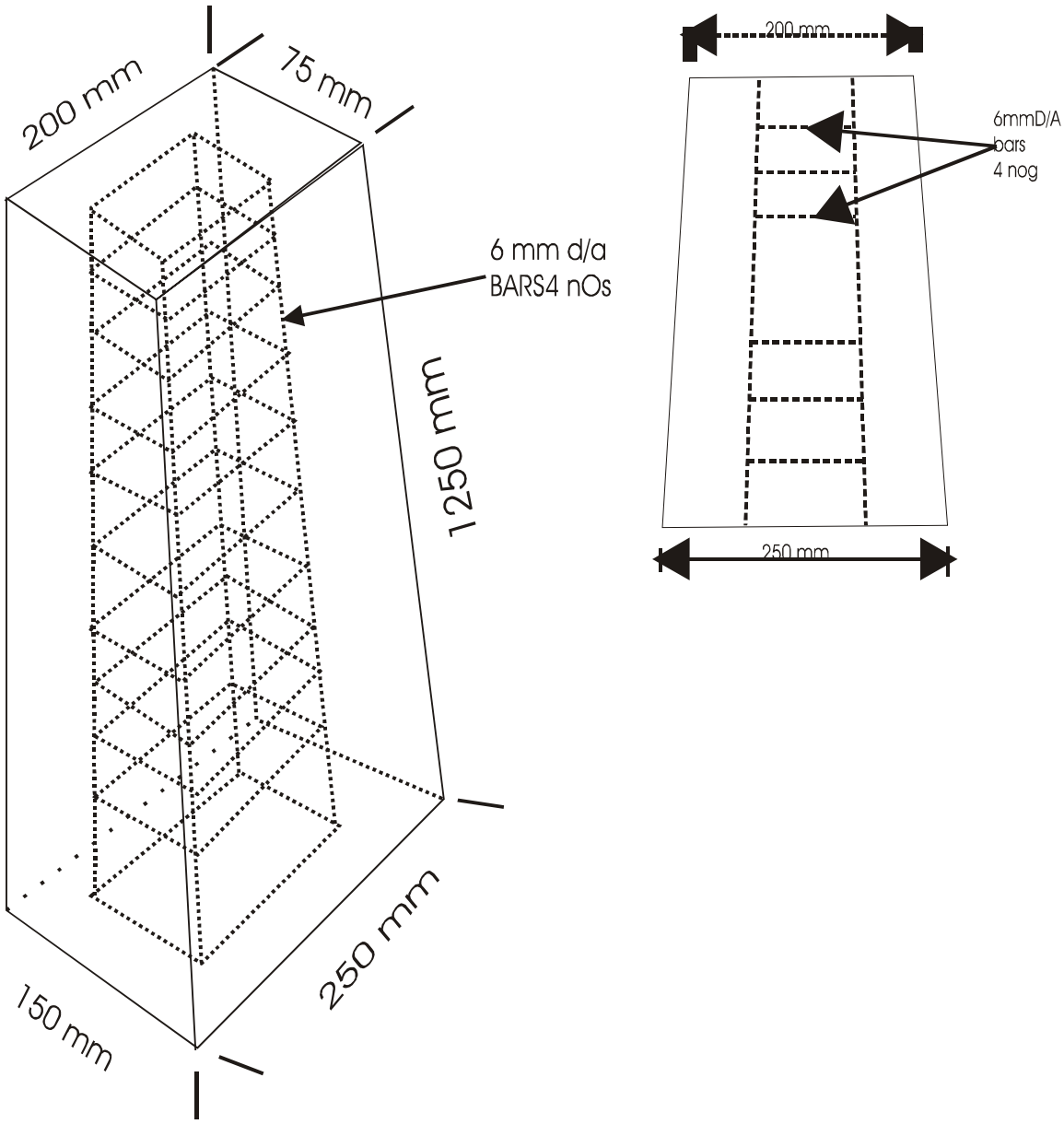


Figure 4 (Not To Scale)

1. Stone OFC Route Indicator

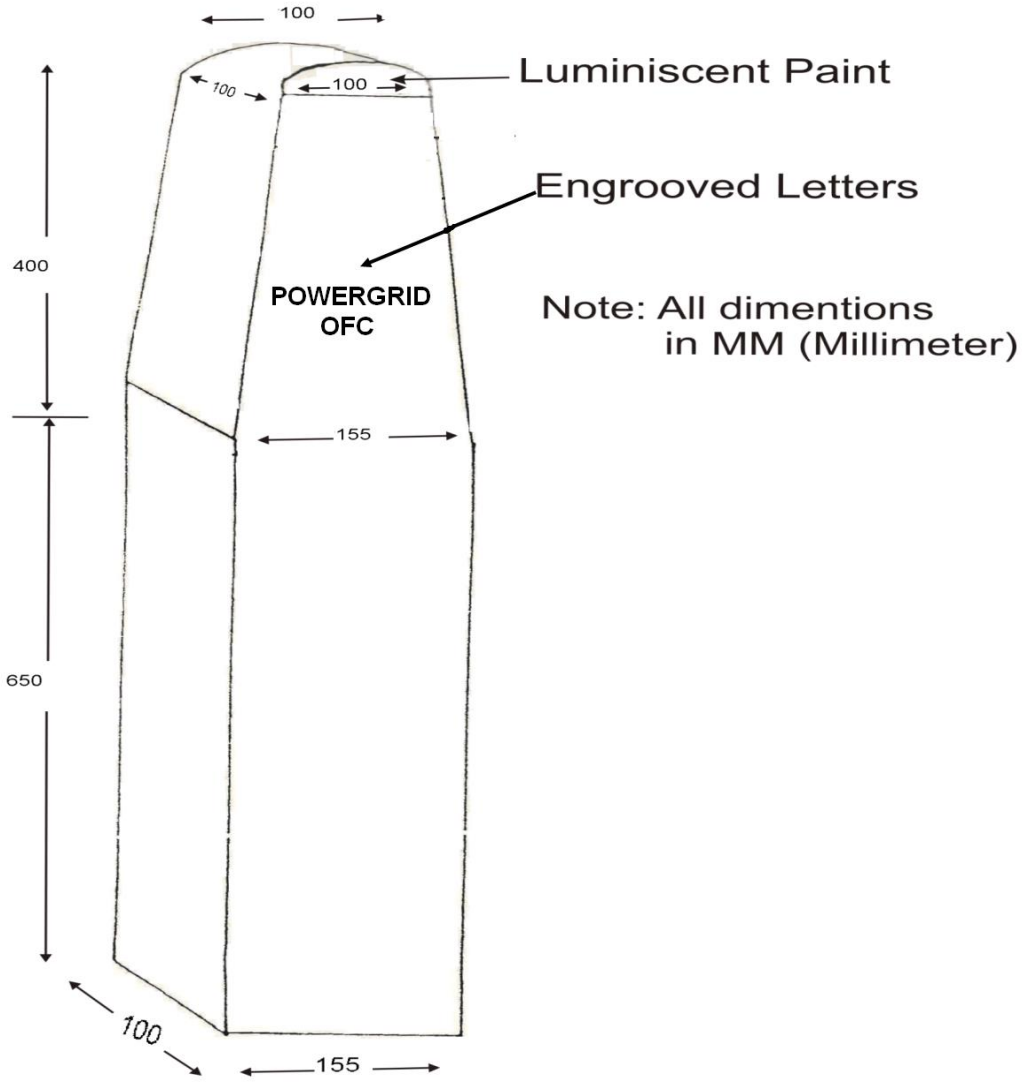
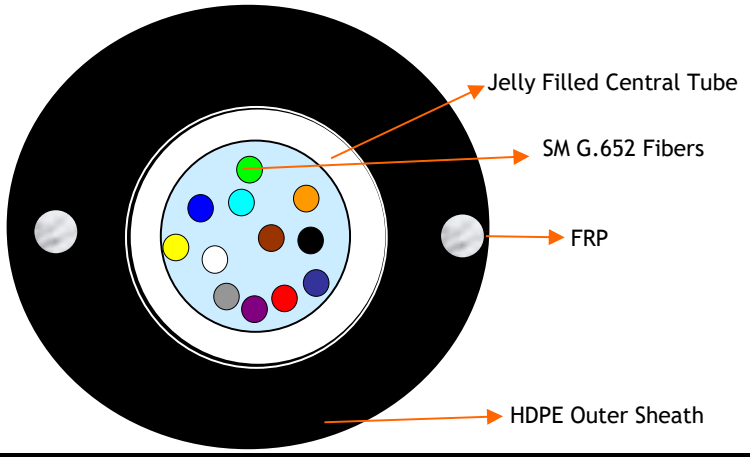


Figure 5 (Not To Scale)

Typical CROSS SECTIONAL DRAWING FOR Aerial Un-Armoured OFC



PART-I-BOQ for Routine and Break-down Maintenance of ……

(Package-……)

SI. No.	Description	Unit	SAC Code	GST rate (%)	Unit Rate excluding GST	Total Amount Including GST
A	Routine patrolling and Breakdown maintenance including arrainging of ROW permissions,fault identification,fault rectification,supply and installation of Joint box/construction of manhole,PCC on exposed duct,laying of RCC/GI pipes(excluding supply) etc.as per specifications and all associated activities for following Telecom UG & OH OFC(Underground and overhead) links					
a	Link-1 : …….	per Km per month				
b	Link-2 : ……	per Km per month				
B	Providing of splicing team including four wheeler vehicle, **Supervisor**, splicer, helper to splicer, OTDR, Splicing machine, tools with a mobile phone etc for Carrying out telecom link maintenance as per Tech Spec. **(Team required per month: ..... nos.)**	Nos. per month				
			TOTAL(PART-I)			

Note:

1. Prices shall be quoted strictly as per above format indicating clear price break-up as sought above.
2. Any conditional discount offered shall not be considered for at par evaluation of the bids, however the same shall be applicable at the time of awarding the contract.
3. The prices shall be quoted on FIRM basis.

PART-II: BOQ for Preventive Maintenance and Last Mile Connectivity

SI. No.	Description		Unit	HSN Code	SAC Code	GST Rate in %	Unit Rate (excl. GST)	Total Amount Incl. GST
1	Survey & Documentation	Survey of route, Documentation for RoW clearances and as built drawing, documentation etc.	Mtr					
2(a)	Excavation & Backfilling	All types of soil, Road. Footpath,sand etc, as per Tech. Specification.						
i)	For Single duct		Mtr					
ii)	For Two ducts		Mtr					
2(b)	[Extra for deployment of Jack hammer for excavation]	For excavation in concrete and / or rocky area.	Mtr					
3	Laying of PLB HDPE pipe O.D.40mm	Including accessories (except Couplers) as per technical Specification.						
i)	For Single duct		Mtr					
ii)	For Two ducts		Mtr					
4	Couplers for PLB HDPE Pipe							
a	Supply	As per Technical Specification.	No.					
b	Installation	As per Technical Specification.	No.					
5	Installation of PLB HDPE Pipe by Trenchless Digging	As per Technical Specification.						
(a)	For Single duct							
i)	0-10 Mtr [Span] (Manual /Hand Augering)		Mtr					

ii)	10-30 Mtr [Span] (Impact moling)		Mtr					
iii)	More than 30 Mtr [Span] (HDD)		Mtr					
iv)	[Extra for Rock drilling]		Mtr					
(b)	For Two ducts							
i)	0-10 Mtr [Span] (Manual /Hand Augering)		Mtr					
ii)	10-30 Mtr [Span] (Impact moling)		Mtr					
iii)	More than 30 Mtr [Span] (HDD)		Mtr					
iv)	[Extra for Rock drilling]		Mtr					
6	Warning Tape							
i)	Installation	As per Technical Specification.	Mtr					
ii)	Supply & Installation	As per Technical Specification.	Mtr					
7	G.I.Pipe							
(a)	50mm nominal bore (for Single duct)							
(i)	Supply	Along with joint sockets as per Tech.specification	Mtr					
(ii)	Installation	As per Tech.specification	Mtr					
(b)	100mm nominal bore (for Two ducts)							
(i)	Supply	Along with joint sockets as per Tech.specification	Mtr					

(ii)	Installation	As per Tech.specification	Mtr					
8	RCC Hume Pipe (Full)							
(a)	80mm internal dia(for single duct)							
	Supply & Installation	As per Technical Specification.	Mtr					
(b)	100mm internal dia (for Two ducts)							
	Supply & Installation	As per Technical Specification.	Mtr					
9	Warning Brick							
	Supply & Installation	As per Technical Specification.	Mtr					
10	Stone slab							
	Supply & Installation	As per Technical Specification.	Mtr					
11	DWC Pipe	As per Technical Specification.						
(a)	75mm nominal size							
	Supply & Installation	As per Technical Specification.	Mtr					
(b)	120mm nominal size							
	Supply & Installation	As per Technical Specification.	Mtr					
12	Laying of Underground Optical Fibre Cable							
(a)	upto 12 fibre	As per Technical Specification.	Mtr					

(b)	upto 24 fibre	As per Technical Specification.	Mtr					
(c)	48 Fibres	As per Technical Specification.	Mtr					
13	Installation of Joint Box in underground (including splicing & testing)	As per Technical Specification.						
(a)	6 Fibres		No.					
(b)	12 Fibres		No.					
(c)	24 Fibres		No.					
(d)	48 fibres		No.					
14	Supply and Installation of Joint box above Ground (Including splicing & testing)	As per Technical Specification.						
(a)	6 Fibres		No.					
(b)	12 Fibres		No.					
(c)	24 Fibres		No.					
(d)	48 fibres		No.					
15(i)	Installation of Fibre Management System (FMS/FDMS)(including Splicing & Testing)	Wall mounted with couplings and pigtails, as per Technical specification.						
(a)	upto 8 fibre		No.					
(b)	upto 12 fibre		No.					

(c)	upto 24 fibre		No.					
(d)	upto 48 fibre		No.					
15(ii)	Supply & Installation of Fibre Management System (FMS/FDMS)(including Splicing & Testing)	Wall mounted with couplings and pigtails, as per Technical specification.						
(a)	upto 8 fibre		No.					
(b)	upto 12 fibre		No.					
(c)	upto 24 fibre		No.					
(d)	upto 48 fibre		No.					
16	Supply and Installation of RCC Manholes	Spun concrete. Cast in-situ/Annular ring doubble walled with RCC top cover as per technical specification.						
(a)	For Joint Locations as per technical specification.		No.					
(b)	For providing service loop as per technical specification		No.					
17	Supply and Installation of brick walled Manholes	Brick wall with RCC top cover as per technical specification.						
(a)	For Joint Locations as per technical specification.		No.					
(b)	For providing service loop as per technical specification		No.					
18	Supply and Installation of FRP based Manholes	Suitable for housing Joint box/Service loops.						

(a)	For Joint Locations as per technical specification.		No.					
(b)	For providing service loop as per technical specification		No.					
19	Sand filling in the RCC/Brick Manhole for Joint/Service loop	As per Technical Specification.	CuMtr					
20	Duct Integrity Testing (DIT) of existing duct	As per Technical Specification.	Mtr					
21	Installation of PLB HDPE pipe on wall in building premises [including routing of OFC through it]	As per Technical Specification.	Mtr					
22	Supply & Installation of flexible PVC Conduit on wall/panel/tray etc. in building premises [including routing of OFC through it]	As per Technical Specification.	Mtr					
23	Inspection of existing Manhole	As per Technical Specification.	No.					
24	Supply and Installation of Overhead OFC							
(i)	6 F OFC, for over head subject to approval	As per Technical Specification.	Mtr					
(ii)	12 F OFC for overhead subject to approval		Mtr					
25	Installation of Aerial OFC/UGOFC on overhead							
(i)	Aerial OFC 6/12/24 F	As per Technical Specification.	Mtr					

(ii)	UGOFC 12/24/48 F		Mtr					
26	Reinstatement of excavated area/damages	In Road, pavement, footpath etc	Sq.Mtr					
27	PCC (1:2:4) over PLB/RCC/DWC etc.(in case of less depth)	As per Technical Specification.	CuMtr					
28	Insulated GI wire for O/H OFC							
a	Supply & Installation	As per Technical Specification.	Mtr					
29	Route Indicator							
(a)	Supply & Installation of Route Indicator (RCC/Pre cast)	As per Technical Specification.	No.					
(b)	Supply & Installation of Route Indicator (Stone)		No.					
30	Mobilization charges (One time) for Last Mile Connectivity	As per Technical Specification.	Per Connectivity					
31	Night Stay Charges for splicing team for rectification in OPGW section.	As per Technical Specification.	Night					
32	Movement Charge for splicing team for rectification in OPGW section	As per Technical Specification.	Km					
							TOTAL	

Note:

1. Prices shall be quoted strictly as per above format indicating clear price break-up as sought above.
2. Any conditional discount offered shall not be considered for at par evaluation of the bids, however the same shall be applicable at the time of awarding the contract.
3. The prices shall be quoted on FIRM basis.