Tamil Nadu FibreNet Corporation Limited

No.807, 5th Floor, Chengalvaraya Naicker Building,
Anna Salai, Chennai - 600 002

E-TENDER REFERENCE NO. NIT_TANFINET_012_LMC_SI dated 05.04.2023

TENDER FOR SELECTION OF A SYSTEM INTEGRATOR FOR IMPLEMENTING BHARATNET LAST MILE CONNECTIVITY IN TAMIL NADU ALONG WITH OPERATION & MAINTENANCE OF THE DEVELOPED NETWORK FOR A PERIOD OF 3 YEARS

Date of Release of Tender	05.04.2023
Prebid Meeting	17.04.2023
Last Date for Submission of Bid	05.05.2023 upto 4.00 PM
Date of Opening of Bid	05.05.2023 at 5.00 PM

CONTENTS

ANNEXURES

IMPORTANT NOTICE

This tender procedure is governed by the Tamil Nadu Transparency in Tenders Act, 1998 and the Tamil Nadu Transparency in Tender Rules, 2000 as amended from time to time. In case of any conflict between the terms and conditions in the tender document and the Tamil Nadu Transparency in Tenders Act, 1998 and The Tamil Nadu Transparency in Tender Rules, 2000 the Act and Rules shall prevail.

1. PREAMBLE

Tamil Nadu FibreNet Corporation (TANFINET) is a Special Purpose Vehicle (SPV) setup by the Government of Tamil Nadu to implement the BharatNet phase-II project to provide high speed connectivity in the rural areas of the State.

The BharatNet project is under implementation and it will provide high-speed connectivity to all 12,525 Gram Panchayats (GP) through Optical Fiber Cable from Blocks. TANFINET now proposes to provide Last Mile Connectivity to about 19,000 Government offices located in GPs, Blocks and District Headquarters.

In this context, TANFINET invites sealed tenders from experienced System Integrators in "Two Cover System" for the survey, design, supply, installation, commissioning, testing and end to end network integration along with operation and maintenance of the network for a period of 3 years through transparent bidding process. The Tender notification has been published fixing the date of opening of tender as 05.05.2023 at 5PM.

2. SCOPE OF WORK

The scope of work would inter-alia include the following:

a. Establishing the last mile connectivity to about 19,000 Govt. Offices through OFC by using Direct Fiber connectivity (IP/MPLS) / G-PON (OLT & ONT) solutions.

b. Design, supply, installation, commissioning and testing of Aerial OFC/ Underground OFC along with all active and passive components and end to end network integration.

c. The proposed solution architecture, functional requirement and detailed specification of required equipments are given in **Annexure-1**.

d. The bidder shall capture the GIS co-ordinates of the entire OFC routes, poles, splitters, manhole, chambers, Jointing / Splicing, along with all active components, and updated in the GIS tool provided by TANFINET. The bidder has to keep the information upto date in the GIS tool during the entire contract period.

e. The bidder shall obtain necessary Right of Way (RoW) from State/Central agencies whichever applicable. TANFINET shall facilitate the bidder in obtaining the same. The cost incurred in obtaining RoW shall be reimbursed on actuals upon submission of proof of payment along with relevant documents.

f. The BOQ Mentioned in the tender is only for the purpose of price discovery. The successful bidder should do a site survey of all the locations and submit the actual BOQ requirements within the stipulated timeline.

g. The Go-live for the project would be declared when 100% implementation and commissioning for the defined locations along with Acceptance testing as envisaged has been completed and the entire network is run in full mode for at least 30 days from commissioning 100% nodes.

h. Undertake Operation & Maintenance (O&M) for a period of 3 years from the date of Go-Live at all locations. However, the bidder has to provide O&M support for the locations which are operationalized before Go-Live with SLA without any additional payment. SLA is applicable during implementation phase (from commissioning of each location/office) and O&M phase.

i. The payment for O&M will commence only after Go-Live at all locations. The detailed tasks to be performed during the O&M period is detailed in Annexure II.

j. The bidder shall demonstrate the performance of all active components to be supplied and installed as part of the contract for conformance to technical specifications before commencement of installation works.

3. QUALIFICATION CRITERIA

Clause	Qualification Criteria	Supporting Documents/Remarks
a.	i. The single bidder should be a registered legal entity in India and should be in existence for the past three years as on 31st March 2023	(i) In case of Private / Public Limited Companies, 1. Copy of Incorporation Certificate issued by the Registrar of Companies 2. Copy of Memorandum and Articles of Association

		(ii) In case of Partnership Firm, 1. Copy of Registered Partnership Deed (or) 2. Copy of Incorporation Certificate (iii) In case of Proprietorship Firm, 1. Copy of GST Registration Certificate
	ii. In case of Consortium of bidders: a) Consortium of Bids is allowed with maximum of 3 partners including prime bidder b) One of the partners shall be designated as Prime Bidder c) Each partner of the Consortium should be a registered legal entity in India and should be in existence for the past three years as on 31st March 2023 d) No partner of the Consortium should bid individually or be a partner of another Consortium	(i) The Consortium partners individually should submit the following: a. In case of Private / Public Limited Companies, 1. Copy of Incorporation Certificate issued by the Registrar of Companies 2. Copy of Memorandum and Articles of Association b. In case of Partnership Firm, 1. Copy of Registered Partnership Deed (or) 2. Copy of Incorporation Certificate c. In case of Proprietorship Firm, 1. Copy of GST Registration Certificate (ii) The original Consortium Agreement should be submitted. (iii) The Consortium Agreement shall contain the following: • A statement that all partners of the consortium shall be liable jointly and severally for the execution of the contract in accordance with the contract terms • The roles and responsibilities of each member • The share of each member in the project

b.	The single bidder or prime bidder of the Consortium should have reported an Average Annual Turnover* of at least Rs.250 Crores in the last three consecutive financial years i.e. 2019-20, 2020-21 and 2021-22. *For the purpose of evaluation, only the Turnover from ICT / IT / Telecom business shall be considered.	(i) The average annual turnover statement duly certified by Chartered Accountant with UDIN as per Annexure VIII (ii) The Annual Report / certified copies of Balance Sheet, Profit & Loss statement for the last 3 consecutive financial years
c.	The single bidder or any one of the consortium partner should have successfully completed laying, installation, testing and commissioning of Optical Fiber Cable for atleast 3,000 kms in Aerial and 300 kms in Underground in a single project in the last 3 years as on 31st March 2023 in India	Work orders and Completion Certificates issued by the Client clearly highlighting the scope of work and Kms covered should be enclosed
d.	The single bidder or any one of the consortium partner should have successfully completed implementation and commissioning of Fiber Optic Last mile network of G-PON / Ethernet technology for atleast 10,000 sites in a single project in the last 3 years as on 31st March 2023 in India	Work orders and Completion Certificates issued by the Client clearly highlighting the scope of work and the number of sites covered should be enclosed

e.	The single bidder or any one of the consortium partner should have successfully implemented NMS/EMS for last mile connectivity using G-PON / Ethernet technology for atleast 10,000 nodes in a single project in the last 3 years as on 31st March 2023 in India	Work orders and Completion Certificates issued by the Client clearly highlighting the scope of work and the number of nodes covered should be enclosed
f.	The single bidder or the prime bidder of the Consortium shall submit Manufacturer Authorization Form (MAF) from Original Equipment Manufacturer (OEM) for all the passive and active components.	(i) Manufacturers Authorization Form (MAF) as per Annexure VII for each component should be enclosed. (ii) The bidders shall submit MAF from a maximum of 3 OEMs for a particular product. However only 1 OEM will be permitted for active components and upto 3 OEMs will be permitted for passive components respectively for implementation. The same has to be confirmed before execution of contract agreement.
g.	The single bidder or each partner of the consortium member shall ensure that OEM complies with restrictions on procurement under rule 144 (xi) vide order no: 06/18/2019-PPD dated 23rd July 2020 inserting Rule 144(xi) in GFRs 2017.	An undertaking form as per Annexure IX should be enclosed.
h.	The single bidder or the prime bidder of the Consortium should have a full-fledged permanent office in Chennai (or) an	(i) Proof of Chennai Office Address (ii) Alternatively, the bidder should give an undertaking that full-fledged office will be established in Chennai within

	undertaking to set up office in Chennai	15 days from the date of issue of Letter of Acceptance
i.	The single bidder or any one of the consortium partner should have support centres in all District Headquarters (or) an undertaking to set up support centres in all District Headquarters	(i) Proof of support centres in all District Headquarters (ii) Alternatively, the bidder should give an undertaking that support centres in all District Headquarters will be established in District Headquarters within 45 days from the date of issue of Letter of Acceptance
j.	The single bidder or each partner of the consortium member should have valid ISO 9001:2015 certification for quality management and ISO 20000-1:2018 for service management	Copy of valid ISO certifications
k.	The single bidder / any of the consortium partners should not have been blacklisted by Central Government, any State Government, a Statutory Body, any Public Sector Undertaking, Banks or Financial Institutions and declared as NPA by Banks or Financial Institutions as on the date of bid submission.	(i) The declaration form as per Annexure X should be enclosed. In case of consortium, each partner should submit a separate declaration form. (ii) Further, if the bidder is found blacklisted in India before the award of contract by any Government Agency / Quasi Government Agency / PSU, the bid will be rejected
l.	In computing the Experience of the Bidder / Consortium member under clauses 3(c), 3(d) & 3(e) the Experience of their respective Associates would also be eligible hereunder: For purposes of this tender, Associate means, in relation to the Bidder /Consortium member, a person who controls, is controlled by, or is under the common control with such Bidder / Consortium member. As used in this definition, the expression "control" means, with respect to a legal entity which is a company or corporation, the ownership,	

	directly or indirectly, of not less than 26% (twenty six percent) of the voting shares of such person, and with respect to a legal entity which is not a company or corporation, the power to direct the management and policies of such person by operation of law. It is clarified that a certificate from the Statutory Auditor who audits the book of accounts or the Company Secretary of the Bidder or the Consortium Member should be provided to demonstrate that a person is an Associate of the Bidder or the Consortium as the case may be.

4. LANGUAGE OF THE TENDER

The Tender prepared by the bidder as well as all correspondences and documents relating to the Tender shall be in English language only. If the supporting documents are in a language other than English/Tamil, the notarized translated English version of the documents should also be enclosed. Tender received without such translation copy will be rejected.

5. CONSORTIUM AGREEMENT

a. A legally valid agreement shall be executed for the consortium binding all the partners in INR 100 Non-Judicial stamp paper. All partners of the consortium shall be liable jointly and severely for the execution of the contract in accordance to the contract terms and it should be explicitly stated in the consortium agreement. The consortium agreement should indicate precisely the role of each partner of the consortium in respect of the contract along with the share of each member in the project.

b. Consortium agreement should be registered in Chennai so as to be legally valid and binding on all partners.

c. Consortium agreement shall be enclosed with the technical bid. Alternatively, a letter of intent to execute a consortium agreement in the event of a successful bid shall be signed by all the partners and submitted with the bid together with the copy of the proposed consortium agreement.

d. The consortium agreement shall authorize one of the partners of the consortium as Prime Bidder. This authorization shall be evidenced by submitting of Power of Attorney signed by the legally authorized signatories of all the partners.

e. The Prime Bidder of Consortium shall be authorized to incur liabilities and receive instruction for and on behalf of him and all partners of the consortium and entire execution of the contract including payment shall be done exclusively with the Prime Bidder. All correspondence will only be made with the Prime Bidder.

f. An undertaking shall be enclosed with the technical bid stating that all the meetings and discussions shall only be attended by the authorized representative of the prime bidder.

6. CONFLICT OF INTEREST

a. A bidder shall not have a conflict of interest (the "Conflict of Interest") that affects the Bidding Process. Any bidder found to have a Conflict of Interest shall be disqualified.

b. A bidder shall be deemed to have a Conflict of Interest affecting the Bidding Process, if:

   i. Any other prospective bidder or a member of consortium or any associate or constituent thereof have common controlling shareholders or other ownership interest; or

   ii. A constituent of such prospective bidder is also a constituent of another prospective bidder. Provided that 'constituent' in such cases will not include the provider of a proprietary technology to more than one bidder; or

   iii. Such prospective bidder, or any associate thereof receives or has received any direct or indirect subsidy, grant, concessional loan or subordinated debt from any other bidder or Respondent, or any associate thereof has provided any such subsidy, grant, concessional loan or subordinated debt to any other bidder or Respondent, its member or any associate thereof; or

   iv. Such prospective bidder has the same legal representative for purposes of the Tender Proceedings as any other prospective bidder; or

v. Such prospective bidder, its member or any associate thereof, has a relationship with another prospective bidder, or any associate thereof, directly or through common third party/ parties, that puts either or both of them in a position to have access to each other's information about, or to influence the Response of either or each other; or

vi. Such prospective bidder, its member or any associate thereof, has participated in preparation of any documents, design or technical specifications of the Project; or

vii. If any legal, financial or technical advisor of the Tender Inviting Authority and Tender Accepting Authority in relation to the Project is engaged by the prospective tenderer, its member or any associate thereof, as the case may be, in any manner for matters related to or incidental to the Project.

viii. Provided that this clause shall not apply where such advisor was engaged by the bidder or Respondent, its member or associate in the past but such engagement expired or was terminated 6 (six) months prior to the date of release of tender or where such advisor is engaged after a period of 3 (three) years from the date of commercial operation of the Project.

ix. Explanation: In case a bidder is a Consortium, then the term bidder as used in this tender document, shall include each Member of such Consortium.

c. A bidder shall be liable for disqualification if any legal, financial or technical adviser of TANFINET in relation to the Project is engaged by the bidder, its Member or any Associate thereof, as the case may be, in any manner for matters related to or incidental to the Project. For the avoidance of doubt, this disqualification shall not apply where such adviser was engaged by the bidder or Respondent, its Member or Associate in the past but its assignment expired or was terminated 6 (six) months prior to the date of release of tender or where such adviser is engaged after a period of 3 (three) years from the date of commercial operation of the Project.

7. DOWNLOADING OF TENDER DOCUMENT

The tender document shall be downloaded from www.tntenders.gov.in at free of cost. For the downloaded tender document, the bidder should give a declaration for not having tampered the Tender document downloaded as per Annexure XI.

8. PREBID MEETING

a. There will be a pre-bid meeting on **17.04.2023 at 11.30 A.M** in the Head Office of Tamil Nadu FibreNet Corporation, No.807, 5th Floor, Chengalvaraya Naicker Building, Anna Salai, Chennai - 600 002 during which the prospective bidders can get clarifications about the tender. The bidders shall send their queries in writing through mail to tenders.tanfinet@tn.gov.in & tanfinet@tn.gov.in if any at least two days prior to the pre-bid meeting date as per the format in Annexure XIV.

b. The bidders are advised to check www.tntenders.tn.gov.in for up-to-date information like change in date / venue etc., of pre-bid meeting as TANFINET may not be able to identify and communicate with the prospective bidders at this stage. Non attending of pre-bid meeting is not a disqualification.

9. CLARIFICATION ON THE TENDER DOCUMENT

Any discrepancies, omissions, ambiguities or conflicts in the tender document or any doubts as to their meaning and any request for clarification may be sent in writing to "The Managing Director, Tamil Nadu FibreNet Corporation, No.807, 5th Floor, Chengalvaraya Naicker Building, Anna Salai, Chennai - 600 002" or through e-mail to tenders.tanfinet@tn.gov.in & tanfinet@tn.gov.in as per Annexure-XIV. The Managing Director, will review the same and where information sought is not clearly indicated or specified in the tender documents, will upload such clarification on www.tntenders.gov.in. The Managing Director will neither make nor be responsible for any oral instructions. Request for clarification should be brought to the notice of the Managing Director, in writing, before 48 hours of the opening of the tender.

10. AMENDMENT OF TENDER DOCUMENT

TANFINET whether on its own initiative or as a result of a query, suggestion or comment of an Applicant or a Respondent, may modify the tender document by

issuing an addendum or a corrigendum at any time before the opening of the tender. Any such addendum or corrigendum will be uploaded on www.tenders.tn.gov.in and the same will be binding on all Applicants or Respondents or Bidders, as the case may be.

11. AUTHORISATION OF THE BIDDER

a. The Tender should be signed on each page by the bidder or by the person who is duly authorized for the same by the bidder.

b. The bidders should submit a Power of Attorney as per the format at Annexure-XII, authorizing the signatory of the bid documents. In the case of a Consortium, the Members should also submit a Power of Attorney in favour of the Prime Bidder as per format at Annexure-XIII.

12. SUBMISSION OF TENDER

a. The eligible bidders shall participate in bidding only in online mode through the website https://tntenders.gov.in/nicgep/app under two cover system (i.e. (i) Technical Bid and (ii) Financial Bid) in the prescribed format.

b. Bidders are allowed to bid until the time of bid closing. The e-Procurement website will not allow any bidder to attempt bidding after the scheduled date and time of bid submission. The submission of bids physically is not permitted.

c. All the documents in support of eligibility criteria are to be scanned and uploaded along with the tender documents in the designated website.

d. The bidder should quote the price in the Price-Bid as per the format given in the E-tender portal.

e. To participate in the bid, the bidder shall have a valid Class 3 Digital Signature Certificate (DSC), obtained from the certifying authorities enlisted by Controller of Certifying Authorities (CCA).

f. Every page of the tender document should be signed and uploaded, in token of having accepted the tender conditions. Failing which the tender will be rejected summarily.

g. No bidder shall submit more than one bid for the Project. A bidder applying individually or as a member of a Consortium shall not be entitled to submit another bid either individually or as a member of any Consortium, as the case may be.

h. The bidders shall be responsible for all of the costs associated with the preparation of their bids and their participation in the Bid Process. TANFINET will not be responsible or in any way liable for such costs, regardless of the conduct or outcome of the Bidding Process.

i. TANFINET shall not be liable for any omission, mistake or error in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to the tender document or the Bidding Process, including any error or mistake therein or in any information or data given by TANFINET.

13. RIGHT TO ACCEPT / REJECT ANY OR ALL BID

a. Notwithstanding anything contained in this tender document, TANFINET reserves the right to accept or reject any bid and to annul the Bidding Process and reject all bids, at any time without any liability or any obligation for such acceptance, rejection or annulment, and without assigning any reasons therefore. In the event that TANFINET rejects or annuls all the Bids, it may, in its discretion, invite all eligible Bidders to submit fresh Bids hereunder.

b. TANFINET reserves the right to reject any bid if:

   i. At any time, a material misrepresentation is made or uncovered, or

   ii. The bidder does not provide, within the time specified by TANFINET, the supplemental information sought by TANFINET for evaluation of the bid documents.

   iii. If the Bidder is a Consortium, then the entire Consortium may be disqualified/ rejected. If such disqualification/ rejection occur after the Bids have been opened and the Lowest Bidder gets disqualified/ rejected or withdraws, then TANFINET reserves the right to invite the remaining Bidders to match the Lowest Bidder/ submit their Bids in accordance with the tender conditions or take any such measure

as may be deemed fit in the sole discretion of TANFINET, including annulment of the Bidding Process.

c. In case it is found during the evaluation or at any time before signing of the Contract Agreement or after its execution and during the period of subsistence thereof, including the agreement period thereby granted by TANFINET, that one or more of the pre-qualification conditions have not been met by the bidder, or the bidder has made material misrepresentation or has given any materially incorrect or false information, the bidder shall be disqualified forthwith if not yet appointed either by issue of the LOA or entering into of the Agreement, and if the bidder has already been issued the LOA or has entered into the Agreement, as the case may be, the same shall, notwithstanding anything to the contrary contained therein or in this tender document, be liable to be terminated, by a communication in writing by TANFINET to the bidder, without TANFINET being liable in any manner whatsoever to the bidder and without prejudice to any other right or remedy which TANFINET may have under this tender document, the Bidding Documents, the Agreement or under applicable law.

d. TANFINET reserves the right to verify all statements, information and documents submitted by the bidders in response to the tender. Any such verification or lack of such verification by TANFINET shall not relieve the bidder of its obligations or liabilities hereunder nor will it affect any rights of TANFINET there under.

14. RIGHT TO VARY SCOPE OF WORK

TANFINET reserves the right to vary the Scope of Work at any time during the contract period, by giving a written order. If any such change causes an increase or decrease in the cost of or the time required for the Bidder's performance of any part of the work under the Agreement, an equitable adjustment shall be made in the Agreement Value or time schedule, or both, and the Agreement shall accordingly be amended. Any claims by the Bidder for adjustment under this Clause must be asserted within one (1) week from date of the Bidder's receipt of TANFINET's order for change. The unit rate of each item quoted/accepted by the selected Bidder shall however not change.

15. EARNEST MONEY DEPOSIT

a. The Tender should be accompanied by an Earnest Money Deposit (EMD) to the value of Rs.1,50,00,000 (Rupees One Crore Fifty Lakhs only) in the form of an Irrevocable Bank Guarantee with a validity period of 12 months from any Indian Nationalized Bank. The EMD in any other form will not be accepted.

b. The bidders have to upload the scanned copy of the Bank Guarantee against the Demand Draft / Banker Cheque / NEFT / RTGS column given in the e-procurement portal.

c. The Bank Guarantee in original should reach the office of Managing Director, Tamil Nadu FibreNet Corporation, No.807, 5th Floor, Chengalvaraya Naicker Building, Anna Salai, Chennai - 600 002 before the due date and time of opening of techno commercial bid. The same shall be submitted in person or through Postal / Courier. TANFINET will not be responsible for any postal delays.

d. Non-submission/Non-remittance of EMD within the stipulated date and time will entail outright rejection of bids.

e. The bids without EMD shall not be considered.

f. Any request of the bidder, under any circumstances claiming exemption from payment of EMD, will be rejected and their price offer will not be opened.

g. The amount remitted towards EMD is liable to be forfeited in the following cases:

    i. Bidder fails to execute the Agreement.
    ii. Bidder fails to remit the Security Deposit within the stipulated date.
    iii. Bidder withdraws the Bid during the period of its validity as specified in the Tender.
    iv. The Bidder(s) should not be involved in any litigation that may have an impact of affecting or compromising the execution of work as required under this contract. If at any stage of tendering process any suppression / falsification is brought to the knowledge of TANFINET,

then TANFINET shall have the right to reject the bid or terminate the contract, and forfeit the EMD or SD as the case may be, without any compensation to the Bidder(s).

16. PRICE BID

a. The price bid should be submitted only in electronic form as per the prescribed format given.

b. The rates for each line item should be quoted in Indian Rupees (INR) in the column highlighted as blue color in the price bid format.

c. The price bid should not be altered and should not contain any commercial conditions. Variation in the commercial terms and conditions of the tender will not be accepted.

17. VALIDITY

The rate quoted in the Tender should be valid for the acceptance by TANFINET for a minimum period of 90 days from the date of opening of the Tender. Escalation in the rates will not be entertained under any circumstances.

18. OPENING AND EVALUATION OF THE TECHNICAL BID

a. The tenders received up to 4.00 PM on 05.05.2023 will be taken up for opening. The technical bid will be opened online at 5.00 PM on 05.05.2023 by the Managing Director, TANFINET or by the persons / committee authorized by him.

b. The Technical bid will be evaluated by the committee of TANFINET in terms of the qualification criteria.

c. Any adverse/not satisfactory remarks on the performance of previous works will entail disqualification of the tender.

d. Bidders will be deemed to have understood and agreed that no explanation or justification on any aspect of the Bidding Process or selection will be given.

e. Any information contained in the bid shall not in any way be construed as binding on TANFINET, its agents, successors or assigns, but shall be binding against the bidder if the Project is subsequently awarded to it on the basis of such information.

f. TANFINET reserves the right not to proceed with the Bidding Process at any time without notice or liability and to reject any or all bid(s) without assigning any reasons.

g. If any information furnished by the bidder is found to be incomplete, or contained in formats other than those specified herein, TANFINET may, in its sole discretion, exclude the relevant details for qualifying in eligibility criteria.

h. In the event that the claim of the bidder towards eligibility criteria submitted is determined by TANFINET as incorrect or erroneous, TANFINET shall reject such claim and exclude the same for qualifying in eligibility criteria. Where any information is found to be patently false or amounting to a material misrepresentation, TANFINET reserves the right to reject the bid in accordance with the provisions of Clause 13(b) and 13(c).

i. TANFINET reserves the right to reject any bid which is non-responsive and no request for alteration, modification or substitution shall be entertained by TANFINET in respect of such bid.

j. To facilitate evaluation of bids, TANFINET may, at its sole discretion, seek bonafide clarifications from any bidder regarding their bid. Such clarification(s) shall be provided within the time specified by TANFINET for this purpose. Any request for clarification(s) and all clarification(s) in response thereto shall be in writing / e-mail.

k. If a bidder does not provide clarifications sought within the prescribed time, the bid shall be liable to be rejected. In case the bid is not rejected, TANFINET may proceed to evaluate the bid by construing the particulars requiring clarification to the best of its understanding, and the bidder shall be barred from subsequently questioning such interpretation of TANFINET.

l. **Sample Testing:**

i. All the Bidders have to submit samples of active components along with their feature test reports within 3 days from the date of submission of bid.
ii. The active components shall comply with the standards & specifications given in the tender and any other compliances that are deemed necessary for the delivery of quality services to the end users adhering to the SLA.
iii. 2 nos. of each type of ONT, 1 no. of each type of OLT and 1 no. of Router (returnable samples) along with the entire kit including but not limited to ONT box, OLT compatible to TANFINET network and other required accessories like interconnection cables have to be submitted for testing.
iv. If the bidder has submitted MAF from more than 1 OEM for a product, then the samples from each OEM has to be submitted as detailed in sub-clause iii above.
v. The samples shall be tested in lab as well as on the field as per the requirements of TANFINET.
vi. Testing of the samples should be completed within fifteen (15) days from the date of submission of bid. In case bidder fails to submit the samples (or) fails to complete the test within the stipulated time, such bids will be rejected and their financial bids will not be opened.
vii. TANFINET will provide the required details and approve the input devices.

m. The bidders who are qualified in the technical bids and successfully complete the testing with existing TANFINET network will be informed the date of opening of Price bid.

19. CONFIDENTIALITY

a. Information relating to the examination, clarification, evaluation, and recommendation for the short-listed / pre-qualified bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor advising TANFINET in relation to or matters arising out of, or concerning the Bidding Process. TANFINET will treat all information, submitted as part of bid, in confidence and will require all those who have access to such material to treat the same in confidence. TANFINET may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to

require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or TANFINET or as may be required by law or in connection with any legal process.

b. All documents and other information provided by TANFINET or submitted by bidders to TANFINET shall remain or become the property of TANFINET. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their bid. TANFINET will not return any bid, or any information provided along therewith.

20. EVALUATION OF THE PRICE BID

a. The price bid will be evaluated in accordance to the Tamil Nadu Transparency in Tenders Act 1998 read with the Tamil Nadu Transparency in Tenders Rules 2000. The bidder who has quoted the lowest rate for survey, design, supply, installation, commissioning, testing and end to end network integration of all equipments and accessories put together along with operation and maintenance of the last mile network for a period of 3 years (i.e. Part A + Part B) will be adjudged as L1.

b. In the price bid, front loading of O&M cost will not be permitted. The O&M cost for 3 years should be minimum 20% of the total cost (i.e. Part A + Part B). In case if any tenderer quotes less than 20% of total cost (i.e. Part A + Part B), then 20% of total cost (i.e. Part A + Part B) will be treated as O&M cost and Part-A cost shall be readjusted to the tune of 80% of total cost (i.e. Part A + Part B) and payments will be released accordingly.

c. The rate for operation & maintenance support for additional 2 years (i.e. for 4th and 5th year) i.e. Part C is asked only for the purpose of price discovery and the option of purchasing the same is solely vested with TANFINET based on the need in future.

21. AWARD OF CONTRACT

a. The bidder who is adjudged as L1 will be invited for price negotiations for further reduction of rates.

b. Upon finalization of negotiated rate, TANFINET will issue the Letter of Acceptance (LoA) to the successful bidder.

c. As per Clause 14(9) of Tamilnadu Transparency in Tender Rules 2000, TANFINET may increase or decrease the order quantity upto 25% on same terms and conditions.

d. Validity of the price approved by TANFINET for Part-A shall remain the same until one year from date of Go-Live.

22. SECURITY DEPOSIT

a. On receipt of the Letter of Acceptance from TANFINET, the successful bidder should remit a Security Deposit (SD) of 5% of the value of Part–A in the form of an irrevocable Bank Guarantee with a validity period of 24 months from any Indian Nationalized Bank, within 10 (Ten) working days from the date of receipt of letter of acceptance.

b. If the Security Deposit amount is not paid within the time specified, the EMD remitted by the bidder shall be forfeited, besides cancelling the communication of acceptance of the Tender.

c. Any amount pending with TANFINET will not be adjusted under any circumstances, against the Security Deposit if so requested.

23. AGREEMENT

a. The successful bidder should execute an agreement as may be drawn up to suit the conditions on a non-judicial stamp paper of value, as prescribed in law and shall pay for all stamps and legal expenses incidental thereto. In the event of failure to execute the agreement, within the time prescribed, the SD/EMD amount remitted by the bidder will be forfeited besides cancellation of the Tender.

b. If the contract is not executed as per the agreed terms and conditions, TANFINET will hold full authority to cancel the agreement or take any such action that will be deemed fit to the occasion at the risk and cost of the successful bidder. Such cancellation will entail forfeiture of SD.

c. In the event of non- performance of the contractual provisions and if the selected bidder, has not fulfilled the contractual obligation with TANFINET in any manner during the currency of the contract or also found on later date,

TANFINET reserves the right to disqualify such bidder to participate in future tenders or black list the company upto a maximum period of 3 years.

24. CONTRACT VALUE AND CONTRACT PERIOD

a. For the purpose of this contract, the value of the contract is defined as the sum of the Part A of the Price Bid + Part B of the Price Bid.

b. Contract Period is defined as the sum of the implementation and operation & maintenance period i.e. 9 months + 3 years.

c. Upon successful completion of the contract period, TANFINET at its discretion shall extend the contract period for a further period of 2 years or part thereof by entering into a new agreement based on the operation & maintenance charges finalized for years 4 and 5.

25. APPROVAL OF DESIGN AND BOQ

a. After payment of Security Deposit and successful execution of the agreement, the bidder should do a site survey of all the Offices in Blocks, GPs and District Headquarters and submit the design and BOQ requirements to TANFINET as per the timeline specified in Clause 28(b).

b. The design and BOQ will be evaluated by the technical committee / authorized representative /authorized agency identified by TANFINET for its appropriateness and approval will be given accordingly.

26. ISSUE OF WORK ORDER

Work order will be issued by TANFINET for the approved quantity.

27. WARRANTY

a. The respective Original Equipment Manufacturer (OEM) through Bidder shall provide a comprehensive on-site warranty on all goods supplied under this contract till the Contract period. The warranty shall include replacement of all equipment for reasons except theft and physically damaged/lost (repair not possible) for reasons not attributable to Bidder. The Replacement/repair under warranty clause shall be made by the Bidder free of all charges at site including freight, insurance, cost of works and other incidental charges.

b. The Bidder shall warrant that the goods supplied under the Contract are new, non-refurbished, unused and recently manufactured; shall not be nearing End of Sale/End of Support; (through Self Certification from the respective OEM) and shall be supported by the Bidder and respective OEM along with service and spares support for next 3 years from the date of Go-Live to ensure its efficient and effective operation for the entire duration of the contract.

c. The Bidder warrants that the goods supplied under this contract are complying the standards and quality specified by the tender documents and consisted with the established and generally accepted standards for materials of this type. The goods shall be in full conformity with the specifications and shall operate properly and safely. All recent design improvements in goods, unless provided otherwise in the Contract, shall also be made available.

d. The Bidder further warrants that the Goods supplied under this Contract shall be free from all encumbrances and defects/faults arising from design, material, manufacture or workmanship (except insofar as the design or material is required by the Purchaser's Specifications)

e. TANFINET shall promptly notify the Bidder in writing of any claims arising under this warranty.

f. Upon receipt of such notice, the Bidder shall, as per the SLA mentioned in Tender, repair or replace the defective Goods or parts thereof, without prejudice to any other rights which TANFINET may have against the Bidder under the Contract.

g. If the Bidder, having been notified, fails to remedy the defect(s), within a reasonable period in consonance with the SLA and remove the defective parts from site within fifteen (15) days, TANFINET may proceed to take such remedial action as may be necessary, at the Bidders risk & expense and without prejudice to any other rights which TANFINET may have against the Bidder under the Contract.

h. During the warranty period, the Bidder shall provide all product(s) and documentation updates, patches/fixes, and version upgrades within 30 days of their availability and should carry out installation and make operational the same at no additional cost to TANFINET.

i. For the better and fast maintenance and recovery of faults, Bidder shall propose to have sufficient spares in each category, and confirm the availability of such spares in warehouse and maintain the same in inventory management tool.

j. All installed equipments should have an onsite warranty at all locations against manufacturing defects and bad workmanship solely by the successful bidder irrespective of whether the same have been manufactured by them or not.

k. All equipments should be supplied to the designated locations free from breakages, malfunctions, manufacturing defects. If any is found defective due to manufacturing defect or design fault or transit damage occurred at the time of supply or within the same should be replaced.

l. During warranty period, the successful bidder should attend any call from TANFINET immediately, in case of any problems, related to operation or malfunctioning of equipments supplied, without any delay for regular functioning of the equipments. The above service should be done at Free of cost.

28. SCHEDULE OF IMPLEMENTATION

a. The specification of the equipments to be supplied should be as per Annexure-I.

b. The successful bidder shall adhere to the following timelines:

Date of Signing of Agreement	**S**
Submission of site survey report including design and BOQ requirements	
~ At atleast 3,000 Government Offices	S+30 days
~ At atleast 10,000 Government Offices	S+60 days
~ At atleast 19,000 Government Offices	S+90 days
Supply, installation, commissioning and testing of Aerial OFC/ Underground OFC along with all active and passive components and end to end network integration	
~ At atleast 1,000 Government Offices	S+90 days
~ At atleast 3,000 Government Offices	S+120 days
~ At atleast 6,000 Government Offices	S +150 days
~ At atleast 10,000 Government Offices	S +180 days

~ At atleast 12,000 Government Offices	S +210 days
~ At atleast 15,000 Government Offices	S +240 days
~ At atleast 19,000 Government Offices	S +270 days

c. Any delay beyond the period specified in Clause 28(b) will attract penalty as per clause 32.

d. If the contract is not completed within the stipulated time or extended time, TANFINET will hold full authority to cancel the tender or take any such action that will be deemed fit to the occasion at the risk and cost of the successful bidder. Such cancellation will entail forfeiture of Security Deposit.

e. In the event of non- performance of the contractual provisions or failure to effect the supply within the stipulated time or during the extended period and if it is found that the Contractor, has not fulfilled the contractual obligation with TANFINET in any manner during the currency of the contract or also found on later date, TANFINET reserves the right to disqualify such supplier to participate in future tenders or black list the firm up to a maximum period of 3 years.

29. ACCEPTANCE TEST

a. The successful bidder shall demonstrate the performance of the installed equipments in complete conformity with the relevant technical specifications and performance parameters.

b. The acceptance test procedure shall be carried out as stipulated in Annexure -III.

30. PERFORMANCE BANK GUARANTEE

a. The supplied equipments and its accessories are to be given warranty/maintenance support for a period of 3 years from the date of Go-Live at all locations.

b. A performance bank guarantee equivalent to 10% of the contract value with a validity period of 3 years and 6 months from any Indian Nationalized bank has to be submitted.

c. Upon the complete fulfillment of this contract by the successful bidder to the satisfaction of the TANFINET i.e. after completion of three year period, for the satisfactory performance of the equipments, the performance security (bank guarantee) furnished by the bidder will be released, after recovery of dues if any.

31. PAYMENT TERMS

a. Mobilization advance up to 10% of Part-A shall be paid upon specific request of the bidder and submission of Bank Guarantee for 110% of the value of mobilization advance from Indian Nationalized Bank with a validity period of 1 year and 6 Months from the date of sanction of the mobilization advance.

b. The mobilization advance will be recovered in the payments to be made for the bills. In other words, payments for the bills will be made only after recovering the mobilization advance in full.

c. The payment to the bidder (Part - A) for the Go-Live locations will be made in the following manner:

   i. 80% of the payment will be made after Go-Live of a location and acceptance by TANFINET read with clause (d) below.
   ii. The balance 10% will be released after Go-Live at all locations acceptance by TANFINET.
   iii. The balance 10% will be released after Go-Live at all locations, acceptance by TANFINET and submission of bank guarantee equivalent to 10% of the contract value valid for 3 years towards performance guarantee and submission of proof for payment of taxes to the Govt. as per invoice.

d. Payments shall be made by TANFINET in every 15 days interval for the number of Go-Live locations accepted by TANFINET provided the number of Go-Live locations per invoice shall be minimum of 500 and the payments shall ordinarily be made within 10 days from the date of receipt of Delivery challan and Installation, Commissioning and Testing certificate from authorized agency of TANFINET for each location complete in all respects along with invoice.

e. If the Bidder fails to furnish necessary supporting documents i.e. GST invoice etc. and also fails to upload the information on GSTN in respect of

the Duties/taxes for which input tax credit is available, the amount pertaining to such Duties/Taxes will be deducted from the payment due to the Bidder.

f. Tax amount will be paid to the Bidder only after the Bidder declares the details of the invoices in its return in GSTR-1 and GSTR-3 uploaded by the Bidder and the same is reflected in GSTR-2A of TANFINET Corporation on GSTN portal.

g. TDS/TCS shall be deducted at the prescribed rate, if any (as the case may be).

h. TANFINET shall adjust/ forfeit Bank Guarantee obtained from the Bidder against any loss of input tax credit to TANFINET on account of Bidder's default.

i. In case TANFINET has to pay GST on reverse charge basis, the Bidder would not charge GST on its invoices. Further, the Bidder undertakes to comply with the provisions of GST law as may be applicable.

j. Note: The material cost for OFC shall be paid as per the physical length and the service costs like trenching & ducting and aerial slinging is applicable only for route length and not on the fiber length.

k. Upon successful Go-Live at all locations and acceptance by the Managing Director of TANFINET or by the Committee authorized by him or the agency identified by TANFINET, SD will be released.

l. For operation and maintenance, payment will be made proportionately on quarterly basis after satisfactory completion of maintenance for the respective quarter certified by the agency identified by TANFINET.

m. Upon successful completion of the O&M period of 3 years, Performance Bank Guarantee will be released.

n. TANFINET also reserves the right to recover any dues from the bidder, which is found on later date, during audit/excess payment, after final settlement is made to them. The bidder is liable to pay such dues to TANFINET immediately on demand, without raising any dispute/protest.

32. PENALTY

a. Failure to complete the site survey including design and BOQ requirements within the stipulated timeline (as per clause 28(b)) will attract a penalty of ₹500 per office/location per week on the unfulfilled portion upto a maximum of ₹2000 per office/location. Delays beyond that period will result in cancellation of the orders. Delays not attributable to the bidder would be exempted in calculation of penalty.

b. Failure to complete the supply, installation, commissioning and testing of Aerial OFC/ Underground OFC along with all active and passive components and end to end network integration within the stipulated timeline (as per clause 28(b)) will attract a penalty of ₹2500 per office/location per week on the unfulfilled portion upto a maximum of ₹10,000 per office/location. Delays beyond that period will result in cancellation of the orders. Delays not attributable to the bidder would be exempted in calculation of penalty.

c. Performance and service levels during the O&M period and Implementation period (for commissioned locations) shall be as per the parameters stipulated in Annexure IV, failing which Penalties will be levied as defined in the Tender.

33. LIQUIDATED DAMAGES

a. The Bidder shall perform the Services and comply in all respects with the critical dates and agrees that failure on part of the Bidder to meet the critical dates without prejudice to any other rights that TANFINET have, may lead to levy of penalty as set and/or termination of the Contract at the discretion of TANFINET.

b. Penalty shall be capped to a maximum 10% of Part-A for implementation activities and 10% of Part-B for O&M activities. Beyond the maximum penalty, TANFINET has the right to terminate the contract or a portion or part of the work thereof. TANFINET shall give 30 days' notice to the Bidder of its intention to terminate the Contract and shall so terminate the Contract unless the Bidder initiates remedial action acceptable to TANFINET during the 30 days' notice period.

c. TANFINET may without prejudice to its right to effect recovery by any other method, deduct the amount of penalties from any amount belonging to the

Bidder in its hands (which includes Security Deposit / Performance Bank Guarantee and the withheld amounts during payments) or which may become due to the Bidder. Any such recovery or penalties shall not in any way relieve the Bidder from any of its obligations to complete the Works or from any other obligations and liabilities under the Contract.

34. SUSPENSION OF WORK

a. The Bidder shall, if ordered in writing by TANFINET, temporarily suspend the works or any part thereof for such a period and such a time as ordered, then the Bidder shall not be entitled to claim compensation for any loss or damage sustained by him by reason of temporary suspension of the Works as aforesaid but shall be eligible for the payment (of products/services delivered and accepted) during the suspension period as per contract.

b. An extension of time for completion, corresponding with the delay caused by any such suspension of the works as aforesaid shall be granted to the Bidder, if request for same is made and that the suspension was not consequent to any default or failure on the part of the Bidder.

c. In case the suspension of works is not consequent to any default or failure on the part of the Bidder and lasts for a period of more than 2 months, the Bidder shall have the option to request TANFINET to terminate the Contract with mutual consent.

d. In the event that TANFINET suspends the progress of work for any reason not attributable to the Bidder for a period in excess of 30 days in aggregate, rendering the Bidder to extend his Bank Guarantee, then TANFINET shall bear only the cost of extension of such bank guarantee for such extended period restricted to the normal bank rates as applicable subject to the Bidder producing the requisite evidence from the bank concerned.

35. TERMINATION OF CONTRACT

TANFINET reserves the right to terminate the contract at any time during the validity period on account of non-fulfillment of contract.

36. FRAUD AND CORRUPT PRACTICES

a. The bidders and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Bidding Process. Notwithstanding anything to the contrary contained herein, TANFINET may reject a tender without being liable in any manner whatsoever to the bidder if it determines that the bidder has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bidding Process.

b. Without prejudice to the rights of TANFINET under Clause 36(b) hereinabove, if a bidder is found by TANFINET to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the Bidding Process, such bidder shall not be eligible to participate in any bid or tender issued by TANFINET for a period of 2 (two) years from the date such bidder is found by TANFINET to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as the case may be.

c. For the purposes of this Clause, the following terms shall have the meaning hereinafter respectively assigned to them:

   i. "corrupt practice" means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bidding Process (for avoidance of doubt, offering of employment to, or employing, or engaging in any manner whatsoever, directly or indirectly, any official of TANFINET who is or has been associated in any manner, directly or indirectly, with the Bidding Process or the LOA or has dealt with matters concerning the contract or arising there from, before or after the execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of TANFINET, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process); or (ii) save and except as permitted under clause 6(c), engaging in any manner whatsoever, whether during the Bidding Process or after the issue of the LOA or after the execution of the Agreement, as the case may be, any person in respect of any matter relating to the Project or the LOA or the Agreement, who at any time has been or is a legal, financial

or technical adviser of TANFINET in relation to any matter concerning the Project;

ii. "fraudulent practice" means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process;

iii. "coercive practice" means impairing or harming or threatening to impair or harm, directly or indirectly, any person or property to influence any person's participation or action in the Bidding Process;

iv. "undesirable practice" means (i) establishing contact with any person connected with or employed or engaged by TANFINET with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bidding Process; or (ii) having a Conflict of Interest; and

v. "restrictive practice" means forming a cartel or arriving at any understanding or arrangement among bidders with the objective of restricting or manipulating a full and fair competition in the Bidding Process.

37. FORCE MAJEURE

a. Force Majeure means an event beyond the control of the bidder and not involving the bidder's fault of negligence and not foreseeable. Such event may include but not limited to the acts of Nature such as fire, flood, epidemic, etc., and other events such as wars, revolutions, quarantine restrictions, etc. (Cyclones that are not above the speed of 100 km/h shall not be considered as force majeure).

b. If a Force Majeure situation arises, the bidder shall promptly notify TANFINET of such conditions and the causes thereof through e-mail within 5 days of such event. Unless otherwise, directed by TANFINET in writing, the bidder shall continue to perform his obligations under the Contract to a reasonably practical extent and shall seek all reasonable alternative means for effective performance of the Contract in time.

c. The bidder, to the extent rendered unable to perform its obligations or part thereof under the Agreement as a consequence of the Force Majeure Event shall be excused from performance of the obligations. Provided that, the

excuse from performance shall be of no greater scope and of no longer duration than is reasonably warranted by the Force Majeure Event.

d. The bidder should bear its costs, if any, incurred as a consequence of the Force Majeure Event.

e. The bidders shall be granted, extension of time specified in the contract for the performance of any obligation by such period not exceeding the period during which the relative performance was affected by the Force Majeure Event and permissible under Applicable Law.

38. GENERAL CONDITIONS

a. Conditional tender in any form will not be accepted.

b. TANFINET reserves the right to relax or waive or amend any of the tender conditions.

c. The right of final acceptance of the tender is entirely vested with TANFINET and reserves the right to accept or reject any or all the bidder in part or in totality or to negotiate with any or all the bidders or to withdraw/ cancel/ modify this tender without assigning any reason whatsoever.

d. After acceptance of the tender by TANFINET, the bidder will have no right to withdraw his tender.

e. Pre-dispatch Inspection: The equipment should be strictly in accordance with the technical specification as per tender document. In case the equipment do not meet the specification, orders will be cancelled besides forfeiture of SD.

f. If performance of the bidder is not as per the schedule, then the TANFINET reserves the right to reallocate full/part order to other qualified bidders. Any additional cost incurred by TANFINET due to such reallocation should be borne by the bidder

g. TANFINET will not have any liability towards the manpower appointed by the bidder for implementation of the project.

h. Any notice regarding any problems, to the bidder shall deemed to be sufficiently served, if given in writing at his usual or last known place of business.

i. Conditions during implementation period

   i. The Bidder shall undertake implementation immediately after the acceptance of LoA by TANFINET.

   ii. The delay in commissioning due to non-understanding of issues on ground and potential threats not identified during the time of site survey shall be counted as delay for calculation of Penalty.

   iii. The delay in commissioning due to RoW issues of Central Government and Central PSUs shall not be counted as delay for calculation of Penalty.

   iv. The date of submission of fully complete commissioning report by Bidder shall be considered for calculating Penalty.

   v. In case the commissioning or the commissioning reports are incomplete and not in the formats or returned/rejected by TANFINET / by any agency appointed by TANFINET for any reason to be recorded by them, then the delay shall be counted as delay for calculation of Penalty.

   vi. Bidder shall maintain the SLA for the commissioned location and penalty is applicable for non-maintenance of SLA within specified limits.

j. Conditions implacable in O&M period

   i. Bidder shall not ordinarily remove any trained person positioned on the ground for maintenance during the entire period of contract without valid reasons.

   ii. Bidder shall provide each person with the standard and quality tool kits and accessories as required.

   iii. Bidder shall respond to the tickets and requests from the OSS tool integrated with external applications like mobile app and undertake required activities.

   iv. All operational activities are under the scope of the Bidder at no additional cost during the warranty and O&M period.

v. Regular maintenance activities such as patrolling, clearing branches of trees that may fall on Aerial fiber, adjusting for tension, checking the joint enclosures, joint indicators, man holes, undertaking preventive and corrective maintenance of the equipment and accessories shall be undertaken.

vi. All the activities related to Road widening shall be excluded from SLA and network uptime calculation.

vii. In case of theft/physically damaged (repair not possible) by reasons not attributable to Bidder or its agents, the equipment shall be replaced on TANFINET's cost after due recommendation of designated representative of TANFINET. In case of theft, such requests for replacements shall be submitted by the Bidder along with the copy of FIR lodged. In such cases, TANFINET will pay for material cost only.

viii. If the OFC cable cut is such that the cable has been damaged for distance more than 10 meter by any external agency, then TANFINET shall bear cost of cable/PLB after due recommendation of designated representative of TANFINET. TANFINET will pay for material charges only.

ix. If the pole has fallen or replaced by electricity department/external agency and cable has been damaged such that it cannot be used further, then TANFINET shall bear the cost of cable, Pole (if required) and other pole kits after due recommendation of designated representative of TANFINET. The cost of workmanship and other store like jointing kits etc. shall be borne by Bidder.

x. The cost of materials and services for pre-notified planned shifting of network / OFC route due to other reasons like widening of road, construction of bridges or asked by central / state authorities (Forest/PWD/NHAI/Railway etc.) or any location operational reasons will be paid by TANFINET after due recommendation of designated representative of TANFINET.

k. Indemnity

The Bidder shall fully indemnify and defend TANFINET and its representatives & employees and hold TANFINET, its representatives, employees harmless from:

i. Damages and losses caused by its negligent or intentional act or omission or any damages and losses caused by the negligent act of any third party or sub-contractor or agency engaged by the Bidder;

ii. Damages or compensation payable at law in respect of or in consequence of any accident or injury to any workman or other person engaged by Bidder or sub- Contractor.

iii. Damages and losses resulting from the non-compliance with the established obligations; Third Party claim against TANFINET or its nominated agency that any Deliverables/Services/Equipment provided by the Bidder infringes a copyright, trade secret, patents or other intellectual property rights of any third party in which case the Bidder shall defend such claim at its expense and shall pay any costs or damages that may be finally awarded against TANFINET or its nominated agency.

iv. If any Deliverable is or likely to be held to be infringing, the Bidder shall at its expense and option either (i) procure the right for TANFINET to continue using it, or (ii) replace it with a non-infringing equivalent, or (iii) modify it to make it non- infringing.

v. Any environmental damages caused by it and/or its representatives or employees or employees of any third party or sub-contractor or agency engaged by the Bidder.

vi. Breach (either directly by it or through its representatives and/or employees) of any representation and guarantee declared herein by it;

vii. From any and all claims, actions, suits, proceedings, taxes, duties, levies, costs, expenses, damages and liabilities, including attorneys' fees, arising out of, connected with, or resulting from or arising in connections with the services provided due to neglect omission or intentional act.

viii. Any liability or penalty (including taxation issues) which may be imposed by the Central, State or Local Authorities.

ix. The selected Bidder shall sign a deed of Indemnity in terms of the above.

l. Labour Welfare & Laws:

i. The Bidder or their contractor shall ensure strict compliance of the provisions of various Acts/ Rules like Workmen's Compensation Act, Contract Labour (Regulation & Abolition) Act, Contract Labour (Regulation & Abolition) Rules, Payment of Wages Act, Minimum Wages Act, Employees Liability Act, Industrial Dispute Act, Maternity Benefits Act, and any other Act or Rules as applicable.

ii. The Bidder or their contractor shall ensure strict compliance of the provisions of EPF and ESI Acts. A comprehensive Group Insurance shall be ensured for workers/ labourers not covered under EPF & ESI.

iii. The Bidder or their Contractors shall indemnify and keep indemnified TANFINET against payments/ claims to be made under and for the observance of all the laws aforesaid.

iv. The aforesaid laws and acts shall be deemed to be a part of this Tender document and any breach thereof shall be deemed a breach of contract on the part of the Bidder or their Contractors.

v. Any failure to fulfil the above requirements shall also attract the penal provisions of this Contract.

39. EXIT MANAGEMENT PLAN

a. The Bidder shall provide TANFINET with a recommended "Exit Management Plan" within 90 days from the date of issue of LoA which shall deal with the aspects of exit management in relation to the Agreement as a whole and in relation to the project Implementation, and the O&M.

b. The Bidder shall redraft the Exit Management Plan annually thereafter to ensure that it is kept relevant and up to date and shall be provided to TANFINET.

c. Each Exit Management Plan shall be presented by the Bidder to and approved by TANFINET.

d. In case the contract period is extended, the Bidder shall extend the contract under the same terms & conditions of the original contract.

e. If TANFINET decides to not extend the contract, a committee consisting of representatives from TANFINET and key resource persons of Bidder as required shall be formed.

f. The committee should be formed at least 6 months before the end of contract period.

g. The committee will define the structure, methodology and resources to carry out the operations and maintenance after exit of Bidder as applicable.

h. Under the supervision of the committee, a team of personnel from the Bidder shall undertake the knowledge transfer. Bidder shall educate and train the new agency/personnel on all operations and maintenance including aspects such as security, confidentiality, record keeping, etc.

i. The knowledge transfer, training and handing over should happen to the satisfaction of the new agency and TANFINET.

j. The new agency may make an offer of employment or contract for services to such employee of the Bidder and the Bidder shall not enforce or impose any contractual provision that would prevent any such employee from being hired by new agency.

k. In the case of termination of the Project during the Implementation phase or during O&M phase the exit management provision shall apply for 6 months from the date agreed between TANFINET and Bidder.

l. The exit management process shall comprise the following activities (illustrative not exhaustive) and the same shall be covered in the exit management plan to be shared by Bidder.

    i. Providing all documents maintained by the Bidder including records and data related to customers and operations and the Bidder shall not retain any copies thereof

    ii. To handover all assets owned by TANFINET in good shape

    iii. Providing list of problems and risks pertaining to the location and services

iv. Provide access to the staff/personnel of the new agency including sharing of user IDs and passwords

v. Identify all third-party contracts and licenses owned or operated by Bidder into those that are transferable (with associated costs) and transfer them on terms not less favourable to TANFINET/new Agency than that enjoyed by the Bidder

vi. For those third-party contracts and licenses that are not transferable, Bidder must provide an alternative

vii. Provide any relevant documentation pertaining to transferable contracts/licenses as required by the new agency

m. General

i. The Bidder shall provide all such information as may reasonably be necessary to effect as seamless a handover as practicable in the circumstances to TANFINET or new agency and which the Bidder has in its possession or control at any time during the exit management period.

ii. The Bidder shall commit adequate resources to comply with its obligations under this Exit Management Schedule.

iii. During the exit management period, the Bidder shall use its best efforts to deliver the services.

40. ARBITRATION

a. In case of any dispute in the bid, including interpretation if any on the clauses of the bid or the agreement to be executed, the matter shall be referred by TANFINET/ bidder to an arbitrator who shall be selected by the bidder from the panel of arbitrators approved by TANFINET the same within 15 days, from the date of receipt of the letter from the TANFINET along with the panel. If there is no reply from the bidder within 15 days, TANFINET shall choose any of the arbitrators from the panel of arbitrators referred to above. The remuneration for the arbitrator and other expenses shall be shared equally by TANFINET and the bidder.

b. The venue of the Arbitration shall be at the Head office of TANFINET, Chennai. The decision of the Arbitrator shall be final and binding on both the parties to the Arbitration.

c. The Arbitrator may with the mutual consent of the parties, extend the time for making the award. The award to be passed by the Arbitrator is enforceable in the Court at Chennai city only.

41. JURISDICTION OF THE COURT

Any dispute arising out of non-fulfillment of any of the terms and conditions of this Agreement or any other dispute arising out of the arbitration award will be subject to the jurisdiction of the Courts in the City of Chennai only.

We agree to the above terms and conditions.

SIGNATURE OF THE BIDDER:

DATE:

NAME IN BLOCK LETTERS:

DESIGNATION:

ADDRESS:

ANNEXURE – I

SOLUTION ARCHITECTURE AND DETAILED SPECIFICATIONS

1. Introduction

1.1. Background

Tamil Nadu FibreNet Corporation (TANFINET), is a Special Purpose Vehicle formed by Govt. of Tamilnadu (GoTN), as the nodal agency for implementation of the BharatNet Phase II project in the State. BharatNet is a project initiated by the Government of India and funded by Universal Service Obligation Fund (USOF), with an aim to provide broadband connectivity to Gram Panchayats. BharatNet project will form the basic platform for the provision of several services like e-governance, e-health, e-commerce, e-banking, video on demand, etc. The BharatNet project envisages to provide high-speed broadband connectivity to 12,525 GP through Optical Fiber Cable from Blocks. As part of BharatNet project, the OFCs are laid from Block to GP through aerial and in underground mode. (In aerial, ADSS 48F and 24F cable are being laid over existing electricity poles whilst in underground, 96F cable are being laid). Through BharatNet, each district would have one or more number of Block rings with capacities of 100Gbps and each Block would have one or multiple GP rings of 10Gbps capacity. Each GP will have dedicated six dark fibers and 1 Gbps of bandwidth.

The project is divided into 4 packages (Package A, B, C and D), executed by four different contractors. The District wise distribution of the project is mentioned in the table below

Package A	Package B	Package C	Package D
Kancheepuram	Cuddalore	Nagapattinam	Kanniyakumari
Tiruvallur	Ariyalur	Thanjavur	Madurai
Vellore	Perambalur	Tiruvarur	Ramanathapuram
Krishnagiri	Dharamapuri	Pudukottai	Theni
Chengalpattu	Kallakurichi	Namakkal	Thoothukkudi
Chennai (NOC)	Salem	Karur	Tirunelveli
Ranipet	Erode	Coimbatore	Virudhunagar
Tirupattur	The Nilgiris	Tiruppur	Tenkasi
Tiruvannamalai	Villupuram	Tiruchirappalli	Dindigul
		Mayiladuthurai	Sivagangai

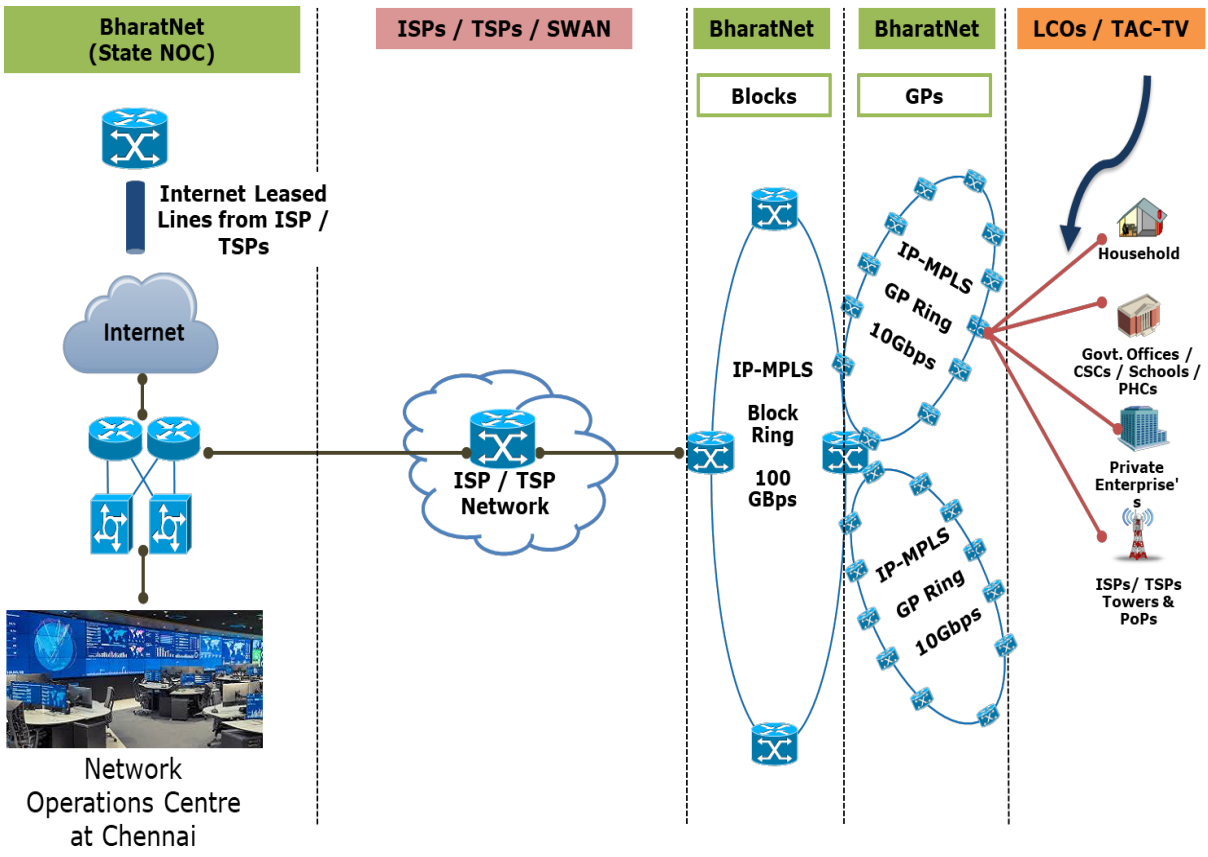
Package wise distribution of blocks, GP, Fiber is mentioned below in the table:

Package	No. of Blocks	No. of GPs	Aerial OFC (in km) (48F/24F ADSS)	UG OFC (in km) (96F)
A	75	3095	12,221	1696
B	94	3001	12,142	1558
C	110	3326	14,112	1438
D	109	3103	12,703	1924
Total	**388**	**12525**	**51,178**	**6616**

BharatNet is an IP-MPLS based network with 10Gbps Gram Panchayat ring and 100 Gbps Block level rings. Aggregation blocks are currently connected to State NoC through ISP links. The GP rings would have a maximum of 14 GPs in a Physical Ring (Including GP connected in Spur or Linear). A logical GP ring (10 Gbps) would contain a maximum of 7 GPs. Six cores of dedicated dark fibers are dropped at each GP from the Block. The Block Ring connectivity is planned as Dual – Homed architecture i.e. GPs that are situated on the same route would be connected between Blocks.

Block rings would have maximum six Blocks in a ring. Two adjacent blocks will be connected using either 96F Underground OFC or 48F Aerial optical fiber cable. The Block ring capacity would be 100Gbps. Aggregation blocks are nodes in which more than one block ring intersects. Aggregation blocks are currently connected to ISP network to take traffic up to NoC.

The Block and GP layer are majorly in ring configuration and it uses IP-MPLS technology. Currently, it is envisaged that the traffic aggregated from Blocks would reach NOC at ELCOT, Perungudi through ISP links. The current network architecture is at Figure below



2. Project Requirement

The infrastructure created under the BharatNet project can be utilized for provisioning IP-MPLS/ broadband/internet services through Wi-Fi Hotspots, Fiber to the Home (FTTH) connections, leased lines, dark fiber, back haul to mobile towers, other emerging services, including triple play services.

Access to broadband primarily has three major components, i.e. availability (presence of a reliable network), affordability (capacity to pay a reasonable price for the expected benefits) and adoption (willingness to use or presence of compelling use cases).

Government has already invested in making available the network in rural and remote areas through BharatNet. Now, the same is required to be utilized to provide affordable connectivity services to end users.

To support the initiatives of BharatNet utilization, the Government is extending Last Mile Connectivity to Government Institutions such as School, Health Centre, Anganwadi, Police Station, Krishi Vikash Kendra, Post Office, Ration Shop etc.

It is planned to extend the last mile connectivity through OFC to various government establishments from Blocks or GP where the fiber has been laid as part of BharatNet, both in the upstream and the downstream (Govt offices near District headquarters including the offices currently served by TNSWAN).

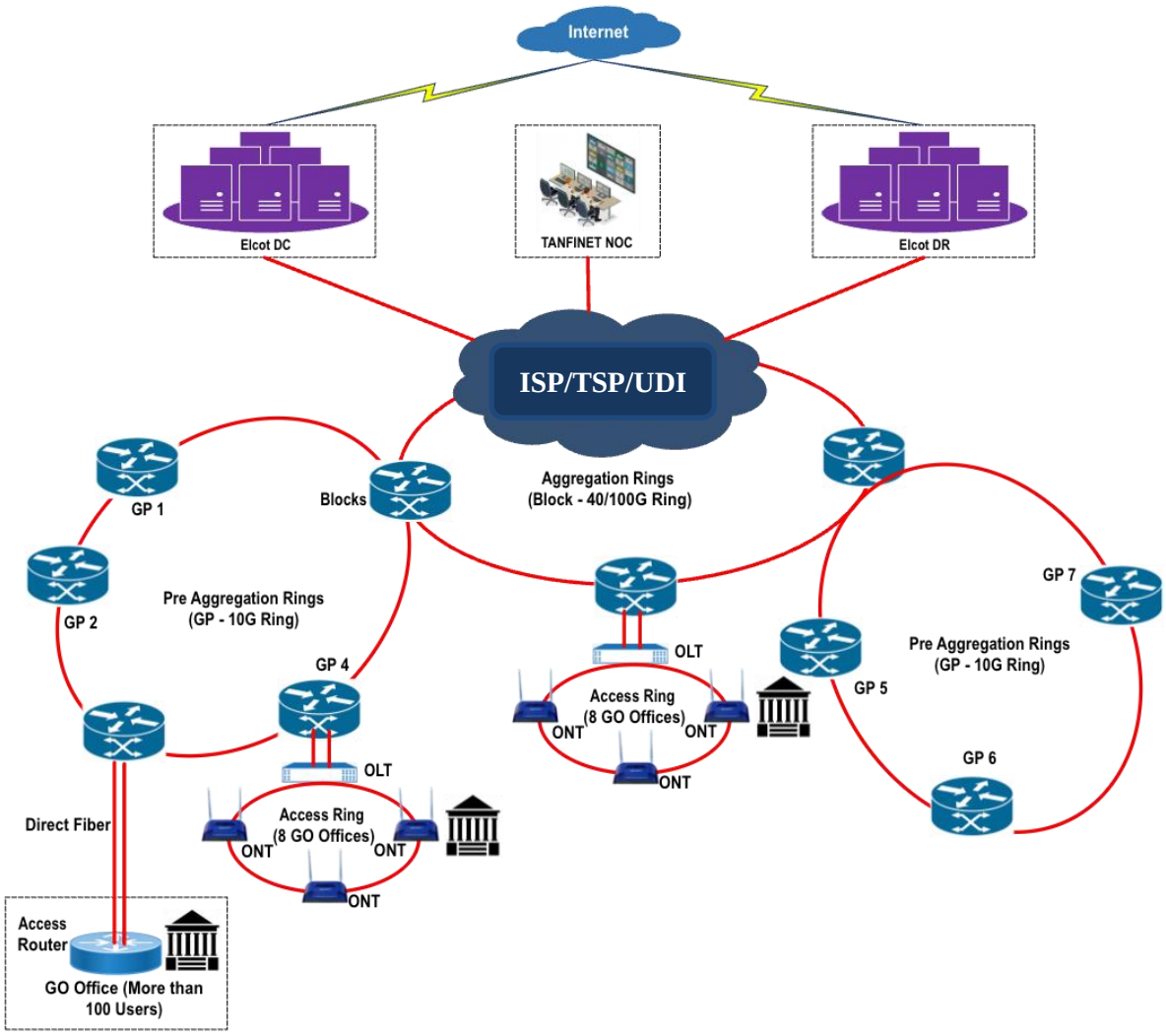
Upon extension of the OFC as Last Mile Connectivity, through this project, it is proposed to connect around 19,000 Government institutions/PHC/Schools near the Gram Panchayat/Block POP or District Headquarters of BharatNet. It is estimated that around 6,600+ Km of fiber laying would be required to accomplish the connectivity to around 19,000 locations. In addition, the fibers so laid across the GPs / Block or District headquarters could be used for providing dark fibers for other agencies - Local cable operators; tower fiberisation project of various telecom service providers etc.

Some of the key considerations used include:

- OFC network from GP / blocks / district headquarters to end user Govt. offices;
- OFC network from GP / blocks / district headquarters to connect government offices which are already connected through TNSWAN;
- GPs to various user location will have aerial or underground fiber connectivity;
- Fiber will be laid along TNEB routes wherever possible to avoid deployment of additional poles;
- 1Gbps capacity of Bandwidth available till GPs and speeds up to 1Gbps to be shared with end users (Govt. offices);
- Roll out e-Services in the state to increase uptake of internet connectivity and digitization.

3. Last Mile Connectivity Technologies

3.1 Overall Solution Architecture



It is proposed to lay the fiber from Block/GP to Government offices through following modes:

1. 6F/12F OFC Cable from each GP to end user location through Overhead OFC
2. 12F/24F OFC Cable from each Block to end user location through Overhead OFC
3. Wherever feasible, it is proposed to provide alternate routes (ring based architecture/alternate route method) from both GPs and Blocks location to serve different groups of government offices
4. In places where aerial fiber cable laying is not feasible; underground fiber cable laying is proposed.

5. The requirements have been analyzed and all Govt. offices with TNSWAN connectivity and other Govt. Offices which are within 1 Km radius of GP or block routers are intended to be connected to the TANFINET network.

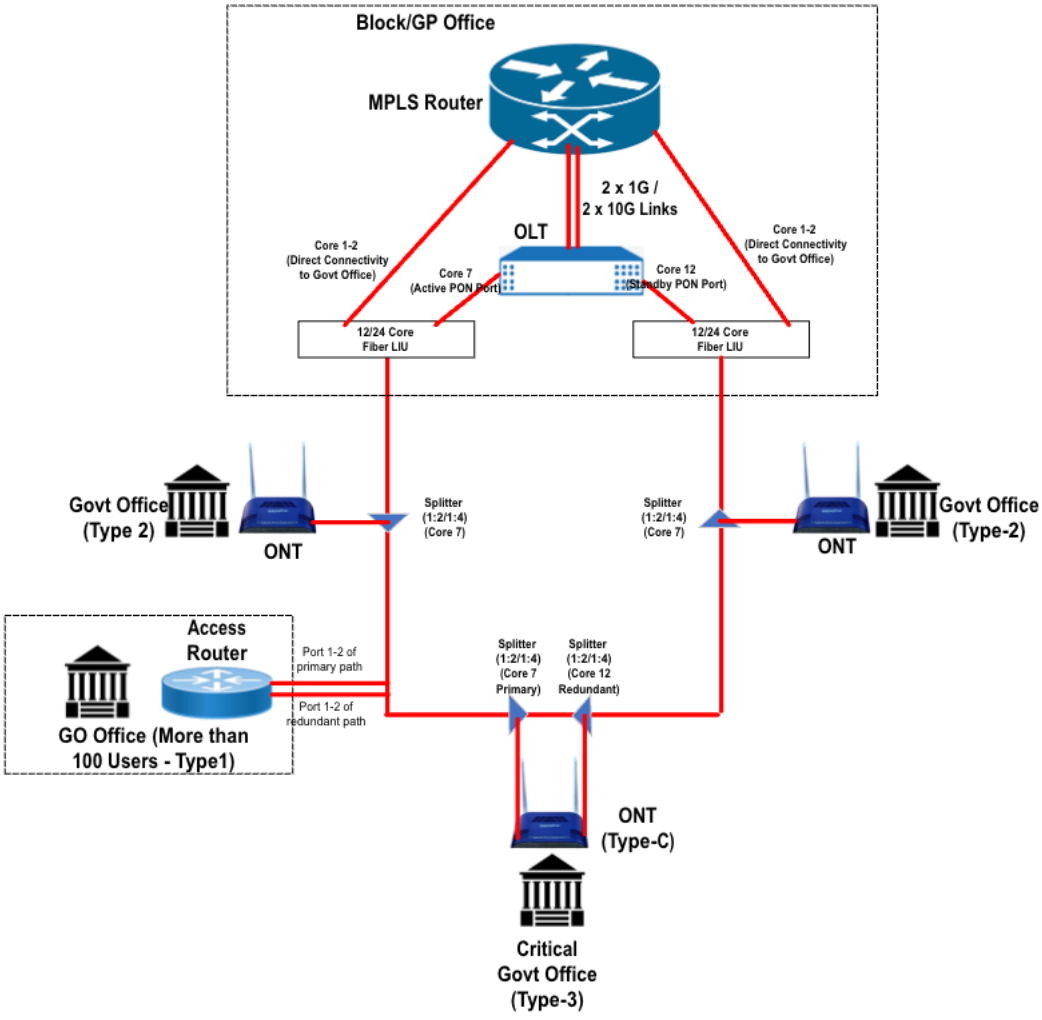
   There are two types of last mile connectivity technologies envisaged to provide robust, secure, private, reliable, high performance connectivity:

1. Direct Connectivity from existing Block/GP Router to large Government offices by allocating dark fibers (Typically for more than 100 users) and

2. GPON based connectivity from Blocks/GPs to Government offices

   In both the solution, it is proposed to have a fiber ring architecture to ensure high availability for critical offices.

3.2 GP/Block Level Solution Architecture



There are four type of Government offices envisaged to be connected within TANFINET framework and the same are as below:

S.No	Number of Users	Is connectivity critical for operations?	Type of offices	Technology	Remarks
1	More than 100	Yes	Type-1	Direct connectivity in MPLS router	Alternate path
2	More than 100	No	Type-2	Direct connectivity in MPLS router	No redundancy
3	Less than 100	Yes	Type-3	GPON solution with Type-C Protection	Alternate path
4	Less than 100	No	Type-4	GPON solution	No redundancy

4. Design Methodology

Bidder should consider the following while designing the connectivity rollout:

1. Number of Government Offices nearby GP or Block level
2. Type of Offices need to be connected
3. 100% Buffer core should be there while considering no. of fiber cores (6 Core, 12 Core, 24 Core) considering connecting different type of offices.
4. All the hardware and software supplied as part of this tender should support IPv4/IPv6/Dual Stack. The bidder must ensure, IPv4/IPv6/Dual Stack is implemented for all the hardware and software delivered as part of this tender.
5. First Priority to connect Offices which are connected through TNSWAN network
6. Second Priority to connect Government offices which are near GP/Block (1 to 3 KM Range) should be considered
7. Future expansions to Private Enterprise / Cable Operators for connecting households to give Triple play services

4.1. Block Level

Bidder should consider the following while designing the Block connectivity rollout:

1. OLT Types
   - 8 port OLT : Maximum 30 Offices near to the block level
   - 16 port OLT : More than 30 Offices near to the block level

2. Even though GPON port allows to connect 128 Offices at each port, it is advisable to connect maximum of 8 offices to give more bandwidth to each office and considering scalability requirement.

3. ADSS Fiber Cable
   - 12 Core Fiber : Maximum 30 Offices near to the block level
   - 24 Core Fiber : More than 30 Offices near to the block level
   - Multiple fiber runs of 12/24 core may be considered for higher density blocks/ geographically diverse locations
   - In a ring architecture, both the fiber ends should be terminated in two different LIUs.

4. Dedicated Fiber core allocation in the 12 /24 Core ring for Type-1 and Type-2 Offices

5. The current utilization including redundancy shall not be more than 50% i.e. 50% of the fiber cores installed shall be available for future requirements.

4.2. GP Level

Bidder should consider the following while designing the GP connectivity rollout:

1. OLT Types
   - 4 port OLT : Maximum 15 Offices near to the GP level
   - 8 port OLT : More than 15 Offices near to the GP level

2. Even though GPON port allows you to connect 128 Offices at each port. It is advisable to connect maximum of 8 offices to give more bandwidth to each office and considering scalability requirement

3. ADSS Fiber Cable
   - 6 Core Fiber: Maximum 15 Offices near to the GP level
   - 12 Core Fiber: More than 15 Offices near to the GP level

- Multiple fiber runs of 12/24 core may be considered for higher density blocks/ geographically diverse locations
- In a ring architecture, both the fiber ends should be terminated in two different LIUs.

4. Dedicated Fiber core allocation in the 6/12 Core ring for Type-1 and Type-2 Offices

6. The current utilization including redundancy shall not be more than 50% i.e. 50% of the fiber cores installed shall be available for future requirements.

4.3. DHQ (District Head Quarter) Level

The bidder shall lay 96 core underground OFC Cable from DHQ to the nearest Block and inter connect to the existing routers using 2X10G ports on each router.

5. Scope of Work

Bidder should carry out the following activities as part of this project:

1. Understand the current BharatNet Architecture and the technologies used in the network.
2. Identify and survey the nearest Block level office to provide connectivity to DHQ
3. Identify GP/Blocks which are required to be part of this project
    a. First priority is to connect offices which are currently connected through TNSWAN Network
    b. GP locations which are having more than 5 Government Offices
4. Site survey of priority locations (Offices connected through TNSWAN)
    a. Bidder should identify nearest GP / Block Locations
    b. Bidder should assess the other government offices connected through that particular GP/Block
5. Site survey of other locations
    a. Bidder should survey other GPs and Govt. offices which are having more than 5 Offices
    b. Bidder should survey GPs and Govt. offices which are part of government initiative (Example All TNHSP need to be connected etc.) or TANFINET Ad-Hoc requirement
6. Design each GP/Block architecture based on the above of design methodology
7. Co-ordinate with TANFINET and associated package vendors for Integration, migration, configuration and network provisioning aspects.

8. Prepare HLD/LLD along with detailed Bill of materials for each GP and Block level based on survey and shall get it approved from TANFINET.
9. Supply, Install/Lay, Implement, Integrate, Migrate, Test and Commission as per approved architecture.
10. Service configuration and modifications shall be the responsibility of Bidder during the implementation and O&M Phase.
11. Provide Operational and Maintenance services and maintain SLA.

6. Implementation Services

1. Bidder should carry out the following implementation activities at all Govt. Offices to be connected as part of this project:

    a. Provide Connectivity and ensure reachability to NOC
    b. Interface with TANFINET and TNSWAN team for IP Subnets, Gateway Information
    c. Co-ordinate with TANFINET/TANFINET Package Team for BSS and OSS Integrations
    d. Co-ordinate with TANFINET/TANFINET Package Team for creation of MPLS segmentation and Backbone configuration once connectivity is provided at Local GP/Block level
    e. Configure ONT/Access router as per Network Requirement
    f. Network Provisioning through centralized GPON EMS solution as per BSS requirements
    g. Verify end to end reachability
    h. Provide the details and SOP to the end user departments' IT/System admin for extending the connectivity to the Govt. office LAN.

2. Implementation and Integration Services at State NOC
    a. Supply, Install, Implementation of GPON EMS Solution for centralized OLT and ONT Provisioning (Zero Touch Provisioning) as per the technical specifications.
    b. Integration of GPON EMS Solutions with TANFINET Enterprise Management System (EMS) and BSS Solutions for provisioning and management services
    c. Integration of access router with TANFINET EMS Solutions.
    d. Integration with TANFINET helpdesk system for O&M and device fault management.
    e. Capture all the cable routes and all active & passive components in the TANFINET GIS system.

7. Indicative Bill of Materials

The following is indicative bill of materials used for price discovery purpose and actual bill of materials will vary based on site survey report and priority of TANFINET's connectivity requirements.

S.No.	BOQ	Qty	UOM
	At Blocks		
1	16 Port OLT with Dual PSU with 2 x 10G SFP	78	Nos
2	8 Port OLT with Dual PSU with 2 x 10G SFP	310	Nos
3	10G SR SFP Transceiver (OLT Side)	776	Nos
4	10G SR SFP Transceiver (MPLS Router side)	776	Nos
5	24 Port Fiber LIU (FDMS)	776	Nos
6	1G Singlemode SFP (MPLS Router side)	300	Nos
7	Multimode Fiber Patch cord – 3metres	776	Nos
8	Singlemode Simplex Patch cord – 3metres	2328	Nos
9	Aerial Optical Fiber Cable ADSS OFC 24 Core	1358	KM
10	Aerial Optical Fiber Cable ADSS OFC 12 Core	582	KM
11	Slinging / Laying of ADSS 6F/12F/24F core of Optical Fiber Cable on EB Poles or new Poles wherever required	1940	KM
12	Formed OFC Dead End & Termination Fittings @12 per km (Wedge Type)- Dead End Termination / Tensioning clamp assembly for the poles having cable angle deviation above 25 deg or at tension point/poles. (2 No-Anchoring clamp, 1 No-Pole Bracket, 1.5 Mtrs-Stainless Steel Strap, 2 Nos-Buckles) @ 3 per km — (Wedge Type - Type 3)	23280	Nos
13	OFC Suspension Fittings @ 8 per km (Wedge Type)	15520	Nos
14	Adjustable Cable Storage Bracket @5per km (One loop bracket 1.5 mtr stainless steel strap & 2 nos buckles) Wedge Type - Type 3	9700	Nos
15	Supply & Erection of GI pole as mentioned in Technical Specifications (6 metre)	3880	Nos
16	Straight Joint Closure / Branch Joint Closure @ one per 2 km+10% extra	1494	Nos
17	Splitter (1:4)	1552	Nos
	At GPs		
1	4 Port OLT with Single PSU with 2 x 1G SFP	1768	Nos

2	8 Port OLT with Dual PSU with 2 x 1G SFP	442	Nos
3	1G SR SFP Transceiver (OLT Side)	4420	Nos
4	1G Singlemode SFP	200	Nos
5	12 Port Fiber LIU (FDMS)	3536	Nos
6	24 Port Fiber LIU (FDMS)	884	Nos
7	Multimode Fiber Patch cord - 3M	4420	Nos
8	Singlemode Simplex Patch cord - 3M	4420	Nos
9	Aerial Optical Fiber Cable ADSS OFC 12 Core	1326	KM
10	Aerial Optical Fiber Cable ADSS OFC 6 Core	3094	KM
11	Slinging / Laying of ADSS 6F/12F/24F core of Optical Fiber Cable on EB Poles or new Poles wherever required	4420	KM
12	Formed OFC Dead End & Termination Fittings @12 per km (Wedge Type)- Dead End Termination / Tensioning clamp assembly for the poles having cable angle deviation above 25 deg or at tension point/poles. (2 No-Anchoring clamp, 1 No-Pole Bracket, 1.5 Mtrs-Stainless Steel Strap, 2 Nos-Buckles) @ 3 per km – (Wedge Type - Type 3)	53040	Nos
13	OFC Suspension Fittings @ 8 per km (Wedge Type)	35360	Nos
14	Adjustable Cable Storage Bracket @5per km(One loop bracket 1.5 mtr stainless steel strap & 2 nos buckles) Wedge Type - Type 3	22100	Nos
15	Supply & Erection of GI pole as mentioned in Technical Specifications	4420	Nos
16	Straight Joint Closure / Branch Joint Closure @ one per 2 km+10% extra	10578	Nos
17	Splitter (1:4)	4420	Nos
18	6U Rack	100	Nos
19	1KVA UPS	100	Nos
Government Offices - Type 3 & 4			
1	ONT without WIFI including Splitter	17560	Nos
2	ONT with WIFI including splitter	500	Nos
3	ONT with Redundancy (Type 3)	500	Nos
4	Fiber enclosure kit	18560	Nos
5	Fiber Patch cord (Simplex)	18560	Nos
Government Offices - Type 1 & 2			
1	Access Router along with two Single Mode SFP	250	Nos
2	12 Port Fiber LIU (FDMS)	250	Nos

3	Fiber Patch cord	500	Nos
4	Rack	100	Nos
State NOC			
1	Servers and Storage for EMS Solution	1	Lot
2	GPON EMS Application Software	1	Lot
Installation Services			
1	Block Installation Services	388	Lot
2	GP Installation Services	2210	Lot
3	State NOC EMS Implementation and Integration Services with TANFINET Enterprise Management System and BSS Solutions	1	Lot
4	Installation and Integration services at each government office	18310	Nos
Underground Fiber Cabling (DHQ to Nearest Blocks for TNSWAN)			
1	Underground Optical Fiber Cable 96 Core Ribbon Type	300	KMS
2	Supply and installation of DWC Pipe (75/61mm) @ 100m per km	30	KMS
3	Supply and installation of FDMS outdoor (Joint Closure)	100	Nos
4	Supply and installation of Route / joint indicator (5 per Km)	1500	Nos
5	Supply and installation of Manhole, Joint chambers & Loop chamber@1 per 2 Km	1500	Nos
6	Supply and installation of HDPE PLB Duct (40 mm/33mm) with All Accessories like Coupler, End Cap, Simplex Plug etc.	300	KMs
7	Excavation of trench, PLB pipe laying, Backfilling, Reinstatement and Compaction after laying of PLB pipe, Pulling/laying / blowing of optical Fiber Cable inside laid PLB pipe, splicing and jointing of 96F UG Optical Fiber Cable	300	KMs
8	GI Pipe and Accessories	10	KMs
9	10KM Singlemode 10G SFP+	150	Nos
Operation & Maintenance cost			
1	State NOC Infrastructure	12	Qtrs
2	OFC including splitters, enclosures, poles etc.	12	Qtrs
3	OLT devices	12	Qtrs
4	ONT devices	12	Qtrs
5	Access Routers	12	Qtrs

8. Qualification Criteria for OEMs

1. OEM shall be operating in India for at least 5 years as on 31st March 2023. (Certificate from Chartered Accountant shall be enclosed)

2. OEM of GPON products should have successfully completed supply of atleast 2000 OLTs and 15,000 ONTs in a single contract to State/Central Government/Bharatnet Projects in India in the last five years as on 31st March 2023. (Purchase order supported by Completion Certificate from end user shall be enclosed)

3. OEM of GPON products should have cumulatively completed supply of atleast 10,000 OLTs and 75,000 ONTs to State/Central Government/Bharatnet Projects in India in the last five years as on 31st March 2023. (Purchase orders supported by Completion Certificates from end users shall be enclosed)

4. The offered equipments or its family should be certified by TEC for any Govt. Tender in last the financial year against TEC GR No. GR/PON-01/02 APRIL 2008 or TEC/GR/TX/PON-02/01.MAY-2013. (Certificate issued by the competent authority shall be enclosed)

5. The OEM should be ISO 9001 and TL 9000 certified. (Copy of certifications)

6. The OEM should have implemented ISO 14001(Copy of certificate)

7. The proposed equipments should have been enlisted in the Trusted Telecom Portal of Department of Telecommunications, GoI.

8. OEM shall provide the entire design and IP for review and security audit if required.

9. OEM should have proven track record in design, manufacturing and support of Carrier Grade Telecom/Networking Products.

10. OEM shall have local spares and repair facilities in India. R&D, IPR creation, and product design shall be done only in India.

11. OEM must have 24x7 technical support facility (in English) in India.

12. Preference to Make In India products

    a. Preference shall be given to Class 1 local supplier as per Department for Promotion of Industry and Internal Trade (DPIIT) order for Public Procurement (Preference to Make in India) vide No. P-45021/2/2017-PP (BE-II) dated

15.06.2017 followed by revisions dated 28.05.2018, 29.05.2019 and amended further on 04.06.2020 & 16.09.2020.

13. The OEM shall comply with the following DoT guidelines/notifications:

    a. Department of Telecommunications, Gazette notification dated 29th August, 2018 for "Public Procurement (Preference to Make in India) Order 2017- Notification of Telecom Products, Services or Works – regarding".

    b. Department of Telecommunications Notification No. 18-04/2019-IP dated 19.02.2020 for "Clause 10(d) of Public procurement order 2017 - identification of telecom items regarding" for defining the Value addition requirement for Domestic OEMs.

9. Technical Specifications

Technical Specifications

1. 16-Port-OLT

S. No.	Minimum Specifications	Compliance (Y/N)
	FTTx solution should be based on GPON with min 16 GPON	
1	The FTTx solution should be based on GPON	
	GPON should support minimum 2.5G downstream, 1.25G upstream.	
	No. Of Subscribers per GPON port minimum is 128(Splitting ratio 1:128)	
	The system shall support multiple GbE / 10xGbE network connections	
	Shall support basic OAM features & remote diagnostic.	
	Should support SNMP v2/V3 Protocol	
	Management System shall support bandwidth provisioning starting from 64 kbps granularity.	
2	100Gbps switching capacity	
	Support 4K VLANs	
	128K MAC	
	16xGPON SFP ports (Loaded with GPON SFP C+), 4xSFP+/SFP (10GE/1GE), 2xSFP (1GE), 2xRJ45 (1GE)	

S. No.	Minimum Specifications	Compliance (Y/N)
	Support Sub 50ms Protection switching features through ERPS & Open ERPS on GE/10GE ports	
	Support of ACL	
	Support Broadcast Storm Control	
	Shall support port-mirroring function for trouble shooting, monitoring, and tracing purpose.	
	Translate/re-write subscribers VLAN ID to another VLAN ID	
	Support Ethernet 802.1p bit prioritization.	
	Mapping of the subscriber traffic based on the IEEE 802.1Q VLAN ID to a specific VLAN	
	Type-B Protection	
	Mapping of the subscriber traffic based on the combination of IEEE 802.1p and 802.1Q tagging to a specific VLAN	
	LSP Ping and Trace route (RFC6426), Pseudo wire ping	
3	DHCP, PPPoE	
	Shall support multiple service delivery of data, voice and video.	
4	The OLTs shall be able to support mobile traffic backhauling.	
	Trusted connectivity where the QOS setting / traffic prioritization configured by customer can be preserved.	
	Un-trusted connectivity where the Qos setting / traffic prioritization configured by customer can be overwritten by the Equipment.	
	The detail Downstream and Upstream Qos and traffic prioritization mechanism supported inclusive of the hardware queue available for each direction.	
	A minimum of 8 hardware queues should be supported at both directions. The OLT should implement some queuing mechanism to manage the hardware queue such as SP, WRR, etc.	
	The offered GPON equipment shall support T-Cont type according to ITU-T G.984.3	
	Shall support Dynamic Bandwidth Allocation (DBA) mechanism to allow optimum bandwidth utilization on each PON interface.	
5	The OLT shall be rack mountable 1 RU meeting ETSI standards for indoor equipment requirements. Equipment Depth should not exceed 300mm	

S. No.	Minimum Specifications	Compliance (Y/N)
	The OLT shall be designed to Operate at 210- 250 V AC as well as -48 V DC	
	Dual Redundant Power supplies. The OLT shall have the flexibility to operate on Dual AC PSU or Dual DC PSU or AC PSU.	
	Operating temperature: 0C to 60C centigrade	
	Power Consumption should be less than 120 Watts	
	The OLT shall provide one craft port for local configuration access.	
	16xGPON SFP ports, 4xSFP+/SFP (10GE/1GE), 2xSFP (1GE), 2xRJ45 (1GE)	
	The OLT shall support one 10/100M Ethernet port for linking with EMS.	
6	Should support Class B+ (28dB) and class C+ (32 dB)	
	The equipment must be able to operate at the physical distance of 20 km (between OLT and ONU/ONT) without any additional amplification required.	
	The OLT should support 1310 and 1490 nm wavelengths	
	No. Of Subscribers per GPON port support is 128 (Splitting ratio 1:128)	
	The Interfaces for the offered FTTx systems shall be of “plug in type (PIU) SFP modules”	
	The offered OLTs shall be inter-operable with third party ONTs	
7	NMS shall be offered to Manage OLT & ONT	
	Bidder shall offer Network Management System for the offered equipment to provide the capabilities for configuration, operation, monitoring, remote monitoring, fault localization, and data storage.	
	GPON OLT should have Customer friendly GUI configurations/operations on a single monitoring view in single page.	
	OLT GUI Should show all the ONT List in Single page Showing status of all the ONT, ALL ONT Serial number , Conflict state , Physical Status of the ONT (Activated /Deactivated , ONT is readiness status , WAN Configuration	
	OLT GUI Should show all the ONT Status List, software & location Field	

S. No.	Minimum Specifications	Compliance (Y/N)
8	Should be compliant to the relevant ISO/ETSI industry quality standards (e.g. ISO9000/9001), defining the quality system requirements for the design, development, production, delivery, installation and maintenance of product and services.	
	The offered equipment shall be able to inter-work with the other user end equipment supplied by other vendors as per ITU-T specifications.	
	The offered equipment shall support single fiber operation on standard SMF G.652, G.655 & G.657.	
	The equipment shall detect the optical power transmission of every ONT.	
	OEM OLT Craft /local login page attributes should be accessible remotely without any physical engineer presence Via in band/DCN management.	
	OLT Should support Open ERPS on uplink ports & SNI ports associated in OLT ring	
	Auto registration of 3rd party ONT in OLT	
	OEM OLT Should support 3rd party ONT with an open License from day 1	
9	Shall comply with ITU-T/IEEE recommendations.	
	ITU-T G.984.3 A broadband optical access system with increased service capability using dynamic bandwidth assignment.	
	GPON products should be compliant to ITU-T G.984 /G.988 standards	
	ITU-T G.8032: Ethernet Ring Protection Scheme	
	IEEE 802.1Q VLAN tagging	
	IEEE 802.1ad VLAN tagging.	
	IEEE 802.3 10 Mbps Ethernet	
	IEEE 802.3u 100 Mbps Fast Ethernet	
	IEEE 802.3ad Ethernet Link Aggregation	
	IEEE 802.3ae 10 Gigabit Ethernet	
	IEEE 802.3z Gigabit Ethernet	
	IETF RFC 2236: Internet Group Management Protocol, Version 2.	
10	Should be able to integrate with TANFINET EMS Solutions for Fault monitoring	

2. 8-Port-OLT

S. No.	Minimum Specifications	Compliance (Y/N)
	FTTx solution should be based on GPON with min 8 GPON	
1	The FTTx solution should be based on GPON	
	GPON should support minimum 2.5G downstream, 1.25G upstream.	
	No. Of Subscribers per GPON port minimum is 128(Splitting ratio 1:128)	
	The system shall support multiple GbE / 10xGbE network connections	
	Shall support basic OAM features & remote diagnostic.	
	Should support SNMP v2/V3 Protocol	
	Management System shall support bandwidth provisioning starting from 64 kbps granularity.	
2	100Gbps switching capacity	
	Support 4K VLANs	
	32K MAC	
	This device is with 40G uplink and 8 GPON ports.	
	Support Sub 50ms Protection switching features through ERPS & Open ERPS on GE/10GE ports	
	Support of ACL	
	Support Broadcast Storm Control	
	Shall support port-mirroring function for trouble shooting, monitoring, and tracing purpose.	
	Translate/re-write subscribers VLAN ID to another VLAN ID	
	Support Ethernet 802.1p bit prioritization.	
	Mapping of the subscriber traffic based on the IEEE 802.1Q VLAN ID to a specific VLAN	
	Type-B Protection	
	Mapping of the subscriber traffic based on the combination of IEEE 802.1p and 802.1Q tagging to a specific VLAN	
	LSP Ping and Trace route (RFC6426), Pseudo wire ping	
3	DHCP, PPPoE	
	Shall support multiple service delivery of data, voice and video.	
4	The OLTs shall be able to support mobile traffic backhauling.	
	Trusted connectivity where the QOS setting / traffic prioritization configured by customer can be preserved.	

S. No.	Minimum Specifications	Compliance (Y/N)
	Un-trusted connectivity where the Qos setting / traffic prioritization configured by customer can be overwritten by the Equipment.	
	The detail Downstream and Upstream Qos and traffic prioritization mechanism supported inclusive of the hardware queue available for each direction.	
	A minimum of 8 hardware queues should be supported at both directions. The OLT should implement some queuing mechanism to manage the hardware queue such as SP, WRR, etc.	
	The offered GPON equipment shall support T-Cont type according to ITU-T G.984.3	
	Shall support Dynamic Bandwidth Allocation (DBA) mechanism to allow optimum bandwidth utilization on each PON interface.	
5	The OLT shall be rack mountable 1 RU meeting ETSI standards for indoor equipment requirements. Equipment Depth should not exceed 300mm	
	The OLT shall be designed to Operate at 210- 250 V AC as well as -48 V DC	
	Dual Redundant Power supplies. The OLT shall have the flexibility to operate on Dual AC PSU or Dual DC PSU or AC PSU.	
	Operating temperature: 0C to 60C centigrade	
	Power Consumption should be less than 100 Watts	
	The OLT shall provide one craft port for local configuration access.	
	1RU GPON OLT, 8xGPON SFP ports (Loaded with GPON SFP C+), 4xSFP+/SFP (10GE/1GE), 2xSFP (1GE), 2xRJ45 (1GE)	
	The OLT shall support one 10/100M Ethernet port for linking with EMS.	
6	Should support Class B+ (28dB) and class C+ (32 dB)	
	The equipment must be able to operate at the physical distance of 20 km (between OLT and ONU/ONT) without any additional amplification required.	
	The OLT should support 1310 and 1490 nm wavelengths	
	No. Of Subscribers per GPON port support is 64 (Splitting ratio 1:64)	
	The Interfaces for the offered FTTx systems shall be of “plug in type (PIU) SFP modules”	

S. No.	Minimum Specifications	Compliance (Y/N)
	The offered OLTs shall be inter-operable with third party ONTs	
7	NMS shall be offered to Manage OLT & ONT	
	Bidder shall offer Network Management System for the offered equipment to provide the capabilities for configuration, operation, monitoring, remote monitoring, fault localization, and data storage.	
	GPON OLT should have Customer friendly GUI configurations/operations on a single monitoring view in single page.	
	OLT GUI Should show all the ONT List in Single page Showing status of all the ONT, ALL ONT Serial number , Conflict state , Physical Status of the ONT (Activated /Deactivated , ONT is readiness status , WAN Configuration	
	OLT GUI Should show all the ONT Status List , software & location Field	
8	Should be compliant to the relevant ISO/ETSI industry quality standards (e.g. ISO9000/9001), defining the quality system requirements for the design, development, production, delivery, installation and maintenance of product and services.	
	The offered equipment shall be able to inter-work with the other user end equipment supplied by other vendors as per ITU-T specifications.	
	The offered equipment shall support single fiber operation on standard SMF G.652, G.655 & G.657.	
	The equipment shall detect the optical power transmission of every ONT.	
	OEM OLT Craft /local login page attributes should be accessible remotely without any physical engineer presence Via inband/DCN management.	
	OLT Should support Open ERPS on uplink ports & SNI ports associated in OLT ring	
	Auto registration of 3rd party ONT in OLT	
	OEM OLT Should support 3rd party ONT with an open License from day 1	
9	Shall comply with ITU-T/IEEE recommendations.	
	ITU-T G.984.3 A broadband optical access system with increased service capability using dynamic bandwidth assignment.	

S. No.	Minimum Specifications	Compliance (Y/N)
	GPON products should be compliant to ITU-T G.984 /G.988 standards	
	ITU-T G.8032: Ethernet Ring Protection Scheme	
	IEEE 802.1Q VLAN tagging	
	IEEE 802.1ad VLAN tagging.	
	IEEE 802.3 10 Mbps Ethernet	
	IEEE 802.3u 100 Mbps Fast Ethernet	
	IEEE 802.3ad Ethernet Link Aggregation	
	IEEE 802.3ae 10 Gigabit Ethernet	
	IEEE 802.3z Gigabit Ethernet	
	IETF RFC 2236: Internet Group Management Protocol, Version 2.	
10	Should be able to integrate with TANFINET EMS Solutions for Fault monitoring	

3. 4-Port-OLT

S. No.	Minimum Specifications	Compliance (Y/N)
	Functional Requirement of GPON OLT	
1	**FTTx solution should be based on GPON with min 4 GPON**	
	GPON should support minimum 2.5G downstream, 1.25G upstream.	
	No. Of Subscribers per GPON port minimum is 128(Splitting ratio 1:128)	
	Shall support basic OAM features & remote diagnostic.	
	Should support SNMP v2/V3 Protocol	
	Management System shall support bandwidth provisioning starting from 64 kbps granularity.	
2	18 Gbps switching capacity	
	Support 4K VLANs	
	32K MAC	
	OLT Should have 2xSFP(1GE/2.5GE) ports, 2x1GE RJ45 ports	
	Support Sub 50ms Protection switching features through ERPS & Open ERPS on GE ports	
	Support of ACL	
	Support Broadcast Storm Control	

S. No.	Minimum Specifications	Compliance (Y/N)
	Shall support port-mirroring function for trouble shooting, monitoring, and tracing purpose.	
	Translate/re-write subscribers VLAN ID to another VLAN ID	
	Support Ethernet 802.1p bit prioritization.	
	Mapping of the subscriber traffic based on the IEEE 802.1Q VLAN ID to a specific VLAN	
	Mapping of the subscriber traffic based on the combination of IEEE 802.1p and 802.1Q tagging to a specific VLAN	
3	DHCP, PPPoE	
	Shall support multiple service delivery of data, voice and video.	
4	The OLTs shall be able to support mobile traffic backhauling.	
	Trusted connectivity where the QOS setting / traffic prioritization configured by customer can be preserved.	
	The detail Downstream and Upstream Qos and traffic prioritization mechanism supported inclusive of the hardware queue available for each direction. A minimum of 8 hardware queues should be supported at both directions. The OLT should implement some queuing mechanism to manage the hardware queue such as SP, WRR, etc.	
	The offered GPON equipment shall support T-Cont type according to ITU-T G.984.3	
	Shall support Dynamic Bandwidth Allocation (DBA) mechanism to allow optimum bandwidth utilization on each PON interface.	
5	The OLT shall be rack mountable 1 RU meeting ETSI standards for indoor equipment requirements.	
	The OLT shall operate with AC power supply	
	Operating temperature: 0C to 60C centigrade	
	Power Consumption should be less than 60 Watts	
	The OLT shall provide one craft port for local configuration access.	
	1RU GPON OLT with 4xGPON ports (Loaded with GPON SFP C+) and 2xSFP(1GE/2.5GE) ports, 2x1GE RJ45 ports	
	The OLT shall support one 10/100M Ethernet port for linking with EMS.	
6	Should support Class B+ (28dB) and class C+ (32 dB)	
	The equipment must be able to operate at the physical distance of 20 km (between OLT and ONU/ONT) without any additional amplification required.	

S. No.	Minimum Specifications	Compliance (Y/N)
	The OLT should support 1310 and 1490 nm wavelengths	
	No. Of Subscribers per GPON port support is 64 (Splitting ratio 1:64)	
	The Interfaces for the offered FTTx systems shall be of "plug in type (PIU) SFP modules"	
	The offered OLTs shall be inter-operable with third party ONTs	
7	NMS shall be offered to Manage OLT & ONT	
	Bidder shall offer Network Management System for the offered equipment to provide the capabilities for configuration, operation, monitoring, remote monitoring, fault localization, and data storage.	
	GPON OLT should have Customer friendly GUI configurations/operations on a single monitoring view in single page.	
	OLT GUI Should show all the ONT List in Single page Showing status of all the ONT , ALL ONT Serial number , Conflict state , Physical Status of the ONT (Activated /Deactivated , ONT is readiness status , WAN Configuration	
	OLT GUI Should show all the ONT Status List , software & location Field	
8	Should be compliant to the relevant ISO/ETSI industry quality standards (e.g. ISO9000/9001), defining the quality system requirements for the design, development, production, delivery, installation and maintenance of product and services.	
	The offered equipment shall be able to inter-work with the other user end equipment supplied by other vendors as per ITU-T specifications.	
	The offered equipment shall support single fiber operation on standard SMF G.652, G.655 & G.657.	
	The equipment shall detect the optical power transmission of every ONT.	
	OEM OLT Craft /local login page attributes should be accessible remotely without any physical engineer presence Via inband/DCN management.	
	OLT Should support Open ERPS on uplink ports & SNI ports associated in OLT ring	
	OEM OLT Should support 3rd party ONT with an open License from day 1	
9	Shall comply with ITU-T/IEEE recommendations.	
	ITU-T G.984.3 A broadband optical access system with increased service capability using dynamic bandwidth assignment.	
	GPON products should be compliant to ITU-T G.984 /G.988 standards	
	ITU-T G.8032: Ethernet Ring Protection Scheme	

S. No.	Minimum Specifications	Compliance (Y/N)
	IEEE 802.1Q VLAN tagging	
	IEEE 802.1ad VLAN tagging.	
	IEEE 802.3 10 MbpsEthernet	
	IEEE 802.3u 100 MbpsFast Ethernet	
	IEEE 802.3ad Ethernet Link Aggregation	
	IEEE 802.3ae 10 Gigabit Ethernet	
	IEEE 802.3z Gigabit Ethernet	
	IETF RFC 2236: Internet Group Management Protocol, Version 2.	
10	Should be able to integrate with TANFINET EMS Solutions for Fault monitoring	

4. ONT Type-C

S. No.	Minimum Requirement Description	Compliance (Y/N)
1	Should support four GigE interface -Dual PON port protection (Type-C)	
2	ONT Should Support Protected GPON ONT with 2xGPON SC/APC , 4x1GE RJ45 ports and 1xUSB port	
3	Should support Wire speed data transfer	
4	Should support Per-subscriber, per-service bandwidth control	
5	Should support IP Management	
6	Should support Protocol (IGMP) v2/v3 for channel change	
7	Should support advanced dynamic bandwidth management allows prioritization per service and user with the ability to burst up to the full line rate. This guarantees very high quality of service and future security, and makes optimal use of electronics, fiber optics and distribution facilities support on ONT	
8	PON interface should support SC/APC optical connector	
9	Operating Temperature: : 0 ºC to 50 ºC	
10	Relative humidity: : 5 to 90% RH non-condensing	
11	Local powering with 12V input DC ,1.5A +/- 5% ,with 110-240VAC, 50/60Hz input	
12	ONT should support Dying gasp	
13	LED: Power, Alarm, Connection, Ethernet	

S. No.	Minimum Requirement Description	Compliance (Y/N)
14	ONT Should Support AAA (Authentication, Authorization, and Accounting	
15	Data rates of 2488Mbps downstream and 1244Mbps upstream.	
16	32 TCONT and 128 GEM port IDs Wavelength: 1490 nm/1310 nm	
17	Functional and technical requirement of ONT Family shall be as per TEC/GR /TX/PON-02/01/ May 2013 With latest	

5. **ONT-4 Port-WIFI**

S. No.	Minimum Requirement Description	Compliance (Y/N)
1	Should support four GigE interface	
2	ONT Should Support 4x1GE RJ45, 2xPOTS, 1xUSB, 2x2 WiFi 2.4GHz 802.11 b/g/n, 2x2 WiFi 5GHz ,802.11ac	
3	Should support Wire speed data transfer	
4	Should support Per-subscriber, per-service bandwidth control	
5	Should support IP Management	
6	Should support Protocol (IGMP) v2/v3 for channel change	
7	Should support received signal strength indication (RSSI) for lean operations and remote troubleshooting	
8	Should support advanced dynamic bandwidth management allows prioritization per service and user with the ability to burst up to the full line rate. This guarantees very high quality of service and future security, and makes optimal use of electronics, fiber optics and distribution facilities support on ONT	
9	PON interface should support SC/APC optical connector	
10	Operating Temperature: 0°C to 50°C	
11	Relative humidity: 5% to 95%	
12	Local powering with 12V input, AC power supply	
13	ONT should support Dying gasp	
14	LED: Power, Alarm, Connection, Ethernet	
15	ONT Should Support AAA (Authentication, Authorization, and Accounting	
16	Data rates of 2488Mbps downstream and 1244Mbps upstream.	

S. No.	Minimum Requirement Description	Compliance (Y/N)
17	32 TCONT and 128 GEM port IDs Wavelength: 1490 nm/1310 nm	
18	Functional and technical requirement of ONT Family shall be as per TEC/GR /TX/PON-02/01/ May 2013 With latest	
19	Wireless Security Open, 802.1x for WiFi/LAN, WPA2-PSK	
20	Wireless Features Standards: 802.11 a/b/g/n/ac with channel bandwidth: 20/40/80MHz (ac) | Frequency of operation: 2.4GHz & 5GHz :	
21	Supported Max clients: 32 per radio	

6. ONT-4 Port- Without WIFI

S. No.	Minimum Requirement Description	Compliance (Y/N)
1	Should support four GigE interface	
2	ONT Should Support 4x1GE RJ45,	
3	Should support Wire speed data transfer	
4	Should support Per-subscriber, per-service bandwidth control	
5	Should support IP Management	
6	Should support Protocol (IGMP) v2/v3 for channel change	
7	Should support received signal strength indication (RSSI) for lean operations and remote troubleshooting	
8	Should support advanced dynamic bandwidth management allows prioritization per service and user with the ability to burst up to the full line rate. This guarantees very high quality of service and future security, and makes optimal use of electronics, fiber optics and distribution facilities support on ONT	
9	PON interface should support SC/APC optical connector	
10	Operating Temperature: 0°C to 50°C	
11	Relative humidity: 5% to 95%	
12	Local powering with 12V input, AC power supply	
13	ONT should support Dying gasp	
14	LED: Power, Alarm, Connection, Ethernet	
15	ONT Should Support AAA (Authentication, Authorization, and Accounting	
16	Data rates of 2488Mbps downstream and 1244Mbps upstream.	
17	32 TCONT and 128 GEM port IDs Wavelength: 1490 nm/1310 nm	

S. No.	Minimum Requirement Description	Compliance (Y/N)
18	Functional and technical requirement of ONT Family shall be as per TEC/GR /TX/PON-02/01/ May 2013 With latest	

7. Access Router

S. No.	Technical Specification	Compliance Yes/No
1	Should be a Hardware Appliance with minimum 2 SFP ports and 2 1G Copper ports. Also, should have USB port support for mobile broadband dongles	
2	Should support Static Routes and Dynamic routing protocols. The device should act as a gateway router for internal network connections.	
3	Following features should be included in the appliance from Day 1: Layer 3 - Layer 4, NAT, VPN, DHCP, QoS, Bandwidth reservation.	
4	Router should support 1 Gbps throughput. Should support IPSec VPN Throughput of 500 mbps or above. Device should support Full tunnel mode based on IPsec.	
6	Should have NDPP/ Common Criteria Certifications and Should Support IPv4 & IPv6. Device Should support Mobile broadband, Ethernet based internet connection, PPPoE, etc.	
7	Router should able to do load balancing of various links	
9	Should be able to integrate with TANFINET EMS Solutions for Fault monitoring	

8. ADSS Spec

S. No.	Parameter	Technical Specification	Compliance (Yes/No)
1	Aerial Optical Fiber Cable ADSS OFC 6/12/24 Core	Aerial OF Cable (ADSS Cable): 6/12/24 Fiber ADSS on power lines: As per TEC GR No. TEC/GR/TX/OFC-022/02/MAR-17 and As per TEC GR No. TEC/GR/TX/OFC-026/01/APR-18 with latest amendments if any. (Type 2A)	

2	Formed OFC Dead End & Termination Fittings	As per TEC GR No. TEC/GR/TX/OAF-001/03/MAR-17) with latest amendments if any.	
3	OFC Suspension Settings	As per TEC GR No. TEC/GR/TX/OAF-001/03/MAR-17) with latest amendments if any.	
4	Adjustable Cable Storage Bracket	As per TEC GR No. TEC/GR/TX/OAF-001/03/MAR-17) with latest amendments if any.	
5	Optical Fiber Joint Closure	As per TEC/GR/TX/OJC-002/03/Apr 2010 with latest amendments if any.	

9. Fiber Patch cord

S. No.	Technical Specification	Compliance (Yes/No)
1	As per TEC GR no. TEC/GR/TX/OFJ-01/05/Nov-09, with latest amendments if any.	

10. **UGC Fiber**

S. No.	Technical Specification	Compliance (Yes/No)
1	Underground (OFC Cable): 96F Ribbon OFC : As per BSNL Tender No: MM/BN-II/OFC/T-680/2020 Issue 11.03.2020	

11. **DWC Pipe specification**

S. No.	Technical Specification	Compliance (Yes/No)
1	DWC Pipe 75/61 mm: TEC/GR/DWC-34/01 Sep.2007 with latest amendments, if any.	

12. FDMS specification

S. No.	Technical Specification	Compliance (Yes/No)
1	FDMS outdoor 96: GR No. TEC/GR/TX/FDM-003/01 MAR 2012 with latest amendments if any. As per BSNL Tender No: MM/BN-II/OFC/T-680/2020 Issue 11.03.2020	
2	FDMS Indoor: GR No. TEC/GR/FDM-01/02 APR 2007 with latest amendments if any. As per BSNL Tender No: MM/BN-II/OFC/T-680/2020 Issue 11.03.2020	

13. Racks

S. No.	Technical Specifications	Compliance (Y/N)
1	Make & Model Number	
2	6 "U" rack	
3	Frame Structure made of 1mm CRCA sheet	
4	Front toughened glass door with 0.8mm MS frame with lock	
5	Rear 0.8mm MS vented door with lock	
6	Fixed side panels, welded structure	
7	Cable entry provision at top & bottom (cable gland shall be used for termination of cables, unused openings shall be sealed properly),	
8	Air circulation technology with 2 Cooling fan fitting option at top	
9	Sufficient perforation provided for ventilation at all sides	
10	Finished with 7 process pre-treated powder coating	
11	Ventilation Fan	
12	ACD- 6 Socket 5/15 Amp	
13	Cable Manager 1U MS/PVC- Horizontal	
14	Certificates:- ISO 9001, ISO14001, ISO45001, UL 2416, UL 60950-1, compliance with EIA 310 , IEC 297	
15	Rack should be Make in India	

14. UPS

S. No.	Specifications	Requirement	Compliance (Y/N)
1	Capacity	1.0 KVA / 900 W	

S. No.	Specifications	Requirement	Compliance (Y/N)
2	Technology	IGBT (Rectifier & Inverter both); ECO Mode	
3	Wave form & Freq converter	Pure Sine wave & shall have frequency converter mode	
4	Display	LCD	
5	Input power factor correction	0.99	
6	Input configuration	1Ph, L-N+PE (160 to 300Vac on full load & shall support upto 130Vac for 60% load). UPS Shall have inbuilt OVCD protection. The input ranges from 110 to 300V must be settable by end user	
7	PF	>=0.99	
8	Frequency (Input)	40 to 70Hz frequency	
9	Frequency (output)	50Hz/60Hz frequency	
10	Output Voltage	200/208/220/230/240Vac shall be available with +/-1% regulation in battery mode	
11	V threshold	3% max full linear load, 5% max on Non-linear load	
12	Output Power factor	0.9	
13	Crest factor	3.0 or better	
14	AC-AC Efficiency	89% for 1.0kva	
15	Transfer time Main Battery	0	
16	Transfer time Inverter-Bypass	4ms	
17	Output Connection	Minimum 10A X 3 no's - Indian Socket inbuilt to the UPS back. One of these O/p Socket shall be Programmable with settable time so as to increase the back-up time for critical load	
18	Monitoring software for UPS	Shall be provided for monitoring of UPS from remote along with SNMP Card	
19	Communication	SNMP	
20	Port	USB, RS 232, RJ45	
21	Battery Type	12V SMF having JIS 8702 Certification	
22	Battery backup	1.0 kVA - 60 minutes (Min VAH 2340)	

S. No.	Specifications	Requirement	Compliance (Y/N)
23	Charger	Min. 15 amp inbuilt (for any future expansion of back-up time). Charger shall be settable for 1/2/4/6/8/10/12/14 A settable for 1/2/4/6/8/10/12/14 A ratings as per the need of battery charging.	
24	LCD Display		
(a)	Operating temperature range	0-40 deg C with full load @ 0.9PF. Later de-rating applicable up to 50 deg C	
(b)	Other	Indication required -> Over Temperature, Load on Battery, Battery on Charge, Battery low, Mains on Fan Speed control (as per load & room temp) shall be possible	
(c)	Humidity	0% to 95% non-condensing	
(d)	Noise Level	52 dBA maxes	
(e)	Mounting	Tower type only (Rack Mount type not acceptable)	
(f)	Auto Start, Cold Start & EPO	Shall be available	
25	Protection	IP20	
26	LCD Display		
(a)	Measurements (On LCD)	Input & Output Voltage, Input & Output Frequency, Bypass: Voltage & Frequency, Remaining time & Battery Level Indicator, Load Level indicator, Fault codes, Estimated or running autonomy time, UPS alarm enable or disable, Overload, Short circuit, Low Battery	
(b)	Fault Indication (On LCD)	Bus start fail, Bus over & under, Inverter soft start failure, Inverter voltage high & low, Inverter output short, Battery voltage high & low, charger output short, over temperature, overload, charger failure, over input current, over input current, battery not connected, over charge, EPO enable, Programmable output enable.	

S. No.	Specifications	Requirement	Compliance (Y/N)
(c)	Settable data	Inverter voltage & frequency, Frequency converter, ECO mode, ECO voltage range, Bypass setting, Bypass voltage range, Autonomy limitation setting, Battery total Ah setting, Charger current, Bypass frequency range, Programmable outlet, Programmable outlet setting, Charger boost & float voltage setting, EPO logic setting, Isolation transformer O/P (if applicable in design of OEM), Display setting for autonomy, Acceptable input voltage range.	
27	Manufacturer	Manufacturer - > ISO 9001, TL 9000, ISO 14001 & OHSAS 18001 (ISO & OHSAS for Indian Operation of OEM only). CE, FCC, certificate of compliance from Indian certifying agency	
28	Product	BIS certification required	
29	Management Supports /Software	Windows® 2000/ 2003 /XP/Vista/ 2008, Windows® 7 / 8/10, Linux, Unix	

15. Poles

S.No.	Technical Specification	Compliance (Y/N)
1	Free standing 8 sided Octagonal continuously tapered structure	
2	Height of the pole: 6M	
3	The Contractor shall conduct the detailed design for the pole based on his site survey.	
4	The Contractor shall conduct the appropriate measure for preventing the vibration.	
5	Hot Dip galvanized confirming to BSEN ISO 1461 [65-micron thickness]. All components of poles may be hot dip galvanized, all components must be well protected against corrosion, minimum thickness of zinc coatings is 85 µ m and min density 500 gm/m 2 on both inside and outside surfaces	
6	Certified BS EN 10025-4:2019 – TC	
7	Required Lighting arrester arrangement inside the pole.	

S.No.	Technical Specification	Compliance (Y/N)
8	The bottom portion of the pole shall be treated for corrosion resistance in accordance with the installation site.	
9	The structural design shall conform to relevant standards and shall be certified by a statutory authority for structural integrity and maximum allowable vibration (typically caused by Wind forces and other external stimuli) to ensure a stable of pole & cable.	
10	Wind Loads Design is based on IS-875. Deflection due to wind shall not exceed 0.1 degrees at a wind speed of at least 28m/s with the equipment mounted on the pole.	
11	Proper Civil foundation	

16. NMS-EMS

S. No.	Description	Compliance (Y/N)
1	General: EMS/NMS Should Support FTTX GPON, Routers, Ethernet Switching, EMS/NMS Should not be restricted to supporting GPON only , Allow Muti-technology	
2	The management system shall be able to auto-discover the network including the network elements.	
3	The management system shall provide access using remote clients that use HTTP.	
4	The functionalities of the offered EMS system shall cover these management layers:	
5	Network Element Management Layer: This shall manage the Network Elements such as their configuration, alarms or performance.	
6	Network Management Layer: This shall manage end-to-end network connectivity, network level protection, network level paths and performance and other network level issues.	
7	The EMS must support a northbound interface.	
8	Graphical User Interface:	
9	The offered EMS system shall employ Graphical User Interface that allows users to manage the network through a multilevel window. (i.e. Network and Sub networks Maps)	

S. No.	Description	Compliance (Y/N)
10	The offered EMS system shall allow the Users to perform, but not restricted to, the following operations on the Network and Sub network Maps:	
11	View the alarm conditions of the OLT"s, ONTs, Routers, Switches in Single NMS	
12	View the performance parameters of an individual link.	
13	Zoom in and out on the Network Map including the ability to define a custom sub- network map.	
14	The graphical user interface shall provide a cascading menu and a graphical display of the shelf layout that allows users to move from shelf to board to port menus and execute	
15	The Graphical User Interface shall provide an End-to-end Network view that could span sub	
16	Configuration Management:	
17	The offered EMS shall support managing ports (enable / disable).	
18	The offered EMS shall support the ability to perform a remote inventory.	
19	Software Management: This shall include the ability to download software loads, activate new software loads, or get information about the active software load).	
20	The offered EMS shall provide the facility to perform backup & restore of the node configuration via non-volatile memory on the OLT or via the NMS database.	
21	Fault Management:	
22	Users shall have the ability to define customizable alarms in terms of severity levels and filtering.	
23	Alarms shall be consistent in terms of marking them with appropriate colors.	
24	There shall be mechanisms to provide for fault isolation.	
25	There shall be connectivity and loopback testing capability in all technologies to help isolate faults.	
26	There shall be alarm correlation to prevent a flood of alarms.	
27	Equipment alarms shall be localized up to the board and port level of a specific shelf of a specific node.	
28	The alarms shall be audible and/or bring up a pop-up window if appropriate.	

S. No.	Description	Compliance (Y/N)
29	There shall be scheduler to run diagnostics at certain times and report problems as alarms.	
30	A scheduler shall also be available to collect performance metrics from network elements to the network management system.	
31	Event Logging:	
32	There shall be a mechanism for alarms and logging including all user actions.	
33	The logging shall be customizable for specific types of events or alarms.	
34	Performance Management:	
35	The management system shall provide the ability to set thresholds on performance metrics and generate alarms from these thresholds.	
36	The management system shall provide capacity planning reports that provide long-term traffic analysis to help in deciding whether to upgrade links or nodes.	
37	Security Management:	
38	Illegal access to the management system shall be prevented; all users shall have a User Id and Password, which defines their access level with the management system.	
39	The offered EMS system shall allow for Domain creation and partitioning, each domain being a different access level of part of the network or different function.	
40	It shall be possible to assign specific users to a particular domain, so the domain access can be restricted to the assigned users only.	
41	Users assigned to a specific Domain shall have different levels of authorization (i.e. d different functions and privileges).	
42	Local access via the Local Craft Terminal to any managed Network Element or node shall be controlled by the network management system.	
43	The management system shall be able to detect a Local Craft Terminal connection to any Network element or node.	
44	In the event of the management system crash, there shall be a way for the local craft terminal to still have access to the device.	
	MANAGEMENT FEATURES & FUNCTIONALITIES:	

S. No.	Description	Compliance (Y/N)
45	It should be possible to download software remotely, with or without EMS. For upgrade/downgrade purposes, the offered product should have active memory and standby memory for ease of upgrade/downgrade.	
46	It should be possible to downgrade a software in the offered system/ Network Element	
47	The offered management system shall be equipped with the XML, SNMP and TMF CORBA open and standard interfaces for easy integration. MTOSI The bidder shall specify the management procedure and interface for the local and remote management of the offered system.	
48	All the related telecom industry supported standards shall be quoted to support the above.	
49	The OEM Should provide necessary hardware, software & License for EMS/NMS installation.	
50	NMS Should Support VNE to represent (3rd party Network cloud or network Device)	
51	NMS Should Support AAA	
52	NMS should Support Alarm monitoring template Basis	
53	NMS Should Support Performance Monitoring Schedule	
54	ONT level translations & downstream rate limiting NMS Should Facilitate required data to the OSS Integrations Subscriber activation, Network Provisioning, Service Assurance, Analytics GPON Network Change Management Bulk ONT Migration. Node Augmentation in Single ton ERPS Scalability for millions of ONTs Support REST APIs for Configuration	
55	NMS Should Support View ONT Topology	
56	NMS Should Support Manage GPON Profiles	
57	NMS Should Support Manage ONTs	
58	NMS Should Support Manage PON Protection	
59	NMS Should Support Discover Services	
60	NMS Should Support QOS	
61	NMS Should Support Create Topological Link	
62	NMS Should Support Set Span Loss parameters	

S. No.	Description	Compliance (Y/N)
63	NMS Should Support Create /Delete VPLS Cloud link	
64	NMS Should Support Enable and disable PM	
65	NMS Should Support Node Augmentation	
66	NMS Should Support Software Upgrade	
67	NMS Should Support Firmware Upgrade	
68	NMS Should Support Scheduling nodes for Software/Firmware upgrade	
69	NMS Should Support View optical power reports of selected node(s) or TL(s)	
70	NMS Should Support Monitor alarms	
71	NMS Should Support View FPU power	
72	NMS Should Support Unacknowledge Alarm	
73	NMS Should Support Alarm clearing procedure	
74	NMS Should Support Show Node in Topology View	
75	NMS Should Support View affected objects	
76	NMS Should Support Alarms report	
77	NMS Should Support Sorting the Alarms	
78	NMS Should Support Audit Logs	
79	NMS Should Support Configure Client IP	
80	NMS Should Support Configure Email Host	
81	NMS Should Support Understand set of operations for Managing Failover	
82	NMS Should Support Forced Switch from Master to Slave	
83	NMS Should Support Manual Switch from Slave to Master	
84	NMS Should Display NMS Load	
85	NMS Should Support Radius Configuration	
86	NMS Should Support Summary report of session details	
87	NMS Should Support Profile Management	
88	NMS Should Support Manage profiles	
89	NMS Should Support User Management	

The above specifications are minimum requirements. The bidders shall offer equipments strictly meeting the above requirements or with better specifications.

Any material or equipment not specifically stated in the specification but which are necessary for satisfactory operation shall deem to be included in the scope of supply.

10. Passive Implementation and Engineering Instructions

1. Abbreviation

   - Aeolian vibration: Wind induced (Aeolian) vibrations of conductors and overhead shield wires (OHSW) on transmission and distribution lines can produce damage that will negatively impact the reliability or serviceability of these line.
   - C - Bracket
   - D - Diameter of cable
   - EI: Engineering Instruction
   - SVD: Spiral Vibration Damper
   - TEC GR: Generic Requirements issued by the Telecommunication Engineering Centre New Delhi

   The bidder shall note that the instructions mentioned in the document does not cover full spectrum of the installation of the network and the methods of O&M. The bidder shall prepare the detailed engineering instructions based on the instructions given here and the same shall be shared with TANFINET.

2. UG OFC Laying Approach

   The Engineering Instructions spelt out in this document part of the document deal with the methods to be adopted for underground OFC laying in PLB HDPE ducts and termination of Cores at Block/Super GP/Type 1 GPs.

   On the basis of the approved survey reports, routes for OFC laying shall be finalized.

   The local authorities governed by the Government of Tamil Nadu shall be informed about the OFC laying along with the maps and shall proceed with the OFC laying after 7 working days. In case the OFC laying requires ROW permission from other authorities such as Railways, NHAI, Forests, necessary permission shall be obtained by the bidder in advance. TANFINET shall facilitate the bidder in such cases.

   Road Cutting Permission shall be obtained from road and rail authorities for laying the OFC along the finalized roads and at rail/road crossing along the route. OFC shall preferably be laid straight as far as possible along the road near the boundaries, away from the burrow pits. When the OFC is laid along the National

Highways, OFC shall run along the road land boundary or at possible farther distance from the center line of the road considering the road expansions and since the OFC is planned for 25 to 30 years of life. It is essential that the cable is laid after obtaining due permission from all the concerned authorities to avoid any damage (which may result in disruption of services/revenue loss) and shifting in near future due to their planned road widening works.

In special cases where it may be necessary to avoid burrow pits or low-lying areas, the Cable may be laid underneath the shoulders at a distance of 0.6 meter from the outer edge of the road embankment provided the same is located at least 4.5 meters away from center line of road.

3. General

a. Soil Classification

Soil shall be classified under two broad categories Rocky and Non-Rocky. The soil is categorized as rocky if the OFC trench cannot be dug without blasting and / or chiseling. All other types of soils shall be categorized as non-Rocky including Murrum & soil mixed with stone or soft rock.

b. Rocky soil.

The terrain which consists of hard rocks or boulders where blasting/chiseling is required for trenching such as quartzite, granite, basalt in hilly areas and RCC (reinforcement to be cut through but not separated) and the like.

c. Non-Rocky soils

This will include all types of soil- soft soil/hard soil/Murrum i.e., any strata, such as sand, gravel, loam, clay, mud, black cotton Murrum, shingle, river or nullah bed boulders, soling of roads, paths etc. (All such soils shall be sub-classified as kachcha soil) and hard core, macadam surface of any description (water bound, grouted tarmac etc.), CC roads and pavements, bituminous roads, bridges, culverts (All such soils shall be classified as Pucca soils)

4. Specifications of Materials to be used

4.1. PLB HDPE Duct

Optical Fiber Cables should be pulled though Permanently Lubricated HDPE Duct of 40mm/33mm size conforming to the specifications as per TEC GR No.

TEC/GR/TX/CDS-008/03/MAR- 11 with latest Amendments. The Ducts shall be yellow in color and have the identification markings as per TEC GR wherein TANFINET logo shall be marked as Purchaser's name. The logos shall be downloaded from the official websites.

4.2. PLB HDPE Duct Accessories

a. Push fit Coupler

Push Fit couplers shall be used for coupling PLB HDPE ducts/coils. The specifications of the couplers shall be as per TEC GR No. TEC/GR/TX/CDS-008/03/Mar-11 with latest amendments.

b. PP Rope

The PP Rope confirm to TEC GR No. TEC/GR/TX/CDS-008/03/MAR-11 with latest Amendments. However, this is optional, and the bidder may use the same on need basis. The PP rope can be ordered along with the PLB duct as required. In this case PP ropes drawn through the HDPE/PLB pipes/coils and safely tied to the end caps at either ends with hooks to facilitate pulling of the OFC at a later stage. The rope used is 3 strands Parapro Polypropylene rope having yellow color and size of 6 mm diameter. It should have a minimum breaking strength of 550 kgs. The length of each coil of rope should be 5 meters more than the standard length of duct (or as ordered) and it should conform to (i) BS 4928 Part-II of 1974 (ii) IS 5175 of 1982. It should be of special grade and should have ISI certificate mark. It should be manufactured out of industrial quality Polypropylene.

c. End Cap

End Cap shall be used for sealing the ends of the empty ducts, prior to installation of the OFC and shall be fitted immediately after laying the duct to prevent the entry of any dirt, water, moisture, insects/rodents etc. It should confirm to TEC GR No. TEC/GR/TX/CDS-008/03/MAR-11 with latest amendments. The ends of the PLB HDPE ducts/coils laid in the manholes should be closed with End Caps. The End Caps used should be suitable for closing 40mm/33mm PLB HDPE ducts/coils. A suitable arrangement should be provided in the End Cap to tie PP Rope. (See figure 1 for details)

d. Cable sealing Plug

Cable sealing plug shall be used to seal the end of the ducts perfectly, after the OFC is pulled in the duct. For pulling the OFC through the ducts, it is necessary to provide manholes at that location and at bends and corners wherever required. The ends of the PLB HDPE ducts/coils are closed with Cable sealing Plugs. The End Plugs used should be suitable for closing 40mm/33mm PLB HDPE ducts/coils. The Cable sealing plug shall confirm to TEC GR No. TEC/GR/TX/CDS-008/03/MAR-11 with latest amendments. (Wherever blowing technique is used for laying OFC, at the discretion of the bidder, the hand holes/manholes required for accessing the cable during cable laying can be at longer distances depending upon requirement.)

e. Material for providing additional protection.

i. RCC Full Round Pipes: Reinforced cement concrete pipes (spun type) coupled with RCC collars sealed with cement mortar used to provide additional protection to PLB HDPE Ducts/coils at lessor depths should be of full round, NP-2 class and size 100 mm (internal diameter), conforming to IS standard 458-1988 with latest amendments. The pipes should have a nominal length of 2 meters.

ii. The RCC collars: RCC collars should be properly sealed using cement mortar 1:3 (1:53 grade cement of reputed brand, 3: fine sand without Impurities). If case of long spans, every third joint will be embedded in a concrete block of size 60 cm (L) x 40cm (W) x 25 cm (H) of 1:2:4 cement concrete mix (1: cement, 2: coarse sand, 4: stone aggregate of 20 mm nominal size) so that the alignment of RCC pipes remain firm and intact. Also, both ends of RCC pipes spans will be sealed by providing concrete block of size 40 cm (L) x 40 cm (W) x 25 cm (H) of 1:2:4 cement concrete mix to avoid entry of rodents.

iii. RCC Split Pipes: The split Reinforced cement concrete pipes (spun type) with in- built collars are used to provide additional protection to PLB HDPE Ducts/coils should be of 100mm internal dia.(Spotted), Class--NP-3, Thickness: 25mm, Length: 2 Meters with inbuilt collaret one end, conforming to ISI Specification IS: 458, 1988 with latest amendment.

iv. G.I. Pipes: G.I. pipes should be of medium duty class having inner diameter of 50mm and should conform to specifications as per IS 554/1985 (revised

upto date) IS 1989 (Part-I), 1900 Sockets (revised up to date) & IS 1239 (Part-II) 1992 (revised upto date).

v. DWC Pipes: Use of normal duty DWC (Double walled corrugated) HDPE pipe – confirming to TEC GR no.GR/DWC-34/01 Sep.2007 with latest amendments shall be preferably utilized as first choice for protection of Optical Fiber Cable instead of GI pipes. The DWC pipes used shall be of size 75/61mm as per table 2 of the said TEC GR.

vi. M.S. Weld Mesh: The PLB HDPE Ducts can also be protected by embedding it in concrete of size of 25 cm x25 cm reinforced with MS weld mesh. The MS weld mesh used should be of 50 mm x 100mm size, 12 SWG, 120 cm in width in rolls of 50m each. One meter of MS weld mesh caters to approx. 3 meters of concreting. (See figure 2 for details). The strength of RCC/CC is dependent on proper curing; therefore, it is imperative that water content of CC/RCC mix does not drain out into the surrounding soil. In order to ensure this, the RCC/CC work should be carried out by covering all the sides by yellow PVC sheets of weight not less than 1 kg per 8 sqm to avoid seepage of water into the soil. (See figure 2 for details)

vii. Joint Chamber: The Joint chamber shall be provided at every joint location to keep the OF cable joint well protected and also to house extra length of cable which may be required in the event of faults at a later date. The Joint chamber shall be of pre- cast RCC type as per construction specification. Brick chamber can also be made with prior permission of TANFINET.

viii. Rubber Bush: To prevent entry of rodents into PLB HDPE DUCTS, the ends of PLB HDPE DUCTS are sealed at every manhole and joint using rodent resistant hard rubber bush (cap) after optical fiber cable is pulled. The rubber bush should be manufactured from hard rubber with grooves and holes to fit into 40 mm PLB HDPE DUCTS pipe, so that it should be able to prevent the entry of insects, rodents, mud, and rainwater into the PLB HDPE DUCTS pipe. It should conform to TEC GR with latest amendments. (See Figure-3 for details).

ix. Route/Joint Indicator: The Route/Joint indicators are co-located with each manhole/joint chamber. In addition, Route indicators are also to be placed were route changes direction like road crossings etc. Either RCC/Pre-cast or Stone based route indicators can be used. The detailed specification and

design of the same shall be as per construction specification. Generally, Stone Route indicators shall be used for the Bharat Net Phase- II project.

5. Excavation of Trenches

5.1. Trenching

a. Location and Alignment of the Trench: In built up areas, the trench will normally follow the footpath of the road except where it may have to come to the edge of the carriage way cutting across road with specific permissions from the concerned authorities maintaining the road (The bidder shall wait for the remarks of the agency/local body in all such cases of road cutting). Outside the built up limits the trench will normally follow the boundary of the roadside land. However, where the road side land is full of burrow pits or afforestation or when the cable has to cross culverts/ bridges or streams, the trench may come closer to the road edge or in some cases, over the embankment or shoulder of the Road and the same shall be mentioned in the survey report and be approved by TANFINET.

b. Once the alignment is marked, no deviation from the alignment is permissible except with the approval of TANFINET. While marking the alignment only the center line will be marked and the bidder shall set out all other work to ensure that, the excavated trench is as straight as possible. The bidder shall provide all necessary assistance and labor, at his own cost for marking the alignment. SI shall remove all bushes, undergrowth, stumps, rocks, and other obstacles to facilitate marking the center line without any extra charges. It is to be ensured that minimum number of bushes and shrubs shall be removed to clear the way and the SI shall give all, consideration to the preservation of the trees. No grown tree should be cut during the OFC laying process and care should also be taken for laying the OFC away from the trees for the safety of the OFC over years.

c. Line-Up: The line-up of the trench must be such that PLB HDPE Ducts shall be laid in a straight line, both laterally as well as vertically, except at locations where it has to necessarily take a bend because of change in the alignment or gradient of the trench, subject to the restrictions mentioned elsewhere.

5.2. Method of Excavation

a. In built up areas, the bidder shall resort to use of manual labor / HDD only to ensure no disturbance to the public and no damage is caused to any underground or surface installations belonging to other public utility services and/or private parties.

b. However, along the Highways and cross country there shall be no objection to the bidder resorting to mechanical means of excavation, provided that no underground installations existing the path of excavation, if any, are damaged.

c. There shall be no objection to resort to horizontal boring to bore a hole of required size and to push through G.I. Pipe (50 mm ID) through horizontal bore at road crossing or rail crossing or small hillocks etc.

d. All excavation operations shall include excavation and 'getting out'. 'Getting out' shall include throwing the excavated materials at a distance of at least one meter or half the depth of excavation, whichever is more, clear off the edge of excavation. In all other cases 'getting out' shall include depositing the excavated materials as specified.

e. In Rocky strata excavation shall be carried out by use of electromechanical means like breakers/ jack hammers or by blasting wherever permissible with express permission from the competent authority. If blasting operations are prohibited or not practicable, excavation in hard rock shall be done by chiseling/jack hammers.

f. Trenching shall as far as possible be kept ahead of the laying of pipes. The bidder shall exercise due care that the soil from trenching intended to be loose for back filling is not mixed with loose debris. While trenching, the bidder should not cause damage to any underground installations belonging to other agencies and any damage caused should be made good at his own cost and expense.

g. Necessary barricades, night lamps, warning board and required watchman shall be provided by the bidder to prevent any accident to pedestrians or vehicles. While carrying out the blasting operations, the bidder shall ensure necessary permissions have been obtained and the process is carried out following the standards with adequate safety by cautioning the Public, vehicular and other

traffic. The bidder shall employ sufficient manpower for this with caution boards, flags, sign writings etc.

h. The bidder should provide sufficient width at the trench at all such places, where it is likely to cave in due to soil conditions without any extra payment. A minimum free clearance of 15 cm should be maintained above or below any existing underground installation. No extra payment will be made towards this. In order to prevent damage to PLB HDPE DUCTS over a period of time, due to the growth of trees, roots, bushes, etc., the PIA shall cut them when encountered in the path of alignment of trench without any additional charges.

i. In large burrow pits, excavation may be required to be carried out for more than 165 cm in-depth to keep gradient of bed less than 15 degrees with horizontal. If not possible as stated above, alignment of trench shall be changed to avoid burrow pit completely.

5.3. Depth and Size of the Trench

a. The depth of the trench from top of the surface shall not be less than 165 cm unless otherwise relaxation is granted by TANFINET at the time of approval of survey and during implementation under genuine circumstances.

b. In rocky terrain, less depth shall be allowed only in exceptional circumstances with additional protection where it is not possible to achieve the normal depth due to harsh terrain/adverse site conditions encountered. This shall be done only with the approval of TANFINET. This shall be properly documented. In all cases, the slope of the trench shall not be less than 15 degrees with the horizontal surface. The width of the trench shall normally be 45 cm at the top & 30 cm at the bottom.

c. In case, additional pipes (HDPE/GI/RCC Pipes) are to be laid in some stretches, the same shall be accommodated in this normal size trench.

d. When trenches are excavated in slopes, uneven ground and 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 depth of 165 cm to keep the bed of the trench as smooth as possible. Near the culverts, both ends of the culverts shall be excavated more than 165 cm to keep the gradient less than 15 degree with

horizontal. For additional depth in excess of 165 cm, no additional payment shall be applicable.

e. If excavation is not possible to the minimum depth of 165 cm, as detailed above, full facts shall be brought to the notice of TANFINET in writing giving details of location and reason for not being able to excavate that particular portion to the minimum depth.

f. Approval shall be granted by TANFINET in writing under genuine circumstances. The decision of TANFINET shall be final and binding on the bidder. All the relaxations granted as specified above shall be dealt with as per the laid down norms and procedure of TANFINET.

g. Dewatering: The bidder shall be responsible for all necessary arrangements to remove or pump out water from trench. The bidder should survey the soil conditions encountered in the section and make his own assessment about dewatering arrangement that may be necessary. No extra payment shall be admissible for this.

h. Wetting: Wherever the soil is hard due to dry weather conditions, if watering is to be done for wetting the soil to make it loose, the same shall be done by the bidder. No extra payment shall be admissible for this.

i. Blasting: For excavation in hard rock, where blasting operations are considered necessary, the bidder shall obtain approval of TANFINET in writing for resorting to blasting operation. The bidder shall obtain license from the District Administration for undertaking blasting work as well as for obtaining and storing the explosive as per the Explosive Act, 1884 as amended up to date and the explosive Rules, 1983. The SI shall purchase the explosives fuses, detonators, etc. only from a licensed dealer. Transportation and storage of explosive at site shall conform to the aforesaid Explosive Act and Explosive Rules. The SI shall be responsible for the safe custody and proper accounting of the explosive materials. Fuses and detonators shall be stored separately and away from the explosives. TANFINET or his authorized representative shall have the right to check the SI's store and account of explosives. The SI shall provide necessary facilities for this. The SI shall be responsible for any damage arising out of accident to workmen, public or property due to storage, transportation, and use of explosive during blasting operation. Blasting operations shall be carried out under the supervision of a responsible authorized agent of the SI (referred subsequently as agent only), during specified hours as approved by the District

Administration. The agent shall be conversant with the rules of blasting. All procedures and safety precautions for the use of explosives drilling and loading of explosives before and after shot firing and disposal of explosives shall be taken by the SI as detailed in IS: 4081 safety code for blasting and related drilling operation.

j. Trenching Near Culverts/ Bridges: The PLB HDPE Ducts shall be laid in the bed of culvert at the depth not less than 165 cm protected by RCC pipes as decided by TANFINET. Both ends of culverts shall be excavated more than 165 cm in depth to keep the gradient of not less than 15 degrees with horizontal. The bed of trench should be as smooth as possible.

k. While carrying out the work on bridges and culverts, adequate arrangement for cautioning the traffic by way of caution boards during daytime and danger lights at night shall be provided. In case of small bridges and culverts, where there is a likelihood of their subsequent expansion and remodeling, the cable should be laid with some curve on both sides of the culvert or the bridge to make some extra length available for readjustment of the cable at the time of reconstruction of culvert or the bridge.

6. Laying OFC PLB HDPE Ducts

6.1. After the trench is excavated to the specified depth, the bottom of the trench has to be cleared of all stones or pieces of rock and levelled up properly. A layer of soft soil/or sand (in case the excavated material contains sharp pieces of rock/stones) of not less than 5 cm is required for levelling the trench to ensure that the cable when laid will follow a straight alignment. Adequate care shall be exercised while laying so that the OF cables are not put to undue tension/pressure after being laid as this may adversely affect the optical characteristics of cables with passage of time.

6.2. The bidder shall ensure that trenching and pipe laying activities are continuous, without leaving patches or portions incomplete in between. In case intermediate patches are left, measurement of the completed portions will be taken only after work in such leftover patches are also completed in all respects.

6.3. Preparatory to aligning the pipe for jointing, each length of the PLB HDPE Ducts shall be thoroughly cleaned to remove all sand, dust or any other debris that may clog, disturb or damage the optical fiber cable when it is pulled at a later stage.

The ends of each pipe and inside of each Socket shall be thoroughly cleaned of any dirt or other foreign materials.

6.4. After the trench is cleaned the PLB HDPE Ducts/Coil shall be laid in the cleaned trench, jointed with Sockets. Drawing up of PP rope is optional as per TEC GR. In case of use of PP Rope, at every manhole approximately at every 200m or at bends or turns the PP rope will be tied to the HDPE end caps used for sealing the PLB HDPE Ducts, to avoid entry of rodents/mud etc.

6.5. At the end of each day work, the open ends of the pipe's sections shall be tightly closed with endcaps to prevent the entry of dirt/mud, water, or any foreign matter into PLB HDPE Ducts until the work is resumed. In built up area falling within Municipal/Corporation limits, the PLB HDPE Ducts shall be laid with protection using RCC Pipes/ Concreting reinforced with weld mesh (only in exceptional cases).

6.6. For lesser depths requiring additional protection in built up areas, towns and cities falling within the municipal limits, suitable protection shall be provided to PLB HDPE pipes/coils using RCC/DWC full round/split pipes or GI pipes or cement concreting reinforced with MS weld mesh or a combination of any of these as per the site requirement. This shall be done only with the prior instructions/approval of TANFINET. The specifications for providing each of these protections are given later in this document.

6.7. Moreover, in cross country routes, if depth is less than 1.2 meters, protection by using RCC/DWC Pipe shall be provided. TANFINET shall decide about such stretches and type of protection to be provided in view of the site requirements based on the recommendations of the bidder in the survey report. Normally 100 mm RCC/DWC Pipes shall be used for protecting PLB.

6.8. HDPE Ducts but if more than one PLB pipe is to be laid and protected, RCC/DWC Pipe of suitable size to accommodate the required number of PLB Pipes shall be used.

6.9. The PLB HDPE Ducts shall be laid in RCC Full Round spun Pipes/GI Pipes as required at Road crossings. The RCC pipes/GI pipes shall extend at least 3 meters on either side of the road at Road crossings. At Road crossings, extra GI/PLB HDPE Ducts may be laid as per the direction/approval of TANFINET. On Rail bridges and crossings, the PLB HDPE Ducts shall be encased in suitable cast iron as prescribed by the Railway Authorities.

6.10. Wherever RCC pipes are used for protection, the gaps between the RCC collars and the RCC pipes shall be sealed using cement mortar 1:3 (1:53 grade cement of reputed brand, 3: fine sand without impurities) to bar entry of rodents. Every third collar of RCC pipes (normally of 2 meters length) and also both ends of RCC Pipes will be embedded in a concrete block of size 40 cm (L)x 40 cm(W) x 25 cm (H) of 1:2:4 cement concrete mix (1:53 grade cement of reputed brand, 2: coarse sand, 3: stone aggregate of nominal size of 20 mm) so that the alignment of RCC pipes remain firm and intact and to avoid entry of rodents.

6.11. Wherever GI pipes are used, special care should be taken to ensure that GI Pipes are coupled properly with the sockets so as to avoid damage to PLB pipe and eventually the OFC in the event of pressure coming on the joint and GI Pipe joint giving its way. Rubber bushes shall be used at either ends of the GI pipes to protect PLB pipe. Both the ends of GI Pipe will be embedded in a concrete block of size 40 cm (L) x 40 cm ((W) x 25 cm (H) of 1:2:4 cement concrete mix (1:53 grade cement of reputed brand, 2: coarse sand, 3: stone aggregate of nominal size of 20 mm) so that the alignment of GI Pipes remain firm and intact and to avoid entry of rodents.

6.12. In case of protection by concreting at site, the nominal dimension of concreting shall be 250 mm x250 mm section. Cement Concrete Mixture used shall be of 1:2:4 composition i.e., 1:53 grade Cement of a reputed company, 2: Coarse Sand, 4: Graded Coarse Stone aggregate of 20 mm nominal size, reinforced with MS weld mesh. As the RCC is cast at site, it is imperative to ensure that special care is taken to see that proper curing arrangements are made with adequate supply of water. The SI shall invariably use mechanical mixer at site for providing RCC protection, to ensure consistency of the mix.

6.13. For carrying out concreting work in trenches, yellow PVC sheets of width not less than 1m and of weight not less than 1 kg. Per 8 sq. meters shall be spread and nailed on sides of the trench to form trapezoidal section for concreting in the cleaned trench, to avoid seepage of water into the soil.

6.14. A bed of cement concrete mixture of appropriate width and 75 mm thickness shall be laid on the PVC sheet, before laying PLB HDPE ducts. The PLB HDPE Ducts shall then be laid above this bed of concrete. After laying the PLB HDPE Ducts, MS weld mesh is wrapped around and tied and concrete mix is poured to form the cross-sectional dimensions as instructed/approved by TANFINET.

6.15. The strength of RCC is dependent on proper curing therefore, it is imperative that water content of RCC mix does not drain out into the surrounding soil. Portions where cement concreting has been carried out shall be cured with sufficient

amount of water for reasonable time to harden the surface. After curing, refilling of the balance depth of the trench has to be carried out with excavated soil.

6.16. The PLB HDPE Ducts/RCC/GI Pipes shall be laid only in trenches accepted by TANFINET or his representative. The SI shall exercise due care to ensure that the PLB HDPE Ducts are not subjected to any damage or strain.

6.17. Water present in the trench at the time of laying the PLB HDPE Ducts shall be pumped out by the SI before laying the pipes in the trench to ensure that no mud or water gets into the pipes, thus choking it.

6.18. In case of nallahs, which are dry for nine months in a year, the PLB HDPE Ducts shall be laid inside the RCC Pipes laid at a minimum depth of 165 cm, as instructed/approved by TANFINET. The mechanical protection shall extend at least 5 meters beyond the bed of nallah on either side.

6.19. Notwithstanding anything contained in clauses referred above, TANFINET may order, based on special site requirements, that the PLB HDPE Ducts may be encased in reinforced cement concrete, as detailed, in the bid. While laying the pipes, a gap of 2m is kept at convenient locations approx. 200 m apart and at the bends and turns, which will be used as manholes during OF cable pulling. Ends of the PLB HDPE Ducts at the manholes shall be sealed using end caps after tying the PP rope to the end caps to avoid choking of the pipes. In a similar manner, manholes shall be kept while approaching bridges, road crossings etc., as instructed/approved by TANFINET.

7. Duct integration Test (DIT) for HDPE ducts

7.1. The bidder shall ensure that the trench does not have any sharp bend and the couplers are tightened to the maximum.

7.2. The bidder shall ensure the backfilling and the compaction of the trench are satisfactory prior to start of DIT.

7.3. The bidder shall ensure to pass the compressed air at 8Kg/Sq.cm and clean the duct from deposits like mud and small stones.

7.4. The bidder shall insert a medium density sponge into the duct and push it with compressed air of 8Kg/Sq.cm. The sponge should eject with full force.

7.5. The mandrill made of hard rubber or polished wood in the shape of cylinder of diameter. 0.75 x D in diameter of HDPE duct and 75 mm long shall be used.

7.6. On completion of test seal, the ends with end plugs.

7.7. The bidder shall ensure that there is no pressure leakage during DIT.

8. Laying Protection Pipes on Bridges and Culverts

8.1. In case trenching and pipe laying is not possible on the culverts, the pipes shall be laid on the surface of the culverts/bridges after due permission from TANFINET. Of late the bridge construction authorities are providing channel ducts on the footpaths on the bridges for various services. The RCC/DWC/GI Pipes can be laid in these ducts for pulling cables. However, for laying cables on existing bridges, where duct arrangement does not exist, one of the following methods may be adopted.

a. In case of the Bridges/Culverts, where there are no ducts and where the cushion on the top of the Arch is 50 cm to 100 cm or more, GI Pipe (Carrying PLB HDPE pipe and cable) may be buried on the top of the Arch adjoining the parapet wall, by digging close to the wheel guards. Every precaution shall be taken to see that no damage occurs to the arch of the culvert. After burying the GI pipe, the excavated surface on the arch shall be restored.

b. Where the thickness of the Arch is less than 50 cm, the pipe must be buried under the wheel guard masonry and the wheel guard rebuilt.

c. If neither of the two methods is possible, the GI Pipes/GI Troughs must be clamped on the parapet wall with the clamps. If necessary, the pipes may be taken through the parapet wall at the ends where the wall diverges away from the road.

8.2. Methods cited in above clauses should be carried out under close supervision of Road authorities.

8.3. The surface to be concreted should be thoroughly cleaned and levelled before concreting. At both ends of the Bridges/Culverts, where the GI Pipes/GI Troughs slope down and get buried, the concreting should be extended sufficiently to ensure that no portion of the GI Pipes/GI Troughs is exposed as approved by TANFINET to protect the pipe/trough from any possible externally caused damage.

8.4. Where whitewash/colour wash is existing on the Bridges/Culverts, the same should also be carried out on the concreted portion to ensure uniformity.

9. Back Filling and Dressing of the Trench

9.1. Provided that the PLB HDPE pipes have been properly laid in the trench at the specified depth, the back-filling operation shall follow as early as practicable. The earth used for filling shall be free from all roots, Grass, shrubs, vegetation, trees, saplings and any other kind of garbage or pebbles. The back-filling operation shall be performed in such a manner so as to provide firm support under and above the pipes and to avoid bend or deformation of the PLB HDPE pipes when the pipes get loaded with the back filled earth.

9.2. At locations where the back filled materials contains stones/sharp objects which may cause injury to the PLB HDPE pipes and where the excavated or rock fragments are intended to refill the trench in whole or in part, the trench should be initially filled, with a layer of ordinary soil or loose earth (free from any stones/pebbles) not less than 10 cm thick over the pipes.

9.3. Back filling on public, roads, railway crossings, footpaths in city areas shall be performed immediately after laying the HDPE pipes. Back filling at such locations shall be thoroughly rammed, so as to ensure original condition so that it is safe for the road traffic. All excess soil/ material left on road/footpath/railway crossing shall be removed by SI. However, along the highways and in countryside, the excess dug up material left over after refilling should be kept in a heap above over the trench.

9.4. In Urban areas (Corporation, Municipality and Town Panchayats), at any given time not more than 50m length of trench should be kept open and, in all places, where excavation has been done, no part of the trench should be kept open over night to avoid occurrence of any mishap or accident in darkness.

10. Restoration of Road Surface

10.1. Road restoration work to be made with bituminous macadam for semi grouting 50 mm thick and premix carpet surfacing 25 mm thick over the grouted surface (total up to 75 mm thick) including supply of asphalt etc. to evenly match the road, including consolidation, and rolling as per standard specification of DSR 1997.

10.2. Road restoration work with cement concrete 1:4:8 mix for thickness varying from 150 mm to 225 mm, including supply of concrete to be made to evenly match the road.

11. Cable Pulling

11.1. Manholes marked during PLB HDPE Ducts pipe laying of approx. size of 2m length x 1 m width x 1.65 m depth shall be excavated for pulling the cables. There may be situations where additional manholes are required to be excavated, for some reasons, to facilitate smooth pulling of cable. Excavation of additional manholes will be carried out, without any extra cost. De-watering of the manhole, if required, will be carried out without any extra costs. Dewatering/ De-gasification of the Ducts, if required, will be carried out without any extra costs.

11.2. The Optical Fiber cables are available in drums in lengths of approx. 2 km and 4 km. The cables shall be blown / manually pulled (in exceptional cases) through already laid PLB HDPE DUCTS. This work is to be carried out under the strict supervision of site in charge. It shall be ensured that during the blowing / pulling of Cable the tension is minimum and there is no damage to the Cable/Optical Fibers.

11.3. After pulling of the drum is completed, both ends of the PLB HDPE DUCTS pipe in each Manhole should be sealed by hard rodent resistant rubber bush, to avoid entry of rodents/mud into PLB HDPE Ducts.

11.4. The Manholes are prepared by providing 40 mm split PLB HDPE DUCTS pipe of 2.5m to 3m length and closing the split PLB HDPE Ducts by providing necessary clamps/ adhesive tape as per the directions of TANFINET Corporation. Afterwards, the split/cut PLB HDPE DUCTS pipe are covered with 100 mm split RCC pipe of 2m length and sealing the ends of RCC pipe with lean cement solution for protecting bare cable in the manhole. After fixing of RCC Split Pipes necessary back filling/reinstatement and dressing of manholes should be carried out as referred under trenching. The location of the pulling manhole should be recorded for preparation of documentation.

12. Stripping/ Cutting of the Cable

12.1. The cable is stripped of their outer and inner sheath with each sheath staggered approximately 10mm from the one above it.

12.2. Proper care must be taken when removing the inner sheath to ensure the fibers are not scratched or cut with the stripping knife or tool to prevent this, it is best to only score the inner sheath twice on opposite sides of the cable, rather than cut completely through it. The two scores marking on either side of the cable are then stripped of the inner sheath by hand quite easily.

12.3. The fibers are then removed from cable one by one and each fiber/ribbon is cleaned individually

13. Jointing/ Splicing Stripping/ Cutting of the Cable

13.1. OFC Joints will be at varying distances depending upon the OFC to be laid for connecting Panchayats. The 96 fibers are to be spliced at every Joint & at both ends (Terminations) in the node as directed by TANFINET. The infrastructure required for cable splicing i.e. Splicing machine OTDR, Optical talk set Tool kit etc., shall be arranged by the bidder and also any additional accessories required at site for splicing will also be arranged by the bidder.

13.2. The OFC thus jointed will be end-to-end tested by the TANFINET / Authorized agency for splice losses and transmission parameters as specified by TANFINET and prevalent at that time. The through OFC should meet all the technical parameters, specified in the AT schedule and no relaxation will be granted.

14. Construction of Jointing Chamber

14.1. The joint chambers are provided at every joint to keep the OFC joint well protected and also to keep extra length of OFC, which may be, required to attend the faults at a later date. Jointing chambers are to be prepared at the Fiber Point of Interconnect (FPIO) or normally at distance of every 2 km. Actual location of jointing chamber depends on length of cable drum and appropriateness of location for carrying out jointing work. The location is finalized/approved by TANFINET.

14.2. The jointing chambers are constructed by way of fixing pre-cast RCC chambers and covers as per the instructions/approval from TANFINET.

15. Construction of Jointing Chamber

For fixing precast RCC chamber, first a pit of size 2.0m x 2.0m x 1.8m depth shall be required to be dug. Precast RCC chamber shall consist of three parts (i) round base plate of 140 cm diameter and 5 cm thickness in two halves (ii) full round RCC

joint chamber with diameter of 120 cm and height of 100 cm and thickness of 5 cm (iii) round top cover will be in two halves with diameter of 140 cm and thickness of 5 cm having one handle for each half in centre and word 'TANFINET OFC' engraved on it. After, fixing the pre cast RCC joint chamber, the joint chamber is filled with clean sand before closing. Back filling of joint chamber pit with excavated soil shall be carried out in the end.

16. RCC Joint protection Chamber/Ring with top & bottom plates

16.1. RCC Joint Protection chamber consists of:

a. RCC ring / collar of inner dia 100cm, Height 50 cm, Thickness 5 cm (See figure 4.1)

b. A bottom circular RCC slab (bottom plate) of thickness 4 cm and 120 cm dia (See figure 4.2)

c. Two semi-circular RCC plates (top plates) of 60 cm radius (120cm dia) with two handles for each plate, and 4 cm thickness with the words "TANFINET OFC" engraved on it. (See figure 4.3)

16.2. Reinforced cement concrete should conform to NP2 class reinforcement. The weight of the chamber should be as prescribed in IS – 458.

16.3. The reinforced Chambers should be machine made.

16.4. All the materials used should be capable of withstanding the effect of water, mud & other chemical & corrosive effects of the soil.

16.5. The quality of material used for cement concrete work etc., shall be got approved by TANFINET / authorized representative of the Department.

16.6. Mild steel bars used for the work shall be of tested quality.

16.7. The materials used shall be of the best quality of several kinds procurable.

16.8. Sand used shall be of fine quality.

16.9. Reinforcement used should be of 6 mm GI wire.

16.10. Cement concrete proportion should be 1:2:3. (1 cement: 2 sands: 3 Jelly)

16.11. Ballast used should be of 6 mm size. 12-gauge GI wire needs to be wrapped before reinforcing the concrete.

16.12. Dimension should confirm to the enclosed drawings.

16.13. Plastering to be done to give a neat appearance. On both side with fine cement.

16.14. Curing period shall not be less than 21 (Twenty-One) days in any case. Curing should be carried out by immersing the pipes completely in water tank.

16.15. A break test should be conducted after the curing of the item, and before acceptance of the same. When the item is dropped from a height of five feet, it should not break and should not develop any cracks.

16.16. For round base and top plates, 8-gauge wire rings-3Nos at equidistance may be used.

17. Entry of the underground OFC into the node

Normal methods for leading in and precautions recommended for leading-in of the OFC should be followed. OFC loop of 20m shall be provided in each zero manhole to enable the splice to be made and to perform maintenance operations. The leading in arrangement from the zero manhole to the wall near the building shall be through underground. HDPE pipe of suitable length from the ground level to the entry point into the building shall be laid. From the entry point the OFC shall not be bent beyond the permissible limits. The required cores of the OFC shall be terminated in the Rack mountable FDMS.

18. of Route Indicators / Joint Indicators

18.1. Pits shall be dug 500 cm to 1000 cm towards jungle side at every Manhole and Jointing chamber for fixing of Route/Joint Indicator. In addition, Route Indicators are also required to be placed were OFC changes directions like road crossing etc.

18.2. The pits for fixing the indicator shall be dug for a size of 60 cm x 60 cm and 75 cm (depth).

18.3. The indicator shall be secured in upright position by ramming with stone and murrum up to a depth of 60 cm 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 cm. Necessary curing shall be carried out for the concreted structure with sufficient amount of water for reasonable time to harden the structure.

19. Fixing of Route Indicators / Joint Indicators

19.1. The route /joint indicator made of pre-cast RCC should have the following dimensions Base - 250 mm x 150 mm Top - 200 mm x 75 mm Height - 1250 mm (See Figure '5')

19.2. The Route indicators shall be painted Blue and placed at 500 to 1000 cm away from the centre of the trench towards jungle side. The Joint indicators are placed at OFC joints and placed 500 to 1000 cm away from wall of the joint chamber facing jungle side and are painted Grey. The engraved word "TANFINET OFC" should be painted in white, on route as well as joint indicators. Numbering of route indicators/joint indicators should also be done in white paint. The numbering scheme for route indicators will be Joint No./Route Indicator No. for that joint. For example, 2/6 marking on a route indicator means 6th route indicator after 2nd joint. Additional joints on account of faults at a later date should be given number of preceding joint with suffix A, B, C, and D. For example, sign writing 2A on a joint indicator means, additional joint between joint No. 2 and 3. The numbering of existing route/joint indicator should not be disturbed on account of additional joints. Enamel paints of reputed brand should be used for painting and sign writing of route as well joint indicators.

19.3. The route and joint indicator shall be painted with primer before painting with oil paint. The material used should bear ISI mark. The size of each written letter should be at least 3.5 cm. The colours of painting and sign writing is as under:

a. For Joint Indicator: Grey colour
b. For Route Indicator: Blue colour
c. For BharatNet OFC & Nos: White colour.

20. Documentation

20.1. The documentation, consisting of the following shall be prepared for each Segment connected. 4 sets of documentation shall be provided both in electronic format on CD as well as Hard-binded copy.

a. Route Index Diagrams – General: This diagram shall consist of OFC Route details on Geographical Map drawn to scale with prominent land marks and alignment of OFC with reference to road. This shall be prepared on A-3 sheets of 80 GSM.

b. Route Index Diagrams –Profile

Route Index diagrams will contain.

i. Make and size of the cable.
ii. Offset of cable from centre of the road at every 10 meters
iii. Depth profile of Cable at every 10 meters
iv. Details of protection with type of protection depicted on it.
v. Location of culvert and bridges with their lengths and scheme of laying of PLB HDPE Ducts pipe thereon.
vi. Important landmarks to facilitated locating the cable in future; Location of Joints and pulling manholes.

c. These diagrams shall be prepared on A-4 sheets of 80 GSM. On one sheet profile of maximum 400 meters shall be given to ensure clarity.

d. As Build Diagrams

The ABD shall be an essential part of the documentation process and shall ensure easy maintenance of the OFC route. The ABD shall be separately prepared for each route (between two nodes). The ABD will contain the following details: -

i. Cable Details
- Make and size of the cable.
- Identification of cable drums deployed.
- Test reports.
- Joint Details
- Location of Joint Chamber (Lat/Long details in decimal degree format up to six decimal places)
- Depth of Joint Chamber covers from ground level.
- Details of cable slack left at each joint chamber. Splice loss details.

ii. FDMS Details
- Details of FDMS deployment.
- OTDR measurements for each fiber terminated at FDMS.

- Fiber Connectivity Details.
- Route marker Details
- Location of Cement route marker Lat/Long details in decimal degree format up to six decimal places)
- Route Marker Identification details.

iii. Optical Test results

- OTDR readings.
- Light Source Power Meter readings.
- Chromatic Dispersion measurement readings.
- Optical test results for each fiber shall be furnished.
- OTDR settings to include wavelength, pulse width and average time shall also be recorded.
- Bi-directional OTDR readings shall be furnished for each Joint Closure.
- OFC Alignment Details
- Offset of cable from center of the road at every 10 meters.
- Details of crossings (road/rail etc.,) should be provided.
- Depth profile of Cable at every 10m interval.
- Details of protection with type of protection.
- Location of culvert and bridges with their lengths and scheme of laying of HDPE/PLB pipe thereon.
- Important landmarks to facilitate locating the cable in future to include culverts, houses, petrol pumps, schools etc.
- Location of Joints and manholes.
- Location of Cement and Electronic Route Markers.
- The OFC alignment details shall be provided at multiple Levels of Detail (LOD) to facilitate section wise identification of route. While one sheet shall contain the entire link the LOD would gradually increase to up to 400m on a single sheet.
- Diagram shall consist of Cable Route Details on Geographical Map drawn to scale with prominent landmarks and alignment of cable with reference to road.
- Indexing and referencing of the diagrams shall be made to provide easy identification of route details.

iv. Landmarks along route

- All the important landmarks for verification along the OFC route corridor would be recorded as part of the ABD. The corridor would

include all verifiable landmarks up to 25m on each side along the center of the road.

- All landmarks recorded as part of the ABD would be provided along with accurate latitude & longitude details in decimal degree up to eight decimal places.
- The broad category of landmarks to be recorded would be as given below:
    - ✓ Milestone.
    - ✓ Culverts.
    - ✓ Bridges
    - ✓ Important building footprint.
    - ✓ Road Features.
- ABD shall provide the basis for carrying out GIS mapping of the entire OFC route alignment. Readings recorded shall be digitally corrected by using appropriate software. ABD shall be generated using CAD tool(s).
- Accuracy of details provided as part of the ABD will be very critical for successful implementation.
- All the diagrams shall bear the signatures of the bidder and the project manager as a proof of accuracy of the details. The diagrams shall be bound in A-4 size book with cover. The cover sheets shall be laminated and should have the following details.
    - ✓ Name of the Project Organization.
    - ✓ Name of the OFC Link with ID.
    - ✓ Name of the SI.
    - ✓ Name of TANFINET Rep as part of Acceptance Test.
    - ✓ Name of SI Rep as part of Acceptance Test.
    - ✓ Date of commencement of work.
    - ✓ Date of completion of work.
    - ✓ Name of the State/District/Block
    - ✓ Name of the Panchayats connected.
    - ✓ Name of the Purchaser
    - ✓ Name of the SI
    - ✓ Date of commencement of work
    - ✓ Date of completion of work
    - ✓ For each Segment, 2 sets of above-mentioned documents shall be submitted to TANFINET.

21. Safety Precautions

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

a. The bidder should get full information from TANTRANSCO/TANGEDCO/Local body 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 TANTRANSCO/TANGEDCO/Local body should be asked to send a representative and work should be preceded with close consultation with them.

b. 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.

c. 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 would be better.

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

e. 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.

f. All electric cables should be regarded as being live and consequently dangerous and standards must be followed.

21.2. Electric shock - Action and treatment

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

21.3. Safety Precautions while working in public street and along railway lines:

a. 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 and warning/caution signs for the workmen and general public are fixed.

b. 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.

c. 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.

21.4. 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.

21.5. Care when working in Excavations.

a. Jumping into a trench is dangerous. If it is deep, workmen should be encouraged to lower themselves.
b. Workers should work at safe distance 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.

c. If an obstruction is encountered, it should be carefully uncovered and protected if necessary.

d. 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.

21.6. Danger of cave in

a. When working in deep trenches in loose soil, timbering up/shoring the sides will prevent soil subsidence.
b. The excavated material should be kept at sufficient distance from the edge of the trencher pit.

c. Vehicles or heavy equipment must not be permitted to approach too close to the excavation.

d. When making tunneled opening, it should be ensured that the soil is compact enough to prevent cave in even under adverse conditions of traffic.

e. 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.

21.7. Protection of Excavations

a. 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.

b. 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.

c. 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.

21.8. Precautions while working on roads.

a. The period between sunset and 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.

b. 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 suitable height or by some other effective means.

c. 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.

d. The flags and the lamps should be placed in conspicuous positions so as to indicate to 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 1.25m along the width and 6m along length of the obstruction in non-congested areas, but 4m along the length in congested areas.

e. If the excavation is extensive, sufficient notice to give adequate warning of the danger, should be displayed consciously not less than 1.25m above the ground and close to the excavation.

f. 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 curb or edge of all such roads from which the excavation or as near the distance as is practicable but not less than 10m from the junction of an entering or intersecting road in which the excavation exists.

g. 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.

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

i. 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.

j. Leads, hoses etc. stretched and across the carriageway should be guarded adequately for their own protection and that of the public.

21.9. Traffic Control

a. The bidder shall liaise with 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.

b. 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.

21.10. Work along Railway Lines

a. 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.

b. When working along double line of railway, the workmen 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.

21.11. Procedure and Safety Precautions for use of explosives during blasting for trenching

a. In areas where the cable trench cannot be done manually on account of boulders and rocks, it is necessary to blast the rocks by using suitable explosives. The quality of explosive to be used depends on the nature of the rocks and the kind of boulders. A few types of explosive fuses and detonators normally used for making trenches for cable works are detailed below:

- ✓ Gun powder

- ✓ Nitrate Mixture
- ✓ Gelatin
- ✓ Safety fuse
- ✓ Electric Detonator
- ✓ Ordinary Detonator

b. A detailed survey of the route is to be done to assess the length of the section where trenching is to be done with the help of blasting. A route diagram of the rocky section may be prepared indicating the length of the route where the explosives are to be used. For the purpose of obtaining license, a longer length of route should be given in the application as in many cases, after digging, rocks appear which was not initially anticipated.

c. Next a license will have to be obtained for use and storing of explosive in that section. If the area falls under a police commissioner, the authority for granting such license is the police commissioner of the concerned area. When the route does not fall in the jurisdiction of a police commissioner, the authority for issuing license is the District Collector.

d. The concerned licensing authority (in most cases it is the respective District Collectors) should be applied in prescribed form with a route map. The concerned authority will make an enquiry and issue license for using/storing explosives for cables trenching work. Such license will be valid for limited period only. The license should be got renewed if the blasting operation needs to be extended. Once the license is granted, it is the responsibility of the holders of the license for the proper use of explosives, its transportation and storing.

21.12. Method

a. The safest explosive is the Gelatin and electric detonator. Gelatin is in the form of a stick. Electric detonator is a type of fuse used for firing the explosive electrically. Holes are made at suitable intervals on rocky terrain or boulders either by air compressor or by manual chipping. The depth of the holes should be 2 to 3 ft. Fill up the holes with small quantity of sand for about 6". First the electric detonator is to be inserted into the Gelatin and the Gelatin is to be inserted into the holes keeping the + ve and - ve wirings of electric detonators outside the holes. Again, refill the holes with sand. These +ve and-ve insulated wires of detonator are then extended and finally connected to an EXPLODER kept at a distance of not less than 100 m.

b. Now the explosive is ready for blasting. But, before connecting wires to exploder for blasting, all necessary precautions for stopping the traffic, use of red flags, exchange of caution signals, etc. should be completed and only then Exploder should be connected and operated.

21.13. Operation of exploder (IDL Scheffler type 350 type exploder)

a. The type 350 blasting machine consists of a bearing block with blasting machine system and the explosion proof light- alloy injection molded housing. The exploder is held with the left hand. The twist handle is applied to the drive pin, clapped with the right hand turned in the clockwise direction in continuous measurements at the highest speed from the initial position until it reached to a stop. At this stage an indication lamp will glow. When the indication lamp glows, “press button switch” should be pressed. This will extend the electric current to detonator and Gelatin will be detonated. The rock will be blasted out of the trench. Number of holes can be blasted in a single stroke by connecting all such detonators in series connection and finally to the exploder. After blasting, again mazdoors are engaged on the work to clear the debris.

b. If the result of the first blasting is not satisfactory; it should be repeated on the same place.

21.14. Warning

There may be two reasons for the unsatisfactory results of the blasting.

a. Misfire of Gelatin due to leakage of current from detonator.
b. Over loading because of overburdens.
c. Never pull the broken wire pieces form the holes in such cases.

Attempt should not be made to reblast the misfired Gelatin. The safest way is to make a fresh hole by its side and put fresh Gelatin in that hole and blast it.

21.15. Precautions

The abstract of Explosives Rules 1983 which are relevant to our work is given below:

a. Restriction of delivery and dispatch of explosives

i. No person shall deliver or dispatch any explosives to anyone other than a person who is the holder of a license to possess the explosives or the agent of a holder of such a license duly authorized by him in writing on his behalf OR is entitled under these rules to possess the explosives without a license.

ii. The explosives so delivered or dispatched shall in no case exceed the quantity, which the person to whom they are delivered or dispatched is authorized to possess with or without a license under these rules.

iii. No person shall receive explosives form any person other than the holder of a license granted under these rules. No person shall receive from or transfer explosives to any person for a temporary storage or safe custody in a licensed premise unless prior approval is obtained from the Chief Controller.

iv. A person holding license for possession of explosives granted under these rules shall store the explosives only in premised specified in the license.

21.16. Protection from Lightening During Storing

Every magazine shall have attached there to one or more efficient lightening conductors designed and erected in accordance with the specification laid down in Indian Standard Specifications No.2309 as amended from time to time. The connections to various parts of earth resistance of the lightening conductor terminal on the building to the earth shall be tested at least once in every year by a qualified electrical engineer or any other competent person holding a certificate of competency in this behalf from the State Electricity Department. A certificate showing the results of such tests and the date of the last test shall be hung up in conspicuous place in the building.

21.17. Precautions during thunderstorm

When a thunder- storm appears to be imminent in the vicinity of a magazine or store house every person engaged in or around such magazine and store house shall be withdrawn to a safe distance from such magazine or store house and the magazine and store house shall be kept closed and locked until the thunderstorm has ceased or the threat of it has passed.

21.18. Maintenance of records

Every person holding a license granted under these rules for possession, sale or use of explosives shall maintain records in the prescribed form and shall produce such record on demand to an Inspection Officer.

21.19. Explosives not to be kept in damaged boxes.

The licensee of every magazine or store house shall ensure that, the explosives are always kept in their original outer package. In case, the outer package gets damaged so that the explosive contained therein cannot be stored or transported, such explosives shall be repacked only after the same are examined by controller of explosives.

21.20. Storage of explosives more than the licensed quantity.

The quantity of any kind of explosives kept in any licensed magazine or store house shall not exceed the quantity entered in the license against such kind of explosives. No explosives in excess of the licensed quantity shall be stored in the magazine or store house unless a permit on this behalf is obtained from the licensing authority by a letter or telegram.

21.21. Precautions to be observed at Site

a. The electric power at the blasting site shall be discontinued as far as practicable before charging the explosives. No work other than that associated with the charging operations shall be carried out within 10 meters of the holes unless otherwise specified to the contrary by the licensing authority.

b. When charging is completed, any surplus explosive detonators and fuses shall be removed from the vicinity of the hole and stored at a distance which should prevent accidental detonation in the event of a charge detonating prematurely in any hole. The holes which have been charged with explosive shall not be left unattended till the blasting is completed. Care shall be taken to ensure that fuse or wires connected to the detonation are not damaged during the placing of stemming materials and tamping.

c. Suitable warning procedure to be maintained.

d. The licensee or a person appointed by the licensee to be in charge of the use of explosives at the site shall lay down a clear warning procedure consisting of warning signs and suitable signals and all persons employed in the area shall be made fully conversant with such signs and signals.

21.22. Precautions to be observed while firing.

a. The end of the safety fuse (if used in place of a detonator should be freshly cut before being lighted. The exploders shall be regularly tested and maintained in a fit condition for use in firing. An exploder shall not be used for firing a circuit above its rated capacity. The electric circuits shall be tested for continuity before firing. All persons other than the shot-firer and his assistant, if any, shall be withdrawn from the site before testing the continuity.

b. For the purpose of jointing, the ends of all wires and cables should have the insulation removed for a maximum length of 5 cm. and should, then be made clear and bright for a minimum length of 2.5 cm. and the ends to be joined should be twisted together so as to have a positive metal contact.

c. Then these should be taped with insulation to avoid leakage when in contact with earth. In case of blasting with dynamite or any other high explosive, the position of all the bore holes to be drilled shall be marked in circles with white paint. These shall be inspected by the SI's agent. Bore holes shall be of a size that the cartridge can easily pass down. After the drilling operation, the agent shall inspect the holes to ensure that drilling has been done only at the marked locations and no extra hole has been drilled. The agent shall then prepare the necessary charge separately for each bore hole. The bore holes shall be thoroughly cleaned before a cartridge is inserted. Only cylindrical wooden tamping rods shall be used for tamping. Metal rods or rods having pointed end shall never be used for tamping. One cartridge shall be placed in the bore hole and gently pressed but not rammed down. Other cartridges shall then be added as may be required to make up the necessary charge for the bore hole. The topmost cartridge shall be connected to the detonator which shall in turn be connected to the safety fuses of required length. All fuses shall be cut to the length required before being inserted into the holes. Joints in fuses shall be avoided.

d. Where joints are unavoidable, a semi-circular niche shall be cut in one piece inserted into the niche. The two pieces shall then be wrapped together with string. All joints exposed to dampness shall be wrapped with rubber tape.

e. The maximum of eight bore holes shall be loaded and fired at one occasion. The charges shall be fired successively and not simultaneously. Immediately before firing, warning shall be given, and the agent shall see that all persons have retired to a place of safety. The fuses of the charged holes shall be ignited in the presence of the agent, who shall see that all the fuses are properly ignited.

f. Careful count shall be kept by the agent and other of each blast as it explodes. In case all the charged bore holes have exploded, the agent shall inspect the site soon after the blast but in case of misfire the agent shall inspect the site after half an hour and mark red crosses (X) over the holes which have not exploded. During this interval of half an hour, nobody shall approach the misfired holes. No driller shall work near such bore until either of the following operations has been done by the agent for the misfired boreholes.

g. The bidders agent shall very carefully (when the tamping is a damp clay) extract the tamping with a wooden scraper and withdraw the primer and detonator.

h. The holes shall be cleaned for 30 cm of tamping and its direction ascertained by placing a stick in the hole. Another hole shall then be drilled 15 cm away and parallel to it. This hole shall be charged and fired. The misfired holes shall also explode along with the new one.

i. Before leaving the site of work, the agent of one shift shall inform the agent relieving him for the next shift, of any case of misfire and each such location shall be jointly inspected and the action to be taken in the matter shall be explained to the relieving agent. The TANFINET Corporation shall also be informed by the agent of all cases of misfire, their cause and steps taken in that connection.

21.23. General Precautions

a. For the safety of persons red flags shall be prominently displayed around the area where blasting operations are to be carried out. All the workers at site,

except those who actually ignite the fuse, shall withdraw to a safe distance of at least 200m from the blasting site. Audio warning by blowing whistle shall be given before igniting the fuse.

b. Blasting work shall be done under careful supervision and trained personnel shall be employed. Blasting shall not be done within 200 meters of an existing structure, unless specifically permitted by the TANFINET Corporation in writing.

21.24. Precautions against misfire

The safety fuse shall be cut in an oblique direction with a knife. All saw dust shall be cleared form inside of the detonator. This can be done by blowing down the detonator and tapping the open end. No tools shall be inserted into the detonator for this purpose. If there is water present or if the borehole is damp, the junction of the fuse and detonator shall be made watertight by means of tough grease or any other suitable material. The detonator shall be inserted into the cartridge so that about one-third of the copper tube is left exposed outside the explosive. The safety fuse just above the detonator shall be securely tied in position in the cartridge. Waster proof fuse only shall be used in the damp borehole or when water is present in the borehole. If a misfire has been found to be due to defective fuse, detonator or dynamite, the entire consignment from which the fuse, detonator or dynamite was taken shall be got inspected by the TANFINET Corporation or his authorized representative before resuming the blasting or returning the consignment.

21.25. Precaution against stray currents

Where electrically operated equipment is used in locations having conductive ground or continuous metal objects, tests shall be made for stray current to ensure that electrical firing can proceed safely.

21.26. Allied Activities

a. Storing/Warehousing of Materials: The bidder will be responsible for storing and warehousing of all the material and accessories, but not limited to, supplied by him at his own cost. No storing/warehouse shall be provided by TANFINET.

b. Transportation of Materials: The bidder shall be responsible for transporting the materials including those supplied by TANFINET or otherwise to execute the work under the contract, to site at his/ their own cost. The costs of transportation are subsumed in the standard quoted Rates and therefore no separate charges are payable on this account.

c. Disposal of Empty Cable Drums: The bidder shall be responsible to dispose of the empty cable drums after laying of the cables. The costs shall be accounted by the bidder at the time of bidding.

    i. It shall be obligatory on part of the bidder to dispose of the empty cable drums at his/their level. The bidder shall not be allowed to dump the empty cable drums in Govt./Public place which may cause inconvenience to the public.

    ii. The bidder shall dispose other scraps, wastages, packing materials etc., as per approved methods at his/their own level.

d. Supply of Materials: There are some materials (Accessories) other than as mentioned in BOQ required to be supplied by the bidder for execution of work under this contract like Bricks, Cement, Wire Mesh and Steel for protection, etc., besides using other consumables which do/don't become the part of the asset. The bidder shall ensure that the materials supplied are of best quality and workmanship and shall be strictly in an accordance with the specifications.

Note: All the materials as above have to be TSEC/Type approved by BSNL QA/TEC against mentioned TEC GR or as per the approval procedure of TANFINET for which TEC GR not there.

Figure 1

HDPE END CAPS

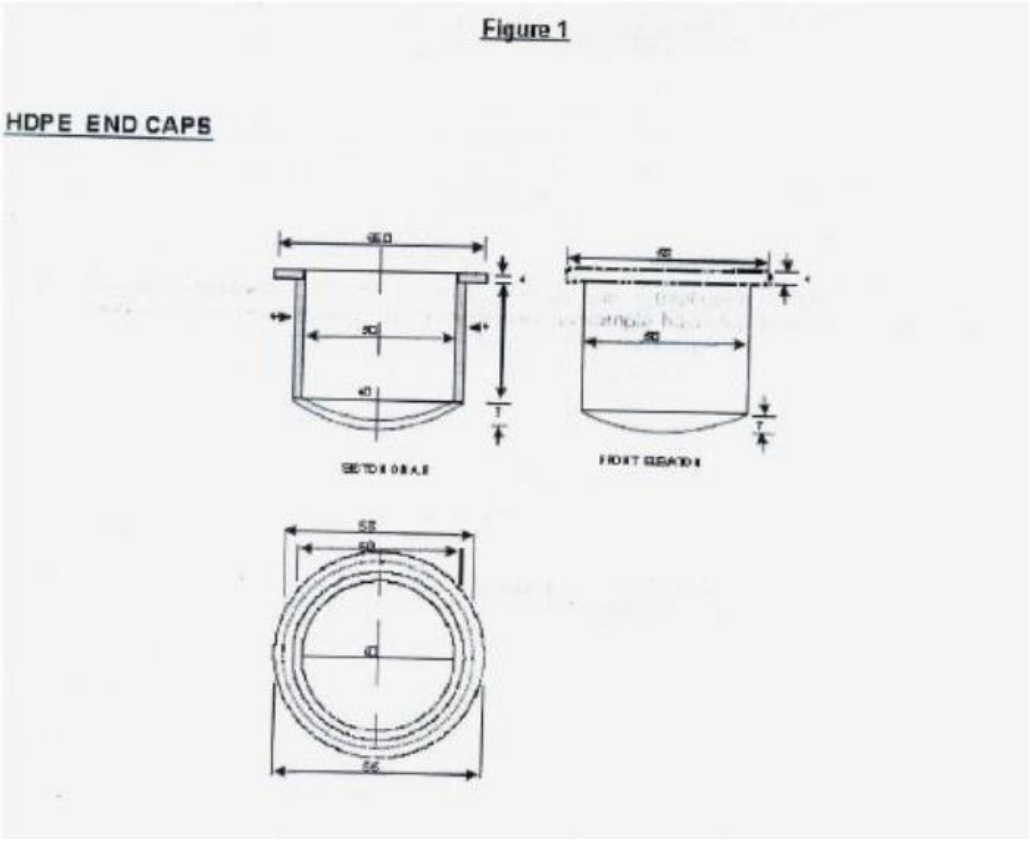


Figure2

M.S.WELDMESH

DETAILS OF 100 MM X 50 MM, 12 SWG MILD STEEL WELD MESH HAVING WIDTH OF 120cm.

All measurements provided below are in Centimeters

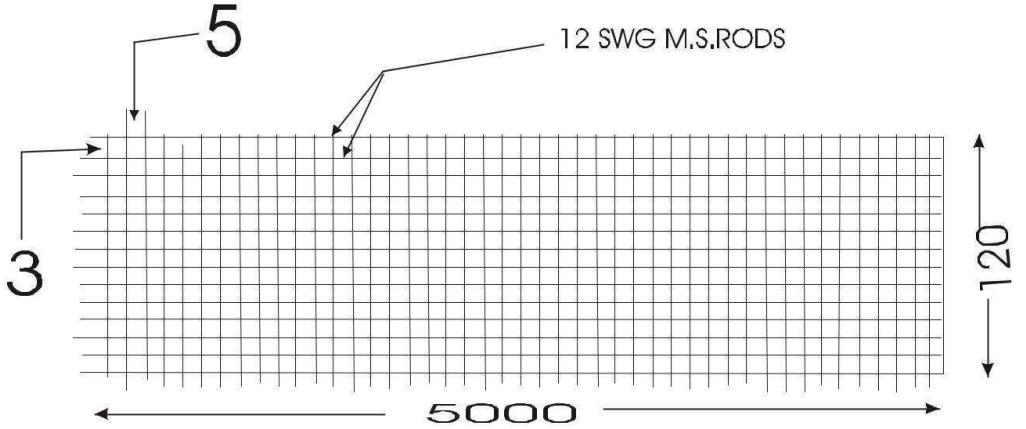
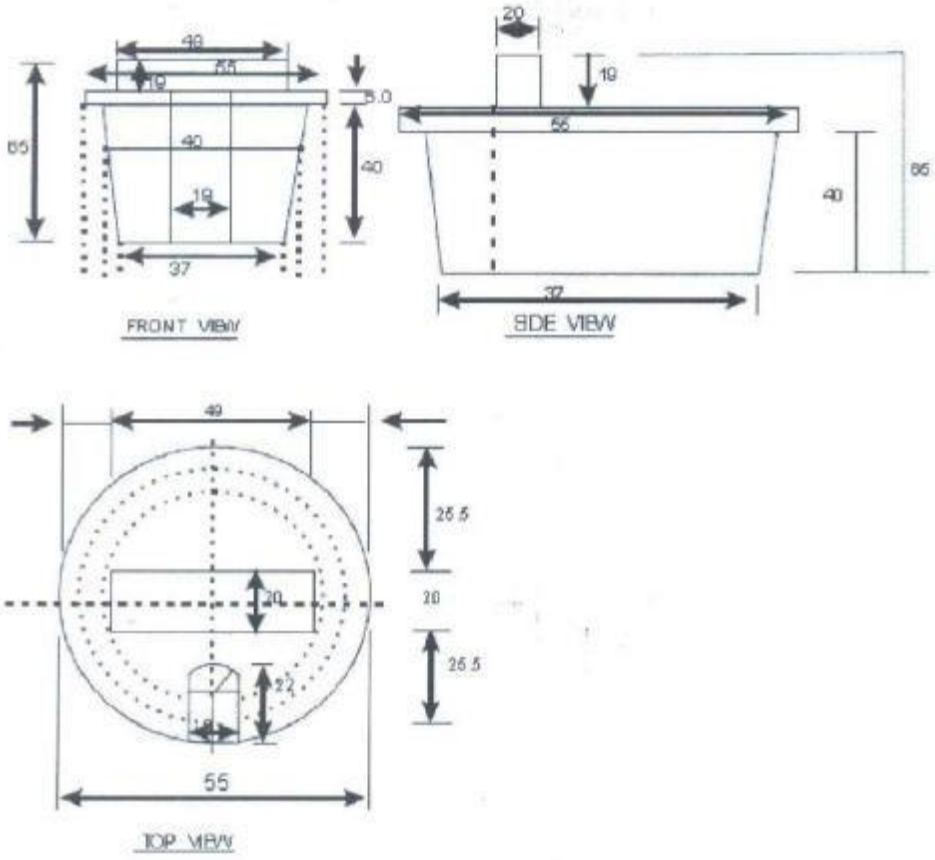


Figure 3

Rubber Cork

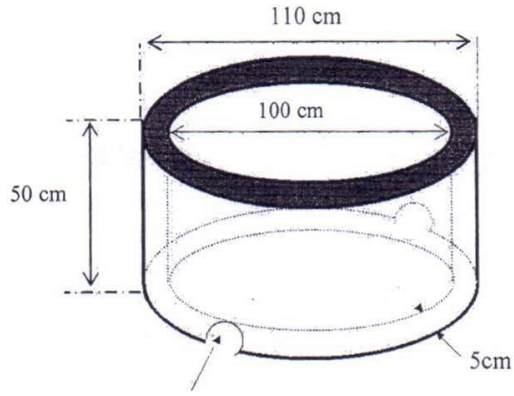


Note:
All Dimensions are in MM.

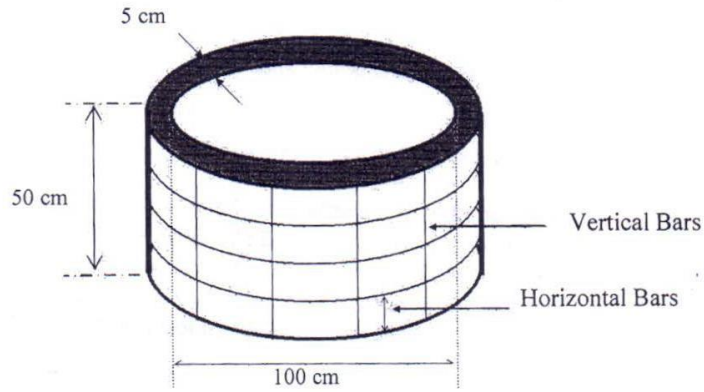
Dimensions are only for Guidance. Tapper should be such that it should tightly fix. Into Type A & Type B Hope 50mm OO Pipes.

Figure 4.1

TECHNICAL SPECIFICATION AND REINFORCEMENT DETAILS OF PRECAST RCC CHAMBER- RINGS/COLLAR



REINFORCEMENT DETAILS



Specifications

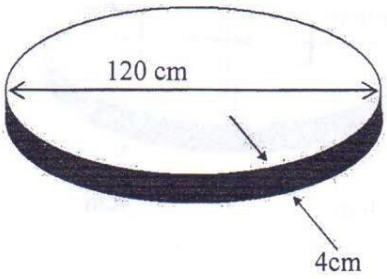
1. Inner diameter : 100 cm
2. Outer diameter : 110 cm
3. Height : 50 cm (2 rings of 25 cm each or 1 ring of 50cm)
4. Thickness : 5 cm
5. Two number of 80 mm diameter semicircular holes for cable entry diametrically opposite to each other at bottom end of the collar.
6. RCC Rings shall be NP-2 Class. The ring may be supplied either as two rings of 25cm each or as one ring of 50 cm. One single ring shall be preferably.

Reinforcement details

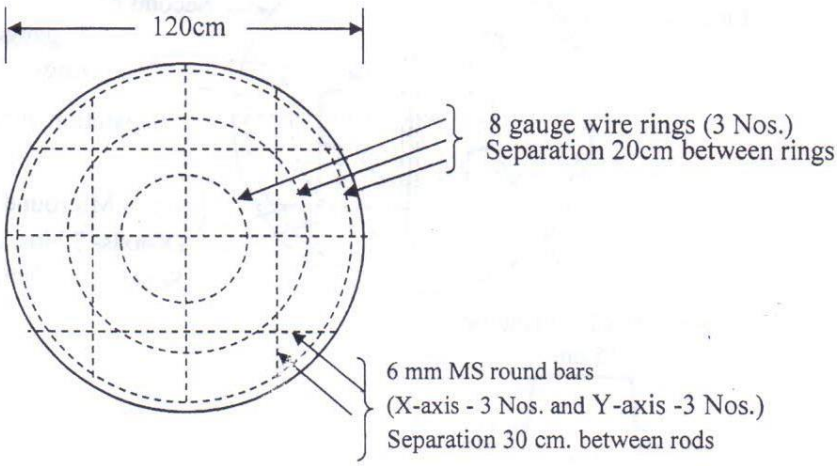
1. 6mm Horizontal Iron round rings - 4Nos
2. 6mm Vertical bars- 12Nos
3. 12 Gauge GI wire mesh to be rapped before reinforcing the concrete.
4. Concrete Mix: 1:2:3 (1 cement: 2 sand : 3 graded stone aggregate 20mm nominal size)
5. Finishing: smooth

Figure 4.2

TECHNICAL SPECIFICATION AND REINFORCEMENT DETAILS
PRECAST RCC CHAMBER-ROUND BASE PLATE



REINFORCEMENT DETAILS

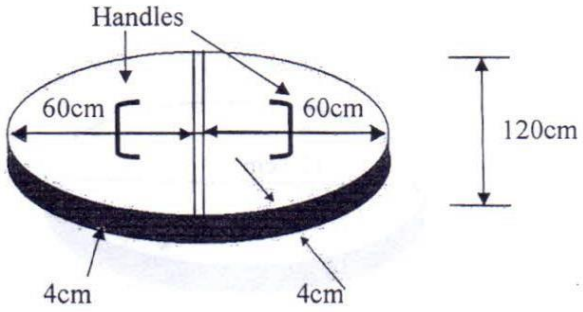


Specifications and Reinforcement Details

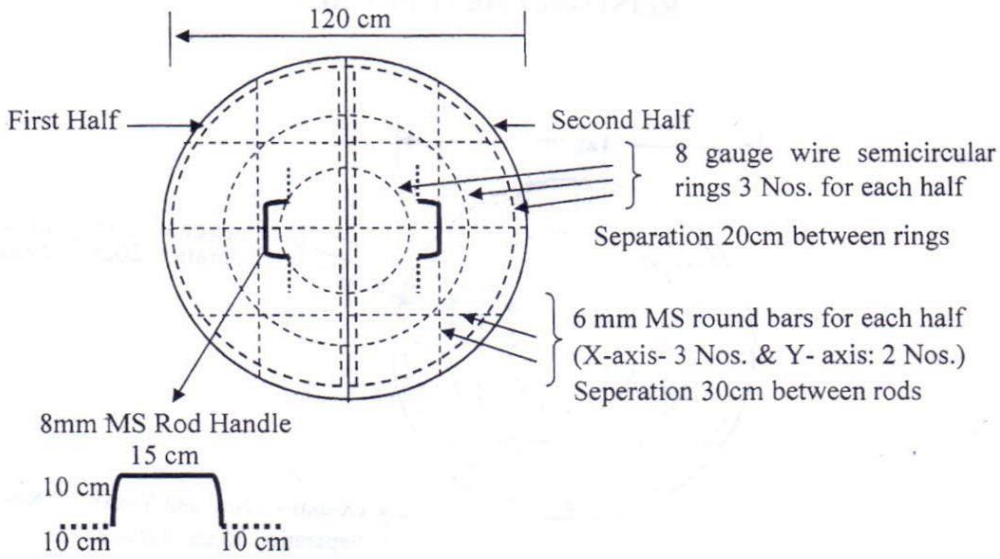
1. 120 cm outer diameter circular plate with 4 cm thickness.
2. 8 gauge wire rings -3 Nos. at equidistance.
3. The separation of 6mm MS round rings shall be about 20cm between the rings.
4. 6 mm MS round bars on X axis - 3Nos and on Y axis - 3Nos.
5. 6 mm MS round bars separation shall be about 30 cm.
6. Concrete Mix – 1:2:3 (1 cement : 2 sand : 3 graded stone aggregate 20 mm nominal size)
7. Finishing: smooth.
8. The base plate can be supplied in two halves also. However in such cases 6 mm MS round bars shall be 3 Nos. on X axis and 2 Nos. on Y axis.

Figure 4.3

TECHNICAL SPECIFICATION AND REINFORCEMENT DETAILS OF PRECAST RCC CHAMBER-ROUND TOP COVER



REINFORCEMENT DETAILS

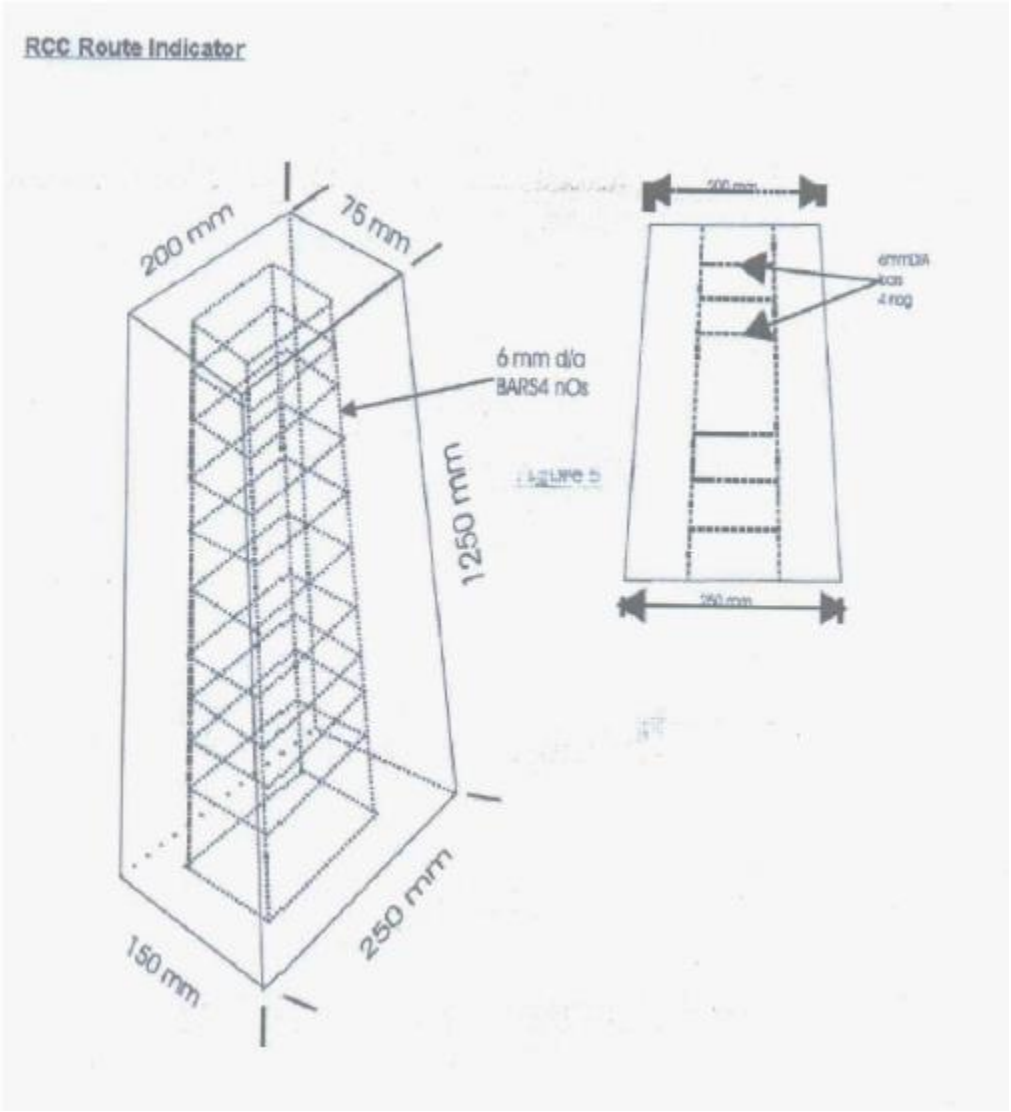


Specifications and Reinforcement Details

1. Two numbers of semicircular plates of 120 cm diameter (60 cm radius)
2. 8 gauge wire semicircular rings 3 Nos. for each half. Separation between the rings shall 20 cm.
3. 6 mm MS round bars X-axis: 3 Nos. and Y- axis: 2 Nos. for each half. Separation between the bars shall be 30 cm.
4. One handle shall be provided for each half in centre for handling and for smooth opening of joint Chamber. The hooks size shall be of size 15 cm x 10cm of 8 mm MS rod and properly secured with the reinforcement.
5. The word "BBNL OFC" shall be engraved on each half.
6. Concrete Mix : 1:2:3 (1 cement: 2 sand : 3 graded stone aggregate 20mm nominal size)
7. Finishing : smooth

Figure 5

RCC Route Indicator



21.27. Aerial OFC Laying Process

The Engineering Instructions spelt out in this document part of the document deal with the methods to be adopted for Aerial OFC (self- supporting metal free) laying in TANGEDCO poles/other poles and termination of Cores at Block/Super GP/Type 1 GP/Type 2 GP.

a. Route Survey

The route should be inspected before the actual installation of Optical Fiber cables. Survey of the aerial route should be carried out pole by pole.

b. Over Head Alignment

The existing route alignment wherever available should be used. On new routes, alignment should be erected, and the span length must not exceed above 90m. All the details shall be captured in the survey report and installation shall be as approved by TANFINET.

c. Line Diagram

A line diagram should be prepared to mark the poles & the actual distance between the poles in a splice section (Normally 15 poles per km are recommended). Additional poles should be erected if required to keep the span length within the specified limits. Care should be taken that the alignment is easily accessible from the road. It is necessary to keep clear head way (Ground clearance) of above 12 feet in a section. As far as possible the ground clearance shall be over 15 feet especially in road crossings (subject to the rules of concerned agency). A complete line diagram should be prepared i.e. from node A to node B. The number of road crossings, canals or nallahs, electric lines should be clearly marked in the Route diagram.

d. Hilly Regions

Line erection rules must be strictly followed. Additional poles may be erected for better support to optical Fiber cable & to avoid sharp curves & bends. Span lengths should be reduced to avoid sags in case of steep slopes.

e. Tension Poles

Tension poles are dead end or termination poles. The tension poles shall have dead end fittings. The Dead-end fittings offer a continuous run of the Aerial OFC. The se fittings relieve the OFC of its compressive, bending & clamping stresses. The performed dead end fittings are suitably gritted for excellent tensile holding strength.

Selection of Tension Poles

Selection of tension poles depends upon the actual site location of the route. Every fifth pole should be a tension pole in straight alignment. Splicing location poles should be tension poles or wherever alignment takes a sharp turn (more than 20 degrees) should also be a tension pole.

f. Suspension Poles

The suspension pole assembly is designed to offer cushion to Aerial OFC against the dynamic stress of Aeolian vibration at the suspension point. They also reduce static stresses at the Support point.

Selection of Suspension Poles

Selection of suspension poles also depends upon actual site location of route. All the intermediate poles between two tension poles will be suspension poles.

g. Selection Of Splice Location

The splice box of the Aerial OFC should be buried underground. Therefore, it is necessary to fix & determine the splicing location as per the designated cable drum length.

21.28. Aerial Optical Fiber Cable Specifications

a. Specifications

i.	Maximum span Length	:	80m
ii.	Maximum Ice loading	:	0 Kg per meter
iii.	Operational Wind Velocity	:	100Km per hour
iv.	Maximum sag allowed	:	1% of span length (Without excess load)
v.	Maximum sag allowed	:	2& of span length (with excess load)
vi.	Temperature range		
	Operation & storage	:	0 to 70 degree C
	Installation	:	0 to 50 degree C
vii.	Minimum bend radius	:	2D (D-Diameter of cable)
viii.	Tensile force		
	Tensile force during installation	:	9.81 x 1.3 xw
	Permanent with wind load	:	9.81 x 3 xw

(Where w is the mass of 1 km length of cable, in kg)

b. Types of Accessories and Fixtures

i. Tension /Dead End/ Anchoring Assembly:

Tension / Anchoring assemblies shall be used to firmly hold ADSS cable to a concrete, wood or steel pole and transmit the mechanical tension,

- At the end of a run

- At Tensioning Points
- At a major change in direction of over 20 degrees. (As shown in figure below)

ii. Suspension Clamp Assembly

Suspension Clamp Assembly shall be used for holding the ADSS cable at an intermediate point of support such as a pole. It can accommodate small angles of deviation up to 20 deg.

iii. Adjustable Cable Storage Bracket Assembly

Adjustable Cable Storage Bracket is used to store the excess cables which is being maintained in the middle of the line and to use at the time of joints.

iv. Down Lead Clamps

Down Lead Clamps shall be used to properly fix the cable on the pole to avoid the movement of the cable under wind condition which may lead to damage of the cable. The Down Lead Clamps shall have provision to fix it on the pole by stainless Steel straps.

v. Stainless Steel Strap and Buckle

Stainless Steel Strap and Buckle is used to fix the Tension Clamp, Suspension Clamp, Adjustable Cable Storage Bracket and Down lead Clamp on to the poles. This has flexibility to fix on to the poles irrespective of its Geometry.

vi. Joint Enclosure and Splicing

The ADSS cables would be required to be spliced at every joint, normally at a distance of every 2km. Splicing can be placed overhead or underground. The choice of placement of joint as overhead or underground buried would depend upon the field conditions & the decision of the executing agency based on the suitability as indicated below.

1. Overhead placement of joint
    - The placement of joint overhead on the poles may be preferred choice of splicing in cases where power utilities are carrying out the work as most Power distribution companies may be more comfortable with aerial joint placement as compared to underground.
    - The overhead joints shall be placed with proper mounting arrangements on the poles.
    - Proper tool/arrangement should be made available during maintenance for overhead joints.

2. Underground buried joint
    - Underground buried joint is an established and field proven practice and is being used by BSNL since very long.
    - This would be safer and better suited methodology in cases where the workmanship of overhead joints may not be of desired quality and that chances of damage due to this may be higher.
    - During maintenance, the handling of underground joints would be easier as compared to Aerial placement of joints.

3. Features
    - Standard fiber count 24F
    - Universal type i.e., suitable for all type of cable (ADSS OFC, Armored and metal free cable)
    - Provide scope for straight / branch joints.
    - Resistance to chemical and corrosive atmosphere.
    - Easy re-entry and closing with mechanical plastic clamp.
    - Shall be water and airproof.
    - Ribs on the body for extra strength
    - 6 cables entry port & 1 oval port
    - Suitable for cable Size up to - 30mm
    - Mounting Bracket for erecting on pole vertically straight.
    - Dome type.

4. Dimensions
    - Length-395mm±5%
    - Outer diameter-273mm±5%

21.29. Material Requirement of Installation Accessories And fixtures

a. For Double Tension poles:

Description	Quantity (In Nos / Mtrs)
Tension Clamp	2
Universal Pole Bracket	1
SS Strap (In Meters)	1.5
SS Buckle	2

b. For Suspension (Intermediate poles)

Description	Quantity (In Nos / Mtrs)
Suspension Clamp	1
SS Strap (in Mtrs)	0.75
SS Buckle	1

c. For Adjustable cable storage bracket assembly

Description	Quantity (In Nos / Mtrs)
Adjustable Cable Storage Bracket	1
SS Strap (in Mtrs)	1.5
SS Buckle	2

d. For Down Lead clamp assembly

Description	Quantity (In Nos / Mtrs)
Down lead clamp	1
SS Strap (in Mtrs)	0.75
SS Buckle	2

e. Preparation

i. Before the installation, OFC should be tested.
ii. As per requirement install the additional new poles of required height (8m or 9m)
iii. Each pole should be laid to the depth as per the procedures. The poles shall be checked for its strength. Provide extra stays if more strength

this required. iv. The Aerial OFC is recommended to be installed on the outermost hole of bracket towards road on the existing bracket/new bracket on the poles.

iv. Replace weak and other poles for clear ground clearance and strength as per the field conditions.

v. Provide ground clearance of minimum 12 feet in non-obstructing areas. 15 feet and above is desirable.

vi. Raise the height to minimum 16 feet at all the road crossings. Lay 9m poles to achieve the ground clearances if required.

vii. Maintain the alignment as straight as possible.

f. Splice Locations

For the cases, where field splices are to be buried underground, the cable should be brought down through a 40mm diameter GI pipe clamped on the pole. Proper bends (120-135 degree) are recommended for negotiating the bend. Wooden/hard rubber bushes shall be used at the entry and exit points of the GI pipe to avoid damage to the cable. A splice chamber as per the standard practice shall be made.

The selection of the splice point shall depend upon the availability of space and the cable length.

g. Calculation of Section Length

Aerial OFC is supplied as per TEC GR in a length of 2 km+ 10% or 4 km + 10%. To arrive at the section length and allocating a particular reel of the cable to a particular section following consideration are required.

Section Length

- Actual section length measured.
- Allowance for sag 2% for each span length.
- Cable at each through tension pole (4 meters).
- Drop length.
- Extra spare cable for coiling at the splice location (10meters).

21.30. Materials Required during Installation

Demountable pulleys	1 each for each pole in the installation section
Jack for cable drum	1 set
Ladders	For each pole
Tools	Screw drivers C&T pliers Spanner set & hammer etc.
Manila rope 12 mm diameter	250 meters
Cable pulling winch machine with tension monitoring device	1
Anti-twist device	1
Cable pole fork	10
Flat twin open type cable grip	2

In addition to the above, the following shall also be required.

- Communication link to connect feeding, pulling and intermediate points.
- 40 mm 61 pipe, bends, bushes & clamps for fixing the pipe at the splice location.
- First aid box.

a. Installation of Aerial Optical Fiber cable:

The following steps are recommended while laying Aerial OFC:

i. Install the accessories and fixtures as per the requirement of the individual poles including tension and suspension fittings.
ii. Install the demountable pulley on all the poles in the section before pulling the OFC.
iii. Keep the cable drum over the jack near the 1st pole at the beginning of the section.
iv. Attach anti twist device and the shackle hook along with the rope to the front and of the cable on pulling eye or on the cable grip. Carry the attached rope over the demountable pulleys for pulling the cable.
v. Depute one person at each pole to monitor and in case it is required to guide the cable over the demountable pulley during pulling operation.
vi. The cable should be pulled till the OFC reaches the last pole of the section.

vii. Wherever in the pulling section, through pulling is difficult; half section or one fourth, action pulling method may be adopted by using figure of a techniques.

viii. The feeding and pulling of the OFC should be synchronized by using communication link. Care is required to be taken so that the OFC is not accumulated at any one point during pulling operation and sharp bends are avoided.

ix. Once the OFC reaches the other end, actual tensioning of the OFC and fixing the installation of the accessories and fixtures shall be taken up with the help of cable pulling winch. The pulling tension must be monitored during tensioning.

x. Install the tension fittings and accessories at the 1st pole.

xi. Fix a flat twin open type cable grip on the OFC after tension pole for tensioning the OFC in the preceding tension section.

xii. The OFC shall be tensioned to a tension of 1-3 to 1-6 times of the cable weight. The Sag shall be monitored and kept between 0.25 to 0.5% of the span length.

xiii. The OFC should be lifted between two poles by using cable pole fork during tensioning and fixing of the cable.

xiv. During the fixing operation the OFC shall remain under required tension for minimizing the sag in the splice section.

xv. Now install tension fitting and accessories at all tensioned pole at the end of the tension section.

xvi. Install the suspension fitting and accessories on the intermediate poles in the tensioned section.

xvii. Similarly, installation should be carried out in each tension pole in the entire section and the tension and suspension fittings are installed.

xviii. At the Through tension poles the OFC shall be kept loose and shall be supported by cable jumper clamp.

xix. At the end pole where the cable reel is kept; the cable to be taken through GI pipe (fixed to the pole) to the splice location in case of underground splicing.

xx. Extra care for the aerial OFC may be taken at the bends and at entry and at the exit of the pipe. About 10m of cable shall be kept at the splice location for coiling (spare cable) and jointing requirement.

xxi. Test the installed OFC.

xxii. Coil the OFC and keep it safe in the splice location for splicing.

b. Precautions

i. Provide display boards.
ii. Provide sufficient number of road sign and traffic cones.
iii. Avoid sharp bending of the OFC during installation.
iv. The OFC should not be given extra tension than the permissible tension limits.
v. While crossing the overhead electric installations, safety measures should be taken. Also provide guard wire.
vi. To avoid manmade damages, safety measures should be taken for each pole.

c. Reference

TEC GR on Planning Guidelines and the Installation Practices for the installation of self- supporting metal free Aerial optical Fiber cable.

21.31. Guidelines for Installation of ADSS Aerial Optical Fiber cable

This document is intended to provide guidelines for selection of appropriate methodology for aerial installation of ADSS optical Fiber Cable on Existing Electrical Poles of 33/11KV Lines and LT lines as per the route map and network design.

The techniques used in installation of Aerial ADSS OFC are described here. With the proper installation hardware and skilled resource, any of these methods can be used to install ADSS OFC. Many a times, it will become necessary to use a combination of these methods to achieve full and complete installation.

Selection of the specific technique (i.e., Moving Drum method, Stationary Drum method or Manual Installation method), or a combination thereof, shall largely depend on the actual site conditions. The bidder I shall select the most appropriate installation technique suitable to the site conditions.

a. Moving Drum method

i. In this method the OFC is pulled directly from the cable drum mounted on a moving vehicle as it drives along the pole line. The cable drum must be mounted on a proper support to allow easy cable to pay off. At the dead-end point, the cable is terminated using Termination

Assembly sets and tensioned using turnbuckles to maintain cable sag within permissible value.

ii. To start installation, park the vehicle with the cable drum approximately 15 - 20 meters away from the pole facing away from it down the pole line. The OFC must pay off from top of the drum towards the rear of the vehicle.

iii. Install the termination supports and temporary hooks on the poles at the starting point and subsequent poles. Pull off the necessary amount of slack, lift the dead end to the top of the pole and mount on the termination assembly.

iv. Once the OFC is fixed at both ends with at the terminating assemblies, carry out tensioning. After the OFC section is properly tensioned and secured at both ends lift the OFC out of the hooks at each of the intermediate pole and support it with the suspension set assemblies.

b. Stationary Drum Method

i. In this method of aerial OFC installation, the cable is pulled along the cable route through temporary support hardware. Stationery drum installation method requires installation of temporary support hardware such as pulley blocks.

ii. A rope wound on the tension limiting winch is passed through the pulleys and connected to the OFC on the drum installed on a stand which allows free rotation of the drum. The pulling load should normally not exceed 60% of the maximum permissible cable tension recommended by cable supplier.

iii. The cable drum and winch locations must have vehicular access. The cable drum should always be placed on level led ground so that its flanges are vertical thus avoiding rubbing of cable against flanges. The orientation should be such that the cable pay-off is directly in the direction of pull. Always pay-out the OFC from top of the drum and not from bottom. The drum should have provision to allow controlled pay-out of cable. Cable pay-out needs to be controlled to prevent free running or jerking.

iv. Once the OFC is completely pulled end to end, it is then ready for installation of permanent supporting system of terminating and suspension set assemblies at required locations and tensioning for sag control.

c. Manual Installation method

i. Manual installation method technique is similar to stationary drum method, except that in this case the OFC is uncoiled from the drum and placed on the ground in the shape of 8.
ii. The pulling operation is same as in stationary drum method. The hardware requirement and pulling equipment also remains same.
iii. For pulling in both directions, two loops of shape of 8 can be made and each can be pulled in separate directions. Loops of size 4 to 5m x 1.5m should be sufficient in most cases.

d. Installation of Accessories

i. Universal Pole Bracket

Prior to fixing any temporary supports / stringing blocks or permanent cable suspension / termination assemblies, it is necessary to fix Universal Pole Bracket using Stainless Steel Strap and Buckle

Terminating (or dead End or Anchoring) Assembly.

1. Termination assemblies are required at dead ends locations where:
   - Cable needs to be terminated at the end facility.
   - Loops are to be kept for future maintenance activities.
2. For double sided termination assembly 2 sets would be required.
3. To fix a termination Assembly following accessories are required.
   - Universal Pole Bracket
   - Tension Clamps
   - SS Strap
   - SS Buckles

ii. Suspension Assembly

ADSS OFC shall be supported on all intermediate poles between two terminating poles using the pole clamp and a suspension assembly set. To fix a suspension Assembly following accessories are required:

- Suspension Clamp
- SS Strap
- SS Buckles

iii. Installation Cable Loop / storage / Joint Closure

Cable loops (on Adjustable Cable Storage Brackets) are to be provided for future maintenance purpose sat regular spacing. A fixture is required to be installed. Excess OFC is then wound & kept on support. The fixture provides a means to ensure Proper bend radius is maintained. Separate clamp is required for installation of Joint Closures.

iv. Supporting Jumper Cable Clamp

Jumper cable hanging between a pair of Termination Assemblies installed at locations where there is sharp change in direction need to be supported with a special twisted link. To support jumper cable, use already installed clamp.

v. Cable Tensioning

After the required Length of OFC has been placed, the OFC shall be properly tensioned before it is permanently secured into suspension assemblies.
The temporary dead end should be installed 4 to 5 m from the pole so that after complete tension is applied, appropriate permanent termination assembly set can be installed while the cable is intension. The chain hoist will also need to be tied to the pole directly using a sling and on to pole clamp.

Once the OFC section is under the required tension and the sag is within limits (i.e. less than 1% of span), the “free” end of the OFC used for tensioning is fitted with termination assembly set and terminated. Once the load is transferred on to permanent termination end, the temporary arrangement shall be removed.

e. Entry of the Aerial OFC into the Building

Normal methods for leading in and precautions recommended for leading-in of the OFC should be followed.

The OFC shall be taken directly inside the building from the nearby overhead pole for termination in the rack mountable FDMS.

If the distance of the last pole is more than 20m away from the node, a new pole may be erected within 5m from the node for achieving the required tension and the ground clearance. The requirement of such new pole shall be captured in the survey report.

The OFC from the pole shall be taken into the building by using 2 nos. of Anchoring bolts as shown in the model node and Engineering diagram to achieve the required tension and to prevent too flow of water inside the building through the OFC.

i. Anchoring Bolt

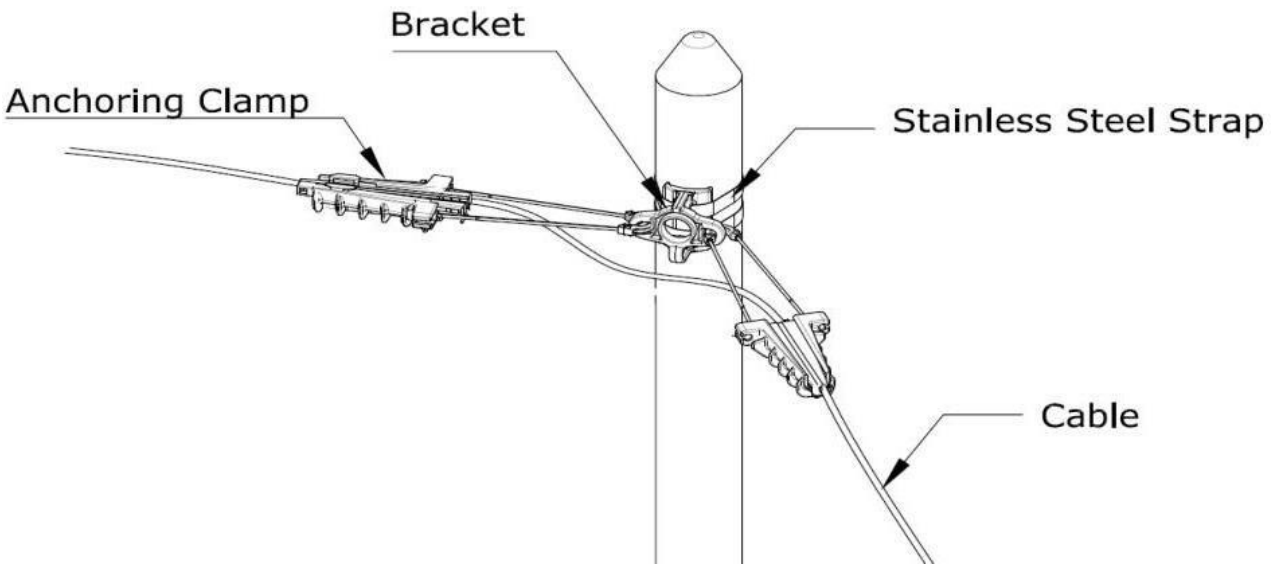
Anchor bolt (in fig below) shall be used to fasten the cable to the building. The bolt shall be hot dip galvanized as per relevant standards. The bolt should be designed in such a way that it should accommodate one tension hardware fittings and withstand the minimum load of 5 km. Each Anchoring Bolt assembly shall consist of a Zamac Body which expands inside the wall at the time of fixation, M12 pig tail bolt made of galvanized steel, Electro plated conical Nut suited for the pigtail bolt / body and a hexagonal nut and washer acting as a stopper in the fixation.

ii. Machinery / Equipment /Tools

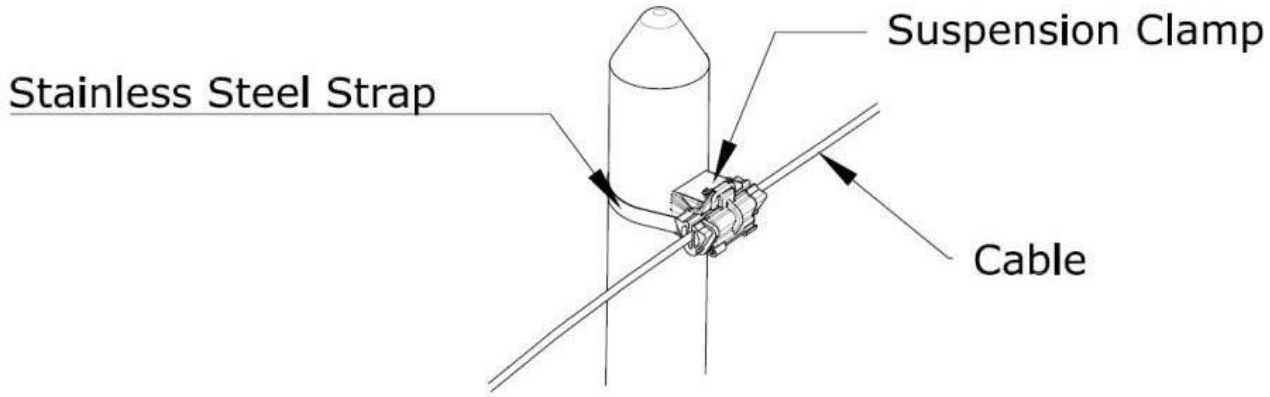
- Ropes and Light weight ladder for installation of termination / suspension assemblies, clamps etc.
- Temporary supports, dynamometer, chain hoists, temporary dead ends steel cables, etc. required during cable laying and / or cable pulling and cable preparation kits, etc.as applicable will have to be arranged by the bidder.

- Van with portable splicing machines and OTDR, power meter, cable preparation kits, etc. for splicing and testing of installed ADSS OFC.
- Other tools and tackles shall include wrenches, spanners, screwdrivers, hummer, ropes etc.
- All safety equipment such as safety belts, insulating and cotton gloves and hard hats, fluorescent vests etc. as required.

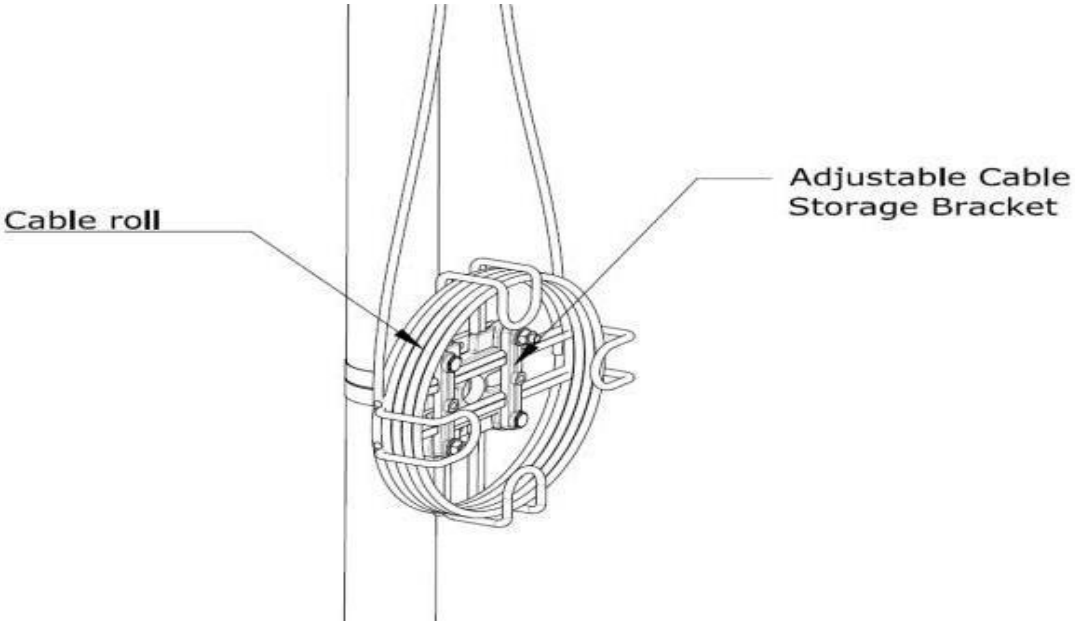
Tensioning (Dead End) Assembly



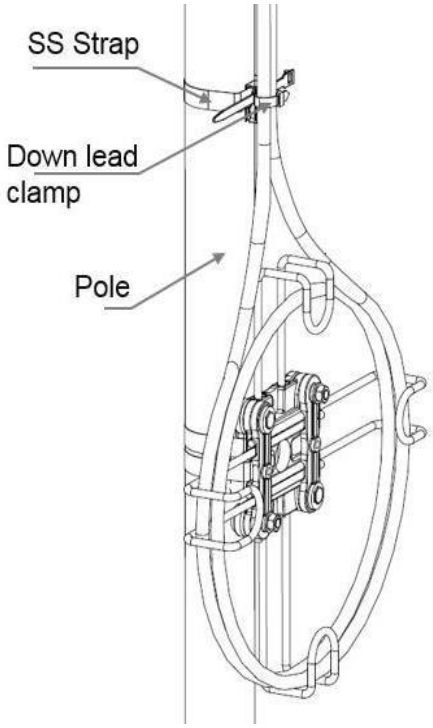
Suspension Clamp Assembly



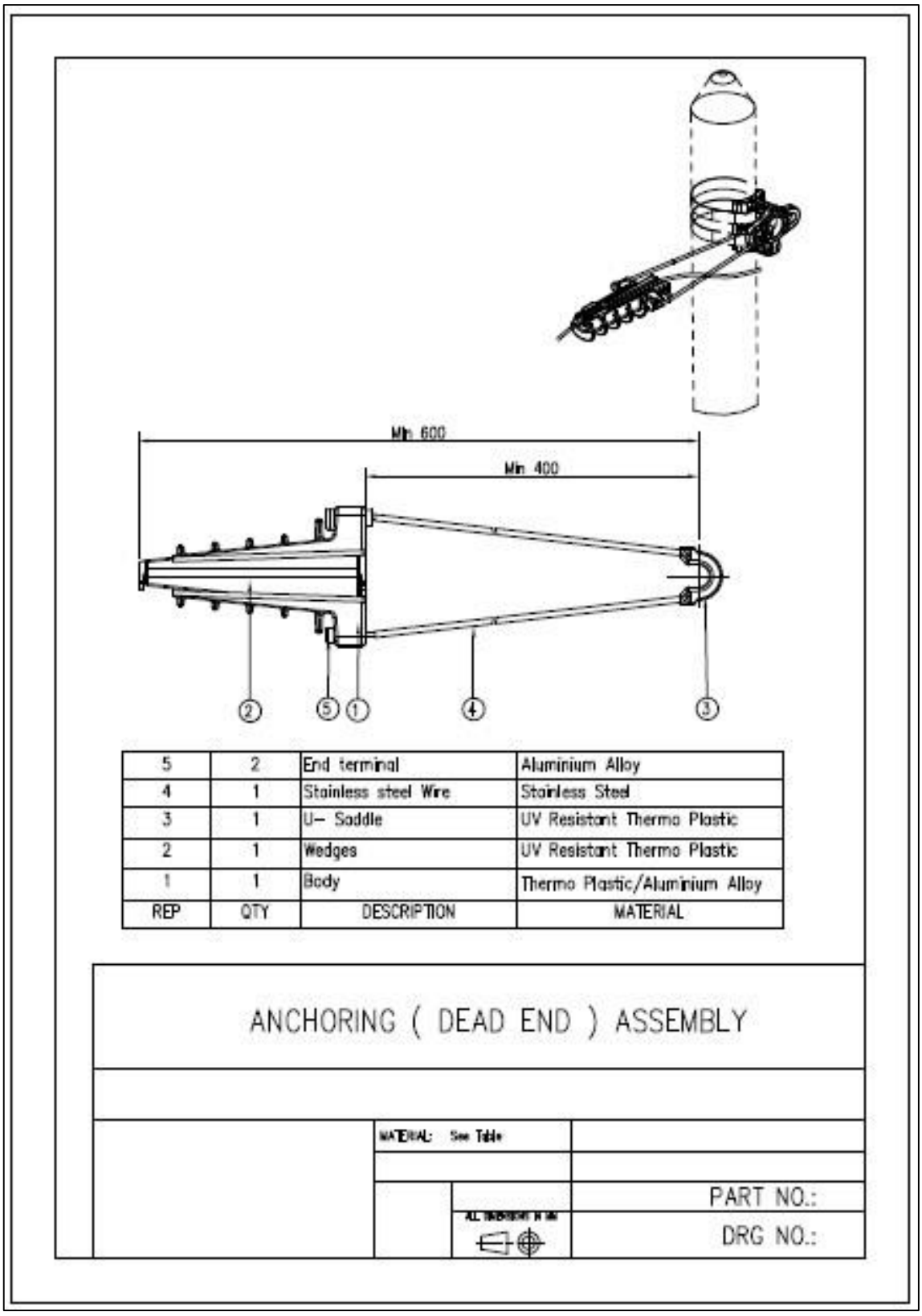
Adjustable Cable Storage Bracket



Down lead clamp



Terminating (or dead End or Anchoring) Assembly



REP	QTY	DESCRIPTION	MATERIAL
5	2	End terminal	Aluminium Alloy
4	1	Stainless steel Wire	Stainless Steel
3	1	U– Saddle	UV Resistant Thermo Plastic
2	1	Wedges	UV Resistant Thermo Plastic
1	1	Body	Thermo Plastic/Aluminium Alloy

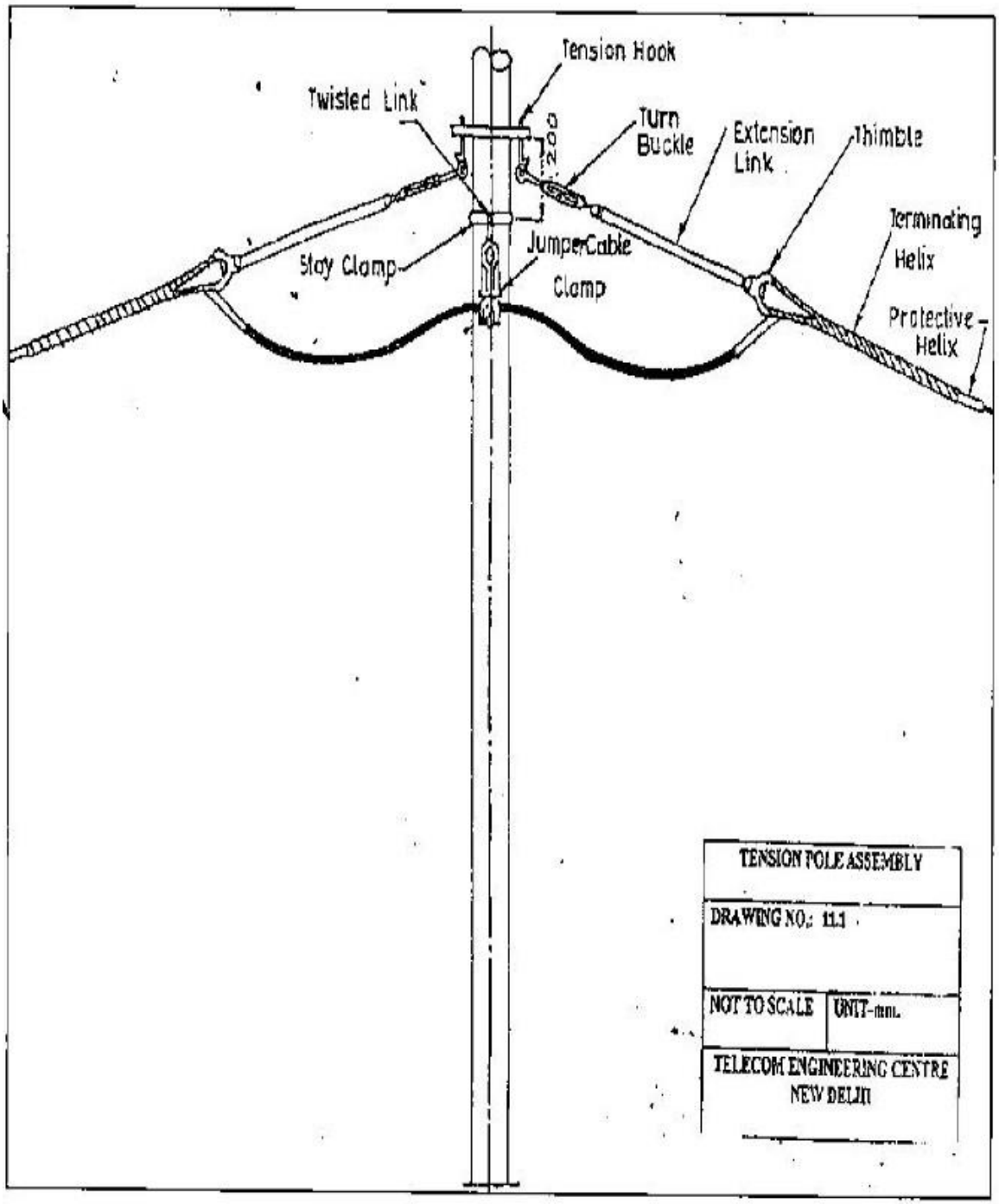
ANCHORING (DEAD END) ASSEMBLY

MATERIAL: See Table

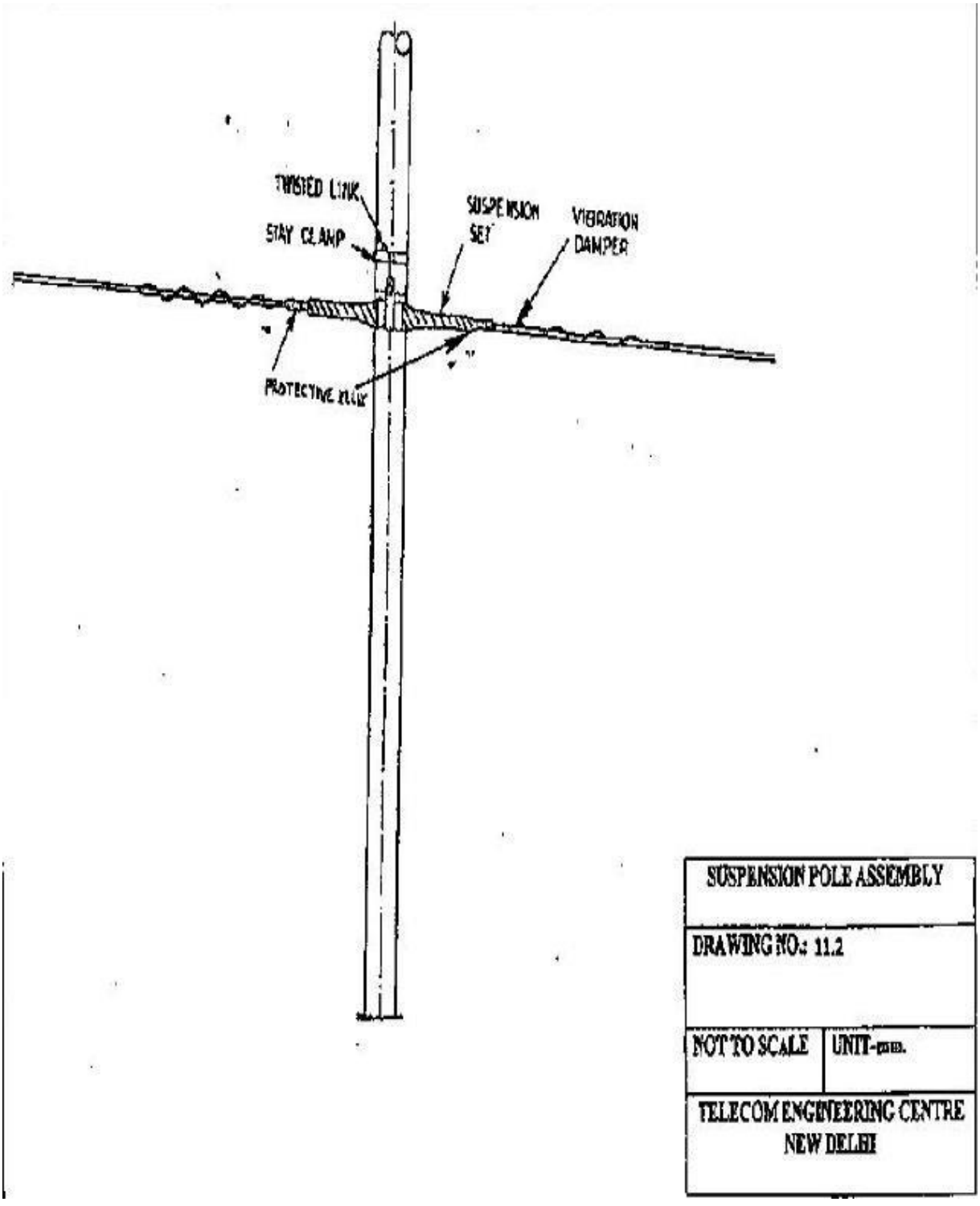
PART NO.:

DRG NO.:

Tension Pole Assembly

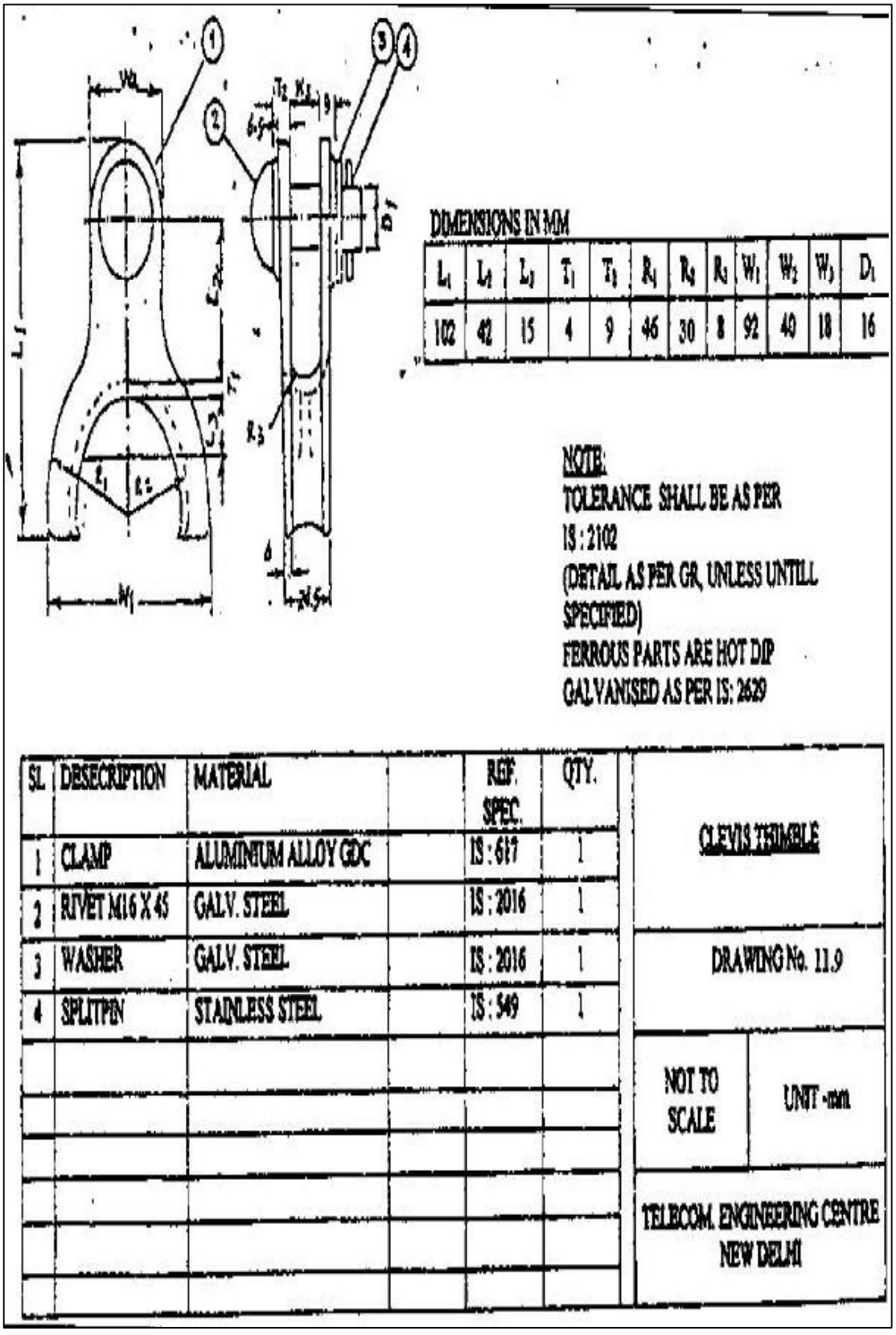


Suspension Pole Assembly



SUSPENSION POLE ASSEMBLY	
DRAWING NO.: 11.2	
NOT TO SCALE	UNIT-mm.
TELECOM ENGINEERING CENTRE NEW DELHI	

Clevis Thimble



DIMENSIONS IN MM

L_1	L_2	L_3	T_1	T_2	R_1	R_2	R_3	W_1	W_2	W_3	D_1
102	42	15	4	9	46	30	8	92	40	18	16

NOTE:
TOLERANCE SHALL BE AS PER
IS : 2102
(DETAIL AS PER GR, UNLESS UNTILL SPECIFIED)
FERROUS PARTS ARE HOT DIP GALVANISED AS PER IS: 2629

SL	DESECRIPTION	MATERIAL		REF. SPEC.	QTY.
1	CLAMP	ALUMINIUM ALLOY GDC		IS : 617	1
2	RIVET M16 X 45	GALV. STEEL		IS : 2016	1
3	WASHER	GALV. STEEL		IS : 2016	1
4	SPLITPIN	STAINLESS STEEL		IS : 549	1

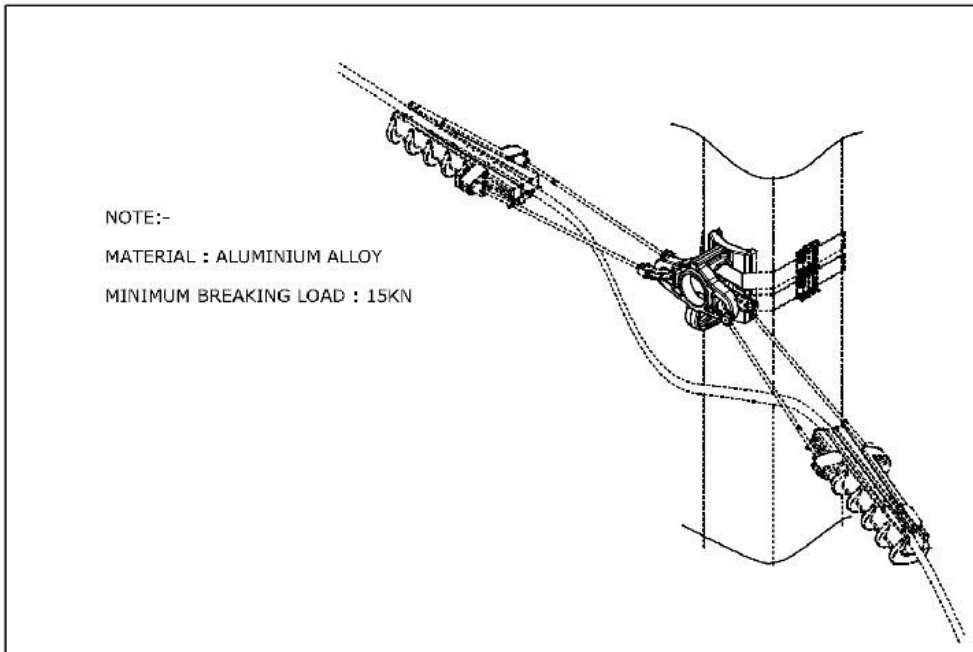
CLEVIS THIMBLE

DRAWING No. 11.9

NOT TO SCALE | UNIT -mm

TELECOM. ENGINEERING CENTRE NEW DELHI

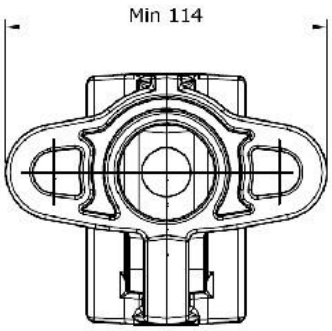
Universal Pole Bracket

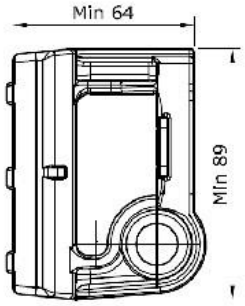


NOTE:-

MATERIAL : ALUMINIUM ALLOY

MINIMUM BREAKING LOAD : 15KN





UNIVERSAL POLE BRACKET

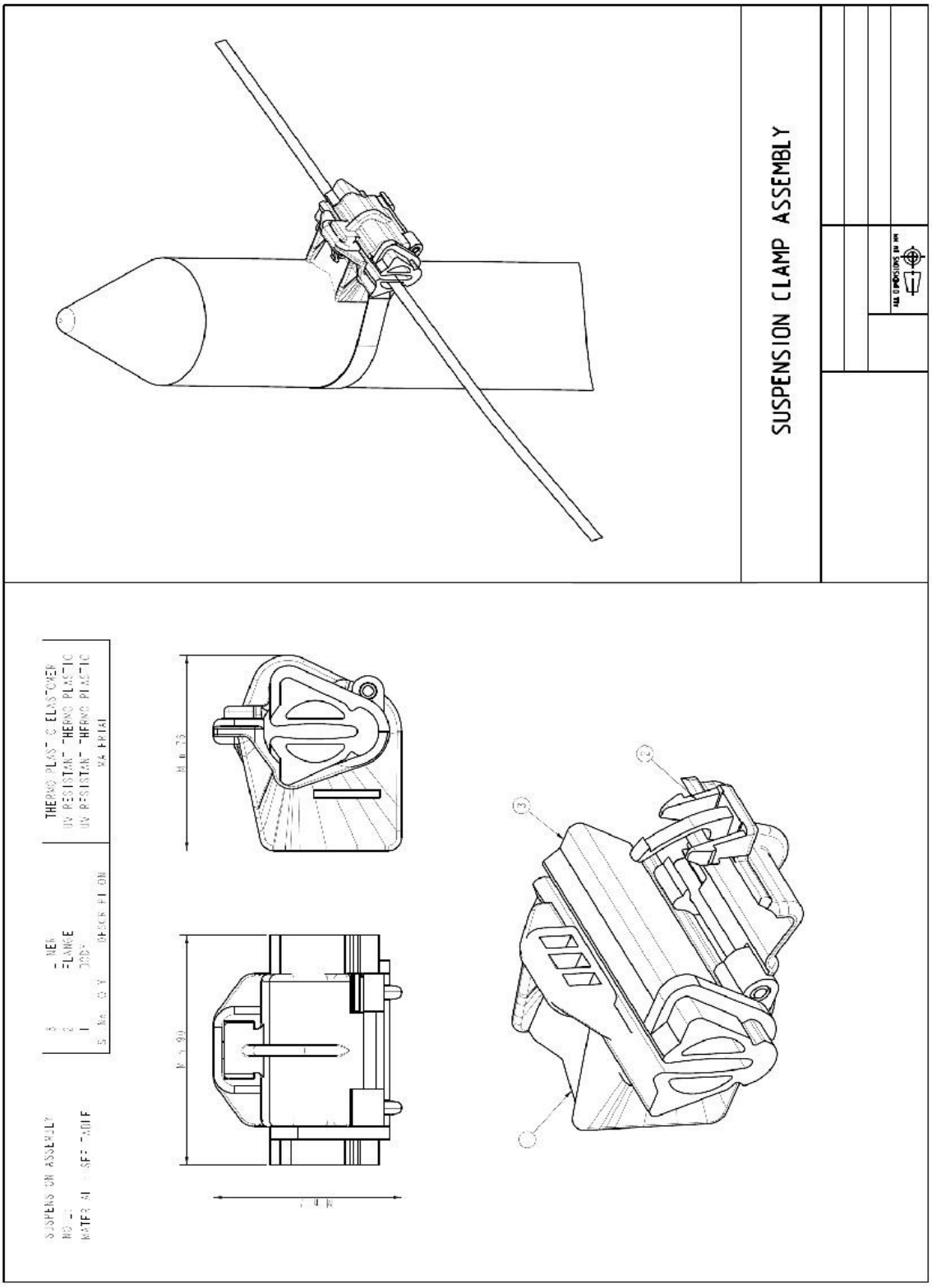
MATERIAL: REFER NOTE

PART NO

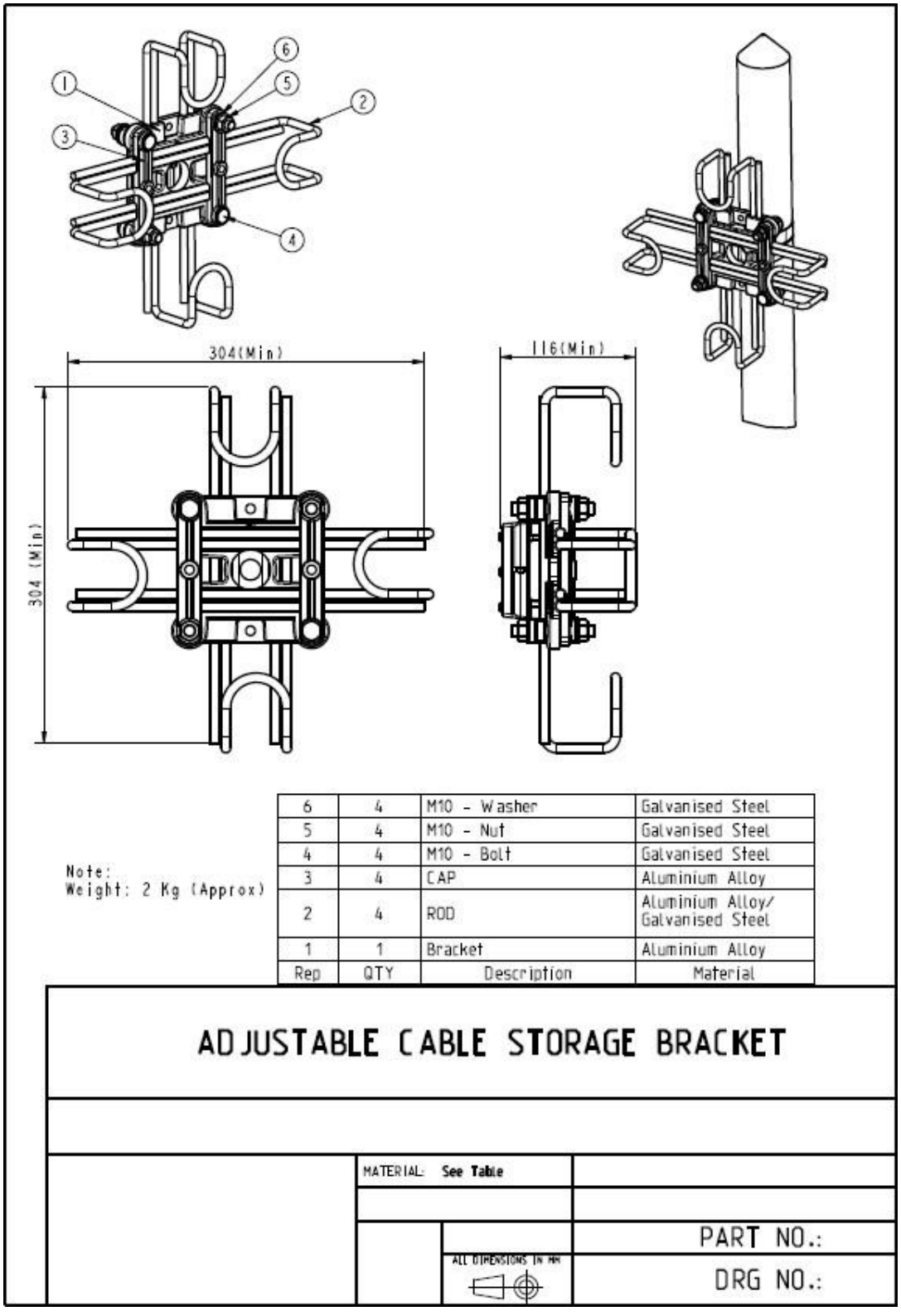
ALL DIMENSIONS IN MM

DRG NO.

Suspension Clamp Assembly



Adjustable Cable Storage Bracket



Note:
Weight: 2 Kg (Approx)

Rep	QTY	Description	Material
6	4	M10 - Washer	Galvanised Steel
5	4	M10 - Nut	Galvanised Steel
4	4	M10 - Bolt	Galvanised Steel
3	4	CAP	Aluminium Alloy
2	4	ROD	Aluminium Alloy/ Galvanised Steel
1	1	Bracket	Aluminium Alloy

ADJUSTABLE CABLE STORAGE BRACKET

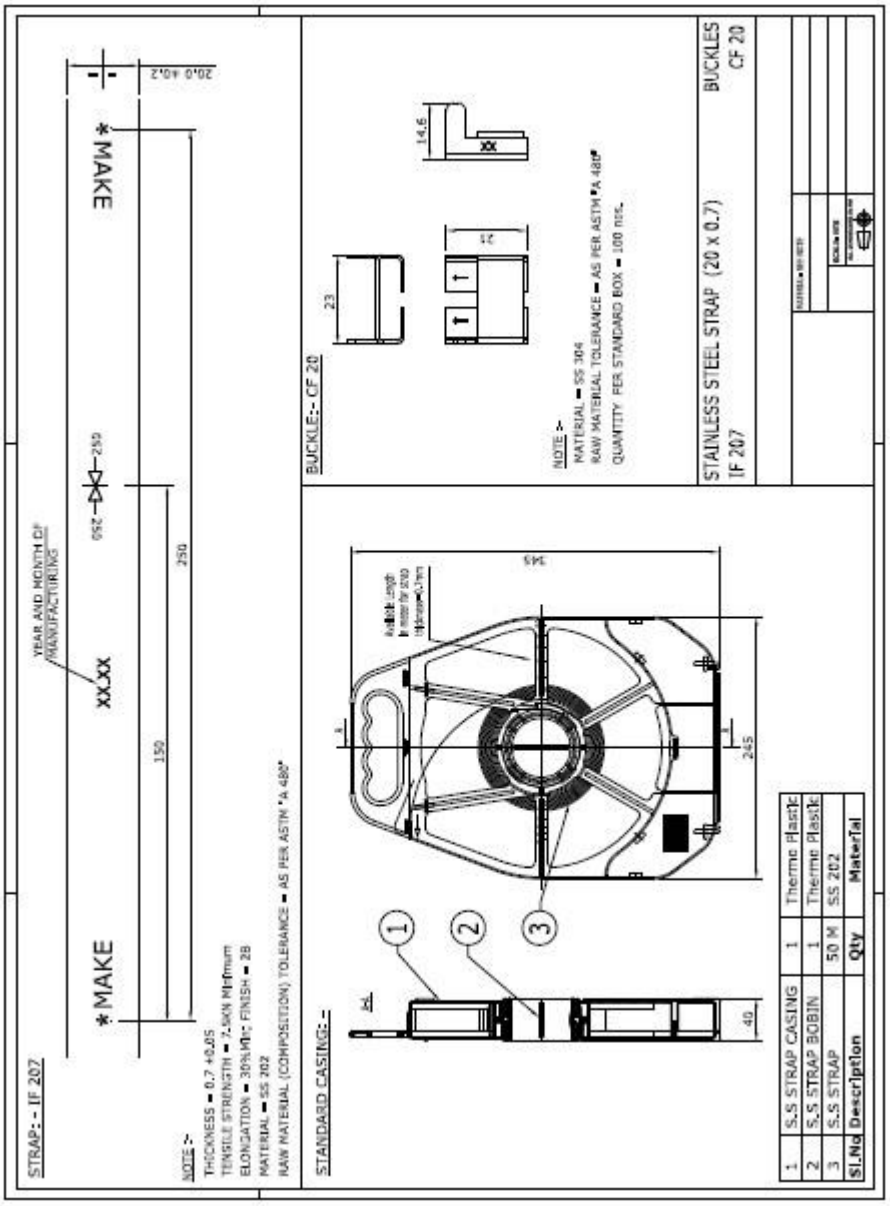
MATERIAL: See Table

ALL DIMENSIONS IN MM

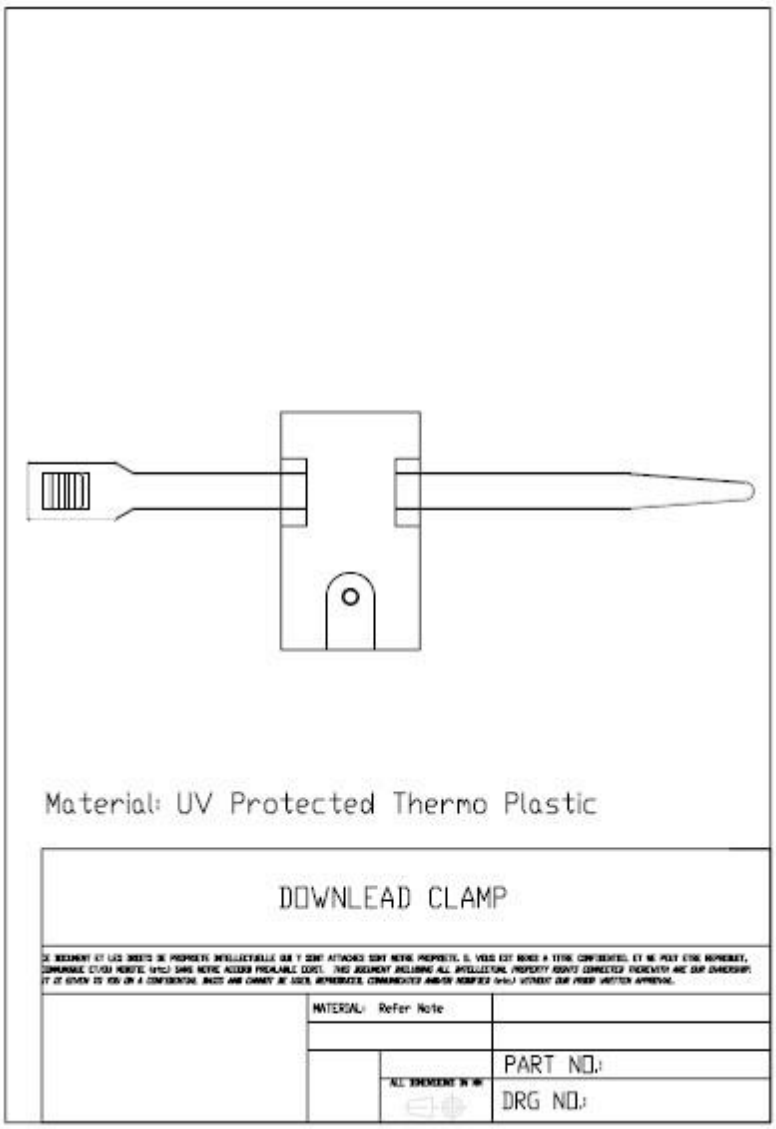
PART NO.:

DRG NO.:

SS Strap and Buckles



Down Lead Clamp



iii. Earthing

All the Electrical/Electronic components must be connected to the ground provided at the existing racks available at the SNOC/GP/Block as per the recommendations of the OEM and industry standards.

21.32. Penalty for Deviation from Standard Engineering Instructions

a. Underground Laying

Normally depth of the trench should 1.65 m in normal & mix soil and 1.2m in hard soil. Deviations due to field conditions will be required to have necessary protections in case of less depth. The cases and solutions are as following.

Minimum depth of burial in general shall be1.65m in rocky area (including Murrum & soil mixed with stone or soft rock) depth of burial shall be 1.2m at the minimum.

In case of utility where depth is 90 to 120 cm then DWC protection is to be used in normal/mix soil case.

In some areas where the depth is 60cm, in those cases reinforced concrete casing of 4"(Four inch) round should be provided.

For hard strata/rock soil layer for 60 to 90 cm cases DWC with wire mess and PCC is to be used. However, for depth relaxation photograph (with GPS) proof and justification is required.

Above ground installation of ducts shall be limited to culvert and bridge crossings only. At such locations, ducts shall be installed inside GI pipe or HDPE DWC pipes with metal sheet protection (GI sheet wrapping) of appropriate size (4” to 6”) suitable for number of ducts to be installed.

The relaxation by the competent authority prescribed below shall be obtained giving reasons for not achieving standard depth or as per the existing BharatNet procedure.

Size/Type of Cable	Standard Depth cm.	Minimum acceptable Depth without Relaxation	Powers delegated for Relaxation, For depth up to	
			Designated TANFINET Officer -1	Designated TANFINET Officer -2
OFC	165	90%	80%	30% As per latest EI and latest instructions with protection

In case, the Successful Bidder does not adhere to the mentioned Engineering Instructions and does not provide requisite protection, then the Bidder is liable to penalty as per below.

Depth between	Reduction in rates	Rate Payable
<165cm. to > 150cm.	5% of approved rates	95% of the approved rates for the achieved depth
<150cm. to > 130cm.	12.5% of approved rates	87.5% of the approved rates for the achieved depth
<130cm. to > 100cm.	25% of approved rates	75% of the approved rates for the achieved depth
<(Bellow)100 cm.	40% of approved rates	60% of the approved rates for the achieved depth

Note: In case of depth below 1.2m, instructions as per latest EI and instructions for protection etc. will be followed.

Assuming that the standard depth required is 165cm and the rate approved is Rs.100/ for the standard depth, then as per the above formula, for a depth of 100 cm the rate worked out.

Rate Applicable = 100 X 0.75 = Rs.75/- per running meter

Actual amount to be paid = (100/165) X75 = Rs 45.455/-
=Rs.45.5/- per running meter

b. Aerial Laying

The pole installation and alignments will be recorded as per the Engineering Instructions. The Successful Bidders shall be required to

provide all articles used for Aerial OFC laying. In case the Successful Bidder does not use any mandatory article, he shall be required to implement the articles mentioned in Engineering Instructions and the payment will be not processed until the proper rectification has been completed.

Annexure – II

Operation and Maintenance (O&M) Framework

The Operation & Maintenance (O&M) period will be for a period of three years from the date of Go- Live.

The bidder shall operate & maintain the network 24x7x365 and perform all the activities during the O&M period to ensure the uptime of the network as per agreed SLAs defined in this Tender Document. SLA mentioned in this section is also applicable before Go-Live, i.e., from time once office locations is commissioned in all respect.

1. The bidder shall prepare an operation & maintenance manual and submit to TANFINET for approval. It shall cover the following, but not limited to:
   a. The details of the manpower deployment for maintenance.
   b. The process/procedure for the periodical maintenance, problem resolution, fault rectification.
   c. The procedure/process for upkeep of fiber infrastructure including periodical maintenance, problem resolution and fault rectification.
   d. The procedure/process for upkeep for G-PON and Access Router including periodical maintenance, problem resolution and fault rectification.

2. The bidder shall provide competent resources at S-NOC to carry out the following tasks:
   a. 24X7 monitoring of all the network equipments installed as part of the contract
   b. Co-ordinate with the field team and TANFINET S-NOC team for troubleshooting of issues and resolving trouble tickets
   c. Generate daily, weekly, monthly & quarterly MIS reports in co-ordination with the TANFINET S-NOC team
   d. To provision and manage the configuration of OLTs/ONTs/Routers
   e. To carryout software upgrades/updates for all active devices

3. Resources for Operation and Maintenance of the active and passive network elements shall include the following but not limited to:

   a. Field engineers with dedicated FRTs (Fault Restoration Team)
   b. The bidder shall use two-wheeler for patrolling and four-wheeler for FRT teams having tools & mobilization of other necessary resources, communication devices to issue reporting and resolution.

c. FRT shall be positioned strategically for geography of 50 km radius thus enabling the team to provide faster response on fault rectification.
d. Equipment like splicing machine, OTDR, LSPM, Visual fault locators, Fiber optic cleaning kits etc. required for maintenance shall be made available.
e. Material storage locations with adequate capacity across the state to speed up material delivery during fault to reduce Mean Time to Repair (MTTR).
f. Spare material including all required active and passive elements in adequate quantity to be maintained at all time at all storage locations.
g. Field engineers with networking certification to maintain active elements of the network including replacement, installation, configuration and integration.

4. The bidder shall submit periodical reports (monthly, quarterly, and annual) against the SLA, periodical updating of the As Built Diagrams (ABDs) and GIS database, Element Management System (EMS), etc. as per requirement.

5. During O&M Phase, the bidder shall have to provide O&M of the complete network including active and passive infrastructure, IT and Non-IT components supplied by the bidder as part of the Contract.

6. The operational requirements such as loading the ports in the Routers, Configuration of networks and Connectivity to the users of the network etc., are within the Operations scope of the bidder. Requests for connections and configurations shall be undertaken by the bidder within 2 days of such request by TANFINET or the user of the network through the TANFINET. Failing to adhere to the timeline for configuration shall attract penalty at Rs. 200 per day from the 3rd day.

7. Periodical Maintenance: The bidder shall carry out periodical maintenance of the network commissioned and shall submit the report on quarterly basis during the O&M period.

8. Corrective Maintenance: If any issue is reported by the end user with regards to the services, then the issue shall be reported to centralized help desk of NOC of TANFINET and if there is any issue in the network connectivity, the issue shall be forwarded to the bidder. These issues shall be rectified within the timelines as per the SLA and report back to the centralized help desk for closure. Issues pertaining to the Fiber/ Fiber Distribution Management System (FDMS) and other active or passive equipment shall be handled by the bidder.

9. In case of any issues pertaining to Aerial Cable, OFC/PLB or Cable in UG or other components due to poor workmanship and other technical reasons, the fault must be rectified, or parts have to be replaced by the bidder. All the components required for such restoration shall to be borne by the bidder.

10. O&M of Network equipment: Routine maintenance/First line maintenance, diagnosis & rectification of faults in Network Equipment etc. shall be the responsibility of the bidder. Required skilled manpower, testing instruments and equipment & material required for proper maintenance and meeting the SLA obligation shall be the responsibility of the bidder.

11. The bidder should have proper legal agreement with the OEM to guarantee quality & timely supply and support during the full lifecycle of the contract period. The Operation & Maintenance shall include, but not limited to the following:

    a. The bidder shall quote for charges for three (3) years comprehensive O&M (including labour, spares, maintenance material, power cable, fiber cable (internal wiring), pig tail patch cord, connectors, consumables, visit of the engineers as and when required to meet the conditions of O&M).

    b. The Bidder shall maintain an up-to-date inventory of all FRU's (Field Replaceable unit) required for the integrated solution. The same shall be liable for inspection by TANFINET or its designated agency. The Bidder has to submit complete address details of nodal/repair centers.

    c. Bidder shall perform the First Line Maintenance as well as Second line maintenance of all equipment (active and passive) supplied under this tender.

    d. As a part of First Line Maintenance (routine maintenance), the bidder's personnel shall visit each location at GP & Block Level every quarter for carrying out routine maintenance and upkeep activities by providing a report of the visit. However, detailed set of maintenance procedures, periodic test/maintenance schedules, Traffic Report generation & analysis and remedial measures to be taken in each occasion shall be finalized by Bidder and approved by TANFINET within a month of award of work.

e. Schedule patrol team staff, regularly to physically clean and inspect G-PON and access router to prevent hardware failure. This helps keep dust and debris out of the circuit boards and fans.

f. Check the status - reporting devices on the craft interface - system alarms and LEDs.

g. Inspect the air filter at the bottom front of the router replacing it every 6 months for optimum cooling system performance. Do not run the router for more than a few minutes without the air filter in place

h. The Bidder shall equip the maintenance personnel with minimum necessary testing equipment and spares required for the maintenance. The same shall be liable for inspection by TANFINET.

i. In case any equipment is down, either reported by TANFINET or its designated agency or monitored through EMS, maintenance personnel shall attend the fault and rectify the same and/or report for Second Line maintenance team, as the case may be.

j. Failure of Bidder to perform maintenance activities as stipulated in the SLA, will be liable for levy of penalty as mentioned in this tender.

12. UPS and battery Maintenance (Wherever provided by the bidder)

a. The qualified Service Personnel of the OEM shall undertake preventive maintenance (Cleaning of UPS and Batteries, checking fitment of internal and external hardware and heating of the UPS, Cleaning of PCBs if any and operating power parameters, checking of input/output voltage of batteries etc.) as per the standards of the OEM which shall be shared to TANFINET by the Bidder.

b. The service personnel shall carry with them blower/vacuum cleaner, digital multi meter, tools etc., as required for the preventive and corrective maintenance.

c. The downtime of the Online UPS shall be counted as downtime/repair of G-PON and the SLA terms for G-PON shall be applicable.

d. The maintenance services will be comprehensive and will include cost of PCBs, components, labour, transportation, faulty parts/complete

equipment replacement with new parts/equipment, including plastic parts and batteries etc. The service personnel shall rectify the complaints notified within the same day.

e. The Bidder should integrate with existing EMS solution to monitor the status of the UPS and batteries online at NOC via SNMP card.

f. Efficiency of the UPS shall always be maintained over 80% by undertaking preventive maintenance as per the OEM standards which shall be shared to TANFINET by the Bidder.

13. O&M of Optical Fiber Infrastructure

a. OFC Maintenance Requirements

i. As the OFC is to be installed in various clusters in the State, the Bidder should have capabilities for long term maintenance & sufficient maintenance team with tools, equipment, accessories, spares, OF cable material etc.

ii. TANFINET shall appoint an agency, who shall be responsible for ensuring that all field works covered under the tender are carried out in accordance with approved designs, drawings & specifications and conditions of tender as agreed to.

iii. Broad Scope of Work under O&M shall primarily include:
   a. Routine inspection, viz. patrolling on the routes, to identify areas where OFC laid (UG or Aerial) is exposed due to natural wear and tear etc.
   b. Fault rectification of OFC cuts along routes.
   c. Replacement of OFC routes due to non-viability of transmission link.
   d. Ensure availability of OFC route marker along the route at regular intervals.
   e. Maintain proper condition of joint closure.
   f. Prevent third party damages viz. theft or damage/s caused by other underground utility
   g. Maintain condition of OFC with casing or with special arrangements near critical areas viz. major bridges, railway crossing, pipeline crossing, Forest, etc.

h. Visual inspection of joint closure to check ingress of water, foreign particles etc.
i. Periodic measurement of the link attenuation loss to ensure that the link is free from any splice loss or point loss defects etc.
j. Maintenance and update of as-built drawing, information along the OFC route.
k. Maintaining history of events, analysis and reporting.
l. Public liaising with concerned authorities.
m. However, detailed set of maintenance procedures, periodic test/maintenance schedules and other shall be finalized by Bidder and approved by TANFINET within a month of award of work.

b. Fault Restoration Services

i. The Bidder shall deploy Maintenance Teams at the designated locations as decided by TANFINET. The Maintenance teams shall comprise of manpower, logistics (Vehicles), required tools/tackles/machinery & equipment.

ii. The Bidder shall provide OFC maintenance service on round the clock basis for attending & rectifying the OFC fault in minimum downtime (including travel time) from regard to the power launched on to the fiber. Restoration of site shall be done to the entire satisfaction of TANFINET.

iii. In case of OFC cut where it is not possible to pull the cable from either end, the Bidder has to make two pits/ splicing joints between the required lengths of new OFC to be laid between the two joints. The spacing of joints/ pits shall be depending up on situation at site and shall be as decided by Site Engineer. Remaining OFC must be coiled in both the pits.

iv. Wherever new joint is provided or existing joint is attended for rectification during the maintenance period, joint shall be buried to the depth of 1.65 Mtr. from the ground level in joint chamber.

v. After the completion of site activities, the Bidder shall ensure the restoration of the traffic from the associated Network Operations Center (S- NOC) and thereafter fresh OTDR measurement & traces shall be taken for the restored fibers & submit to TANFINET.

vi. After the completion of site activities & hop test, the As-built drawing shall be updated by incorporating the new details like OFC loop used, Joint-pit location, etc. The length of loop in joint pit after fault restoration shall be incorporated in as built drawings.

vii. After attending the fault & permanent restoration, a Fault-Rectification report jointly signed by TANFINET & Bidder, shall be generated for the closure of the complaint.

viii. Any other job required for the restoration of the OFC fault/cut in totality is to be taken up by the Bidder.

ix. In case the site condition is not favourable for the immediate restoration of the fault, the temporary restoration of the service fibers shall be taken up immediately with the approval of TANFINET. Permanent restoration work will not be considered in downtime unless there is link break again during restoration job. Permanent restoration of joint pits is to be carried out by Bidder within reasonable time of fault/OFC cut. In case the site is not conducive for permanent restoration, some arrangement of manpower has to be done by Bidder for safeguarding exposed OFC till permanent restoration. No extra payment shall be given to Bidder on account of deployment of additional manpower. In case of further cuts at exposed OFC location, Bidder will be accountable for this additional downtime of OFC link.

x. It is mandatory for the Bidder to install the jointing chambers after permanent restoration is done.

xi. In case of any breakdown in the OFC network, Bidder shall be responsible for obtaining approval at his own cost from statutory authorities like Municipal Corporation, Development Authorities, RWS&S, Electricity Department, NHAI and any other concerned authority as required for carrying out the repair. TANFINET shall assist in getting permission for repair in few cases where there is urgency.

xii. Drains, pipes, cables, overhead wires and similar services encountered in the course of the works shall be guarded by the Bidder at his own cost, so that they may continue in full and

uninterrupted use to the satisfaction of the owners thereof. Should any damage be done by the Bidder to any AC Power mains, utility pipelines cables or lines (whether above or below ground etc.) whether or not shown on the drawings, the Bidder must make good or bear the cost of making good the same without delay to the satisfaction of TANFINET.

xiii. Bidder shall observe all national and local laws, ordinances, rules and regulations and requirements pertaining to the work and shall be responsible for extra costs arising from violations of the same.

xiv. Bidder shall have at all times during the performance of the work, a competent supervisor at block level. Any instruction given to such Supervisor shall be considered as having been given to the Bidder.

xv. Bidder shall employ as many personnel as deemed necessary to comply with the local rules and administrative orders governing the Working Hours of Employment.

xvi. The Bidder shall be responsible for compliance with all statutory requirements including personnel related matters.

xvii. In the event of urgency, the team has to move to the adjacent section.

xviii. The minimum down time shall include time taken in restoration of fault/cut caused by any means like miscreant activity at day or night, due to work done by any other organization, development of high losses / break at existing joints, fault caused due to rodent, ant etc.

xix. In case of partial damage of the cable or development of high loss in the working and spare fiber or cable cut at any time (day/night) by miscreants or by any agency, the responsibility of repairing the defective fiber lies with the Bidder. In case Bidder fails to completely restore the fault (as per original condition) or submit OTDR & test (power level in live equipment) records to establish completion of work, a penalty shall be levied for the work involved at site.

xx. When finished work is taken down for the purpose of inspection for any reason, the Bidder shall bear the entire expenses incidental thereto in the event that the said work is found to be defective. This situation may be applicable to both planned works as also to emergency restoration.

xxi. During the maintenance or fault rectification work, should any damage occur to the other cables, Bidder is liable to pay compensation as demanded by the respective authorities.

c. Audit and Security services

i. The bidder shall be required to provide comprehensive support to TANFINET during the Third-Party Audit and Security Audit etc. TANFINET shall be responsible in getting the required readiness built in the network during audit for security solutions.

ii. State/ TANFINET reserves the right to inspect, monitor and assess the progress and performance of the project either itself or through another designated agency as it may deem fit, throughout the course of the Contract. TANFINET may demand and upon such a demand being made, TANFINET shall be provided with any document, data material or any other information which it may require, to enable it to assess the progress of the project.

iii. State/ TANFINET shall also have the right to conduct, either itself or through another agency as it may deem fit, an audit to monitor the performance of the Bidder of its obligations/ functions in accordance with the standards committed to or required by TANFINET and the Bidder undertakes to cooperate with and provide to TANFINET or any other agency appointed by USOF (DoT)/ TANFINET all documents and other details as may be required by them for this purpose.

d. MIS Reports

i. The Bidder shall submit the periodical reports on a regular basis as per the prescribed formats provided by TANFINET.

ii. Indicative report may inter-alia include the following reports:

Summary of issues/ complaints

a. Summary of resolved/ unresolved and escalated issues/ complaints
b. Summary of resolved/ unresolved and escalated issues/ complaints to vendors
c. Summary fault/complain reported and pending at TANFINET end.
d. Component wise IT infrastructure availability and resource utilization
e. Consolidated SLA/ (non) conformance report

Note:

1. In case any associated component is required not covered in the BoM, TANFINET may ask the bidder to procure the associated component so required. The price shall be determined by TANFINET and upon approval; the bidder shall install the associated equipment. This shall be dealt on case-to-case basis.
2. The bidder shall be required to follow the Technical Specification & Testing Parameters as mentioned for implementation of the project.
3. Any deviation from the standard EI, shall be liable for penalty.
4. In case there are any changes in the standard engineering instructions, the bidder may be asked to execute the work as per the latest engineering instructions.
5. The bidder shall obtain necessary Right of Way (RoW) from State/Central agencies whichever applicable. TANFINET shall facilitate the bidder in obtaining the same. The cost incurred in obtaining RoW shall be reimbursed on actuals on giving necessary/relevant documents.

Annexure – III

Acceptance Test Procedure

1. TANFINET or its appointed agency, "hereinafter known as TPA", would be responsible to oversee the work being done by the bidder to ensure quality of work as well as quantity verification. The bidder need to coordinate with TPA for getting the acceptance certification done and the schedules for the same need to be planned by the bidder in consultation with the TANFINET and TPA. All records and testing output conducted by bidder has to be verified by TPA.

2. TPA shall be broadly responsible for below responsibilities but not limited to:

    a. Audit and inspection of material at warehouse and certifying the invoices as well
    b. Quality Review of the work done by bidder on day to day basis for all 100% sites
    c. Complete passive infrastructure shall be validated as per the engineering instructions provided in this tender document.
    d. Complete acceptance testing of the active and passive equipment shall be done as per the technical specifications mentioned in Annexure-I.
    e. GIS co-ordinates of the entire OFC route shall be captured by bidder, and updated in the GIS tool at an interval of minimum 250 meters (including Equipment Site, Manhole, chambers, Jointing / Splicing, etc.).
    f. The GIS tool along with its licenses need to be bought in the name of TANFINET by the bidder and will belong to TANFINET
    g. Acceptance testing shall be performed on both IP-MPLS ring and G-PON ring fail over along with Network convergence for path failure
    h. TPA shall do verification of bidder's final deliverables including ABDs
    i. TPA shall conduct all pre-defined tests for ensuring quality of work done by bidder including:
        i. Field Acceptance Test – of OFC laid
        ii. End-to-End testing which means Complete Installation, Integration, Commissioning and Testing of the created network which shall include OTDR link test, Power On & Self-Testing, IP-MPLS ring and G-PON ring fail over testing for path failure, power supply failure, Radio equipment testing (If applicable), As Build Diagram (ABD reports with optical power loss budget), integration equipment and Final acceptance certificate.

For all such testing's, the requisite tools shall be provided by the bidder to the TPA.

3. TANFINET shall have the right to perform an audit and technical examination of the work and the final bills of the bidder including all supporting vouchers, abstract etc. If as a result of such audit and Technical examination, any sum is found to have been overpaid in respect of any work done by the bidder under the contract or any work claimed by him to have been done by him under the contract and found not to have been executed, the bidder shall be liable for refund of the amount of over payment and it shall be lawful for TANFINET to recover the same from bidder.

    a. TANFINET shall be entitled to recover any sum overpaid.
    b. Any sum of money due and payable to the bidder (including security deposit returnable to him) under this contract may be appropriated by the TANFINET for the payment of a sum of money arising out or under any other contract made by the bidder with TANFINET.

    All payments shall be released after certification of Delivery and Implementation Milestones by TANFINET or its appointed agency.

4. Measurement & Inspection

    a. Measurement: The measurement books are to be prepared by bidder office wise and are to be certified by TPA. One hard bound copy (duly signed on each page by bidder and TPA) and soft copies (scanned) in CD will be handed over by TPA to TANFINET every month.

    b. The measurements of various items of work shall be taken and recorded in the measurements Books. The measurements shall be taken and recorded by bidder which will be countersigned by the TPA. TPA shall be directly responsible for supervision of work, shall be responsible for accuracy of 100% of measurements. All the support in terms of tools, availability of manpower at sites and all other assistance etc. shall be provided by the bidder. TANFINET, without any prejudice, reserves the right to carry out any kind of inspection of the works being carried out by TPA and bidder at any time to ascertain its quantity and quality.

    c. Site Images (Photographs) and others shall be taken by bidder through Digital Cameras during Acceptance Testing and verification of

measurement book. The images should be minimum resolution of 1024 x 768 pixels. The images must display the date and time of capture of the image on it bottom right corner. The digital camera should also have the capability to record the GPS co-ordinates of the location and embed the co-ordinates (Latitude, Longitude and Altitude) as EXIF data in the image. No alteration, fabrication or makeover of any kind should be made to the Site images being submitted. Site images shall be captured at every 500 meters and at site. The site images are to be captured in such a manner so that the object being captured is clearly visible and the surrounding areas are also identifiable or distinguishable. The photographs shall be printed in sizes 5" x 7" (matte) and attached along with the Field Acceptance Test Report. The site images, in soft copies, are to be maintained in separate folders / directories. The site images should be so arranged such that they are easily locatable and identifiable in the folder where they are stored. The site images are to be monthly recorded on a non-erasable, good quality Compact Disk and sent to TANFINET along with the Monthly Status Reports. The site images are to be uploaded and GIS co-ordinates are to be entered by bidder in the project management tool and GIS tool. Printing of site images to be arranged by the bidder.

d. Method of measurement: The measurement of the work shall be done activity-wise as and when the item of work is ready for measurement. The method of measurement of various items are enumerated as under:

    i. Measurement of length of cable: The length of cables laid underground shall be measured by use of OTDR. The length should be cross verified with the marking of lengths on the cables. The lengths shall be recorded in sheet provided in the measurement book.

    ii. Measurement of other items: The measurement/ numerical details of other items shall be recorded in the sheets provided for respective items viz. Termination of Cable in equipment room, The number of joints, Record splice loss details for each joint

    iii. The TPA & bidder shall sign all the measurement recorded in the measurement sheet/book. This will be considered as an acceptance by the TPA of measurements recorded in the MB by bidder.

iv. Measurement of the work of cable for calculation of services portion will be taken equal to the route length on which the cable has been laid (as measured in the Roadometer) and not the total length of the cable laid.

v. Measurement Book (MB): The bidder shall also maintain a Measurement Book for each Block. This will be maintained as compilation of copies of the measurement sheets verified by TPA. This book is one of the primary records to be maintained by the bidder carrying out the work during the course of execution of works. The bidder shall remove all the defects pointed out by TPA in the Measurement Sheet. The TPA / bidder or their authorized representatives shall also be at liberty to note their difficulties etc. in these Sheets. The hard-bounded measurement sheets shall invariably be consulted at the time of making final payments to the TPA/ bidder.

5. Procedure for preparation, processing and payment of bill for works

a. For claiming the payment on successful completion of the milestones defined in payments Section, the bidder shall prepare the bill along with office wise testing and acceptance document of all the works submit the same to TPA. The final bill shall be prepared as per measurements of all items involved in execution of complete route

b. TPA shall scrutinize the final bill against the works entrusted and accord necessary certificates stating that the work has been executed satisfactorily in accordance with Specification and terms and conditions of the contract. The TPA shall verify the quantities of items of work done by bidder with reference to measurement recorded in the measurement sheet and Acceptance Testing procedure as defined in this Clause shall be followed:

i. TPA shall verify and submit the bills (for work carried out) provided by the bidder along with all self-certifications, test reports and measurement records to TANFINET.
ii. TANFINET shall release the payment to bidder accordingly based on certificates received from TPA
iii. TPA shall submit its report to TANFINET, however the payment shall be made as per payment schedule. TANFINET shall exercise

the prescribed checks on the bills provided by TPA and make payments and Measurement & Inspection

6. Procedure for Payment for Sub-Standard Works: The bidder is required to execute all works satisfactorily and in accordance with the Specification. If certain items of work are executed with unsound, imperfect or unskilled workmanship or with materials of any inferior description or that any materials or articles provided by him for execution of work or unsound or of a quality inferior to that contracted for or otherwise not in accordance with the contract (referred to as substandard work hereinafter), TANFINET shall make a demand in writing specifying the work, materials or articles about which there is a complaint.

7. Timely Action by TPA

    a. Timely reporting and action, to a great extent, can prevent occurrence of sub- standard work, which will be difficult or impossible to rectify later on. It is incumbent on the part of TPA for supervision of work to point out the defects in work in time during progress of the work. The TPA responsible for supervision of work shall without any loss of time submit a report of occurrence of any sub- standard work to TANFINET besides making an entry in the site order book. A notice in respect of defective work shall be given to the bidder in writing during the progress of work asking the bidder to rectify/replace/remove the sub-standard item of work and also definite time period within which such rectification/removal/replacement has to be done. After expiry of the notice period, if the bidder fails to rectify/ replace/ remove the sub-standard items, the defects shall be rectified/replaced/removed by TANFINET, at its sole discretion, through some other agency at the risk and cost of the bidder.

    b. Non-reporting of the sub-standard work in time on the part of TPA shall not in any way entitle the bidder to claim that the defects were not pointed out during execution and as such the bidder cannot be absolved of the responsibility for sub-standard work and associated liabilities

8. Quality Control of Works

    a. The importance of quality of Fiber optic cable splicing works cannot be over- emphasized. The quality and availability of long-distance media and

efficiency of the reliable media connectivity between terminal equipment depends upon quality of optic fiber cable plant. The quality of fiber optic cable plant depends upon the quality of individual items of work involved viz. laying, Protection, Jointing of cables and Terminations in equipment room and also on documentation of cable network. The work shall be carried out strictly in accordance with Specifications laid down to achieve the requisite quality aim

b. TANFINET shall be the final judge of the quality of the work and the satisfaction of the TANFINET in respect thereof set forth in the contract document. Laxity or failure to enforce compliance with the contract documents by TANFINET and/ or its representative shall not manifest a change or intent of waiver, the intention being that, notwithstanding the same, the bidder shall be and remain responsible for complete and proper compliance with the contract documents and the specifications there in. The representative of the TANFINET has the right to prohibit the use of men and any tools, materials and equipment which, in his opinion, do not produce the required work or performance meet the requirement of the contract documents.

c. It is imperative that the bidder is fully conversant with the construction practices and shall be fully equipped to carry out the work in accordance with the specifications. The bidder is expected and bound to ensure quality in construction works in accordance with specifications laid down. The bidder shall engage adequate and experienced supervisors to ensure that work is carried out as per specifications, with due diligence and in a professional manner. A two stage testing process will be incorporated as follows:

    i. The first level of testing shall be carried out by the bidder. Once the bidder is confirmed about the quality assurance of their work and material then they will hand it over to TPA for review and testing.
    ii. The TPA team shall carry out the second level of testing.

d. In addition to Acceptance Testing being carried out by TPA, all works at all times shall be open to inspection of TANFINET. The bidder shall be bound, if called upon to do so, to offer the works for inspection without any extra payment. The presence of monitoring teams nominated by TANFINET during construction shall not preclude separate acceptance

testing teams to recheck adherence to all aspects as mentioned in the contract

9. Quality Control of material supplied by bidder: TPA shall ascertain that all the material being supplied by bidder for works being carried out are in compliance with the required standard and quality and as per Quality Assurance Plan. Any instance of violation by bidder shall be immediately reported to TANFINET by TPA. On a very random basis, TPA of the project may involve external agencies to carry out the tests on required basis.

10. Inspection and Testing

    a. All materials furnished and all work performed under this Contract shall be inspected and tested. The bidder shall furnish all manpower and materials for tests, including testing facilities, power and instrumentation, and replacement of damaged parts. The costs shall be borne by the bidder and shall be deemed to be included in the contract price.

    b. The entire cost of testing for factory & site acceptance, routine tests, production tests and other test during manufacture & site activities specified herein shall be treated as included in the quoted unit price of materials, except for the expenses of TANFINET representative.
    c. Prior notice of at least 15 days should be given to TPA by bidder for making the representative of TPA available for observing the factory tests. Any cost of pertaining to making available the TPA representative at the necessary site shall be solely borne by TPA and non-chargeable to TANFINET.

    d. All tests conducted by bidder must be verified by TPA.

    e. Should any inspections or tests indicate that specific item does not meet Specification requirements; the appropriate items shall be replaced, upgraded, or added by the bidder as necessary and as applicable to correct the noted deficiencies at no cost to TANFINET. After correction of a deficiency, all necessary retests shall be performed to verify the effectiveness of the corrective action.

f. Deliveries shall not be shipped until all required inspections and tests have been completed and all deficiencies have been corrected to comply with this specification and approved for shipment by TANFINET.

g. Acceptance or waiver of tests will not relieve the bidder from the responsibilities to furnish material and works in accordance with the specifications and to TANFINET's satisfaction.

h. Unless otherwise specified in this Contract, selection of test samples, number of specimens and acceptance of results shall be in accordance with the terms of the relevant Standards and Codes. Where no terms exist, TANFINET is to instruct details in advance of the inspection and tests in response to the request of the bidder.

i. The bidder shall comply with various instructions / guidelines issued by TANFINET relating to testing and acceptance of the deliverables of the bidder.

11. Optical Fiber Identification

a. Individual optical fibers within the fiber units shall be identifiable in accordance with EIA/TIA 598 or IEC 60304 or Bellcore GR-20 colour coding scheme. The actual colouring scheme shall be mentioned by the bidder in Data Requirement Sheet and the same shall be finalized during the detailed engineering in consultation with TANFINET.

b. Colouring utilized for colour coding optical fiber shall be integrated into the fiber coating and shall be homogenous. The colour shall not bleed from one fiber to another and shall not fade during fiber preparation for termination of splicing. Each fiber cable shall have traceability of each fiber back to the original fiber manufacturer's fiber number and parameters of the fiber.

12. Testing Methodology

a. Acceptance Testing

i. The works shall be deemed to have been completed only after the same has been accepted by TPA as per the process mentioned in this tender and after it has been informed by TPA to TANFINET confirming

the completion of work. The various testing will be undertaken by bidder in the presence of TPA. The bidder may conduct its own test prior for self-assessment before asking for tests to be conducted in the presence of TPA. Certificate will be issued by TPA representative after successful completion of testing (for each milestone).

ii. The bidder, after having satisfied himself of completion of work, from equipment at Block PoP / GP PoP to equipment at Government Offices, shall offer the work to TPA for conducting Testing. The work shall be offered or Inspection as soon as link is complete.

iii. If the measurements (of length of OFC laid) taken by TPA are found to be lesser than the measurements recorded by the bidder responsible for recording the measurements, the measurement taken by TPA shall prevail without prejudice to any punitive action against the bidder as per provisions of the contract and the testing officer of bidder recording the measurements.

iv. The bidder shall be obligated to remove defects/deficiencies pointed out by the TPA without any additional cost. TANFINET does not take any responsibility of return of defective used items / items previously accepted by bidder.

v. Factory Acceptance Test: Factory Acceptance Tests shall be conducted as per relevant Standards and Codes on randomly selected final assemblies of selected equipment to be supplied. These tests shall be carried out in the presence of TANFINET's authorized representatives or TANFINET appointed agency unless waiver for witnessing by the TANFINET is intimated to the bidder. Factory acceptance testing shall be carried out on OFC and related accessories, all active and passive equipment, Test Equipment, installation accessories and all other items to be supplied unless factory testing and inspection has been waived off by TANFINET.

vi. Equipment shall not be shipped to TANFINET until required factory tests are completed satisfactorily, all variances are resolved, and TANFINET has issued Dispatch Clearance, which may be issued after completion of FAT by TANFINET or its authorized representatives deputed for carrying out the FAT. Successful completion of the

factory tests and TANFINET approval to ship shall in no way constitute final acceptance of the system or any portion thereof.

vii. The Factory Acceptance Test (FAT) shall demonstrate the Technical characteristics of the Fiber Optic cable & associated accessories in relation to this specifications and approved drawings and documents. The list of factory acceptance tests shall be supplemented by the bidders standard FAT testing program. In general the FAT for other items shall include at least: Physical verification, demonstration of Technical characteristics, various operational modes, functional interfaces, alarms and diagnostics etc. For Test equipment, FAT shall include supply of proper calibration certificates, demonstration of satisfactory.

viii. There shall be no factory splice allowed within a continuous length of cable. Only one continuous cable length shall be provided on each drum. The lengths of the cable to be supplied on each drum shall be standard or as determined by a "cable drum schedule" prepared by the bidders as the route survey done by survey agency appointed by TANFINET.

ix. Scope of Acceptance Testing: It is essential to verify the integrity and the capability of the Optical Fiber Cable and to assess its readiness for intended services. This scope defines the methodology for cable and accessories. The purpose of acceptance and testing is to verify integrity of measurement and quality of work done.

b. Fiber Optic cable link testing:

   i. Fiber continuity and link attenuation (Bi-directional) between FODP connectors at two ends for each fiber at 1310 and 1550 nm by OTDR

   ii. Fiber continuity and link attenuation (Bi-directional) between FODP connectors at two ends for each fiber at 1310 and 1550 nm by Power meter & Laser source

   iii. Average fiber attenuation and average splice loss in the link including FODP

iv. Proper termination and labelling of fiber and fiber optic cables at FODP

v. Data loss test and ensuring that the same is within the acceptable limits

c. Termination arrangement: The fibers of the cable shall be spliced to the pigtails for connection to the optical line systems. Pigtails shall be duly terminated at the FDMS (fiber distribution management system).

d. Field Acceptance Test

i. The field installation test shall be performed for all equipment at each location. If any equipment has been damaged or for any reason does not comply with this Specification, the bidder shall provide and install replacement parts at its own cost and expense

ii. As per Technical requirements, the Acceptance Test is required to be carried out for all Fibers in each cable section, and TANFINET Acceptance Test schedule is to be followed for proper testing of the OF cable network

iii. The OF cable sections shall be identified on ABDs attached with the Acceptance Test Report and in the GIS tool.

iv. Testing shall be done in each OF cable section in one direction only and for two wavelengths viz. 1310 nm and 1550 nm using power meter and source. OTDR traces would be obtained for each OF Cable sections to measure and record the splice loss wherever applicable.

v. A minimum length of 2.0 km shall be maintained for all the OF cable between splices except as directed by TANFINET for any intermediate T-offs

e. End to End Testing of Optical Fiber Cable Route from GP PoP / Block PoP to Government Office: This document defines the procedure to be adopted for end to end testing of the OF cable route from GP PoP / Block PoP to Government Office

i. The End to End testing shall be carried out using Power meter/source and with OTDR after splicing OF cable
ii. The average attenuation (dB/Km) for cable shall be recorded
iii. End to end Testing shall be done in one direction only for the two wavelengths i.e. 1310 nm & 1550nm using Power meter and source. The Fiber connected to each port of the OTN shall also be tested using the OTDR and the traces obtained shall be recorded for future reference
iv. The bidder shall be responsible for co-ordination for conducting this test
v. After carrying out this test, the respective Government Office shall be detected in the EMS of NOC and shown as active at the NOC implemented by the bidder as part of this document. The bidder shall share the list of Government Offices in each Block and GP wise which have gone active.

13. Fiber Link Length

The estimated optical fiber lengths for various feeder lengths from one terminal point (FODP) to the other are given in the respective price schedules. However, the bidder shall supply and install the optical fiber cable as required based on actual work requirements finalized after detailed site survey carried out by the site survey agency. The payment will be based on actual quantities of work carried out by the bidder, as per the measurement criterion set forth in these specifications.

14. Performance and Functionality Test

a. The bidder shall ensure that they demonstrate the reachability between each Government Office to NOC.

b. The Bidder shall demonstrate the bandwidth performance as per centralized configuration.

c. The bidder shall demonstrate Multicast functionality at each GP level.

15. Commissioning Certificate

a. The bidder shall be eligible to apply for Commissioning Certificate after successful completion of End to End testing of a Govt. Office.
b. The End-to-End Testing Report has to be submitted for obtaining the Commissioning Certificate.
c. TANFINET, without any prejudice, reserves the right to carry out any kind of inspection of the works being carried out by TPA and the bidder at any time to ascertain its quantity and quality.
d. Testing will also be done for all other components supplied by the bidder as per the guidelines issued by TANFINET in this regard from time to time.

16. Final Completion Certificate

Only upon completion of all Works as required to be done by the bidder, the bidder shall be given the Final Completion Certificate or Go-Live Certificate by the TANFNET.

Annexure IV

Service Level Agreement & Targets

The Bidder has to maintain the operations for 3 years as per the terms & conditions of the tender and to meet the SLA as given in the tender. SLA is applicable in O&M and Implementation Phase (once commissioning of location is complete).

1. Network Availability Definition: (At all levels)

    a. Network Availability (%) for a month = (Total minutes during the month – Downtime minutes during the month) *100 / Total minutes during the month.

    b. Network Equipment Availability for a month = Total time (in minutes) in a month - total down time (in minutes) in a month.

    c. The network is considered available when all the services in full capacity are available. Total Time shall be measured on 24*7 basis.

    d. Measurement Tool: Reports from EMS duly approved by the TANFINET or its appointed agency. Bidder shall submit monthly and quarterly reports on the performance and adherence to the SLA.

    e. Packet losses and latency shall be measured between the GP/Block router/OLT and the ONT/Access router through EMS at every 6 hour interval between 8AM to 8PM. The average packet loss and latency shall be calculated on a monthly basis.

    f. The SLA for end office locations shall be measured from the time of the call being registered at help desk.

    g. SLA would be applicable in operations and maintenance phase of the project. The penalties shall be deducted from the Operations & Maintenance cost payable by TANFINET.

h. SLA would be applicable in implementation phase (once location is commissioned). The penalties shall be deducted from the Implementation Cost (Part-A) payable by TANFINET.

i. Unavailability of device due to fiber cuts laid by the Bidder shall be taken in to account if MTTR is greater than 8 hours.

2. Measurements & Targets

a. Availability of Devices

Measurement	**Definition**	**Monthly Target**	**Penalty per device**
Availability of OLT device in Block (Aggregation)	All commissioned equipment is available with full functionalities	≥99.5 %	No Penalty
		≥97.5 % to <99.5 %	₹5,000 per occurrence per device
		≥95.0 % to <97.5 %	₹10,000 per occurrence per device
		<95.0 %	₹10,000 + ₹2000 for each 0.5% reduction in uptime
Availability of OLT in Gram Panchayat	All commissioned equipment is available with full functionalities	≥99.0 %	No Penalty
		≥97.5% to <99.0%	₹1,000 per occurrence per device
		≥95.0% to <97.5%	₹2,500 per occurrence per device
		<95.0 %	₹2,500 + ₹500 for each 0.5% reduction in uptime
Availability of ONT/Access Router	All commissioned equipment is available with full functionalities	≥99.0 %	No Penalty
		≥97.5.0% to <99.0%	₹200 per occurrence per device
		≥95.0% to <97.5%	₹500 per occurrence per device
		<95.0 %	₹500 + ₹50 for each 0.5% reduction in uptime

b. Network related operational SLAs

S.No.	Measurement	Monthly Target	Penalty
1.	Network packetloss (GP/block to Govt. Office)	Up to 1%	No Penalty
		More than 1%	₹1000 per month
2.	Network latency (GP/block to Govt. Office)	Up to 10 ms	No Penalty
		More than 10 ms	₹1000 per month
		More than 20 ms	₹2000 + ₹500 on account of each 5 ms additional latency

1. The penalties for each of the above parameters shall be exclusive.
2. Availability of devices at GPs from 10 PM to 6 AM shall be excluded from the calculation of downtime.
3. In case of unavailability of ONT devices due to the failure of an OLT, the penalty shall be applicable for both OLT and the ONTs as per the SLA requirements of the devices.
4. Unavailability of the equipment due to the failure/under performance of UPS/Batteries or any other accessories supplied by the bidder shall be considered as unavailability of the equipment.
5. Unavailability of any of the specified features of the equipment at the time of service delivery shall be considered as unavailability of the equipment and the penalty shall be levied for each such lapse at 1% of the total cost of the work orders (for this purpose, the work order cost will be considered with 10% increment every year from the issue of LoA).
6. In order to have optimal performance of the equipment (Power consumption, Noise level, Maintenance etc.,) the OEM of Electronics shall be consulted and considered for the selection of UPS, Batteries and other accessories, which have impact on the performance of the equipment.

c. OFC Restoration

	Time to repair	Penalty per incidence
MTTR – Fiber Restoration	< 8 hrs.	No Penalty
	>= 8 hrs. and <12 hrs.	₹1000
	>= 12 hrs. and <18 hrs.	₹2000
	>= 18 hrs. and <24 hrs.	₹3000
	> 24 hrs.	₹3000 + ₹200 every hour

1. If the restoration of fiber cut takes beyond 8 hrs, the penalty applicable for both non-availability of corresponding devices and OFC restoration shall be levied.
2. Temporary restoration with the approval of TANFINET during emergency circumstances shall not be counted as downtime.
3. Bidder shall propose to shift the Aerial routes during O&M period to avoid cuts and TANFINET may agree on merits and in such cases, TANFINET shall bear the cost of materials only.
4. If the splice loss is more than 0.2 dB, the splicing shall be done again and the period till achieving the splice loss levels shall be considered as downtime.
5. During post-implementation period, in case any field equipment is damaged by a vehicular accident (or due to any other reason outside the control of bidder) and needs repair/replacement, then the corresponding equipment to be replaced by bidder as per the SLAs defined in this section. In such cases, damages are to be borne by bidder through proper comprehensive insurance for all the equipment (in the field) during contract period.

3. Service Levels Monitoring

The Service Level parameters defined shall be monitored on a periodic basis, as per the individual parameter requirements. Bidder shall be responsible for providing appropriate web based online SLA measurement and monitoring tools as part of the EMS. These tools are subject to an independent audit by any agency appointed by TANFINET. Bidder is obliged to provide to these agencies any reports/support /access to these tools as requested. Bidder shall be expected to take

immediate corrective action for any breach in SLA. Bidder shall provide support for any independent audit of the SLA tools/ reports.

4. Reporting Procedures

   a. Bidder representative shall prepare and distribute Service level performance reports in a mutually agreed format by the 5th working day of subsequent month. The reports shall include "actual versus target" Service Level Performance, a variance analysis and discussion of appropriate issues or significant events. Performance reports shall be submitted to TANFINET.
   b. Also, bidder may be required to get the Service Level performance report audited by the agency appointed by TANFINET.
   c. Bidder shall be entitled to a maximum of 6 hours of Planned Outages per PoP with maximum four (4) Maintenance Windows per year, thus totaling 24 hours of outages during 1-year period for the network installed and commissioned by the bidder. Such downtime shall not be treated as part of downtime for Service Level calculations. The bidder shall give 1-week prior notice in case of any such planned outages. The time for such outages shall be normally during non-peak generally during 00:00 to 06:00 hours only, preferably on Saturdays and Sundays, unless otherwise decided mutually for some other time window for some exceptional reasons.

5. Exclusions

For the purpose of calculating SLA, the following faults or outage hours shall be excluded:

   a. Periods where the TANFINET staff is inaccessible to confirm the status of the system after fault clearance by the bidder.
   b. Periods where any link is switched off at PoP location due its own reasons and the same has to be supported with the report from EMS.
   c. Downtime due to any back bone infrastructure failure and the same has to be supported with the report from EMS.
   d. Periods where the failure of any components or equipment belonging to TANFINET/Govt.
   e. Unavailability of the equipment due to Power failure /power turned

off shall be excluded from the calculation of SLA and the same has to be supported with the report from EMS.

f. Any downtime due to issues with third party backhaul link.

6. Issue Management Process

a. Either TANFINET or bidder may raise an issue by documenting the business or technical problem, which presents a reasonably objective summary of both points of view and identifies specific points of disagreement with possible solutions.
b. Any unresolved issues/disputes concerning the Project/Contract between the Parties shall first be referred in writing to the Project Manager for his consideration and resolution. If the Project Manager is unable to resolve any issue/dispute within 5 days of reference to them, the Project Manager shall refer the matter to the Project Management Unit. If the Project Management Unit is unable to resolve the issues/disputes referred to them within 15 days the unresolved issue/dispute shall be escalated as per the agreed escalation matrix for resolution. TANFINET within 30 days of reference to them shall try to resolve the issue/dispute.
c. If TANFINET fails to resolve a dispute as per the above clause, the same shall be referred to arbitration. The arbitration proceedings shall be carried out as per the Arbitration procedures mentioned in Clause 40 of this tender.

7. Service Level Change Control

a. General: It is acknowledged that this Service levels may change as TANFINET business needs evolve over the course of the contract period. As such, this document also defines the following change management procedures:

(i) A process for negotiating changes to the Service Levels
(ii) An issue management process for documenting and resolving particularly difficult issues.
(iii) TANFINET and bidder management escalation process to be used in the event that an issue is not being resolved in a timely manner by the lowest possible level of management.

b. Any changes to the levels of service provided during the term of this Contract shall be requested, documented and negotiated in good faith by both parties. Either party can request a change.

c. Service Level Change Process: The parties may amend Service Level by mutual agreement in accordance. Either party can propose changes. Unresolved issues shall also be addressed. Bidder representative shall maintain and distribute current copies of the Service Level document as directed by TANFINET. Additional copies of the current Service Levels shall be available at all times to authorized parties.

d. Version Control / Release Management: All negotiated changes shall require changing the version control number. As appropriate, minor changes may be accumulated for periodic release or for release when a critical threshold of change has occurred.

ANNEXURE - V

PART-I

Date:_____

From,
Name:
Address:
Ph:
Fax:
E-mail:

To,
The Managing Director,
Tamil Nadu FibreNet Corporation Limited (TANFINET),
No.807, 5th Floor, Chengalvaraya Naicker Building,
Anna Salai, Chennai - 600 002

Sir,

Sub: Tender for Selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years – Submission of Part I –Reg.

Ref: Your Tender Notice Dt. .....

With reference to your tender notice, we submit herewith our tender for Selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years as specified by TANFINET in this tender document.

We enclose the following documents:

1) Tender conditions duly signed in each page
2) Bank Guarantee no……. for Rs.1,50,00,000 /- (One Crore Fifty Lakhs only), in favour of " TANFINET Ltd." towards Earnest Money Deposit
3) Power of Attorney for signing of tender document as per Annexure XIII.
4) In case of consortium, Power of Attorney for lead member of consortium as per Annexure XIII.
5) Compliance report to the technical Specifications as per Annexure-I.
6) Details of the Bidder (as per Annexure-III)
7) The copy of certificate of incorporation/registration. Incase of consortium documents shall be enclosed for both the members.
8) Copy of Memorandum and Articles of Association. Incase of consortium documents shall be enclosed for both the members.
9) Copy of Registered Partnership deed, in case of Partnership Firm. Incase of consortium documents shall be enclosed for both the members.

10) Consortium Agreement
11) Average annual turnover statement duly certified by a Chartered Accountant (as per Annexure-VIII).
12) The Annual Report / certified copies of Balance Sheet, Profit & Loss statement along with schedules for the last 3 consecutive financial years i.e. FY2019-20, 2020-21 and 2021-22
13) Work orders and completion certificates in support of clauses 3(c), 3(d) and 3(e).
14) Letter of authorization from original equipment manufacturer for all active and passive components (as per Annexure-VII)
15) Undertaking on Rule 144(xi) in GFRs 2017 as per Annexure IX
16) Proof of Chennai office address or an undertaking that full-fledged office will be established in Chennai within 15 days from the date of issue of Letter of Acceptance
17) Proof of support centres in all District Headquarters or an undertaking that support centres in all District Headquarters will be established in District Headquarters within 45 days from the date of issue of Letter of Acceptance
18) Copy of valid ISO certifications (ISO 9001:2015 and ISO 20000-1:2018)
19) Declaration for not having black listed either by TANFINET or by any other Govt. agencies (as per Annexure-X). In case of consortium, each partner should submit a separate declaration form.
20) Declaration for not having tampered the Tender documents downloaded from the website www.tntenders.gov.in (Annexure-XI).
21) Copy of GST Registration certificate.
22) Latest I.T return.
23) Data sheets for all equipments quoted.
24) Proof for OEMs of equipments having the relevant experiences in support of clause 8 of Annexure I.
25) Notarized translated English version of the documents in a language other than English/Tamil, if any.

Yours faithfully,

SIGNATURE OF THE BIDDER

Encl: As stated above

ANNEXURE – VI

DETAILS OF THE BIDDER

S.No.	Particulars	Description/Details
A	**Name of Bidder**	
B	**Contact Details**	
	Registered Office Address	
	Telephone No.	
	Fax	
	Email	
	Website	
C	**Incorporation Details**	
	Incorporation Number	
	Date of Incorporation	
	Authority	
D	GST Number	
E	**Name of Authorized Signatory**	
	Position	
	Telephone	
	Fax	
	Mobile	
	Email	
F	**Number & Address of Offices**	
	a) In Chennai	
	b) Outside Chennai	

ANNEXURE – VII

LETTER OF AUTHORIZATION FROM THE ORIGINAL EQUIPMENT MANUFACTURER

To,
The Managing Director,
Tamil Nadu FibreNet Corporation Limited (TANFINET),
No.807, 5th Floor, Chengalvaraya Naicker Building,
Anna Salai, Chennai - 600 002

Sir,

We hereby authorize M/s .....to undertake to submit a Bid, and subsequently negotiate and sign the contract with the TANFINET against Tender No:_____ for the (type the Description of goods) manufactured by us. We hereby extend our full warranty for the goods offered for supply by the above company against this tender.

We also undertake to provide timely supplies as per terms of tender and as agreed mutually and also to provide a trouble free and continuous support either directly or through our authorized partners under our supervision during the said support period. We will provide the necessary support in the event of up gradation of any of the software is necessitated while providing the support and will arrange for complete replacement of the item(s) with an equivalent / higher version.

Further, if any product is declared end of sale, we shall proactively ensure that a suitable equivalent or higher roll over product is offered through the existing Bidder to TANFINET for due approval, contract and order executions thereafter. We do certify that none of the equipment covered under this subject tender are declared end of sale already or are planned for such declaration within the next 3 years.

For this tender we authorize M/s. _____ (Complete address and full contact details of the partner) to be our sales and service partner. In the event of discontinuation of supply and service by our partner or any problem arises during provision of supply and services, the entire responsibility to provide trouble free and continuous supply and services to the end user rests with us and we undertake to provide supply and services directly or through our alternative sales / service partners.

In case of violation of any of the conditions above, I/We ..... understand that I/ We are liable to be blacklisted by TANFINET for a period of three years.

(Signature for and on behalf of Principal)

NOTE: COMPETENT AUTHORITY OF THE MANUFACTURER SHOULD ISSUE THE LETTER OF AUTHORIZATION FOR EACH BIDDER SEPARATELY.

ANNEXURE – VIII

ANNUAL TURN OVER STATEMENT

The Annual turnover of M/s ..... for the past three years from ICT/IT/Telecom business are given below and certified that the statement is true and correct.

S.No.	Year	Turnover from ICT/IT/Telecom business (Rs. in Crores)
1.	2019-2020	
2.	2020-2021	
3.	2021-2022	
	Total	
Average annual turnover		

Note: Average Turnover of three consecutive audited financial years will be considered i.e. FY2019-20, FY2020-21 and FY2021-22.

DATE :

SIGNATURE OF THE BIDDER

SIGNATURE OF CHARTERED ACCOUNTANT
(with seal and Address)

Annexure IX

Self-Declaration GFR Rule 144(xi)

Ref: Date:

To
The Managing Director,
Tamil Nadu FibreNet Corporation Ltd.,
807, 5th floor, Chengalvaraya Naicker Maaligai, Anna Salai,
Chennai – 600 002.

Subject: Declaration Letter: Restrictions on procurement under rule 144 (xi).

Sir,

I/We, <Bidder/ OEM Name> have read the clause regarding restrictions on procurement from a Bidder/ OEM of a country which shares a land border with India.

I/We hereby certify that I/We, <OEM/ BIDDER Name> is not from such country or, if from such a country, has been registered with Competent Authority.

I/We hereby Certify that I/We fulfill all requirements in this regard and eligible to be considered.

Thanking You

For <OEM/ Bidder>

< (Authorized Signatory)>
Name:
Designation:
Contact Details:
Seal of the Company

NOTE:

1. The letter should be submitted on the letter head of the Bidder / OEM and should be signed by the authorized signatory.
2. Any deviation would lead to summarily rejection of bids.
3. Where Applicable, evidence of valid registration by the Competent Authority shall be attached.

ANNEXURE – X

CERTIFICATE

Date: _____

Certified that M/s...../ the firm /company or its partners / shareholders had not been blacklisted by Tamil Nadu FibreNet Corporation Limited (TANFINET), or by any Government Agencies.

SIGNATURE OF THE BIDDER
(with seal and address)

ANNEXURE - XI

DECLARATION FORM

Date: _____

a) I/We …….. having our office at …….. do declare that I/We have carefully read all the conditions of tender sent to me/us by Tamil Nadu FibreNet Corporation Limited (TANFINET), for the tenders floated vide tender ref.no._____ for Selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years and complete the contract as per the tender conditions.

b) I/We have downloaded the tender document from /www.tntenders.gov.in and I /We have not tampered / modified the tender document in any manner. In case, if the same is found to be tampered / modified, I/ We understand that my/our tender will be summarily rejected and full Earnest Money Deposit will be forfeited and I /We am/are liable to be banned from doing business with TANFINET or prosecuted.

SIGNATURE OF THE BIDDER
(with seal and address)

Annexure-XII

Power of Attorney for Signing of Tender Documents
(INR 100/- Stamp Paper)

Know all men by these presents, We…….. (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorise Mr/ Ms (name), …… son/daughter/wife of …… and presently residing at ……., who is presently employed with us/ the Lead Member of our Consortium and holding the position of …… , as our true and lawful attorney (hereinafter referred to as the "Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our tender for selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years by TANFINET including but not limited to signing and submission of all applications, Bids and other documents and writings and providing information/ responses to TANFINET, representing us in all matters before TANFINET, signing and execution of all contracts and undertakings consequent to acceptance of our Bid, and generally dealing with TANFINET in all matters in connection with or relating to or arising out of our Bid for the said Project and/ or upon award thereof to us and/or till the entering into of the Agreement with TANFINET.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, ……., THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS …… DAY OF ……., 20.....

For

……..

(Signature, name, designation and address)

Witnesses:
1.
2. (Notarised)

Accepted

……

(Signature)
(Name, Title and Address of the Attorney)

Notes:

- *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.*
- *Wherever required, the Applicant should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Applicant.*
- *For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Applicants from countries that have signed the Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.*

Annexure – XIII

Power of Attorney for Prime Member of Consortium
(INR 100/- Stamp Paper)

Whereas TANFINET has invited applications from interested parties for selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years.

.

Whereas, ……., ……., ……. and ……. (collectively the "Consortium") being Members of the Consortium are interested in bidding for the Project in accordance with the terms and conditions of the tender and other connected documents in respect of the Project, and

Whereas, it is necessary for the Members of the Consortium to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the Consortium, all acts, deeds and things as may be necessary in connection with the Consortium's Bid for the Project.

NOW, THEREFORE, KNOW ALL MEN BY THESE PRESENTS

We, ……. having our registered office at ……., and M/s…..……. having our registered office at ……., (hereinafter collectively referred to as the "Principals") do hereby irrevocably designate, nominate, constitute, appoint and authorise M/s. ……. having its registered office at ……., being one of the Members of the Consortium, as the Lead Member and true and lawful attorney of the Consortium (hereinafter referred to as the "Attorney"). We hereby irrevocably authorise the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the Consortium and any one of us during the bidding process and, in the event the Consortium is awarded the concession/contract, during the execution of the Project and in this regard, to do on our behalf and on behalf of the Consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the pre-qualification of the Consortium and submission of its Bid for the Project, including but not limited to signing and submission of all applications, Bids and other documents and writings, participate in Bidders and other conferences, respond to queries, submit information/ documents, Accept Letter of Award sign and execute contracts and undertakings consequent to acceptance of the Bid of the Consortium and generally to represent the Consortium in all its dealings with TANFINET, and/ or any other

Government Agency or any person, in all matters in connection with or relating to or arising out of the Consortium's Bid for the Project and/ or upon award thereof till the Agreement is entered into with TANFINET.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/ Consortium.

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ……. DAY OF ……., 20.....…

For ……..
(Signature)
……..
(Name & Title)
For ……..
(Signature)
……..
(Name & Title)
For ……..
(Signature)
……..
(Name & Title)

Witnesses:
1.
2.
……
(Executants)

(To be executed by all the Members of the Consortium)

Notes:

- *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.*

- *Also, wherever required, the Applicant should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Applicant.*
- *For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Applicants from countries that have signed the Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.*

ANNEXURE- XIV

CLARIFICATION ON TENDER DOCUMENT FORMAT

BIDDER'S REQUEST FOR CLARIFICATION			
Name and Address of the Organization submitting request		Name and Position of Person submitting request	Contact Details of The Organization / Authorized Representative
			Tel: Fax: Email:
S.N.o	**Reference(s) (Section, Page)**	**Content of Tender requiring Clarification**	**Points of clarification required**
1			
2			

SIGNATURE OF THE BIDDER
(with seal and address)

ANNEXURE - XV

PART-II

From,

Name:
Address:
Ph:
Fax:
E-mail:

To,

The Managing Director,
Tamil Nadu FibreNet Corporation Limited (TANFINET),
No.807, 5th Floor, Chengalvaraya Naicker Building,
Anna Salai, Chennai - 600 002

Sir,

Sub: Tender for Selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years - Submission of Part – II – Price Offer-Reg

Ref:- Our tender (Technical Bid) submitted for "Tender for Selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years"

In continuation of our above tender, we submit herewith the price offer for "Selection of a System Integrator for Implementing Last Mile Connectivity in Tamil Nadu along with Operation & Maintenance of the Network for a period of 3 years" as specified by TANFINET in this tender document. We agree to abide by the terms and conditions stipulated by the TANFINET and also agree to complete the entire contract, at the rates quoted by us. The rate quoted and approved by the TANFINET in this tender will hold good as per TANFINET tender conditions.

Yours faithfully,

SIGNATURE OF THE BIDDER

ANNEXURE -XVI

PRICE BID – PART A

(Amount in Rs.)

S.No.	BOQ	Qty	UOM	Unit Cost	Extended Price (Qty X Unit Cost)	GST	Total (Extended Price + GST)
At Blocks							
1	16 Port OLT with Dual PSU with 2 x 10G SFP	78	Nos				
2	8 Port OLT with Dual PSU with 2 x 10G SFP	310	Nos				
3	10G SR SFP Transceiver (OLT Side)	776	Nos				
4	10G SR SFP Transceiver (MPLS Router side)	776	Nos				
5	24 Port Fiber LIU (FDMS)	776	Nos				
6	1G Singlemode SFP (MPLS Router side)	300	Nos				
7	Multimode Fiber Patch cord – 3metres	776	Nos				
8	Singlemode Simplex Patch cord – 3metres	2328	Nos				
9	Aerial Optical Fiber Cable ADSS OFC 24 Core	1358	KM				
10	Aerial Optical Fiber Cable ADSS OFC 12 Core	582	KM				
11	Slinging / Laying of ADSS 6F/12F/24F core of Optical Fiber Cable on EB Poles or new Poles wherever required	1940	KM				

S.No.	BOQ	Qty	UOM	Unit Cost	Extended Price (Qty X Unit Cost)	GST	Total (Extended Price + GST)
12	Formed OFC Dead End & Termination Fittings @12 per km (Wedge Type)- Dead End Termination / Tensioning clamp assembly for the poles having cable angle deviation above 25 deg or at tension point/poles. (2 No-Anchoring clamp, 1 No-Pole Bracket, 1.5 Mtrs-Stainless Steel Strap, 2 Nos-Buckles) @ 3 per km — (Wedge Type - Type 3)	23280	Nos				
13	OFC Suspension Fittings @ 8 per km (Wedge Type)	15520	Nos				
14	Adjustable Cable Storage Bracket @5per km (One loop bracket 1.5 mtr stainless steel strap & 2 nos buckles) Wedge Type - Type 3	9700	Nos				
15	Supply & Erection of GI pole as mentioned in Technical Specifications (6 metre)	3880	Nos				
16	Straight Joint Closure / Branch Joint Closure @ one per 2 km+10% extra	1494	Nos				
17	Splitter (1:4)	1552	Nos				
At GPs							
1	4 Port OLT with Single PSU with 2 x 1G SFP	1768	Nos				
2	8 Port OLT with Dual PSU with 2 x 1G SFP	442	Nos				
3	1G SR SFP Transceiver (OLT Side)	4420	Nos				
4	1G Singlemode SFP	200	Nos				
5	12 Port Fiber LIU (FDMS)	3536	Nos				
6	24 Port Fiber LIU (FDMS)	884	Nos				
7	Multimode Fiber Patch cord - 3M	4420	Nos				

S.No.	BOQ	Qty	UOM	Unit Cost	Extended Price (Qty X Unit Cost)	GST	Total (Extended Price + GST)
8	Singlemode Simplex Patch cord - 3M	4420	Nos				
9	Aerial Optical Fiber Cable ADSS OFC 12 Core	1326	KM				
10	Aerial Optical Fiber Cable ADSS OFC 6 Core	3094	KM				
11	Slinging / Laying of ADSS 6F/12F/24F core of Optical Fiber Cable on EB Poles or new Poles wherever required	4420	KM				
12	Formed OFC Dead End & Termination Fittings @12 per km (Wedge Type)- Dead End Termination / Tensioning clamp assembly for the poles having cable angle deviation above 25 deg or at tension point/poles. (2 No-Anchoring clamp, 1 No-Pole Bracket, 1.5 Mtrs-Stainless Steel Strap, 2 Nos-Buckles) @ 3 per km — (Wedge Type - Type 3)	53040	Nos				
13	OFC Suspension Fittings @ 8 per km (Wedge Type)	35360	Nos				
14	Adjustable Cable Storage Bracket @5per km(One loop bracket 1.5 mtr stainless steel strap & 2 nos buckles) Wedge Type - Type 3	22100	Nos				
15	Supply & Erection of GI pole as mentioned in Technical Specifications	4420	Nos				
16	Straight Joint Closure / Branch Joint Closure @ one per 2 km+10% extra	10578	Nos				
17	Splitter (1:4)	4420	Nos				
18	6U Rack	100	Nos				
19	1KVA UPS	100	Nos				

S.No.	BOQ	Qty	UOM	Unit Cost	Extended Price (Qty X Unit Cost)	GST	Total (Extended Price + GST)
Government Offices - Type 3 & 4							
1	ONT without WIFI including Splitter	17560	Nos				
2	ONT with WIFI including splitter	500	Nos				
3	ONT with Redundancy (Type 3)	500	Nos				
4	Fiber enclosure kit	18560	Nos				
5	Fiber Patch cord (Simplex)	18560	Nos				
Government Offices - Type 1 & 2							
1	Access Router along with two Single Mode SFP	250	Nos				
2	12 Port Fiber LIU (FDMS)	250	Nos				
3	Fiber Patch cord	500	Nos				
4	Rack	100	Nos				
State NOC							
1	Servers and Storage for EMS Solution	1	Lot				
2	GPON EMS Application Software	1	Lot				
Installation Services							
1	Block Installation Services	388	Lot				
2	GP Installation Services	2210	Lot				
3	State NOC EMS Implementation and Integration Services with TANFINET EMS and BSS Solutions	1	Lot				
4	Installation and Integration services at each government office	18310	Nos				
Underground Fiber Cabling (DHQ to Nearest Blocks for TNSWAN)							
1	Underground Optical Fiber Cable 96 Core Ribbon Type	300	KMS				

S.No.	BOQ	Qty	UOM	Unit Cost	Extended Price (Qty X Unit Cost)	GST	Total (Extended Price + GST)
2	Supply and installation of DWC Pipe (75/61mm) @ 100m per km	30	KMS				
3	Supply and installation of FDMS outdoor (Joint Closure)	100	Nos				
4	Supply and installation of Route / joint indicator (5 per Km)	1500	Nos				
5	Supply and installation of Manhole, Joint chambers & Loop chamber@1 per 2 Km	1500	Nos				
6	Supply and installation of HDPE PLB Duct (40 mm/33mm) with All Accessories like Coupler, End Cap, Simplex Plug etc.	300	KMs				
7	Excavation of trench, PLB pipe laying, Backfilling, Reinstatement and Compaction after laying of PLB pipe, Pulling/laying / blowing of optical Fiber Cable inside laid PLB pipe, splicing and jointing of 96F UG Optical Fiber Cable	300	KMs				
8	GI Pipe and Accessories	10	KMs				
9	10KM Singlemode 10G SFP+	150	Nos				
Total							

Amount in Words: Rupees _____ only

SIGNATURE OF THE BIDDER
(with seal and address)

Note: The quantity mentioned above is only indicative for the purpose of price discovery. The actual quantity may vary. Accordingly, payment will be made only for the actual quantity used.

PRICE BID – PART B

Operation & Maintenance cost for 3 Years

(Amount in Rs.)

S.No.	Description	Qty	UOM	Unit Cost	Extended Price (Qty X Unit Cost)	GST	Total (Extended Price + GST)
1	State NOC Infrastructure	LS					
2	OFC including splitters, enclosures, poles etc.	6660	Kms				
3	OLT devices along with all allied equipments and accessories	2598	Nos.				
4	ONT devices along with all allied equipments and accessories	18,560	Nos.				
5	Access Routers along with all allied equipments and accessories	250	Nos.				
Total							

Amount in Words: Rupees _____ only

SIGNATURE OF THE BIDDER
(with seal and address)

Note: The quantity mentioned above is only indicative for the purpose of price discovery. The actual quantity may vary. Accordingly, payment will be made only for the actual quantity installed.

PRICE BID – PART C

Operation & Maintenance cost for additional 2 years (4th and 5th Year)

(Amount in Rs.)

S.No.	Description	Qty	UOM	Unit Cost	Extended Price (Qty X Unit Cost)	GST	Total (Extended Price + GST)
1	State NOC Infrastructure	LS					
2	OFC including splitters, enclosures, poles etc.	6660	Kms				
3	OLT devices along with all allied equipments and accessories	2598	Nos.				
4	ONT devices along with all allied equipments and accessories	18,560	Nos.				
5	Access Routers along with all allied equipments and accessories	250	Nos.				
Total							

Amount in Words: Rupees _____ only

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