

Additional Terms & Conditions for procurement of 48 Fiber Armoured OFC

Information to Bidder for the "Supply of 48 Fibre Optical Fibre Cable (armoured) as per RDSO Specs. RDSO/SPN/TC/110/2020 Revision-0 with latest amendment for RailTel Optic Fiber Network".

1. The item/items in this bid should be quoted as per the technical specifications. The details of the specifications along with consignee/site details are also available on website www.railtelindia.com.
2. 48 Fibre Optical Fibre Cable (armoured) offered shall have complete data sheets and detailed description on OEM web sites. Bidders are required to submit duly filled and signed Technical compliance of the 48 Fibre Optical Fibre Cable (armoured) offered in Annexure-I, failing which the bids may be rejected.
3. GST registration certificate of vendor should be provided from where goods will be supplied.
4. **Tender Cost: NIL**
5. **Estimated cost of tender:** Estimated cost of the Tender is **Rs. 28,39,085/-** (Incl. GST).
6. **Earnest Money Deposit (EMD): Rs. 56,790/-** with Payment online through Demand Draft in favour of "RailTel Corporation of India Ltd." payable at New Delhi **or** through Online Transfer in RailTel Bank A/c detail below:

Name of Bank: **Union Bank of India**

Name of the Account Holder: **RailTel Corporation of India Limited**

Account Number: **307801010917906**

IFSC: **UBIN0530786**

Branch: 1st Floor, 14/15, Rajiv Chowk, Block- F, Connaught Place, New Delhi-110001

(b) Proof of payment shall be submitted online on GeM portal & Original DD should reach at RailTel Corporation of India Limited, Northern Region office, 6th Floor, Block III, Delhi IT Park, Shastri Park, Delhi-110053 before date of opening of Tender. No interest is allowed on this Deposit and RailTel Corporation reserves the right to forfeit this Deposit if the successful tenderer fails to submit the Security Deposit required by the terms and conditions of the tender. Tenders not accompanied by Earnest Money will be summarily rejected.

(c) For NSIC registered firm and micro & small enterprises (MSEs) who are having valid Udyog Aadhar memorandum and for Small Scale Units registered with NSIC under single point registration scheme and participating in this tender, following exemptions shall be available.

They shall also be exempted from depositing Earnest money. These exemptions shall be applicable provided units are registered with NSIC for tendered item and registration is current and valid. Firms claiming these exemptions are required to submit along with their offer, a copy of their current and valid NSIC registration certificate for the tendered item/items, otherwise their offer would not be considered.

- (d) Earnest Money of the unsuccessful bidder will be returned on finalization of Tender. No interest shall be payable on the EMD.
- (e) The successful bidder's bid security will be discharged upon the bidder's acceptance of the purchase order satisfactorily and furnishing the performance bank guarantee in accordance with clause-14.

7. Eligibility Criteria for bidder:

- 7.1 The bidder should have established manufacturing facilities for manufacture & Supply of 48 Fibre Optical Fibre Cable (armoured) as per RDSO Specs. **RDSO/SPN/TC/110/2020 Revision-0** with latest amendment.

7.2 Technical Eligibility Criteria:

The tenderer must have successfully completed any of the following during last 07 (seven) years, ending last day of month previous to the one in which tender is invited:

- Three similar works each costing not less than the amount equal to 30% of advertised value of the tender, or
- Two similar works each costing not less than the amount equal to 40% of advertised value of the tender, or
- One similar work each costing not less than the amount equal to 60% of advertised value of the tender.

Similar Work- The work for Supply of 6/12/24/48/96FADSS/Armoured/Unarmoured/Metal Free OFC in any Government / State Government/PSU/Public listed company/reputed Telco.

Note: Work experience certificate from private individual shall not be considered. However, in addition to work experience certificates issued by any Govt. Organization, PSU or any reputed TELCO, work experience certificate issued by Public listed company having average annual turnover of Rs.500 crore and above in last 3 financial years excluding the current financial year, listed on National Stock Exchange or Bombay Stock Exchange, incorporated/registered at least 5 years prior to the date of opening of tender, shall also be considered provided the work experience certificate has been issued by a person authorized by the Public listed company to issue such certificates.

In case tenderer submits work experience certificate issued by public listed company, the tenderer shall also submit along with work experience certificate, the relevant copy of work order, bill of quantities, bill wise details of payment received duly certified by Chartered Accountant, TDS certificates for all payments received and copy of final/last bill paid by company in support of above work experience certificate.

7.3 **Financial Eligibility Criteria:** The tenderer must have received contractual payments in the previous three financial years and the current financial year up to the date of inviting of tender, at least 150% of the advertised value of the tender. The tenderers shall submit Certificates to this effect which may be an attested Certificate from the concerned department / client or Audited Balance Sheet duly certified by the Chartered Accountant/Certificate from Chartered Accountant duly supported by Audited Balance Sheet.

(Note: Client certificate from other than Govt. Organization should be duly supported by Form 16A/26AS generated through TRACES of Income Tax Department of India).

7.4 (a) The bidder should not have been blacklisted by any agency / purchaser during the past 5 years and should give an undertaking for the same.
(b) The bidder should have positive net worth and should give CA certificate for the same.

8. The Tenderer shall quote Total all Inclusive Rate on C.I.P. destination basis clearly indicating the breakup of rates, applicable duties, taxes, etc.

9. Validity of offer:

Validity of offer: 45 days (Forty-five days only) from the date of opening of tender.

10. Issue of Purchase Order:

10.1 The purchase order in favor of the successful bidder will be issued and shall constitute the intention of the purchaser to enter into contract with the bidder. The bidder should submit unconditional acceptance within 07 days of issue of PO after finalization of tender, along with SD/PG within 15 days of issue of P.O.

10.2 Tenderers may be asked for staggered delivery of the stores, if required, based on site requirements and same shall be advised with issue of purchase order.

11. Payment Conditions:

- i. 100% payment against full supply of the ordered quantity.
- ii. 80% payment against part supply of the ordered quantity.

The following documents are to be submitted for payment:

- a. Original Tax Invoice
- b. Delivery Challan
- c. E-way bill
- d. Original Consignee receipt for receipt of goods in good condition.
- e. Original Inspection Certificate

- f. Warranty Certificate from OFC manufacturer (OEM)
- g. Proof of PBG/SD submission
- h. Insurance certificate for Transit period
- i. Declaration form for not imposing TDS rate as per sec.206AB/206CCA of Income Tax Act.
- j. Entry of material in RailTel Store
- k. Fall Back Clause Certificate.
- l. Bill Passing Authority: Dy. General Manager/Project
Bill Paying Authority: Joint General Manager/Finance

Note: Payment will be released only when GST amount is reflecting on GST Portal against invoices processed for payment.

12. Online Submissions:

The bidder is required to upload and submit the following documents online before due date & time of bid.

- i. EMD.
- ii. Clause wise compliance of all the clauses of GeM Bid and ATC documents.
- iii. No deviation statements.
- iv. Eligibility Criteria documents.
- v. Technical Compliance of RDSO Specification.
- vi. Notarized affidavit on a non-judicial stamp paper as per Annexure-IV regarding authenticity of the documents submitted /information provided in the bid. Non submission of an affidavit by the bidder shall result in rejection of his/their bid.
- vii. Power of Attorney: Power of attorney in favor of the signatory duly authorizing the signatory shall be submitted online before the due date and time of submission of the e-Tender and Original copy is needed to be submitted by the successful bidder before issuance of PO.

Note: i. The bidder is required to give acceptance of all the clauses mentioned in the **“Information to the Bidders”** document is mandatory. Any deviation / non-acceptance may lead to rejection of the bid.

ii. Information to Bidder viz. corrigendum /addendum/ amendments etc. for this bid shall be posted on www.railtelindia.com only.

iii. This bid is governed by the Specific Additional Terms & Conditions and General Terms & Conditions laid down by the GeM against this GeM Bid.

If there is any contradiction in any of the condition between ITB terms & conditions and GeM Terms & conditions, in all such cases the Terms & conditions mentioned in ITB will be final and binding on bidder/supplier.

13. Delivery period: 60 days from the date of issue of PO.

14. Security Deposit/Performance Guarantee:

- I. On receipt of the Letter of Acceptance of Tender from the RailTel, the successful Tenderer *should give a Performance Guarantee in the form of BG/DD/Banker's Cheque in favour of RailTel Corporation of India Limited payable at New Delhi* from any Nationalized Bank or from any Scheduled Bank, amounting to 10% of the contract/PO value with validity 3 months beyond warranty period of supply.
- II. The successful bidder shall have to submit a Performance Guarantee (PG) within 15 (fifteen) days from the date of issue of Letter of Acceptance (LOA). Extension of time for submission of PG beyond 15 (fifteen) days and upto 30 days from the date of issue of LOA may be given by the Authority who is competent to sign the contract agreement. However, a penal interest of 15% per annum shall be charged for the delay beyond 30 (thirty) days, i.e., from 31st day after the date of issue of LOA. In case the contractor fails to submit the requisite PG even after 60 days from the date of issue of LOA, the contract shall be terminated duly forfeiting EMD and other dues, if any payable against that contract. The *failed contractor shall be debarred from participating in re-tender* for that work.
- III. The Performance Guarantee should be furnished by the successful contractor after letter of acceptance has been issued. The PG will be returned only after fulfillment of contractual obligations.
- IV. A separate advice of the BG will invariably be sent by the BG issuing bank to the RailTel's Bank through SFMS and only after this the BG will become acceptable to RailTel. It is therefore in own interest of bidder to obtain RailTel's bank IFSC code, its branch and address and advise these particulars to the BG issuing bank and request them to send advice of BG through SFMS to the RailTel's Bank.
- V. RailTel's Bank details are as under for PBG SFMS confirmation:

Account Number : 912020032008218
Name : RailTel Corporation of India Ltd.
IFSC : UTIB0003108
Bank Name : Axis bank Limited
Bank Address : D-15, South Extension, New Delhi-110049.
MICR Code : 110211187

Note:

1. Any Performance security **up to a value of Rs.5.0 Lakhs** is to be submitted through online transfer or in the form of Demand Draft **ONLY**. Demand Draft in favour of "RailTel Corporation of India Ltd." payable at New Delhi or through Online Transfer in RailTel Bank A/c detail below:

Name of Bank : **Union Bank of India**
Name of the Account Holder : **RailTel Corporation of India Limited**
Account Number : **307801010917906**
IFSC : **UBIN0530786**
Branch : 1st Floor, 14/15, Rajiv Chowk, Block- F, Connaught Place, New Delhi-110001

- VI. Performance Guarantee shall be released after satisfactory completion of the work, maintenance period and on expiry of the warranty period and issue of the certificate of final acceptance of the entire system.
- VII. Wherever the contracts are rescinded, the security deposit should be forfeited and the Performance Guarantee shall be en-cashed and the balance work should be got done separately.

15 Inspection of material:

- 15.1 The supplier/manufacturer bidder will send inspection call letter to concerned Inspecting Authority RDSO/RITES/Purchaser's representative the material is ready to be supplied and ready for inspection. The Inspection shall be carried out at supplier's/Manufacturer's premises by the Inspecting Authority
- 15.2 In case material/equipment fails during inspection, the fresh lot of same material/equipment shall be offered without any extra cost, by the manufacturer/supplier. In such a case, total cost of re-inspection including travel, lodging & boarding of the inspecting officials shall be to manufacturer's / supplier's account/cost.
- 15.3 **Inspection** of the material including that of raw material if deemed required shall be conducted by approved Govt. inspecting authority of repute like RDSO/RITES or any other agency /representative authorized by RailTel in exceptional circumstances, at the firm's premises. The inspection shall be conducted by inspecting authority as per required test procedures /test plan for ensuring that the material offered meets the required specifications.
- 15.4 The material should be offered for inspection within three weeks of issue of purchase order. Travelling, lodging and boarding expenses of RailTel representative shall be borne by RailTel, but necessary facilities to carry out test /witness inspection shall be provided by the manufacturer/supplier, free of cost.
- 15.5 The manufacturer shall maintain stock register (receipt, issue and balance) and defect records for the raw material. The defect records shall be in standard formats and it shall be compiled on a daily/ weekly/ monthly basis and it shall be analyzed. "NIL" Report shall be segregated from the accepted material. First-in First-out concept shall be implemented in foolproof manner. The batches of the raw material shall be identified and traceable. All relevant documents necessary to ensure trace-ability shall be maintained. The raw material shall be protected from direct exposure to sunlight, moisture, water ingress and heat etc.
- 15.6 Finished products shall be tested 100% by the factory QC personnel before being offered to RailTel for acceptance to ensure that it meets all quality requirements as per the relevant specifications. Duly filled in test formats indicating the results of such tests shall be submitted along with material offered for inspection to RailTel.

(a) Inspection of 48 Fibre Optical Fibre Cable (armoured) shall be carried out as per RDSO Specs. **RDSO/SPN/ TC/110/2020 Revision-0** with latest amendment at OEM premises.

(b) Inspection charges shall be borne by the bidder. No additional charges will be paid by the purchaser on account on inspection charges.

16. **Warranty:** The 48 Fibre Optical Fibre Cable (armoured) should be warranted for a period of **18 months** from the date of delivery.
- 16.1 The supplier shall warrant that material to be supplied shall be new and free from all defects and faults in material, workmanship, manufacture and shall be of the highest grade consistent with the established and generally accepted standards of materials for the type ordered and shall perform in full conformity with the specifications and drawings. The supplier shall be responsible for any defects (with respect to the specification of the material) that may develop subsequently under the conditions provided in the contract under proper use, arising out of faulty materials, design or workmanship such as corrosion, inadequate quantity of material to meet equipment requirements, deficiencies in design and/ or otherwise and shall remedy such defects at his own cost when called upon to do so by the Purchaser who shall state in writing in what respect the stores are faulty.
- 16.2 If it becomes necessary for the contractor to replace or renew any defective portion/portions of the supplies under this clause, the provisions of the clause shall apply to the portion/portions of the equipment/ material so replaced or renewed or until the end of the above-mentioned period, whichever may be later. If any defect is not remedied within a reasonable time, the Purchaser may proceed to do the work at the contractor's risk and expenses, but without prejudice to any other rights which the Purchaser may have against the contractor in respect of such defects.
- 16.3 Replacement under warranty clause shall be made by the contractor free of all charges at site including freight, insurance and other incidental charges.
- 16.4 The Contractor/Seller hereby covenants that it is a condition of the contract that all goods/stores/articles furnished to the Purchaser under this contract shall be of the highest grade free of all defects and faults and of the best materials, quality, manufacture and workmanship throughout and consistent with the established and generally accepted standards for materials of the type ordered and in full conformity with the contract specification, drawing or sample, if any and shall, if operable, operate properly.
- 16.5 The Contractor also guarantees that the said goods/stores/articles would continue to conform to the description and quality as aforesaid, for a period of 18 months after their delivery, and this warranty shall survive notwithstanding the fact that the goods/stores/articles may have been inspected, accepted and payment thereof made by the Purchaser.

- 16.6 If during the aforesaid period, the said goods/stores/articles be discovered not to conform to the description and quality aforesaid or have deteriorated, otherwise that by fair wear and tear the decision of the Purchaser in that behalf being final and conclusive that the Purchaser will be entitled to reject the said goods/stores/articles or such portions thereof as may be discovered not to conform to the said description and quality. On such rejection, the goods/stores/articles will be at the Seller's risk. If the Contractor/Seller so desires, the rejected goods may be taken over by him or his agents for disposal such manner as he may deem fit within a period of 3 months from the date of such rejection. At the expiry of the period, no claim whatsoever shall lie against the **Purchaser** in respect of the said goods/stores/articles, which may be disposed of by the Purchaser in such manner as he thinks fit. Without prejudice to the generality of the foregoing, all the provisions in the Standard Conditions of Contract relating to the 'rejection of stores' and 'failure' and 'termination' shall apply.

The Contractor/Seller shall, if required, replace the goods or such portion thereof as have been rejected by the Purchaser, free of cost, at the ultimate destination, or at the option of the Purchaser, the Contractor/Seller shall pay to the Purchaser, the value thereof at the contract price and such other expenditure and damage as may arise by reason of the breach of the conditions hereinbefore specified. Nothing herein contained shall prejudice any other right of the Purchaser in that behalf under this contract or otherwise

17. Variation of Quantities: Option Clause –

a) Unless otherwise specified in the tender document, the purchaser shall be entitled to increase the order quantity to full tender quantity as well as option to increase/decrease the quantity by 25% of the order quantity anytime within the validity of the contract (original/extended). The increase in quantity with respect to the tender quantity can be done even at the time of ordering and the tenderer shall be bound to accept the quantity so ordered.

b) The purchaser shall be entitled to operate +/- 25% option clause in one or more than one installment as long as the total variation in quantity does not exceed the limit of 25% of the ordered quantity.

c) The purchaser reserves the right to accept the tender with splitting of tender quantity on minimum two firms with the option to increase the quantity to full tendered quantity on any of the firms.

d) Additionally, the purchaser shall also be entitled to vary the total order quantity of those firms by +/- 25% anytime within the delivery period (including extended delivery period). The increase in quantity with respect to the tender quantity can be done even at the time of ordering and the tenderer shall be bound to accept the quantity so ordered on the basis of his original offer.

e) Total coverage against the tender considering the orders placed on all the firms in the tender should not increase the tendered quantity by more than 25%.

f) In case where separate orders for an item for different consignee(s)/ paying authority(ies) are placed on one firm against one tender, total quantity of all such orders be the basis for the purpose of option clause. In such cases, option clause can be operated in any of the order/ or for any consignee(s) so long as Delivery Period of any of the order in the tender is alive.

18. TReDS Platform:

18.1 RailTel is registered with m1xchange TReDS platform having buyer registration number "BUYER00001496". The URL for m1xchange platform is <https://m1xchange.com>. MSE suppliers/vendors are required to register themselves on m1xchange platform for availing the facility of bill discounting on TReDS portal. The bidder is mandatorily required to submit its TReDS registration number (as provided by m1xchange portal) and GRN (Goods/Service Receipt Note) Number (as provided by RailTel on delivery of Goods/Service) while submitting the invoices if requires to avail TReDS facility.

18.2 MSE vendor will bear all costs relating to availing the facility of discounting on TReDS platform including but not limited to Registration charges, Transaction charges for financing, Discounting charges, Interest on financing, or any other charges known by any name shall be borne by MSE vendor.

18.3 MSE vendor hereby agrees to indemnify, hold harmless and keep RailTel and affiliates, Directors, Officers, representative, agents and employees indemnified, from any and all damages, losses claims and liabilities (including legal costs) which may arise from Sellers submission, posting or display, participation, in any manner, on the TReDS platform or from the use of Services from the Buyer's breach of any of the terms and conditions of the Usage terms or of this agreement and any applicable Law on a full indemnity basis.

18.4 RailTel shall not be liable for any special, indirect, punitive, incidental or consequential damages or any damages whatsoever (including but not limited to damage for loss of profits or savings, business interruption, loss of information), whether in contract, tort, equity or otherwise or any other damages resulting from using TReDS platform for discounting their (MSE Vendor's) invoices.

19. For NSIC registered Firm:

19.1 For small scale units registered with NSIC under single point registration Scheme and participating in this tender enquiry, following exemptions are available:

(i) They are also exempted from depositing Earnest money.

These exemptions are applicable provided units are registered with NSIC for tendered item and registration is current and valid. Firms claiming these exemptions are required

to submit along with their offer, copy of their current and valid NSIC registration certificate for the tendered item, otherwise their offer would not be considered.

(ii) The bidder seeking EMD exemption, must submit the valid supporting document for the relevant category. Under MSE category, only manufacturers for goods and Service Providers for Services are eligible for exemption from EMD. Traders are excluded from the purview of this Policy.

19.2 No exemption is, however, applicable to these units from payment of security deposit/ Performance Bank Guarantee.

NOTE:

This bid complies with “Public Procurement (preference to make in India) Policy Order, 2017 issued by DIPP and Public Procurement Policy for Micro and Small Enterprises (MSEs) order, 2012” issued by MoSME.”

The bidders claiming the preference have to submit relevant documents prescribed under relevant order.

20. Make in India clause:

Public Procurement (Preference to Make in India): Applicable only for all Global tenders & for all tenders where the minimum local content shall be 50% & tenders valuing above Rs. 5 Lakhs.

The provisions of Public Procurement (Preference to Make in India), Order-2017 dt. 15.06.2017 or latest is applicable.

20.1 (a) Local content: The minimum local content shall be 50% or as indicated in the tender enquiry.

(b) Margin of Purchase Preference: The margin of purchase preference is 20%.

(c) Fee for complaints: Fee for filing a complaint under the order shall be Rs.10,000/- per case. The complaint shall be filed in the office of the Director RailTel. The fee shall be deposited with the office of the Director Finance/RailTel, New Delhi.

20.2 Verification of local content:

a) The local supplier at the time of tender, bidding or solicitation shall be required to provide self-certification that the item offered meets the minimum local content and shall give details of the location(s) at which the local value addition is made.

b) In case of procurement for a value in excess of Rs.10 Crores, the local supplier shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.

- c) False declarations will be in breach of the Code of integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.
- d) A Supplier who has been debarred by any procuring entity for violation of this order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment.
- e) Debarment of bidders: In respect of procuring entities other than the one which has carried out the debarment, the debarment takes effect prospectively from the date of uploading on CPPP so that ongoing procurements are not disrupted.

20.3 Requirement of Purchase Preference:

Subject to the provisions of this Order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order, purchase preference shall be given to local suppliers in all procurements undertaken by procuring entities in the manner specified hereunder:

- a) In procurement of goods in respect of which the Nodal Ministry has communicated that there is sufficient local capacity and local competition, and where the estimated value of procurement is Rs.50 Lakhs or less, only local suppliers shall be eligible. If the estimated value of procurement of such goods is more than Rs.50 Lakhs, the provisions of sub-paragraph b or c as the case may be, shall apply.
- b) In the procurements of goods which are not covered by paragraph (a) above and which are divisible in nature, the following procedure shall be followed:
 - i) Among all qualified bids, the lowest bid will be termed as L1. If L1 is from a local supplier, the contract for full quantity will be awarded to L1.
 - ii) If L1 bid is not from a local supplier, 50% of the order quantity shall be awarded to L1 Thereafter. The lowest bidder among the local suppliers will be invited to match the L1 price for the remaining 50% quantity subject to the local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such local supplier subject to matching the L1 price. In case such lowest eligible local supplier fails to match the L1 price or accepts less than the offered quantity, the next higher local supplier within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on local suppliers, then such balance quantity may also be ordered on the L1 bidder.
- c) In procurements of goods not covered by sub-paragraph (a) above and which are not divisible, and in procurement of services where the bid is evaluated on price alone, the following procedure shall be followed:
 - i). Among all qualified bids, the lowest bid will be termed as L1.If L1 is from a local supplier; the contract will be awarded to L1.

ii). If L1 is not from a local supplier, the lowest bidder among the local suppliers will be invited to match the L1 price subject to local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such local supplier subject to matching the L1 price.

iii) In case such lowest eligible local supplier fails to match the L1 price, the local supplier with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the local suppliers within the margin of purchase preference matches the L1 price, then the contract may be awarded to the L1 bidder.

21. Taxes & Duties:

The price quoted in the offer should be firm, fixed indicating the breakup and inclusive of all taxes & duties like import, custom, Anti-Dumping, CGST, SGST, IGST, UTGST etc. The offer should be inclusive of packing, forwarding, freight up to destination, insurance charges.

21.1. Bidder shall issue valid tax invoice to RailTel for availing proper credit of CGST/SGST/IGST/UTGST in case of award of Contract. GST will not be reimbursed in the absence of valid tax invoice.

21.2. For all the taxable supplies made by the vendor, the vendor shall furnish all the details of such taxable supplies in the relevant returns to be filed under GST Act.

21.3. If the vendor fails to comply with any of the above, the vendor shall pay to purchaser any expense, interest, penalty as applicable under the GST Act.

21.4. In case of incorrect reporting of the supply made by the vendor in the relevant return, leading to disallowance of input credit to purchaser, the vendor shall be liable to pay applicable interest under the GST Act to the credit of purchaser. The same provisions shall be applicable in case of debit/credit notes.

21.5. Tenderer shall quote all-inclusive rates, but there shall be break up of basic price and all type of applicable taxes such as SGST/CGST/IGST/UT GST along with respective HSN/SAC Code under GST Law (Including tax under reverse charges payable by the recipient).

21.6. Wherever the law makes it statutory for the Purchaser to deduct any amount towards GST at sources, the same will be deducted and remitted to the concerned authority.

21.7. The imposition of any new tax and/or increase/ in the aforesaid taxes, duties levies, after the last stipulated date for the receipt of tender including extensions if any and the bidder there upon necessarily and properly pays such taxes/levies/cess, the bidder shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of RailTel attributable to delay in execution of work within the control of bidder. The bidder shall, within a period of 30 days of the imposition of any such tax or levy or cess, give a written notice thereof to RailTel that the same is given pursuant to this condition, together with all necessary information including details of input credit relating thereto. In the event of non-payment/default in payment of any of the above taxes, RailTel reserves the right to with-hold the dues/payments of bidder and make payment to state/Central Government authorities as may be applicable. However, if the rates are reduced after the last stipulated date for receipt of tender, bidder has to pass on the benefits to RailTel.

22. Fall Back Clause:

The order/contract, if and when placed, will be subject to following Fall Back Clause: -

The price quoted by the supplier should not be higher than the maximum price, if any, for the materials and the same shall not be higher than the price usually charged by the supplier for materials of the same nature, class or description to any other purchaser.

- a. The price charged for the materials supplied under the order/contract by the supplier shall in no event exceed the lowest price at which the supplier sells the materials of identical description to any other person during the period till performance of all supply orders placed during the currency of the contract is completed. If at any time during the period the supplier reduces the sale price of such materials or sells such materials to any other person including his dealers at a price lower than the price chargeable under the contract, he shall forthwith notify such reduction or sale to the purchase and the price payable under the contract for these materials supplied after the date of coming into force of such reduction or sale shall stand correspondingly reduced.
- b. If it is discovered that the supplier has contravened the above conditions, then without prejudice to any other action which might be taken against him, it shall be lawful for the purchaser to terminate the order/contract and purchase the materials at the risk and cost of the supplier and in that event the provision of General Conditions of tender shall, as far as possible, be applicable or recover the loss.

c. The Contractor shall furnish the following certificate to the concerned Account Officer along with each bill for payment of supplies made against the order/contract:

“I/We certify that there has been no reduction in sale price of the stores of description identical to the stores supplied to the Government under the contract herein and such stores have not been offered/sold by me/us to any person /organization including the purchaser or any Department of Central Government or any Railway Office or any Railway Undertaking as the case may be up to the date of bill/the date of completion of supplies against all supply orders placed during the currency of the order/contract at a price lower than the price charged to the RailTel, Northern Region, under the contract.”

23. Restrictions under Rule 144(xi) of GFR, 2017:

Any bidder from a country which shares a land border with India will be eligible to bid in this procurement, if the bidder is registered with the competent authority only, as per Gol guidelines.

24 Insurance:

24.1 The Contractor shall take out and keep in force a policy or policies of insurance from the date, the delivery of material starts (including the transit portion) against all liabilities of the contractor or the Purchaser. The contractor shall take out and keep in force a Policy or policies of Insurance for all materials covered in schedule of requirement irrespective of whether used up in the portion of work already done or kept for the use in the balance portion of the work until such material are provisionally handed over to RailTel. The contractor should ensure the stores brought to site, against risks as required under the Emergency Risk (Goods) Insurance Act in force from time to time up to contract value.

24.2 It may be noted that the beneficiary of the insurance policy should be RailTel or the policies should be pledged in favor of RailTel. The contractor shall keep the policy/policies current till the item/equipment are handed over to the purchaser.

25 Settlement of Dispute:

a) For all commercial contracts with Private entities:

In case of any dispute concerning this order both the supplier and RailTel shall try to settle the same amicably through mutual discussion/negotiations. Any unsettled dispute shall be settled in terms of Indian Act of Arbitration and conciliation 1996 or any amendment thereof. Place of arbitration shall be New Delhi. Arbitrator shall be appointed by Managing Director, RailTel Corporation of India Limited.

b) For all commercial contracts with Public Enterprises/ Govt. Departments:
In the event of any dispute or difference relating to the interpretation and application of the provisions of the contracts, such dispute or difference shall be referred by either party for Arbitration to the sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprise. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary/Additional Secretary, when so authorized by the Law Secretary, whose decision shall bind the Parties finally and conclusively? The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.

26. RailTel's Contact Person /Designation: (for general Information)

In case of any queries, may please contact:

Shri Vachaspati Bhardwaj AGM/Projects Mobile: 9717612008 E-mail ID: vachaspatibhardwaj61@railtelindia.com	Mrs. Priti Singh, Dy. GM/Projects Mobile: 9717644110 E-mail ID: priti@railtelindia.com
--	--

Annexure-I

Technical Specifications

Specification of SOR-A1 (48 F OFC Armoured):

The specification of OFC should conform to RDSO specs for Optical Fibre Cable Specification No. RDSO/SPN/TC/110/2020 Revision-0 with latest Amendments for 48 Fibre Armoured Optical Fibre Cable *for RailTel Optic Fiber Network*.

Annexure-II**Schedule of Requirements**

S. N.	Description of Item	State	Unit	Qty.	Unit Basic Price (in Rs.)	Packing & Forwarding Charges m (in Rs.)	Freight & Insurance Charges (in Rs.)	GST @ 18%	Unit Cost CIP destination (in Rs.)	Total cost CIP Destination (in Rs.)
SOR	48 Fibre Optical Fibre Cable (armoured) as per RDSO Specs. RDSO/SPN/TC/110/2020 Revision-0 or latest	Delhi / NCR	Km.	30						

Annexure-III

PERFORMANCE GUARANTEE BOND FOR SECURITY DEPOSIT

(On Stamp Paper of requisite value)
(To be used by approved Scheduled Banks)

In consideration of the RailTel Corporation of India Limited, Northern Region, 6th Floor, Block III, Delhi IT Park, Shastri Park, Delhi-110053 (Herein after called the RailTel) having agreed to exempt (Hereinafter called "the said Contractor(s)") from the demand, under the terms and conditions of an Agreement No. dated made between RailTel Corporation of India Limited and for (hereinafter called "the said Agreement") of security deposit for the due fulfillment by the said Contractor (s) of the terms and conditions contained in the said Agreement, on production of a Bank Guarantee for Rs. (Rs. only). We, (indicate the name of the Bank) hereinafter referred to as "the Bank") at the request of Contractor(s) do hereby undertake to pay the RailTel an amount not exceeding Rs. against any loss or damage caused to or suffered or would be caused to or suffered by the RailTel by reason of any breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement.

We,(name of Bank) do hereby undertake to pay the amounts due and payable under this Guarantee without any demur, merely on demand from the RailTel stating that the amount as claimed is due by way of loss or damage caused to or would be caused to or suffered by the RailTel by reason of breach by the said Contractor(s) of any of terms or conditions contained in the said Agreement or by reason of the Contractor(s) failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.only.

We,(name of bank) undertake to pay to the RailTel any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) / Supplier(s) in any suit or proceedings pending before any court or Tribunal relating thereto our liability under this present being, absolute and unequivocal.

The payment so made by us under this Bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s) / Supplier(s) shall have no claim against us for making such payment.

We,(name of bank) further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the RailTel under or by virtue of the said Agreement have been fully paid and its claims satisfied or

discharged or till RailTel certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this Guarantee. Unless a demand or claim under the Guarantee is made on us in writing on or before the We shall be discharged from all liability under this Guarantee thereafter.

We,.....(name of bank) further agree with the RailTel that the RailTel shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the Agreement or to extend time or to postpone for any time or from time to time any of the powers exercisable by the RailTel against the said contractor(s) and to forbear or enforce any of the

terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension to the said Contractor(s) or for any forbearance, act or omission on the part of RailTel or any indulgence by the RailTel to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have affect of so relieving us.

This Guarantee will not be discharged due to the change in the Constitution of the Bank or the Contractor(s)/ Supplier(s).

We (the name of Bank) lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the RailTel in writing.

Dated theday of 2023

for
(indicate the name of the Bank)

Witness

Signature
Name

Signature
Name

Annexure-IV

FORM-2A

FORMAT FOR AFFIDAVIT TO BE UPLOADED BY TENDERER ALONG WITH THE TENDER DOCUMENTS

(To be executed in presence of Public notary on non-judicial stamp paper of the value of Rs.100/-The stamp paper has to be in the name of the tenderer)**

I.....(Name and designation)** appointed as the attorney/authorized signatory of the tenderer (including its constituents),

M/s. _____ (Herein after called the tenderer) for the purpose of the Tender documents for the work of

_____ as per the tender No. __ of (Railway), do hereby solemnly affirm and state on the behalf of the tenderer including its constituents as under:

- (i) I/We the tenderer (s), am/are signing this document after carefully reading the contents.
- (ii) I/we the tenderer(s) also accept all the conditions of the tender and have signed all the pages in confirmation thereof.
- (iii) I/We hereby declare that I/We have downloaded the tender documents from electronic-tender portal. I/We have verified the content of the document from the website and there is no addition, no deletion or no alteration to the content of the tender document. In case of any discrepancy noticed at any stage i.e. evaluation of tenderers, execution of work or final payment of the contract, the master copy available with the railway Administration shall be final and binding upon me/us.
- (iv) I/We declare and certify that I/we have not made any misleading or false representation in the forms, statements and attachments in proof of the qualification requirements.
- (v) I/We also understand that my/our offer will be evaluated based on the documents/credentials submitted along with the offer and same shall be binding upon me/us.
- (vi) I/We declare that the information and documents submitted along with the tender by me/us are correct and I/we are fully responsible for the correctness of the information and documents submitted by us.
- (vii) I/We undersigned that if the certificates regarding eligibility criteria submitted by us are found to be forged/false or incorrect at any time during process for evaluation of tenders, it shall lead to forfeiture of the tender EMD besides banning of business for five year on entire IR. Further, I/we (*insert name of the tenderer*) **

_____ and all my/our constituents understand that my/our offer shall be summarily rejected.

(viii) I/we also understand that if the certificates submitted by us are found to be false/forged or incorrect at any time after the award of the contract, it will lead to termination of the contract, along with forfeiture of EMD/SD and Performance Guarantee besides any other action provided in the contract including banning of business for five year on entire IR.

DEPONENT

SEAL AND SIGNATURE OF THE TENDERER

VERIFICATION

I/We above named tenderer do hereby solemnly affirm and verify that the contents of my/our above affidavit are true and correct. Nothing has been concealed and no part of it is false.

DEPONENT

SEAL AND SIGNATURE OF THE TENDERER

Place:

Dated:

** The contents in Italics are only for guidance purpose. Details as appropriate are to be filled in suitably by tenderer. Attestation before Magistrate/Notary Public.

Annexure – V

OFFER LETTER

RailTel Corporation of
India Ltd. 6th Floor,
Delhi IT Park, Shastri
Park, Delhi

1. I/We _____ have read the various conditions detailed in tender documents attached here to and hereby agree to ABIDE BY THE SAID CONDITIONS. I/We also agree to keep this offer open for acceptance for a period of 45 days from the date of opening and in default thereof, I/We will be liable for forfeiture of my/our Earnest Money. I/We offer to supply various equipment at the rates quoted in the attached schedules and hereby bind myself/ourselves to complete the work of “Supply of 48 Fibre Armoured Optical Fibre Cable as per RDSO Specification No. RDSO/SPN/TC/110/2020 Revision-0 with latest Amendments for *RailTel Optic Fiber Network*” within 60 days from the date of issue of Purchase Order. I/We also hereby agree to abide by the Various Conditions of Contract and to carry out the supplies according to the Specifications for materials and works laid down by Railtel.

2. I/We have submitted “Earnest Money” amounting Rs..... through DD No. dated...../online transfer UTR No..... dated

SIGNATURE OF SUPPLIER (S)

Date:

SUPPLIER (S) ADDRESS

SIGNATURE OF

WITNESS:1.

2.

Annexure - VI**Consignee Details:**

Consignee Details					
Sl. No	Territory	Consignee Address	48F OFC (KM)	Contact Person	State/ GST No.
1	Delhi- NCR	RailTel corporation of India Ltd, 2 nd Floor, Microwave Complex, Thompson Road, New Delhi-100002	30	Sanjeev Kumar/AGM/Delhi NCR	Delhi/ 07AABCR7176C2ZE

Note: All the locations/stations name given above are tentative and may change. Successful Bidder may ask the final location with complete address after finalizing the tender. RailTel has the right to change location within RailTel Western Region area & firm has to supply & commission at location given by RailTel.

Annexure-VII

Self Certification under Preference to “MAKE IN INDIA” Policy

CERTIFICATE

In line with Government Public Procurement Order No. P-45021/2/2017-BE-II dt. 15.06.2017, as amended from time to time and as applicable on the date of submission of tender, we hereby certify that we M/s_____ (supplier name) are local supplier meeting the requirement of minimum Local content (50%) as defined in above orders for the material against Tender No _____

Details of location at which local value addition will be made is as follows:

We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rule for which for which a bidder or its successors can be debarred for up two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

Seal and Signature of Authorized Signatory

Annexure-VII

**PROFORMA FOR Nil Deviation Component Compliance Undertaking Letter
(TO BE SIGNED BY BIDDER)**

To,

**PED/NR
RailTel Corporation of India Ltd.
Northern Region
6th Floor, Block-III, Delhi IT Park,
Shastri Park, Delhi-110053**

Dated:

Dear Sir,

Sub: NIL Deviation Compliance for **GeM Bid No.**

Dt2023

Over and above all our earlier conformations and submissions as per your requirements of the bid, we confirm that,

We will ensure our unconditional compliance of all the terms and conditions as mentioned in the Tender document. In case of any deviation, the same should be attached as an Annexure (as per Format given below) to this form. In case of any deviation, RailTel reserves the right to reject the bid without giving any justification. Format of Annexure (Deviation Statement)

S. No.	Clause No. & Chapter No.	Existing Clause of Tender	Proposed Clause	Remarks, if any

All the proposed items to be supplied as per SOR for the technical specifications as mentioned in Annexure-I of Bid.

We hereby certify that the items/materials mentioned in our offer are complete.

We confirm that there is no requirement of any other hardware and software to fulfil requirements as per scope against the bid. If any additional hardware and software is

required to meet in scope requirements, then it would be provided by us at no extra cost to RailTel.

Place:

Date:

Seal and signature of the bidder

(This Form along with Annexure (if required) should be on the letterhead of the bidder duly signed by an authorized signatory)

Page 1 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
--------------	-----------------------------	----------------------	---------



**RDSO SPECIFICATION
OF
24/48 FIBRE ARMOURED OPTICAL FIBRE CABLE**

SPECIFICATION NO. RDSO/ SPN/ TC/110/2020

Revision - 0

Number of Pages : 34

**TELECOM DIRECTORATE
RESEARCH DESIGNS & STANDARDS ORGANISATION
LUCKNOW-226011**

DOCUMENT DATA SHEET		
Specification RDSO/SPN/TC/110/2020		Revision 0
Title of Document RDSO Specification of 24/48 Fibre Armoured Optical Fibre Cable		
Author Director / Telecom-I/ RDSO		
Approved by Executive Director / Telecom/ RDSO		
Abstract		
<p>This document specifies technical specifications of 24/48 Fibre Armoured Optical Fibre Cable.</p>		

DOCUMENT CONTROL SHEET

NAME	ORGANIZATION	FUNCTION	LEVEL
Director/ Telecom-I	RDSO	Member	Prepare
Executive. Director/ Telecom	RDSO	-	Approve

Page 4 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
--------------	-----------------------------	----------------------	---------

I. SUMMARY

This document covers the requirement of 24/48 monomode fibre underground armoured optical fibre cable for use on Indian Railways Telecommunication.

II. SOURCE

Indian Railway Standard Specification was issued with serial no. IRS:TC 55-2006 Revision 1.0 by RDSO, Lucknow. As per Railway Board letter no. 2010/Tele/9(1)/1 pt-1 dated 31.12.2019 and recommendations of 38th Telecom Standard Committee (TCSC) meeting duly approved by Railway Board vide letter No.2011/Tele/9(2) /1 dated 25.04.2016 that specification of this item is to be updated to include option of both 24 fibre and 48 fibre in the specification. Purchaser shall specify as per its requirement.

Draft SPN specification is being issued due to increase in number of fiber in the product and various clauses have been updated based on TEC Generic Requirements of Armoured Optic Fibre Cable for direct Burial(underground) No. GR/OFC-02/03.Sep 2003 and Generic Requirements of Raw Material Used in Manufacturing of Optical fibre Cable No. TEC/GR/TX/ORM-001/05/DEC-17.

III. FOREWORD

Research Designs and Standards Organisation (RDSO) is an attached office of Ministry of Railways, engaged in design and standardization of equipment for use on Indian Railways.

RDSO/ SPN specification is issued as draft specification for discussion. This specification is circulated to customers/ Railways and field inspection units for comments.

RDSO/ SPN along with comments received from various quarters is discussed in Telecom Standards Committee Meeting (TCSC). Recommendation made by TCSC is put up to Railway Board for approval. After approval from Railway Board, the specification is given an IRS number and issued as Indian Railway Standard Specification.

In the absence of IRS specification, procurement may be made as per RDSO/ SPN specification.

TABLE OF CONTENTS

S.No.	Item	Page Number
0.0	FOREWORD	6
1.0	SCOPE	7
2.0	GENERAL REQUIREMENTS	7
3.0	TERMINOLOGY	8
4.0	SERVICE CONDITIONS	8
5.0	TECHNICAL REQUIREMENTS	8
6.0	PACKING	18
7.0	TEST PARAMETERS AND TEST ON RAW MATERIALS & FINISHED CABLE	19
8.0	TESTS	22
9.0	INSPECTION	29
10.0	WARRANTY	30
11.0	REJECTION	30
12.0	INFORMATION TO BE FURNISHED BY SUPPLIER WITH THE OFFER	30
--	FIGURE-1a	31
--	FIGURE-1b	32
--	FIGURE -2	33
--	FIGURE -3	34

Page 6 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
--------------	-----------------------------	----------------------	---------

RDSO SPECIFICATION
FOR 24/48 FIBRE ARMOURED OPTIC FIBRE CABLE-

0. FOREWORD:

0.1 This specification was adopted in 1991, Ist revision was issued in May 1996, 2nd revision in October 1996, 3rd revision in 1998 & 4th revision in 2000 and specification was issued with serial no. IRS:TC 55-2000. After issue of specification in year 2000, Ist amendment was issued in year 2003, 2nd in 2004 & 3rd in 2005. specification was issued with serial no. IRS:TC 55-2006 (Rev.1.0) After issue of specification in year 2006 , Ist amendment was issued in year 2006, 1.1 in 2007 , 2rd in 2012& 3rd in 2016. This specification is being issued incorporating all the amendments and recommendation of 38th Telecom standards committee meeting 24/48 fibre as serial no. RDSO/SPN/ TC/110/2020 Revision-0 .

0.2 In preparing this standard, assistance has been derived from the following :

- i) Vol. III - FASCICLE III.2 - International Analogue carrier systems, Transmission Media- characteristics – ITU-T , 2003, Rec.G.652 D (03/03),ITU-T,(Characteristics of Single Mode Optic Fibre Cable).
- ii) Vol III - FASCICLE III.3 - Digital Networks Transmission system and multiplexing equipment Rec.G.956,ITU,1984.
- iii) IEC Publication 60793-1(1998) - Optical Fibres, Part 1:Generic specification.
- iv) IEC Publication 60793-2 (1998), Optical Fibres, Part-2: Production Specifications.
- v) IEC Publication of 60794-1(1998-02) Optical Fibre Cables, Part 1 : Generic specification.
- vi) IEC Publication 189-1 (1986).
- vii) International Electrotechnical Vocabulary on Optical Communication -DOC 1 (IEV 731), C.O.1270-I & II.
- viii) ASTM:D789-92 Standard Test method for Polyamide materials (Nylon & others).
- ix) ASTM:D1248-84(Reapproved 1989) Standard Specification and Test methods for Polyethylene Moulding and Extrusion Materials.
- x) ASTM:D374-88 Standard Test method for Thickness of Solid Electrical insulation.
- xi) ASTM:D3916-84 Standard Test method for Tensile Properties of Pultruded Glass Fibre Reinforced Plastic Rod.

Page 7 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
--------------	-----------------------------	----------------------	---------

- xii) ASTM:A167-92b Standard specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip.
- xiii) ASTM:A751-92 Standard Test Methods, Practices and Terminology for Chemical Analysis of Steel Products.
- xiv) ASTM:A370-82 Standard method and definition for mechanical Testing of Steel Products.
- xv) ASTM D:2581-91 Standard specification for Polybutylene (PB) Plastic moulding and extrusion material.
- xvi) ASTM D:2287-81 Nonrigid Vinylchloride Polymer and Copolymer Moulding and Extrusion Material.
- xvii) Generic Requirements of Armoured Optic Fibre Cable for direct Burial(underground) No. GR/OFC-02/03.Sep 2003 and Generic Requirements of Raw Material Used in Manufacturing of Optical fibre Cable No. TEC/GR/TX/ORM-001/05/DEC-17, issued by TEC.
- xviii) ASTM: D 638 F.R.P.
- xix) ASTM: D 217,566,FTM 791B, 93-IP-34 for Jelly.
- xx) ASTM: D 570,211 for P.B.T.P.
- xxi) ASTM: D 1505 for Poly Carbonate.
- xxii) ASTM: D 1633,150 for H.D.P.E.

0.3 Wherever in this specification, any other specification is referred to, the latest issue is implied, otherwise the particular issue mentioned is to be meant.

1. SCOPE:-

1.1 This specification covers the requirements of optical, mechanical characteristics and testing & inspection for monomode underground armoured optical fibre cable for use on Indian Railway Telecommunication Network between 1250 nm to 1625 nm band.

2. GENERAL REQUIREMENTS:-

2.1 The cable shall consist of 24/48 monomode (Single mode) fibres.as specified by the purchaser.

2.2 The cable shall be suitable for direct underground burial and mechanized laying in the duct.

3. TERMINOLOGY:

The terminology used in this specification is as indicated in International Electrotechnical Vocabulary on Optical communication [DOC 1(IEV 731) C.O. 1270 – I and II].

4. SERVICE CONDITIONS:-

4.1 The optic fibre cable shall be able to withstand the following environmental conditions.

- | | | |
|-----|--|--|
| (a) | Ambient temperature over which specification are guaranteed (50% RH max) | 0 ⁰ C to +55 ⁰ C |
| (b) | Storage temperature | - 20 ⁰ C to +70 ⁰ C. |

5. TECHNICAL REQUIREMENTS :-

5.1 CHARACTERISTICS OF FIBRE :-

5.1.1 Monomode (Single mode) fibre shall be as per ITU-T Rec.G.652 D(03/03 or latest) unless otherwise specified and also conform to the generic requirement for DWDM equipment suitable to TEC GR NO. GR/ TX/WDM 010 /01 Dec-16

5.1.2 Cut-off wave length : Fibre Cut off wavelength for 2 meter fibre section shall be 1320 nm max.

5.1.3 Attenuation :

(a) Fibre Attenuation before cabling

- | | | |
|-------|-------------------------|----------------|
| i) | At 1310 nm | : ≤ 0.34dB/km |
| ii) | Between 1285 to 1380 nm | : ≤ 0.37 dB/km |
| iii) | Between 1390 to 1525nm | : ≤ 0.34dB/km |
| iv) | At 1550 nm | : ≤ 0.20 dB/km |
| v) | Between 1525 to 1625nm | : ≤ 0.24dB/km |
| vi) | At 1270 nm | : ≤ 0.40dB/km |
| vii) | At 1490 nm | : ≤ 0.24dB/km |
| viii) | At 1625 nm | : ≤ 0.23dB/km |

(b) Fibre Attenuation after cabling

- | | | |
|-----|------------|----------------|
| i) | At 1310 nm | : ≤ 0.36 dB/km |
| ii) | At 1550 nm | : ≤ 0.22 dB/km |

Page 9 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
--------------	-----------------------------	----------------------	---------

- iii) At 1625nm : ≤ 0.26 dB/km
- iv) At 1490 nm : ≤ 0.26 dB/km

Note - Sudden irregularity in attenuation shall be less than 0.1 dB.

5.1.4 i) Nominal diameter : 9.2 ± 0.4 μ m for matched clad fibre.
(Pettermann method).

ii) Nominal Cladding diameter : $125 \mu\text{m} \pm 0.7 \mu\text{m}$

iii) Cladding Non-circularity : $\leq 0.8\%$

iv) Mode field concentricity error : $\leq 0.5 \mu\text{m}$

5.1.5 i) Primary coating : Material UV curable acrylate, Diameter 242 ± 5 μ m . It should not have any reaction with cladding or cable material. (This diameter is of natural coloured/ uncoloured fibre).

5.1.5 ii) Coloured fibre coating diameter : 252 ± 10 μ m

5.1.6 Chromatic dispersion : Max.5.3 ps/nm.km from 1270 to 1340 nm with value not exceeding 3.5ps/nm.Km in 1285 to 1330 window. It shall be Max.18 ps/nm. km at 1550 nm. The zero dispersion slope shall be ≤ 0.092 ps/nm² Km . Zero dispersion Wavelength range shall be 1300 - 1324 nm.

5.1.7 Proof test for Minimum strain level: 1%

Note : In case of non-availability of test facilities, fibre manufacturer's certificate shall be submitted for the particular lot/batch.

5.1.8 Fibre Macro bend

- i) Change in attenuation when fibre is coiled with : ≤ 0.05 dB at 1550 nm
100 turns on 60 ± 1.0 mm diameter mandrel : ≤ 0.1 dB at 1625 nm
- ii) Change in attenuation when fibre is coiled with : ≤ 0.5 dB at 1550 nm
1 turns around 32 ± 0.5 mm diameter mandrel : ≤ 1.0 dB at 1625 nm
- iii) Change in attenuation when fibre is coiled with : ≤ 0.05 dB at 1310 nm
100 turns on 50 ± 0.5 mm diameter mandrel

5.1.9 a) Polarisation Mode dispersion at 1310 & 1550 nm

- i) Fibre : ≤ 0.15 Ps/ $\sqrt{\text{km}}$

Note : Fibre manufacturer's certificate shall be submitted for the particular lot/batch.

- ii) Cabled Fibre : $\leq 0.3 \text{ Ps}/\sqrt{\text{km}}$
- b) Strippability force to remove primary coating of the fibre : $1.3 \leq F \leq 8.9 \text{ N}$

Note : The force required to remove $30 \text{ mm} \pm 3 \text{ mm}$ of fibre coating shall not exceed 8.9 N and shall not be less than 1.3 N. In case of non-availability of test facilities, fibre manufacturer's certificate shall be submitted for the particular lot/ batch.

- c) Fibre curl : ≥ 4 meter radius of curvature

Note : Fibre manufacturer's certificate shall be submitted for the particular lot/batch.

- d) Fibre microbend at 1550 nm : $\leq 0.5 \text{ dB}$
 (1 turn around 32 ± 0.5 mm diameter mandrel) and
 at 1625 nm : $\leq 1.0 \text{ dB}$

e) Fibre materials :

- (i) The substance of which the fibres are made : To be indicated by the manufacturer

(ii) Protective material requirement

- The physical and chemical properties of the material used for the fibre primary coating and for single jacket fibre : It shall meet the requirement of fibre coating stripping force.

- The best way of removing protective coating material : To be indicated by the manufacturer

(iii) Group Refractive index of fibre : --- do ---

Note : Documents/ certificates of fibre manufacturer are to be submitted by cable manufacturer of particular fibre used in the cable.

- Cl. 5.1.10 Dynamic Tensile Strength of fibre
- a) Un-aged $\geq 550 \text{ KPSI (3.80 Gpa)}$
- b) Aged $\geq 440 \text{ KPSI (3.00 Gpa)}$

Note : In case of non availability of test facilities, fibre supplier's certificate shall be acceptable.

- Cl. 5.1.11 Dynamic Fatigue of fibre : ≥ 20
 Test Method IEC 60793 –I- 33
 Note : In case of non availability of test facilities, fibre supplier's certificate shall be acceptable.
- Cl. 5.1.12 Static Fatigue of fibre : ≥ 20
 Test Method IEC 60793 –I- B7C
 Note : In case of non availability of test facilities, fibre supplier's certificate shall be acceptable.
- Cl. 5.1.13 The raw material used shall be approved by CACT as per TEC GR No.TEC/ GR/TX/ ORM-001 /05. Dec 17 or latest.
- Cl. 5.1.14 The HDPE black in colour used for sheath shall be UV stabilized.
 Note: A test certificate from raw material manufacturer or a recognized laboratory or institute may be submitted for the UV stability of the HDPE sheath material.
- Cl. 5.1.15 The material used in optical fibre cable must not evolve hydrogen that will effect the fibre glass.
 Note : A test certificate from raw material manufacturer or a recognized laboratory or institute may be submitted.
- Cl. 5.1.16 Safety : The material used in the manufacturing of the armoured optical fibre cables shall be non toxic and dermatologically safe in its life time and shall not be hazardous to health. The manufacturer shall submit MSDS (Material Safety Data Sheet) for all the material used in manufacturing of the cable to substantiate the statement.

5.2 CABLE CONSTRUCTION:

5.2.1 GENERAL:

- (a) LOOSE TUBE CABLE : (Ref : Fig. 1a, 1b & 2) Primary coated fibres shall be covered by a secondary coating loose tube made of Polybutylene terephthalate or Polypropylene material of Outer diameter $2.4 \text{ mm} \pm 0.1 \text{ mm}$.
 Construction details of 24/48 fibre shall be as under:-

	No. of loose tubes	No of fibres in each tube	Total
24 Fibre	6	4	24
48 Fibre	6	8	48

Page 12 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

The space between the primary coated fibres and the secondary coating tube shall be filled with a suitable water blocking thixotropic jelly compound which shall be compatible with primary and secondary coating materials. The secondary coating loose tubes shall be stranded around strength member in an appropriate manner to form the cable core. A pictorial format depicting the design shall be specified.

- 5.2.2 The cable core shall be wrapped with suitable material which does not adhere to secondary fibre coating. The cable core shall not have any metallic component and shall have splice free optical fibre.
- 5.2.3 (i) The strength members in the cable shall be for strength and flexibility of the cable. These shall also keep the fibres strain within permissible values.
- (ii) The construction of the strength member shall be such as to meet mechanical strength criteria given in para 5.3.1 of this specification.
- (iii) Manufacturer shall submit the design calculation of FRP young modulus, excess fibre, cable factor, ratio of fibre length to cable length etc to achieve the above values.
- (iv) The armoured optic fibre cable shall have solid non- metallic FRP central strength member.
- (v) To provide additional strength aramid/ glass yarn can be used in addition to central member in the periphery if required.
- 5.2.4 CABLE CORE COVERING – MOISTURE BARRIER: The cable core shall be covered with a continuous layer of a non-hygroscopic dielectric material applied longitudinally or helically with an overlap. The cable core shall be filled with suitable water blocking jelly compound compatible to fibre. Further, to achieve additional tensile strength aramid yarn can be provided between the core covering and inner PE sheath.
- 5.2.5 INNER PE SHEATH: Over the core covering a PE sheath of HDPE, free from pinholes, joints, mended places or other defects, and which is made of sheath of a tough, weather resistant and high molecular weight polyethylene compound shall be provided. The thickness of the sheath shall be 1.5 mm (minimum) through out from top end to bottom end.
- 5.2.6 ARMOURING OF CABLE: Over the inner PE sheath and below outer sheath, armouring to the following construction shall be provided to make the cable rodent and termite proof.
- 5.2.6.1 The thickness of stainless steel Alloy shall not be less than 0.125mm. The steel tape shall be both sides coated with a transparent copolymer of thickness 0.05

Page 13 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

mm(min.) so as to bond the armouring to the outer jacket and make a unitary construction.

- 5.2.6.2 Stainless steel armouring corrugated transversely for lateral strength and bending flexibility to be applied longitudinally with an overlap of 10% (minimum) over the inner PE sheath. The corrugation over the entire length of the tape used in the cable shall be uniform. Polyamide based hot melt adhesive should be provided in between overlap portion of cable armouring for bonding to avoid ingressing of moisture. The detail of specification of compound used should be submitted by the manufacturer.

The height of corrugation shall be 0.6mm (min.) & the pitch of corrugated tape shall be 2.5 mm (max.). Height and pitch of corrugation shall be measured between crest and trough base line.

- 5.2.6.3 (a) The corrugated armouring of stainless steel shall offer excellent corrosive resistance and shall be of AISI Alloy 304 or 305.

- (b) The chemical composition and mechanical properties of steel shall be as specified in table 1 and table 2 of ASTM:A 240/ A240 M-99 for AISI 304 or 305 respectively.

- 5.2.6.4 (i) OUTER SHEATH : Over corrugated steel armouring outer jacket of HDPE of thickness 2.0 mm (minimum), shall be provided through out the length from top end to bottom end.

- (ii) RIP CORD : Four suitable rip cord(s) shall be provided which shall be used to open the sheath(s) and the armour of the cable.

- a. Two suitable ripcord below the inner sheath.
b. Two suitable ripcords below the armour.

The rip cord(s) shall be properly waxed to avoid wicking action and shall not work as a water carrier.

- 5.2.6.5 The outer jacket of HDPE shall be such as to preserve the sheath from attack by termites. Manufacturer will submit the details of doping material used.

- 5.2.6.6 SPARK TEST (IEC 794-1-F3): The over all outer jacket shall withstand spark test voltage of 10 KV AC rms or 12 KV DC at the time of extrusion. There shall be no spark over.

- 5.2.7 MARKING ON CABLE: On the outer jacket there shall be indelible length marking at an interval not exceeding 1 meter. The outer jacket shall be in black colour and marking shall be in white colour. Sequential length and identification marking will be one by hot melt printing process by pressing white tape causing indentation on the outer jacket. The accuracy of the sequential markings shall be within $\pm 0.5\%$ of the actual measured length.

The sequential length markings shall not rub off during normal installation. The marking on the cable shall be as given below. “Manufacturer/ Company’s trade mark, I.R.marking, telephone mark, laser symbol, type of cable, no. of fibres, type of fibres, month, year of manufacture and drum no.”

5.2.8 OVERALL DIAMETER: The overall diameter of the cable shall be 16mm \pm 1 mm and uniform through out the length from top end to bottom end.

5.2.9 THE FIBRE & UNIT IDENTIFICATION:

5.2.9.1 Fibres shall be coloured with readily distinguishable durable colours. (a)The colour of four fibres in a tube for 24 fibre cable shall be Blue, Orange, Green and Natural. (b) The colour of eight fibre in a tube for 48 fibre cable shall be Blue, Orange, Green, Brown , Slate, White, Red, and Natural.

5.2.9.2 Loose tubes shall be placed in circular format as given below.

<u>Loose Tube No.</u>	<u>Loose Tube colour</u>
1.	Blue
2.	Orange
3.	Green
4.	Brown
5.	Slate
6.	white

5.3 MECHANICAL PERFORMANCE OF CABLE:

The following requirement shall be met.

5.3.1 TENSILE STRENGTH TEST (IEC 2015-03): The cable shall have sufficient strength to withstand a load of $9.8 * W * 2.5$ Newtons or 2670 N, whichever is higher. (where W is the weight of 1 KM of cable in Kg). The distance between pulleys shall be minimum 15 meter , minimum number of pulleys shall be 5 and sample of cable under test shall be minimum 50 meter. This load shall be sustained for 10 minutes. It shall not produce elongation of cable fibre exceeding 0.25% and shall not cause permanent damage to constituent parts of the cable.

5.3.2 COMPRESSIVE STRESS TEST (IEC 60794-21-E3) : The fibre and component parts of cable shall not suffer permanent damage when subjected to a compressive load of 4000 Newton applied between two plates of dimensions 100mm * 100mm. The load shall be applied for 600 seconds.

5.3.3 CABLE BEND TEST (IEC 60794-1-21-E11) : The fibre and the component parts of the cable shall not suffer permanent damage when the cable is repeatedly wrapped and unwrapped four complete turns of ten complete cycle, around a mandrel of 20 D in diameter, where D is the overall diameter of cable .

5.3.4 IMPACT TEST (IEC 60794-1-21-E4):The fibre and the component parts of the cable shall not show any cracks or break when the cable is exposed to 10 impacts each of

Page 15 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

50 Newton from a height of 0.5 meter with impacting surface radius of 300 mm.

- 5.3.5 TORSION TEST (IEC 60794-1-21-E7): The fibre and the component parts of the cable shall not suffer any damage when a 2 meter length of cable is subjected to torsion of $\pm 180^\circ$ with 400 Newtons load for 10 times. The twist mark shall not be taken as damage.
- 5.3.6 KINK TEST (IEC60794-1-21-E10) :The bending radius shall be 20 D where D is the overall diameter of the cable. When a sample length of ten times the minimum bending radius of the cable is subjected to kinking, it shall not result in breakage of any fibre and kink should disappear after normalising the cable.
- 5.3.7 REPEATED BENDING TEST (IEC60794-1-21-E6) : When a sample length of minimum 5 meter is subjected to repeated bending test under load of 5kg for 50 cycles. It shall not result in breakage of any fibre.
- 5.3.8 CHANGE IN ATTENUATION AFTER MECHANICAL TESTS : Initial reading of fibre attenuation shall be measured at 1310 and 1550 nm and after conducting mechanical tests (cl. 5.3.1 to 5.3.7) final reading of fibre attenuation shall be measured. Change in attenuation shall not be more than 0.05 dB/Km
- 5.4 TEMPERATURE CYCLING TEST (IEC 60794-1-22-F1): (Ref: Fig 3) Temperature cycling test shall be carried out on one drum length of the cable to ensure stability of attenuation parameter of the cable when subjected to temperature changes which may occur during storage, transportation and usage. The permissible temperature change for storage and operation shall be from -20°C to $+70^\circ\text{C}$.

The rate of change of temperature during the test shall be 1°C per minute (approx). After attaining temperature stability in the chamber the cable shall be subjected to temperature cycling for 12 hours at each temperature as indicated below.

TA2 temp : -20°C
 TA1 temp : -10°C
 TB1 temp : $+60^\circ\text{C}$
 TB2 temp : $+70^\circ\text{C}$

The attenuation shall be measured at the end of each temp. range both at 1310 nm & 1550 nm. The change in attenuation for entire range of temperature shall not be more than 0.05 dB/Km. Two such cycles tests shall be performed. Time/temperature print out shall be maintained.

- 5.5 WATER PENETRATION TEST:(IEC60794-1-21-F5) A circumferential portion of the sheath and wrapping 25mm wide shall be removed from one end of a sample length of 3 meter of the cable and a watertight sleeve shall be applied over the exposed core so as to bridge the gap in the sheath. The cable shall be supported horizontally and a 2

Page 16 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

meter head of water, containing a sufficient quantity of water soluble fluorescent dye for the detection of seepage, shall be applied to the core at ambient temperature for a period of 24 hours for Acceptance Test and 7 days for Type Test. No dye shall be detected when the end of the 3 M cable is examined after removing it from water column with ultra violet light. It should be conducted on top and bottom end.

- 5.6 DRIP TEST : The test specimen of 30 cm length shall be cut from a completed cable. One end of the cable shall be stripped of 5 cm approx. and the fibre with jelly shall be flared out at 45 degree angle. The other end shall be sealed by the end cap. The sample shall then be suspended in an air oven with a glass disc placed directly below the flared end of the cable. The oven temperature shall be set at $70^{\circ}\text{C} \pm 1^{\circ}\text{C}$ for a period of 24 hours. At the end of the test the glass disc shall be examined for the presence of filling compound which might have dripped. There shall be no dripping of jelly compound or oil impression on the glass disc.
- 5.7 LIFE OF CABLE: The minimum expected life of the cable shall not be less than 25 years, supportive documents should be submitted by the manufacturer.
- 5.8 CABLE ENDS: Both ends of the cable shall be provided with a thermo shrink cap and pulling eye/ pulling grip with anti twist device.
- 5.9 LENGTH OF CABLE DRUM: The standard factory length of optical fibre cable shall be 3.0 Km $\pm 10\%$ However the purchaser may specify special lengths as per requirement. The fibre in cable lengths on a reel shall not have any joints.
- 5.10 SHORT LENGTH: Short lengths, single length not less than 1.5 Km, will not exceed 5% of the total ordered quantity.
- 5.11 Tolerance on ordered quantity - $\pm 1.5 \%$

5.12 **CABLE ABRASION TEST :**

Objective : To test the abrasion resistance of the sheath and the marking printed on the surface of the cable

Method : IEC-60794-1-21-E2 or any other international test method

Test Specs.: The cable surface shall be abraded with needle (wt. 150 gm) having diameter of 1 mm with 500 grams weight (Total weight more than or equal to 650 gms.)

No. of cycles : 50

Duration : One minute (Nominal)

Requirement : There shall be no perforation & loss of legibility of the marking on the sheath.

5.13 **CHECK OF EASY REMOVAL OF SHEATH :**

Page 17 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

Objective : Check of the easy removal of sheath of the optic fibre cable by using normal sheath removal tool.

Procedure : To check easy removal, the sheath shall be cut in circular way and about 300 mm length of the sheath should be removed in one operation. It should be observed during sheath removal process that no undue extra force is applied and no component part of the cable is damaged. One should be able to remove the inner sheath easily.

Note : Easy removal of both the outer jacket and the inner sheath shall be checked separately.

5.14 **CHECK OF EFFECT OF AGGRESSIVE MEDIA ON THE CABLE SURFACE (ACIDIC AND ALKALINE BEHAVIOUR)**

Procedure : To check the effect of aggressive media, solution of PH4 and PH10 are made. The two test samples of the finished cable each of 600 mm in length are taken and the ends of the samples are sealed. These test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. (Test method no. ISO 175).

Requirement : The sample should not show any effect of these solution on the sheath and other marking of the cable.

5.15 **TO CHECK THE QUALITY OF THE LOOSE TUBE :**

(a) **EMBRITTLE TEST OF LOOSE TUBE :**

This test method is based on bending by compression.

Sample : The minimum length of the test sample depend on the outside diameter of the loose tube and should be 85 mm for tubes upto 2.5 mm outside dia. The length of the bigger tubes should be calculated by using the following equation :

$$L_o > 100 * \sqrt{(D^2 + d^2)}/4$$

L_o = Length of tube under test

D = Outer dia. of loose tube

d = Inner dia. of loose tube

Procedure : Both the ends of a buffer tube test sample may be mounted in a tool which is clamped in jaws of a tensile machine which exert a constant rate of movement. The movable jaw may move at a rate of 50 mm per minute towards the fixed jaw. Under load the tube will bend, so that the tube is subjected to tensile and compressive stresses. The fixture for holding the tube should be designed in a manner that the tube might bend in all directions without further loading.

Requirement : The tube should not get embrittled. No kink should appear on the tube upto the safe bend dia. of the tube (20 D) where D is the outside diameter of the loose tube.

Page 18 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

There should not be any physical damage or mark on the tube surface

(b) KINK RESISTANCE TEST ON LOOSE TUBE :

Objective : To safeguard the delicate optical fibres, the quality of the loose tube material should be such that no kink or damage to the tube occur while it is being handled during installation and in splicing operations.

Procedure : To check the kink resistance of the loose tube, a longer length of the loose tube is taken (with fibre and gel), a loop is made and loop is reduced to minimum bend radius of loose tube i.e. 20 D (where D is the outside dia. of the loose tube). This test is to be repeated 4 times on the same sample length of the loose tube.

Requirement : No damage or kink should appear on the surface of tube

5.16 DRAINAGE TEST FOR LOOSE TUBE :

Sample Size : 30 cm tube length.

Test procedure :

1. Cut the tube length to 40 cm.
2. Fill the tube with the tube filling gel ensuring there are no air bubbles and the tube is completely full.
3. Place the filled tube in a horizontal position on a clean worktop and cut 5 cm. from each end so that the finished length of the sample is 30 cm.
4. Leave the filled tube in a horizontal position at an ambient temperature for 24 hours.
5. The sample tube is then suspended vertically in an environment heat oven over a weighed beaker. It is left in the oven at a temperature of 70⁰C for a period of 24 hours.
6. At the end of the 24 Hrs. period the beaker is checked and weighed to see if there is any gel in the beaker.

Requirement : There shall be no gel or oil in the beaker.

6. PACKING:

- 6.1 The cable shall be wound on strong wooden drums of suitable size conforming to DOT/TEC,s Generic Requirements No. G/CBD-01/02.Nov 94.
- 6.2 Before dispatch, drums shall be effectively lagged with suitable closely fitting battons and every batton shall be secured so as to prevent the batton from getting displaced or damaged during transit and storage. The lagging shall further be strengthened by steel straps bound circumferentially over the drum.
- 6.3 Nails used in the drums shall be properly clinched. Both ends of the cable shall be kept inside the drums & shall be located so as to be easily accessible for the test. The battons on the drum to gain access to the cable end shall be painted red.
- 6.4 The cable ends shall be sealed immediately after the tests to prevent entry of moisture

Page 19 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

and shall be so fastened and secured to the drum that during transit, transhipment and rolling, neither the cable end sealing gets damaged nor does the cable get loosened or displaced.

6.5 Each drum shall be stenciled in good oil paint giving the following particulars:

- a) Drum number;
- b) Name of the manufacturer; Month, Year;
- c) Address of the consignee;
- d) Description of contents including size, and type of fibre in cable;
- e) Cable length;
- f) Gross weight and Batch number;
- g) Arrow to indicate the direction in which the drum can be safely rolled;

6.6 Packing list supplied with each drum shall have the following information:

- 1) Drum Number
- 2) Cable length
- 3) Number of fibres
- 4) Type of cable
- 5) Attenuation/Km. of each fibre
- 6) USER'S/consignee name
- 7) Manufacture's Name, Month, Year & Batch No.
- 8) Group refractive index.
- 9) Cable factor i.e ratio of fibre length to cable length.
- 10) Precautions for handling OFC during transportation and laying sheet to be provided one copy in each lot during dispatch.

7. TEST PARAMETERS AND TEST ON RAW MATERIALS & FINISHED CABLE:-

7.1 Test on Stainless steel tape:

- a) Thickness (Cl.5.2.6.1)
- b) Chemical composition of the stainless steel alloy (values as given Table 1 of ASTM A 240/ A 240 M-99)
- c) Tensile strength & Elongation at break (values as given in Table 2 of ASTM A 240/ A 240 M-99)
- d) Thickness of copolymer on either side of steel tape (Cl.5.2.6.1)
- e) Resistivity of SS tape at 20°C : $72 \pm 8 \times 10^{-6}$ ohm.cm
should be given by manufacturer
- f) Force of adhesion of SS tape to HDPE as per ASTM 4565 : ≥ 14 Newton

7.2 Test for PE granules (to be used for inner sheath & outer jacket):

- a) Density (0.94 to 0.958 gm/cc), Test method BS 2782 part 6 (Method ASTM D 792)
- b) Melt flow index (≤ 0.8 gm/10 minutes at 190°C, load 2.16 Kg. Test Method BS 2782. (Method ASTM D 1238)

Page 20 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

- c) Oxidation Induction Time (≥ 20 minutes), Test Method ASTM D 3895
- d) Carbon black content (2.5 ± 0.5)%, Test Method ASTM D 1603, IS 2530 (P:10)
- e) Carbon black dispersion (uniform dispersion), Test Method IS 7328-1992 (Annx.B)
- f) Environmental stress cracking Resistance (ESCR), (10% Igepal solution, 50° C for 48 hours) No crack shall be observed. Test Method ASTM D 1693
- g) Tensile strength (≥ 2 Kg/mm²) , Test Method ASTM D 638
- h) Elongation at break (≥ 600 %) , Test Method ASTM D 638
- i) Dissipation factor(tand), (0.007 max.)
- j) Volume resistivity ($\geq 10E+10$ Ohm-Cm.), Test Method ASTM D 257
- k) Dielectric constant. 2.75 Max. Test Method ASTM D150
- l) Brittle Temperature (-55° C Max.), Test Method ASTM D746
- m) Moisture control (to be tested on granule) $\leq 0.022\%$ ASTM – D 817

7.3 Test for secondary coating material (for loose tube construction only)

7.3.1 Test for Polypropylene :

- a) Density 0.9-0.906 gm/cc, Test method ASTM D 1505
- b) Melt flow Index (MFI) at 190° C with load of 2.16 Kg- (≤ 5 gm/10 minutes.), test method ASTM D 1238
- c) Tensile strength at break, (≥ 2.5 kg./Sq.mm), Test method ASTM D 638
- d) Elongation at break, ($\geq 500\%$) , test method ASTM D 638
- e) Oxidation Induction time, (> 30 minutes), Test Method IEC 538
- f) ESCR(10% Igepal Solution) At 50° C for 48 hours, No cracks shall be noticed.

7.3.2 Test for Polybutylene Terephthalate (PBTP) :

- a) Density (1.30-1.33 gm/cc) ASTM-A-1505
- b) Melt flow Index (MFI) at 250° C with load of 2.16 Kg- (≥ 9 gm/10 minutes) ASTM-1238
- c) Tensile strength at Yield, (≥ 5.0 kg./Sq.mm) ASTM-D-638
- d) Elongation at break, ($\geq 50\%$) ASTM-D-638
- e) Melting point, ($220-227^{\circ}$ C), Test method ASTM D 2117
- f) Water absorption for 24 Hrs. ($\leq 0.5\%$), Test method ASTM D-1238 or ASTM D-570.
- g) Hardness (≥ 70 shore D) as per ISO 868
- h) Tensile modulus (2000 – 3000 Mpa) as per ISO 527 /ASTM D 638
- i) Flexural modulus (1900 – 2800 Mpa) as per ISO178/ASTM D 790

7.4 Test on Central Strength Member (FRP) :

- a) Tensile strength at break, (≥ 140 kg./Sq.mm), Test Method ASTM D 3916 / D 638
- b) Elongation at break, ($\leq 4\%$) Test Method ASTM D 638
- c) Water absorption for 24 Hrs. $\leq 0.1\%$ Test method ASTM D 570.
- d) Young Modulus ≥ 5000 Kg/sq.mm Test method ASTM D 638
- e) FRP diameter : $2.5 \text{ mm} \pm 0.05 \text{ mm}$.
- f) Min. Bend Radius at 25° C ($\leq 25D$) : No decomposition or delamination

Page 21 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

Note : A 300 mm long rod sample is bent towards making a half circle (hold the rod at two ends with hand and bend it). The radius at which the loose glass fibre becomes visible , is the mini. bent radius of the rod. It is calculated by dividing the distance between the two bent ends by the diameter of the rod.

- g) Flexural strength ($\geq 70 \text{ kg/mm}^2$) as per ASTM D 790
 - h) Flexural modulus ($\geq 5000 \text{ kg/mm}^2$) as per ASTM D 790
 - i) Coefficient of thermal expansion $\leq (6.6 \text{ E}-06)\text{cm}^0\text{c}$ As per ASTM D 696
- 7.5 Test on filling/compound (Secondary filling): The jelly shall be highly purified, thixotropic, air bubble free, anti-toxic & odourless).
- a) i) Cone penetration at $+25^0\text{C}$, ≥ 350 , 1/10 mm
as per ASTM 217/ASTM D-937
 - ii) Cone penetration at -30^0C , ≥ 230 , 1/10 mm
 - b) Oil separation $\leq 0.8\%$ (24 hrs, 150^0C)FTM (321)
 - c) Flash point $\geq 200^0\text{C}$ ASTM-D- 92 (DIN ISO 2592)
 - d) Drop point $\geq 150^0\text{C}$ ASTM-D 566
 - e) O.I.T. at 190^0C ≥ 30 minute as per ASTM D 3895/ D 4765
 - f) Density : $0.8 - 0.9 \text{ g/cm}^3$ DIN 51757/ ASTM D 1217/ ASTM D 1475
- 7.6 Test on flooding compound (Core filling): The Jelly shall be highly purified, soft, hydrophobic gel, non-toxic, odourless, thixotropic and fibre compatible.
- a) i) Cone penetration at $+25^0\text{C}$: ≥ 280 1/10 mm
ASTM-D-217/ ASTM-D-937
 - ii) Cone penetration at -30^0C : ≥ 180 , 1/10 mm
 - b) Oil separation $\leq 0.8\%$ (24 hrs, 150^0C) FTM 791 C
 - c) Flash point $\geq 200^0\text{C}$ ASTM-D- 92 (DIN ISO 2592).
 - d) Drop point $\geq 170^0\text{C}$ ASTM D 566
 - e) Density : $0.8 - 0.9 \text{ g/cm}^3$ DIN 51757/ ASTM D 217/ ASTM D 1475
- 7.7 Lightning test (Fibre damage test) as per EIA/TIA – 455 – 181
To determine the lightening damage susceptibility of armoured optical fibre cable to direct arc and to magnetic field. The cable shall pass the current level $\geq 105 \text{ K Amp}$.
- No Damage to optical fibre in the cable and optical continuity should be present after the test in 2 meter sample.
- 7.8 Termite test for the cable : 30 days termite resistance test shall be carried out.
- 7.9 Testing of aramid/ glass yarn : (if used)
- 7.9.1 Testing of Aramid Yarn
- (a) Total no. of yarns in dTex unit on tensile test (dTex = weight in grams per 10 Kms)
 - (b) Tensile modulus (5160 to 9970)N/tex as per ASTM 885-98
- 7.9.2 Testing of Glass Yarn
- (a) Total no. of yarns in dtex : $1700 \pm 10\%$ for type 'A' & $800 \pm 10\%$ for type 'B',
ASTM D 578

- (b) Tensile Strength in Newton : ≥ 1100 for type 'A' & ≥ 440 for type 'B', ASTM D 885
- (c) Thickness in mm : 0.45 ± 0.25 for type 'A' & 0.20 ± 0.10 for type 'B', ASTM D 885
- (d) Elongation at break : ≤ 5 for both type A & B, ASTM D 885

8.0 TESTS:

- 8.1 Manufacturer will submit the following documents during type test & acceptance test to inspecting authority
- 8.1.1 Statement of deviation, obtained from the specification at the time of type testing if any.
- 8.1.2 Statement of raw material used in offered lot and at the time of type testing.
- 8.1.3 Routine test results as per Cl. 8.4 on all the offered drums should be submitted during type & acceptance tests.
- 8.1.4 During acceptance test, sampling percentage figure shall be rounded off to the next higher integer.
- 8.1.5 New firms shall have
- Current DOT type approval for manufacturing of Optical Fibre Cable.
 - DOT/ CACT/RDSO valid approval of all raw material used wherever applicable

8.2 TYPE TESTS:

SAMPLING PLAN FOR TYPE TEST

S.No.	Type of Test	Clause numbers	Sampling
I.	Test on fibre & finished cable		
1.	Optical characteristic of fibre		
a)	Cut off wave length on 2 M fibre section	Cl. 5.1.2	Test should be conducted on all fibres of both drums.

b)	i) Fibre attenuation before cabling	Cl 5.1.3 (a)	Test should be conducted on all fibres of left over spool from same fibre ID.
	ii) Fibre attenuation after cabling	Cl 5.1.3 (b)	Test should be conducted on all fibres of both drums.
c)	Nominal dia., nominal cladding dia., cladding non-circularity, mode field concentricity error	Cl 5.1.4	-- do--
d)	Primary coating (for natural coloured/ un coloured fibre)	Cl. 5.1.5	-- do--
e)	Chromatic dispersion	Cl. 5.1.6	-- do--
f)	Proof test	Cl 5.1.7	Test should be conducted on all fibres of leftover spool from same fibre ID. Note : In case of non availability of test facilities, fibre manufacturer's certificate shall be submitted for particular lot/ batch.
g)	Change in attenuation	Cl 5.1.8	Test should be conducted on all fibres of both drums.
h)	Polarisation Mode dispersion	Cl. 5.1.9 (a)(i)	Fibre manufacturer's certificate shall be submitted for the particular lot/ batch.
		Cl. 5.1.9 (a)(ii)	Test should be conducted on all fibres of both drums.
i)	Strippability force	Cl. 5.1.9 (b)	Test should be conducted on all fibres of leftover spool from same fibre ID. Note : In case of non availability of test facilities, fibre manufacturer's certificate shall be submitted for particular lot/ batch.
j)	Fibre curl	Cl. 5.1.9 (c)	Fibre manufacturer's certificate shall be submitted for the particular lot/ batch.
k)	Fibre microbend	Cl. 5.1.9 d)	Test should be conducted on all fibres of both drums.
l)	Fibre materials	Cl. 5.1.9 e)	Documents/ certificates of fibre manufacturer are to be submitted by cable manufacturer of particular fibre used in the cable.
m)	Dynamic Tensile Strength of fibre	Cl. 5.1.10	Test should be conducted on all fibres of both drums. In case of non

n)	Dynamic Fatigue of fibre	Cl. 5.1.11	availability of test facilities, fibre manufacturer's certificate/documents shall be submitted.
o)	Static Fatigue of fibre	Cl. 5.1.12	
p)	Tests/ Certificates	Cl. 5.1.13, 5.1.14, 5.1.15 & Cl. 5.1.16	Should be submitted
2.	Mechanical Test		
a)	Tensile Strength Test	Cl. 5.3.1	Test will be conducted on single loop after splicing of all fibres on both drums.
b)	Compressive stress, Cable bend, Impact, Torsion, Kink, Repeated bending test & Cable abrasion test	Cl. 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.12	On both drums.
c)	Change in attenuation after mechanical tests	Cl. 5.3.8	On both drums.
3.	Temperature Cycle test	Cl 5.4	Two cycle test will be done on one drum.
4.	Water Penetration Test	Cl. 5.5	On top end and bottom end of both the drum.
5.	Drip Test	Cl. 5.6	On both drums
6.	Physical test	Cl. 5.2.1, Cl. 5.2.5, Cl. 5.2.6.4, Cl. 5.2.8,	To be done on both the ends of both the drums.
		Cl. 5.2.6.2,	To be conducted on 2 samples of leftover spools of corrugated tape used for manufacturing the both drums cable
7.	Spark Test	Cl. 5.2.6.6	In process test result on both cable drums shall be submitted. Test on one drum will be conducted, and armouring of the cable will be earthed at the time of conduction of this test.
8.	Visual inspection Test	Cl 5.2.7, 5.2.9, 5.8, 5.9 & 6.5	On both the drums.
9.	Check of easy removal of sheath	Cl. 5.13	On both the drums.
10.	Check of the effect of aggressive media on the cable surface	Cl. 5.14	On both the drums.

11.	To check the quality of the loose tube		On all loose tubes of both the drums.
	a) Embrittle test of loose tube	Cl. 5.15 (a)	
	b) Kink resistance test on loose tube	Cl. 5.15 (b)	On all loose tubes of both the drums.
12.	Drainage test for loose tube	Cl. 5.16	On both the drums.
13.	Lightening Test	Cl. 7.7	On one drum.
14.	Termite test for the cable	Cl. 7.8	On one drum.
15.	Testing of aramid/ glass yarn	Cl. 7.9	On both drums (if used).
16.	Test on inner & outer HDPE sheath		
a.	OIT	Cl. 7.2 c)	1 sample each from both the drums.
b.	Carbon black content	Cl. 7.2 d)	-- do --
c.	Carbon black dispersion,	Cl. 7.2 e)	-- do --
d.	ESCR	Cl. 7.2 f)	-- do --
e.	TS & Elongation	Cl. 7.2 g) & h)	2 samples each from both the drums.
17.	Test on FRP		
a.	TS & Elongation	7.4 a), b)	2 samples each from both the drums.
b.	FRP dia.	7.4 e)	-- do --
c.	Min. Bend Radius	7.4 f)	-- do --
18.	Test on loose tube made of Polypropylene or PBTP		
	TS & Elongation OR	7.3.1 c), d)	On all the six loose tubes from both the drums.
	TS & Elongation	7.3.2 c), d)	
II.	Test on Raw Materials		
19.	Test on stainless steel tape		
a.	Thickness,	Cl. 7.1 a)	5 samples from coil used for manufacturing cable for type test.
b.	T.S. & Elongation	Cl. 7.1 c)	
c.	Thickness of copolymer	Cl. 7.1 d)	
d.	Chemical composition	Cl. 7.1 b)	1 sample from coil used for manufacturing cable for type test
e.	Resistivity	Cl. 7.1 e)	
f.	Force of adhesion.	Cl. 7.1 f)	5 samples from coil used for manufacturing cable for type test.
20.	Test for PE granules		
a.	Density	Cl. 7.2 a)	

b.	MFI	Cl. 7.2 b)	1 sample from the same bag used for manufacturing cable for type test
c.	Dissipation factor	Cl. 7.2 i)	
d.	Volume resistivity	Cl. 7.2 j)	
e.	Dielectric constant	Cl. 7.2 k)	
f.	Brittle Temperature	Cl. 7.2 l)	
g.	Moisture content	Cl. 7.2 m)	
21.	Test for secondary coating material : Note : Tests as per S.No. 21.1 or 21.2 are to be conducted depending upon type of materials of loose tubes.		
21.1	Test for Polypropylene		
a.	Density	7.3.1 a)	1 sample from the same batch used for manufacturing cable for type test
b.	MFI	7.3.1 b)	
c.	OIT	7.3.1 e)	
d.	ESCR	7.3.1 f)	
21.2	Test for PBTP		
a.	Density	7.3.2 a)	1 sample from the same batch used for manufacturing cable for type test
b.	MFI	7.3.2 b)	
c.	Melting point	7.3.2 e)	
d.	Water absorption	7.3.2 f)	1 sample to be prepared from the same bag used for manufacturing cable for type test
e.	Hardness	7.3.2 g)	
f.	Tensile Modulus	7.3.2 h)	
g.	Flexural Modulus	7.3.2 i)	
22.	Test on FRP		
a.	Water absorption	7.4 c)	1 sample from the same coil of FRP used for manufacturing cable for type test
b.	Young modulus	7.4 d)	
c.	Flexural strength	7.4 g)	
d.	Flexural Modulus	7.4 h)	
e.	Coefficient of thermal expansion	7.4 i)	
23.	Test on filling compound		
a.	Cone penetration	7.5 a)	1 sample from the jelly barrel used for manufacturing cable for type test.
b.	Oil separation	7.5 b)	
c.	Flash Point	7.5 c)	
d.	Drop Point	7.5 d)	
e.	O.I.T	7.5 e)	
f.	Density	7.5 f)	
24.	Test on flooding compound		
a.	Cone penetration	7.6 a)	1 sample from the jelly barrel used for manufacturing cable for type test.
b.	Oil separation	7.6 b)	
c.	Flash Point	7.6 c)	
d.	Drop Point	7.6 d)	
e.	Density	7.6 e)	

8.3

ACCEPTANCE TESTS:

SAMPLING PLAN FOR ACCEPTANCE TEST

S. No.	Type of test	Clause No.	Sample size (Number of drums)
I.	Optical characteristics of fibre		
a)	Cut-off wavelength	5.1.2	To be done on 10% the number of offered drums subject to minimum of 1 drum.
b)	Fibre attenuation after cabling	Cl 5.1.3 (b) ii) & iv)	To be done on 10% the number of offered drums subject to minimum of 1 drum.
		Cl 5.1.3 (b) i) & iii)	On 20% of the offered drums on all the fibres with a check of optical continuity by the OTDR, subject to minimum of 1 drum.
c)	Nominal dia., nominal cladding dia., cladding non- circularity, mode field concentricity error	Cl 5.1.4	To be done on 10% the number of offered drums subject to minimum of 1 drum.
d)	Primary coating (of natural coloured/ uncoloured fibre)	Cl. 5.1.5	To be done on 10% the number of offered drums subject to minimum of 1 drum.
e)	Chromatic dispersion	Cl. 5.1.6	-- do --
f)	Polarisation Mode dispersion	Cl. 5.1.9 (a) ii)	To be done on 10% the number of offered drums subject to minimum of 1 drum.
g)	Change in attenuation & Fibre Microbend	Cl. 5.1.8 & 5.1.9 d)	Test should be done on one drum per lot.
II.	Mechanical Tests		
a)	Tensile Strength Test	Cl. 5.3.1	To be done on 2.5% of the number of offered drums subject to minimum of 1 drum, by splicing all the fibre.
b)	Compressive stress, Cable bend, Impact, Torsion, Kink test, Repeated bending test	Cl. 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7,	To be done on 5% of the number of offered drums subject to minimum of 1 drum. Test should be done on all the fibres.
c)	Change in attenuation after mechanical tests	Cl. 5.3.8	-- do --
d)	Cable abrasion test	5.12	To be done on 5% of the number of offered drums subject to minimum

			of 1 drum.
III.	Water Penetration Test	Cl. 5.5	20% of the no. of offered drums, subject to minimum of 2 drums. Test to be conducted on both top and bottom end of the cable.
IV.	Drip Test	Cl 5.6	2.5% of the number of offered drums, subject to minimum of 1 drum.
V.	Physical Tests	Cl 5.2.1(a), Cl. 5.2.5, Cl.5.2.6.4, Cl. 5.2.8	10% of the no. of offered drums, subject to minimum of 2 drums. Tests are to be conducted on both ends of the drums.
		Cl. 5.2.6.2	To be Conducted on 5 sample of leftover spools of corrugated tape used for manufacturing particular lot of cable
VI.	Visual Inspection	Cl. 5.2.7, 5.2.9, 5.8, 6.5	5% of the no of offered drums, subject to minimum of 1 drum.
VII.	Spark test	Cl.5.2.6.6	Results for the entire lot offered for inspection shall be submitted. Inspecting authority shall conduct on one drum spark test randomly from the offered lot while rewinding the drum. Armouring should be earthed while conducting the spark test.
VIII.	Tests on finished Cable	Cl.7.1(b)	Two drums per lot of finished cables.
		Cl. 7.2 (a), (b), (d), (e), (f), (g) & (h)	5% of the nos. of offered drums subject to minimum two drums.
		7.4 a), b), c), e)	One drum per lot of finished cable.
		Cl. 7.3.1(c), (d) OR Cl. 7.3.2 (c), (d)	
IX.	Test on Raw Materials	Cl. 7.5 (f), Cl. 7.6 (e)	To be done on one sample of jelly used for manufacturing the same lot of cable.
X.	Test on continuity of armouring		Check of electrical continuity of armouring of all the drum by Multimeter.
XI.	Test certificate on raw materials	Cl. 5.2.6.1, Cl. 7.1, Cl. 7.2, Cl 7.3.1 or 7.3.2,	Test certificate of raw material manufacturers should be submitted of particular lot/ batch used for manufacturing the cable by cable

Page 29 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

		Cl. 7.4, Cl.7.5 & Cl. 7.6	manufacturer.
--	--	---------------------------------	---------------

8.4 ROUTINE TESTS :

Routine test result for Cl. 5.1.3(a), 5.1.3(b), 5.1.4, 5.1.5, 5.1.6, 5.2.1(a), 5.2.6.2, 5.2.6.4, 5.2.6.6, 5.2.8, 5.5 & 5.6 on all the offered drums.

8.5 Change of Raw Material:

Raw materials are to be used only from approved sources of CACT wing of BSNL. In case cable manufacturer wants to change raw material/ materials other than mentioned in Type Approval Certificate (TAC), manufacturer shall have to obtain prior permission from RDSO, Lucknow. All those tests related to changed raw material/ materials and required tests on finished cable shall be carried out by inspecting authority of RDSO on two drums of cable and necessary corrigendum to Type Approval Certificate (TAC) shall be issued.

9. INSPECTION:-

9.1 GENERAL:

9.1.1 Inspection and testing shall be carried out by the inspecting authority nominated by the purchaser to ensure that all the requirements of this specification are complied with for the acceptance of the materials offered by the supplier for inspection.

9.1.2 The purchaser or his nominee shall have free access to the works of the manufacturer and to be present at all reasonable times and shall be given facilities by the manufacturer to inspect the manufacturing of the cables at any stage of manufacture. He shall have the right to rejection whole or part of any work or material that does not conform to the terms of this specification or any other specification or requirement applicable and may order the same to be removed/replaced or altered at the expense of the manufacturer. All reasonable/complete facilities considered necessary by the inspecting authorities for the inspection of the cables shall be supplied by the manufacturer free of cost.

9.1.3 The manufacturer shall supply the cable samples and samples of the raw materials free of charge as required by the inspecting authority and shall at his own cost prepare and furnish the necessary test pieces and appliances for such testing as may be carried out at his own premises in accordance with this specification. Failing the existence of facilities at his own premises for the prescribed tests, the manufacturer shall bear the cost of carrying out the tests in an approved laboratory, workshop or test house.

9.2 TESTS BY THE MANUFACTURER AND TEST CERTIFICATE:

9.2.1 Before any supply of the cables covered by this specification are offered for inspection, the manufacturer shall carry out the routine tests on each individual cable

Page 30 of 34	Effective from: 23- 06-2020	RDSO/SPN/TC/110/2020	Rev.: 0
---------------	-----------------------------	----------------------	---------

drum as specified in Cl.8.4 in addition to any other manufacturing tests which have to be carried out by him.

9.2.2 The test certificate incorporating the results of the routine tests shall be produced and supplied prior to each lot offered for inspection. In case the inspecting authority observes as a result of the tests carried out by him that the recorded test results supplied to him are not reasonably accurate for the lot offered for inspection, he may reject the complete lot at his discretion and call upon the manufacturer to have the cables type tested before any further supplies are inspected or accepted.

9.3 **SAMPLING:**

9.3.1 For the type tests, the manufacturer or the supplier shall submit to the Inspecting authority at least two complete cable drums of standard lengths to carry out the tests as detailed in the specification. Other necessary tests pieces of the cable or its constituent material shall also be drawn as samples out of these selected samples.

9.3.2 For acceptance tests, the sampling plan shall be as indicated in Cl. 8.3 unless otherwise specified by the purchaser. The drum of the sample sizes shall be selected at random from the total number of drums offered for inspection. The percentage figure shall be rounded off to the next higher integer.

10. **WARRANTY:**

The manufacturer shall warrant the material supplied by this specification to be free from defects in design, material & workmanship under ordinary use & service, his obligation under this warranty being to replace free of cost of the defective material within one year after delivery to the purchaser.

11. **REJECTION:**

In case, the cables tested and inspected in accordance with this specification fail to pass the test or comply with the requirements of this specification, , the whole consignment shall be rejected.

12. **INFORMATION TO BE FURNISHED BY SUPPLIER WITH THE OFFER:-**

The supplier shall supply the following information along with his offer:-

12.1 Complete test results.

12.2 Copies of "Manufacturers specification" for raw materials used in the cable construction which are not specifically covered by the specifications.

13. All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 latest version (titled "Vendor-Changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways

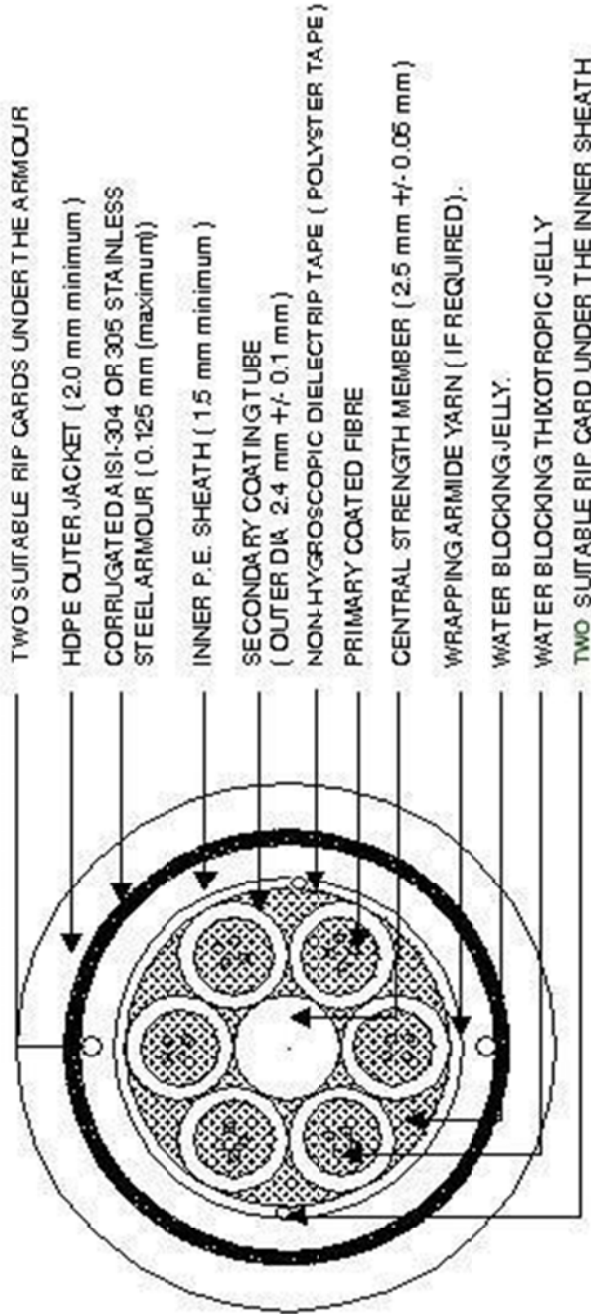


FIG -1a

R . D . S . O

CONSTRUCTIONAL DIAGRAM
OF 24 FIBRE ARMoured
OPTIC FIBRE CABLE

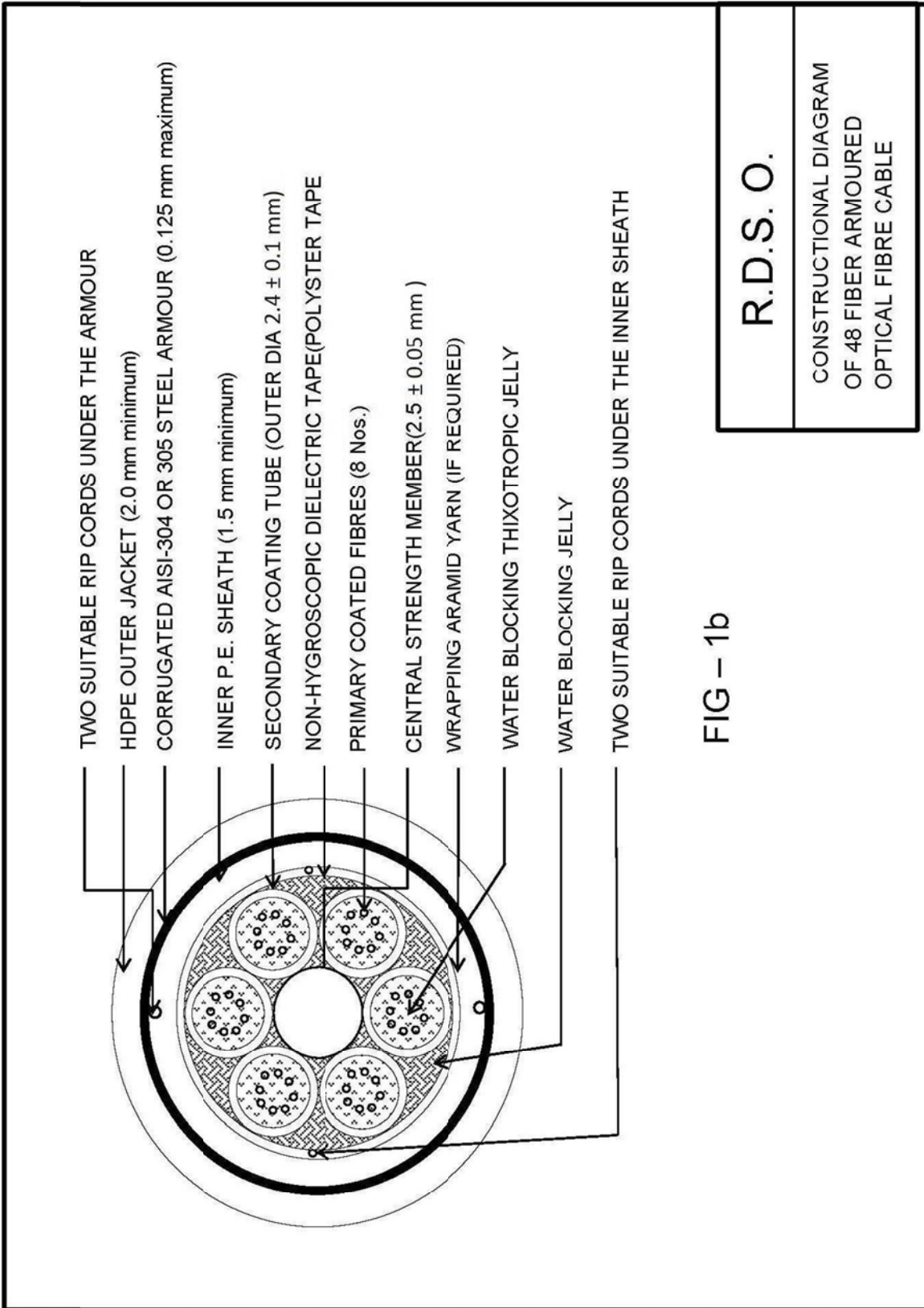


FIG – 1b

R.D.S. O.

CONSTRUCTIONAL DIAGRAM
OF 48 FIBER ARMoured
OPTICAL FIBRE CABLE

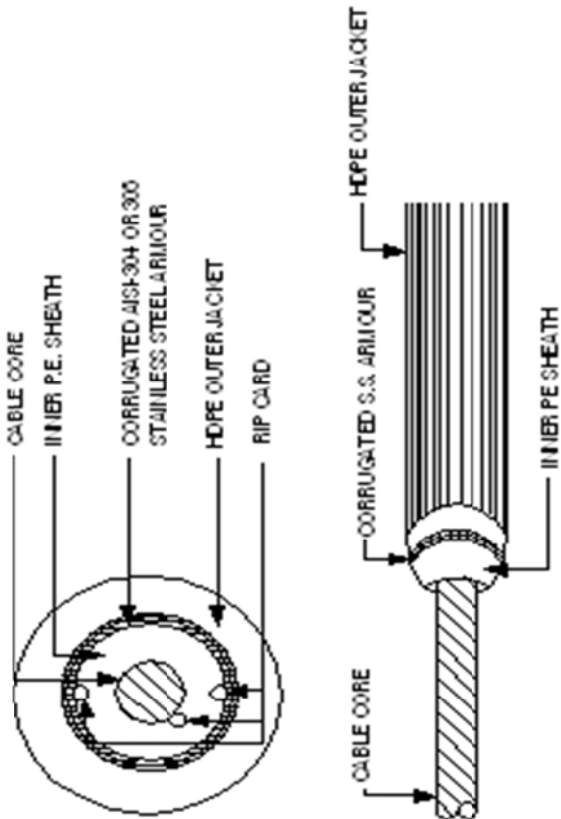


FIG -2

P. D. S. O

CROSS SECTIONAL
VIEW OF ARMoured
OPTIC FIBRE CABLE

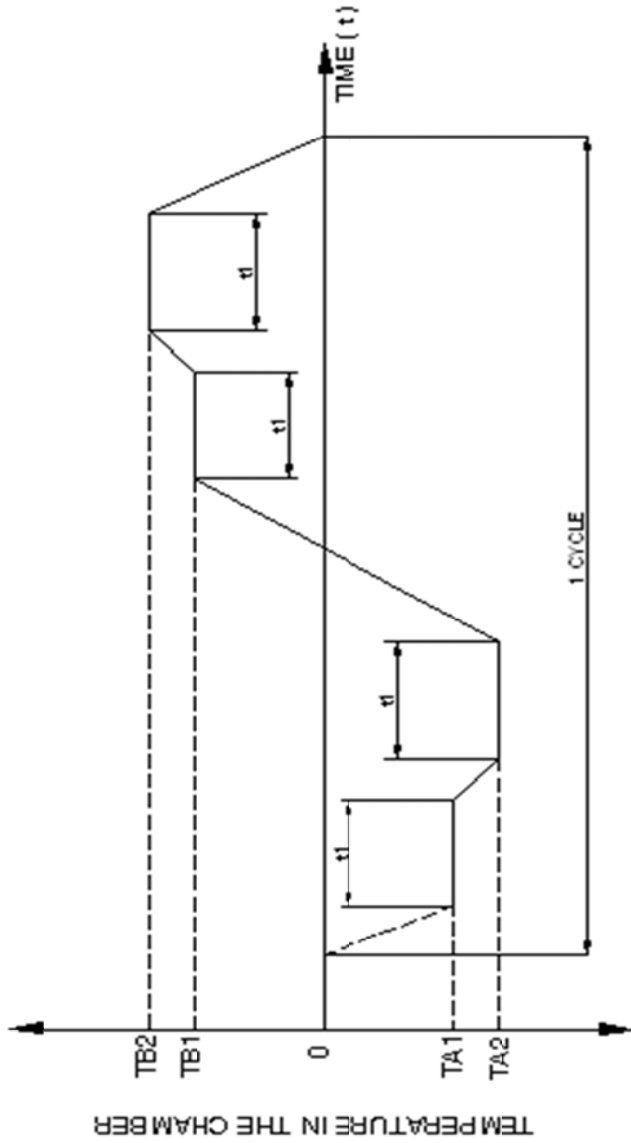


FIG -3

R . D . S . O

TEMPERATURE CYCLING TEST

A= START OF FIRST CYCLE

NOTES