

SOUTH EASTERN RAILWAY

TENDER DOCUMENT

e-Tender No: **SnT_e_Tender_ADA_26_27_19**

Name of Work: S&T work in connection with Interlocking of 4 nos. of LC gates in the section of SSE/Signal/BQA in Adra Division.

SSE/S/PLG/ADRA

ASTE/ADRA

**Sr. DIVISIONAL SIGNAL & TELECOM ENGINEER
(SIGNAL & TELECOM)
ADRA DIVISION**

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Please follow all the guidelines given in IRGCC April 2022 with all the issued correction slip.

Scope of the work

Name of Work: S&T work in connection with Interlocking of 4 nos. of LC gates in the section of SSE/Signal/BQA in Adra Division.

Scope:

1. All the S&T work as mentioned in Tender Schedule
2. Supply of other Indoor & Outdoor Signalling & Telecom materials.
3. It includes out-door work like excavation of trenches, laying of Signalling /power/ quad cables, casting of foundation & erection of MACL signal posts, apparatus case, relay racks, fixing of power equipment, relays etc.
4. Any other works required in the adjacent station and section for commissioning these stations in connection with the above works.
5. Any other works allotted by Railway officer in charge and site engineer related to this work.
6. JPO issued from office of PCSTE/GRC dated 19.2.2024 with Computer No. 126508 i.e., “Procedure for undertaking digging work in vicinity of Underground S&T cable to prevent the damages of Underground Utilities.” Shall be applicable.
7. Telcom Circular 17/2013 shall be applicable during the execution of schedule work. Railway Board Letter No. 2003/tele/RCIL/1 Pt. IX dated 24.06.2013 is attached with NIT.
8. Provision of Earthing should be done as per latest RDSO TAN STS/E/TAN/3006 Ver.3.1.

Special Conditions of contract

1. In case of any contradiction between Special Conditions and General conditions, the provision of Special conditions will prevail upon General Conditions to the extent of contradiction.
2. This tender is not transferable.
3. All the works shall be carried out in accordance with the instructions given in:
 - a. Signal Engineering manuals with latest correction slips.
 - b. Telecom Engineering manual with latest correction slips.
 - c. Drawings and instructions issued by RDSO/Lucknow.
 - d. Drawings and instructions issued by PCSTE/S.E. Railway.
 - e. Instructions given by the original equipment manufacturer.
 - f. Any other instructions issued from time to time by the Engineer of the Railway at site.
4. Commencement of Contract: The contract covered by this Tender shall be deemed to commence from the date of issue of Acceptance Letter.
5. **PRICE BASIS**
 - 5.1 No State or Central tax will be paid for separately for the works portion as well as supply portion of the work. Any such taxes, duties and other charges should be deemed to have been included in the rates quoted for the works in the Tender.
 - 5.2 All rates, as per schedule of works shall be quoted is inclusive of cost of delivery at Consignee's depot including all cost of packing, forwarding, insurance, freight, customs Duty, GST and any other specified taxes and including Local taxes and TDS.
 - 5.3 Transportation of all the required materials from store of SSE (consignee) to the work execution site for installation and commissioning unless otherwise provided in Tender schedule shall be responsibility of contractor at his own cost.
 - 5.4 The contractor shall be entirely responsible and shall bear all expenses towards loading, transport, handling and unloading for all materials equipment, machines, tools and plants etc. from the source of supply to the store of SSE/SIG/Store/ADRA and/or SSE(Tele)/Line/ADRA. The responsibility for damage to any equipment during transportation and till it is taken over by Railways shall be that of the contractor. The correct functioning of the equipment for installation shall, however, be governed by the warranty clause of the contract.
2. **TECHNICAL.**
 - 2.1 Technical discussions may be held with the tenderes whenever necessary. Insufficiency of technical details, if any, may also be indicated to them. Based upon these discussions, the tenders will submit in writing the details of clarifications required by Railways.
 - 2.2 The terms "Correction slip" as referred to in this tender document includes following terms also:
Addendum slip.
Corrigendum slip.

- Addendum slip and Corrigendum slips which are issued in consecutive serials.
- 2.3 **Use of Technical Terms and conditions:** Definitions, technical words and symbols used in circuits and other places shall be as per Indian Standard specifications, where they are not available, they should confirm to appropriate British Standard Specifications. The tenderer's representative and the Railway.
- 2.4 Supervisor shall jointly inspect the site and make up a programme and put up to Sr. DSTE/Adra or his authorized representative for his approval. The work shall be carried out as per the programmed approved by Sr. DSTE/Adra or his authorized representative.
- 2.5 **Discrepancy in drawings and other documents:** The tenderer shall carry out at his expense any alteration of the works due to any discrepancy, error or omissions in the drawings or other particulars. Any approval given by the Railway for this purpose shall be in no way absolve the tenderer from any or all responsibilities for the correct and safe functioning of the equipment. In this regard the sole responsibility rests with the tenderer in all respects. Any fittings or accessories which may have not been specifically mentioned in the tender or the agreement executed thereon, but which are usual and / or necessary as per the normal practice are to be provided by the tenderer without extra charges so that the work is completed in all respects for rendering useful services.
- 2.6 The Railway may require such alterations to be made on the work during the progress and may be necessary but should the said alterations be such that either party to the contract considers alteration in prices justified such alterations shall not be carried out until amended prices submitted by the contractor and accepted by the Railway and intimated in writing to the tenderer.
- 2.7 **Future Development:**
If during the intervening period between the date of tender opening and signing of the contract, there have been any developments resulting in improvements or advancement to the equipments to be installed, in the design, fabrication, the tenderer shall make available to the Railway all information. The Railway may modify the orders to take advantage of these developments on the basis of mutually agreed terms. The Railway reserves the right for alteration / modification of decision in respect of the work at any stage of the execution. The charges incurred there is to be settled mutually between contractor and the Railway.
This should be clearly understood that it is entirely contractor's responsibility and liability to in procurement of such items due to their non-availability or import difficulties or any other cause of what so ever will not be taken as an excuse for slow and nonperformance of work.
3. **Inspection of work and Measurement:**
- 3.1 Measurements: After completion of the stages of work the Contractor should inform in writing about the completion of the work to the Railway Supervisor and request him for a joint inspection. The measurements of quantities for purpose of payment to the contractor will be undertaken as per IRGCC.
- 3.2 The Engineer or the Railway Supervisor may inspect and test the various portion of the work at all stages and shall have the full power to reject all or any portion of the work that he may consider to be defective or inferior in quality of material or workmanship or design in comparison to specification.
- 3.3 In the event of any work already executed and not in accordance with the specification as in this tender and / or determined by the Engineer of which the Contractor have been apprised, the Contractor shall carryout alteration / replacement to such works to the satisfaction of the engineer for which no additional expenses shall be borne by the Railway Administration.
- 3.4 The Contractor shall carryout such tests at his own expenses as are necessary in the opinion of the

Engineer to determine that the contract is being complied with satisfaction and that the contractor is not entitled to the payment in respect thereof.

- 3.5 All materials to be used by the Contractor on the work shall be of approved quality and shall be approved by the engineer in charge before being used in the work.
- 3.6 No extra charges shall be paid to the contractor towards carriage, loading, unloading and handling etc. of the materials supplied by the tenderer and he shall include all such charges in supply of materials.
- 3.7 If the completed work or any portion thereof, before it is taken over or during the warranty period (works includes equipment also) be found defective or otherwise failed to fulfil the requirement of specification or its purpose, the Railway shall give the contractor notice setting forth, particulars of such defects or failure and the contractor shall forthwith make good the defective work or alter the same to make it satisfactory to comply with said requirement free of cost. Should the contractor failed to do so within a reasonable time (to be decided by the Engineer in charge) after the service of the said notice. The Railway may reject and replace the whole or part of such defective work as the case may be at the cost of the Contractor. Such replacement shall be carried out by or at the instance of the Railway within a reasonable time and so far, reasonably practicable under competitive conditions. The Contractor's full liability under this clause shall be satisfied by the payment to the Railway of the extra cost being the ascertained difference between the prices paid by the Railway under the above-mentioned provision for such replacement and the contract price for the work so replaced plus the sum if any paid by the Railway to the Contractor in respect of such defective work.
- 3.8 If it becomes necessary for the Contractor to replace / review any defective portion of the work under the clause above, then the provision of the said clause, shall also apply to the portion of the work as replaced or renewed until expiry of six months from the date of such replacement or renewal. If any defect be not remedied within a reasonable time during the aforesaid period, the Railway proceed to do the work, at the Contractor's risk and expenses but without prejudice to any other rights or remedies which the Railway may have against the Contractor in respect of such defects or faults.
- 3.9 In the event of such rejection as aforesaid, the Railway shall without prejudice to other rights and remedies, and in particular without prejudice to this right under the clause just preceding, be entitled to the use of the rejected work in a reasonable and proper manner for a time reasonably sufficient and to enable the Railway to obtain other replacement. During such period, if the rejected work is used commercially; the Contractor shall be entitled to a reasonable sum as payment for such use but the Contractor shall not be entitled to claim any damages in respect of such period.
- 3.10 Railway reserves the right to suspend the progress of work or any part thereof by reason of weather conditions or by some default on the part of the contractor or as necessary for proper execution and the safety of the work for such time or times and in such manner as may be considered necessary by the Engineer and the Contractor shall during such suspension period protect and secure the work as is necessary in the opinion of the Engineer. The Contractor shall not be entitled to the extra cost (if any) incurred by him during the period of suspension ordered by the Engineer owing to the reasons other than aforementioned and when each such period of suspension exceeds 14 days, the Contractor shall be entitled to such extension of time for completion of the work as the Railway may consider proper.
- 3.11 If during the progress of works any material of the Railways are damaged the cost of the repairs or replacement of such cables or accessories shall be recovered from the Contractor. Decision of

Sr. DSTE/Adra in regard to the cost to be recovered towards repairs or replacement of the material supplied by the Railway Administration shall be final and binding on the Contractor.

4. **Materials:**

4.1 The percentage quoted by the Contractor above / below the rates incorporated for various items / works in the schedules of the tender shall be inclusive of cost of supply of these items, to be procured by the contractor. The tendered rates shall also be inclusive of all taxes, such as Central, State / Local including loading, unloading lifting, stacking and re-handling of all materials including transportation to the work site. Even after the equipments are installed and put 'ON' and on account payments are made to the contractor, the security of the equipments so installed solely lies with the contractor and he has to replace the same at his own cost if any, theft or loss or damage occurs till the entire section/ part is commissioned to the complete satisfaction of Railway and the same is handed over to the Railway.

4.2 **Inspection of Materials:**

The materials / equipments to be supplied by the Contractor shall be inspected by RDSO /RITES/ authorised representative before dispatch of the materials as specified in the tender schedule. All the **Inspection charges shall be borne by Contractor**. If required by Railway Engineer, these materials / equipments shall be subjected to the further inspection at the work site also and the cost thereof shall be borne by the Contractor.

4.3 **Security of materials:** Security of all materials in the section where the work is in progress shall be the contractor's responsibility and he shall arrange to guard the same from theft. In the event of any loss the contractor shall be responsible to that effect and shall execute an indemnity bond for the materials that will remain in his custody, which has been supplied by the Railway. The store lost/unaccounted/consumed excess or damaged shall be recovered as per GCC clause.

4.4 If any material, which the Contractor would normally have arranged for himself, if supplied by the Railway either at Contractor's request or suo moto in order to prevent any possible delay in the execution of the work likely to occur due to the Contractor's inability to make adequate arrangements for supply thereof or otherwise, recovery of prices of such materials will be made from Contractor's bill at the highest of the following rates:

i] Book rate or Last purchase rate whichever is higher Plus 5 percent on account of freight, 2 percent on account of incidental charges and 12.5 percent towards departmental charges on the overall cost.
ii] Accepted tender rate for such material under the Contract.

If, however, the material required by the Contractor is not available in Railway stock, or the Railway decides not to supply the same, be that for whatever reason, the Railway should not be bound to arrange for the supply at cost quoted above or at any other cost nor will this fact be accepted as an excuse for delay in execution of the works.

4.5 **Supply Of Materials from Railway's Stores:**

i] The materials required for the work will be supplied by the Railway at Signal / Telecom Supervisor's stores. The quantity required would be determined by the Railway according to the quantum of work to be done. The Contractor shall be responsible for checking before taking delivery that all the materials given to him are in good condition. The receipt of materials shall be acknowledged by the Contractor or his representative, mentioning details of materials and their quantities on prescribed proforma. The Contractor shall make his own arrangements for transportation of these materials to the work spot and guarding thereof till the works are completed and provisional acceptance letter issued by the Railway.

ii] The Contractor shall be liable to render full account of all the materials issued by the Railway. If any quantity of Railway materials consumed excess or wasted or damaged or lost or otherwise not satisfactorily accounted for, necessary recovery shall be made from him at the prevalent market rate Plus Railway freight, handling, loading, supervision and incidental charges at rates fixed by the Railway Administration. To this will be added an increase of 100%.

iii] The Contractor shall return all the excess or unused materials supplied to him by the Railway

including empty cement bags, empty cable drums and all released materials to the authorized Railway representative at stores of Signal / Telecom Supervisor from where the materials were drawn by the contractor.

5. Deployment Of Qualified Engineers at Work Sites by The Contractor:

5.1 In terms of provisions of Clause 26A.1 to the General Conditions of Contract, contractor shall also employ following Qualified Engineers during execution of the allotted work: a] One Qualified Graduate Engineer when cost of work to be executed is Rs.200 Lakh and above, and b] One Qualified Diploma Holder Engineer when cost of work to be executed is more than Rs.25 Lakh, but less than Rs.200 Lakh.

5.2 In case the contractor fails to employ the Qualified Engineer as aforesaid in 4 [a] and [b], he, in terms of provision of Clause 26A.2 to the General Conditions of Contract, shall be liable to pay an amount of Rs.40,000/- and Rs.25,000/- for each month or part thereof for the default period for the provision, as contained in para 4[a] and [b] respectively.

6. Terms of Guarantee/Warranty:

[i] The Contractor shall guarantee satisfactory operation of all installation under the contract for a period of 12 months, beginning from the date of provisional acceptance certificate is issued by the Rly. This guarantee shall also cover rectification of defects that may arise in the works executed under the contract due to bad workmanship on the part of the Contractor or otherwise. The defects pointed out by the Railway 's Engineer in this regard will be final and binding and the contractor/s shall have to rectify the same at his/their own cost.

[ii] The Contractor, during the guarantee period, shall carry out in his own expense all modifications, additions or substitutions that may be considered necessary, for the satisfactory working of the equipments.

[iii] During the period of guarantee i.e., 12 months from the date of issue of provisional acceptance by the Railway, the Contractor shall be liable for the replacement of any parts that may be found defective in the equipment whether such equipment be of his own manufacture or of his sub-contractor/s provided always that such defective parts as are not repairable at site are promptly returned to the [Contractor/s] works if so, required by him at his [Contractor/s] own expense. The Contractor shall bear the cost of minor repair carried out by him or on his behalf by the Railway at site. Such defective parts should be replaced by new parts, which should correct the defects.

[iv] During the period of guarantee the Contractor shall keep all materials, tools and other requisite equipment readily available and shall carry out at his own expense all modifications, additions or substitutions, that may be considered necessary for satisfactory working of the contracted work or equipment supplied by him. Final decision in respect of unsatisfactory working of the contracted work or equipment or faulty design or workmanship, etc., shall rest with the Senior Divisional Signal and Telecommunication Engineer, South Eastern Railway, Adra or Divisional Signal and Telecommunication Engineer, Adra or Assistant Signal and Telecommunication Engineer, Adra / Bokaro Steel City.

[v] No compensation towards any accident whatsoever will be paid by the Railway.

7. Repair/replacement of defective work:

Contractor shall be responsible for effectively maintain and uphold in good substantial, sound and perfect condition all and every part of the work and shall make good from time to time and that all times as often as the Engineer shall require, any damage or defect that may during the execution & warranty period arise in or discovered in any way connected with the works, provided such damage or defect is not directly caused by errors in the contract documents, act of providence or insurrection of civil riot, and the contractor shall be liable for, and shall pay and make good to the Railway or other person legally entitled there to whenever required by the engineer so to do, all losses, damages, cost and expenses they or any of them may incur or be put or be liable to, by reason or in consequence of the operations of the contractor or of his failure in any respect.

This shall include repair/replacement of defective components/ cards/equipment/cable etc. **free of cost** arising out of whatsoever reason. The contractor shall repair/replace such defective item within 15 days failing which it shall be temporarily replaced by the like item. Otherwise, penalty of 2% per week of the cost of defective PCB/module/equipment etc. will be recovered by the Railways. The time of 15 days will be counted from the date & time of information given to the contractor.

8. **Price Variation Clause is not applicable for this Tender.**
9. Letter of Credit as per Railway Board's letter no. 2018/CE-I/CT/9 dated 04.06.2018:
- 9.1 For all the tenders having advertised cost of Rs 10 lakh or above, the contractor shall have the option to take payment from Railways through a letter of credit (LC) arrangement.
- 9.2 This option of taking payment through LC arrangement has to be exercised in IREPS (Indian Railway Electronic Procurement System the e-application on which tenders are called by Railways) by the tenderer at the time of bidding itself, and the tenderer shall affirm having read over and agreed to the terms and conditions of the LC option.
- 9.3 The option so exercised, shall be an integral part of the bidder's offer.
- 9.4 The above option of taking payment through LC arrangement, once exercised by tenderer at the time of bidding, shall be final and no change shall be permitted, thereafter, during execution of contract.
- 9.5 In case tenderer opts for payment through LC, following shall be the procedure to deal release of payment through LC:
- 9.5.1 The LC shall be a sight LC.
- 9.5.2 The contractor shall select his Advising/Negotiating bank for LC. The incidental cost towards issue of LC and its operation thereof shall be borne by the contractor.
- 9.5.3 SBI, New Delhi, Main Branch will be the nodal branch for issue of LCs based on online requests received from Railway Accounts Units for tenders opened in financial year 2018-19. SBI branches where the respective Railway Accounts Office has its Account (local SBI branch) will be the issuance/reimbursing branch for LC issued under this arrangement. The Bank shall remain same for this tender till completion of contract. The incidental cost at the rate 0.15% per annum of LC value, towards issue of LC and operation thereof shall be borne by the contractor and shall be recovered from his bills.
- 9.5.4 The LC shall be opened initially for duration of 180 to 365 days in consultation with contractor. The LC shall be extended time to time as per the progress of the contract, on the request of the contractor. The value of LC to be opened initially as well as extended thereafter shall be finalized by the engineer in consultation with the contractor on the basis of expected progress of work.
- 9.5.5 The LC terms and conditions shall inter-alia indemnify and save harmless the Railway from and against all losses, claims and demands of every nature and description brought or recovered against the Railways by reason of any act or omission of the contractor, his, agents or employees, in relation to the Letter of Credit (LC). All sums payable/borne by Railways on this account shall be considered as reasonable compensation and paid by contractor.
- 9.5.6 The LC terms and conditions shall inter-alia provide that Railways will issue a Document of Authorization (format enclosed as Annexure 2) after passing the bill for completed work, to enable contractor to claim the authorized amount from their bank.
- 9.5.7 The acceptable, agreed upon document for payments to be released under the LC shall be the Document of Authorization.
- 9.5.8 The Document of Authorization shall be issued by Railway Accounts Office against each bill passed by Railways.
- 9.5.9 On issuance of Document of Authorization, a copy of Document of Authorization shall be posted on IREPS for download by the contractor. A digitally signed copy of Document of Authorization shall also be sent by Railway Accounts Office to Railway's bank (Local SBI Branch).
- 9.5.10 The contractor shall take print out of the Document of Authorization available on IREPS and present his claim to his bank (advising Bank) for necessary payments as per LC terms and conditions. The claim shall comprise of copy of Document of Authorization, Bill of Exchange and Bill.
- 9.5.11 The payment against LC shall be subject to verification from Railway's Bank (Local SBI Branch). The contractor's bank (advising bank) shall submit the documents to the Railway's Bank (Local SBI Branch).
- 9.5.12 The railway's bank (issuing bank) shall, after verifying the claim so received w.r.t. the digitally signed Document of Authorization received from Railway Accounts Office, release the payment to contractor's bank (advising bank) for crediting the same to contractor's account.
- 9.5.13 Any number of bills can be dealt within one LC, provided the sum total of payments to contractor is within the amount for which LC has been opened.
- 9.5.14 The LC shall be closed after the release of final payment including PVC amount, if any, to the contractor.
- 9.5.15 The release of performance guarantee or security deposit shall be dealt directly by railway with the contractor i.e., not through LC.
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TECHNICAL CIRCULAR NO. 2 OF 1988/ Laying of Signalling Cables.

(Issued in super session of Technical Circular No. 2 of 1984)

INTRODUCTION

Life and performance of a **Signalling cable** depend to a large extent on the care taken in installation of the cable and its joining. It has been observed of late that adequate care is not being exercised in handling and laying the cable as a result of which such cables have developed faults within a few months of their installation.

The **following instructions** are accordingly issue for laying down a uniform practice for correct procedure of laying signalling cables, which should be followed by all concerned. Wherever laying of cables is entrusted to Contractor, these instructions should be brought home to them as special conditions in the tender paper. While supervising the cable laying work to be done by the Contractor, the field Inspectors and Officers shall ensure compliance.

1. **PLANNING:**

- 1.1.1 While planning for cabling on a route, the number of conductors required, depending upon the circuits required should be first determined.
 - 1.1.2 In any cable, **spare cores shall be provided up to at least 20% of the capacity of the cable with a minimum of 2 cores.**
 - 1.1.3 Where a number of cables have been laid along a route, the circuits shall be so distributed that cables can be disconnected for maintenance purpose with the least possible dislocation to traffic. **In a double line station, it will be preferable to use separate cables for Up and Dn line.**
 - 1.1.4 After deciding the size and the number of conductors in the different types of cables to be used on a route, a foot-by-foot survey along the track should be done to determine the best route for the cable.
 - 1.1.5 The desired route should be shown clearly on a cable route plan conforming to typical cable route plan no. SI/11 9896 issued by CSTE/GRC showing the actual alignment of track crossings, crossing with power cables, water and sewage mains and other points of importance.
 - 1.1.6 A Cable core distributed plan according to CSTE's typical drawing no. SI/W 9896 should be drawn in respect of each installation. In the case of core distribution plan, all the cables should be numbered in ascending order from HWH end i.e, right hand side of the plan. If there be a necessary to lay any extra cable higher numbers can be used without distribution the existing numbering arrangement. The cables are numbered as follows: say the number is 0112(4) the extreme left two digits 01- indicates cable No: 1 the next two left digits 12- indicate total no. of cores of the cables; the digits in bracket (4) indicate the no. of spare cores available.
The tail cable is also numbered in the similar fashion with the insertion of the letter 'T' after the extreme left two digits.
 - 1.1.7 All the cables should be given distinctive numbers when the cables are initially laid. The number should be punched on a lead sleeve and the sleeve should be wrapped round the cable every 3 mts. The numbering should be in a row at one place and not put haphazardly.
 - 1.1.8 Circuit route termination chart should be drawn in respect of each circuit should be shown in each circuit starting from beginning to end. The route of the circuit should be shown in each location hut concerning it. All the cores of the existing cable should be numbered with plastic markers. These core numbering is essential so that under no circumstances a wrong. Connection can take place.
2. **CABLE LAID UNDERGROUND:**
 - 2.1 Cable should be laid underground, either directly in the trench, in ducts (in cement troughs or in pipes).

- 2.2 Laying the cables in ducts:
- 2.2.1 In yards where **large number of cables is required to be laid in connection with Panel/RRI installation**, the cables may be laid in **RCC ducts or brick channels with removable top cover**. In such cases the **cable shall be laid in a serial order with one two rows** or as necessary taking core **to avoid crossing of the cable** inside the duct and at the entry to the cable termination room. The location of cable such should be so decided that in case of derailment there is no possibility of damage of the cable inside the duct by the derailed vehicles.
- 2.2.2 Laying of the cables in the ducts is subject to a special check to ensure that the area is not theft prone.
- 2.2.3 The ducts shall have suitable covers capable of being removed for inspection.
- 2.2.4 Whenever the cable is laid in the duct there shall be **holes on the bottom**, of the ducts for draining away any water that may collect.
- 2.2.5 Ducts shall be kept close to the surface of the ground so that the cover can be removed easily without digging the earth.
- 2.2.6 When cables are laid **in rocky areas**, it is desirable to protect that with **split RRC ducts**.
- 2.2.7 Where **several cables of different categories** have to be laid in the same trench, they **shall be placed as far as possible** in the following order starting, from the main trackside, so that in the event of failures, the maintenance staff may easily recognize the damaged cables:
- i) Derivation cable for Axle Counter.
 - ii) Signalling cable or cables.
 - iii) L.T. Power cable (less than 660 Volts).
3. **Telecom cables** or cables belonging to Posts & Telegraphs Deptt. or cables of Electrical Department **must not be laid in the same trench along with signal cables**. However, laying of derivation cables for axle counter and LT Power cable for signalling circuit is permitted in the same trench along with Signalling cable as a special case. **The signalling cables must be separated from power cables by a row of bricks between them.**
- 3.1 **TESTING OF CABLE BEFORE LAYING:**
- 3.1.1 Before the cable is laid, visual inspection of cable shall be made and it shall be tested for insulation and continuity of the cores.
- 3.1.2 Bedding and armouring shall also be inspected to see that there has been no damage during transit for in storage.
- 3.1.3 Before the cable is unwound from the drum; its insulation must be measured after removing the end seals. No having insulation lower than that specified in the specification shall be laid.
- PAYING OUT THE CABLES:**
- 3.1.4 For paying out cables, the cable drums shall be mounted on able wheels.
- 3.1.5 The drum on the wheel shall be brought to one end of the trench and the end of the cable freed and laid in the trench
- (i) The cable wheel shall then be drawn along the road track.
- 3.1.7 A party of labourers shall follow the drum and guide the cable from the road into the trench carefully so that the cable is not damaged pr bent unduly.
- 3.1.8 In cases where the wheels are not available, **the drums shall be mounted on an axle at one end of the trench and cable paid out and carried by labourers.**
- 3.1.9 **In no case, shall the drum be rolled off on to the road for laying the cable and the cable dragged on the ground for laying purposes.**
- 3.1.10 It should be ensured that **no kink** is formed while paying out the cable.
- 3.1.11 In no case shall be cable drum be laid flat on the ground and cable unrolled from, the drum by **twisting** the cable. This procedure may cause permanent damage ton the cable.
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3.2 **LAYING:**

Cables shall be laid generally as per standard instructions. Special precautions shall be taken in the station yards etc. where a number of other utilities may be existing.

3.2.1 The cable laid parallel to the track and between home signals of at station shall be laid at depth of 1 meter. Cable laid across the track shall be **1 metre below the rail flanges**. Cable laid beyond the home signals in a yard Automatic signals area; or IBS or level crossing gates must be at a **depth of 1.2 metre**. At station yards which are **theft prone, the cable shall be laid at 1.2 metre depth**.

3.2.2 The **width of the cable trench shall normally be 0.5 metre**. The bottom of the cable trench shall be leveled and got rid of any sharp materials. In the soft ground, the cable shall lay at the bottom of the trench previously leveled. In the **rocky ground, the cable shall be laid on a layer of sand** or sifted earth of 0.05-meter thickness previously deposited at the bottom of the trench. Both the above cases, **the cable shall be covered with a layer of sand or sifted earth of 0.10 Mt. thicknesses**.

3.2.3 **CABLE CROSSING:**

3.2.4. When a cable has to cross the track, it should be ensured that: -

- i) The cable crosses the track at right angles.
- ii) The cable does not cross the track under points and crossing end.
- iii) The cable is laid concrete/G.I./C.I./ pipes, or suitable ducts while crossing the track.
- iv) In no case cable should be laid without ends having been sealed to avoid water entering through pipe end and damaging the cables.

3.2.5 When cables have to be laid along **culverts**, they shall be suitably protected end supported. These shall be taken either (a) on the covert through a G.I. pipe not less than 2" dia or (b) taken in the bed of the culvert provided the river or gutter remains dry, most of the season. When taking cable through pipe along the bridge, it should be suitably supported and the entry and exist ends of the cable at the diversion point, cable shall be laid in concrete duct as it is most vulnerable portion of the cable run. **NOTE: Extreme care should be taken to ensure that outer P.V.C. insulation and armouring of cable is not damaged while taking cables through pipes.**

3.2.6 When cables have to be laid along a metallic bridge, they should be placed inside a metallic trough which may be filled, an anti-theft measure, with sealing compound. The cable should be supported across the bridge in manner which would involve minimum vibrations to the cable and which will facilitate maintenance work. In A.C. electrified areas where suitable return patch may not be available for traction an additional thick conductor must be laid along with signalling cable and should be earthed at both ends. **An extra length of about 6 Mts. should kept at both ends in the form of coils in case it is laid along culvert or bridge.**

3.2.7 **In theft-prone areas Cable Markers must not be provided** but the route plan should clearly indicate the off sets from reference marks.

3.2.8 While laying the cables in accordance with the above instructions, the following precautions should be adhered to for the safety of the track: -

i) **Outside the station limits**, the cable shall generally be laid at not less than **5.5 meters from the centre of the nearest track**.

ii) **Within the station limits**, the trenches shall preferably be dug at distance of **not less than 3 Mts**. From the centre of the track, width of the trench being outside the 3 Mts. Distance.

iii) At each end of the main cable an extra loop length of **6 to 8 meters shall be kept**.

3.2.9 It is desirable that the excavation of the trenches is not done in long lengths and does not remain uncovered overnight. It is preferable that trenches are dug, cables laid and refilling done on the same day.

- 3.2.10 The inspecting official, who supervises the excavation work, shall have the shoring materials ready in hand so that in banks where ashes or loose materials are encountered, shoring can be adopted.
- 3.2.11 Back filling of the trenches should be done properly, rammed and consolidated.
- 3.2.12 During excavation, the earth of the trenches shall not be thrown on the ballast. The earth shall be thrown by the side of the trenches away from the track.
- 3.2.13 In places where cables are to be laid close to the track, though preliminary digging up to 0.5 Mts. may be done excavation to the full depth should be done only just before laying the cables in the presence of an official from Engineering Department.
- 3.2.14 The work shall be supervised at site personally by an official of the Signal and Telecommunication Department not below the work of a Signal Inspector.
- 3.2.15 **JOINTING OF CABLES IN 25 KV A.C. ELECTRIFIED AREAS:**
When underground straight-through joints are made, special care must be taken to maintain the electrical continuity of the sheath and armouring. For jointing PVC cables, EPOXY cable jointing Kit similar to M. Seal kit No. S/II, S/III, S/V should be used.
4. **JUNCTION BOX:**
No underground straight –through joints shall be used in signalling cables for future installations. The junction /Location Boxes of approved design shall be used for putting through the signaling cables.
- a) The installation of junction boxes for cable termination are to be restricted strictly between the Home Signals of a station.
- b) Beyond the Home Signals of a station where termination of the main cables is required for connecting to track point or signal control, location boxes only should be installed and not junction boxes.
- c) The cable leading into the junction box should be suitably protected by G.I. pipes.
- d) The bolts heads of the junction box covers shall be invariably riveted.
5. Cable leading to the signal posts should be taken through the post if the signal is tubular. In case of any other type of signal posts such as lattice type of joist type, cables should be taken through pipes.
6. **CABLES LEADING TO CABIN/ STATION BUILDING/ RELAY ROOM/ GOOMTIES:**
- 6.1 In case of cable leading to cabins/Station Building/Relay Rooms/ Goomties the floors of which are considerably higher, they should be taken through G.I. pipes by giving off sets. **A number of cables should not be tightly fitted in one pipe.** Extreme care should be taken that outer P.V.C. insulation or armour of the cable is not damaged while these are taken through G.I. pipes.
- 6.2 In the Cabin/Relay room/Goomty/Location hut, the entry point of cable from outdoor should be **protected by suitable masonry and plaster to guard against physical damage as well as entry of water and insets.**
- 6.3 The area enclosing the base of cables should be filled up with layer of sand. In addition, thin layer of cement plaster with good top finish should be provided. The cement plaster layer should be such that in case of necessity, the same can be easily broken for repair of cables or for laying additional cables. This arrangement is to adopted; in respect of both existing and future installations.
7. **MAINTENANCE:**
- 7.1 Cable routes should be checked by walking along the route to ensure; that there is no feasibility of cable exposure on account of any excavation work over the cable route or due to soil erosion. If necessary, earth work should be done over the cable route to ensure that there is no possibility of accumulation of rain water over the cable route due to the formation of a drain on account of sinkage of soil. The cable route should be checked at least once a month.
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- The cable routes should also be kept free from jungle growth, etc. so that in case of necessity, excavation work can; undertaken by S&T staff without difficulty.
- 7.2 Should an existing cable be exposed due to making of a drain, the same should be protected by two channel irons of adequate length to cover the exposed length. The channel irons should be firmly secured with clamps should not bolt. The inter distance between two clamps should not exceed one meter. The ends of the channels should be concerted.
- 7.3 Should there be heavy soil erosion over a portion if the cable route and it is not possible to cover the same with earth, the effected portion of the cable route should be concreted taking precaution that the cable is not damaged on account of concreting.
- 7.4 Before any excavation work is under taken affecting the cable route. Signalling staff should be posted at site to guide the excavating party so that the cable is not exposed or damaged. It must be ensured that such excavation work is not undertaken by any party without the express permission of the concerned Signal Inspector. Copies of the cable route plan should be given to IOW, PWI, Electrical Foreman etc. as inadvertent excavation is avoided.

8. MEASUREMENT OF INSULATION RESISTANCE OF THE CABLE:

- 8.1 The insulation resistance of the main cable should be measured at least once in a year. The insulation resistance of tail cable should be measured at least once in six months.
- The insulation resistance of the main cable should be measured strictly as per procedure mentioned in CSTE's Technical Circular No. Sig/1 of 1981. The test results should be recorded in a register according to the proforma supplied along with above circular. The defective cable if any should be rectified at the earliest. The details of all joints in a cable should also be mentioned in the register in addition to mentioning them in cable route plan.
- This super deeds Technical Circular No. 2 of 1984.

Cable laying Process for various S&T cables/Telecom

1. SUPPLY OF TAPPING & ROUTE PLAN:

Tentative cable route plan, tapping plan and jointing schedule for jointing of cable will be prepared and supplied by the contractor in consultation with the Railway's Engineer after survey of the cable route and **before the commencement of the work**. This shall give an accurate idea of number & locations of various tapings required. **After completion of the work, final cable route plan & tapping chart etc. should be submitted as per tender schedule.**

2.1 The Railway supervisor will show the cable route to the contractor and the contractor shall mark the route before starting the trenching work.

2.2 Drawing indicating the kilometer rage of the section, level crossing gates, SP/ SSP/FP will be provided by the Railway.

3 The 20 pair / 10 pair Jelly Filled armoured Telecom cable is to laid at each Railway station. The exact cable plan for each station will be furnished after awarding the contract. The Communication from Optic Fibre repeaters to the Station Master, repeater stations and other places shall be provided by this cable.

4 One or more 4/6-Quad cable is to be laid for the following purpose: -

(i) Communication to the level crossing gates and to SP/ SSP/ FP from Optic fibre repeaters. The level crossing gates and SP/ SSP/FP are located enroute and exact location shall be provided after award of contract.

(ii) Station-to-Station Block working.

(iii) The emergency communication. The cable will be tapped at every (1+ 0.1) KM. and at other obligatory points such as SP/ SSP/ FP enroute.

5. CABLE TRENCHING: -

5.1 **Trenches for Telecommunication cable shall be normally dug to a depth of 1.2 Mtr.** or as specified in the schedule of work. **The width of the trench shall be 300 mm.** or as specified in the schedule. In places where, underground pipes, electric main etc. come in the way, trenches deeper than 1.2 Mtr. shall be dug as necessary and protection arrangement shall be given as per drawing/ instruction of the Engineer.

9.5.16 Execution of trenches and laying of Underground cable Optic Fibre & 4/6-Quad Telecom Cables in all type of soil and chase cutting in beds of rock alongside the Railway track in mentioned section. this includes cable laying under the road and rail crossing and on culverts a bridge inside G.I. pipe/Brick channel/RCC/DWC pipe as per approved drawing.

5.3 The Railway Engineer shall be the sole authority for deciding whether the ground is classified as moorum, rocky soil or otherwise. In places where underground pipes, tree roots, electric main etc., come in way, the depth of the trench shall increase as considered necessary by the Railway Engineer at site. The decision regarding depth of trench required at different section, the Engineer at site shall make depending on the site condition.

5.4 Supply of earth pipe, earthing wire excavation of pit and preparation of pit shall be made as per approved drawing.

- 5.5 The excavation of trenches shall generally be done in lengths consistent with the average daily rate of cable laying so that it may be possible to lay the cable and cover the trench up during the course of the same day. The trenches will not remain uncovered overnight unless authorized by the Railway's Engineer. During excavation, the excavated soil shall not be thrown on ballast but to the other side of the trench well away from track.
- 5.6 If during the excavation of trenches for laying cables, the contractor representative notices the presence of oil substance or any other chemical or rodents which are likely to cause deterioration of the cable, he shall bring the matter to the notice of the Railway's Engineer at site as per decision the contractor shall adopt alternative alignment for the cable or protect the cable as advised in writing by the Railway's Engineer.
- 5.7 The excavation shall include excavation of trial holes, clearing bushes and roots of trees along the trench, and adopting shoring in case of loose soil or banks made of cinders and ashes, nothing extra will be payable to the contractor on these counts.
- 5.8 Where the direction of the trench has to change it should be done in gentle curve of not less than one metre radius.
- 5.9 While excavation if the contractor comes across any other cable already laid, he shall first report the fact to the Railway's Engineer at site. In case the cable is identified by the Railway Engineer as a power cable (L.T. or HT), the trench shall be done as far away from the route of the power cable as may be practicable. The telecom cable should be laid inside the RCC pipe/brick channel keeping the distance from SP/SSP as per standard practice or as advised by Railway site engineer.
6. **TRACK CROSSING:**
- 6.1 All cable crossings across Railway track shall be done in RCC/DWC pipes, laying the cable inside the HDPE pipe through these pipes. The contractor shall do the trenching to the required depth wherever necessary such as approaches to track crossings the length in between the adjacent tracks. **Two G.I. wires of 10 SWG size shall be threaded through RCC/DWC pipes one to pull the cable and one for future use.** The arrangement of cable and RCC/DWC pipe for track crossing has been shown in SEM Drawing No. 15-D5.
7. **ROAD CROSSING:**
- 7.1 When crossing the road ways, it is necessary to lay the cables in such a manner as to avoid necessity of handling the cable sharply and minimize the excavation of road surface as far as possible.
- 7.2 The crossing of main roads often involves difficulties especially if traffic is heavy, precaution to avoid accident to work men, pedestrians and vehicle should be taken. On minor roads which can be temporarily closed to traffic, it is possible to open up and cross the entire width of the road. Pipes should be installed quickly in the cutting and then filled in there by reducing to a minimum time for which the road is closed.
- 7.3 Some roadways, which are broad may be opened for half their width, allowing other half for use of traffic. Pipes are laid, trench filled in the first half and then other half opened up, pipes laid and linked with the pipe laid in the first half.
8. **INSPECTION AND TESTS: -**
- 8.1 The inspection and tests for the materials supplied under this tender will carried out by the representative of Sr. DSTE/ADA to ensure that all the requirement of the specifications is complied with. The purchaser has the right to reject units or parts there of which are defective in any respect.

- 8.2 The Railway shall depute not more than two Engineers for the inspection at the premises of the contractor. The contractor shall give a clear fifteen days advance notice to the Railway for this purpose. The contractor should bear the cost of inspection. The traveling expenses in India will be borne by the Railway.
- 8.3 Test equipments and circuits which ensure accurate results shall be used and provided by the contractor
9. **Instructions for transporting and uncoiling the cable drums:**
- 9.1 The cable drums shall be transported by the contractor from the concerned store of and shall be distributed along the route. The drums shall be unloaded by the side of the Railway track by the contractor, the drums shall normally be unrolled at the same place and the cable carried by the workmen near the trench. **The drums shall not be dragged.** In case it is found necessary to shift the drum, it shall be rolled cautiously on a smooth surface, taking sufficient care that cable is not damaged in any manner.
- 9.2 The drums after being unloaded shall be guarded and protected by the contractor. **The cable drums shall be covered by tarpaulin arranged by the contractor until the cable is laid.** The cable drums are to be covered up immediately on unloading.
- 9.3 **The cable drums shall be kept upright, i.e., axles in horizontal position.** The drums shall not be set by jerks but shall be handled slowly with care.
- 9.4 The contractor shall rewind the surplus cable and transport back the same as well as empty cable drums, wheels etc. to the concerned stores for which no extra payment will be made to him.
- 9.5 Cable drums must always be rolled in the direction of the arrow usually painted on the drum. In case the arrow mark is missing, on any drum, the direction of rotation shall be ascertained from Railway's Engineer. The drums shall not be rolled more than what is absolutely necessary, not even in the prescribed direction.
- 9.6 **The cable shall in no case be bent such that the bending is not less than 30 times the outside diameter of the cable.**
- 9.7 While rolling a cable drum for laying, the drum shall be supported on axle running through its center, the height of the axle being such that the end flanges are free to roll and do not touch the ground at any point. The cable shall be carefully uncoiled by gently pulling the cable and carefully turning the drum. Quick pulling of the cable or turning the drum shall be avoided. Each cable drum shall be braked while laying is in progress to prevent sharp bending or buckling, particularly when the cable coils are sticking together. The following personnel (minimum) shall be employed near the drums:
2 men for handling the brakes
1 men.... properly trained for uncoiling of cable
2 men for uncoiling (close to the drum).
drums are to be covered up immediately on unloading.

- 10.1 **Before proposing to lay the HDPE pipe /OFC in the section, the contractor shall obtain the permission of the Railway Engineer.**
- 10.2 The **bottom of the trench** where the HDPE pipe and 4/6quad/ PIJF cable is to be laid shall be prepared and **shall be free from any loose earth, stones etc.** The copper cable and HDPE pipe shall be covered with sieved soil.
- 10.3 The condition of cable shall be visually inspected throughout its length and in case any damage or defect is noticed, it shall be notified to the Railway's Engineer for his examination. The contractor to the Railway's satisfaction shall repair any visible damage noticed on the cable or the contractor at his cost shall replace entire cable.
- 10.4 The back filling of the trenches shall be done by spreading and consolidating the excavated soil in layers not exceeding six-inch depth. All the soil that excavated be put back into the trench and consolidation shall be done properly to ensure that there is no shrinkage in monsoon.
- 10.5 At locations where rocky soil is encountered, the chase cutting shall be performed as per drawing No. Con/SK/T/1 with prior approval of Railway's Engineer. The HDPE pipe and bitumen shall then be poured on the HDPE pipe and copper cable uniformly up to a height of 12 mm. above the top of the HDPE pipe/copper cable. **While pouring bitumen compound** condition of the copper cable and HDPE pipe shall be observed minutely against any damage care shall be taken to ensure that the temperature of compound to be poured **not exceed 140 degrees Celsius. The optic fibre cable shall be drawn through HDPE pipe after cooling of bitumen temperature.** The chase shall then be covered with bricks placed breadth wise and plastered with cement mortar as per the drawing. The drawing does not show the HDPE pipe, which shall be fixed by the contractor. Instead of pouring of bitumen compound, brick work and cement concreting up to the rock formation level can be done as per the decision of the site Engineer-in-charge.
- 10.6 All cable crossing across Railway tracks shall be done by taking the HDPE pipe and copper cable through RCC/DWC pipes with collars as specified in the schedule at a depth of 1.0 M.
- 10.7 For laying the cable on culverts & arch bridges, which are normally full with water, the HDPE pipe and copper cable shall be laid in separate G.I. pipes. The cable laying shall be done as per SEM Drawing No. 15-D7.
- 10.8 The cable laying on girder bridges having a span up to 6 Mtrs. without any intermediate support and up to 12 M. with an intermediate support, copper cable and HDPE pipe shall be laid as per SEM Drawing No. 15-D6.
- 10.9 For fixing of G.I. pipe on girder bridges with a span of more than 6 Mtrs. without an intermediate support, **fixing of G.I. pipe shall be done by clamping arrangement.** The design of the clamping arrangement shall be approved by Engineer-in-charge of the work as per site conditions. The clamp shall be fixed at the maximum interval of 2 Mtrs.
- 10.10 For taking the cable inside any masonry building, **it shall be drawn through cutting a hole in the wall of the masonry structure at a depth of 0.75 M.** and shall be protected at the bottom by drawing a cable through flexible GI pipe of inside dia. 40mm. thickness 2 mm. and length 600 mm. and as per drawing No. RE/S&T/ALD/SK/161/81. After the cable has been laid inside the masonry wall, the floor inside the building shall be duly repaired and finished by the contractor.
- 10.11 For laying the cable through pipes, **a galvanized steel wire of not less than 10 SWG thickness** shall be used as a lead wire. **Two such wires shall be laid through the pipes,** such that after cable is threaded through the pipes, **one wire is permanently left in the pipe with a suitable overlay at two ends to enable the cable to be pulled out at a later date,** whenever is required.
- 11 **Laying of 4/6quad/ PIJF cable:**
- a) While laying the 4/6quad/PIJF cable, the contractor shall employ adequate number of men so that cable is handed conveniently. The distance between any 2 adjacent persons while carrying the cable shall be such that maximum sag of the cable between any two adjacent persons is not more than 0.25 Mtr.

b) Before laying commenced, the cable shall be uncoiled first in a straight line supported by men and then carried to the trench and laid. Under no circumstances cable shall be thrown into the trench. The cable shall not be twisted while laying on any account. The condition of cable shall be visually inspected throughout its length and in case any damage or defect is noticed, it shall be notified to the Railway's engineer for his examination. The contractor to the Railway's satisfaction shall repair any visible damage noticed on the cable or the contractor at his cost shall replace entire cable.

c) The cable shall not be laid tightly on the bottom of the trench but shall have a slack. A minimum slackness of 30 Cm. of cable length shall be provided for every 10 Metre of trench near embankment that is lying to slip to allow for any possible subsequent downward movement of the soil.

12 **Optical Fibre Cable laying:**

HDPE pipe shall be laid in the trench while laying copper cable. The subsection on which OFC cable can be blown shall be made continuous by providing **coupling at pipe joints** and **cable plug shall provided both ends of subsection**. The subsection ends at which cable is blowing and taken out shall be marked and pit of sufficient size shall be dug for OFC cable laying. After cable laying in the duct, **the ends of the duct shall be sealed with sealing plug**. Optical Fibre cable shall be laid inside laid HDPE pipe by blowing technique. The contractor shall arrange all the machinery, equipments required for laying Optical Fibre Cable in this procedure. The cost involves any consumables & labour required for laying the cable.

13. **GENERAL:**

- 13.1 The contractors are to submit their quotations as per enclosed schedule and shall submit the following details as per check list & the Tender.
- 13.2 The Contractor shall quote for the system as a whole covering all items of material supply and work specified in the tender. Bids quoting only some or part items will be treated as incomplete and will be rejected.
- 13.3 Tenderer shall submit time schedule for completing different stages of the work within the specified completion period from the date of issue of letter of acceptance including monsoon together with details of deployment of personnel indicating approximate number of skilled and unskilled staff in different stages. Deployment of vehicle and machinery shall also be mentioned.
- 14.1 The packing shall be able to withstand the tropical conditions fully and give adequate protection to the equipment during transit and pre-installation storage.
- 14.2 The packing shall be strong and durable so as to able to withstand handling and transportation without damage to the equipment.
- 14.3 If necessary, the packing shall have anti shock suspension devices to enable the equipment to withstand without damage shock experienced during handling and transportation.

15 **Cable Jointing:**

- 15.1 The marking of excavation of pit for cable jointing will be given by Railway's Engineer.
- 15.2 Pit of optic fibre cable joint: - For OFC jointing, cable pit shall be made as per drawing No. RDSO/TCDO/COP-21(a) or alternate drawing approved by the competent authority. The jointing of the optic fibre cable shall be done by the contractor under the supervision and certified by the authorised representative of Sr. DSTE/ADA. Splicing loss should be within the limit as laid down by the CCITT/ ITU-T specification. High quality fusion splicing machine should be used.
- 15.3 Pit for Telecom cable joint: - A pit of size **1.5 M. x 2 M. x 1.2 M. (depth)** shall be dug wherever 4/6Quad telecom cable or 20 pair jelly filled cable jointing is required to be made. Its bed should be properly rammed. If the bed soil is found to be loose then the contractor shall resort to ballast soiling.
- 15.4 Jointing of Telecom. Cables: -The 4/6Quad telecom cable shall be jointed using RTSF kit thermo-

shrink sleeve technique. The 20 pair jelly filled cable shall be jointed with 20 pair RTSF kit thermo-shrink sleeve technique. This jointing work is to be executed by the contractor under the supervision of site engineer / his representative.

16 **Cable Termination:**

16.1 The marking of cable termination will be given by Railway's Engineer.

16.2 Termination of telecom cable: - A board of approved make suitable size depending on the size of C.T. Box shall be mounted on the wall where termination is required. 10 pair C.T. Box shall be used for terminating 4-quad Telecom. Cable. 20 pair C.T. Box shall be used for terminating 6 quad cable and 20 pair jelly filled telecom cable. Before termination, insulation resistance of each conductor of the cable shall be tested between conductors and conductor and cable sheath with 500 V. Megger. Also, insulation resistance between terminals and terminals and C.T. Box case shall be measured with 500 V. Megger. The test results shall be signed by both Railway's and Contractor's representative. Any deviation in insulation and attenuation from the specified values, shall be replaced by the contractor to the Railway's satisfaction at his cost.

17. **RECORDS AND MARKING: -**

17.1 Contractor shall provide plastic laminated file at all repeater station to keep station data. following station data shall be recorded in the A4 size paper, plastic laminated and keep in the file for future reference: -

- a) Name of the section, date of measurement, fibre signal level loss, exact location of cable joints, OFC and Quad cables insulation resistance, loop resistance etc.
- b) Insulation, Attenuation & Pair Allocation data of each telecom cable terminated inside cable hut / Repeater.

18. **ACCEPTANCE CRITERIA:**

18.1 Before and after laying the cable, each fiber of the laid cable will be subjected to OTDR test at 1310nm & 1550nm. window. The hard copy result, as well as soft copy, if any obtained, shall represent secondary performance base line. The result will be compared with primary performance base line (Factory test Report). In case of any deviation in the attenuation profile, the same will have to be repaired (by the Contractor) and any trenching or digging or relaying done for such repairs, will not be paid by the Railway. The acceptance tests shall be conducted on sub-sections and the result should be in conformity with the design standard.

18.2 While taking delivery of 4/6quad/ PIJF cable from the Railway store, all parameters of the cable shall be tested and ensured that the cable fulfils all the standard parameters, before laying and after laying, all the parameters shall be tested. In case of any deviation beyond the acceptable limit, the same will have to be repaired (by the Contractor) and any trenching or digging or relaying done for such repairs, will not be paid by the Railway. The acceptance tests shall be conducted on sub- sections and the result should be in conformity with the standard value.

