

## 1. Scope of the work

Name of the Work:- Provision of Cable clearance for Execution of Chakulia Yard Modification including FOB, Minor Bridges, Service Building etc. and other miscellaneous works under jurisdiction of Dy.CE/Con-II/KGP, of Kharagpur division in South Eastern Railway. Not limited to, includes as under:

1. Preparation of cable route plan existing as well as new before the start of the outdoor works.
2. Outdoor works i.e. trenching, cable laying, signal/location foundation/erection/wiring, cable jointing, DC track circuiting work, painting, testing, commissioning, etc including outdoor work as per schedule of works of concerned stations/sections.
3. Necessary Cable clearance related works at Yard and Section as per site conditions as per instruction of Railway site Engineer.
4. Supply of all types of underground cables such as 6 Quad, signalling cables, power cables & OFC cables are not covered under the scope of the work.
5. Any other works required as per schedule of works for cable clearance of the said station and section.

The above list is not exhaustive and may include any other works allotted by the Engineer in charge, if required.

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## 2. Special Conditions of Contract

1 All the works shall be carried out in accordance with the instructions given in:

- i. Signal Engineering Manuals with latest correction slips.
- ii. Telecom Engineering Manual with latest correction slips.
- iii. Specification, Drawings and instructions issued by RDSO/Lucknow.
- iv. Technical circulars issued by South Eastern Railway.
- v. Instructions given by the original equipment manufacturer.
- vi. Drawings issued by the HQ office.
- vii. Any other instructions issued from time to time by the Engineer of the Railway at site.

2 **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.

3 Supervisor shall jointly inspect the site and make up a program and put up to Dy.CSTE/Construction/KGP or his authorized representative for his approval. The work shall be carried out as per the program approved by Dy.CSTE/Construction/KGP or his authorized representative.

4 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.

5 **Inspection of work and Measurement:**

5.1 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 the purpose of payment to the contractor will be undertaken as per IRGCC-2022 with latest correction slip.

5.2 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.

- 5.3 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 carry out alteration / replacement to such works to the satisfaction of the engineer for which no additional expenses shall be borne by the Railway Administration.
- 5.4 The Contractor shall carry out 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.
- 5.5 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.
- 5.6 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.

**6 Warranty** (PCSTE/GRC's office letter no. S&T/PI/1654(Tender/Policy)/1080 dated 24.11.2020.

- 6.1 The contractor shall guarantee that all materials and equipment to be supplied and installed as per this tender shall be free from defects and faults in design, material, workmanship and manufacture and shall be of the highest grade and consistent with the established and generally accepted standard for materials of the type ordered and in full conformity with the contract specifications.
- 6.2 The contractor shall warranty satisfactory operation of complete installation under the contract for a period of 12 (Twelve) months, beginning from the date of actual commissioning of the asset/ station or shifting of cables in the station/section.
- 6.3 All inspections, replacements or renewals carried out by the Contractor during the warranty period shall be subject to the same conditions of the contract.

**7 Penalty to be imposed for damages to cable:**

The penalty in case cables is damaged by the contractor during execution of the work shall be dealt as per Railway Board Letter No.2021/Tele/5(2)/3-Part(1) (3425647) dated 12.06.2023 along with local circular letter No. Computer No. 126508 dated 19.02.2024 or any other latest Circular/Policy issued in this regard.

**8 Deployment of Qualified Engineers at Work Site by the Contractor:**

- 8.1 The contractor shall employ minimum 1 number of Qualified Diploma/Degree Engineers during the execution of the allotted work. Further, in case the contractor(s) fails to employ the Qualified Diploma/Degree Engineer aforesaid above, he shall be liable to pay an amount Rs 15,000/- per month
- 8.2 The contractor shall submit the copy of Bio-data and Degree/Diploma certificate of the above technical staff employed by him for the scrutiny by Railway and the same will be approved by Railway and shall be available during the currency of work execution for record purpose. Railway reserve the right to scrutinise the records of the contractor to ascertain as to whether the qualified staff has been actually employed by him and is paid for. The decision of the Engineer-in-Charge as to the period for which the required technical staff was not employed by the Contractor and as to the reasonableness of the amount to be deducted on this account shall be final and binding on the Contractor.

**9 Supply of Materials:**

- 9.1 Before placing an order for the materials to the firm, a detailed list of item/items which are going to be procured indicating address/location of the said firm, firm name, proposed quantity to be procured & total quantity available in the contract agreement/supplementary contract agreement to be submitted to the Dy. CSTE/CON/KGP.
- 9.2 The supply of materials through Works contract should commensurate with the progress of work vide PCSTE/GRC's office Letter No S&T/Proj/Tender/Misc-Policy/860 Dated 29.11.2022 point no 4.
- 9.3 The items, which are to be procured as per IRS/RDSO specifications shall be procured from RDSO approved firms (if available).

**10 Inspection of Materials:**

- 10.1 The materials/equipments to be supplied by the Contractor shall be inspected by RDSO/RITES/authorized representative of Railways before dispatch of the materials as specified in Annexure (Details of Inspection Authority) attached along with tender document. Any mismatch of inspection authority between tender schedule & above mentioned annexure for inspection, Inspecting authority will be decided as per latest guidelines of Railway Board/RDSO/RITES. All the inspection charge for third parties (RDSO/RITES etc.) will be borne by the Contractor. If required by Railway Engineer, these materials/equipment shall be subjected to the further inspection at the work site also and the cost thereof shall also be borne by the Contractor. If RDSO/RITES decides, not to inspect the material due to whatsoever the reasons, inspection will be carried out by representatives of Railways.
- 10.2 Whether a product has or has not been accepted at the point of manufacture, if, upon arrival at destination, it does not meet the requirements of the specification, it may be rejected and the Contractor shall undertake disposal of the rejected products and shall bear all charges.
- 10.3 The Contractor shall provide such instruments and apparatus as may be necessary for carrying out the tests.
- 10.4 If inspection authority of any item/items is not defined then Tender Accepting Authority will be the final authority to decide the same.
- 10.5 Any relaxation with respect to inspection authority, shall be with the prior approval of the Tender Accepting Authority, giving full justification by the field unit. This is to be resorted to in very rare cases. The Railways' decision shall be final and binding on the contractor.
- 10.6 Certificate of inspection to be submitted along with the supply.

**11 Period of Completion:**

Period of completion of this work is 6 Months from the date of issue of LOA. The Contractor shall execute the Project in accordance with the Project Completion Schedule decided by Railway.

**12 Delays and extension of time:**

Will be dealt as per IRGCC-2022 with latest correction slip.

**13 Cable laying practice and outdoor installations:**

- 13.1 For cable laying by HDD, procedure as detailed in CSE's letter No. S&T/S/313/Pt. II/134 dated 20/02/2024 should be adopted.
- 13.2 DWC HDPE Pipes should not be used for protection of cable in exposed portion vide CSE's letter No. S&T/S/313/Pt.II/114 dated 12/02/2024.
- 13.3 No underground joint is permitted in signaling cable.
- 13.4 Initial/proposed cable route plan shall be approved by divisional authorities. Initial cable route plan of Station should show existing cables also in different colour. Final cable route plan (as built) should be submitted to the division after commissioning of work after joint verification with Open Line SSE. Cable Route Plan should clearly show provision of duct/pipe and also scheme of protection in bridges/culverts and areas of low depth.
- 13.5 Where proper depth cannot be ensured, only RCC duct/GI Pipe should be used along with protective masonry work. In track crossing, DWC pipe/RCC pipe can be used if track is crossed more than one meter below.
- 13.6 Conductors of 6 Quad cable being terminated in Apparatus cases shall be provided with insulating sleeves for the entire length for which armory has been removed.
- 13.7 In corrosion prone area, galvanized/stainless steel/FRP location boxes shall be provided
- 13.8 Availability of proper cutters/strippers with the wiremen of the contractor should be ensured at site before any outdoor/indoor cable termination work is undertaken.
- 13.9 Screw less type terminal block of International Standard as per RDSO Specification No. RDSO/SPN/189/2004 with 2 in - 2 out facility only to be used on Cable Termination Rack inside Relay Rooms, Relay Huts, Goomties, Cable Huts etc. Petroleum jelly shall be used at the stage of termination of cable conductors.
- 13.10 Modular cable sealing arrangement as per RDSO Specification No. RDSO/2010/EM/SPEC/0000, Rev '0' is to be used for sealing of cable at entry point in Relay Room, Location Hut and Location Boxes etc.
- 13.11 In yard, cable duct for OFC shall be laid with proper Duct coupler and Duct stopper for utilizing in future works
- 13.12 Electronic cable route marker which enables geo-tagging of cable route should be used to mark the existing main cable and tail cable at Green colour (which are infringing) and black colour (Not infringing cable). New main cable and tail cable route should be shown in Red colour.

### 3. Cable laying Process for various S&T cables/Signal

#### 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 issued 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 Contractors, 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 While planning for cabling on a route, the number of conductors required, depending upon the circuits required should be first determined.
- 1.2 In any cable, spare cores shall be provided up to at least 10% of the capacity of the cable with a minimum of 2 cores.
- 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.
- 1.4 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.
- 1.5 The desired route should be shown clearly on a cable route plan conforming to typical cable route plan no. SI 9896 issued by PCSTE showing the actual alignment of track, giving offsets from permanent way or permanent structures. The diagram should preferably indicate the various road and track crossings, crossing with power cables, water and sewage mains and other points of importance.

- 1.6 A Cable core distributed plan according to CSTE's typical drawing no. SI 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 necessity to lay any extra cable higher numbers can be used without disturbing 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.
- 1.7 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 mtrs. The numbering should be in a row at one place and not put haphazardly.
- 1.8 Circuit route termination chart should be drawn in respect of 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 markers should generally tally with the terminal nos. This 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 serial order with one or two rows as necessary taking care to avoid crossing of the cable inside the duct and at the entry to the cable termination room. The location of cable duct 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 them with split RCC 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 recognise the damaged cables:
- I. Derivation cable for Axle Counter.
  - II. Signalling cable or cables.
  - III. L.T. Power cable (less than 660 Volts) (if necessary).
- 2.2.8 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 signaling cables must be separated from power cables by a row of bricks between them.

### 3 **Installation:**

#### 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 cable 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 cable 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.
- 3.1.6 The cable wheel shall then be drawn along the road or 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 or 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 the cable drum be laid flat on the ground and cable unrolled from the drum by twisting the cable. This procedure may cause permanent damage to the cable.

### 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 a 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 levelled and got rid of any sharp materials. In the soft ground, the cable shall be laid at the bottom of the trench previously levelled. In the rocky ground, the cable shall be laid on a layer of sand or sifted earth of 0.05meter thickness previously deposited at the bottom of the trench. In both the above cases, the cable shall be covered with a layer of sand or sifted earth of 0.10 Mt. thickness.

### 3.2.3 **Cable crossing:**

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

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

3.2.5 When cables have to be laid along culverts, they shall be suitably protected and supported. These shall be taken either (a) on the covert through a G.I. pipe not less than 4" 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. In addition the entry and exist ends of the cable from the pipe to the diversion point of the cable shall be laid in concrete duct this being the 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, as 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 path may not be available for traction current 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 be 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 offsets 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: -

- a) Outside the station limits, the cable shall generally be laid at not less than 5.5 meters from the centre of the nearest track.
  - b) 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.
  - c) At each end of the main cable an extra loop length of 6 to 8 metres 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 Backfilling 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 rank of a Signal Inspector Gr. II.
- 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:**

The details of anti-theft measures that are required for S&T gears have been enumerated in Circular No. SIG/2 of 1981. However, precautions to be taken for installation of junction boxes are indicated below:

- a) The installation of junction boxes for cable termination are to be restricted strictly between the Home Signals of a station.
- b) The junction boxes should only be installed where different conductor capacities of cables are to be put through or for connecting main cable to the tail cables.
- c) For putting through two main cables of similar conductor capacities, only underground joints are to be made. Underground joints must be epoxy joint similar to M. Seal type.
- d) Beyond the Home Signals of a station where termination of the main cables are required for connecting to track point or signal control, location boxes only should be installed and not junction boxes.
- e) The cable leading into the junction box should be suitably protected by G.I. pipes.
- f) The bolts heads of the junction box covers shall be invariably riveted.

**5 Cable leading to signal posts:**

Cable leading to the signal posts should be taken through the post if the signal post 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/ Hut :**

- 6.1 In case of cable leading to cabins/station building/relay rooms/ Hut the floors of which are considerably higher, they should be taken through G.I. pipes by giving offsets 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/ Hut /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 insects.

- 6.3 The area enclosing the base of cables should be filled up with layer of sand. In addition to 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. The cable routes should also be kept free from jungle growth, etc. so that in case of necessity, excavation work can be 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 or adequate length to cover the exposed length. The channel irons should be firmly secured with clamps and riveted with bolts. The inter distance between two clamps should not exceed one meter. The ends of the channels should be concreted.
- 7.3 Should there be heavy soil erosion over a portion of 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, Signaling 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 necessary so that possibility of damage to cable by inadvertent excavation is avoided.

## **8 Measurement of insulation resistance of the cable:**

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 a

six months. The insulation resistance 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 supersedes Technical Circular No. 2 of 1984.

Any amendment over Technical Circular No. 2 of 1988 in future will be applicable.

#### 4. 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.

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

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

2 The 20 pair / 10 pair Jelly Filled armoured Telecom cable to be 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.

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

a. 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.

b. Station-to-Station Block working.

c. 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.

##### 4 Cable trenching:

4.1 Trenches for Telecommunication cable shall be normally dug to a depth of 1.2 Mtrs. 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 Mtrs. shall be dug as necessary and protection arrangement shall be given as per drawing/ instruction of the Engineer.

- 4.2 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.
- 4.3 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 incharge. The decision regarding depth of trench required at different section, the railway engineer incharge shall make depending on the site condition.
- 4.4 Supply of earth pipe, earthing wire excavation of pit and preparation of pit shall be made as per approved drawing.
- 4.5 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.
- 4.6 If during the excavation of trenches for laying cables, the contractor representative notice 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 engineer incharge 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.
- 4.7 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.
- 4.8 Where the direction of the trench has to change it should be done in a gentle curve of not less than one meter radius.
- 4.9 While excavation if the contractor comes across any other cable already laid, he shall first report the fact to the railway engineer incharge. 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 engineer incharge.

5 **Track crossing:**

- o 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 Drawing No.TW/KGP/09-Rev-2.

- **Road crossing:**

- o 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.
- o The crossing of main roads often involves difficulties especially if traffic is heavy, precaution to avoid accidents to work men, pedestrians and vehicles 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.
- o 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.

- **Inspection and tests:**

- o The inspection and tests for the materials supplied under this tender will be carried out by the representative of Railway to ensure that all the requirements of the specifications are complied with. The purchaser has the right to reject units or parts there of which are defective in any respect.

- o 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 by train within IR network will be borne by the Railway and all other expenses will be borne by contractor.
- o Test equipments and circuits which ensure accurate results shall be used and provided by the contractor.

**6 Instructions for transporting and uncoiling the cable drums:**

- 6.1 The cable drums shall be transported by the contractor from the store of SSE/SIG/CON/KGP of South Eastern Railway 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.
- 6.2 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.
- 6.3 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.
- 6.4 The contractor shall rewind the surplus cable and transport back the same as well as empty cable drums, wheels etc. to the stores of SSE/SIG/CON/KGP of South Eastern Railway for which no extra payment will be made to him.
- 6.5 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.
- 6.6 The cable shall in no case be bent such that the bending is not less than 30 times the outside diameter of the cable.
- 6.7 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 man.... properly trained for uncoiling of cable  
 2 men .... for uncoiling (close to the drum).

**7 Cable laying:**

- 7.1 Before proposing to lay the HDPE pipe /OFC in the section, the contractor shall obtain the permission of the Railway Engineer.
- 7.2 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.
- 7.3 The condition of the 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 the entire cable.
- 7.4 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.
- 7.5 At locations where rocky soil is encountered, the chase cutting shall be performed as per drawing No.TW/KGP/07-Rev-2 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 degree 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 railway engineer incharge.

- 7.6 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.
- 7.7 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 drawing No. TW/KGP/10-Rev-2.
- 7.8 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 drawing No. TW/KGP/DRG/4.
- 7.9 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.
- 7.10 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.
- 7.11 For laying the cable through pipes, a galvanised 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.

#### 8 **Laying of 4/6quad/ PIJF cable:**

- a) While laying the 4/6quad/PIJF cable, the contractor shall employ an adequate number of men so that cable is handled 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 Mtrs.

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 the 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.

9 **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 be 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 a 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

10 **General:**

10.1 The contractors are to submit their quotations as per enclosed schedule and shall submit the following details as per check list & the Tender.

10.2 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.

10.3 Tenderer shall submit a 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.

11 **Packing:**

- 11.1 The packing shall be able to withstand the tropical conditions fully and give adequate protection to the equipment during transit and pre-installation storage.
- 11.2 The packing shall be strong and durable so as to able to withstand handling and transportation without damage to the equipment.
- 11.3 If necessary, the packing shall have anti shock suspension devices to enable the equipment to withstand without damage shock experienced during handling and transportation.

12 **Cable Jointing:**

- 12.1 The marking of excavation of pit for cable jointing will be given by Railway's Engineer.
- 12.2 Pit of optic fiber cable joint: - For OFC jointing, cable pit shall be made as per drawing No. CORE/S&T/ALD/SK/435/95 or alternate drawing approved by the competent authority. The jointing of the optic fiber cable shall be done by the contractor under the supervision and certified by the authorized representative of Dy. CSTE/CON/KGP. Splicing loss should be within the limit as laid down by the CCITT/ ITU-T specification. High quality fusion splicing machines should be used.
- 12.3 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.
- 12.4 Joining 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 joined with 20 pair RTSF kit thermo-shrink sleeve technique. This jointing work is to be executed by the contractor under the supervision of railway engineer incharge / his representative.

13 **Cable Termination:**

- 13.1 The marking of cable termination will be given by the Railway's Engineer.

13.2 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 pairs 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 the 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.

14 **Records and marking:**

Contractor shall provide plastic laminated file at all repeater stations 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, fiber 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.

15 **Acceptance criteria:**

15.1 Before and after laying the cable, each fibre 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.

15.2 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

3069884/2026/O/o DY.CE/CON/KGP/SER

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 values.

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