

# Protection Measures for Under Ground Cable

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Normally the PIJF underground cables are laid alongside the Railway track, which carry important signalling safety circuits as well as other communication circuits of Indian railways. Due to modernisation and advancements in Indian Railways, lot of earth excavating activities are taking place along the Railway tracks, which is causing damage to cables. The protection of 6 quad cable is very important during the construction/ renovation of Bridges and culverts, ROB and RUBs, track cess enhancement works, gauge conversion, doubling and third line works by diverting the cable path temporarily or on permanent basis. The temporary status may sometimes extend to months and even more than a year. Hence proper shifting or diverting of telecom cables has become mandatory for safe running of trains and for providing an effective and reliable mode of telecommunications and avoiding signal and telecom failures affecting punctuality and safety of trains.

- In many occasions, it can be noticed that temporary shifting of PIJF 6 quad cables are unable to provide standard expected performance parameters for Signalling and Telecommunication equipment which are in use. Some times active service also getting affected leading to severe traffic detention. Some of them can be attributed to improper methods used in diversion or shifting of cables temporarily by using vulnerable switch board cables. Usage of Switch board cable in nonRE or RE area leads to severe impairment to existing 6 quad cable circuits leading to malfunctioning and intermittent failure of safety signalling gears like axle counters resulting in signal failures and thus unsafe condition for train working.
- Hence usage of switchboard cable for temporary connections with existing quad cable to be totally avoided, more particularly in RE area. To prevent electromagnetic interference, it is always advisable to use 6 quad U/G cable or under unavoidable cases 100 pair PIJF underground cable rather than using Switch board cable irrespective of length of shifting involved.
- In RE area, for ensuring path for induced current to flow, it is necessary that screened and

armored cable shall be used and their continuity ensured. Hence, Quad cable screen & armor shall be made continuous at the shifting or diversion locations. Absence of sheath continuity and armour continuity in PIJF 6 Quad will result in heavy induced voltages and consequent impairment of the telecom circuits.

- When the cable is to be diverted towards track side or close to OHE mast from existing location due to non availability of land, it is preferable to lay the telecom cable through cement concrete pipes to minimise cable damages as well as to minimise the induced voltage.
- To ensure reliable communication, these temporary cable-shifting locations shall be thoroughly surveyed before planning shifting. Frequent inspection of location shall be carried out by the maintenance supervisor after temporary shifting of cable till all the engineering works are completed and permanent arrangement of the cable to the original location or permanent diverted location is done.
- For shifting of cable for longer periods (more than a week), it is always preferable to lay the PIJF cable in underground at proper depth. The depth can be more than one metre as per the local requirement for crossing the road where active engineering work takes place and drilling / boring technique to be adopted to achieve greater depths at these points that ensures safety of the crossed cable so as not to be affected by the engineering works/ machines. Remaining length of cable may be laid at normal depth or even lesser depth of 30 cms if the duration is not going to be very long. Use of GI or DWC pipes may also be useful to protect this temporary cable, since lot of interference may be expected from engineering works.
- Joining of temporary PIJF cable with existing main cable shall be carried out with proper RTSF jointing kit to avoid failures because of joints. After completion of joints 6 quad cable shall be tested from station to station. The existing 6 quad cable ends shall be perfectly sealed and appropriate care shall be taken to protect

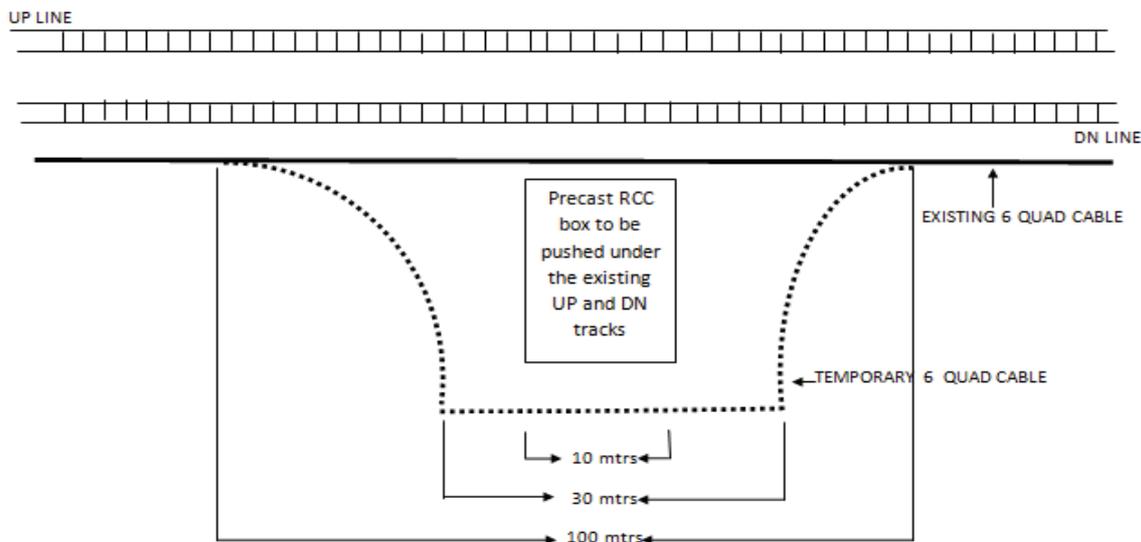


Figure 1: Temporary Shifting of 6-quadrant cable in case of LHS/RUB & other bridge related works.

S.N.	Description	Qty	Unit	Rate(₹)	Amount(₹)	Remarks
1	6 Quad PUF U/G telecom cable of size 0.9 mm dia.	120	mtr	300	36000	20m for loop at both ends
2	RTSF jointing kits	5	Nos.	3000	15000	One as spare for unforeseen requirement
3	GI/DWC pipes	100	mtrs	200	20000	
4	Excavation of trench at 1 metre depth and laying of cable	100	mtrs	55	5500	
5	Excavation of trench and laying of cable using horizontal boring method	20	mtrs	1800	36000	
6	Jointing of PUF cable	4	Nos.	1000	4000	
7	Releasing cable from temporary trench after completion of work	120	mtrs	30	5400	
8	Provision of pipe earth	1	no	2500	2500	Only for RE area
9	Transportation of material from stores to site	LS	LS	5000	5000	
					129400	
General Charges at 15%					19410	
<b>Total</b>					<b>148810</b>	
Rounded to 150000 for 100m length or ₹1500 /metre approx.						

Figure 2: Sample Shifting Estimate

from damages since same cable may be used to bring back to original condition.

- Where high-induced voltages in cables due to severe EMI effects are expected, a temporary conventional earth to be provided at the diverted location.
- In case of major diversion or temporary shifting, it is advisable to make an estimate provision in the work at the initial stage itself. Example for provision of material and work portion estimate for 100 mtrs length of 6 Quad cable diversion work is given in the table shown in figure 2.

This type of shifting is very important not only for cable protection but also to protect safety S&T circuits which involves safe operation of train traffic system since the existing 6 quad cable is carrying Block, IBH, EC, LC gate comm and BPAC circuits.

1. Temporary shifting of 6 quad cable shall be carried out by using the temporary trench with the depth of 30 cm. if the duration is less and normal depth if duration is more or uncertain. 6 quad cable shall be drawn through GI/DWC pipes where earth work and other related machine movements are high.
2. **Case 1** RCC box is to be pushed from cable side: 100 mtrs length of cable path is involved for shifting. Here horizontal drilling at greater depths may be adopted for crossing.
3. **Case 2** RCC box is to be pushed from one side and the cable is on other side of the track: 20 m of existing cable is to be exposed and the same is to be protected with GI pipe, if the work is for more than a week. If the work is going to be completed within a week, watchman may be provided for cable protection without disturbing the existing alignment. This is to be adopted only if the safety of the cable can be ensured by deputing a person.
4. **Case 3** RCC boxes are to be pushed from both sides of tracks, then case 1 procedure is to be followed.
5. In all the cases, the temporary shifting of cable has to be carried out within Railway boundary. If the shifting is to be done temporarily in private land due to non-availability of railway land, the temporary cable shall be protected by using GI/DWC pipes.
6. After completion of entire work, original existing cable shall be put through and functioning of

circuits shall be monitored for a further period of 48 hours, then only the temporary cable with its related GI pipes shall be released .

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*The information / views expressed in this paper is of the authors and are based on their experience. Comments / observations may be sent to the author at [spt.iriset@gmail.com](mailto:spt.iriset@gmail.com).*

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