UNDERGROUND CABLES

PIJF CABLE

Telecom Cables Require Protection:-

From probable mechanical damages

From water and chemical or soil condition

From digging by different agencies

From damages while handling

Advantages of PIJF Cable

Counting of Pairs easy

Jointing easy, No chamber required

Failure of Joint is less

Entry of moisture is prevented

Can be directly terminated to MDF/Pillar/DP etc

Handling easy

Life is more.

Design of Cable

•Conductors

•Core

•Moisture Barrier

•Screen

•Sheath (PVC)

•Bedding

•Armouring

•Jacket.

CODE FOR CONDUCTOR INSULATION

Identification and Length markings on a Cable

1. Telephone handset emblem
2. Name of the Manufacturer
3. Year of Manufacture
4. Capacity of the cable in pairs
5. Size of the conductor
6. Length marking

Surveying

The route should be as short as possible

Normally laid along road and Railway Tracks

Corrosive soil should be avoided

Opening expensive pavements and roads should be avoided

Consideration given to the existence, alteration and growth of services

Proper co-ordination with other underground services like Water, Electricity, Sewage, Gas etc

Permission for Digging From

Municipal or Local Authorities

Traffic Authorities

Highway Authorities

Railway Department

Port Trust Authorities

Co-ordination to be maintained

Electric Supply

Water supply

Gas Pipeline

Sewage system

Construction practice (Cable Laying)

Classified in to:-

Receipt, Storage, Handling and Transport

Surveying and selection of route

Trenching and Laying

Jointing of Cable & Termination

Preparation of Cable Plan, Cable diagram and other records

Acceptance Testing.

LAYING METHODS

There are three methods normally adopted:-

1. Laying direct in the ground
2. Laying solid
3. Drawing through Duct / Duct laying.

Trenching

The Depth of trench should be 1.2Mts, and in any case it should not be less than 60 cms.

The alignment should be straight at least 50 mts at a stretch.

It should be at least 30 cms from the boundary walls.

Width should be between 30 to 40 cms.

A separation of 60 cms to be maintained while laying parallel to electric cables.

Power Parallelism should not exceed 800 mts

While crossing with Electric cables, telephone cable should be laid solid in between for 90 cms on either side

The minimum-bending diameter for armoured cable should be 15 times of Diameter of the cable

Road crossing

Cable should be laid through G.I Pipes.

The depth of pipe from the surface of road should be 1 mtr with a slope to pass water.

The number of pipes should cater for 20 yrs.

No Joints in the middle of the road.

The trench should be reinstated with sand.

Along National highways: - Cable should be laid at a distance of 457 cms from the centre of the road.

Along over bridge/Culvert/Flyover

Culverts should be paved by a concrete channel of 12" depth below the bed of the culvert

While laying across small bridges Gi pipes to be clamped to and extend beyond piers for safety of cables

In the case of **long bridges/flyovers** liaison should be kept with authorities for suitable arrangements or can use concrete channel provided with removable covers at a depth of 90 cms

Laying cable along Railways

The trench should be at a distance more than 5.5 mts from the center of Railway track

The Railway staff at the cost of BSNL should attend excavation and reinstatement within 3 mtrs

Railway crossing:- Use G.I pipes of 75mm dia, and Minimum depth from rail level should be 1.25 mtrs, and the length of pipe should be sufficiently long and should not extend 4.5 meters from the center of last track. No overhead crossing permitted

Crossing Culverts

Use G.I Pipes cut at the ends in V- Shape on the outer surface and bend downwards so as to lead in the cable end to the trench

Cable Jointing

Jointing technique consists of: -

1.Conductor jointing (Uses UY Connector)

For Cables more than 200 pairs jointing done by 20 pair modules

2. Protection against moisture entry

Protect against corrosion & Mechanical damage

Type of Jointing KITs and usage

TSF –1	10, 20 Pair (straight joint)
TSF – 2	50, 100 Pair
TSF – 3	200 Pair
TSF – 4	400 Pair
TSF – 5	800 Pair
TSF – 6	1000 Pair
TSF – 7	1200 & Above

Sequence of Joint closure

1) Cable Marking
2) Armour continuity
3) Conductor jointing
4) Sheath continuity
5) Filling compound
6) Metal canister
7. Cable preparation
8. Install sleeve
9. Thermo shrinking
10. Armour continuity completed

Location of Cabinet & Pillar

Should be located at obstruction free place

To be mounted on concrete Plinth

Easily accessible

Adequate space for jointing and other works

Should not be in a curve, or a crowded place

Should not obstruct pedestrians

Avoid Marshy & Floods area

Siting of Cabinets, Pillars & DP

Cabinet & Pillars normally **800** and **1000** pair.

DP's **3/5/10/20** pairs are available

In Pillars and Cabinets CT-Boxes of terminating capacity of 100 pairs are mounted – which is made up of Krone type modules of 10 numbers

Krone tool is used for terminating wires. (No stripping, No soldering, No screwing required)

Leading in Distribution Cable to DP

In case of external DPs, the cable is carried to DP box through GI pipe of 2"diameter. The GI pipe is fixed to the post by 2 nos of G.I clamps to hold the GI Pipe firmly. The lower end of the GI pipe should be about 30 cms below the ground surface.

In case of internal DPs, the cable is lead into the building through a leading in pipe usually provided by the subscriber.

<u>Construction & Mtce of DP</u>

External DPs are fitted on posts by means of suitable size of U backs

Internal DPs are fitted inside buildings on the wall at suitable location

In cases of Multistoried buildings, where the telephone demand is very high the distribution cable of 20 pair or 10 pair size are taken to different floors or blocks and terminated on 10 or 20 pairs subs DPs. Individual wires are further provided from the subs DPs to the location of the telephone.

LOCATION OF DP ON THE POST

DP should normally be fixed at minimum height of 6 feet from the ground or in cases where it is fitted still higher to avoid risk of damage or interference by unauthorized persons, its top should be 1 foot below the ultimate lowest bracket

The DP is fitted to the post with the help of U backs. The cable tail is passed through the GI pipe and the pipe is pushed up so that the bottom of the DP sits on the upper end of the GI Pipe.

MAINTENANCE OF CABLE RECORDS

Cable records are very effective tools for the maintenance of cable networks.

The cable records may be divided into three categories

1. Plan,
2. Line diagram and
3. cards.

PLAN OR MAPS

The following types of plans are generally maintained

The exchange area layout map which show the following details:-

Boundaries of existing exchange area

Proposed boundaries of future exchanges but liable to alterations

Location of existing exchanges

Localities where future exchanges may be situated

CABINET AND PILLAR AREA LAYOUT MAPS (xge wise)

The location of the cabinets, Primary cable routes, Duct lines, Manholes etc.

Location of pillar, Secondary cable route, Location of Secondary cable joints, Duct lines, Man-holes etc.

Location of DPs (either internal or external) the distribution cable route, the location of joint etc.

LINE DIAGRAM

These diagrams show the actual orientation of the cable network including the size of the joints, type and size of the DPs etc.

Primary line diagram:-

When the primary is laid through the duct, the diagram is named as primary duct lines diagram. It show all relevant information in respect of configuration of the primary cable, Ducts and Manholes for Primary cables.

DISTRIBUTION LINE DIAGRAM

This diagram represents the cable orientation for all the distribution cables emerging out of a particular Pillar

One diagram is meant for a pillar and all the DPs connected to it.

JUNCTION CABLE DIAGRAM

This diagrams show the junction cable network in multi exchange area

Drop wire Installation

Drop wire normally used is two hard drawn copper cadmium conductor 1.25mm or 0.91 mm diameter laid parallel side by side and covered with black PVC of hard grade insulation.

A ridge is provided between the two conductors so that they can be separated into two fully insulated conductors without any injury to the insulation of individual conductors

Hardware accessories for Installation

Drop wire Distribution Clamp:-

It is intended for suspending the self supporting drop wires at DP's and intermediate point on poles

Support clamp with U – Back

For supporting distribution clamp

It is fixed on Channel Iron Bracket using U-Back

DP CARDS

These cards show the number, size, type (internal or external) and location of the DP and how each terminal of the DP is utilized. One card is required for each 10 or 20 pairs DP.

The cabinet and pillar cards

One set of cards is required for each cabinet or pillar.

The set contains one card for each 100 pair CT- box

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Each card shows the following particulars:-

Number ,size, and type of the CT box, size of shell,

location of the cabinet or pillar,

Circuits working one each terminal of the CT box,

The terminal to which The circuit is jumpered.

The distant end code corresponding to each terminal of the CT box and the codes of cable pairs connected to the terminals.

These cards must be filled in at the time of installation and subsequent additions or alterations effecting the entries must be incorporated.

COMPUTERISATION OF CABLE RECORDS

Objective of Cable Records Management System (CRMS) i.e. Digitization of cable records & drawings to facilitate BSNL

Design & maintain a communication network model.

To analyze the network model in different ways, distribute information as needed & interact with variety of enterprise systems.

To manage the planning , design , construction , operation & maintenance of cable network.

Development of centralized telecom database

DATA INPUT TO COMPUTER

The complete subscriber information has to be entered in computer, Fault control system is required to be fed to the computer in a suitable manner

The complete subscriber information referred in manual fault control system is required to be fed to the computer in a suitable manner before the system can be made operation. (Information like Directory no, Address, Pillar - In/Out, DP termination, Category, VIP,PABX /CCB/STD PT etc)

Numbering schemes of cabinet, pillar and DP

Cabinets are given two digits number in the series 01 to 20

Pillars are also given two digits numbers but in the series 21 to 99 Once the number is given to a Pillar, it must not be changed unless it is transferred to another exchange area.

The verticals are numbered serially commencing from non-growing end in two digits 01 to 99 .

Coding of primary, secondary & Distribution cables

Primary cables are given a single letter code A, B,C,D..... etc. (I and O omitted)

Secondary cables are coded with the cabinet number followed by single letter A,B,C,D,.....etc. (Example 12 C)

The junction cable code consists of two letters denoting the exchanges at which the cable is terminated and digit denotes the serial number (Eg:-Junction cable between City & Park exchanges are coded as CP 1, CP2, CP3.....etc.)

DPs are given four digit number

The first two digits correspond to the number of pillar from which the DP is fed.

In case of Inner zone DP the first two digit will be 00.

The last two digits denote the serial number of DP with the pillar area or the inner zone

QUESTION _ UNDERGROUND CABLES

Fill the blanks

1) The circuit between two exchanges in a local network is called …..…

2) ……. Is the last cable termination point from where subscriber line is connected.

3) The cable connecting Pillar and DP is called ……

4) In ducted cable system we use.. ----------cables

5) Entry of moisture into PIJF cables is prevented by filling ……..

6) PCM cables are designed with a conductor diameter of ……..mm.

7) A 400 pair cable consist of. ------No of super units of …….. Size.

8) while selecting the route for laying cable ---------- ---------- route should selected.

9) While crossing power cables the telecom cables should be laid at ---------- ---------- ------- to the power cables.

10) While crossing roads it should be ensure that ---------- should fall in between road crossing.

11) The bending diameter should be minimum of---------- ------- ---------- time the diameter of the cable.

12) The laying of telecom cables across railway crossing should be laid in ---------- pipes.

13) The protective stone/ slabs which are placed over the cables after laying in the trench are called ---------- ---------- and they help in preventing damages due to digging by other service utility personnel.

14) Indicator kept at 200 m apart in the route of the cable is called ----------

15) The indicator kept at every joint place is called ----------.

16) While crossing the power cables the telecom cables should be laid in solid for a distance of ---------- on either

17) The jointing of pairs of one large size cable to two or more smaller size cables is called ---------- jointing.

18) The jointing of one cable to another cable of same size is called ---------- jointing.

19) For jointing 100 pair PIJF cable conductors---------- number of UY connectors are required.

20) For jointing conductors of bigger sizes of PIJF cables ---------- pair module are used.

21) Power induction in telecom lines is due to ---------- of power and telecommunication wires.

22) At the crossing of power lines, telecom wires or cables should be crossed at almost ---------- with sufficient vertical separation.

23) The PTCC clearance is to be obtained if the length of parallelism between telecom and power lines is ----------and above.

24) The minimum vertical clearance between power and telecom line is --------.

25) Ensure sheath continuity at ---------- and earthing at DP pillar and MDF.

26) Ensure use of ---------- in the splice to avoid any possibility of ingress of moisture setting in to the joint of PIJF cables.

27) While crossing power cables the telecom cables should be laid at right angles and should be laid in ----------.

28) The quality of telecommunication circuit and signals are affected by the type of induction called ----------

29) The arrangement provided above telecom lines or below the power lines to safe guard the personnel and equipment due to contact of the lines is called ----------

30) Gas discharge Tubes are of ---------- restoring type. They come to normal position once the induced voltage drops down to with in limits.

31) CRMS stands for----------

32) In case of PIJF cables ensure use of ---------- for pressing UY connectors for jointing the conductors instead of ordinary pliers to avoid break faults.

33) As far as possible a single length of drop wire should be run from ----------up to maximum length of four spans

34) Improper cable works and lack of Co-ordination with other public utility services result in cable ----------.

35) Elimination of ----------in drop wire reduces high resistance faults. Following accessories are to be used.

36) Fault Prone cables with low insulation should be ---------- All heavy overhead alignment should be ----------by new DPs.

37) Cabinets and pillars should be installed for more than ---------- line exchanges.

38) In a local cable network where there are no cabinets and pillars then the network is called ---------- system

39) In a local cable network where there are Pillars only then the cable connected to DP and pillar is called---------- cable and the cable connected to pillar and Exchange MDF is called ---------- --------- cable.

40) The size of the module used in Krone type CT Box termination of underground cables at Pillar or cabinet is ---------- .

41) No soldering, no screwing and no stripping of insulation is required for termination of cable pairs on a ---------- type of termination points

42) Service line is the portion of the ---------- from pole Mount DP to the terminating points.

43) Internal DP is the cable termination Point where underground cable is laid directly to the ----------

44) The Inspection of ---------- consists of the inspections carried out by checking DPs / cabinet Pillars and subscriber lines.

45) When the insulation between the earth and the conductor in test in a cable becomes very low the fault is called ----------

46) When the insulation between conductors in the cable or between the pairs or between pair and earth falls below a prescribed limit (normally 0.5 meg ohm) the fault is called ----------

47) When the Conductor is cut then the fault is called ----------

48) The existence of potential, even when the circuit is idle or isolated from the potential of exchange and subscriber premises equipment then the fault is called ----------

49) Bad constructional practices like in-efficient, nonstandard and careless work-man ship, specially during the time of laying & jointing of cable result in ----------

50) This instrument is extensively used in all the cable maintenance sections for testing all types of faults which on Wheatstone Bridge principle is ----------

INDICATE WHETHER TRUE OR FALSE

1. The material used as conductor in local telecom under ground cables is high conductivity annealed copper

2. The sheath of a underground cable protect the conductors from damage due to entry of moisture to safe guard the insulation resistance of pairs.

3. Jacket is the sheathing arrangement made over armoured cable to protect the armour against corrosion and rusting

4. Paper Insulated cables are now being replaced with Polythene insulated Jelly filled cables to improve efficiency of cable network

Write short notes

A. What are the important cable record to be maintained.
B. Write important features of maps and diagrams to be maintained.
C. Write the details a DP card shows.
D. Write the details a pillar card shows.
E. Mention Three Advantages Of Computerizing The Fault Control System
F. What are the points to be checked during inspection of External plant. The Points should be noted at cabinets and pillars while inspection ?

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