Section 821
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MULTIPAIR DISTRIBUTION WIRE PROTECTION

CONTENTS

1. GENERAL

1.01 This section is intended to provide REA borrowers, consulting engineers, contractors, and other interested parties with technical information for use in the design and construction of REA borrowers' telephone systems. It describes various protective measures to be used on aerial multipair distribution wire (MPDW) circuits.

1.02 These measures are intended for the protection of users and subscribers' property, protection of personnel working on the lines, and the protection of circuit facilities. Consideration of other factors can be found in REA TE & CM-633, "Design and Construction of Aerial Distribution Wire, Multipair" and other sections of the REA TE & CM. This revision is being made to bring our practices in line with experience gained since 1956.

2. LIGHTNING PROTECTION CONSIDERATIONS

2.01 The impulse dielectric strength of MPDW between conductors and between conductors and support wire is about 30 kv. This dielectric strength is adequate to prevent damage from lightning surges except for direct strokes and those arising from connections to severely exposed stations such as fire towers, radio stations, etc. Application of protection for the wire itself therefore generally is not necessary.

2.02 Although distribution wire itself is expected to be free from dielectric failure, it will tend to feed damaging surges to weaker dielectric plant such as paper insulated cable. Generally at such junctions protection must be applied.

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3. POWER CONTACT CONSIDERATIONS

3.01 With all types of outside plant wire and cable the most effective measure in the prevention of power contact lies in the provision of sound construction, proper clearances, and the avoidance of non-standard conditions. The high dielectric strength of distribution wire makes electrical contact between phase conductors of a power distribution circuit and the multipair conductors unlikely, except where the wire insulation is abraded or defective. Although power contact protection is not generally required, under certain conditions protective measures are necessary as outlined in the following paragraphs.

4. SPECIFIC APPLICATIONS OF PROTECTION MEASURES

4.01 Lightning Protection

4.011 Junctions with Any Type of Cable - Lightning arrester protection at junctions between MPDW and cable of any type, if required, has the function of protecting the cable rather than the MPDW. The protection practices for such junctions are therefore covered in REA TE & CM-815, "Cable Circuit Protection" and REA TE & CM-640, "Design of Buried Plant."

4.012 Junctions with Open Wire, Drop Wire, or Single Pair Distribution Wire - No protection is required at junctions between MPDW and open wire, drop wire, or single pair distribution wire except where extensions are connected to severely exposed stations such as fire towers, radio stations, etc. Pairs extending to such exposures should be protected at their junctions with the distribution wire by means of protected distribution wire terminals.

4.02 Joint Use Power Contact Protection

4.021 General - The same general protection principles specified for the joint use of poles with high voltage power (above 2900 volts to ground) distribution circuits with open wire are applicable to MPDW. (See REA TE & CM-690, "Joint Use of Poles" and REA TE & CM-820, "Open Wire Circuit Protection.") Where MPDW is unshielded, that is, without cable or open wire between it and the power conductors, the principal protection objective is that coordination be achieved.

In order that electrical contact between the power and telephone conductors may occur, the power voltage must

be sufficient to arc through the MPDW insulation. Under such conditions it is probable that the arcing will burn through the insulation of the support wire, providing a ground path adequate for deenergizing the power circuit.

4.022 Power Circuit Below 2900 Volts to Ground - For power circuits operating below 2900 volts to ground, station protectors provide adequate protection to subscriber premises, and the conductor insulation generally can be relied on to prevent electrical contacts to the conductors even though a physical contact may occur. Therefore no special protection measures are required beyond conformance to the bonding practices covered in later paragraphs.

4.023 Power Circuits Exceeding 2900 Volts to Ground

4.0231 Where MPDW is not shielded by cable or open wire the MPDW (and telephone plant to which it is connected) will require protection against power contact as follows: Power contact protection should be installed on all such circuits at or near both ends of the exposed section, unless the section is 1,500 feet or less in length in which case protection should be installed only at or near one (either) end of the section.

4.0232 If station drops are connected to the multipair wire within the exposed section, power contact protection should be installed on the pair or pairs serving the stations at or within 1,000 feet of each drop wire location. Power contact protection should be provided in the form of protected distribution wire terminals (Figures 1 and 3).

4.024 No special protective measures are required where MPDW is installed below aerial cable or open wire and is therefore shielded from contact.

4.03 Power Crossings Exceeding 2900 Volts to Ground

4.031 Joint pole crossings should be utilized wherever practicable for reasons given in REA TE & CM-801, "Conditions Requiring Electrical Protection." At all crossings where distribution wire is shielded from power contacts by other telephone plant, no additional protection devices are required on the distribution wire.

4.032 At or near all crossings with MGN type power lines where the distribution wire is not shielded from contacts by other telephone plant, protection should be provided on all pairs by means of a protected wire terminal. Where additional crossings of the same MPDW and the same power circuit occur within 1,500 feet of a protected crossing, protection at the additional crossings is not required.

4.04 Loading Coil Protection - Loading coils for multipair distribution wire are available having dielectric strength such that protection is not required.

4.05 Bonding to Aerial Cable - At junctions between MPDW and aerial cable the support wire should be bonded to the cable strand. Where multipair distribution wire is carried on the same pole line with aerial cable, the support wire should be bonded to the cable suspension strand at each end of the wire run and at intervals of approximately one-fourth mile (Fig. 2).

4.06 Bonding of Protector Ground Terminals - The MPDW steel support wire affords a method of obtaining a common grounding conductor for protection devices. Where protectors are required the protector ground terminal or plate of all assemblies should be connected either directly or indirectly to the metallic support wire. If the protector assembly design is such that a satisfactory electrical connection is not made to the support wire in mounting the protector assembly, the connection should be made by means of a #10 ground wire.

4.07 Grounding the Support Wire

4.071 Where power contact protection is required, protectors should have their ground binding posts connected to the multipair support wire as described in paragraph 4.06. In order to assist in deenergizing the power circuit in the event of a contact between the two facilities and to reduce induced voltage in joint use sections, the multipair support wire should be grounded by bonding to the power line MGN at approximately one-fourth mile intervals via a vertical pole ground wire (Fig. 1).

4.072 Grounding conductors from power system lightning arresters should not be used unless they are connected to the MGN conductor.

4.073 In joint use with non-MGN systems, the support wire should be effectively grounded at approximately one-fourth mile intervals by connection to artificial grounds so constructed that coordination is achieved. (See Fig. 3, and REA TE & CM-690.)

4.074 At junctions with buried wire or cable the multipair support wire should be bonded to the buried wire or cable shield.

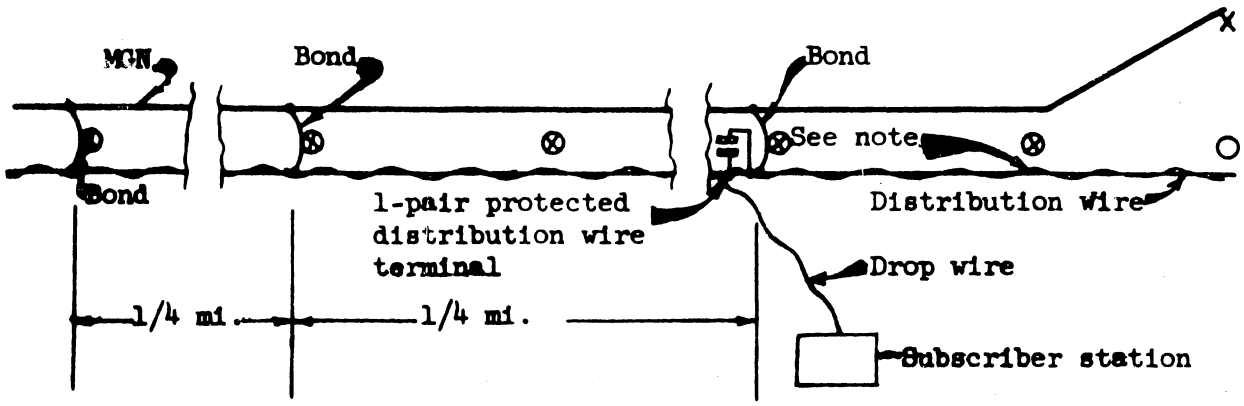
4.08 Grounding of Guys - When distribution wire is placed on existing pole lines beneath existing shielding plant such as cable or open wire, no change in guying arrangements regarding solidly grounded guys versus use of strain insulators in guys is necessary. (See REA TE & CM-650, "Guys and Anchors on Wire and Cable Lines.") Where distribution wire is not shielded by other telephone plant in either joint use or at crossings with separate pole line construction, strain insulators may be omitted if the support wire is grounded to a grounded cable sheath or shield or to a power MGN within one-fourth mile of the guy location.

5. DRAINAGE

5.01 The voltage induced into MPDW in joint use with power distribution circuits is much less than would be induced into open wire with the same separation because of the relatively high capacitance between the distribution wire conductors and the grounded support wire. When the support wire is grounded in accordance with paragraph 4.07 the induced voltage in MPDW would be appreciably less than that which would be induced into open wire under the same conditions. The surprise shock hazard and the probability of damage to grounded ringers on MPDW is therefore negligible. In view of the above, no drainage units are normally required on multipair distribution wire.

5.02 An exception to 5.01 would be where a portion of a circuit is in open wire joint use and a portion is in distribution wire. In such instances the combined open wire and distribution wire sections should be considered to be equivalent to an open wire circuit having a length equal to the length of the open wire section plus one-half the length of the distribution wire section. The open wire drainage protection requirements of REA TE & CM-820 should be applied to this equivalent open wire circuit.

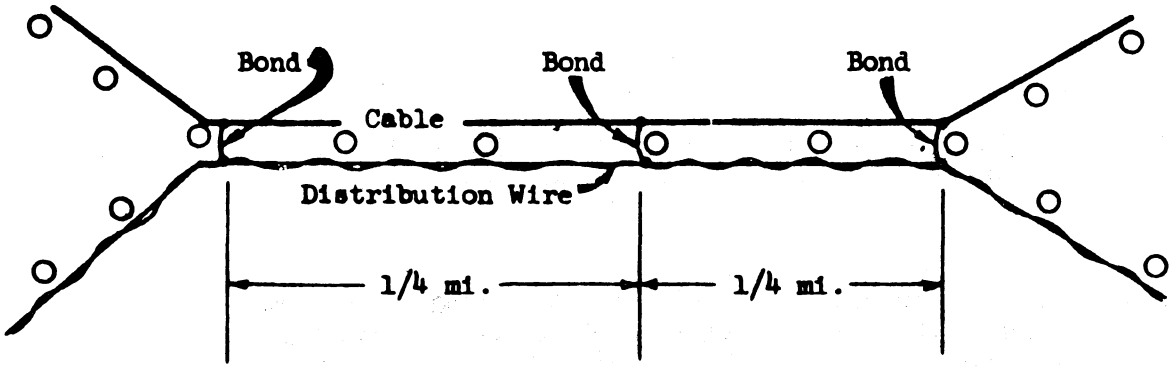
5.03 During construction operations, precautionary measures against induced voltages should be taken in accordance with REA TE & CM-633.



Note: Protect all pairs at beginning of joint use with a protected distribution wire terminal.

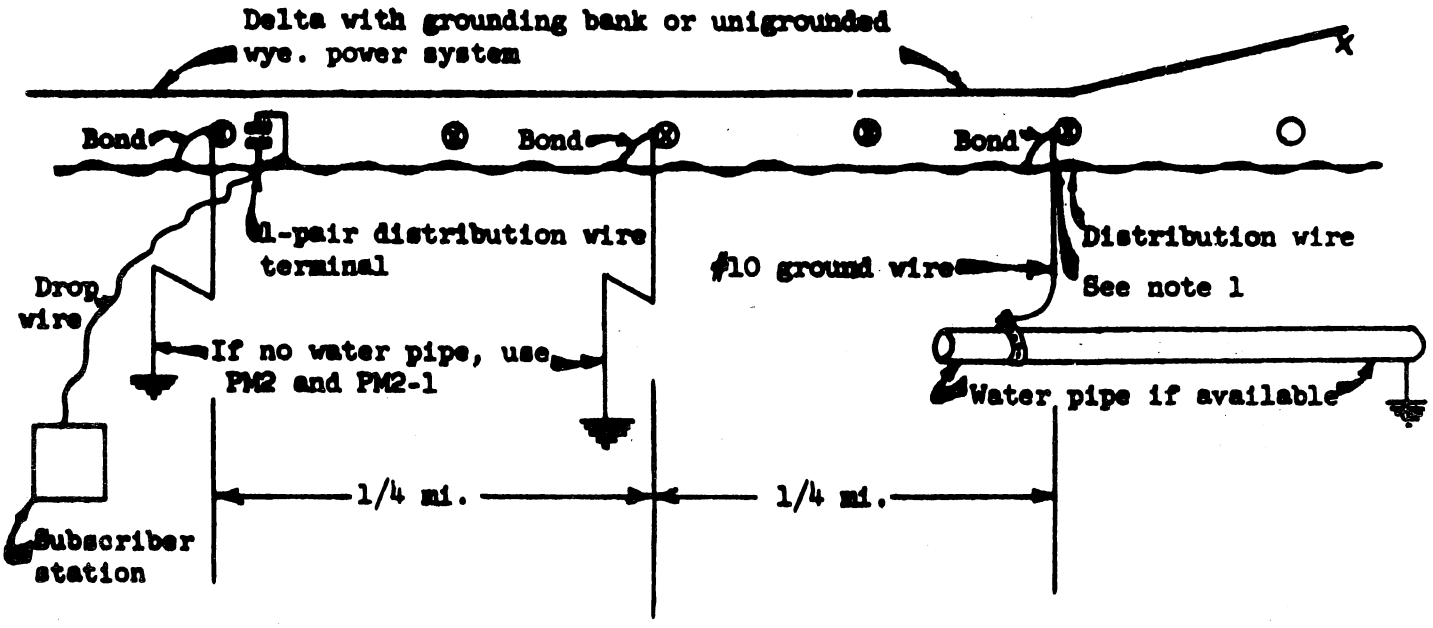
JOINT USE WITH MULTIGROUNDED NEUTRAL TYPE DISTRIBUTION LINE

FIGURE 1



JOINT USE WITH STRAND SUPPORTED CABLE

FIGURE 2



Note 1: Protect all pairs at beginning of joint use with a protected distribution wire terminal.

*Joint construction should <u>not</u> be used with nonmultigrounded neutral type distribution circuits <u>unless</u> sufficiently low resistance grounds can be obtained to insure coordination.

JOINT USE WITH NONMULTIGROUNDED NEUTRAL TYPE DISTRIBUTION LINE*

FIGURE 3