INTERNATIONAL TELECOMMUNICATION UNION

ITU-T K.13

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

PROTECTION AGAINST INTERFERENCE

INDUCED VOLTAGES IN CABLES WITH PLASTIC - INSULATED CONDUCTORS

ITU-T Recommendation K.13

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation K.13 was published in Volume IX of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Recommendation K.13

INDUCED VOLTAGES IN CABLES WITH PLASTIC-INSULATED CONDUCTORS

(Geneva, 1972)

According to [1], when a fault occurs on a power line near a telecommunication cable having all its circuits terminated by transformers, the permissible induced longitudinal voltage in the cable conductors should not exceed 60% of the voltage used to check the dielectric strength of the cable, as required by individual specifications for checks of the breakdown strength between the cable conductors and the sheath. This induced voltage is generally 1200 V r.m.s. value for paper-insulated conductors (60% of 2000 V). The *Directives* give no indication of the frequency of occurence of such a voltage or of its permissible duration. In order that such voltages do not endanger line maintenance staff, the safety precautions for staff given in [2] must be observed.

Plastic-insulated cables can have a much higher dielectric strength than paper-insulated cables. Moreover, this dielectric strength is retained following the mechanical stresses that occur during the laying of the cable. There should thus be no danger of breakdown of the insulation between the conductors and the metal sheath when it is subjected to induced logitudinal e.m.f. sufficiently below the breakdown voltage of the cable. A sufficient safety margin is ensured if induced voltages are kept below 60% of the voltage used for checking the dielectric strength of the cable as given in the individual specifications; this voltage is, of course, related to the breakdown voltage.

At very little extra expense, sleeves and joints can be made to have the same dielectric strength as the insulation between the conductors and the metallic sheath, although transformers and terminal equipments must be suitably protected when their dielectric strength is not up to the conditions concerned.

If the source of the induced longitudinal e.m.f. is a high- reliability power line, as defined in the *Directives*, there is only a very small probability that staff will be in contact with a line at the precise moment when such a voltage of short duration occurs in the telecommunication cable. Any danger to staff is very slight given due observation of the safety precautions for maintenance staff working on telephone lines in which high voltages may be induced by neighbouring electricity lines.

For a cable not having its circuits terminated by transformers the above conditions also apply provided that surge voltages are prevented from reaching the telecommunication equipment by the striking of the lightning protectors installed at the ends of the circuits.

For these reasons, the CCITT is unanimously of the opinion that:

1 It is possible to make telecommunication cables with conductors that are insulated from each other and from the metallic sheath by high breakdown strength plastics. For such cables, when there is a fault on a neighbouring electricity line, the value of induced longitudinal e.m.f. that can be allowed is that which does not exceed 60% of the test voltage applied between the conductors and the metallic sheath for checking the dielectric strength (this test voltage, which is given in the individual cable specifications, is related to the breakdown voltage) provided the following conditions are observed:

a) circuits in such cables are terminated at their ends and at branching points on transformers or are provided with lightning protectors;

b) equipment, joints and cableheads associated with such cables must have a dielectric strength at least equal to that of the insulation between the conductors and the metallic cable sheath of the cable, given that the transformers mentioned in a) above must be provided with lightning protectors when their dielectric strength does not meet the required conditions;

c) the power line causing the induction must meet the conditions for high-reliability power lines given in [1];

d) staff working on telecommunication cables must take the safety precautions specified in [2].

2 When the circuits of such a cable are connected direct to the telecommunication equipment, that is, when no transformers or lightning protectors are inserted, and when the condition laid down in § 1c) above is fulfilled, the maximum permissible induced longitudinal e.m.f. should be 650 V.

References

[1] CCITT manual *Directives concerning the protection of telecommunication lines against harmful effects from electric power and electrified railway lines*, Vol. VI, ITU, Geneva, 1988.

[2] *Ibid*., Vol. VII.