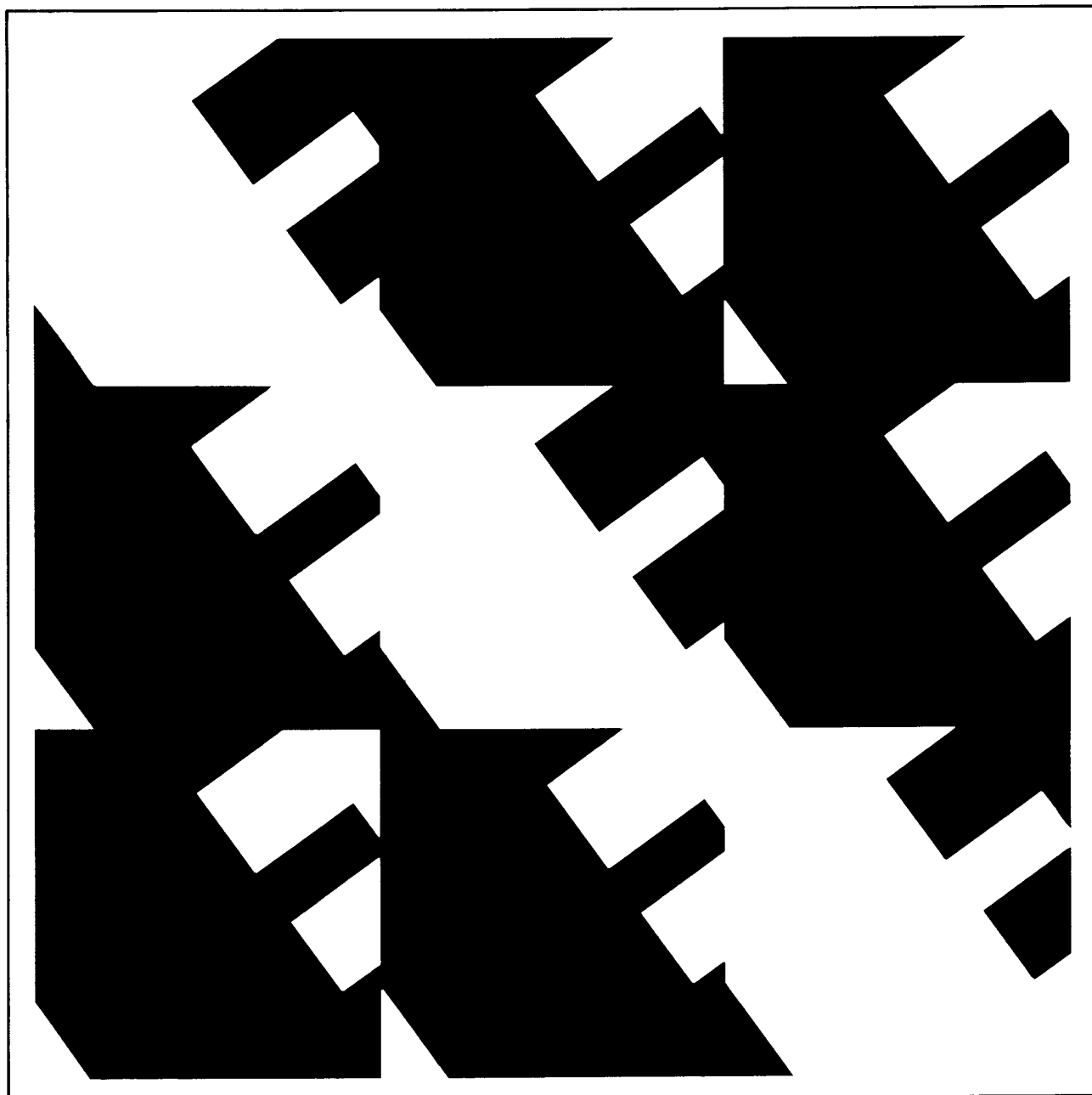


IEEE Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field



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1. Introduction

1.1 Need for Testing. While cable is intensely tested by the manufacturer before shipment, it may be subject to damage or improper treatment in shipment or installation. Consequently, further testing of completed installations before being placed in service is widely practiced. Additionally, many users find that with time alternating voltage will cause deterioration or defects or reveal damage caused in manufacturing or installation which were undetectable by factory and installation tests. Hence, periodic testing after time in service has been found to be a useful practice.

Just as the factory and installation test voltages are frequently too low to detect minute defects, maintenance test voltages have often been found to be too low to locate defects which subsequently failed in service. Since users tend to mix cable types in service, it has also become evident that the test voltage should be related to the circuit basic impulse level (BIL) rather than to the type and thickness of the insulation. These principles have been followed in the development of this guide.

The traditional method of testing the insulation of high-voltage cable has been to subject it to a high alternating potential in the factory. Because of the size and weight of the test transformer and equipment, it has not been practical to employ alternating voltage testing on cable at its installed location. Many installed cables have therefore not been tested, or a high direct voltage has been used. The supply unit for the direct voltage may be relatively small and light, suitable for transporting to most field locations. The direct voltage used has been related to the prescribed alternating test voltage by a ratio, fixed for an individual insulation

type, but varying between types of insulation. The establishment of such a ratio lacks scientific basis and many engineers believe that the direct test voltage should be related to the ultimate dielectric strength of the insulation.

Experience has shown that the application of high direct voltage deteriorates sound insulation very slowly, if at all, so the duration of the direct voltage test is not highly important.

Since the direct voltage strength of cable insulation approaches the impulse strength, it is logical to relate the direct voltage test levels to system BIL as shown in Table 1. For effectively grounded systems having a reduced BIL, the test voltage to be applied shall therefore be selected to accord with the BIL rather than with the rated voltage.

Many users of appreciable quantities of cable apply tests to newly-installed cables before placing them in service. The principle of maintenance testing, while not widely used at present, is found practicable, especially with polymer-insulated cable, in reducing service failures from faults of the cable or its accessories. Such maintenance tests are found at least partially effective in detecting cables which are approaching failure. With such procedure some users note substantial reductions of service failures with polymeric cable systems [4].¹ Most users, however, do not practice maintenance testing.

The decision to employ maintenance testing must be evaluated by the individual user, taking into account the costs of service failure, including intangibles and the costs of testing.

This guide does not purport to require that testing be performed, either at the time of installation or periodically thereafter for main-

¹Numbers in brackets correspond to those in the References, Section 3 of this guide.