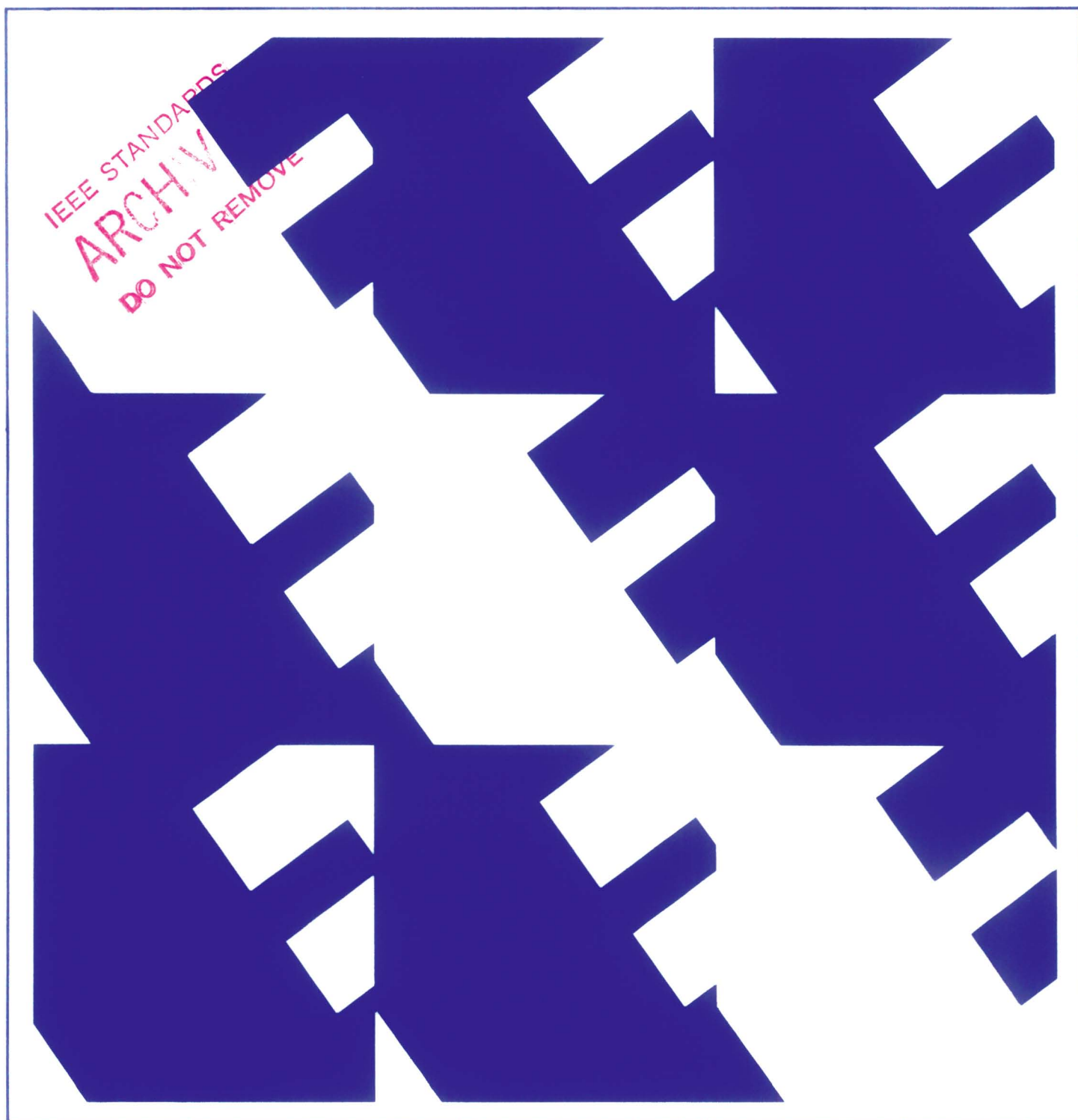


IEEE Recommended Guide for Measuring Ground Resistance and Potential Gradients in the Earth



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RECOMMENDED GUIDE FOR MEASURING GROUND RESISTANCE AND POTENTIAL GRADIENTS IN THE EARTH

1.00 PURPOSE

- 1.01 It is the purpose of this Guide to describe and discuss the present state of the technique of measuring ground resistance and impedance, earth resistivity, and potential gradients resulting from currents in the earth and the prediction of the magnitudes of ground resistance and potential gradients from scale model tests.¹ Factors governing the choice of instruments and the techniques for various types of work are covered, such as the purpose of the measurement, the accuracy required, the time and instruments available, and the nature of the ground or grounding system under test.
- 1.02 The Guide is intended to assist the engineer or the technician in obtaining accurate, reliable data, but not in the interpretation of such data. It points out test procedures to promote the safety of personnel and property, and to prevent interference with the operation of neighboring facilities.

2.00 SCOPE

- 2.01 The testing methods covered in this Guide include those applicable to:
- (1) The measurement of the resistance and impedance to earth of electrodes varying from small rods and plates to large grounding systems of stations.
 - (2) Ground potential surveys, including the measurement of step and touch voltages, and potential contour surveys.
 - (3) Scale-model tests for laboratory determination of the ground resistance and potential gradients for an idealized design.
 - (4) The measurement of earth resistivity.
- 2.02 The methods covered herein are generally limited to those using direct current or periodically reversed direct current, or commercial power frequencies. This Guide does not claim to cover all possible methods, even within these limitations.
- 2.03 Extreme precision is seldom possible because of the many variables encountered; therefore, the measurements should be carefully made by the most suitable method available, with a thorough understanding of the possible sources of error.
- 2.04 Definitions of terms pertinent to the subject matter are given, with references to their sources where known. Those approved or standardized by other bodies are used wherever possible.

3.00 OBJECTIVES OF TESTS

- 3.01 Measurements of ground resistance or impedance and potential gradients on the surface of the earth due to ground currents are necessary to:
- (1) Verify the adequacy of a new grounding system.
 - (2) Detect changes in an existing grounding system.
 - (3) Determine hazardous step and touch voltages.
 - (4) Design protection for personnel and for power and communication circuits.
- 3.02 Scale-model tests are useful in developing new designs for grounding systems and for comparing them with old ones.
- 3.03 Earth resistivity measurements are useful for:
- (1) Estimating the ground resistance of a proposed station structure or grounding system.
 - (2) Estimating potential gradients including step and touch voltages.
 - (3) Computing the inductive coupling between neighboring power and communication circuits.
 - (4) Designing cathodic protection systems.

4.00 DEFINITIONS

- 4.01 Definitions as given herein apply specifically to the application of this Guide. For additional definitions see American Standard Definitions of Electrical Terms C42-1941, C42.35-1957 and C42.65-1957, or the latest revision thereof approved by the American Standards Association. The three-part numbers in parenthesis preceding the titles of some of the definitions included in this Guide indicate the number of the corresponding definition in C42. The definitions which do not carry the three-part number will be submitted for consideration of inclusion in the next revision of C42.

4.0210 (35.15.005) Ground. A ground is a conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth or to some conducting body, of relatively large extent, which serves in place of the earth. It is used for establishing and maintaining the potential of the earth (or of the conducting body) or approximately that potential, on conductors connected to it, and for conducting ground current to and from the earth (or the conducting body).

4.0211 (35.15.010) Grounded. Grounded means that the system, circuit, or apparatus referred to is provided with a ground.