

IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems—Part V: Transmission Systems and Subtransmission Systems

IEEE Power and Energy Society

Developed by the
Surge Protective Devices Committee

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IEEE SA Standards Board

Abstract: Basic factors and general considerations in selecting the class and means of neutral grounding for a particular ac transmission or subtransmission system are covered in this guide. An apparatus to be used to achieve the desired grounding is suggested, and methods for specifying the grounding devices are given. Transformer tertiary systems, equipment-neutral grounding, and the effects of series compensation on grounding are discussed.

Keywords: electrical utility systems, equipment neutral grounding, grounding, IEEE C62.92.5™, neutral grounding, series compensation, subtransmission systems, transformer tertiary systems, transmission systems

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Introduction

This introduction is not part of IEEE Std C62.92.5-2020, IEEE Guide for the Application of Neutral Grounding in Electrical Utility Systems—Part V: Transmission Systems and Subtransmission Systems.

This guide is a part of a series of standards on neutral grounding in electrical utility systems. When the series was first approved and published, it replaced IEEE Std 143™-1954, IEEE Guide for Ground-Fault Neutralizers, Grounding of Synchronous Generator Systems, and Neutral Grounding of Transmission Systems. In this series of documents, individual considerations and practices have been given to the grounding of synchronous generator systems, generator-station auxiliary systems, and distribution systems.

IEEE Std 143-1954 is a revision of AIEE No. 954, October 1954, which was a compilation of the following three AIEE Transaction papers:

- AIEE Committee Guide Report, “Application of Ground-Fault Neutralizers,” *AIEE Transactions (Power Apparatus and Systems)*, vol. 72, pt. III, pp. 183–190, April 1953.
- AIEE Committee Report, “Application Guide for the Grounding of Synchronous Generator Systems,” *AIEE Transactions (Power Apparatus and Systems)*, vol. 72, pt. III, pp. 517–530, June 1953.
- AIEE Committee Report, “Application Guide on Methods of Neutral Grounding of Transmission Systems,” *AIEE Transactions (Power Apparatus and Systems)*, vol. 72, pt. III, pp. 663–668, August, 1953.

The contents of Parts I–V of the revision of IEEE Std 143-1954 are based on the foregoing documents, but are amplified and updated with new material from the IEEE tutorial course “Surge Protection in Power Systems” (79EH0144–6-PWR) and other sources. Part VI of this series addresses current-regulated power sources.

In Part I through Part V of this series, emphasis is placed on power system grounding practices rather than the grounding, for example, of industrial systems, which is covered in other guides and standards. These guides and standards should be referenced, when appropriate, to gain a full picture of other grounding practices.

This revision of this Part V contains no major changes, but is an editorial update and technical clarification as required by IEEE-SA. It incorporates both technical and editorial comments received during the balloting process that have made it more valuable to the reader.

It is impossible to give recognition to all those who have contributed to the technology and practices of grounding of power systems, and work involving the preparation of this guide has been in progress for more than 80 years. However, the assistance of both past and present members of the Neutral Grounding Devices Subcommittee of the Surge-Protective Devices Committee, and other similar groups with comparable purposes, should be acknowledged.

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1. Overview

1.1 Scope

The scope of this document is to provide the basic factors and general considerations in selecting the class and means of neutral grounding for a particular ac transmission or subtransmission system, and the suggested method and apparatus to be used to achieve the desired grounding. Definitions of grounding terms used in this part of the guide can be found in IEEE Std C62.92.1™.¹

1.2 Purpose

The purpose of this document is to provide the user with insight on the basic factors and general considerations in selecting the class and means of neutral grounding for a particular ac transmission or subtransmission system. An apparatus to achieve the desired grounding is suggested, and methods for specifying the grounding devices are given.

1.3 Word Usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).^{2,3}

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

¹Information on references can be found in [Clause 2](#).

²The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is only used to describe unavoidable situations.

³The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.