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# IEEE Guide for Bonding Shields and Sheaths of Single-Conductor Power Cables Rated 5 kV through 500 kV

IEEE Power and Energy Society

Sponsored by the
Insulated Conductors Committee

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**IEEE Std 575™-2014**
(Revision of
IEEE Std 575-1988)

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# IEEE Guide for Bonding Shields and Sheaths of Single-Conductor Power Cables Rated 5 kV through 500 kV

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**Abstract:** The most common shield/sheath-bonding systems now in use on medium through extra high-voltage (5 kV to 500 kV) single-conductor shielded power cables and the methods of calculating the corresponding shield/sheath voltages and currents, when the cables are operated as part of a three-phase system, with the neutral grounded directly or through an impedance, are described in this guide.

**Keywords:** bonding, cross bonding, distribution cable, grounding, high-voltage cable, IEEE 575™, medium-voltage cable, power cable, sheath, sheath bonding, sheath voltage limiters, shield, shield bonding, shield voltage limiters, single-point bonding, special bonding, SVL, transmission cable

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## Introduction

This introduction is not part of IEEE Std 575™-2014, IEEE Guide for Bonding Shields and Sheaths of Single-Conductor Power Cables Rated 5 kV through 500 kV.

This document is a revision of IEEE 575-1988, which had been reaffirmed multiple times without change in years past. The current revision changes the document title to more appropriately reflect the intent of the guide. Most clauses of the guide were revised and updated to better clarify recommendations and procedures. Advances in computer technology now allow many of the equations to be programmed and solved rapidly using software that can analyze the corresponding circuit configuration and make recommendations for application of specialized bonding. Considerations for shield/sheath optimization have been included in Clause 5. A major addition is Annex F, which provides new information on current and voltage distribution on cable shields/sheaths in situations involving installations with multiple cables per phase.

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# IEEE Guide for Bonding Shields and Sheaths of Single-Conductor Power Cables Rated 5 kV through 500 kV



## 1. Overview

Large investment costs, generally associated with the installation of underground transmission circuits, typically mandate optimizing cable operation from the standpoint of efficiency and power throughput capacity. With the popularity of single-conductor cables and the use of low loss, high dielectric-strength insulating materials and improved cable jackets in the mid-1960s, and their application at sub-transmission and transmission voltages, there is significant interest in the use of single-conductor cables and the problems of the induced voltages and currents associated with their use. Many of these problems (for example, failure of shield/sheath insulators, failure of cable jackets, and shield/sheath corrosion) have been recognized since metallic-sheathed cables were first used, and the fundamentals of calculating shield/sheath voltages and currents have been defined for many years. However, increasingly, ampacity requirements and short-circuit capabilities of modern power systems have accentuated some problems, while improvements in shield/sheath insulations have virtually eliminated others.

Thus it is evident that there is a need for some guidelines whereby the cable engineer can select the shield/sheath-bonding method that best fits the needs of a particular installation.

### 1.1 Scope

This guide describes the most common special shield/sheath-bonding systems now in use on high-voltage single-conductor shielded power cables and the methods of calculating shield/sheath voltages and currents, particularly as applied to three-phase systems operating at 60 kV and above, with the cable neutral grounded directly or as part of a special bonding system as described in the guide.