

# IEEE Std 3004.7™ -2021

Recommended Practice  
for Conductor Protection in  
Industrial and Commercial  
Power Systems



# IEEE Recommended Practice for Conductor Protection in Industrial and Commercial Power Systems

Developed by the

**Industrial and Commercial Power Systems Standards Development Committee**  
of the  
**IEEE Industry Applications Society**

Approved 9 February 2021

**IEEE SA Standards Board**

**Abstract:** The protection of power cables used in industrial and commercial power systems is covered in this recommended practice. It is likely to be of greatest value to the power-oriented engineer with limited experience in the area of protection and control. It can also be an aid to all engineers responsible for the electrical design of industrial and commercial power systems.

**Keywords:** conductors, IEEE 3004.7™, overcurrent protection, power distribution protection, power system protection, wire

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## Introduction

This introduction is not part of IEEE Std 3004.7™-2021, IEEE Recommended Practice for Conductor Protection in Industrial and Commercial Power Systems.

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This recommended practice was developed by the Industrial and Commercial Power Systems Standards Development Committee of the Industry Applications Society, as part of a project to repackage the popular IEEE Color Books®. The goal of this project is to speed up the revision process, eliminate duplicate material, and facilitate use of modern publishing and distribution technologies.

When this project is completed, the technical material included in the 13 “color books” will be included in a series of new standards. Approximately 60 additional “dot” standards, organized into the following categories, will provide in-depth treatment of many of the topics formerly covered in the color books:

- Power Systems Design (3001 series)
- Power Systems Analysis (3002 series)
- Power Systems Grounding (3003 series)
- Protection and Coordination (3004 series)
- Emergency, Standby Power, and Energy Management Systems (3005 series)
- Power Systems Reliability (3006 series)
- Power Systems Maintenance, Operations, and Safety (3007 series)

In many cases, the material in a dot standard comes from a particular chapter of a particular IEEE Color Book. In other cases, material from several IEEE Color Books has been combined into a new dot standard.

### IEEE Std 3004.7™

This publication provides a recommended practice for the electrical design of commercial and industrial facilities. This recommended practice covers the protection of conductors used in industrial and commercial power systems. It is likely to be of greatest value to the power-oriented engineer with limited commercial or industrial plant experience. It can also be an aid to all engineers responsible for the electrical design of commercial and industrial facilities. However, it is not intended as a replacement for the many excellent engineering texts and handbooks commonly in use, nor is it detailed enough to be a design manual. It should be considered a guide and general reference on electrical design for commercial and industrial facilities.

Tables, charts, and other information that have been extracted from codes, standards, and other technical literature are included in this publication. Their inclusion is for illustrative purposes; where technical accuracy is important, the latest version of the referenced document should be consulted to assure use of complete, up-to-date, and accurate information.

This publication is based on North American installation codes and product standards, primarily those in the United States and Canada, and thus will be most useful in those jurisdictions and in jurisdictions that follow North American codes and standards. Elsewhere similar codes and standards may apply, such as those published by the International Electrotechnical Commission (IEC).

The material in this recommended practice was originally published in Chapter 9 of IEEE Std 242™-2001 (*IEEE Buff Book*™) [B16] and has been updated as required based on US codes and standards.

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# IEEE Recommended Practice for Conductor Protection in Industrial and Commercial Power Systems

## 1. Overview

### 1.1 Scope

This recommended practice covers the protection of conductors used in main and branch power circuits in industrial and commercial power systems against damage from short circuits and overloads as well as against physical damage from mechanical hazards, adverse environmental conditions, and improper handling.

### 1.2 Purpose

### 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*).<sup>1,2</sup>

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*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

## 2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

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<sup>1</sup>The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is used only to describe unavoidable situations.

<sup>2</sup>The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.