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IEEE Recommended Practice for Electrical Installations on Shipboard—Controls and Automation

IEEE Industry Applications Society

Sponsored by the
Petroleum & Chemical Industry Committee

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IEEE Recommended Practice for Electrical Installations on Shipboard — Controls and Automation

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IEEE-SA Standards Board

Abstract: The recommendations for controls, control applications, control apparatus, and automation on shipboards are established by this document. These recommendations reflect the present-day technologies, engineering methods, and engineering practices.

This document is intended to be used in conjunction with IEEE Std 45™.

Keywords: automation, computer based system, control system, IEEE 45.2, interior communication system, monitoring, navigation system, remote control, safety system

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Introduction

This introduction is not part of IEEE Std 45.2-2011, IEEE Recommended Practice for Electrical Installations on Shipboard — Controls and Automation.

The IEEE Std 45 series comprises nine recommended practices addressing electrical installations on ships and marine platforms. IEEE Std 45.2 provides recommended practice for controls and automation and is intended for use with the IEEE Std 45 series of documents. The topics covered in this document should be considered from the beginning of the project and throughout the design and construction processes, and thereby should facilitate the integration of electrical systems at the shipyard level. Adherence to the IEEE 45.2 controls and automation process provides an effective set of integration requirements and identifies key issues and recommended solutions or options.

Previous editions of IEEE Std 45 were developed as single documents addressing all areas. On 9 June 2005 PAR 45 for the Revision of IEEE Std 45-2002 was approved and the revision of IEEE Std 45 as a single document began. It soon became apparent that attempting to cover all issues in a single document would produce a document that was very large and therefore difficult to ballot due to the wide range of issues needed to be addressed. In September 2008 it was decided that the revision of IEEE Std 45 should be developed as a base document with separate documents addressing specific areas.

On 10 December 2008 separate Project Authorization Requests (PARs) were approved for eight separate recommended practices. Subsequently, it was recognized that two areas were very close to balloting and contained important information. Additional PARs were then prepared and approved on 11 September 2009 for Switchboards and 9 December 2009 for Cable Systems bringing the total number of standards in the IEEE Std 45 Series to nine:

— IEEE P45™, Recommended Practice for Electrical Installations on Ships.

— IEEE P45.1™, Recommended Practice for Electrical Installations on Shipboard— Design

— IEEE P45.2™, Recommended Practice for Electrical Installations on Shipboard— Controls and Automation

— IEEE P45.3™, Recommended Practice for Shipboard Electrical Installations—Systems Engineering

— IEEE P45.4™, Recommended Practice for Electrical Installations on Shipboard— Marine Sectors and Mission Systems

— IEEE P45.5™, Recommended Practice for Electrical Installations on Shipboard—Safety Considerations

— IEEE P45.6™, Recommended Practice for Electrical Installations on Shipboard— Electrical Testing

— IEEE P45.7™, Recommended Practice for Electrical Installations on Shipboard—AC Switchboards

— IEEE P45.8™, Recommended Practice for Electrical Installations on Shipboard— Cable Systems

Several other IEEE standards have been prepared or are currently being developed to support the IEEE 45 Series. These include:

— IEEE Std 1580™, IEEE Recommended Practice for Marine Cable for use on Shipboard and Fixed or Floating Platforms

— IEEE P1580.1™, Recommended Practice for Insulated Bus Pipe for Use on Shipboard and Fixed or Floating Platforms

— IEEE Std 1662™-2008[a] IEEE Guide for Design and Application of Power Electronics in Electrical Power Systems on Ships

— IEEE Std 1709™-2010 IEEE Recommended Practice for 1 kV to 35 kV Medium-Voltage DC Power Systems on Ships

— IEEE P1826™, Standard for Power Electronics Open System Interfaces in Zonal Electrical Distribution Systems Rated Above 100 kW

— IEEE P60092-510, Electrical Installations in Ships – Part 510: High Voltage Shore Connection Systems (HVSC)

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[a] Information on normative references can be found in Clause 2.

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Errata

Errata, if any, for this and all other standards can be accessed at the following URL: http://standards.ieee.org/findstds/errata/index.html. Users are encouraged to check this URL for errata periodically.

Interpretations

Current interpretations can be accessed at the following URL: http://standards.ieee.org/findstds/interps/index.html.

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Michael Janezic, *NIST Representative*

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IEEE Recommended Practice for Electrical Installations on Shipboard — Controls and Automation

1. Overview

These recommendations establish the minimally acceptable guidelines for the design, selection, and installation of systems and equipment aboard marine vessels applying electrical apparatus for power, propulsion, steering, automation, navigation, lighting, and communications. These recommendations describe present-day acceptable electrical engineering methods and practices. The primary focus of these IEEE Std 45.2 guidelines is on the deliverability of control systems and the equipment, conditions and documentations that should be required. Guidelines for the design and integration of ship electrical systems are discussed elsewhere in this IEEE Std 45™ Series, which comprises nine recommended practices addressing electrical installations on ships and marine platforms.

It is recognized that changes and improvements in shipboard requirements may develop that are not specifically covered herein; such changes, if incorporated in the design, should be equal to the safety and reliability levels established herein and generally in accord with the intent of these standards.

In developing these recommendations, consideration was given to the electrical and engineering requirements promulgated by various regulatory agencies, classification societies, and by the International Maritime Organization's International Convention for the Safety of Life at Sea (IMO SOLAS), as amended.

This recommended practice was developed by a voluntary consensus body to provide assistance and guidance to regulatory agencies governing electrical engineering requirements.

Corrosion due to improper or inadvertent grounding of control systems is a significant problem in marine platforms. Corrosion is not addressed in this standard; however, it must be considered in the overall design of the platform's control systems.

1.1 Scope

The recommendations for controls, control applications, control apparatus, and automation on shipboards are established by this document. These recommendations reflect the present-day technologies, engineering methods, and engineering practices.

This document is intended to be used in conjunction with the IEEE Std 45.[1]

1.2 Purpose

An extension of the baseline technology and methods covered in IEEE Std 45 and IEEE Std 45.2 provides a consensus of recommended practices for control applications and automation in marine electrical engineering as applied specifically to ships, shipboard systems and equipment.

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.

API RP 14F, Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class 1, Division 1 and Division 2 Locations, Fifth Edition.[2]

ASTM F1166-95a(2006), Standard Practice for Human Engineering Design for Marine Systems, Equipment and Facilities.[3]

Code of Federal Regulations Title 46 Part 111 (46 CFR 111), Electric Systems – General Requirements.[4]

Code of Federal Regulations Title 46 Part 113.25-25 (46 CFR 113.25-25), Communication and Alarm Systems and Equipment.

Code of Federal Regulations Title 46 Part 113.25-30 (46 CFR 113.25-30), Communication and Alarm Systems and Equipment.

IEC 60068-2-1, Environmental Testing – Part 2-1: Test- Test A: Cold.[5]

[1] Information on normative references can be found in Clause 2.
[2]API publications are available from the Publications Section, American Petroleum Institute, 1200 L Street NW. Washington, DC 20005, USA (http://www.api.org/).
[3]ASTM publications are available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA (http://www.astm.org/).
[4]CFR publications are available from the U.S. Government Printing Office, 732 N. Capitol Street, Washington, DC 20401, USA (http://www.gpo.gov/).