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Electrical Safety Manual

2015

A Comprehensive Guide to
Electrical Safety Standards
For Healthcare Facilities

Matthew F. Baretich, PE, PhD

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Electrical Safety Standards
For Healthcare Facilities

Matthew F. Baretich, PE, PhD

This publication is intended to be a helpful information resource,
and reflects the expert advice and views of the author.
It is not to be construed as legal or regulatory advice.

SPECIAL NOTE

This manual contains references to generally accepted, national standards relating to electrical safety. It is important to note that many state, county, and city codes/standards may be more rigid and enforced by the local authority having jurisdiction (AHJ). The healthcare facility employee designated as responsible for electrical safety policy and procedures will need to identify the AHJ and determine if additional laws or ordinances apply.

Published by

Association for the Advancement of Medical Instrumentation
4301 N. Fairfax Drive, Suite 301
Arlington, VA 22203-1633
www.aami.org

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Printed in the United States of America

ISBN 1-57020-582-5

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Foreword

Most of the general populace know the basic rules of electrical safety, such as *don't stand in water while handling live electrical equipment* or *exposed wires are dangerous*. Most of them also take for granted that electricity is safe when these basic rules are followed. They have little appreciation for all the engineering years of experience and safety standards that have helped to make it so safe for the general population. As this *Electrical Safety Manual* so ably illustrates, there are many aspects of electrical safety beyond these few basic principles.

In spite of the best efforts of those who write standards on electrical safety—myself included—those in the healthcare field charged with implementing and interpreting the various standards need some help. The different standards sometimes overlap, and may even conflict. Even definitions may differ.

In addition, electrical safety thinking has changed over the years. The 2012 version of *NFPA 99*, for example, removed many of the “nice to have” aspects of the earlier editions as the document was transformed from a voluntary standard into a “code” on an equal footing with the National Electrical Code and the Life Safety Code.

Matt Baretich has done an excellent job of pulling together this *Electrical Safety Manual* and making it accessible to readers. As Matt has shown with this latest edition, there is definitely a need to refresh.

With the aid of this manual, I hope that you will be able to help your organization comply with relevant sections of the various standards on electrical safety. Keep in mind that this manual is not intended to be the final authority, rather a guide to the pertinent standards. When compliance with a pertinent standard is essential, go back to the source standard.

Alan Lipschultz, PE, CCE, CSP
President, HealthCare Technology Consulting LLC
North Bethesda, MD

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Introduction to the 2015 Edition

TARGET AUDIENCE

This document is directed toward those who are responsible for electrical safety in healthcare facilities. A healthcare facility may be a clinic, an outpatient surgery center, a nursing home, a hospital, or a complex healthcare system incorporating any combination of facilities that provide patient care. To simplify the presentation, the *Electrical Safety Manual (ESM)* uses the term “healthcare facility” to represent any of these units.

RESPONSIBILITY

Departments within the healthcare facility that may be responsible for electrical safety include clinical engineering, biomedical equipment technology, healthcare technology management (HTM), healthcare facilities engineering, or other technically qualified components of the organization. In each healthcare facility, one or more of these departments are responsible for application of this manual in accordance with facility policies and applicable electrical safety codes, standards, and regulations.

Healthcare facilities must have access to appropriate technical expertise to effectively apply this manual. When such expertise is not available on staff, the healthcare facility should work with an external service organization or consultant that has appropriate technical qualifications.

In most cases, the recommended testing procedures can be carried out by the healthcare facility’s technical

personnel. It should be noted that electrical safety procedures for medical devices and healthcare environments are not intended to be separate from other equipment maintenance activities. They should be integrated into a comprehensive equipment inspection and maintenance program for the facility.

In addition, accreditation and regulatory agencies expect clinical unit managers and equipment operators to be aware of their roles in ensuring compliance with appropriate codes and standards, and to have access to documents that demonstrate compliance.

MANUAL ORGANIZATION

The *ESM* contains four chapters that provide a range of information regarding electrical safety, including discussions of codes, standards, regulations, and general concepts upon which the manual is based. The chapters also include recommendations for organizing an electrical safety program and descriptions of electrical safety-related procedures to be used in the program.

The manual also contains several Quick Views that summarize key information for easy reference and Policy Guides that provide recommendations for developing policies and procedures for use in an electrical safety program.

For further reference, the manual includes a Glossary of key terms, a References list of cited material, and a Further Reading section for additional resources.

CHANGES FROM THE 2008 EDITION

The most fundamental difference between the 2008 and 2015 editions is the incorporation of material from the latest codes and standards (listed below). Reference sources used for the 2008 edition of the *ESM* have had significant updates and, in some cases, have been superseded by new documents. A key objective of the manual is to provide a single publication that pulls together critical material from the full range of applicable codes and standards.

Two major areas of change in the 2015 edition of the *ESM* are these:

- There is additional material regarding facility-related electrical safety. In particular, new material regarding isolated power systems (IPSS) has been added. Material regarding facility-related safety requirements has been brought together in a single chapter (Chapter 3) to distinguish it from material regarding equipment-related safety requirements (Chapter 2).
- The 2012 edition of *NFPA 99: Health Care Facilities Code*¹ represents a fundamental rewriting of the 2005 edition. New and revised material, particularly with regard to IPSS and risk-based building system categories, has been incorporated into this edition of the *ESM*.

And, as with every edition, efforts have been made to clarify and expand various topics to enhance the value of the *ESM* for its readers. A few topics that, over time, have become of limited interest have been removed.

REFERENCE SOURCES AND CITATIONS

The *ESM* is based on material from organizations that have developed codes, standards, and regulations applicable to healthcare facilities in the United States. Chapter 4 of the *ESM* describes these organizations and their requirements. These reference sources are national in scope; however, individual states or other government jurisdictions may have exceptions or additions. Moreover, various authorities having jurisdiction (AHJs) may enforce earlier editions of these references. Therefore, readers of the *ESM* should make themselves aware of local requirements.

For simplicity, citations of the reference sources used will be abbreviated as shown in the examples below.

The Joint Commission (TJC) document listed below addresses accreditation of hospitals. TJC offers several distinct accreditation programs; however, the *hospital* accreditation program is the most comprehensive with regard to the topics in the *ESM*. There are also other hospital accreditation organizations, including the Healthcare Facilities Accreditation Program (www.hfap.org), DNV GL Healthcare (www.dnvglhealthcare.com), and the Center for Improvement of Healthcare Quality (www.cihq.org), all with very similar requirements regarding the topics of the *ESM*.

Finally, it should be noted that the 2015 edition of *NFPA 99* has already been published. However, with regard to the topics in the *ESM*, there are only minor differences between the 2012 and 2015 editions. The *ESM* uses the 2012 edition rather than the 2015 edition because CMS (Centers for Medicare and Medicaid Services) and TJC have indicated their intent to adopt the 2012 edition of *NFPA 99*.

Full Reference (Example)	Abbreviated Citation
ANSI/AAMI ES60601-1:2005/(R)2012 (IEC 60601-1:2005 MOD) <i>Medical electrical equipment—Part 1: General requirements for basic safety and essential performance</i> , clause 3.2	AAMI 60601-1 3.2
<i>Guidelines for Design and Construction of Hospitals and Outpatient Facilities</i> , 2014 edition, 2.1-8.3.6	<i>FGI Guidelines</i> 2.1-8.3.6
<i>2015 Comprehensive Accreditation Manual for Hospitals</i> , Standard EC.02.04.03, Element of Performance 1	<i>CAMH</i> EC.02.04.03 EP 1
<i>NFPA 70: National Electrical Code</i> , 2014 edition, paragraph 517.18	<i>NFPA 70</i> 517.18
<i>NFPA 70E: Standard for Electrical Safety in the Workplace</i> , 2015 edition, paragraph 120.1	<i>NFPA 70E</i> 120.1
<i>NFPA 99: Health Care Facilities Code</i> , 2012 edition, paragraph 10.2.2	<i>NFPA 99</i> 10.2.2
<i>OSHA Electrical Safety Standard</i> , Code of Federal Regulations, paragraph 29 CFR 1910.147	<i>OSHA</i> 29 CFR 1910.147