

Progress in Impacting Policy in Workplace Electrical Safety



H. Landis “Lanny” Floyd II, PE, CSP, CMRP, Fellow IEEE
Principal Consultant – Electrical Safety & Technology



The miracles of science™

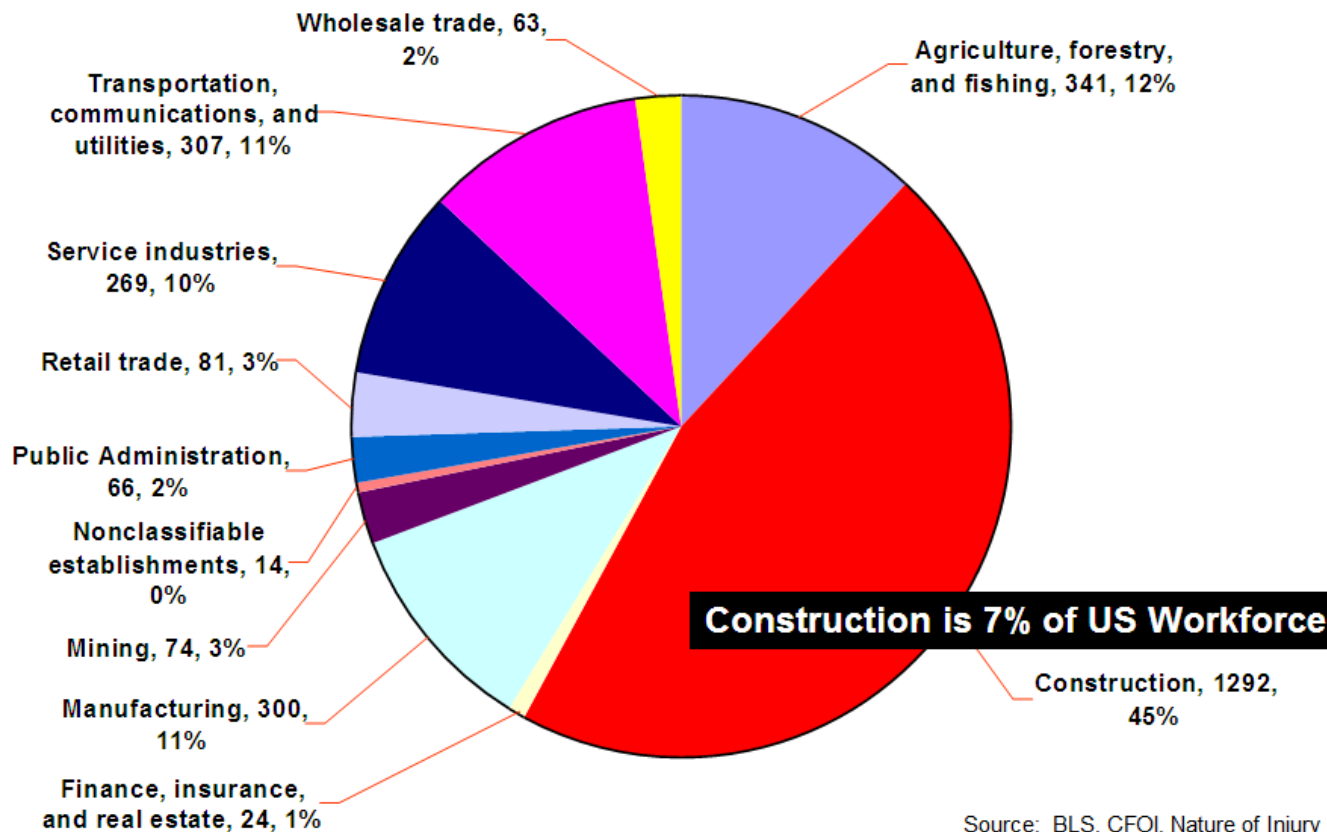
NIOSH PtD Conference
Washington DC
August 22-24, 2011

Trends in Electrical Injury in the US, 1992 – 2002

James C. Cawley and Gerald T. Homce
NIOSH



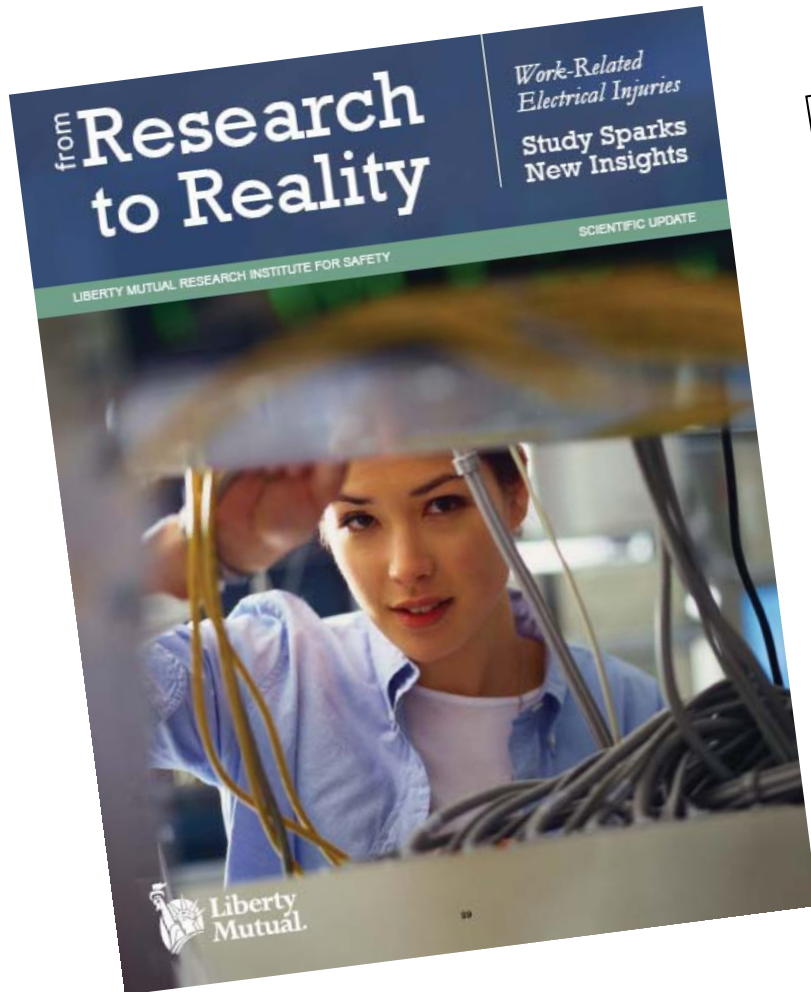
Workplace electrical deaths, 1992-2000



Source: BLS, CFOI, Nature of Injury

From Cawley and Homce, "Trends in US Electrical Injuries 1992-2002",
IEEE Transaction on Industry Applications, Aug/Sept 2008

Electrical Injuries are 2nd Most Costly Workers Comp Claim



Journal of Occupational and Environmental Hygiene, 6, 612-623
 ISSN: 1545-9624 print / 1545-9632 online
 Copyright © 2009 JOEH, LLC
 DOI: 10.1080/15459620903133683

Etiology of Work-Related Electrical Injuries: A Narrative Analysis of Workers' Compensation Claims

David A. Lombardi,¹ Simon Matz,¹ Melanye J. Brennan,¹ Gordon S. Smith,² and Theodore K. Courtney¹

¹Liberty Mutual Research Institute for Safety, Center for Injury Epidemiology, Hopkinton, Massachusetts
²University of Maryland School of Medicine, National Study Center for Trauma and Emergency Medical Systems, Baltimore, Maryland

Keywords: electrical, epidemiology, injury, narrative analysis, occupational

Address correspondence to: David A. Lombardi, Liberty Mutual Research Institute for Safety, Quantitative Analysis Unit, 71 Franklin Road, Hopkinton, MA 01748; e-mail: david.lombardi@libertymutual.com.

The purpose of this study was to provide new insight into the etiology of primarily nonfatal, work-related electrical injuries. We developed a multistage, case-selection algorithm to identify electrical-related injuries from workers' compensation claims and a customized coding taxonomy to identify pre-injury circumstances. Workers' compensation claims routinely collected over a 1-year period from a large U.S. insurance provider were used to identify electrical-related injuries using an algorithm that evaluated: coded injury cause information, nature of injury, "accident"-related injury description narratives. Concurrently, a customized coding taxonomy for these narratives was developed to abstract the activity, source, initiating process, mechanism, vector, and voltage. Among the 586,567 reported claims during 2002, electrical-related injuries accounted for 1283 (0.22%) of nonfatal claims and 15 fatalities (1.2%). Of 1283 (0.22%) of nonfatal claims and 15 fatalities (1.2%), 36, working in services (33.4%), manufacturing (24.7%), retail trade (17.2%), and construction (7.2%). Body parts injured most often were the hands, fingers, or wrist (34.9%); multiple body parts/systems (25.0%); lower/lower arm; elbow; shoulder, and upper extremities (19.2%). The leading activities were conducting manual tasks (55.1%); working with machinery, appliances, or equipment; working with electrical wire; and operating powered or nonpowered hand tools. Primary injury sources were appliances and switches/equipment (24.4%); wires, cables/cords (18.0%); machines/tools (11.8%); and lighting (4.2%). No vector was identified in 10.4% of cases, and the work process was initiated by others in less than 1% of cases. Injury narratives provide valuable information to overcome some of the limitations of pre-coded data, more specifically for identifying additional injury causes and in supplementing the etiology of work-related electrical injuries that may lead to further prevention opportunities.

[Supplemental materials are available for this article. Go to the publisher's online edition of the *Journal of Occupational and Environmental Hygiene* for the following free supplemental resources: tables detailing activity source by coding and BLS primary and secondary event coding for electrical injuries, case selection algorithm of work-related electrical injuries, and a table detailing electrical injury narrative coding taxonomy.]

INTRODUCTION

Electrocution is a leading cause of on-the-job fatalities in the United States,^(1,2) and according to recent data from the U.S. Bureau of Labor Statistics (BLS), it accounted for an estimated 4% of all workplace fatalities in 2007.⁽³⁾ When ranked by average years of potential life lost per case,⁽⁴⁾ electrical fatalities are second only to traffic fatalities, leading to an estimated 41.1 years of potential life lost per case.⁽⁴⁾ Reported, electrical injuries have higher average workers' compensation costs than all other recorded injuries except motor vehicle crashes.⁽⁵⁾ Likewise, survey estimates from the BLS suggest that in 2005, there were 2950 nonfatal electrical incidents involving days away from work in private industry.⁽⁶⁾ There has been a marked decrease over the past century in the incidence of many fatal and nonfatal workplace injuries.⁽⁷⁾ In general, this decrease can be attributed to strong government and private industry prevention efforts that included stronger safety regulations and increased dissemination of the prevention of electrocutions and electrical injury was a primary emphasis area of the National Institute for Occupational Safety and Health (NIOSH).⁽⁸⁾

In addition, mortality due to electrocution decreased more than any other cause of death to workers during this period potentially attributable to OSHA regulatory efforts, changes in National Electrical Codes, and safety awareness campaigns. More recently, trends in fatal electrical injuries have continued

Fatal Occupational Electrocutions in the United States

A. J. Taylor, G. McGwin Jr., F. Valent and L.W. Rue



Includes in depth analysis of fatalities by workplace scenarios



Progress in Electrical Safety



- Communicating awareness
- Professional activities
- Codes and Standards

PREVENTION THROUGH DESIGN

NIOSH strategy advancements for electrical safety benefits

BY H. LANDIS FLOYD, II

THIS STUDY REVIEWS the scope and potential impact that the Prevention through Design (PtD) initiative sponsored by the U.S. National Institute of Occupational Safety and Health (NIOSH) could have on electrical safety. It also describes some of the key learnings and recommended actions from the July 2007 workshop held in Washington, DC, to launch this initiative. Opportunities to help assure electrical safety benefits from this initiative are outlined.

Launching the PtD Initiative

In July 2007, NIOSH convened a workshop to obtain the views of a variety of stakeholders on a major initiative to create a sustainable national strategy for PtD [1]. The logo for this initiative is shown in Figure 1.

One product of the workshop was a revised definition of PtD: "PtD involves addressing the occupational safety and health needs in the design and redesign



IEEE INDUSTRY APPLICATIONS MAGAZINE • MAY/JUNE 2010 • WWW.IEEE.ORG/IAAS
1077-2618/10/524-00030-10 IEEE

HAZARD MITIGATION THROUGH DESIGN

Electrical safety for all crafts in construction work environments

BY H. LANDIS FLOYD, II & DANNY P. LIGGETT

PREVENTION THROUGH design (PtD) is a seven-year initiative launched by the U.S. National Institute of Occupational Safety and Health (NIOSH) in July 2007 to advance the practical application of workplace hazard mitigation through design. This initiative is intended to raise awareness and stimulate innovation in policies, regulations, and standards supporting application design techniques that reduce the risk of injury through the full life cycle of installations, including construction, commissioning, operations, maintenance, renewal, and demolition. The intent of this article is to start a dialog for exploring the concepts of PtD as applied to the hazards in construction. This article summarizes the scope and potential impact the NIOSH PtD initiative could have on electrical safety for all crafts in construction work environments. Based on NIOSH analysis, the construction industry represents 7% of the U.S. workforce but accounts for 45% of occupational fatalities due to electrical hazards in the workplace. This article summarizes the goals and offers input in developing strategies to be a part of the PtD initiative. Practical examples are provided to further stimulate expansion of these concepts in construction work environments.

In July 2007, NIOSH convened a workshop to obtain the views of a variety of stakeholders on a major initiative to "create a sustainable national strategy for Prevention through Design" [1], [2]. One product of the workshop was a revised definition of PtD: "Addressing occupational safety and health needs in the design and redesign processes to prevent or minimize work-related hazards and risks associated



IEEE INDUSTRY APPLICATIONS MAGAZINE • MAY/JUNE 2010 • WWW.IEEE.ORG/IAAS
1077-2618/10/524-00030-10 IEEE

Managing Risks of Overhead Line Contact



What is the best way to manage crane proximity to overhead power lines when servicing the drilling rig?

Permits, training, administrative procedures, PPE?

Professional Recognition



*The Institute of Electrical and Electronics Engineers, Inc.
Certifies that*

James Bowen

has been elected to the grade of

Fellow

*for leadership in "safety by design" in electrical substation
engineering*

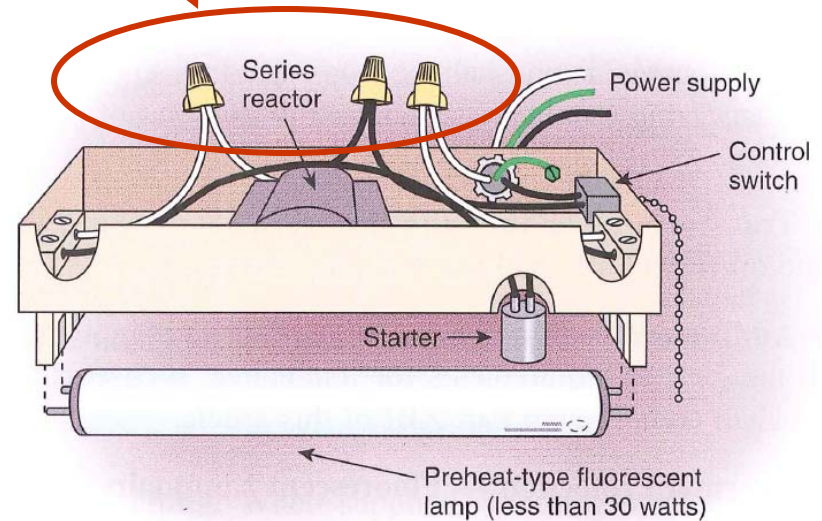


Michael Lightner
President

Joseph B. Brinn de la Cruz
Secretary

Impacting NFPA Standards

Touch safe disconnect device replaces traditional connections for lighting ballasts

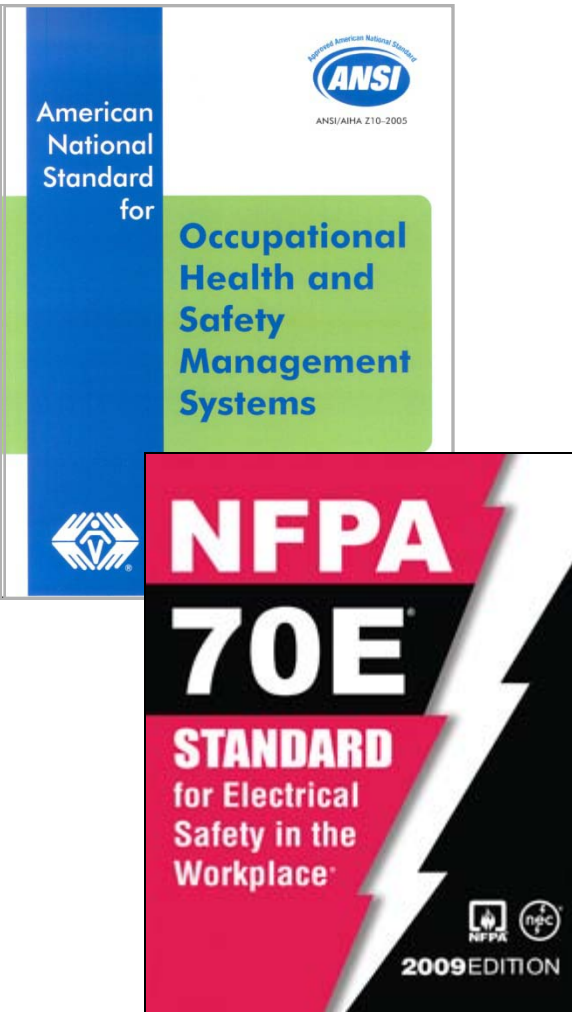


Impacting NFPA Standards

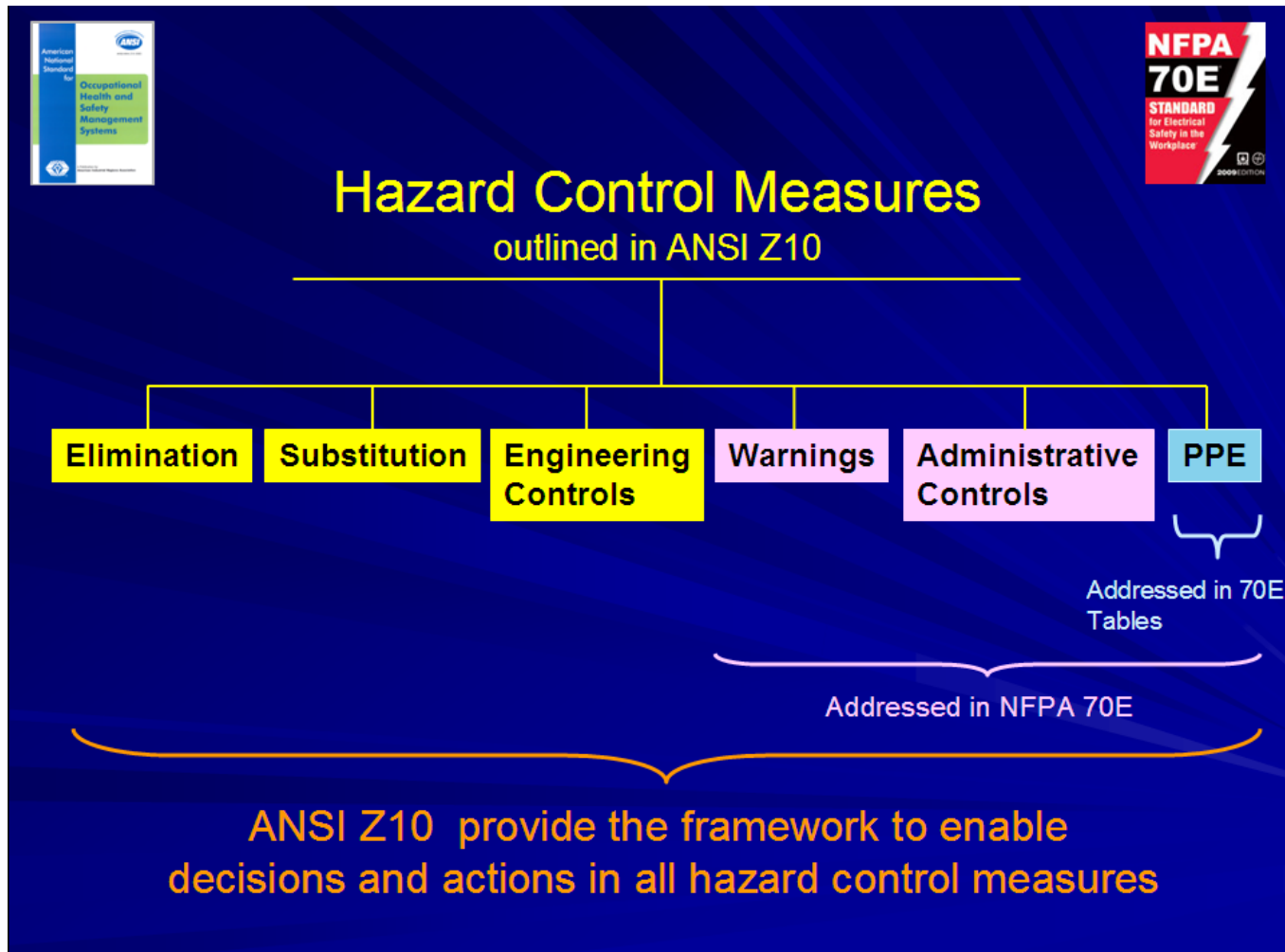


110.7 Electrical Safety Program

- FPN 1: Safety-related work practices are just one component of an overall electrical safety program
- FPN No. 2: ANSI/AIHA Z10-2005, American National Standard for Occupational Health and Safety Management Systems, provides a framework for establishing a comprehensive electrical safety program as a component of an employer's occupational safety and health program.



Impacting NFPA Standards



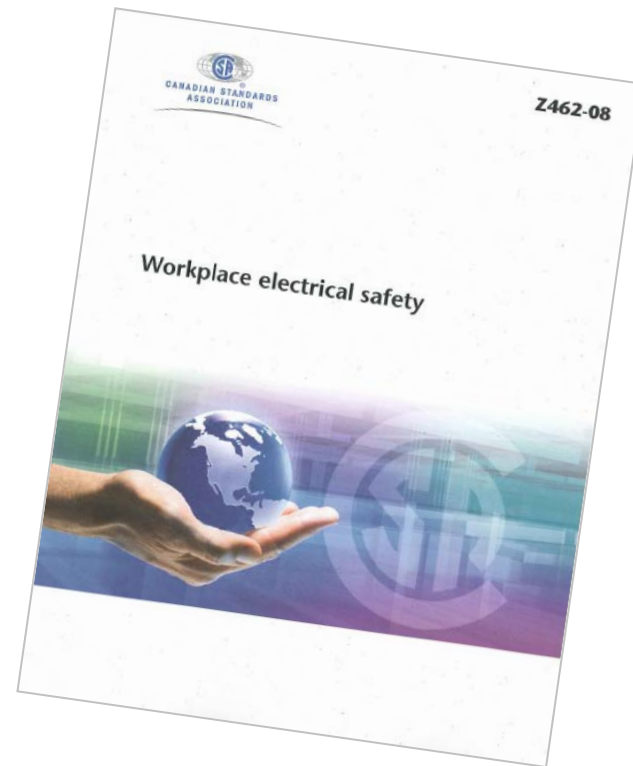
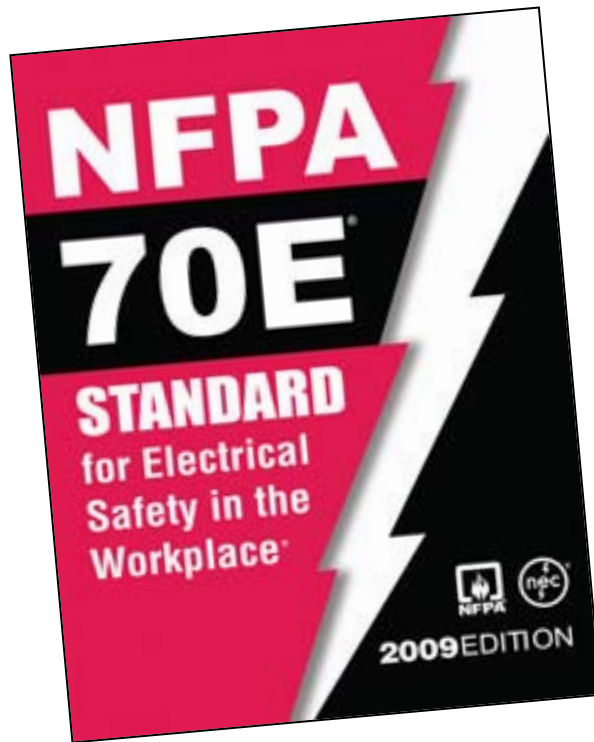
Impacting NFPA Standards



Annex O Safety-Related Design Requirements

The application of <hazard analysis methods> should be used to compare design options and choices to facilitate design decisions that serve to eliminate risk, reduce frequency of exposure, reduce magnitude or severity of exposure, enable the ability to achieve an electrically safe work condition, and otherwise serve to enhance the effectiveness of the safety-related work practices contained in this standard.

Impacting CSA Standards



CSA Z462-2008 adopted the requirements in NFPA 70E-2009

Impacting IEEE Standards



Under development.....

**IEEE Standard 1814
Recommended Practice for Electrical System
Design Techniques to Improve Electrical Safety**



Inherently Safer Technology

GFCIs (or RCDs)



Extension cord



Adapter



Wall outlet

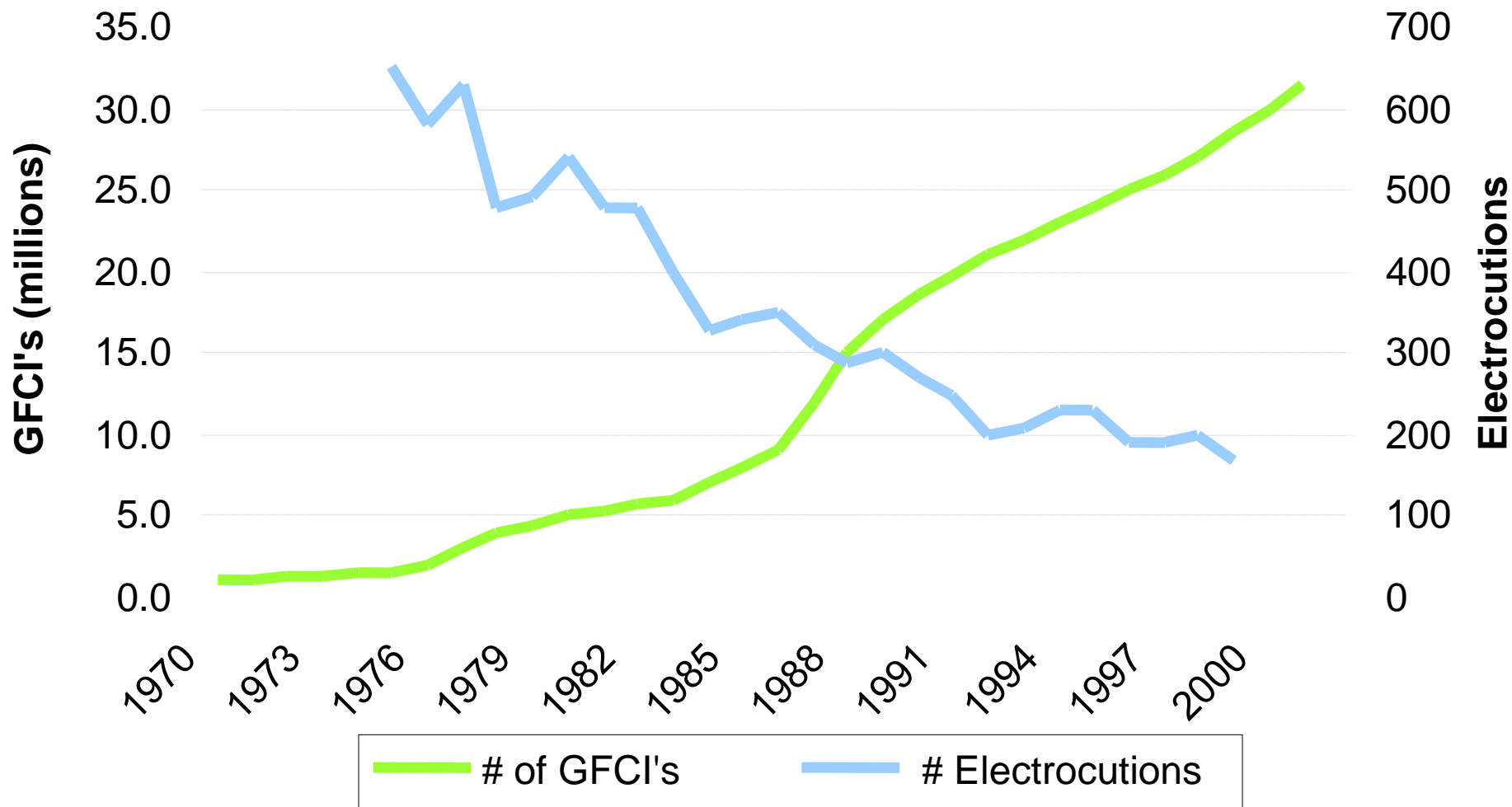


Circuit Breaker



240-600 V

GFCI Impact on Electrocutions Associated with Consumer Products



Inherently Safer Design

Arc Resistant Switchgear
Arc energy directed away from personnel



Non Arc Resistant Switchgear
Personnel in line of fire

Inherently Safer Design



Smart motor control centers and substations



Smart MCC troubleshooting



Traditional troubleshooting

Inherently Safer Design

Substitution of less hazardous systems or equipment



Ports to allow thermographic & ultrasonic inspection without removing covers

Inherently Safer Design

- **High resistance grounding for 480V systems**
 - Reduces frequency and magnitude of arcing faults
- **Remote racking for draw out circuit breakers**
- **Remote switching**



ESW 2012

2012 IEEE IAS Electrical Safety Workshop *changing the electrical safety culture*

...an international forum for changing the electrical safety culture and serving to advance application of technology, work practices, codes and regulations to prevent electrical incidents and injuries in the workplace...

www.ewh.ieee.org/cmte/ias-esw

Daytona Beach Hilton

January 30 – February 3, 2012



Our 19th Annual Conference

- Fundamental & Advanced Tutorials
- Products & Services Exposition
- Standards Working Groups
- Expert Presentations
- Technical Tours
- and more



The Goal is ZERO

Progress in Impacting Policy in Workplace Electrical Safety



.....the journey continues.....

H. Landis “Lanny” Floyd II, PE, CSP, CMRP, Fellow IEEE
Principal Consultant – Electrical Safety & Technology



The miracles of science™

NIOSH PtD Conference
Washington DC
August 22-24, 2011