

# Entertainment Services and Technology Association



American National Standard  
E1.19- 2009  
Recommended Practice for the use of  
Class A Ground-Fault Circuit Interrupters (GFCIs)  
intended for personnel protection in the  
Entertainment Industry

This is a preview of "ANSI E1.19 - 2009". [Click here to purchase the full version from the ANSI store.](#)

[inside front cover]

# Entertainment Services and Technology Association



## American National Standard E1.19 — 2009 Recommended Practice for the use of Class A Ground-Fault Circuit Interrupters (GFCIs) intended for personnel protection in the Entertainment Industry

EP/2001-7012r14.1

This document was approved as an American National Standard by the ANSI Board of Standards Review  
on 15 May 2009.

This page intentionally blank.

## Notice and Disclaimer

The Entertainment Services and Technology Association does not approve, inspect, or certify any installations, procedures, equipment or materials for compliance with codes, recommended practices or standards. Compliance with an ESTA standard or recommended practice, or an American National Standard developed by ESTA is the sole and exclusive responsibility of the manufacturer or provider and is entirely within their control and discretion. Any markings, identification or other claims of compliance do not constitute certification or approval of any type or nature whatsoever by ESTA.

ESTA neither guarantees nor warrants the accuracy or completeness of any information published herein and disclaim liability for any personal injury, property or other damage or injury of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document.

In issuing and distributing this document, ESTA does not either (a) undertake to render professional or other services for or on behalf of any person or entity, or (b) undertake any duty to any person or entity with respect to this document or its contents. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstance.

**Published by:**

Entertainment Services and Technology Association  
875 Sixth Avenue, Suite 1005  
New York, NY 10001 USA  
Phone: 1-212-244-1505  
Fax: 1-212-244-1502  
[standards@esta.org](mailto:standards@esta.org)  
<http://www.esta.org/>

**For additional copies of this document contact:**

ESTA Publications  
The ESTA Foundation  
875 Sixth Avenue, Suite 1005  
New York, NY 10001 USA  
Phone: 1-212-244-1505  
Fax: 1-212-244-1502  
<http://www.estafoundation.org>

---

## The ESTA Technical Standards Program

The ESTA Technical Standards Program was created to serve the ESTA membership and the entertainment industry in technical standards related matters. The goal of the Program is to take a leading role regarding technology within the entertainment industry by creating recommended practices and standards, monitoring standards issues around the world on behalf of our members, and improving communications and safety within the industry. ESTA works closely with the technical standards efforts of other organizations within our industry, including USITT, PLASA, and VPLT, as well as representing the interests of ESTA members to ANSI, UL, and the NFPA. The Technical Standards Program is accredited by the American National Standards Institute.

The Technical Standards Committee (TSC) was established by ESTA's Board of Directors to oversee and coordinate the Technical Standards Program. Made up of individuals experienced in standards-making work from throughout our industry, the Committee approves all projects undertaken and assigns them to the appropriate working group. The Technical Standards Committee employs a Technical Standards Manager to coordinate the work of the Committee and its working groups as well as maintain a "Standards Watch" on behalf of members. Working groups include: Camera Cranes, Control Protocols, Electrical Power, Floors, Fog and Smoke, Followspot Position, Photometrics, and Rigging.

ESTA encourages active participation in the Technical Standards Program. There are several ways to become involved. If you would like to become a member of an existing working group, as have over two hundred people, you must complete an application which is available from the ESTA office. Your application is subject to approval by the working group and you will be required to actively participate in the work of the group. This includes responding to letter ballots and attending meetings. Membership in ESTA is not a requirement. You can also become involved by requesting that the TSC develop a standard or a recommended practice in an area of concern to you.

The Electrical Power Working Group, which authored this Standard, consists of a cross section of entertainment industry professionals representing a diversity of interests. ESTA is committed to developing consensus-based standards and recommended practices in an open setting. Future Working Group projects will include updating this publication as changes in technology and experience warrant, as well as developing new standards and recommended practices for the benefit of the entertainment industry.

## Contact Information

### Entertainment Services and Technology Association

Karl G. Ruling  
Technical Standards Manager  
ESTA  
875 Sixth Avenue, Suite 1005  
New York, NY 10001  
Phone: 1-212-244-1505  
FAX: 1-212-244-1502  
[standards@esta.org](mailto:standards@esta.org)

### Technical Standards Committee Chairperson

Mike Garl  
James Thomas Engineering, Inc.  
10240 Caneel Drive  
Knoxville, TN 37931  
Phone: 1-865-692-3060  
FAX: 1-865-692-9020  
[mikeg@jthomaseng.com](mailto:mikeg@jthomaseng.com)

### Electrical Power Working Group Chairpersons

Mitch Hefter  
Entertainment Technology (Royal Philips Electronics), representing USITT  
10911 Petal St.  
Dallas, TX 75238  
Phone: 1-214-647-7967  
FAX: 1-214-647-8032  
[heftermk@DesignRelief.com](mailto:heftermk@DesignRelief.com)

Ken Vannice  
Leviton Manufacturing Co., Inc.  
P.O. Box 2210  
Tualatin, OR 97062  
Phone: 1-503-404-5563  
FAX: 1-503-404-5663  
[KVannice@Leviton.com](mailto:KVannice@Leviton.com)

## Acknowledgments

The Electrical Power Working Group was the consensus body for the development of this Standard. The working group's voting membership for the final approval of this standard is listed below. The observer membership listed is from the membership list current at the time of the 19 July 2008 meeting when the motion to accept BSR E1.19 as an American National Standard was offered.

### Voting members:

Patric J. Abaravich; I.A.T.S.E. Local 728 [U]  
Joe Boardman; Bender GmbH & Co. KG [MP]  
Ron Bonner; PLASA [U]  
Louis Bradfield [U]  
John (Javid) D. Butler; Integrated Theatre, Inc. [CP]  
Vincent J. Cannavale; Motion Laboratories [CP]  
Michael J. Carnaby; Mikan Theatricals [DR]  
Elizabeth E. (Lizz) Chancellor [U]  
James Davey; AC Power Distribution Inc. [CP]  
Jeff deRecat; Marinco [MP]  
William Drake; Marinco [MP]  
Ian Foulds; IATSE Local 873, representing the Entertainment Electrical Safety Committee of Ontario [G]  
Jerry Gorrell; Theatre Safety Programs [U]  
Bill Grande; Leviton Manufacturing Co., Inc. [MP]  
Mitch Hefter; Entertainment Technology (Royal Philips Electronics), representing USITT [U]  
Peter Herrmann; Motion Laboratories [CP]  
David Herrmann; Motion Laboratories [CP]  
Wolfgang Hofheinz; Bender GmbH & Co. KG [MP]  
Wendy Holt; Alliance of Motion Picture and Television Producers [G]  
Simon Hunt; IATSE Local 891 [U]  
Stephen J. Kay; K-Tec Corporation [MP]  
Edwin S. Kramer; I.A.T.S.E. Local 1 [U]  
W. G. Krokaugger, P. E.; Mole-Richardson Co. [CP]  
Roger Lattin; I.A.T.S.E. Local 728 [U]  
Michael Lay; Royal Philips Electronics [MP]  
George Long; Aggreko Event Services [DR]  
Bob Luther; Lex Products Corp. [CP]  
William L. Maiman [U]  
Kenneth M. Makowski; Lex Products Corp. [CP]  
Greg Mayberry; AC Power Distribution Inc. [CP]  
Tyrone Mellon Jr.; Lex Products Corp. [CP]  
Paul Menetrey; Bender GmbH & Co. KG [MP]  
R. Bruce Prochal; I.A.T.S.E. Local 728 [U]  
Alan M. Rowe; I.A.T.S.E. Local 728 [U]  
Michael Scudday; SSRC, Inc. [CP]  
Steve Terry; Electronic Theatre Controls, Inc. [MP]  
Stephen Vanciel [U]  
Ken Vannice; Leviton Manufacturing Co., Inc. [MP]  
Richard Wolpert; Union Connector Company [CP]  
Keith S. Woods; IATSE Local 891 [U]

### Observer members:

Robert Barbagallo; Solotech Inc. [DR]  
Lee J. Bloch; Bloch Design Group, Inc. [G]  
Eric Bouchard; Cirque du Soleil [CP]  
Andre Broucke; ADB - TTV Technologies [MP]



Jeremy B. Collins; Selecon [MP]  
Kenny Delahoussaye; Aggreko [DR]  
Marsha DuBois; Pintech Stage Connectors, Inc. [CP]  
Steve DuBois; Pintech Stage Connectors, Inc. [CP]  
James Eade; PLASA [G]  
Don Earl; Earl Girls, Inc. [DR]  
Richard L. Eberth Jr.; North Shore Safety [MP]  
Jose J. Flores; Kino Flo, Inc. [MP]  
Trevor Forrest; Helvar Lighting Control [MP]  
Phil Fram; Marinco [MP]  
Douglas Franz; QVC Network [U]  
Richard B. Glickman; Gliconen Corporation [MP]  
Reuben Goldberg; Technic Services [U]  
Jim Holladay; Luxence [G]  
Hiroshi Kita; Marumo Electric Co., Ltd. [MP]  
Wayne Kowalski; Coleman Cable Inc. [MP]  
Marty Lazarus; Chicago Spotlight, Inc. [DR]  
Reinhold Luther; Lex Products Corp. [CP]  
Paul F. Mardon; Pulsar Ltd. [MP]  
Brian Merriken; Airpax Corporation [MP]  
Pat Miller; Hubbell Wiring Devices [MP]  
David Murray; IPC Resistors Inc. [CP]  
Mac Perkins; PNTA Inc. [G]  
Julie Rogers; City of Phoenix Civic Plaza [G]  
Ford Sellers; Cornell University [U]  
Mike Skinner; CBS Studio Center [U]  
Arnold Tang; Arnold Tang Productions [G]  
Eric Tishman; Rosco Laboratories [MP]  
Dominic Vincenty; Television Production Service [DR]  
Art Wanuch; Robertson Electric Wholesale [G]  
Colin Waters; TMB [MP]  
Jiantong Wu; Beijing Special Engineering Design & Research Institute [G]

[CP] Custom-market Producer  
[MP] Mass-market Producer  
[DR] Dealer or Rental company  
[U] User  
[G] General Interest

## Table of Contents

|   |     |
|---|-----|
| Notice and Disclaimer.....  | i   |
| Contact Information .....   | iii |
| Acknowledgments .....   | iv  |
| Table of Contents .....   | vi  |
| 1 Scope and Exclusions .....  | 1   |
| 1.1 Scope .....   | 1   |
| 1.2 Exclusions .....  | 1   |
| 1.2.1 Ground Fault Protection of Equipment .....  | 1   |
| 1.2.2 Residual Current Devices (RCDs) and Earth Leakage Circuit Breakers (ELCBs).....   | 1   |
| 2 Definitions .....   | 1   |
| 3 Entertainment industry application types defined.....                                 | 2   |
| 4 Class A GFCI products.....  | 2   |
| 4.1 Listed GFCI duplex receptacles.....   | 2   |
| 4.2 Listed GFCI portable adapters, 15-100 ampere 120-240 VAC single or three phase..... | 3   |
| 4.3 Listed portable power distribution units with GFCI. ....                            | 3   |
| 4.4 Listed GFCI quad strings .....  | 3   |
| 4.5 Listed GFCI circuit breakers.....   | 3   |
| 4.6 GFCI outlets on dimmed circuits.....  | 3   |
| 4.7 GFCI feeding electronic ballasts .....  | 4   |
| 5 Where to place GFCI protection. Overview.....   | 4   |
| 5.1 Outdoor and wet and damp locations .....  | 4   |
| 5.2 When not to use Class A GFCI devices.....   | 4   |
| 6 Specific Recommendations for Entertainment Industry applications .....                | 4   |
| 6.1 Places of assembly .....  | 4   |
| 6.2 Theatres .....  | 4   |
| 6.2.1 Stage areas indoors.....  | 4   |
| 6.2.2 Covered stages outdoors.....  | 4   |
| 6.2.3 Outdoors and wet and damp locations .....   | 4   |
| 6.2.4 GFCI protection for dimmers .....   | 4   |
| 6.3 Carnivals, circuses, fairs and similar events .....                                 | 5   |
| 6.4 Motion picture studios (soundstages) and filming locations. ....                    | 5   |
| 6.4.1 Indoor soundstages .....  | 5   |
| 6.4.2 Outdoor filming of motion picture, TV or video .....                              | 5   |
| 7 Successful implementation of a Class A GFCI system .....                              | 5   |
| 7.1 Preventive maintenance.....   | 5   |
| 7.2 Place GFCI units close to the load (utilization equipment) .....                    | 5   |
| 7.3 Test electrical installations for ground-fault leakage .....                        | 5   |
| 7.3.1 Off-line testing.....   | 6   |
| 7.3.2 On-line measuring and monitoring .....  | 6   |
| 7.4 Test cords and cables for leakage current.....                                      | 7   |
| 8 Testing the GFCI installation .....   | 7   |

## 1 Scope and Exclusions

### 1.1 Scope

The scope of this document is to recommend a practice for the safe use of Class A Ground Fault Circuit Interrupters (GFCIs) on 100 ampere or lower 120-240 VAC single and three phase 60 Hz circuits where the voltage to ground does not exceed 150 VAC (hereinafter referred to as 15 to 100 ampere, 120-240 VAC, single and three phase circuits). These devices are used for personnel protection in entertainment applications encompassing places of assembly; the production of film, video, and broadcast; theatrical productions; carnivals; circuses; fairs; and similar events in North America.

FPN: Systems that are 240 VAC to ground (e.g., European power systems) are outside of the scope of the class A GFCI Standard (the GFCI Standard) so they are outside the scope of this E1.19 Recommended Practice.

### 1.2 Exclusions

#### 1.2.1 Ground Fault Protection of Equipment

Ground Fault Protection of Equipment is a system designed to provide protection of equipment from line to ground fault currents by operating to cause a disconnecting means to open all ungrounded conductors of the faulted current. This protection is provided at fault current levels higher than those for Class A GFCI protection for personnel. Ground Fault Protection is equipment protection not personnel protection. Ground Fault Protection of Equipment shall not be used anywhere that Class A GFCI protection for personnel is required or desired.

#### 1.2.2 Residual Current Devices (RCDs) and Earth Leakage Circuit Breakers (ELCBs)

Residual Current Devices (RCDs) and Earth Leakage Circuit Breakers (ELCBs) are terms used for circuit protection devices commonly used in Europe, Australia and other countries. They are considered personnel protection in some countries but not in the U.S.A. or Canada. They do not meet the requirements of Class A GFCI for personnel protection. RCDs and ELCBs shall not be used to provide Class A GFCI protection for personnel.

## 2 Definitions

**2.1 Class A GFCI:** A device whose function is to provide personnel protection by de-energizing a circuit, or portion thereof when the fault current to ground exceeds 6 milliamps within a period of time established by the GFCI Standard. A Class A GFCI will not interrupt the circuit when the fault current to ground is less than 4 mA. This must occur under a variety of electrical and environmental conditions as defined in the GFCI Standard. GFCI products that meet these requirements are referred to by Nationally Recognized Testing Laboratories (NRTLs) as Class A GFCIs.

**2.2 Nationally Recognized Testing Laboratory (NRTL):** An organization that is recognized by the United States Department of Labor's Occupational Safety and Health Administration (OSHA) in accordance with the requirements of 29 CFR 1910.7 "Definition and Requirements for a Nationally Recognized Testing Laboratory" that accepts equipment or materials and tests for safety, lists and labels accordingly. Examples of acceptable NRTLs include CSA, ETL, ITS, Intertek, NTS, UL and USTC.

**2.3 NEMA:** National Electrical Manufacturers Association.

**2.4 Underwriters Laboratories (UL):** A Nationally Recognized Testing Laboratory located in the U.S.A. UL also writes safety standards.

**2.5 Class A GFCI Standard:** The harmonized, trinational Standard for construction and testing of Class A GFCIs. The document was issued jointly by ANCE in Mexico as NMX J 520, CSA in Canada as CSA C22.2 No. 144.1-06 and in the United States by UL as UL 943, Fourth Edition. The Standard is accepted