ANSI E1.29 – 2009 (R2018)

Product Safety Standard for Theatrical Fog Generators That Create Aerosols of Water, Aqueous Solutions of Glycol or Glycerin, or Highly Refined Alkane Mineral Oil

F&S/2007-3004r6

This document was approved as an American National Standard by the ANSI Board of Standards Review on 6 November 2018. It is a reaffirmation of the 2009 edition.

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Published by:

Entertainment Services and Technology Association
630 Ninth Avenue, Suite 609
New York, NY 10036
USA
Phone: 1-212-244-1505
Fax: 1-212-244-1502
standards@esta.org

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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, 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.

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The Fog & Smoke 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.

Contact Information

Technical Standards Manager

Karl G. Ruling
ESTA
630 Ninth Avenue, Suite 609
New York, NY 10036
USA
1-212-244-1505 x703
karl.ruling@esta.org

Assistant Technical Standards Manager

Richard Nix
ESTA
630 Ninth Avenue, Suite 609
New York, NY 10036
USA
1-212-244-1505 x649
richard.nix@esta.org

Technical Standards Council Chairpersons

Mike Garl
Mike Garl Consulting LLC
1-865-389-4371
mike@mikegarlconsulting.com

Mike Wood
Mike Wood Consulting LLC
1-512-288-4916
mike@mikewoodconsulting.com

Fog & Smoke Working Group Chairpersons

M. Brad Dittmer
Stage Labor of the Ozarks
1-417-616-9948
slobrad17@gmail.com

Larry Schoeneman
DesignLab Chicago, Inc.
1-773-265-1100
Larry@dlabchicago.net

Acknowledgments

The Fog & Smoke Working Group members when this document was approved by the working group on 24 September 2018 are shown below.

Voting members:

Brad Dittmer; Stage Labor of the Ozarks; U
Cedric Jackson; Screen Actors Guild - American Federation of Television & Radio Artists; U
Chris Moulton; Contract Services Administration Trust Fund; U
Don Ward; I.A.T.S.E. Local 891; G
Edwin S. Kramer; I.A.T.S.E. Local 1; DE
Karl G. Ruling; Unit 12 Productions; CP
Larry Schoeneman; DesignLab Chicago, Inc.; DR
Margaret Burke, MPH; 20th Century Fox; U
Mark Elliott; Walt Disney Company; U
Marnie Styles; Ultratec Special Effects Inc.; MP
Matthew Antonucci; Contract Services Administration Trust Fund; U
Mike Wood; Mike Wood Consulting LLC; G
Mona Shum; Aura Health and Safety Corporation; U
Paul Jordan; NBC Universal; U
Peter T. Donovan; I.A.T.S.E. Local 1; DE
Stephen Vanciel; IATSE Local 631; U

Observer (non-voting) members:

Robert Barbagallo; Solotech Inc.; U
Paul Beasley; Walt Disney Company; U
Justin Cicerone; Harman International Industries; MP
Jerry Gorrell; Theatre Safety Programs; G
Robert Haycock; UC Berkeley; U
Kent H. Jorgensen; IATSE Local 80; G
Nathan Kahn; Look Solutions USA Ltd.; MP
Ford Sellers; Chauvet Lighting; MP
Keith Sklar; Actors' Equity Association; U
Colin Waters; TMB; G

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John Huntington
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Eddie Kramer
Jason Kyle
Michael Lay
Lizz Pittsley
Michael Skinner
Skjonberg Controls Inc.
Stage Labor of the Ozarks
Tracy Underhill
Charlie Weiner

Planned Giving donor: Ken Vannice

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Foreword (non-mandatory, informative only)

This standard is intended to help guide product safety testing laboratory personnel in their evaluation of fog-making equipment for design or construction defects that might create unacceptable hazards to users of the equipment or the public. It is based on ANSI/UL 998 - 2006, Humidifiers, and adopts the requirements of that standard, but with modifications as noted in this Standard.

Many of the modifications listed in this standard are to allow the use of components sized in SI units. ANSI/UL 998 - 2006 uses SI units as the primary units, but they are hard conversions from the US customary units used historically and describe few or no real components. It is in the interests of the industry and the end-users of the products covered by this Standard to advance the development of products for a global market, so this Standard attempts to correct the regional bias in the component descriptions of the UL document without compromising safety.

1 Introduction

1.1 Scope

The requirements of this Standard cover electrically powered theatrical fog generators rated 600 V or less, intended for use in professional live theatrical entertainment, professional film and video production, theme parks, and fire safety training, and to be used in accordance with the requirements of ANSI/NFPA 70, and the Canadian Electrical Code (CEC), Part 1, C22.1.

1.1.1 The theatrical fog generators that are the subject of this Standard use one or more of the following fluids.

Name	Chemical Abstracts Service (CAS) #
triethylene glycol	112-27-6
monopropylene glycol (propylene glycol; 1,2-propanediol)	57-55-6
diethylene glycol	111-46-6
dipropylene glycol	25265-71-8, 106-62-7, 110-98-5, 108-61-2
1,2-butylene glycol (1,2-butanediol)	584-03-2
1,3-butylene glycol (1,3-butanediol)	107-88-0
glycerin (glycerol; 1,2,3- propanetriol)	56-81-5
white mineral oil, medicinal or food grade	8042-47-5
water	07732-18-5
nitrogen, liquefied (LN2, L-N2))	7727-37-9
oxygen, liquefied (LOX)	80937-33-3
carbon dioxide, liquified (LCO2, L-CO2)	124-38-9

Fog generators that use fog fluids not on this list are outside the scope of this Standard.

1.1.2 The aerosols created by the theatrical fog generators within the scope of this Standard are injected directly into the environment or are carried out of the fog generating equipment on a stream of ambient air, or a stream of nitrogen, argon, carbon dioxide, or a mixture of nitrogen and oxygen that approximates the composition of normal air. The Chemical Abstracts Service registry numbers for the gases that are used as vehicles for the aerosols within the scope of this Standard are as follows:

Name	CAS #
oxygen	7782-44-7
nitrogen	7727-37-9
argon	7440-37-1
carbon dioxide	124-38-9

Fog generators that use gases not on this list are outside the scope of this Standard.

1.2 Definitions

The following definitions apply in this Standard:

1.2.1 Alkane mineral oil, highly refined: water-clear white mineral oil, consisting almost entirely of saturated hydrocarbons (alkanes), lacking significant amounts of aromatic hydrocarbons, and suitable for use in medicines or food.

1.2.2 Class 2 Circuit: The portion of the wiring system between the load side of a Class 2 power source and the connected equipment. A Class 2 power source is limited to 0 to 20 volts at 100 watts or 5 amps; 21 to 30 volts at 100 watts or 3.3 amps; and 31 to 150 volts at 0.5 watts or 5 milliamps.