



ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES

IPC-1331

Voluntary Safety Standard for Electrically Heated Process Equipment

IPC-1331

March 2000

A standard developed by IPC

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- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

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Adopted October 6, 1998

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Developed by the Health and Safety Subcommittee (4-32) of the
Environmental Health and Safety Committee (4-30) of IPC

Users of this standard are encouraged to participate in the
development of future revisions.

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Acknowledgment

Any Standard involving a complex technology draws material from a vast number of sources. While the principal members of the Health and Safety Subcommittee (4-32) of the Environmental Health and Safety Committee (4-30) are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

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Voluntary Safety Standard for Electrically Heated Process Equipment

1 SCOPE

This voluntary standard establishes minimum requirements for the design, installation, operation and maintenance of electrically heated process equipment in order to minimize electrical hazards and prevent fires that may occur in combustible tanks, tank liners and drying equipment. It is intended to cover both liquid and gas (e.g., air) process heaters used in the manufacture of printed wiring boards (PWBs) and printed wiring assemblies (PWAs). Minimum requirements are indicated by the use of the term “shall.”

Please note: This standard does not purport to address all safety issues associated with its use. Users should establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to standard's use.

2 REFERENCE DOCUMENTS

2.1 This Standard is intended to be compliant with the following regulations and codes:

29 CFR 1910 Subpart S-Electrical

ANSI C2-1997 National Electrical Safety Code

NFPA 70 National Electrical Code, Article 427 of National Electric Code

NFPA 79 National Fire Prevention Association

UL 499 Electric Heating Appliances

CSA C22.2 No. 88-1958 Industrial Heating Equipment

CEmark

3 GENERAL APPLICATION AND USE

3.1 Electric immersion heaters are generally used to heat aqueous or semi-aqueous solutions. They are not recommended for use with flammable solutions and **shall not** be used with class 1 or 2 flammable liquids.

3.2 Users **shall** verify with equipment and/or heater manufacturer and chemical supplier(s) that heater sheath material is compatible with the intended solution before installation and use. If user changes chemical composition, user **shall** ensure that heater sheath material is compatible with the new solution by checking with equipment and/or heater manufacturer.

3.3 Electric immersion heaters may ignite combustible tanks or liners. To prevent ignition, heating elements **shall** be securely mounted in a manner that prohibits direct contact with the tank or tank liner. Heating elements **shall** be located at least 25 mm [0.984 in] from the tank bottom and sidewalls or minimum distance recommended by manufacturer.

3.4 Electric heating elements, used in both liquid and gas process heating applications, **shall** be equipped with appropriate and adequate supports to prevent contact with combustible surfaces as a result of heating element deflection or sag due to use.

3.5 Electric immersion heaters **shall** be protected from physical damage. They **shall** be shielded or located to prevent physical damage from contact with other items entering tanks such as anodes, cathodes, racks, product, concentrated chemicals, and/or electrically charged components. Protection **shall** be accomplished by proper placement or appropriate guarding.

3.6 Heater elements **shall** be allowed to cool before they are removed from equipment for service or replacement.

3.7 Tanks **shall not** be drained until heater element has cooled.

3.8 Electric heating devices **shall** be built and tested to comply with a nationally recognized independent testing laboratory specification, Underwriters Laboratories (UL) and Factory Mutual (FM), for their intended application.

4 DESIGN AND INSTALLATION REQUIREMENTS

Electrically heated process equipment **shall** comply with the following design and installation requirements:

4.1 Control Circuit Design

4.1.1 A corrosion-resistant temperature-sensing element, such as a thermocouple, thermistor, or resistance thermal device (RTD), **shall** be used in conjunction with a temperature-indicating controller (see 4.1.2). The use of a thermostat with set point indication is also permitted. All sensing elements **shall** be compatible with the environment in which they are used (i.e., bath chemistry, fumes, or vapors) or be housed in a chemically compatible thermowell.