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IEEE Std 844.2™-2017/CSA C293.2-17

# IEEE/CSA Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures—Application Guide for Design, Installation, Testing, Commissioning, and Maintenance

IEEE Industry Applications Society

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# IEEE/CSA Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures—Application Guide for Design, Installation, Testing, Commissioning, and Maintenance

**This document was developed under the Partner Standards Development Organization cooperation agreement between IEEE and CSA Group and was submitted for a parallel enquiry vote by both organizations.**

Sponsor

**Petroleum and Chemical Industry Committee**
of the
**IEEE Industry Applications Society**

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**IEEE-SA Standards Board**

**Abstract:** An application guide for the design, installation, testing, commissioning and maintenance of skin effect trace heating systems for pipelines, vessels, equipment, and structures intended for use in general industrial applications are provided in this standard. This standard provides requirements when utilizing skin effect trace heating systems in ordinary as well as hazardous areas having potentially explosive atmospheres.

**Keywords:** condensation prevention, CSA C293.2, freeze protection and temperature maintenance, heating systems, IEEE 844.2™, long line, process heating, re-melting solidified fluids, skin effect trace heating, structure heating, thermal insulation

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## IEEE Introduction

This introduction is not part of IEEE Std 844.2-2107/CSA C293.2-17, IEEE/CSA Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures—Application Guide for Design, Installation, Testing, Commissioning, and Maintenance.

Skin effect trace heating systems have been used for a number of years by industry. They were recognized for the first time in the 1981 issue of the National Electrical Code® (NEC®) ANSI/NFPA 70.[a]

Skin effect trace heating of pipelines, vessels, equipment, and structures in petrochemical as well as other industries is a growing portion of total heating requirements because of its advantages in heating long pipelines with temperature control.

This standard is a companion document to IEEE Std 844.1/CSA C22.2 No. 293.1, IEEE/CSA Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures—General, Testing, Marking, and Documentation Requirements.

Since skin effect trace heating systems are interrelated with electric power, control, and alarm systems, other standards, some of which are listed in Clause 2, should be referred to when using this standard. This standard is not intended to supersede any current standards or recommended practices, and sound engineering judgment should always be used when applying this or any other standard.

This standard correlates industry practices; it is not intended to be a design guide or an exhaustive procedure manual. The annexes that are included in this standard are informative.

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## CSA Preface

This is the first edition of IEEE Std 844.2™/CSA C293.2, Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures—Application Guide for Design, Installation, Testing, Commissioning, and Maintenance, which is a harmonized Standard jointly developed by IEEE and CSA Group.

Skin effect trace heating systems have been used for a number of years in the industry. Skin effect trace heating of pipelines, vessels, equipment, and structures in petrochemical as well as other industries is a growing portion of total heating requirements because of its advantages in heating long pipelines with temperature control.

This Standard should be used in conjunction with IEEE Std 844.1™/CSA C22.2 No. 293.1, Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures—General, Testing, Marking, and Documentation Requirements.

Since skin effect trace heating systems are interrelated with electric power, control, and alarm systems, other standards, some of which are listed in Clause 2, should be referred to when using this Standard.

This Standard was reviewed for use in Canada by the CSA Integrated Committee on Trace Heating, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

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## Contents

# IEEE/CSA Standard for Skin Effect Trace Heating of Pipelines, Vessels, Equipment, and Structures—Application Guide for Design, Installation, Testing, Commissioning, and Maintenance

## 1. Overview

### 1.1 General

This standard is divided into seven clauses. Clause 1 provides the scope and purpose. Clause 2 lists references to other standards that are useful in applying this standard. Clause 3 references definitions that are found in IEEE Std 844.1/CSA C22.2 No. 293.1. Clause 4 establishes the design guidelines for skin effect trace heating. Clause 5 provides installation considerations and guidelines. Clause 6 covers field testing, start-up, commissioning, and operation of skin effect trace heating systems. Clause 7 provides maintenance and repair guidelines.

This standard also contains annexes. Annex A provides bibliographical references. Annex B provides pipe heat loss considerations. Annex C provides vessel heat loss considerations. Annex D covers heat-up and cool-down considerations. Annex E provides a method to determine equivalent thicknesses of insulating cements. Annex F provides an example of design input parameters for a skin effect trace heating design. Annex G presents an example of a record for installation requirements. Annex H shows an example of a form that can be used to document the commissioning of the system. Annex I presents an example of a preventive maintenance record.

### 1.2 Scope

This standard provides for the application of skin effect trace heating systems for pipes, vessels, and structures. It provides recommendations for design, installation, maintenance, and repair of these systems in general industry for ordinary locations, as well as in hazardous areas with potentially explosive atmospheres.