

DEP SPECIFICATION

ELECTRICAL TRACE HEATING FOR NORTH AMERICAN APPLICATION

DEP 33.68.30.34-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for electrical resistance trace heating systems for winterising and heat loss compensation of piping and equipment, in terms of design, material selection, installation and testing.

Electrical resistance trace heating within the scope of this DEP shall be designed and constructed so as to ensure electrical, thermal and mechanical durability and reliable performance so that, in normal use, it poses no danger to the user or the surroundings.

This DEP is applicable to factory-assembled and field-assembled trace heaters including series heating cables, parallel heating cables or heating panels that have been assembled and terminated in accordance with the Manufacturer/Supplier's instructions.

This is a revision of the DEP of the same number dated February 2015; see (1.5) regarding the changes.

1.2 DISTRIBUTION, APPLICABILITY AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in oil refineries, chemical plants, gas plants, exploration and production facilities and supply/distribution installations. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Accredited Certification Organization (ACO)	An organization that has been accredited by the Standards Council of Canada, in accordance with specific criteria, procedures and requirements, to operate, on a continuing basis, a certification program for electrical equipment. When a reference is made to a NRTL in this DEP, this also includes the Accredited Certification Organization in Canada.
Principal's Electrical Technical Authority	The Principal's Electrical Technical Authority is the discipline engineer appointed by the Principal and is responsible for all technical decisions associated with the work. The Principal's Electrical Technical Authority is responsible for technical integrity.
Zone	A zone is a section or sections of pipe and equipment on which the tracing can be operated with control from one or more temperature sensing points. The power and control for a given zone shall be from one "Control" point (i.e., EHT Controller). Generally, the various portions of a zone will form part of the same process system.

Refer to IEEE 515, section 3 for additional definitions.

1.3.3 Abbreviations

Term	Definition
EHT	Electrical Heat Tracing
MCC	Motor Control Centre
NEMA	National Electrical Manufacturers Association
NRTL	Nationally Recognized Testing Laboratory
RTD	Resistance Temperature Detector

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (9).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2015. The changes followed a requirements quality review and were not a full technical update. The following are the main, non-editorial changes.

Section/Clause	Change
All	Restructured and clarified requirements, enforced use of shall/should/may for normative statements.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://swwww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

2. DESIGN REQUIREMENTS

2.1 GENERAL REQUIREMENTS

1. Data sheet DEP 33.68.30.95-Gen. shall be used to specify electrical heat tracing systems.

2.2 CONTRACTOR'S RESPONSIBILITIES

1. The basic design of, and the calculations for, the trace heating system shall be the responsibility of the Contractor.
2. The design shall be in accordance with the following:
 - a. IEEE 515 section 6;
 - b. the specific requirements stated on the process data specifications, drawings, piping isometrics; and
 - c. completed data sheet DEP 33.68.30.95-Gen.
3. The Contractor shall acquire all process data needed for the correct design of the trace heating system.
4. The Contractor should involve the Manufacturer/Supplier in the design
5. The Manufacturer/Supplier's shall use his approved software for all heat loss calculations and EHT design.
 - a. Custom third party, non-vendor, design software should not be used.

2.3 QUALITY ASSURANCE

1. The Manufacturer/Supplier and Contractor shall implement a quality assurance system in accordance with a recognised standard such as ISO 9001.

2.4 SAFETY

2.4.1 General

1. Refer to the requisition for the climatic, environmental and operating conditions to be used for the design
2. As far as practicable, the electrical equipment shall be located in non-hazardous areas or, if not, in the least-hazardous areas.
 - a. Electrical equipment shall not be located in Zone 0 areas, or in Div 1 areas where there is a continuous presence of hazardous gases.
3. All heat tracing components shall be suitable for the hazardous area in which they are installed.

2.4.2 Equipment approvals

1. Heat tracing system equipment shall be approved by a National Recognized Testing Laboratory (NRTL) for application in the specified service conditions and area classification as defined on the heat tracing data sheets and area classification documentation.
2. If the equipment is not NRTL approved, the Manufacturer/Supplier shall provide documentation that certifies that the equipment is adequate for the intended service conditions.
 - a. Documentation shall be submitted to the Principal for review.

2.4.3 Codes and regulations

1. The electrical tracing design and materials shall be in accordance with the following:
 - a. applicable national codes;
 - b. applicable provincial or local electrical codes and regulations; and
 - c. requirements of the electrical inspection authority having jurisdiction.

2.4.4 Non-hazardous areas

1. For reasons of standardization, and agreed to by the Principal, material specified for Zone 1, Division 1 and/or Zone 2, Division 2 areas shall be used in non-hazardous areas.

2.4.5 Safety showers

1. The temperature of lines supplying safety showers and eye wash stations shall be controlled to prevent overheating and injury to personnel.
 - a. Refer to IEEE 515 for the requirements for electrical tracing requirements for safety showers and eyewash stations.

2.4.6 Critical devices and lines

1. The need to electric trace critical devices such as relief valves and pressure regulators shall be subject to approval by the Principal (Process Automation and Control (PACO) group).
 - a. If agreed by the Principal, trace heating circuits for safety critical elements shall be segregated from other circuits.
 - b. The following shall be evaluated for tracing critical devices:
 - i. all parts traced (such as impulse lines); and
 - ii. maximum temperature does not exceed the limit of the device where damage to components such as diaphragms and fill fluids could occur;
 - iii. redundancy of trace heating.
2. Temperature monitoring on critical devices and lines shall be provided.

2.5 SITE CONDITIONS

1. The parts of a heating system installed outdoors shall be designed for outdoor use in a relative humidity of 100%, and exposed to direct sunlight without protective shelter.
2. The parts of a heating system installed outdoors shall be designed for saliferous, sulphurous and dusty atmospheres.

These are environments commonly encountered in petrochemical installations located close to open water.

3. The possibility of condensation, as experienced during large temperature fluctuations in a humid atmosphere, shall be evaluated.
4. Extremely corrosive and saliferous conditions shall be taken into consideration, especially in offshore or similar locations.

Site information will be included in data sheet DEP 33.68.30.95-Gen.

5. Unless the wind velocity is available and specified in the data sheet, the outdoor heat loss for piping and vessels shall be based on 11 m/s (25 mph) wind velocity.

2.6 DEGREE OF PROTECTION

1. The enclosures shall have a degree of protection of at least IP 55 (IP 56 for offshore installations) in accordance with IEC 60529 or NEMA 4X.
2. Enclosures for indoor panels may be IP 44 or NEMA 12.

2.7 ELECTRICAL SUPPLY SYSTEM

1. The AC supply to the trace heating system shall be either single phase or symmetrical three-phase, + neutral, with a nominal voltage and frequency as indicated in the requisition.
2. Supply variations at the distribution panel under steady-state conditions shall be limited to the following:
 - a. Nominal system voltage: $\pm 5\%$
 - b. Nominal system frequency: $\pm 2\%$
3. Equipment shall be suitable for temporary, input voltage variations of +10% and -20% of the nominal voltage, caused by e.g., motor starts.

2.8 HEAT-UP AND MELT OUT

Heat up to operating temperature from ambient or melt out to permit operation to begin, might on occasion be required after a prolonged power failure, or for normally dormant systems, which are required in an emergency. These will be identified on the heat tracing data sheet.

These cases may considerably increase the heat input over simple winterising. Over temperature conditions due to temperature control malfunction will be more severe.

1. The maximum allowable line or process temperature shall not be exceeded.
2. Series tracers shall be designed and fit for the intended purpose of the pipe or equipment.
3. Excess tracer length shall be limited to no more than 5% of the total cable length.
4. Excess length should be distributed proportionally amongst the heat sinks such as valves, flanges and pipe supports.
5. A dual voltage system with series tracer cables may be used.

In some instances, it might be desirable to design a two tracer system, one low-wattage tracer for normal operation and one high-wattage tracer for heat up or melt out.

This type of design will be identified on the heat tracing data sheets.

2.9 START LOAD

1. The Manufacturer/Supplier shall determine the requirements for start-up loads and loads that require changes in the circuit protection.