

Recommended Practice for Wet and Dry Thermal Insulation of Subsea Flowlines and Equipment

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Recommended Practice for Wet and Dry Thermal Insulation of Subsea Flowlines and Equipment

1 General

1.1 Scope

This recommended practice (RP) provides guidance for the performance, qualification, application, quality control, handling, and storage requirements of wet and dry thermal insulation for subsea applications in the petroleum and gas industries. This guideline also covers the inspection of the insulation, and the repair of insulation defects.

[Annex A](#) specifies the minimum recommendations for the performance qualification testing and inspection testing requirements for wet insulation systems (insulations in direct contact with seawater).

[Annex B](#) specifies the minimum recommendations for the performance qualification testing and inspection testing requirements for dry insulation systems (insulations not in direct contact with seawater).

This document is not intended to address either installation procedures or proprietary fabrication of any particular insulation type.

This RP is not a prescriptive document. If agreed between company and supplier, prescriptive requirements for wet insulation systems presented in ISO 12736 could be used.

1.2 Applicability

This RP is applicable to the following and components such as:

- flowlines and risers;
- Christmas tree, valve block, and piping;
- manifold valves and pipework on subsea structures;
- jumpers (i.e. piping and bends);
- connectors and fittings;
- valves and chokes;
- Subsea Separators.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

API Recommended Practice 5L1, *Recommended Practice for Railroad Transportation of Line Pipe*

API Recommended Practice 5LW, *Recommended Practice for Transportation of Line Pipe on Barges and Marine Vessels*

ASTM C165, *Standard Test Method for Measuring Compressive Properties of Thermal Insulations*

ASTM C167, *Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations*

ASTM C303, *Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation*

ASTM C518,¹ *Standard Test Method for Steady State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus*

ASTM C1511, *Standard Test Method for Determining the Water Retention (Repellency) Characteristics of Glass Fiber Insulation*

ASTM C1763, *Standard Test Method for Water Absorption*

ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension*

ASTM D575, *Standard Test Methods for Rubber Properties in Compression*

ASTM D638, *Standard Test Method for Tensile Properties of Plastics*

ASTM D695, *Standard Test Method for Compressive Properties of Rigid Plastics*

ASTM D696, *Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer*

ASTM D792, *Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement*

ASTM D1621, *Standard Test Method for Compressive Properties of Rigid Cellular Plastics*

ASTM D2240, *Standard Test Method for Rubber Property—Durometer Hardness*

ASTM D2842, *Standard Test Method for Water Absorption of Rigid Cellular Plastics*

ASTM D4060, *Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser*

ASTM D5034, *Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)*

ASTM E1269, *Determining Specific Heat Capacity by Differential Scanning Calorimetry*

ASTM E228, *Standard Test Method for Linear Thermal Expansion of Solid Materials with a Push-Rod Dilatometer*

ASTM E831, *Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis*

ISO 12736, *Petroleum and natural gas industries — Wet thermal insulation systems for pipelines and subsea equipment Part 1: Validation of materials and insulation systems*

ISO 12736 ², *Petroleum and natural gas industries — Wet thermal insulation systems for pipelines and subsea equipment Part 2: Qualification processes for production and application procedures*

ISO 12736, *Petroleum and natural gas industries — Wet thermal insulation systems for pipelines and subsea equipment Part 3: Interfaces between systems, field joint system, field repairs and prefabricated insulation*

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.

² International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org.

3 Terms, Definitions, and Abbreviations

3.1 General

For the purposes of this document, the following terms and definitions apply.

3.1.1

applicator

Person or team in charge of applying or installing the insulation material.

3.1.2

batch/lot

Quantity of insulation material produced in a single manufacturing run with identical processing parameters.

3.1.3

company

Organization that possesses ownership of supplied equipment to be insulated.

3.1.4

component

Any self-contained part of a larger entity.

3.1.5

contractor

Organization responsible for purchasing the insulation application.

3.1.6

cooldown time

Time taken for a fluid contained within the equipment to reach a predetermined temperature from a specified start temperature when fluid flow is stopped.

3.1.7

cutback

Length of pipe left uncoated at each end for joining purposes (e.g. welding).

3.1.8

dry insulation system

Insulation system not in direct contact with seawater or other liquid ambient environments.

3.1.9

equipment

Refers to any hardware that needs to be thermally isolated from the environment.

3.1.10

field joint

An uncoated area that results when two pipe sections or a pipe section and a fitting with coating cutbacks are assembled, by welding or other means, in the field.

3.1.11

hold point

H

point in the manufacturing process to observe a particular or a prescribed set of manufacturing steps planned to occur on a certain date; constituting a firm stoppage of the manufacturing schedule and procedures around the announced "hold start date."

NOTE A hold point may include a sign-off and approval by the inspection party for the witness point that has taken place and manufacturing steps that have been observed; manufacturing cannot continue until inspection sign-off has taken place.

3.1.12

holiday

Discontinuity in a protective anticorrosion coating that exposes unprotected metal surface to the environment.

3.1.13

inspector

Authorized agent of company or contractor.

3.1.14

insulation system

Any combinations of pretreatment, anticorrosion coating, insulation, and protective outer sheath as applicable to achieve the corrosion protection and insulation properties as described in this RP.

3.1.15

item

Any part, component, device, assembly, subsystem, functional unit, equipment, or system that can be individually considered.

3.1.16

monitor

M

Allowance of Company or third-party inspection to observe the manufacturing process at no prescribed step, with no interruption of manufacturing schedule or procedures, and without approval of manufacturing steps observed.

3.1.17

precast and half shell insulation

A form of insulation that is preformed and subsequently affixed to the equipment.

3.1.18

purchaser

An organization, facility, or individual that buys the insulation system.

3.1.19

service life

Specified maximum period of time the insulation system is in service.

3.1.20

shelf life

Specified maximum period of time the insulation can be stored prior to installation under prescribed storage requirements.

3.1.21

supplier

Organization that provides the insulation material.

3.1.22

U-value

U-value, also known as thermal transmittance, is the rate of transfer of heat through a structure (which can be a single material or a composite), divided by the difference in temperature across that structure. The units of measurement are W/m^2K .

NOTE U-value is also called the overall heat transfer coefficient (OHTC).