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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 8175-2025

Replacing GB/T 8175-2008

Guide for design of thermal insulation of equipment and pipes

设备及管道绝热设计导则

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1 Scope

GB/T 8175-2025 is the Chinese national standard covering designing insulation rather than measuring it - the economic thickness that balances heat lost against insulation bought, the personnel protection and anti-condensation cases, the material selection by temperature, and the supports, vapour barrier and cladding. It replaces GB/T 8175-2008, with the measurement standard GB/T 8174-2025. In force from 1 May 2026. Issued on 31 October 2025, it has been in force since 1 May 2026, replacing GB/T 8175-2008.

This document specifies the basic principles for the thermal insulation design of equipment and piping, insulation design classifications, principles for material selection, thermal insulation calculations, insulation structures, major technical requirements for the construction of insulation projects, the testing and evaluation of thermal insulation performance. This document applies to the thermal insulation design of equipment, piping, and their accessories, which have external surface temperatures ranging of $-196\text{ }^{\circ}\text{C}$ ~ $850\text{ }^{\circ}\text{C}$. This document does not apply to equipment and piping within systems, such as nuclear energy, aviation, or aerospace, which have special requirements.

2 Normative references

The contents of the following documents, through normative reference within this text, constitute essential provisions of this document. For dated references, only the edition corresponding to that specific date applies to this document; for undated references, the latest edition (including all amendments) applies to this document.

GB/T 4272 General principles for thermal insulation technique of equipment and pipes

GB/T 8174 Method of measuring and evaluation thermal insulation effects for equipments and pipes

GB/T 31013 Acoustics - Acoustic insulation for pipes, valves and flanges

GB 50264 Code for design of industrial equipment and pipeline insulation engineering

3 Terms and definitions

The terms and definitions established in GB/T 4272 and GB 50264 apply to this document.

4 Basic principles

The basic principles of thermal insulation design are to ensure safe and stable operation, satisfy process requirements, minimize heat (or cold) loss, conserve energy, enhance economic efficiency.

5 Classification of thermal insulation design

Thermal insulation design shall be classified, in accordance with the provisions of GB/T 4272, into thermal insulation (for heat retention), cold insulation, personnel protection insulation, fire protection insulation, noise reduction insulation, dual-temperature insulation.

a) Thermal insulation (for heat retention) shall be applied in any of the following situations.

1) When it is necessary to lower the external surface temperature of equipment, piping, and their accessories, meanwhile, to reduce heat loss; 2) When it is necessary to meet the temperature drop limits permitted by the process requirements; 3) When it is necessary to prevent or delay the freezing or solidification of the medium.

b) Cold insulation shall be applied in any of the following situations. 1) When it is necessary to reduce cold loss; 2) When it is necessary to prevent or reduce the temperature rise or vaporization of the medium; 3) When it is necessary to prevent condensation on the external surfaces of equipment, piping, and their accessories.

c) Personal protection insulation shall be applied in any of the following situations. 1) For equipment, piping, and their accessories involved in process operations that do not require thermal insulation, where the external surface temperature exceeds 333 K (60 °C) and where no other measures can be taken, necessitating insulation solely to prevent burns; 2) When the ambient temperature is above 273 K (0 °C), for equipment, piping, and their accessories involved in process operations that do not require cold insulation, where the external surface temperature falls below 273 K (0 °C) and where no other measures can be taken, necessitating insulation solely to prevent frostbite.

d) Fire protection insulation shall be applied in any of the following situations. 1) Where, in the event of a fire, the insulation structure is required to limit the temperature rise of the internal medium within a specified timeframe; 2) Where, in the event of a fire, the insulation

structure is required to impede heat transfer and maintain structural integrity within a specified timeframe.

e) Noise-reduction insulation shall be applied in any of the following situations. 1) Where it is necessary to reduce noise levels at the plant boundary; 2) Where it is necessary to reduce noise levels within the production area.

f) Dual-temperature insulation shall be applied to any single piece of equipment or piping that requires operation under alternating conditions involving both thermal insulation (heat retention) and cold insulation.

6 Material selection

6.1 Material properties shall comply with the provisions of GB/T 4272, GB 50264, relevant product standards. When selecting new materials, a specific technical assessment regarding their suitability shall be conducted.

6.2 The insulation layer may consist of a single material, a combination of two or more materials, or a composite insulation product. Insulation materials offering the highest overall benefit, based on factors such as thermal conductivity, density, safety, service life, cost, ease of installation, shall be selected.

6.3 The permissible service temperature of thermal insulation materials or products shall exceed the maximum temperature of the internal medium. The permissible service temperature of cold insulation materials or products shall be lower than the minimum temperature of the internal medium. When selecting a combination of two or more insulation materials, the permissible service temperature of the outermost layer shall satisfy the temperature requirements at the interface between layers.

6.4 For applications involving a medium temperature range of $-5\text{ }^{\circ}\text{C} \sim 200\text{ }^{\circ}\text{C}$, as well as dual-temperature insulation systems covering the range of $-20\text{ }^{\circ}\text{C} \sim 320\text{ }^{\circ}\text{C}$, appropriate insulation materials shall be selected based on the potential impact of the insulation material on corrosion under insulation.

6.5 Adhesives, sealants, abrasion-resistant agents that meet operational requirements shall be selected, based on the characteristics of the insulation material and the specific application conditions.

6.6 Materials used for the fixation and banding of the insulation layer shall be selected, based on the type of insulation material and the process conditions. For cold insulation layers, banding shall be performed using stainless steel bands, adhesive tapes, or similar materials.

6.7 Materials for the moisture barrier layer shall be selected as either trowel-applied or wrap-around types, depending on the specific application scenario.

6.8 The outer protective layer shall be constructed using materials that are waterproof, moisture-resistant, high-strength, corrosion-resistant; these materials shall be compatible with the prevailing environmental conditions and the geometry of the insulation layer, while also facilitating ease of on-site installation.

6.9 Materials utilized for noise-reduction insulation shall possess one or more functions, such as sound absorption, sound insulation, damping, or vibration reduction.

6.10 Materials utilized for fireproof insulation shall satisfy the fire resistance temperature requirements as well as the specific fire safety requirements associated with the contained medium.

6.11 In dual-temperature insulation systems. If a single type of insulation material is employed, it shall be capable of simultaneously meeting the distinct operational requirements for both thermal insulation (heat retention) and cold insulation; if different types of insulation materials are employed, the specific insulation material in direct contact with the equipment or pipe wall surface shall be capable of simultaneously meeting the distinct operational requirements for both thermal insulation and cold insulation.