NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 4732.1-2024

Pressure vessels design by analysis - Part 1: General requirements

压力容器分析设计 第1部分：通用要求

Issued on: July 24, 2024 **Implemented on: July 24, 2024**

Issued by: State Administration for Market Regulation; Standardization Administration of the PRC

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting. This document is Part 1 of GB/T 4732 "Analysis and Design of Pressure Vessels". GB/T 4732 has been published in the following parts.

1.General requirements;

3.Formula method;

4.Stress classification method;

5.Elastic-plastic analysis methods;

6.Manufacturing, inspection and acceptance. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document is proposed and coordinated by the National Technical Committee for Standardization of Boilers and Pressure Vessels (SAC/TC262). This document was drafted by: China Special Equipment Testing and Research Institute, China National Machinery Industry Corporation, Zhejiang University, Jiangsu Special Equipment Equipment Safety Supervision and Inspection Institute, Gansu Lanke Petrochemical High-tech Equipment Co., Ltd., Tsinghua University, Dalian Jinzhou Heavy Machinery Group Co., Ltd. Company, Sinopec Engineering Construction Co., Ltd., and China Tianchen Engineering Co., Ltd. The main drafters of this document are. Yang Guoyi, Chen Xuedong, Xu Feng, Zheng Jinyang, Li Jun, Miao Chunsheng, Zhang Yanfeng, Lu Mingwan, Liu Jing, Chen Zhiwei, Duan Rui and Qu Jianping.

GB/T 4732 "Analysis and Design of Pressure Vessels" provides the requirements for the construction of pressure vessels according to the analysis and design method. GB/T 150 is based on The rule design concept puts forward the requirements for the construction of

pressure vessels. Pressure vessel design and manufacturing units can choose two construction methods according to the specific design conditions. One of the standards implements the construction of pressure vessels. GB/T 4732 consists of 6 parts.

1.General requirements. The purpose is to provide general requirements for pressure vessels built according to analysis and design, including relevant management requirements. Requirements, common terms and definitions, and basic requirements shared by other parts of GB/T 4732.

2.Materials. The purpose is to give the relevant requirements and material properties of steel materials in pressure vessels built according to analysis and design. Energy data, etc.

3.Formula method. The purpose is to give typical pressure components and structural design requirements of pressure vessels built according to analytical design. The thickness calculation formulas for commonly used container parts designed by the formula method are specifically given. GB/T 4732.3 can be used as The design basis of GB/T 4732.4 and GB/T 4732.5 can also be simplified and completed according to GB/T 4732.3. Analysis design.

4.Stress classification method. The purpose is to give the stress classification method used in pressure vessels built according to analysis and design. Design related regulations.

5.Elastic-plastic analysis method. The purpose is to give the elastic-plastic analysis method used in pressure vessels built according to analytical design. Relevant provisions for design in accordance with the law.

6.Manufacturing, inspection and acceptance. The purpose is to give the structural types of pressure vessels built according to analysis and design. Manufacturing, inspection and acceptance requirements for devices. GB/T 4732 includes the pressure vessel construction process based on the analysis and design method (i.e. materials, design, manufacturing, inspection, testing and verification). GB/T 4732 does not need to and cannot cover all the technical requirements and special prohibition regulations that need to be followed in the collection work. All technical details of the pressure vessel construction, therefore, under the premise of meeting the basic safety requirements specified in the safety technical specifications, there is no restriction There is no special mention of technical content in GB/T 4732.GB/T 4732 cannot be used as a technical manual for the construction of specific pressure vessels, nor can it be used as a technical manual for the construction of specific pressure vessels. Alternative training, engineering experience and engineering evaluation. An engineering evaluation is a review of a specific Technical evaluation of products. Engineering evaluation needs to comply with the relevant technical requirements of GB/T 4732. GB/T 4732 does not restrict the use of other advanced technical methods in actual engineering construction, but engineering and technical personnel use advanced technical methods. Reliable judgment is needed when applying the law to ensure that it meets the requirements of GB/T 4732. GB/T 4732 neither requires nor restricts designers to use

computer programs to analyze and design pressure vessels, but the use of computers is When analyzing and designing the program, in addition to meeting the requirements of GB/T 4732, it is also necessary to confirm.

1 Scope

GB/T 4732.1-2024 is Part 1 of the Chinese standard for pressure vessels designed by analysis, the design-by-analysis route that stands beside the design-by-formula rules of GB 150 as ASME VIII Division 2 stands beside Division 1. Design by analysis buys thinner walls and heavier duty than a rule-based code allows, at the price of a full stress analysis and a failure-mode assessment for every component, and Part 1 is the part that sets the framework the other five parts operate inside. It specifies the general requirements for the material, design, fabrication, inspection and acceptance of a vessel designed by this route, the failure modes the design has to be shown to prevent, and the basic requirements including the risk assessment report required in the normative annex. Its applicability is defined here for the whole series: design pressure from 0.1 MPa up to 100 MPa, or vacuum of 0.2 MPa or more, with the design temperature range and the exclusions stated in this part and referred to by every other. For any manufacturer, design institute or purchaser working with high-duty Chinese pressure vessels, this is the entry point to the series.

1.1 GB/T 4732 specifies the construction requirements for steel pressure vessels (hereinafter referred to as "vessels") designed using the analytical design method, and provides Design method based on failure mode based on elastic stress analysis or elastoplastic stress analysis. General requirements for materials, design, manufacture, inspection and acceptance of vessels designed in accordance with this law.

1.2 GB/T 4732 Applicable design pressure.

a) Containers with a pressure greater than or equal to

0.1 MPa and less than 100 MPa;

b) Containers with a vacuum degree greater than or equal to 0.02MPa.

1.3 The applicable design temperature range of GB/T 4732 is determined according to the applicable temperature range of each part.

1.4 The following containers are not within the scope of application of GB/T 4732.

a) Containers with a design pressure less than

0.1 MPa and a vacuum degree less than

0.02 MPa;

b) Pressure chambers that are integral or part of rotating or reciprocating mechanical equipment (e.g. pump casings, compressor casings, turbine housings, etc.) housing,

hydraulic cylinder, etc.);

c) Containers in nuclear power plants that are at risk of failure due to neutron radiation damage;

d) direct flame heated vessels;

e) Inner diameter (for non-circular cross-sections, it refers to the maximum geometric dimension of the inner boundary of the cross-section. For example, for a rectangle, it is the diagonal line; for an ellipse, it is the major axis) For 150mm container.

1.5 Container Structure Defining Scope

1.5.1 Connection between container and external pipeline.

a) The first circumferential joint groove end face of the welded connection;

b) The first threaded joint end face of the threaded connection;

c) The first flange sealing surface of the flange connection;

d) The first sealing surface of a special connector or pipe connection.

1.5.2 Pressure-bearing heads, flat covers and their fasteners for connecting pipes, manholes, handholes, etc.

1.5.3 Connecting welds between non-pressure components and pressure components.

1.5.4 Non-pressure-bearing components directly connected to the vessel, such as supports, skirts, etc.

1.5.5 Overpressure relief device for containers (see GB/T 150.1).

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 150.1 Pressure vessels Part