NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 4732.3-2024

Pressure vessel design by analysis - Part 3: Formulae method

压力容器分析设计 第3部分：公式法

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

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

Table of Contents

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 3 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: Sinopec Engineering Construction Co., Ltd., Tsinghua University, Zhejiang University, Zhejiang University of Technology, China Special Equipment Testing and Research Institute, China Huanqiu Engineering Corporation Beijing Branch, and Hefei General Machinery Research Institute Co., Ltd. The main drafters of this

document are. Yuan Shaoyun, Xue Mingde, Zheng Jinyang, Feng Qingxiao, Chen Bingbing, Xiang Zhihai, Chen Zhiwei, Zhu Guodong, Yang Jie, Duan Rui, Zhang Yingkai, Wu Jian, Li Keming, Gao Zengliang, and Yao Zuoquan.

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 is 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 and capacities 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 4732.3-2024 is the formulae method part of the Chinese design-by-analysis pressure vessel series, and at some eighty-seven thousand words it is by far the largest part of the set. Its role is practical: a vessel designed by analysis does not need a finite element model for every component, and this part gives closed-form rules for the typical pressure components and structures so that the analysis effort can be concentrated where it is actually needed. It covers internal pressure shells, external pressure shells and the allowable compressive stress, flat covers, flanges, tubular heat exchanger tubesheets and opening reinforcement, together with the rules for handling axial force, bending moment and thermal stress within a defined range. A normative annex gives the stress analysis of basic components and combined assemblies, and further annexes cover welded joints and related material. It applies to typical components under static loads of pressure, axial force and bending moment, and to those under alternating load that satisfy the fatigue analysis exemption of GB/T 4732.4-2024.

This document specifies the formula-based design method for typical pressure components and structures under pressure loads (internal or external pressure), as well as the Rules for handling axial force, bending moment and other loads and thermal stress within the specified range. This document is applicable to static loads such as pressure, axial force, bending moment, and alternating loads but meets GB/T 4732.4- Typical pressure components and structures that are exempted from fatigue analysis provisions in 2024. This document applies to pressure vessels covered by GB/T 4732.1-2024.

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 150.2 Pressure Vessels Part

3 Terms and definitions

The terms and definitions defined in GB/T 4732.1-2024 apply to this document.

4 Stress classification method

GB/T 4732.5-2024 Analysis and design of pressure vessels Part

5 Elastic-plastic analysis methods

GB/T 4732.6-2024 Pressure vessel analysis and design Part

6 Manufacturing, inspection and acceptance

GB/T 16749 Pressure vessel corrugated expansion joints

HG/T 20592 Steel Pipe Flange (PN Series)

HG/T 20615 Steel Pipe Flange (Class Series)

HG/T 20623 Large Diameter Steel Pipe Flange (Class Series) NB/T 47013.2 Nondestructive testing of pressure equipment Part

2.Radiographic testing NB/T 47013.3 Nondestructive testing of pressure equipment Part

3.Ultrasonic testing NB/T 47020 Classification and technical requirements for pressure vessel flanges NB/T 47021 Type A flat welding flange NB/T 47022 Type B flat welding flange NB/T 47023 Long Neck Butt Weld Flange