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NB

ENERGY INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

NB/T 20482-2018

Specification for design and construction of steel containment vessel of nuclear power plant of PWR

压水堆核电厂钢制安全壳设计建造规范

Issued on: March 22, 2018 **Implemented on: September 1, 2018**

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Foreword

This document was issued on 22 March 2018 by the National Energy Administration of the PRC and takes effect on 1 September 2018.

It is a NB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

It is classified under ICS 27.120.20, Chinese classification F 69.

This standard has been drafted in accordance with the rules given in GB/T 1.1-2009.

This standard was proposed by the Technical Committee for Nuclear Power Standardization of the Energy Industry.

This standard is under the jurisdiction of the Nuclear Industry Standardization Research Institute.

Drafting organization of this standard: Shanghai Nuclear Engineering Research and Design

Institute Co., Ltd.

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1 Scope

NB/T 20482-2018 governs the design and construction of the steel containment vessel of a pressurised water reactor nuclear power plant. The containment is the last physical barrier between the reactor and the outside world: it must hold the pressure and temperature of a design basis accident, stay leaktight while doing so, and survive the external hazards the site can present. The specification sets the design conditions and load combinations - normal operation, test, accident pressure and temperature, dead and live loads, wind, snow, seismic input, and the loads arising during construction and heavy lifting. It fixes the materials permitted for the shell, heads, penetrations and attachments, with their allowable stresses at temperature and the toughness required. Design rules follow for the cylindrical shell and heads, openings and reinforcement, equipment hatches and personnel airlocks, mechanical and electrical penetrations, brackets and internal supports, and buckling under external pressure. Fabrication and erection are treated in their own right: plate forming, weld joint design and classification, welding procedure and welder qualification, dimensional tolerances of the assembled vessel, heat treatment, and the sequence of site assembly. Examination and testing close the document - non-destructive examination and its acceptance criteria, the structural integrity pressure test, and the integrated leak rate test that proves the containment does what it exists to do. It applies to PWR plants built in China.

This standard specifies the requirements for the design, construction, testing and acceptance of the steel containment vessel of a pressurized water reactor (PWR) nuclear power plant.

This standard is applicable to the steel containment vessel of pressurized water reactor nuclear power plants.

The provisions cover the complete life sequence of the component: selection and qualification of materials, design by formula and design by analysis, openings and their reinforcement, welded joint design, fabrication and erection, heat treatment, non-destructive examination, leak tightness and structural integrity testing, overpressure protection and nameplate marking, together with four normative annexes giving supplementary material provisions, allowable stress and allowable stress intensity values, external pressure charts and design fatigue curves.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including all amendments) applies.

HAF601-2008, Regulations on the supervision and administration of design, manufacture, installation and non-destructive examination of civil nuclear safety equipment.

HAF602-2008, Regulations on the qualification management of non-destructive examination personnel for civil nuclear safety equipment.

HAF603-2008, Regulations on the qualification management of welders and welding operators for civil nuclear safety equipment.

GB/T 17569, Classification of items of pressurized water reactor nuclear power plants.

GB/T 6803, Test method for drop weight nil-ductility transition temperature of ferritic steels.

GB/T 223, Methods for chemical analysis of iron, steel and alloy.

GB/T 228.1-2010, Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1: 2009, MOD).

GB/T 229-2007, Metallic materials - Charpy pendulum impact test method (ISO 148-1: 2006 Part 1, MOD).

GB/T 4336, Standard test method for spark discharge atomic emission spectrometric analysis of carbon and low-alloy steel (routine method).

GB/T 4338-2006, Metallic materials - Tensile testing at elevated temperature (ISO 783: 1999, MOD).

GB/T 6394, Determination of estimating the average grain size of metal.

GB/T 10561-2005, Steel - Determination of content of non-metallic inclusions - Micrographic method using standard diagrams (ISO 4967: 1998, IDT).

GB/T 20066-2006, Steel and iron - Sampling and preparation of samples for the determination of chemical composition (ISO 14284: 1996, IDT).

GB/T 20123-2006, Steel and iron - Determination of total carbon and sulfur content - Infrared absorption method after combustion in an induction furnace (routine method) (ISO 15350: 2000, IDT).

GB/T 1954-2008, Method for measuring ferrite content in chromium-nickel austenitic stainless steel weld metal.

NB/T 20003.1-2010, Non-destructive examination of mechanical equipment of the nuclear island of nuclear power plants - Part 1: General requirements.