NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

GB/T 20801.3-2020

Pressure piping code - Industrial piping - Part 3: Design and calculation

Issued on: November 19, 2020 **Implemented on: June 1, 2021**

Issued by: SAMR; SAC

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1 Scope

This Part of GB/T 20801 specifies the basic requirements for the design and calculation of pressure pipelines. These basic requirements include design conditions, design criteria, piping components and their pressure design, pipeline stress analysis, etc.

This Part applies to the design and calculation of pressure piping, which is defined within the scope of GB/T 20801.1.

2 Normative references

The following documents are essential to the application of this document. For the dated

documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 150 (all parts) Pressure vessel

GB/T 196 General purpose metric screw threads - Basic dimensions

GB/T 197 General purpose metric screw threads - Tolerances

GB/T 1031 Geometrical product specifications (GPS) - Surface texture.

Profile method - Surface roughness parameters and their values

GB/T 1047 Pipework components - Definition and selection of nominal size

GB/T 1048 Pipework components - Definition and selection of PN

GB/T 3287 Malleable cast iron pipe fittings

GB/T 3420 Gray iron castings for pipe fittings

GB/T 3422 Cast-iron pressure pipe made by continuous casting process

GB/T 5625 Flared couplings - Straight thread

GB/T 5626 Flared couplings - Male

GB/T 5627 Flared couplings - Male long

GB/T 5628 Flared couplings - Union

GB/T 5629 Flared couplings - Male elbow

GB/T 5630 Flared couplings - Union elbow

GB/T 5631 Flared couplings - Straight thread elbow

GB/T 5632 Flared couplings - Swivel elbow

GB/T 5633 Flared couplings - Straight thread branch tee

GB/T 5634 Flared couplings - Swivel run tee

GB/T 5635 Flared couplings - Male branch tee

GB/T 5637 Flared couplings - Straight thread run tee

GB/T 5638 Flared couplings - Swivel branch tee

3 Terms and definitions

The following terms as defined in GB/T 20801.1-2020, GB/T 20801.2-2020,

GB/T 20801.4-2020, GB/T 20801.5-2020, GB/T 20801.6-2020, as well as the following

terms and definitions, apply to this document.

3.1 Piping system

Pipelines, which are determined by the same design conditions AND connected to each other.

3.2 Elevated temperature fluid service

The use temperature of the material is in a working condition where the high-temperature strength reduction factor W of the welded joint is less than 1 (see 4.2.7 and Table 5), which is equivalent to the working condition where the working temperature is within the allowable stress temperature range, which is determined by the long-term strength of the material.

3.3 Fluid service

A comprehensive term, which involves the application of piping systems;

takes into account fluid properties, operating conditions and other factors;

forms the basis of piping system design.

3.5 Branch connection fitting

The integral reinforcing fittings, which connect the branch to the trunk pipe, through butt welding connection, socket welding connection, threaded connection.

3.6 Rating value

The pressure value of the piping components, which are specified by the standard.

4.2.1 Pressure-temperature design criteria for piping components

The pressure-temperature design of piping components shall adopt one of the methods specified in 4.2.1.1 ~ 4.2.1.4.

4.2.2 Pressure-temperature design criteria of piping system

The pressure-temperature design of the piping system shall meet the following requirements.

4.2.3.1 When determining the design pressure and design temperature, it shall

consider the pressure and temperature changes, that occur during the operation of the piping system.

4.2.3.4 Occasional changes in pressure, which exceed the design conditions, shall be limited to any of the following ranges.

4.2.5 Factor of longitudinal welded joint Phiw

The longitudinal welding joint factor Phiw, of pipes and butt-welded fittings, shall be determined, according to the criteria specified in Table 3 or Table A.3 of GB/T 20801.2-2020.

4.2.6 Casting's quality factor PhiC

4.2.6.1 The casting quality factor PhiC of iron castings (grey cast iron, ductile iron, malleable cast iron) takes 1.0.

4.2.6.2 Except for cast iron, static metal castings in Table A.1 of GB/T 20801.2-

2020 shall be visually inspected, according to JB/T 7927.It shall not be lower than the requirements of grade B. The casting's quality factor shall be taken as 0.8.

4.2.6.3 For castings that require additional non-destructive testing, it can use

the casting quality factor in Table 4.However, the change in the casting quality factor PhiC does not affect the pressure-temperature ratings of the piping components.

5.1.1 General provisions

The piping components shall be selected, according to the nature of the fluid, various possible operating conditions, the requirements of the external environment, economic rationality.

5.1.5 Short radius elbow

The short radius elbow and short radius return elbow (R = 1.0D) shall meet the requirements of GB/T 12459.

5.2.1 General provisions

The selection of the connection form of the piping components shall be compatible with the pipeline material and fluid working conditions. Meanwhile, it shall consider the influence of pressure, temperature, external load on the sealing performance and mechanical strength of the connection joint, under the expected use and test conditions.

5.2.5.1 The pipe thread type of the thread seal shall meet the requirements of

Table 11.

5.2.6 Straight thread connection

The straight thread connection joint can adopt the structure, as shown in Figure 4, to be