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**Steel reinforced plastic composite pressure pipes for cold and
hot water**

冷热水用钢增强塑料复合压力管

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1 Scope

The document lays down the classification, the service condition classes and marking, the materials, the specifications and dimensions and the physical, mechanical and hygienic requirements of steel reinforced plastic composite pressure pipes for cold and hot water, abbreviated below as PSP; it lays down the inspection rules and the content of marking, packaging, transport and storage, and it describes the corresponding test methods.

It applies to cold and hot water piping systems inside and outside towns and buildings, including drinking water and heating piping systems.

Where chemical resistance and corrosion resistance meet the conditions of use, PSP for industrial drainage refers to this document.

2 Normative references

The content of the following documents constitutes, through normative reference in the text, indispensable provisions of this document. For dated references, only the edition corresponding to that date applies; for undated references, the latest edition, including all amendments, applies.

GB/T 228.1-2021 Metallic materials - Tensile testing - Part 1: Method of test at room temperature. GB/T 242 Metal pipe - Flaring test method. GB/T 1033.1 Plastics -

Determination of the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method. GB/T 2520-2017 Cold reduced electrolytic tinplate. GB/T 2791 Adhesives - Test method for T peel strength - Flexible-to-flexible. GB/T 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection. GB/T 2918 Plastics - Standard atmospheres for conditioning and testing. GB/T 3280-2015 Cold rolled stainless steel plate, sheet and strip. GB/T 3682.1 Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method.

GB/T 6111 Thermoplastics piping systems for fluid conveyance - Determination of the resistance to internal pressure. GB/T 6461 Metallic and other inorganic coatings on metallic substrates - Rating of test specimens and manufactured articles subjected to corrosion tests. GB/T 8806 Plastics piping systems - Plastics components - Determination of dimensions. GB/T 10125 Corrosion tests in artificial atmospheres - Salt spray tests. GB/T 13663.1 Polyethylene (PE) piping systems for water supply - Part 1: General. GB/T 15560-1995 Test method for the hydraulic instantaneous burst and pressure resistance of plastics pipes for fluid conveyance. GB/T 15675-2020 Continuously electrogalvanized and zinc-nickel alloy coated steel sheet and strip. GB/T 17219 Standard for safety evaluation of equipment and protective materials in drinking water distribution systems. GB/T 18742.1 Polypropylene piping systems for hot and cold water - Part 1: General. GB/T 18991 Thermoplastics pipes and fittings for hot and cold water systems. GB/T 19278-2018 Thermoplastics pipes, fittings and valves - General terms and their definitions. GB/T 19466.3 Plastics - Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization. GB/T 19466.6 Plastics - Differential scanning calorimetry (DSC) - Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT). CJ/T 237-2006 Double hot-melt fittings for steel plastic composite pressure pipes. CJ/T 253-2007 Fittings for steel plastic composite pressure pipes. QB/T 5634-2021 Electromagnetic induction double hot-melt welding fittings for steel plastic composite pressure pipes.

3 Terms and definitions

The terms and definitions given in GB/T 19278-2018, together with the following, apply to the document.

3.1 steel reinforced plastic composite pressure pipe: a pipe composited into one body by an extrusion moulding method, having a welded steel pipe as the middle reinforcing layer, polyethylene or polypropylene plastic as the inner and the outer layer, and a dedicated hot-melt adhesive between them, as shown in Figure 1. The key to Figure 1 gives 1 for the inner plastic layer, 2 for the hot-melt adhesive, 3 for the steel pipe layer, 4 for the weld seam and 5 for the outer plastic layer.

3.2 maximum (allowable) operating pressure: the allowable pressure of the pipe determined

after taking into account the overall service (design) coefficient C. Note: the maximum (allowable) operating pressure is expressed in megapascals (MPa). Source: GB/T 19278-2018, 2.5.1.6, modified.

3.3 cold and thermal stress resistance of adhesive interface: the ability of the adhesive interface between the steel pipe and the plastic layer to resist damage from cold and thermal stress.

3.4 protection rating: the class of ability of the covering layer to protect the base metal from corrosion. Note: it is expressed by a numerical code.

3.5 proof strength plastic extension: the stress at which the plastic extension is 0.2 %. Source: GB/T 228.1-2021, 3.10.3, modified.

4 Symbols and abbreviations

4.1 Symbols. The following symbols apply to the document: the maximum mean outside diameter, in millimetres (mm); the minimum mean outside diameter, in millimetres (mm); the nominal outside diameter, in millimetres (mm); PN, the nominal pressure, in megapascals (MPa); MOP, the maximum (allowable) operating pressure, in megapascals (MPa); the design temperature, in degrees Celsius; the malfunction temperature, in degrees Celsius; and the maximum design temperature, in degrees Celsius.

4.2 Abbreviations. The following abbreviations apply to the document. MFR: melt mass-flow rate. PE: polyethylene. PP-R: polypropylene random copolymer. PP-RCT: polypropylene random copolymer with modified crystallinity. PSP: steel reinforced plastic composite pressure pipe. PSP-I: steel reinforced plastic composite pressure pipe type I. PSP-II: steel reinforced plastic composite pressure pipe type II. PSP-III: steel reinforced plastic composite pressure pipe type III.

5 Classification, service condition classes and marking

5.1.1 Classification by the materials of the composite components. PSP is divided, according to the materials of its composite components, into the three types PSP-I, PSP-II and PSP-III. Note: PSP-I has polyethylene inner and outer layers and an electrogalvanized or electrotinned steel pipe as metal layer; PSP-II has polypropylene inner and outer layers and an electrogalvanized or electrotinned steel pipe as metal layer; PSP-III has polypropylene inner and outer layers and a stainless steel pipe as metal layer.

5.1.2 Classification by use. PSP is classified by use with the following codes: a) cold water, code L; b) cold and hot water, code R.

5.2.1 Service conditions of PSP-I. PSP-I applies to cold water piping systems in which the water temperature is not above 40 °C and the maximum working pressure is not above 2.5 MPa.

5.2.2.1 Service condition classes. PSP selects, according to the provisions of GB/T 18991, one of the four service condition classes given in Table 1, each service condition class corresponding to the conditions of use under a fifty year design life. In some regions, because of particular climatic conditions, other classes may also be used. Where a service condition class other than those specified in Table 1 is used, the agreement of the design party, the production party and the user party is to be obtained.

Table 1 has eight columns: service condition class, design temperature in degrees Celsius, time at the design temperature in years, maximum design temperature in degrees Celsius, time at the maximum design temperature in years, malfunction temperature in degrees Celsius, time at the malfunction temperature in hours, and typical field of application. Class 1 gives a design temperature of 60 °C for 49 years, a maximum design temperature of 80 °C for 1 year and a malfunction temperature of 95 °C for 100 h, for hot water supply at 60 °C. Class 2 gives a design temperature of 70 °C for 49 years, a maximum design temperature of 80 °C for 1 year and a malfunction temperature of 95 °C for 100 h, for hot water supply at 70 °C. Class 4 gives design temperatures of 20 °C for 2.5 years, 40 °C for 20 years and 60 °C for 25 years, a maximum design temperature of 70 °C for 2.5 years and a malfunction temperature of 100 °C for 100 h, for floor heating and low temperature radiator heating. Class 5 gives design temperatures of 20 °C for 14 years, 60 °C for 25 years and 80 °C for 10 years, a maximum design temperature of 90 °C for 1 year and a malfunction temperature of 100 °C for 100 h, for high temperature radiator heating. The table carries no class 3.

5.2.2.2 Service conditions. The MOP corresponding to work under the service condition classes specified in Table 1 is given in Table 2. Table 2 has three heading columns, service condition class, use code and PSP code, followed by the MOP in megapascals under the three nominal pressures PN1.6, PN2.0 and PN2.5. For class 1, use code R, PSP-II and PSP-III, the MOP is 1.60 MPa, 2.00 MPa and 2.50 MPa. For class 2, use code R, PSP-II and PSP-III, it is 1.25 MPa, 1.60 MPa and 2.00 MPa. For class 4, use code R, PSP-II and PSP-III, it is 1.60 MPa, 2.00 MPa and 2.50 MPa. For class 5, use code R, PSP-III only, it is 1.25 MPa, 1.60 MPa and 2.00 MPa.

5.3 Marking. PSP is marked as shown in Figure 2.