

ICS 23.040.60

CCS J 15



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 29038-2024

Replacing GB/T 29038-2012

Technical specification for light gauge stainless steel piping

薄壁不锈钢管道技术规范

Issued on: September 29, 2024

Implemented on: April 1, 2025

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

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1 Scope

The document lays down the technical specification for the materials, design, construction and acceptance of light gauge stainless steel piping.

It applies to the design, construction and acceptance of light gauge stainless steel piping for water supply (the medium being piped direct-drinking water, domestic hot water, cold water and the like) and for boiled-water supply in industrial and civil buildings, at a nominal pressure not greater than PN 25, a nominal size not greater than DN 300 and a temperature not greater than 80 °C.

2 Normative references

The documents cited are GB 5749 (drinking water hygiene), GB/T 12771 (welded stainless steel pipes for fluid transport), GB/T 19228.1, GB/T 19228.2 and GB/T 19228.3 (stainless steel press-fit fitting assemblies: fittings, light gauge pipes for connection, and O-ring rubber seals), GB/T 21359 (stainless steel threaded joints for the food and water supply industry), GB/T 21472 (stainless steel elbows and tees for the food industry), GB/T 33926 (stainless steel ring-compression fittings), GB 50015 (building water supply and drainage design), GB 50981 (seismic design of building mechanical and electrical works) and CJ/T 151 (light gauge stainless steel pipes).

Dated references apply only in the edition quoted; undated references apply in their latest edition, including all amendments.

3 Terms and definitions

3.1 Light gauge stainless steel pipes - stainless steel pipes whose ratio of wall thickness to outside diameter is not greater than 6 % and whose wall thickness is 0.6 mm to 4.0 mm.

3.2 Light gauge stainless steel pipes wrapped in plastic - light gauge stainless steel pipes with a plastic covering layer on the outer wall.

3.3 Press jointing - a jointing method in which the pipe is connected by a socket fitting carrying a special sealing ring, the pipe mouth being pressed with a dedicated tool so as to seal and secure the joint; according to the end structure, press jointing is divided into the S type and the D type.

3.4 D-type socket jointing (single-press extrusion jointing) - press jointing in which the socket end of the fitting has no extended straight section.

3.5 S-type socket jointing (double-press extrusion jointing) - press jointing in which the socket end of the fitting has an extended straight section.

3.6 Ring (annular) compressing jointing - an extrusion jointing method in which a wide-band sealing ring is placed at the spigot and socket and the socket is crimped with a dedicated ring-compression tool so that it is tightened and sealed in an annular compressed form.

3.7 Plug-in TIG welding jointing - a jointing method in which the stainless steel pipe is inserted into the socket of the fitting and the two are fused into one body by tungsten inert gas (TIG) welding.

3.8 Balanced TIG welding jointing (butt TIG welding jointing) - a jointing method, described in the document as a jointing without a joint, in which stainless steel pipes are butted directly against each other, or a pipe is butted against a fitting, and welded by tungsten inert gas (TIG) welding.

3.9 Clip cover jointing - an extrusion jointing method in which tightening a nut deforms a drum-shaped stainless steel ring inside the fitting so that it secures and closes the gap at

the pipe connection.

3.10 Press jointing with clamp ring - a jointing method in which the pipe is connected by a socket fitting carrying a pull-out resisting clamp ring and an O-ring rubber seal, the pipe mouth being pressed with a dedicated tool so as to seal and secure the joint.

3.11 Compression jointing - a jointing method in which a nut is tightened so that the sleeve at the pipe mouth compresses the sealing ring and thereby seals the joint.

3.12 Clasp flange jointing - a flared-ring jointing method in which a raised ring of right-triangular or circular-arc section is expanded at the pipe end with a dedicated tool, the seal being made on the end face and an anti-slip rubber ring being fitted at the thread.

3.13 Grooved coupling jointing (trench type jointing) - a jointing method forming a quickly assembled joint, in which an annular groove is machined (by roll grooving or by cutting) at the joint area of the plain end of the pipe or fitting, the joint then being made up of a split clamp, a C-shaped rubber sealing ring and fasteners.

3.14 Threaded coupling jointing - a jointing method in which a 90° flanged face is expanded at the pipe end with a dedicated tool, two such flanged faces then being pressed against a sealing ring with a limiting structure and tightened.

3.15 Flanged jointing (flange joint) - a jointing method in which fasteners are tightened to secure the flanges on adjacent pipe ends.

3.16 Circular water supply for branch pipe - a supply arrangement in which double-socket bends serve the water fittings inside a building and the supply pipework is laid out as a ring, so that water standing in the pipe is set in motion whenever any one draw-off point is used.

4 Pipes and fittings

4.1 to 4.2 Pipes and fittings shall carry a test report from a nationally recognised product testing body and a works quality certificate; those used for drinking water shall also carry the hygiene licence documents for water-contact products issued by the health authority. They shall meet GB/T 12771, GB/T 19228.1, GB/T 19228.2, GB/T 19228.3, GB/T 21359, GB/T 21472, GB/T 33926 and CJ/T 151.

4.3 Table 1 lists seven designations with their service conditions. The austenitic types are S30408 (06Cr19Ni10) and S30403 (022Cr19Ni10), both for water supply (piped direct-drinking water, domestic hot water, cold water and the like) and boiled-water supply; S31608 (06Cr17Ni12Mo2) where higher corrosion resistance than S30403 is required; and S31603 (022Cr17Ni12Mo2) for high-chloride media or where higher corrosion resistance than S31608 is required. The ferritic types are S11972 (019Cr19Mo2NbTi) for high-chloride media and fire-fighting supply, S12362 (019Cr23MoTi) where higher chloride-ion resistance than S11972 is required, and S12361 (019Cr23Mo2Ti) where higher chloride-ion resistance than S12362 is required.

4.4 Table 2 sets the permitted chloride content of the water conveyed for the same seven designations. For cold water (temperature not above 40 °C) the limit is 200 mg/L for S30408 and S30403 and 1 000 mg/L for S31608, S31603, S11972, S12362 and S12361. For hot water (temperature above 40 °C) the limit is 50 mg/L for S30408 and S30403 and 250 mg/L for the other five.

4.5 to 4.8 Joints shall use matching stainless steel fittings, preferably of the same designation as the pipe; dimensions and tolerances shall meet the national or industry standards in force; chemical composition and mechanical properties shall meet Annex A. Fitting structures include press-fit, ring-compression, welded, clip-cover, clamp-ring press, compression, threaded, grooved and flanged types.

4.9 After the forming and welding process, austenitic stainless steel fittings shall be given a bright solution treatment under a protective gas (pure hydrogen or an AX gas mixture) at 1 000 °C to 1 100 °C. Ferritic stainless steel shall be annealed at 850 °C to 1 050 °C.

4.10 to 4.11 Sealing rings shall match the jointing method; rubber is preferred, the choice being made from the jointing method, the medium temperature, the sealing requirement and the service life. Sealing rings for press-type joints shall meet GB/T 19228.3, and those for other jointing methods shall meet the relevant national or industry standards in form, dimensions and material.

5 Design

5.1 Layout and installation. The piping shall be made up throughout of light gauge stainless steel pipes, fittings and accessories, and measures against galvanic corrosion shall be taken where it meets other materials. Buried piping should be of a designation not lower than 022Cr17Ni12Mo2 (S31603), with external corrosion protection that should be free of chloride ions; plastic-wrapped pipe is preferred where the pipe is embedded in a wall or in a screed. Buried pipe should not pass through building foundations, and shall be run in a sleeve where it passes through a wall, a hole being left in the wall and building settlement taken into account. Wall-embedded pipe shall not use clip-cover or other threaded joints and its diameter should not exceed 20 mm; it shall be run horizontally or vertically in a preformed or cut chase and fixed with clips. The pipe shall not be cast into reinforced concrete structural layers, should not cross settlement, expansion or movement joints without a device to take up expansion and shear, and shall not be run in switch rooms, power or communication risers, flues, air ducts or drainage channels. Piping to be drained should fall towards the drain point at a gradient of 0.002 to 0.003.

5.1.9 Bathroom distribution pipework should use branch pipe circular water supply: the ring should not exceed 15 m in length, and where a branched layout is used instead the water volume in the pipework should not exceed 0.003 m³.

5.1.10 to 5.1.13 Threaded adaptors or flanges shall be used at the service entry, at the