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**Code for construction and quality acceptance of industrial
non-ferrous metallic piping engineering**

工业有色金属管道工程施工及质量验收规范

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Code for construction and quality acceptance of industrial non-ferrous metallic piping engineering

1 General provisions

1.0.1 In order to improve the construction level of industrial non-ferrous metal pipeline projects, strengthen the quality control and acceptance of the construction process of industrial non-ferrous metal pipeline projects, ensure the quality of the project, this Code is hereby formulated.

1.0.2 This Code is applicable to the construction and quality acceptance of industrial pipeline projects of copper, aluminum, lead, nickel, titanium, zirconium, tantalum, niobium and their alloys.

1.0.3 This Code does not apply to the construction and quality acceptance of the following industrial non-ferrous metal pipeline projects:

- 1 The manufacturer designs complete sets of pipes, that are integrated into the equipment.
- 2 Special pipelines for military facilities and nuclear energy devices.
- 3 Pipes for offshore facilities and underground mines.

1.0.4 The construction and quality acceptance of industrial non-ferrous metal pipeline projects shall not only comply with this Code, but also comply with the relevant national standards.

2 Terms

2.0.1 Industry non-ferrous metal pipeline

Process pipes, other auxiliary pipes, pipes serving industrial production, which are connected or assembled by non-ferrous metal pipes and other piping components, to transport process media in production device.

2.0.2 Intergranular corrosion

In some environments, when the dissolution rate of the grain boundaries is greater than the dissolution rate of the grains themselves, corrosion occurs along the metal grain boundaries or grain boundaries.

2.0.3 Solution treatment

A heat treatment process, in which the alloy is heated to a high temperature and maintained at a constant temperature in the single-phase region, so that the excess phase is fully dissolved into the solid solution and then rapidly cooled, to obtain a supersaturated solid solution.

2.0.4 Roundness

The ratio -- of the difference between the maximum outer diameter and the minimum outer diameter on the cross section of the elbow TO the average of the maximum outer diameter and the minimum outer diameter.

2.0.5 Tack welding

Welding, which is performed to assemble and secure the position of welded joints.

2.0.6 Fixed welding

In the process of pipe welding connection, the welding between the pipe segment to be installed and the installed and fixed piping joint.

3 Basic requirements

3.0.1 Pipeline projects shall have approved construction program, construction plan, other technical documents, before construction.

3.0.2 Process handover inspection shall be conducted between pipeline engineering construction and other related disciplines, meanwhile quality acceptance records shall be formed.

3.0.3 During the pipeline project construction process, various construction technical documents, construction records, inspection reports, quality acceptance records, and other project acceptance work shall be completed.

3.0.4 The quality acceptance of industrial non-ferrous metal pipeline projects can be divided into item work, segment work (sub-division work).

3.0.5 The non-ferrous metal pipeline project in the same unit project can be divided into one segment work or several sub-division work.

3.0.6 Item work shall be divided, according to pipeline pressure levels and materials.

3.0.7 The construction of pressure pipeline projects shall comply with the relevant provisions of the current national standards "Pressure pipe safety technology supervision regulation for industrial pressure pipe" TSG D0001 and "Pressure piping code - Industrial piping" GB/T 20801.

3.0.8 The construction and quality acceptance of non-ferrous metal pipeline engineering parts for equipment, which is designed in complete sets by the manufacturer, supplied in bulk and required to be assembled on site, shall comply with the technical requirements of the manufacturer's products and shall not be lower than the provisions of this Code.

3.0.9 In addition to complying with the provisions of the design documents, the pipeline insulation work shall also comply with the relevant provisions of the current national standard "Code for construction of industrial equipment and pipeline insulation engineering" GB 50126.

4 Inspection and storage of piping components

4.1 General requirements

4.1.1 Piping components shall have product quality certification documents from the manufacturer; the technical parameters shall meet the requirements of the design documents.

4.1.2 Before use, the material, specifications, model, quantity, marking of piping components shall be checked, in accordance with the design documents and the current national standards for non-ferrous metals and their alloy products; the appearance quality and geometric dimensions shall be subject to inspection and acceptance. When the design requires non-destructive testing, it shall be carried out in accordance with the relevant provisions of the current industry standard "Nondestructive testing for pressure equipment" JB/T 4730. The identification of piping components shall be clear and complete, which can trace the supply status of the product; it shall fill the quality inspection record of piping components. The format should comply with the provisions of Table A.0.1 of this Code.

4.1.3 For piping components made of nickel, titanium, zirconium, tantalum, niobium and their alloys, it shall carry out witnessed sampling reinspection and mark it.

4.1.4 For materials that are stipulated in the design documents for low-temperature impact testing, the quality certification documents shall have low-temperature impact test data and shall comply with the provisions of the design documents.

4.1.5 For piping components that are stipulated in the design documents for intergranular corrosion testing, it shall provide intergranular corrosion test documents; meanwhile the test results shall comply with the provisions of the design documents.

4.1.6 For copper and copper alloy pipes, aluminum and aluminum alloy pipes, lead pipes which are used for bulging or flanging connections, bulging or flanging tests shall be carried out before construction.

documents.

3 The valve stem shall not be skewed or deformed; the transmission mechanism and opening mechanism shall be flexible and free of obstruction and jamming.

4 The screw rod, hand wheel, valve handle, etc. shall be free of burrs, scratches, marks.

4.3.2 When the design document stipulates that the valve undergoes a low-temperature sealing test, it shall provide the valve low-temperature sealing test report.

4.3.3 For nickel, titanium, zirconium, tantalum, niobium and their alloy valves, the valve body shall be re-inspected.

4.3.4 Before the valve is installed, a shell pressure test and a sealing test shall be conducted. Valves with an upper sealing structure shall also undergo an upper sealing test. Valve testing shall comply with the following requirements:

1 The accuracy of the pressure gauge used for testing shall not be lower than level 1.6; it shall be certified and qualified.

2 Clean water shall be used for the valve shell pressure test and sealing test. When testing nickel and nickel alloy valves, the chloride ions in the water shall not exceed 50 mg/L.

3 The test pressure of the valve shell shall be 1.5 times the maximum allowable working pressure at 20 °C. The pressure stabilization time shall not be less than 5 minutes. It shall be qualified, when the shell does not deform or break, the valve does not leak, the pressure does not drop.

4 The sealing test shall be carried out after the pressure test is qualified. The sealing test pressure shall be 1.1 times the maximum allowable working pressure at 20 °C. The pressure stabilization time shall not be less than 3 minutes. It shall be qualified, when the sealing surface does not leak and the pressure does not drop.

5 Valves that have passed the test shall be drained of internal water and blown dry. The valve shall be closed, both ends sealed, marked.

4.3.5 The shell pressure test and sealing test are not required for valves that have been degreased.

4.3.6 Before the safety valve is installed, it shall be calibrated in accordance with the relevant provisions of the current industry standard "Safety technical supervision regulations for safety valves" TSG ZF001; it shall be sealed and a calibration report shall be issued.

4.3.7 After the valve passes the test, the valve test record shall be filled in. The format

should comply with the provisions of Table A.0.2 of this Code.

4.4 Inspection of other piping components

4.4.1 The surface of pipe fittings shall be smooth and clean, without defects such as cracks, pinholes, folds, delamination, dents, scratches, blisters, etc.

4.4.2 Flanges and flange covers shall be marked with product names, standard numbers, specifications, materials, pressure levels, sealing surface forms, etc., which shall be consistent with the quality certification documents. Flange quality shall comply with the following requirements:

1 The flange sealing surface shall be smooth and flat, without burrs, radial scratches, blisters, pinholes.

2 There shall be no damage to the tail groove of the butt welding flange.

4.4.3 The threads of bolts and nuts shall be complete and free of scratches, burrs and other defects; the processing accuracy shall meet the requirements of the design documents. The bolts and nuts shall fit well and shall not be loose or stuck.

4.4.4 Sealing gaskets shall be subject to sampling inspection and acceptance; the gaskets shall meet the following requirements:

1 The wound gasket shall not be loose or warped; the surface of the gasket shall be free from scratches, gaps, unevenness, rust spots and other defects that may affect the sealing performance.

2 The size, accuracy, surface roughness of metal gasket processing shall comply with the provisions of the design document; the surface shall be free of defects, such as cracks, burrs, grooves, radial scratches, rust.

3 The edges of non-metallic gaskets shall be cut neatly; the surface shall be flat and smooth, without defects such as blisters, delamination, wrinkles, scratches, etc.

4.4.5 The inspection of support-bracket and hanger shall comply with the following requirements:

1 The materials, specifications, models, appearance, geometric dimensions of pipe support-bracket and hanger shall comply with the provisions of the design documents.

2 The surface of the support-bracket and hanger shall be free of burrs, floating rust, cracks, missing welds, surface blisters, etc.

3 There shall be nameplates and displacement indication plates on the spring

- 5 The allowable deviation of the telescopic arm length of the square compensator shall be ± 10 mm; the allowable deviation of the plane warpage per meter shall be ± 3 mm; the total planar allowable deviation shall be ± 10 mm.

4.5 Storage and transportation of piping components

4.5.1 Piping components shall be stored separately and neatly, according to category, material, specification. They shall be labeled. They shall not be stored in a mixed manner. Steel stamps must not be used for marking pipes and pipe fittings. The materials used for marking nickel and nickel alloy pipes must not contain halogens or halides; meanwhile measures such as anti-corrosion, anti-deformation, anti-surface damage shall be taken.

4.5.2 Nickel and nickel alloy piping components shall not be protected by materials containing halogen or halide. Pipes and pipe fittings shall not be stored in a humid environment, which has a chloride ion content exceeding 50 mg/L.

4.5.3 Protective measures shall be taken when transporting piping components; flexible materials shall be used for spacer protection between the piping components and the transport box.

4.5.4 Lead pipes, tantalum and tantalum alloy pipes, niobium and niobium alloy pipes shall be stored on support surfaces with flexible protection; lead pipes shall be placed in a single layer.

4.5.5 When loading and unloading pipes, special lifting gears or flexible lifting belts shall be used for lifting.

4.6 Quality inspection and acceptance

I Main control items

4.6.1 Piping components shall be checked against the quality certification documents provided by the manufacturer. The performance parameters shall comply with the provisions of relevant technical documents.

Inspection quantity: 100% inspection.

Inspection method: Check the certificate of conformity and quality inspection report; check relevant technical documents.

4.6.2 The material verification inspection data of nickel, titanium, zirconium, tantalum, niobium and their alloy pipes, pipe fittings, flanges and other piping components shall comply with the design documents and the current national standard "Code for acceptance of construction quality of industrial metallic piping engineering" GB 50184

and "Code for construction quality acceptance of metallic piping in petrochemical engineering" GB 50517.

Inspection quantity: Randomly inspect 5% of materials of the same designation and furnace number, which is not less than 1 piece.

Inspection method: Check the spectrum analysis report or other material re-inspection report.

4.6.3 For piping components that are to be inspected for low-temperature impact and intergranular corrosion as specified in the design document, the inspection results shall comply with the provisions of the design documents.

Inspection quantity: 100% inspection.

Inspection method: Check the inspection report.

4.6.4 The bulging or flanging test of copper and copper alloy pipes, aluminum and aluminum alloy pipes, lead pipes shall comply with the provisions of Article 4.1.6 of this Code.

Inspection quantity: Randomly check 1% of the product of same materials, same specifications, same batch numbers, which is not less than 2 pieces.

Inspection method: Check test records.

4.6.5 The quality certification document of low-temperature seal test valve shall include the low-temperature seal test report; it shall comply with the provisions of the design document.

Inspection quantity: 100% inspection.

Inspection method: Check quality certification documents.

4.6.6 The inspection and test before valve installation shall comply with the provisions of Article 4.3.4 of this Code.

Inspection quantity: 100% inspection.

Inspection method: Use observation inspection, check valve test records.

4.6.7 The safety valve setting pressure adjustment, sealing test, other performance test results shall comply with the relevant provisions of the design documents and the current industry standard "Safety technical supervision regulations for safety valves" TSG ZF001.

Inspection quantity: 100% inspection.

5 Pipe processing

5.1 General requirements

5.1.1 Special processing tools shall be used for pipe processing. During processing, measures shall be taken to prevent pipe damage, deformation, deterioration, and reduction of material performance. Iron tools shall not be used in direct contact with pipes.

5.1.2 Before cutting the pipe, mark transplantation shall be carried out. Pipes shall not bear hard-printed markings. When color printing is used for marking, the color marking shall not contain material elements, that would damage the pipe material.

5.1.3 When processing pipes, measures shall be taken to ensure personal safety and protect the environment.

5.1.4 Pipe processing shall comply with relevant technical documents and the current national standard "Code for construction of industrial metallic piping engineering" GB 50235.

5.2 Pipe straightening and rounding

5.2.1 Pipe straightening and rounding shall be carried out on a platform, which is paved with soft pads. Straightening shall meet the following requirements:

- 1 Copper, aluminum, lead, tantalum, niobium and their alloy pipes should be straightened using a wooden hammer or rubber hammer.
- 2 Nickel, titanium, zirconium and their alloy pipes should be straightened using a copper hammer.

5.2.2 After the pipe is straightened and rounded, the inside and outside of the pipe shall be cleaned.

5.3 Pipe cutting and groove processing

5.3.1 Mechanical methods should be used for cutting copper, aluminum, lead, nickel, titanium, zirconium and their alloy pipes. When thermal cutting is used, mechanical methods shall be used to remove the heat-affected area of the cutting. Tantalum, niobium and their alloy pipes should be cut by wire cutting or mechanical methods.

5.3.2 When using grinding wheels to cut and grind nickel, titanium, tantalum, niobium and their alloy pipes, special grinding wheels and special devices shall be used.

- 5 The flange end face shall be perpendicular to the center line of the pipe; the perpendicularity tolerance shall be ± 1 mm.
- 6 The minimum thickness of the flange shall not be less than 95% of the minimum wall thickness of the pipe.
- 7 The flanged joint shall not have defects such as cracks, gaps, pull marks, scratches, necking, wrinkles.

5.5.2 Welded flanging shall comply with the following requirements:

- 1 The thickness of the welded flange shall not be less than the nominal wall thickness of the connecting pipe.
- 2 The surface of the flanged joint matched with the gasket shall be processed, according to the requirements of the pipe flange sealing surface; it shall comply with the design documents and the current national standards for pipeline accessories.
- 3 After welding, the flanging part shall be mechanically processed or shaped; the outer weld seam shall be ground.

5.6 Fabrication of piping support-bracket and hanger

5.6.1 The type, material, processing dimensions, accuracy of support-bracket and hanger shall comply with the design documents and the current national standards for pipeline accessories.

5.6.2 The assembly of support-bracket and hanger, welding and inspection of main stress-bearing components shall comply with the design documents, as well as the provisions of the current national standard "Code for construction of industrial metallic piping engineering" GB 50235. Observation and inspection shall be carried out after welding; welding deformation shall be corrected.

5.6.3 Support-bracket and hanger shall be treated against corrosion and stored in categories.

5.7 Quality inspection and acceptance

I Main control item

5.7.1 The minimum thickness of the pipe shall be checked after bending; it shall not be less than the nominal wall thickness of the straight pipe.

Inspection quantity: 100% inspections; no less than 3 thickness measurement

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