



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

GB 50273-2022

**Standard for construction and acceptance of boiler installation
engineering**

Issued on: January 5, 2022

Implemented on: May 1, 2022

Issued by: MOHURD; SAMR

Table of Contents

1 General provisions	7
2 Foundation recheck and surveying	8
3 Steel racks	9
4 Drum, header and tubes on heated side	12
4.1 Drum and header	12
4.2 Tubes on heated side	15
4.3 Welding of pressure components	19
4.4 Economizer, superheater and air preheating piping	22
5 Pressure test	25
6 Tap, instrumentation, valves, soot blower and auxiliaries	29
6.1 Tap	29
6.2 Instrumentation	31
6.3 Valves, soot blower and auxiliaries	34
7 Burning equipment	38
7.1 Stroker	38
7.2 Spreader	41
7.3 Burner	42
8 Furnace wall building and insulation	45
8.1 Furnace wall building	45
8.2 Insulation	46
9 Air leakage test, furnace drying, boiling out, tightness test and test run	47
9.1 Air leakage test	47
9.2 Furnace drying	48
9.3 Boiling out	50
9.4 Tightness test and test run	51
10 Acceptance	53
Explanation of wording in this standard	56
List of quoted standards	57

1.0.1 This Standard is formulated to improve the construction level of boiler installation

engineering, promote technological progress, ensure project quality and safety, and improve economic benefits.

1.0.2 This Standard applies to the construction and acceptance of fixed steam boilers

with a rated working pressure less than or equal to 3.82 MPa for industrial, civil and district heating, fixed hot water boilers with a rated water outlet pressure greater than

0.1 MPa, and organic heat carrier furnace installation engineering. It is not applicable to the construction and acceptance of cast iron boilers, boilers for transportation vehicle and ship, nuclear power boilers, and power station boilers installation engineering.

1.0.3 Boilers whose engineering acceptance procedures have not been completed

are strictly prohibited from putting into use.

1.0.4 Before and during the installation of boilers, if any quality problems are

found in the pressure-bearing parts that affect safe use, the installation must be stopped and it must be reported to the construction unit.

1.0.5 In addition to complying with this Standard, the construction and acceptance of

boiler installation engineering shall also comply with the provisions of relevant national standards in force.

Where. H_n - tube expansion rate of inner diameter control method;

H_w - tube expansion rate of outer diameter control method;

d_1 - actual inner diameter of the tube after expansion (mm);

d_2 - measured inner diameter of the tube when not expanded (mm);

d_3 - actual diameter of the tube hole when not expanded (mm);

d_4 - measured outer diameter of the tube close to the outer wall of the drum after expansion (mm);

δ - difference between the tube hole and the actual outer diameter of the tube when not expanded (mm).

2) The control of the expansion rate of boilers with a rated working pressure greater than 2.5 MPa shall comply with the provisions of the accompanying technical documents.

5 The expansion end and starting point should be expanded repeatedly with a distance of

10 mm ~ 20 mm.

6 The tube mouth shall be beveled; the starting point of the bevel shall be flush with the surface of the boiler drum (tube sheet). There shall be no obvious cuts or extrusion, and the bevel angle should be $12^{\circ} \sim 15^{\circ}$.

7 After expansion, the tube ends shall not have defects such as peeling, wrinkles, cracks, cuts and extrusion.

8 The number of expander rollers should not be less than 4; the effective length of the expander cylindrical straight section shall be the drum wall thickness plus 15 mm. The expansion tube shall be measured using special tools. The surface of the expansion rod and roller shall be free of defects such as bumps, pits, and scratches. The speed of electric and pneumatic tube expanders shall not be greater than 60 r/min.

4.2.8 After the expansion work is completed, a water pressure test shall be carried out, and the tightness of the expansion joints shall be checked and the expansion joints that need to be expanded shall be determined. The expansion shall be carried out immediately after the water is released, and the number of expansions should not exceed

2 times.

4.2.9 Before expansion filling, the inner diameter of the expansion mouth shall be remeasured and the expansion filling value shall be determined. The expansion filling value shall be calculated based on the change in the measured inner diameter of the expansion mouth before and after the expansion filling. After the expansion filling, the cumulative expansion rate of the expansion mouth shall be the sum of the expansion rate before the expansion and the expansion filling rate. The cumulative expansion rate

3 The quality of the radiographic testing of the welds of the butt joints of the tubes on

heated side of the organic heat carrier furnace shall not be lower than Grade II, and the quality of the ultrasonic testing shall not be lower than Grade I.

4.3.12 When adopting radiographic testing or ultrasonic testing, the number of non-

destructive tests shall comply with the following provisions.

1 When the rated working pressure of the steam boiler is equal to 3.82 MPa and the nominal outer diameter is less than or equal to 159 mm, the number of non-destructive tests shall not be less than 25% of the number of welded joints; when the rated working pressure of the steam boiler is greater than 0.8 MPa and less than 3.82 MPa, and the nominal outer diameter is less than or equal to 159 mm, the number of radiographic tests

shall not be less than 10% of the number of welded joints. When the rated working pressure of the steam boiler is greater than 0.8 MPa, the nominal outer diameter is greater than 159 mm or the nominal wall thickness is greater than or equal to 20 mm, the welded joints shall be subjected to 100% non-destructive testing. When the rated working pressure of the steam boiler is less than or equal to 0.8 MPa, non-destructive testing is not required.

2 When the rated outlet water temperature of the hot water boiler is greater than or equal to 120 degrees C and the nominal outer diameter is less than or equal to 159 mm, the number of radiographic testing shall not be less than 10% of the total number of circumferential seams; when the nominal outer diameter is greater than 159 mm or the wall thickness is greater than or equal to 20 mm, each weld shall be 100% non-destructively inspected;

when the rated outlet water temperature of the hot water boiler is less than 120 degrees C, non-destructive testing is not required.

3 For the butt joints of the pressurized organic heat carrier furnace with an outer diameter greater than or equal to 159 mm, 20% of the number of joints shall be subjected to radiographic testing; for the butt joints of the tubes with an outer diameter less than 159 mm, 10% of the number of joints shall be subjected to radiographic testing;

for the condensate tank, expansion tank and storage tank, 20% of each weld shall be subjected to radiographic testing.

4 For welding joints with wall thickness less than 20 mm, the radiographic testing method shall be used; for welding joints with wall thickness greater than or equal to 20 mm, the ultrasonic testing method can be used. The ultrasonic detector should be a digital recordable instrument. When an analog ultrasonic detector is used, an additional 20% local X-ray detection shall be performed.

5 When the result of non-destructive testing is unqualified, in addition to repairing the

unqualified welds, the same type of welded joints welded by the welder on the same day shall be re-inspected, and the number of re-inspections shall be twice the number of random inspections. If there are still unqualified results after re-inspection, all welding joints welded by the welder on that day shall be inspected.

4) When the rated thermal power of the gas phase organic heat carrier boiler is greater than 0.7 MW or the rated thermal power of the liquid phase organic heat carrier boiler is greater than 4.2 MW, the allowable pressure drop shall be less than or equal to 0.10 MPa;

5) When the working pressure of the steam boiler is less than or equal to 0.8 MPa, the rated outlet water temperature of the hot water boiler is less than 120 degrees C, the rated thermal power of the gas-phase organic heat carrier boiler is less than or equal to 0.7 MW, and the rated thermal power of the liquid-phase organic heat carrier boiler is less than or