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

GB/T 9978.10-2026

**Fire resistance tests of building elements - Part 10: Specific
requirements for structural systems**

建筑构件耐火试验方法 第10部分：结构体系的特殊要求

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1 Scope

GB/T 9978.10-2026 is the Chinese national standard covering testing a structural system rather than a single member - the restraint, the continuity and the load redistribution that a real frame provides and that a furnace test on an isolated beam or column cannot reproduce. Part 10 of the series, first edition of this part, in force since 1 October 2026. It was issued on 31 March 2026 and takes effect on 1 October 2026, as a first edition. The document is under the responsibility of the National Fire and Rescue Administration. This page is published from the official record of the 2026 edition; the clause text of a standard this recent is not yet in circulation, and the figures, limits and tables it contains are those of the document itself, delivered in full with the English translation.

This document describes the test methods for the fire resistance performance of structural systems under conditions of overall or partial fire exposure. This document applies to fire resistance testing of building structural systems, including beam-column joints, beam-column planar frames, and beam-column spatial frames. Structure systems, etc.

Note. When an untested structural system meets the direct application scope of the test results specified in Appendix A of this document, a fire resistance test shall be conducted in accordance with the requirements of this document. The obtained fire resistance performance results of the structural system are directly applicable to the same type of untested structural system.

5. Experimental Apparatus The test apparatus used for fire resistance testing includes a test furnace (including burners, furnace exhaust ports, exhaust pipes, exhaust fans, a measurement and control system, and an ignition system). The equipment includes systems, fuel lines, air lines, air blowers, loading devices, constraint and support frames, and measuring instruments, as shown in Figure 1. The testing apparatus shall comply with GB/T 9978.1 regarding the test furnace, loading device, constraint and support frame, thermocouples, and furnace pressure measuring probe. In addition to the relevant requirements for the accuracy of measuring instruments such as heads, loading systems, deformation measuring instruments, and fire resistance integrity measuring instruments, the following requirements must also be met.

- a) The internal space of the test furnace meets the requirements for variations in the size of the structural system specimens, specific structural designs, and overall or partial firing conditions;
- b) It should be able to set and control the furnace temperature to meet the requirements of 6.1;
- c) It should be able to control and monitor the pressure of the hot flue gas inside the furnace to ensure that it meets the requirements of 6.2;
- d) Loads and constraints should be applied to the components in an appropriate manner, and the loading devices, constraints, and frame supports should be able to meet the requirements of different structural systems. The test specimens must meet the requirements for variations in load application, constraint methods, and arrangement, while also possessing load control and monitoring functions, and be convenient. For specimen installation;
- e) The furnace bottom and its supporting structure should be able to withstand the high-temperature environment inside the furnace, and their load-bearing capacity and location should meet structural requirements. Bottom constraint requirements for system specimens;
- f) Fuel lines (systems) shall be equipped with emergency shut-off valves with remote and on-site shut-off capabilities, and necessary fuel leak monitoring measures shall be implemented. measure.

- a) Frame fire resistance test
- b) Frame specimens
- c) Joint fire resistance test
- d) Node specimens

6 Test conditions

6.1 Furnace temperature During the test, when the standard fire resistance conditions were used for the fire resistance test, the average furnace temperature (T) and furnace temperature deviation were measured according to the requirements of 8.1.1. The temperature difference (de) should meet the relevant requirements of GB/T 9978.1, such as the heating curve and furnace temperature deviation; when specific fire environment conditions are used for resistance testing... During the fire test, the average furnace temperature (T) and furnace temperature deviation (de) measured according to requirements

8.1.1 should conform to the optional test specifications specified in GB/T 26784. The test includes requirements such as temperature-time curves and furnace temperature deviation.

6.2 Pressure difference inside the furnace During the test, the furnace pressure should meet the following requirements.

a) A linear pressure gradient exists along the height of the furnace. This pressure gradient fluctuates slightly with changes in furnace temperature, ensuring a stable pressure gradient along the height of the furnace. The pressure gradient per meter in the directional direction remains within the range of (13 ± 5) Pa;

b) The pressure value at a specified height inside the furnace is an average value, excluding pressure fluctuations caused by factors such as turbulence, and is the same as the pressure value at the same height outside the furnace. The pressure is related to the pressure; the average pressure value inside the furnace is monitored and its changes are controlled in accordance with the requirements of 9.3.

c) When the test furnace is running, the furnace pressure at the theoretical neutral pressure surface 500mm above the furnace bottom in the heating space is controlled to be 0.

6.3 Constraints and Boundary Conditions In addition to complying with the relevant requirements for constraints and boundary conditions in GB/T 9978.1, constraints and boundary conditions should also conform to the structural system. The actual constraint conditions of the specimen.

6.4 Loading Conditions

6.4.1 The test load values for various load-bearing components in the structural system shall be in accordance with the relevant requirements for loading in GB/T 9978.1. Sure.

6.4.2 The loading conditions of load-bearing vertical partition members in the structural system shall comply with the relevant requirements for loading conditions in GB/T 9978.4.

6.4.3 The loading conditions of load-bearing horizontal partition members in the structural system shall comply with the relevant requirements for loading conditions in GB/T 9978.5.

6.4.4 The loading conditions of beam members in the structural system shall comply with the relevant requirements for loading conditions in GB/T 9978.6.

6.4.5 The loading conditions of column members in the structural system shall comply with the relevant requirements for loading conditions in GB/T 9978.7.

6.4.6 The loading conditions shall conform to the actual loading conditions of the structural system.

6.5 Environmental Conditions The test furnace should be installed in a laboratory, and the size of the laboratory should meet the test requirements. At the start of the test, the ambient temperature should be recorded as the initial temperature. temperature.

6.6 Deviation of test conditions During the test, if the furnace temperature, furnace pressure, or ambient temperature exceeds the upper limit of the deviation of the structural system's fire-exposed conditions, the structural system under such circumstances... The test results are still considered valid.

7.1 General Rules

7.1.1 The structural system specimens selected for the test should be representative in terms of materials, structure, manufacturing process, and installation method, and should preferably be similar to those used in actual applications. The situation is consistent.

7.1.2 When installing structural system specimens within a specific support and constraint frame, it should be ensured that the installation method and the frame itself do not affect the performance of the specimens. To ensure the validity of the experimental results, it is necessary to take measures to avoid significant impacts.

7.1.3 When the structural system includes auxiliary components in practical applications, the auxiliary components should participate in the overall test as part of the test specimen, and its installation status should be consistent with its actual usage status.

7.2 Specimen Dimensions The specimens should preferably be the actual dimensions of the structural system. If the specimens cannot be tested according to the actual dimensions, a scaled-down model can be used to test the specimens.

Note. Scaled-down model testing refers to using a model smaller than the prototype, without requiring strict similarity conditions, to verify design theory, design assumptions, and calculations. Tests whose main objective is to conduct experiments using methods are also known as small component tests.

7.3 Number of Specimens

7.3.1 For each structural system with specified support structures or constraints, at least one representative specimen shall be selected for fire resistance testing. test.

7.3.2 When a structural system is used in practical applications, changes in external factors such as load-bearing conditions, constraints, installation location, and fire location may lead to... When the fire resistance performance of the structural systems varies significantly, a