GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

UDC

P **GB 55005-2021**

Code for design of timber structures

木结构通用规范

Issued on: April 12, 2021 **Implemented on: January 01, 2022**

Issued by: Ministry of Housing and Urban-Rural Development of PRC;
State Administration for Market Regulation.

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1 General

1.0.1 This specification is hereby formulated, in order to ensure the quality and safety of timber structure projects, implement resource conservation and environmental protection policies, ensure the safety of people's lives and property and personal health, improve the sustainable development level of timber structure projects.

1.0.2 Timber structure engineering must implement this specification.

1.0.3 Whether the technical methods and measures, which are adopted in the project construction, meet the requirements of this specification, shall be determined by the relevant responsible entities. Among them, innovative technical methods and measures shall be demonstrated, to meet the relevant performance requirements in this specification.

2 Basic provisions

2.0.1 The safety level of timber structure and its components shall not be less than level 3. When the safety levels of structural members and components are inconsistent with that of the structures, they shall be clearly marked in the design documents.

2.0.2 The design service life of timber structure shall meet the following requirements:

1 The structure of the building (structure) shall not be less than 50 years;

2 The bridge structure shall not be less than 30 years;

3 Structural members and parts, that are easy to replace, shall not be less than 25 years;

4 When the design service life of timber structural members and components is less than the design service life of the structure, it shall be clearly marked in the design documents, meanwhile it shall adopt the connection structure, that is easy to replace.

2.0.3 Within the design service life, the performance of the timber structure shall meet the following requirements:

engineered timber products, which have clear material grade or strength grade.

3.0.2 The moisture content of structural timber shall meet the requirements for design, production, installation of timber structure.

3.0.3 The strength design value of structural timber shall meet the following requirements:

1 The strength design value of structural timber shall be determined, by the strength standard value and resistance item factor. Meanwhile, it shall take into account of the influence of the duration of the load on the timber strength;

2 The resistance item factor shall be determined, according to the target reliability index and the coefficient of variation of wood strength.

3.0.4 The strength design index of structural timber shall be adjusted, according to factors such as the dimensions of the timber components, the conditions of use, the design service life of the structure.

3.0.5 The steel used in the timber structure shall meet the following requirements:

1 The steel shall have the qualified guarantee of tensile strength, yield strength, elongation at break, carbon, sulfur, and phosphorus content;

2 The welded structural steel, that needs to check fatigue, shall have the guarantee of qualified impact toughness;

3 For the steel, for which the design requires anti-lamellar tearing performance, in the thickness direction, it shall have the qualified guarantee of the reduction of cross-sectional area;

4 When conducting seismic design, the yield ratio of steel and the elongation at break shall meet the requirements of plastic design of steel structure.

3.0.6 In addition to meeting the requirements of Article 3.0.5 of this specification, the metal connectors, which are used in the timber structure, shall also provide a product quality certificate. The cast steel connectors shall also have a qualified guarantee for the reduction of cross-sectional area. Stainless steel connectors shall also have the qualified guarantee of nominal yield strength, tensile strength, elongation, content of carbon, nickel, chromium, molybdenum.

3.0.7 The type of structural adhesive shall meet the requirements of the use environment; meanwhile its bonding performance shall meet the strength and durability indicators, which are required by the design.

state, it shall meet the following requirements:

1 Bending members shall undergo deformation check calculations;

2 For floor structures with requirements for comfort, they shall be subject to the vibration comfort verification;

3 Under the action of earthquake and wind load, they shall be subject to the inter-layer displacement of the structure;

4 Timber structure bridges shall be subject to the verification of the normal use limit state, under the enduring conditions.

4.2 Component design

4.2.1 The axially stressed members and eccentrically stressed members shall be subject to strength calculations. Axially compressed members and compression-bending members shall be subjected to stability verification, to ensure that the members meet the strength and stability requirements.

4.2.2 For bending members, it shall calculate the bending strength, shear strength, stability and deformation. For bending members with notches, it shall also calculate the strength at the notches. The calculation results shall meet the needs of safe use.

4.2.3 It shall carry out the calculation, for the local compressive strength, at the concentrated load acting on the flexural member AND the transverse compression zone at the member support, to ensure safety.

4.2.4 The design of timber shear wall shall meet the following requirements:

1 For shear walls that are subjected to the actions of vertical loads OR out-of-plane loads, it shall calculate the bearing capacity of the normal cross-section of the shear wall; check the stability;

2 For shear walls subjected to horizontal loads in the plane, it shall carry out the calculation of shear strength, stability check, anti-overturning check, deformation check;

3 The connection between the shear wall and the floor, roof, foundation shall be subject to the shear design AND the pullout design under overturning load.

4.2.5 Floor (roof) slab's design shall meet the following requirements:

1 It shall carry out the verification of bearing capacity and the deformation calculation, under the actions of vertical load;

4.4 Anti-seismic and anti-wind design

4.4.1 For light timber structure buildings, which have 3 and less floors, when the following conditions are met, the anti-seismic and anti-wind design shall allow the use of structural design methods:

1 The area of each floor of the building is not more than 600 m^2; the floor height is not more than 3.6 m;

2 The standard value of floor live load is not more than 2.5 kN/m^2; the standard value of roof live load is not more than 0.5 kN/m^2;

3 The roof slope of the building is not less than 1:12 AND not more than 1:1. The overhanging length of the cornice on the longitudinal wall is not more than 1.2 m. The overhanging length of the cornice on the gable wall is not more than 0.4 m;

4 The net span of load-bearing members shall not be greater than 12.0 m.

4.4.2 For the high-rise timber structures and high-rise timber mixed structures, it shall consider the adverse effects of the second-order effect of gravity.

4.4.3 When the seismic fortification intensity is 8 degrees or 9 degrees, the design of the timber structure shall also consider the load effect combination of the vertical earthquake action.

4.4.4 For the timber mixed structure, whose upper part is timber structure AND the lower part is other structures, the connection shall be subject to strength, local compression, aseismic design of pullout action. The lateral force and overturning moment, which is caused by the earthquake action, shall be multiplied by the magnification factor, which is not less than 1.2.

4.4.5 In the seismic design, when the total shear force of each layer frame, in the timber frame support structure and timber frame shear wall structure, is less than 20% of the total bottom shear force, the value of the seismic shear force, which is borne by each layer frame, shall not be less than the following requirements, whichever is smaller:

1 The 25% of the total shear force at the bottom of the structure;

2 The 1.8 times the maximum seismic shear force of each floor of the frame part.

4.4.6 The wind-resistant design of timber structural members shall meet the following requirements:

soil, shall be of concrete or masonry structure;

2 Where there is no basement, the ground floor shall adopt concrete structure;

3 The equipment cable gaps and pipe hole gaps, which lead from the basement to the indoor, as well as the joints between the top surface of the foundation and the bottom concrete floor, it shall use termite-proof physical barrier or a soil chemical barrier, to perform local treatment;

4 It shall provide a continuous insect-proof net, at the opening of the drainage and ventilation air layer of the exterior wall; the aperture of the insect-proof net shall be less than 1 mm;

5 When the external drainage layer or external thermal insulation layer of the foundation is higher than the outdoor floor, it shall take technical measures for local termite prevention treatment.

5.2.4 In zones with termite hazard grades Z3 and Z4, it shall take insect prevention measures, such as anti-termite soil chemical treatment and termite bait systems. Soil chemical treatment and termite bait systems shall use chemicals, that are harmless to humans and the environment.

5.2.5 When the timber structure building is located in the Z4 zone of termite hazard area, the timber used for the structure shall use the timber after anti-corrosion treatment.

5.3 Anticorrosion

5.3.1 Timber structures shall take corresponding chemical anti-corrosion treatment measures, according to the use environment. Under the following use environment conditions, structural timber shall be subject to the anti-corrosion treatment:

1 Immersed in water;

2 Direct contact with soil, masonry, concrete;

3 Long-term exposure to the outdoors;

4 Long-term in a poorly ventilated and humid environment.

5.3.2 The mechanical processing of timber components shall be carried out, before the treatment of anti-corrosion and insect-preventing agents. When the anti-corrosion wood is partially trimmed, it shall coat the agents of the same brand and the same variety, on the exposed surface of the mechanically

2 The fire endurance limit of the timber structure's connection shall not be less than the fire endurance limit of the connected components;

3 The timber structure shall meet the requirements of fire separation;

4 When the pipeline traverses timber components, it shall take fire-proof sealing measures; the fire-resistant performance of the fire-proof sealing material shall not be lower than that of the relevant components;

5 It shall take fire prevention measures, for power distribution lines, in timber structure buildings.

5.4.3 Timber, timber components, wood products and other flammable materials, which are stacked on the construction site of the timber structure, shall be kept away from the fire source. The storage location shall be upwind from the fire source. Open flame operation is strictly prohibited.

5.4.4 It shall adopt fire prevention measures or fire-fighting equipment, at the construction site of timber structure engineering.

6 Construction and acceptance

6.0.1 In the engineering construction of timber structures, it shall take safety measures to ensure the bearing capacity and stability of the structure, during the construction process, as well as measures to ensure the safety of construction equipment and facilities; meanwhile, it shall carry out necessary verification.

6.0.2 For the timber structure, it shall be composed of process shall be composed of two item works: timber structure production and installation, timber structure protection. Only when all item works are qualified, can the item works be accepted.

6.0.3 The inspection batch shall be divided, respectively, according to the quality control of the physical and mechanical properties of materials, timber products and structural parts, as well as the quality control of the production and installation of structural components.

6.0.4 The construction quality control of timber structure engineering shall meet the following requirements:

1 Timber and timber products, steel products, connectors, etc., shall be inspected on site; the materials or semi-finished products, which are related to structural safety and use functions, shall be inspected;

2 The quality of each process shall be controlled, according to the

shall be all qualified;

2 The inspection results of the general items of the inspection batch shall have more than 80% of the inspection points qualified; meanwhile the maximum deviation shall not exceed 1.2 times the allowable deviation;

3 The inspection results of the inspection batch, which is contained in the timber structure's item work, shall be qualified; meanwhile there shall be a complete record of the quality acceptance of each inspection batch.

6.0.10 The quality acceptance of the item work of timber structure shall be carried out in accordance with the following requirements:

1 The quality of the item works, which are contained in the divisional work, shall be checked and accepted;

2 The quality data and the acceptance records of the item works, which are contained in the divisional work, shall be complete;

3 The data of the safety function test items shall be complete; all the spot-checking items shall be qualified.

7 Maintenance and removal

7.0.1 Within the design service life of the timber structure buildings, it shall establish an inspection and maintenance system, for waterproof, moisture-proof and anti-biological hazard measures, according to the local climate conditions, the degree of termite hazards, the characteristics of the building.

7.0.2 After one year after the completion and acceptance of the timber structure construction project, the timber construction project shall be subject to regular inspections. For public buildings, it shall carry out routine inspections, one every 3 years during use. When finding the hazards and hidden dangers, which affect the applicability and durability of the structure, during the inspection, it shall make repairs immediately. Routine inspections shall include the following items:

1 Cracking, inclination, deformation of main structural components;

2 Loose connections between structural members, as well as broken or missing connections;

3 Timber component's decay and termite damage;

4 Deformation, cracking, damage of the timber structure wall;

5 Moisture of timber structure wall panels, as well as loosening and falling off of the fixing screws of the panels;

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