Strengthening of Compression of Glue Metal Strengle Compounds and Determination of Deformation

Turdimurod. Makhmatkulov
Professor,Samarkand city (Uzbekistan)
Samarkand State Architectural and Construction Institute

ABSTRACT

The junction of wooden columns with the foundation is the most responsible part. The strength of a wooden column attached to the foundation with metal rods attached to it depends on the stress-strain state of the elements used under the influence of longitudinal load and bending moment. The article presents the results of experimental testing of the compressive strength and deformation of glued metal rod joints used in the connection of columns.

Keywords: Glued wooden column, responsibility knot, glued metal stem, compound, test results. strength, shear, deformation.

The issue of attaching glued columns to the foundation in timber-framed buildings is one of the most important issues today [3].

Therefore, it is important to pay attention to the following issues when researching new coupling methods:

- to achieve a minimum bending of wooden columns under the influence of alternating signal stresses;

-ensure reliable operation of nodes over time;

- Minimize labor costs when installing columns in the design condition;

- to achieve the minimum reduction of material consumption in the joints;

-use of constructive solutions that meet modern architectural and technological requirements, etc.

One solution that meets the above requirements is the use of glued metal rod joints. This is because the use of the above-mentioned joints in bonding glued wooden columns to the foundation has been proven to be one of the most effective methods today [4].

Metal rods glued to the base node act on elongation and compression under the influence of alternating signal stresses. Therefore, the properties of the materials in the compounds used in the constructions must be studied to a certain extent.

This allows for in-depth analysis of the identified data, the correct formulation of conclusions based on the comparison of results.

Specimens prepared for experimental testing of compressed metal rod joints and the physical and mechanical properties of the materials used in them were determined on the basis of QMQ requirements [1].

Humidity W = 10 ± 2%, density for the preparation of experimental specimens r = 586.1 kg / m3, the ultimate compressive strength of the fibers is sscheg = 35.2 MPa, the bending elastic modulus is Eyo = 12.0 MPa. EPTs-1 type epoxy glue based on ED = 16 resin was used to glue the rods to the wood. The effective composition of the glue was determined based on the results of experimental testing of specimens with dimensions of 10x10x15 mm [2].

The research focuses on the following key issues:

- verification of theoretical data and the proposed formulas on the basis of experience;

-determine the actual load-bearing capacity and deformability of glued rods working in compression in accordance with their diameter, the size and length of the grooves;

-analysis of the degradation properties and working nature of glued rods working on compression, etc.

Copies with cutting surfaces bxh = 80x100 mm and length l = 500 mm were prepared for experimental work. The prepared specimens were in the form of wooden prisms, and reinforcing rods of the above-mentioned class with a diameter d = 16 mm were glued to the grooves of different sizes.

Length of glued rods l = 320 mm. and in all copies this ratio was chosen to be l / d = 20. The size of the grooves prepared for gluing was 2, 4, 6 and 8 mm larger than the size of the rods. A total of 16 copies of 4 identical types were prepared for the experiment.

a) b) v)

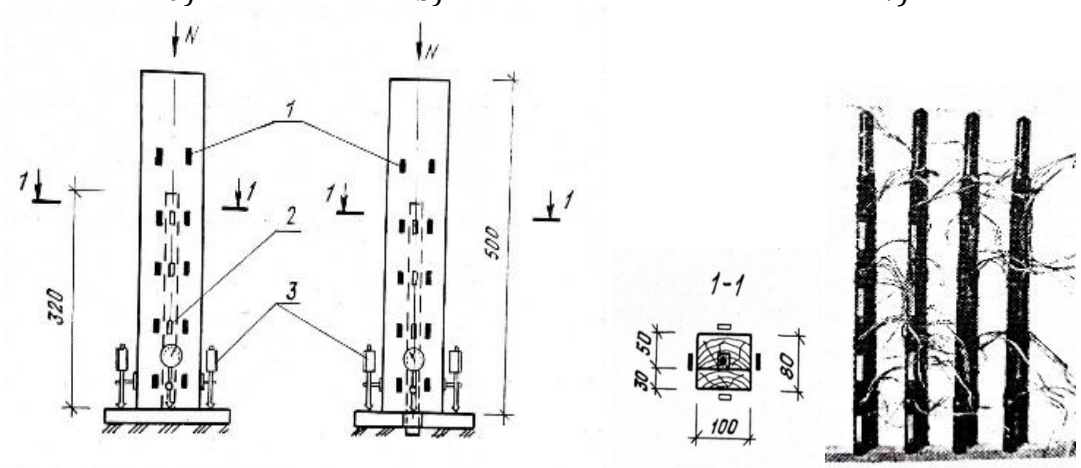

Figure 1. General view of the samples prepared for the experiment and placement of measuring instruments: 1-strain gauges placed on a wooden prism; 2 placed on the same armature; 3-hour type indicators (ICh-10).

The inspection of the stress-strain state in the compression of glued metal rod joints was carried out according to two schemes. In the first scheme, the stress is taken together with a wooden prism attached to the base and a glued rod (Fig. 1a), while in the second the compressive stress is received only with a wooden prism attached to the base, where the tension in the glued rod is due to the displacement of the glue. Fig. b).

The magnitude of the deformation in the metal rods was determined by analyzing the performance of the strain gages attached to them (Figure 1c).

The compression test of the specimens was performed on a PG-10-25 type press at a loading speed of 60–80 n / s, at a loading stage of 5 kN (Fig. 2).

Prior to the test, the moisture content of the samples prepared for the experiment was determined using an EV-2M type measuring instrument and was 10%. During the test, it was acknowledged that the room temperature was 190S and the humidity was 63%.

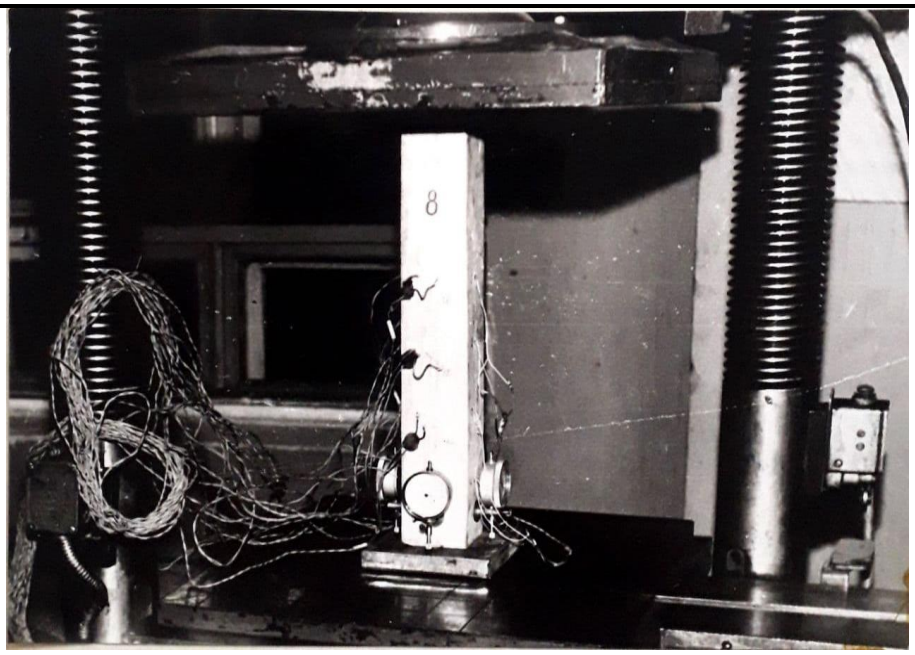

Figure 2. The process of testing compressed copies of experiments.

The magnitude of the deformations in the wooden prism and glued rods was determined at a distance of 50 mm from the base using indicators with a clock accuracy of 0.01 and 0.001 mm mounted on them.

The results of experiments to determine the compressive deformation of joints are shown in Figure 3.

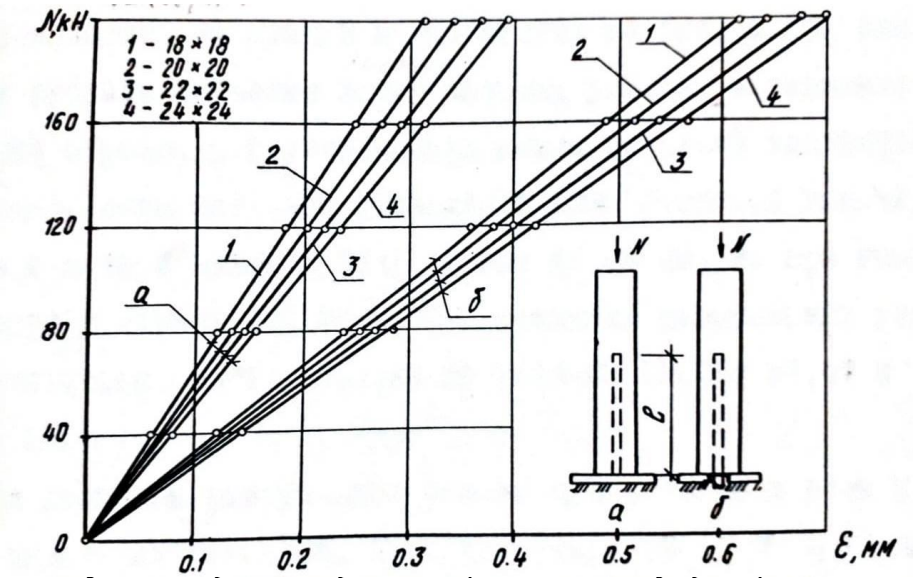

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Figure 3. Compression deformation of joints (arithmetic mean): a-according to the first scheme; b - according to the same second scheme.

From the analysis of the identified results, it was found that the magnitude of the deformations (50 mm above the base) was smaller in the first scheme, i.e., when the stresses were taken together with a wooden prism and glued rods, in the second scheme.

In both cases, the change in the size of the pits relative to the diameter of the stem showed that the deformations increased accordingly. For example, when the size of the pit was increased from 18x18 mm to 24x24 mm, the deformation was 0.062 mm in the first

case, while in the second scheme this value was increased by 0.07 mm, ie 1.2 and 1.3 times.

The degree of dependence of deformation on the diameter and length of the rods was also analyzed in the same way. In this case, the size of the pit was taken to be 2 mm larger than the diameter of the rod, and 4 specimens of the same type were tested and the results were analyzed.

Admittedly, the deterioration of the specimens was mainly manifested in the form of cracking and fragmentation of the wooden prism.

Based on the results of the experiment, it should be noted that:

- When designing the base node of the columns with the help of glued metal rods, it is necessary to ensure that the stresses are received simultaneously with a wooden element and glued rods;

- It is recommended to make the size of the holes for attaching metal rods to the wooden element 2 mm larger, taking into account the results of the study;

- It is advisable to take the length of glued rods in the joints in the range of 20-30d;

- The results of the study showed that the results determined on the basis of theoretical calculations are within the allowable values in comparison with the experimental indicators.

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