IS 4924-2 (1968): Method of Test for Nail-jointed Timber Trusses, Part II: Proof Test [CED 13: Building Construction Practices including Painting, Varnishing and Allied Finishing]

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Indian Standard

METHOD OF TEST FOR NAIL-JOINTED TIMBER TRUSSES

PART II PROOF TEST

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 1

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METHOD OF TEST FOR NAIL-JOINTED TIMBER TRUSSES

PART II PROOF TEST

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 12 December 1968, after the draft finalized by the Building Construction Practices Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Extensive investigations have been carried out in the Forest Research Institute, Dehra Dun on nail-jointed timber trusses fabricated from representative Indian species of timber, to find out relation between their long-term service behaviour and the observations made in short-term load tests. A method for conducting such long-term proof testing for these trusses systematically, so as to obtain dependable results, has now been evolved. To give necessary guidance to engineers, details of this method are given in this standard. The details of nail-jointed construction have been covered in IS : 2366-1963*.

0.3 The main objectives of the tests shall be as detailed below:

a) To simulate service conditions of loading on the truss, determining the stiffness of members and joints;

b) To observe the joint slip (instantaneous deformation) and creep in timber roof trusses under prolonged loading, thus finding out the stiffness as a whole;

c) To observe maximum deflection in the truss under long continued loading in order to provide initial camber in the bottom chord during fabrication stage; and

d) To study the effect of humidity and temperature variation on timber roof frames with normal building openings.

0.4 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.5 In reporting the results of a test or analysis, made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960†.

*Code of practice for nail-jointed timber construction.

†Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard (Part II) covers the method of proof testing for the fabricated nail-jointed timber trusses to ascertain the actual behaviour of truss with regard to joint slip, deflection, etc, under service conditions and prolonged loading.

2. PROCEDURE OF TEST (EXPERIMENTAL SET-UP)

2.1 Support Conditions — The truss (test specimen) shall be supported either on timber column or masonry pillars and shall be fixed firmly. Sufficient clearance shall be made available under the bottom chord for observation as well as for hanging the weights.

2.2 Loading Arrangement — The arrangement for loading shall be as illustrated in Fig. 1. Loads shall be applied at the node points in top and bottom chords of the truss in the form of hanging platforms conforming to those actually applied in the field of construction.

2.3 Guiding Attachment for Lateral Stability — Guiding attachment shall be provided to keep the lateral stability of the unit under test. This may be done by keeping a similar truss unit placed at suitable distance to simulate rigidity in actual use brought by attachment of adjacent trusses through purlins, and linking both the units together with hinged timber purlins, so that the truss under test receives only lateral restraint without any restraint to the vertical deflection.

2.4 Deflection Measuring Equipment — One dial gauge at the centre of the bottom chord of the truss shall be fixed permanently for recording vertical deflection of the whole truss under test.

3. LOADING

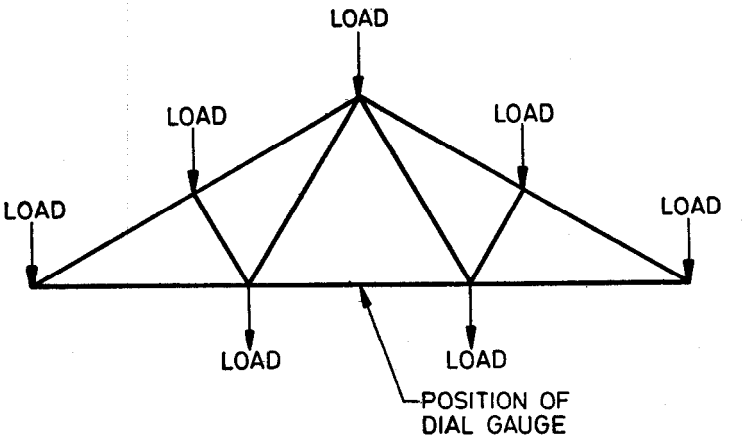
3.1 Rate of Loading — Apply gradually a test load 1·25 times the design load at each of the node points in top and bottom chords.

NOTE — It is assumed that this test load will produce the same effect as in long duration caused due to incidental and wind loads which generally produce impact on account of their speed, resulting in increased stresses.

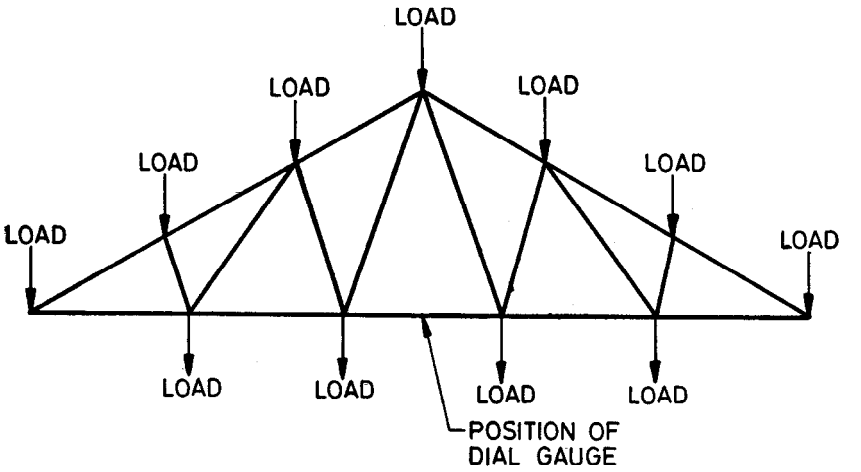
3.2 Period of Loading — Test load shall be kept constant until a permanent set in the dial gauge reading is reached, subject to a maximum period of one year.

4. OBSERVATION

4.1 Record of Deflection — Deflection reading shall be recorded, at the centre of the bottom chord, daily.



1A Type of Truss to be Used for Three, Four and Five Metres Spans



1B Type of Truss to be Used for Six Metres Span

FIG. 1 LOADING ARRANGEMENT FOR STANDARD SHORT SPAN TIMBER TRUSSES

4.2 Climatic Variations — Major climatic variations and their effects on deflection shall also be noted.

5. INTERPRETATION AND UTILIZATION OF DATA

5.1 Time-slip curve shall be plotted to a convenient scale showing complete observation for the whole year. A specimen of such curve is shown in Fig. 2.

5.2 Instantaneous deflection shown by the graph after 24 hours may be taken as due to slip of joints.

5.3 Initial camber shall be provided at the bottom chord of the truss. This shall be equal to $\frac{1}{200}$ of the span or double of the maximum deformation observed during proof test, whichever is more.

6. GENERAL GUIDANCE

6.1 Details are given below:

a) Nail-jointed timber trusses shall be designed conforming to IS : 883-1966*;

b) The two ends of the truss shall be considered fixed at their supports;

c) Split-chord construction shall be preferred as it allows the use of higher value of nail strength being in multiple shear;

d) Timber splice plates, if used, shall be provided in such a way that the grain of the plates coincides with the direction of load to be transmitted;

e) The individual thickness of a timber splice plate shall not be kept less than 2 cm as it is liable to split due to atmospheric variations. It is recommended that the total thickness of the side members (or two splice plates) shall be kept 1·5 times the thickness of main member for better behaviour of structural units;

f) The thickness of main member in monochord construction shall not be kept less than 3 cm;

g) The individual thickness of spaced members in split-chord construction shall not be kept less than 2·0 cm in case of web members and 2·5 cm in case of chord members;

h) The space between two spaced members shall be restricted to a maximum of 3 times the individual thickness of the member;

*Code of practice for design of structural timber in building (*second revision*).

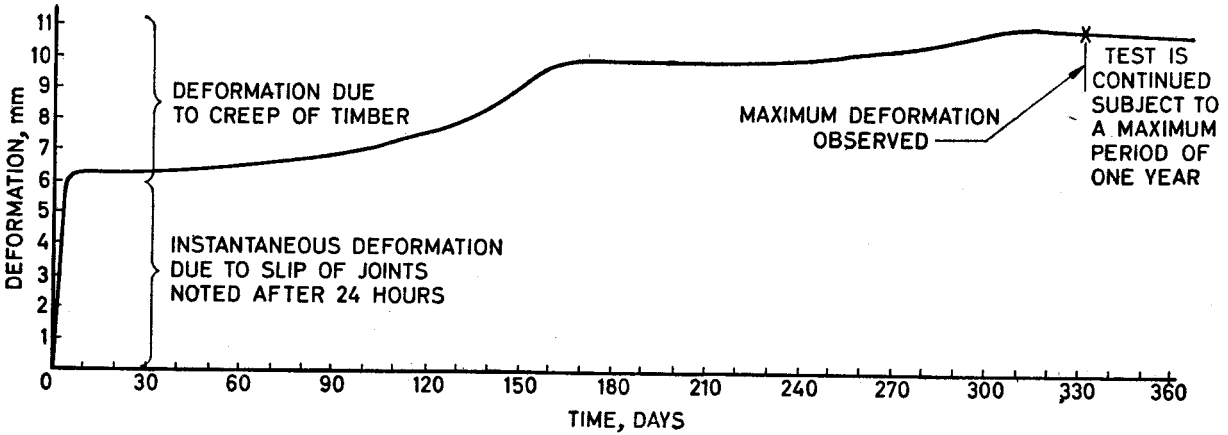


FIG. 2 SPECIMEN CURVE IN LONG-TERM PROOF TESTING OF NAIL-JOINTED TIMBER TRUSSES

j) Care shall be taken that serious knots, shakes and checks (which are strength-reducing defects) do not occupy places where joints are provided;

k) For nail-jointed construction only seasoned timber is recommended. The timber is to be seasoned to an optimum average moisture content which it is liable to experience while in service, so that the effect of atmospheric variation is minimized;

m) Timber distance pieces shall be inserted in the spaced compression member, at a distance of 30 d, where d is the thickness of individual member, with a minimum of one piece at the centre between two node points. In the spaced tension members one spacer piece at the centre is sufficient to keep the integrity and safety of the truss during and after fabrication stages;

n) Better pieces (with lesser strength-reducing defects) shall be used for longer tension members or longer compression members;

p) As far as possible, the nails at the joints shall be arranged in such a way that the line of force in the members passes through the centroid of the group of nails transmitting load to it. Where it is not practicable, suitable allowance shall be made for any eccentricity in computing the maximum force in the member;

q) A minimum of two nails at a node point and four nails at a lengthening joint shall be provided for the rigidity of a joint;

r) In order to avoid splitting of the members recommended prebore for a particular gauge of nail shall be provided; and

s) Nailing of joints shall be done from both the faces. Protruding nail shall either be cut flush or may be clenched across the grains of timber.