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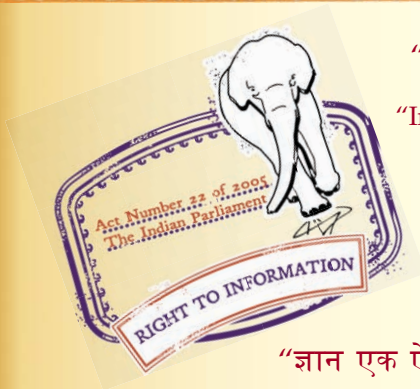
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IS 13416-4 (1994): Recommendations for preventive measures against hazards at workplaces, Part 4: Timber structures [CED 29: Construction Management including safety in Construction]



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“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

कार्यस्थलों पर खतरों के विरुद्ध एहतियाती उपाय —
सिफारिशें

भाग 4 लकड़ी की संरचनाएँ

Indian Standard

**PREVENTIVE MEASURES AGAINST
HAZARDS AT WORKPLACES —
RECOMMENDATIONS**

PART 4 TIMBER STRUCTURES

UDC 699.81:658.382.3

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

This Indian Standard (Part 4) was adopted by the Bureau of Indian Standards, after the draft finalized by the Safety in Construction Sectional Committee had been approved by the Civil Engineering Division Council.

Components of timber structures commonly used in building construction are columns, beams, trusses, rafters, purlins, etc of different sizes and forms. Construction and erection of timber structures, though appear to be simple, involve considerable hazards. Depending on their weight and mode of fixing particularly in space or height, some precautionary measures should be adopted during works for necessary safety of the works and the workers.

There are various methods in vogue in industries in India and abroad to prevent accident while working on timber structures. This standard has been formulated for providing general guidance in respect of safety requirements to all those involved in timber works, such as the designers, engineers, architects, contractors, supervisors, carpenters and all other workers. This standard also covers the merits and demerits of the institutional practice and suggests suitable remedial measures. However, the list is not exhaustive and any other methods considered to be good depending on the facilities of works may also be adopted, if approved by the competent authority. In addition, from fire safety point of view, a reference may be made to IS 13416 (Part 5) : 1994 'Recommendations for preventive measures against hazards at workplaces : Part 5 Fire safety'.

The composition of the technical committee responsible for the formulation of this standard is given in Annex B.

Indian Standard

PREVENTIVE MEASURES AGAINST HAZARDS AT WORKPLACES — RECOMMENDATIONS

PART 4 TIMBER STRUCTURE

1 SCOPE

1.1 This standard (Part 4) lays down the safety requirements for the works and workers, while working on timber structures starting from processing the timber, jointing them to make beams, columns, trusses, purlins, etc and erecting them to make the structures including structures with roof covering.

1.2 This standard does not cover the safety requirements during masonry or concrete works for flooring, walling, etc of the structures.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 SAFETY IN TIMBER HANDLING

3.1 On Ground

Timber pieces, big or small, may cause injury if carelessly handled during processing, fabrication, erection and transportation. A slender piece with sufficient length should not be attempted to process, push or pull so that it may not get broken at weaker points like at knots with a sudden thrust on the persons working on it. Smaller pieces should be carried in bundles. Carts, trolleys, trucks, etc should be used as per convenience, for heavier and bigger pieces. For proper handling of the timber by the workers, stronger ropes, wires, aiding poles or rods, etc should be used. While using trucks for transportation, sufficient care should be taken in loading and unloading the bundles and bigger pieces particularly over the sloped surfaces so that these do not cause any injury to the people working below who should be given clear sound or signal to leave the place well in advance.

3.2 In Space

In cases of works in space or height where the pieces are required to be taken for fixing with adjacent members, these should be lifted by using wires or ropes, cranes, etc while nobody should be allowed to stand or work under the structure.

3.2.1 No fragile material should be used as ladder or supporting aid of the workers during works in space.

4 SAFETY IN TOOL HANDLING

4.1 In timber works, right from the stage of processing of timber pieces, different types of tools such as saws and drills of various sizes, hammers, planers, chisels, etc are used. The tools should be carefully checked for sharpness before starting the work. Particular attention should be paid to tools with wooden handles or butts. In no case tools like hammer, chisel, handsaw, screw-drivers, etc should be used with loose handles as it may cause injury by falling suddenly on the people working nearby. Blunt tools and tools with broken or loose handles are certain to retard the progress of work in addition to causing constant inconvenience to the concerned carpenters.

4.2 During work in height, tools like drills, chisels, hammers or even the box containing them or any other containers or nails and bolts should not be kept haphazardly. This may inadvertently harm the people working there or below by being dislodged due to movement of carpenters. In general, no tool or the box carrying tools, etc should be left within 500 mm of the edge of a high working platform.

5 SAFETY IN WORKING IN HEIGHT

5.1 Wearing of Safety Dress Material

Proper dress including shoes, gown or apron, head gear, etc should be used by the carpenters, which are essential safety measures in carpentry works, and safety belts should be used while working in space or height.

5.1.1 Wearing of Head-Gear

All the workers should wear suitable head gear/helmet (IS 2925 : 1984) for precaution against any untoward happening.

5.1.2 Wearing of Shoes

Workers should wear such type of shoes that will ensure freedom of movement as well as minimize chances of fall from height or roof.

5.2 Spreading of Nylon Rope Nets or Galvanized Wire Mesh

In roofing work, nylon rope net or galvanized iron mesh should be spread, duly fixed to the framework below the roof, covering the area from ridge purlin to eave purlin.

5.3 For executing works on the overhanging portion of pitched roof, it is better and easier to work on pitched roof, by spreading a strong bamboo-culm or 70 mm to 100 mm diameter eucalyptus pole along the lower side parallel to eave duly bound by strong ropes from the ridge. The workers will be able to work by making the bamboo or eucalyptus pole as supporting base. The system of such loose support over pitched roof will not cause hinderance in placing the roof covering.

6 SAFETY IN FABRICATION OF STRUCTURAL COMPONENTS

6.1 Fabrication of Beams, Trusses, etc

The joints in beams, trusses, etc are fixed earlier in fully fabricated structures but in case of semi-prefab structures, the positions for jointing with necessary prebores and finished ends are duly marked for easy identification and fastening with adjacent parts by using nails or bolts. Simple type of joints like butt fish joints should be employed in joining truss members placed over the layout (full scale) made on workshop floor.

6.1.1 Though it is desirable to use defect-free timber, the same is not always available. Defects, like knots, cross grains, checks, shakes, etc should be accommodated on the timber as per the codal provisions given in IS 3364 (Part 1) : 1976 and IS 3364 (Part 2) : 1976. Timber pieces with the accommodable knots particularly at central zone of beams, purlins, etc should be so placed as to bring the knotty face in the compression zone for adequate safety.

6.1.2 Use of Fasteners

Fasteners, like mild steel nails and bolts should be used in prebored holes to avoid splitting of the members during driving. The bore diameters for nails should be a bit less, say about 0.8 times the diameter of the respective nails and a bit more for the bolts with edge, end, intermediate and row distances as per the provision given in IS 2366 : 1983 and IS 11096 : 1984 respectively for nail and bolt joints. Operation of electric drills for long period of time on harder and thicker pieces, and forcible or casual driving of nails on harder timbers without preboring should be avoided. Otherwise such nails, during hammering, may suddenly and swiftly get thrown out causing serious injury to the carpenter himself or any other person helping him or working

nearby. Protruded ends of mild steel nails should either be clenched or cut off at the concerned face of the timber. Unnecessarily extended length of bolts beyond the nuts should also be cut and filed. All these, if inadvertently left out, may cause serious injuries to workers at any stage of fabrication, erection or application of paints, creosote, etc.

6.2 Fabrication and Fixing of Columns

Proper fixing of the timber columns, particularly box types or spaced columns fabricated by use of assorted planks and spacer blocks generally require at the base ready made dwarf RCC footing having extended iron straps duly prebored. This is an essential arrangement for safe erection of the structure. The columns should have suitable bearing at the top to accommodate the trusses. At least two bolts at base and one bolt at top should be provided to ensure safety against collapse. The required number of purlins should be duly fixed on the trusses, generally aided by wooden cleats or iron straps.

6.3 Spreading of Roof Covering

Precautionary measures should be adopted while fixing the Corrugated GI or AC sheets over the sloped roof. Due overlapping at the ends and edges of the sheets, screwing the sheets with purlins and fastening by J-hooks, etc are the requisites for safety against storms, cyclones, etc. While laying and fixing the sheets, from eave to ridge, the carpenters should not move over the sloped roof to avoid slipping down inadvertently. Wooden or bamboo poles may be stretched horizontally over the lower end of the sloped roof to facilitate easy working and safe movement of the carpenters as described in 5.3. Their tools may also be kept leaned against this type of temporary supports which will have to be raised or pulled towards the ridge depending on the progress of work. Sufficient number of labourers should be engaged to lift or carry up the necessary materials including Corrugated GI or AC sheets, timber purlins, etc and there should be clear signals and shoutings at the start and end of the lifting work to avoid any untoward happenings.

Workers engaged in the work should use safety dress materials (*see* 5.1) including cat ladders and safety harness.

7 WARNING SIGNALS

7.1 Adequate warning signals, notice boards, etc should be depicted at or near the working places highlighting the danger involved in non-observance of safety rules. In addition to written signals, there may also be occasional verbal warnings sounded by the supervisors, senior or experienced workers so that the busy workers may not be in difficulty even when they inadvertently forget the basic safety rules.

7.2 In the workplace, there should be adequate quantity of safety equipment, garments, shoes, helmets, etc as per the number of workers to be engaged. The supervisor should ensure that no person in workplace violates the safety rules even in short or temporary absence of the supervisor.

8 PRECAUTIONS

In addition to the specific provisions, following precautions should also be adopted:

- a) Trusses should be carefully handled while tilting up as very large stresses and bending moments arise in the upper chord due to its possible bending out of the plane and reversal of stresses may also take place.
- b) Framing presents problem after erection had commenced and joists, purlins, sheathing, etc are still not provided. This skeleton may need adequate bracings to protect compression members in particular and the frame as a whole until structure is complete.

c) The sling points should be suitably positioned from safety considerations particularly in case of laminated timber constructions involving use of small dimensioned timber as slings may have embedding effect in timber pieces due to pulls and self weight of structural component. Similarly adequate precaution should be taken while unslinging under unfavourable conditions of height after the structure has been hoisted in place.

- d) While using scaffolds and ladders the provisions for safety given in IS 3696 (Part 1) : 1987 and IS 3696 (Part 2) : 1991 respectively should be followed.

9 TRAINING

The carpenters should be imparted basic training in respect of dangers associated with the works and the methodology of avoiding the dangers for smooth and speedy completion of the work.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
2366 : 1983	Code of practice for nail-jointed timber construction (<i>first revision</i>)		Part 2 Converted timber (<i>first revision</i>)
2925 : 1984	Specification for industrial helmets (<i>second revision</i>)	3696 (Part 1): 1987	Safety code of scaffolds and ladders : Part 1 Scaffolds
3364 (Part 1) : 1976	Methods of measurement and evaluation of defects in timber: Part 1 Logs (<i>first revision</i>)	3696 (Part 2) : 1991	Safety code of scaffolds and ladders : Part 2 Ladders
3364 (Part 2) : 1976	Methods of measurement and evaluation of defects in timber:	11096 : 1984	Code of practice for design and construction of bolt-jointed timber construction

ANNEX B

(Foreword)

COMMITTEE COMPOSITION

Safety in Construction Sectional Committee, CED 45

<i>Chairman</i>	<i>Representing</i>
MAJ GEN S. N. BOURI	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
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CHIEF ENGINEER (TRAINING)	Central Public Works Department, New Delhi
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SHRI VIKRAM KUMAR (<i>Alternate</i>)	
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ASSISTANT DESIGN ENGINEER (B&S) (<i>Alternate</i>)	
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SHRI A. P. BAHADUR (<i>Alternate</i>)	
FIRE ADVISER	Ministry of Home Affairs (Fire Services), New Delhi
DEPUTY FIRE ADVISER (<i>Alternate</i>)	
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DR J. L. JETHWA	Central Mining Research Station, Dhanbad
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SHRI J. P. MITAL	The Institution of Engineers (India), Calcutta
SHRI A. C. NIRWANI	Hindustan Construction Co Ltd, Bombay
SHRI A. K. KHANNA (<i>Alternate</i>)	
SHRI UMAKANT B. PARELKHAR	The Indian Institute of Architects, Bombay
SHRI A. L. CHHATRE (<i>Alternate</i>)	
SHRI A. J. PATANKAR	Hindustan Steelworks Construction Ltd, Calcutta
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