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IS 14242 (1995): Code of practice for design and construction of roof with L-Panel units [CED 51: Planning, Housing and pre-fabricated construction]



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भारतीय मानक

पूर्वढली प्रबलित काँक्रीट एल-पैनेल का उपयोग कर छत  
का निर्माण — रीति संहिता

*Indian Standard*

DESIGN AND CONSTRUCTION OF ROOFS USING  
PRECAST REINFORCED CONCRETE  
L-PANELS — CODE OF PRACTICE

UDC 691.328-413 : 692.4

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BUREAU OF INDIAN STANDARDS  
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NEW DELHI 110002

March 1995

Price Group 3

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Housing Sectional Committee had been approved by the Civil Engineering Division Council.

Considerable shortage of houses in the country, which is also increasing continuously, has led to increasing stress being laid in the development programmes of central and state governments, on facilitating speedy and economical construction of houses. Problem of housing being enormous amongst the lower income groups, both rural and urban, the greatest stress is being laid on housing for these target groups.

This calls for development and standardization of new building materials and construction techniques which are simple and economical, commensurate with structural and hygienic safety and durability, in order to ensure speedy and economical construction.

This standard is one of the series of standards on new materials and techniques of roof/floor construction which when implemented is likely to result in substantial savings in materials and cost of construction, in addition to achieving speedy construction. The other standards in the series are:

- a) Precast reinforced concrete L-panels for roofing — Specification
- b) Precast reinforced concrete planks and joists for roofing and flooring — Specification
- c) Design and construction of floor and roof with precast reinforced concrete planks and joist — Code of Practice
- d) Prefabricated brick panel and partially precast concrete joist for flooring and roofing — Specification
- e) Design and construction of roofs and floors with prefabricated brick panel — Code of Practice
- f) Precast reinforced concrete channel units for construction of floors and roofs — Specification
- g) Design and construction of floor and roof with precast reinforced channel units — Code of Practice
- h) Construction of walls using precast concrete stone masonry blocks — Code of Practice

Prefabricated reinforced concrete L-panel can be used for construction of sloping roofs in place of conventional roofings. It mainly consists of a full span reinforced concrete L-shaped component thereby combining sheeting, purlins and battens of a conventional sloping roof into a monolithically composed component fulfilling the functions of all these separate components. The panel acts as L-beam having wide flange for resisting flexural compressive stress and hence resulting in saving material and overall cost. Additional advantages of L-panels are its durability and its reusability to suit temporary constructions.

Considerable assistance has been rendered in the preparation of this standard by the Central Building Research Institute, Roorkee, who have developed this technique.

The Committee responsible for the formulation of this standard is given at Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## Indian Standard

# DESIGN AND CONSTRUCTION OF ROOFS USING PRECAST REINFORCED CONCRETE L-PANEL — CODE OF PRACTICE

## 1 SCOPE

1.1 This standard lays down the criteria for design of precast reinforced concrete L-panel for roof construction and the recommendations for construction of roof with these L-panel.

## 2 REFERENCES

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

## 3 MATERIALS

### 3.1 Concrete

Concrete used for making L-panels, supporting beams, if any, as well as the *in-situ* concrete shall conform to grade M-15, or for higher rainfall area or corrosive atmosphere, grade M-20 or M-25 of IS 456 : 1978. Raw materials used for making concrete shall conform to the requirements of IS 456 : 1978. Impermeability of concrete shall be ensured, in addition to strength. While designing the mix or otherwise choosing the mix proportions, Table 1 of IS 14241 : 1995 should be followed.

### 3.2 Steel

Mild steel conforming to grade 1 of IS 432 (Part 1) : 1982, high strength deformed bars conforming to IS 1786 : 1985 or other steels as recommended in IS 456 : 1978 shall be used.

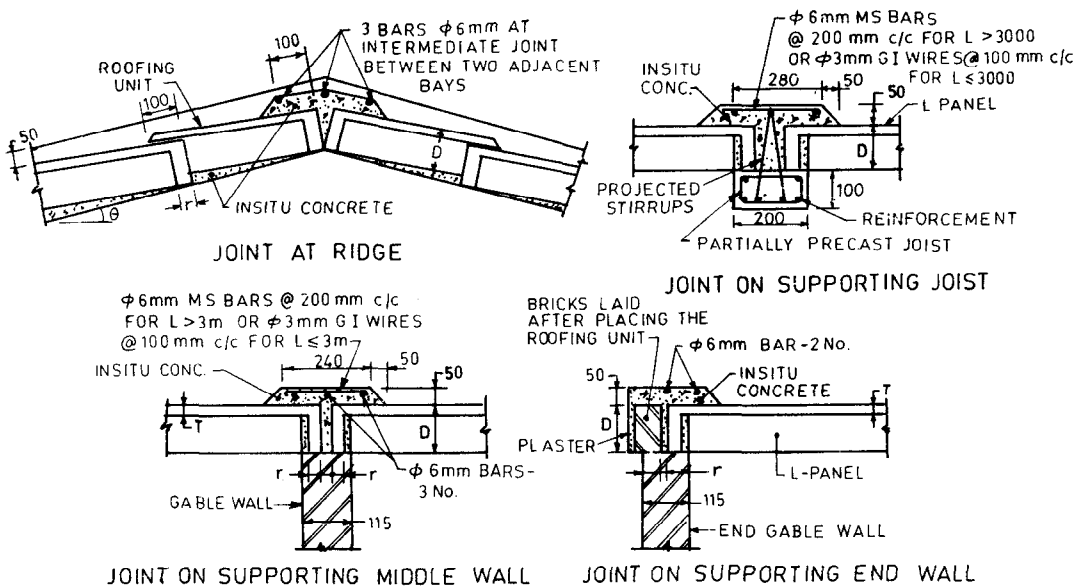
## 4 ELEMENTS OF ROOF

### 4.1 L-panel

L-panel used for construction of roofs shall conform to IS 14241 : 1995.

### 4.2 Supporting Beam

Supporting beam, when used, shall be designed as simply supported rectangular beam as per IS 456 : 1978. However, combination of a partially precast reinforced concrete joist and *in-situ* concrete with suitable reinforcement may provide more economic design of the supporting beam, in such case a Tee-beam shall be considered for the design as shown in Fig. 1.



All dimensions in millimetres.

FIG. 1 VARIOUS JOINT DETAILS IN L-PANEL ROOFINGS ( ILLUSTRATIVE )

### 4.3 Channel Unit

The last unit at the eave in case of a verandah or where wide fascia is desired from aesthetic considerations shall be of channel cross section which shall also conform to IS 14241 : 1995.

## 5 DESIGN CRITERIA FOR L-PANELS

**5.1** L-panel shall be designed as simply supported L-beams in accordance with IS 456 : 1978.

**5.2** Total moment acting on the L-panels shall be split into two components, one perpendicular to the flange of panel and the other parallel to the flange of panel. Thus if vertical simply supported Bending Moment is  $M$ , then Bending Moment perpendicular to the flange  $M_1 = M \cos \theta$  and parallel to the flange  $M_2 = M \sin \theta$ , where angle  $\theta$  is the angle made by flange of L-panels to the horizontal, which will be given by the following equation:

$$\tan \theta = \frac{1}{n} - \frac{T}{(B - b)}$$

where

$\frac{1}{n}$  = is the slope of supporting wall with the horizontal =  $\tan \theta$ ,

$T$  = thickness of flange of L-panel,

$B$  = Overall width of L-panels,

$b$  = width of overlap of L-panels in roof, and

$\theta$  = slope of supporting wall with horizontal.

However, the Bending Moment parallel to the flange is usually very small and shall be taken care of by the steel provided in the flange for temperature and handling stresses. Hence, the L-panel shall be designed as per 5.1, only for the moment  $M_1$ , perpendicular to the flange.

**5.3** Safety against shear force and bond stresses shall also be checked as per IS 456 : 1978.

### 5.4 Loads

Following loads shall be considered in designing the L-panels:

- i) Self weight,
- ii) Live load as per IS 875 (Part 2) : 1987,
- iii) Wind load as per IS 875 (Part 3) : 1987,

- iv) Handling stresses while lifting the unit simply supported and upside down. In absence of actual load, 1.25 times the self weight of the panels can be considered for calculation.

**5.4.1** Load factors taken while designing or checking the stability under wind load and handling stresses shall be those recommended in IS 456 : 1978.

**5.5** No anchorage is usually found necessary for basic wind pressure of  $150 \text{ kg/m}^2$  if the dimensions given in Table 2 of IS 14241 : 1995 are adopted. For basic wind pressure higher than  $150 \text{ kg/m}^2$ , anchorage shall be designed. However, for dimensions other than those indicated above, anchorage requirement shall always be checked.

**5.6** For the prevailing wind pressures in India, no extra reinforcement in L-panels shall be needed to resist wind force.

## 6 SUPPORTING BREAM OR TRUSS

**6.1** When the rooms of large lengths are required to be covered by more than one span of L-panels, L-panels shall be supported on either a truss or a simply supported rectangular reinforced concrete, steel or composite beam. Any of these supporting members shall be designed to take all the loads coming on the roof in addition to its self weight.

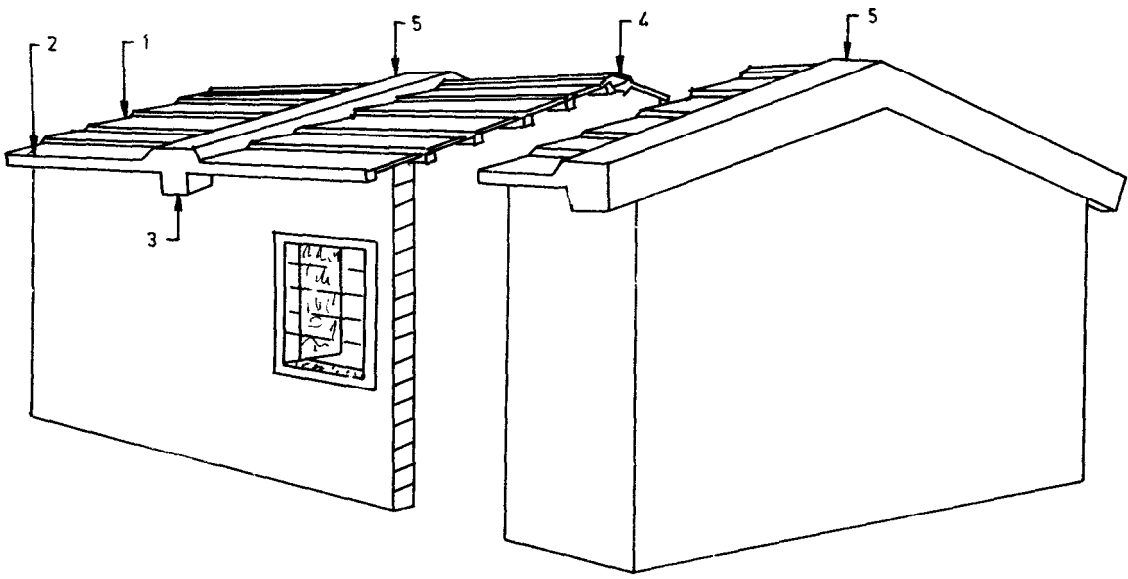
## 7 TRANSPORTATION

**7.1** The components may be transported by trolley, cart or truck always keeping the flange nearly vertical. For loading in layers, intermediate flat cross timber pieces shall be used between two layers.

## 8 ERECTION

**8.1** The bearing surfaces of gable walls and the L-panels shall be properly cleaned to remove dust and loose material. The panels shall then be placed over the gable walls with suitable overlap and side bearing. The joints shall then be filled with *in-situ* concrete of the same grade as used for L-panel along with required reinforcement (see Fig. 1). Perspective view of the roof constructed with L-panels is shown in Fig. 2.

**8.2** *In-situ* concrete shall be cured by sprinkling water for at least one week. Roof surfaces shall then be painted with cement slurry containing suitable water proofing compounds (see IS 2645 : 1975).



- 1 Precast L-Panel
- 2 Precast Channel Unit
- 3 Gable Wall/Rafter
- 4 *In-situ* Ridge Concrete
- 5 *In-situ* Side Concrete

FIG. 2 SECTIONAL PERSPECTIVE VIEW OF L-PAM ROOFINGS



# ANNEX A

## (Foreword)

### COMITTEE COMPOSITION

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Delhi Development Authority, New Delhi

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## ANNEX B

( Clause 2.1 )

## LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
432 (Part 1) : 1982	Mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement: Part 1 Mild steel and medium tensile steel bars ( <i>third revision</i> )	875 (Part 3) : 1987	Code of practice for design loads (other than earthquake) for building structures: Part 3 Wind loads ( <i>second revision</i> )
456 : 1978	Code of practice for plain and reinforced concrete ( <i>third revision</i> )	1786 : 1985	Specification for high strength deformed steel bars and wires for concrete reinforcement ( <i>third revision</i> )
875 ( Part 2 ) : 1987	Code of practice for design loads ( other than earthquake ) for building structures : Part 2 Imposed loads ( <i>second revision</i> )	2645 : 1975	Specification for integral cement water proofing compound
		14241 : 1995	Specification for precast reinforced concrete L-panel for roofing

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### Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition.

This Indian Standard has been developed from Doc No. CED 51 (5039)

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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