CSIR-CENTRAL BUILDING RESEARCH INSTITUTE, ROORKEE – 247667 (INDIA)
(A Constituent Establishment of CSIR)

BUILDING RESEARCH NOTE

B.R.N.52

PRECAST CHANNEL UNIT FOR FLOOR/ ROOF

Introduction

Channel Units developed at the Central Building Research Institute, Roorkee have been used in a number of buildings all over the country. Earlier, a Building Research Note (BRN) giving various details regarding design, casting, erection and its use in floor/ roof was published. The present BRN is an updated version of that note, incorporating the latest code & guidelines etc. Indian standards i.e. IS 14201 : 1994 & IS 14215 : 1994 have also been released for 'Precast Reinforced Concrete Channel Units for Construction of Floors and Roofs – Specification' & 'Design and Construction of Floors and Roofs with Precast Reinforced Concrete Channel Units- Code of Practice' respectively.

Precast Channel Unit

It is a full span precast RCC unit, trough shaped in section (Fig. 1). It can be used for floors and roofs supported on suitable structures like brick/stone walls and RCC beams. It does not require any intermediate temporary props or supports, since the unit is strong enough to support the load, for which it is designed. The outer sides of the unit are corrugated and are grooved at the ends to provide shear key action between adjacent units (Fig. 2). Nominal width of the unit is varies from 300 mm to 600 mm, its depth from 130 mm to 200 mm and a minimum flange thickness of 30 mm. The length of the unit may be adjusted to suit the span to be covered, but the maximum length is restricted to 4.2 m from stiffness considerations. Horizontal corrugations are provided on the two longitudinal faces of the units so that the structural roof/ floor acts monolithic after concrete grouted in the joints between the units attains strength.

Main reinforcement of the channel units shall comprise two bars of required diameter as per the design placed at the bottom of two legs of channel unit. Two bars of minimum mild steel grade I conforming to IS 432 (Part 1) : 1982, 6mm dia shall be provided at top corners to support the stirrups (see Fig. 2). Stirrups of 3 mm dia at the rate of 300 mm c/c along the length of the channel unit shall be provided.

Mould

The mould should be made from well seasoned good quality timber or steel. For economy in the long run in large projects, it is advantageous to have steel moulds or to line the surface of timber moulds coming in contact with concrete, by G.I. sheet. The mould mainly consists of two parts viz., the outer frame and the inner trough frame. The dimensions and shapes of the various components of timber mould of channel units are given in (Fig. 3 & 4).

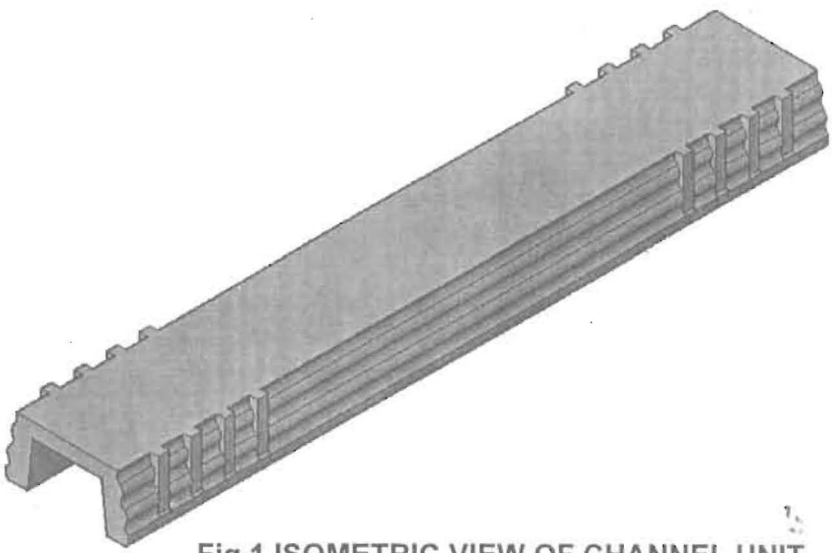

Fig.1 ISOMETRIC VIEW OF CHANNEL UNIT

ALL DIMENSIONS IN mm

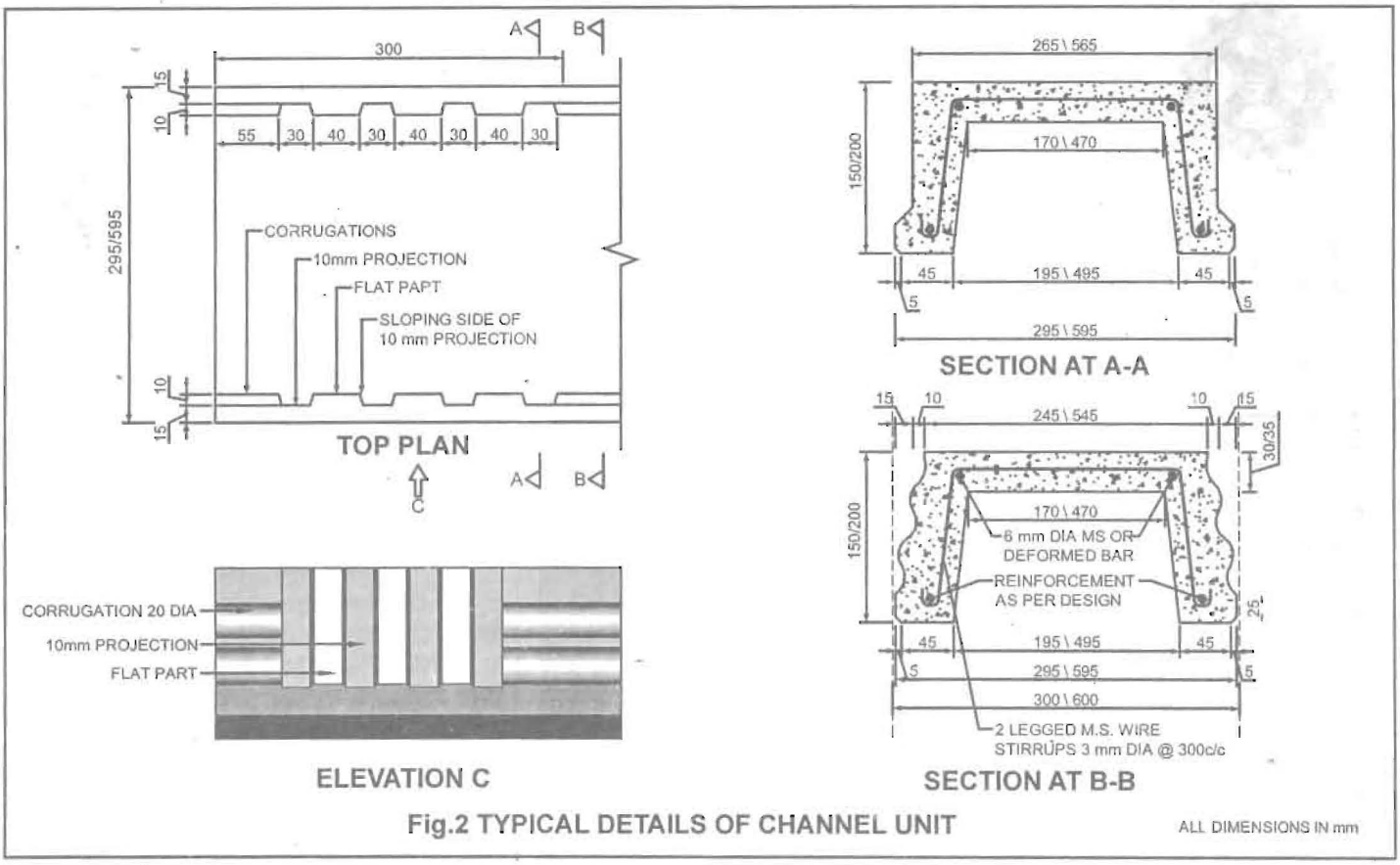

Fig.2 TYPICAL DETAILS OF CHANNEL UNIT

ALL DIMENSIONS IN mm

Casting and Curing of Units

The inner side of outer frame of the mould is oiled and placed on a specially prepared smooth and level platform as shown in Fig. 4. The reinforcement cage is placed in position and M 20 concrete with 12 mm and down, graded aggregate is filled in the flange portion and vibrated with a plate vibrator. The trough frame duly oiled is kept inside the outer frame and concrete is levelled by moving the trough frame to and fro. Afterwards the trough frame is fixed in position with the outer frame using U clamps. Web portion is now filled with M 20 concrete, vibrated and finished level.

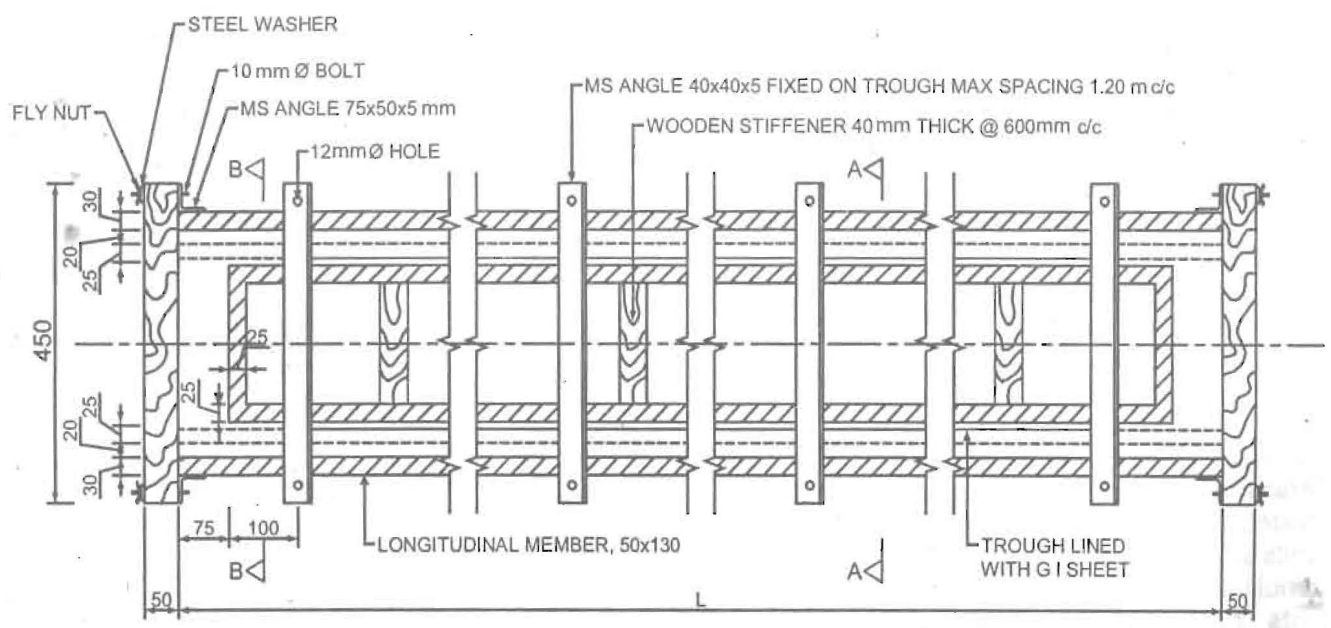

Fig.3 TOP PLAN OF MOULD

ALL DIMENSIONS IN mm

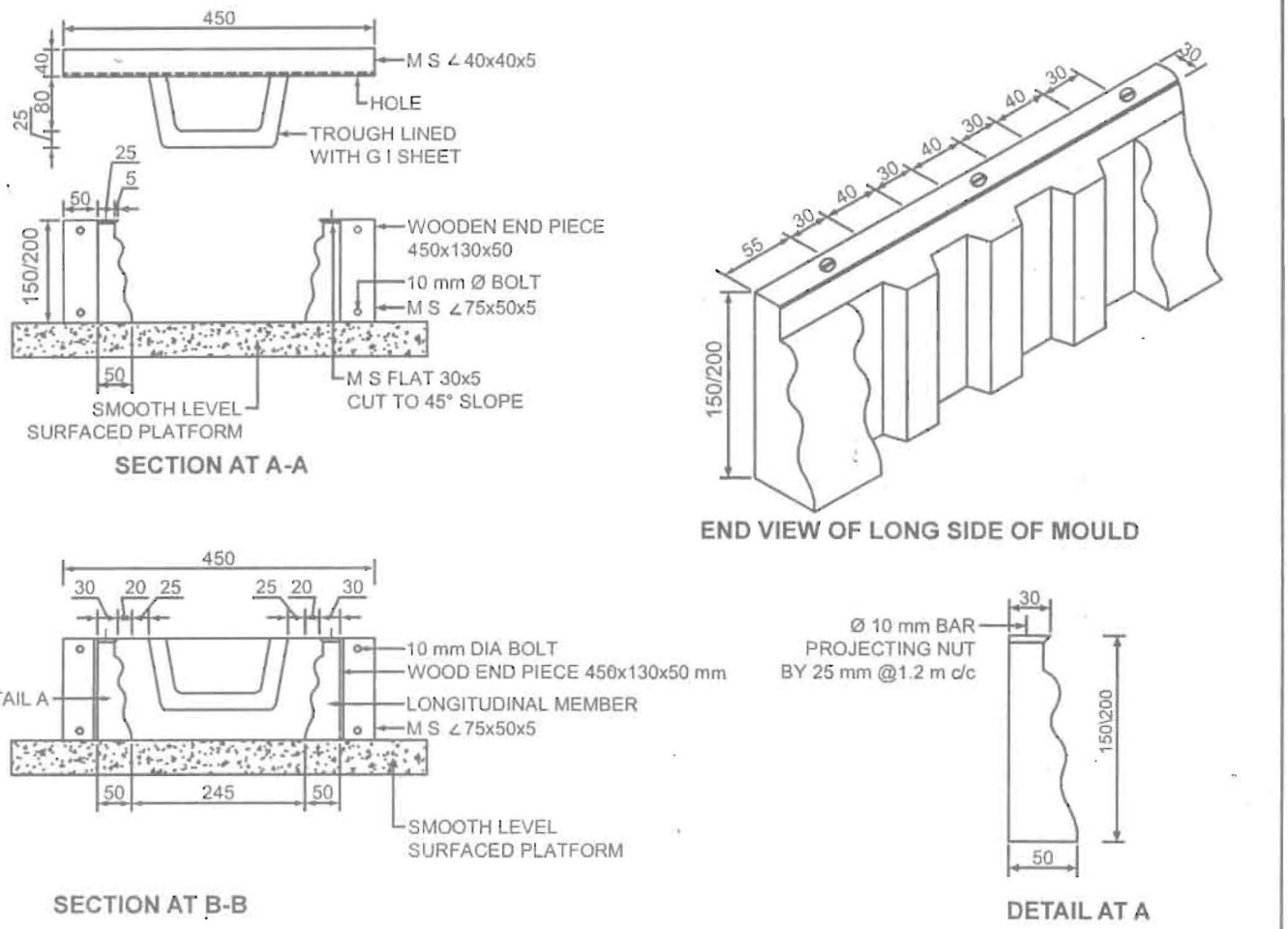

Fig.4 DETAILS OF MOULD FOR CHANNEL UNIT

ALL DIMENSIONS IN mm

After about one hour of casting (depending upon the weather) U clamps are pulled up and the trough frame, gently lifted off. The surface may then be finished smooth with a trowel, if necessary. About three hours after casting, the outer frame is also stripped off. The unit is left undisturbed for 48 hours except that; it is kept wet by occasional sprinkling of water or by putting wet gunny bags over it. The unit is then turned upside down such that the flange is brought to the top. The unit is then transported to the curing yard by supporting at the ends and stacked, keeping the trough upwards. The unit must be cured for 12 days by keeping the trough filled with water and air cured for another 14 days before placing it in position in a building. Once the mould is released, it is cleaned and oiled and the above mentioned process repeated for further castings.

Assembly of Floor/ Roof

The top surface of the wall or beam support, as the case may be, is levelled so as to provide uniform bearing to the webs of channel units. Channel units are then shifted from the curing cum-stacking yard. While transporting, the units should be supported near the ends and with the trough pointing towards the ground, i.e. in the same position as they are to be laid in the floor/roof. The units are brought near the place where they are to be lifted in position. The units are then lifted one by one manually or with the help of a chain pulley block or mechanically with a hoist and placed side by side across the span to be covered. The units are then aligned and levelled properly (Fig. 5). Negative reinforcement in the case of continuous floor/ roof slab is placed in position, at supports, near the top in the joints between the units. Thin cement wash is applied to the sides of the units and the joints are filled with M 20 concrete using 10 mm graded aggregate and consolidated by roding. Care should be taken to see that the negative reinforcement placed at continuous support is in position. The in-situ joint concrete is then cured for 14 days by sprinkling water. The channel units shall have a minimum end bearing of 75 mm, and a minimum side bearing of 50 mm. Some of the constructional details are shown in (Fig. 6).

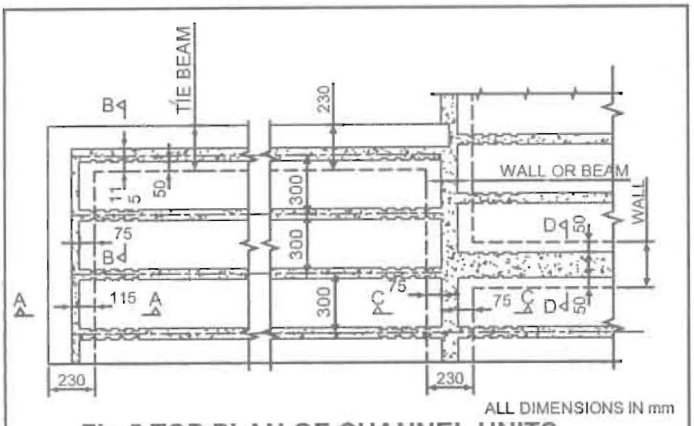

Fig.5 TOP PLAN OF CHANNEL UNITS

In case of intermediate floor, any flooring treatment such as I.P.S or mosaic tiles or in-situ floor may be laid. For roof, a coat of bitumen is first applied on the entire surface and then lime concrete or mud phuska with tiles over it is laid. 1:4 cement sand mortar is then applied in the joints between the units in the ceiling. Mortar filled joints in the ceiling are then finished with deep ruled lines for better appearance (Fig. 7). The ruled joints will also conceal the fine cracks at the joint, which are likely to occur due to shrinkage of concrete in the joint.

Structural Design

The channel units may be designed by limit state method

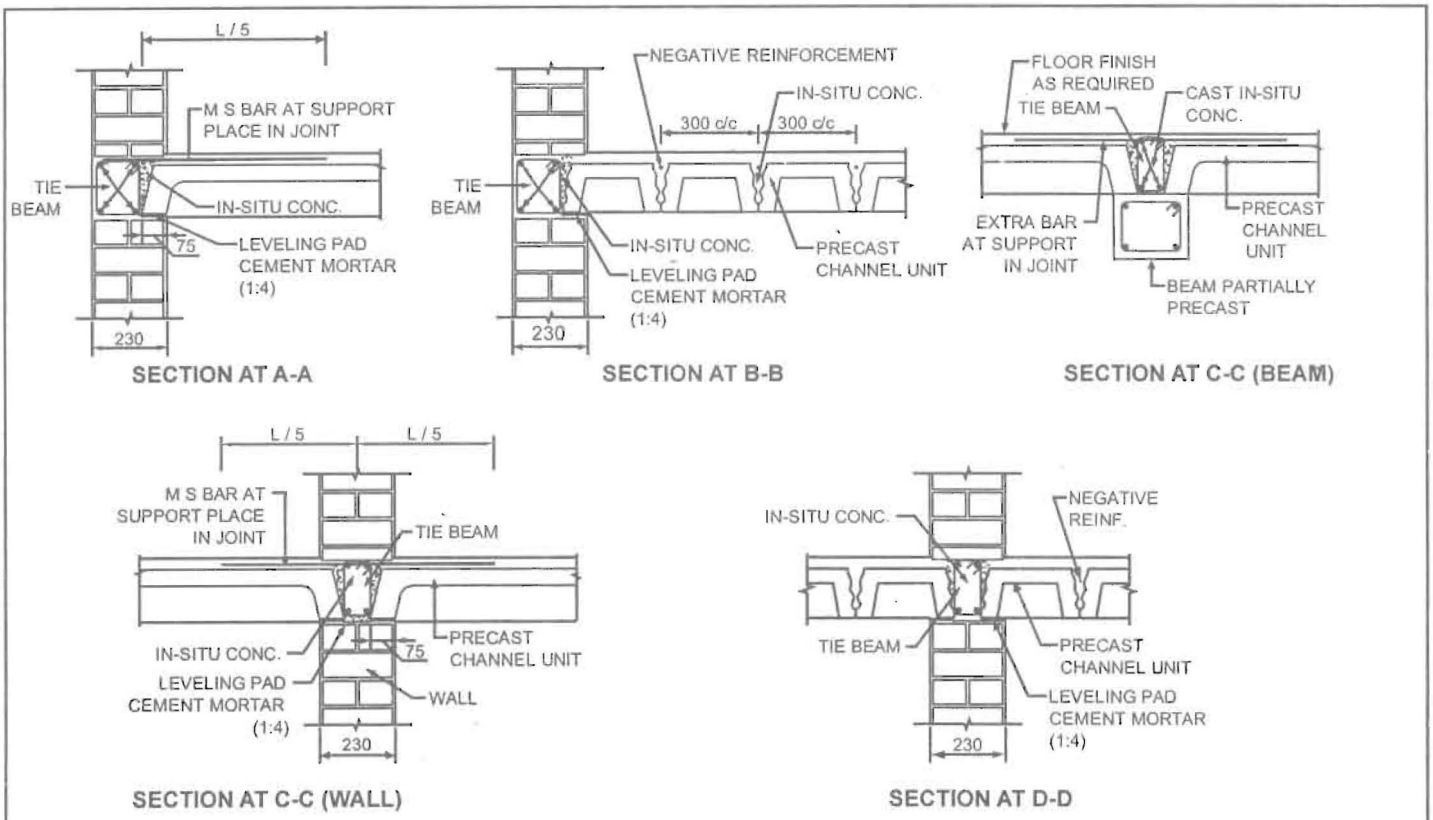

Fig.6 DETAILS OF JOINTS IN A FLOOR WITH CHANNEL UNIT ALL DIMENSIONS IN mm

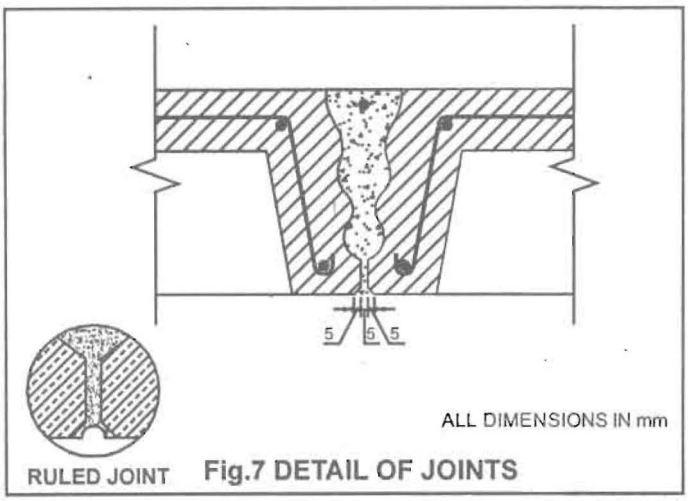

Fig.7 DETAIL OF JOINTS

as per IS 456-2000. The units may be designed either simply supported or continuous depending on the end conditions. Unlike cast-in situ slab, channel units are to be designed for two distinct stages of loading.

Stage I – Loading (Just After Placing of In-situ Concrete)

At the time of laying the units, the load comprises of self weight of unit, in-situ concrete in the joint between the units and also the incidental live load. At this stage of loading, it is assumed that the in-situ joint concrete has not attained any strength to ensure monolithicity and continuity over the spans. Hence, at this stage of loading, the following values of bending moment and shear force should be taken:

B.M. at mid-span $= 1.5(w_c + w_l)\, l^2/8$

S.F. $= 1.5 (w_c + w_l) l/2$

where,

w_c = dead weight per unit length of the unit including the in-situ concrete in joints between the units for nominal width of one channel unit.

w_l = incidental distributed live load per unit length of unit.

l = span of the unit.

Stage II – Loading (With Full Design Load)

Depending on the end conditions, force at the critical sections should be determined for the full load likely to act on the units during their life time. When the floor/roof is of three or more continuous spans of approximately equal distance the following values of bending moment and shear force may be taken:

B.M. in the middle of interior span

$$= 1.5(w_c/8 + w_l/12 + w_d/16) l^2$$

B.M. in the middle of end span

$$= 1.5(w_c/8 + w_l/10 + w_d/12) l^2$$

B.M. at support next to end support

$$= 1.5(w_l/9 + w_d/10) l^2$$

B.M. at any other interior support

$$= 1.5(w_l/9 + w_d/12) l^2$$

S.F. $= 1.5(0.5 w_c + 0.5 w_l + 0.6 w_d) l$

where,

w_d = Dead load per unit length due to flooring/roofing treatment etc. for nominal width of channel unit (uniformly distributed).

w_l = Super-imposed live load per unit length for nominal width of one channel unit (uniformly distributed).

An illustrative design of channel unit is given in Appendix - I. The self weight of various types of channel units is:

a) 300 x 130 mm = 500 N/m (1666 N/m²)
b) 600 x 130 mm = 825 N/m (1375 N/m²)
c) 300 x 150 mm = 580 N/m (1930 N/m²)
d) 300 x 200 mm = 750 N/m (2500 N/m²)
e) 600 x 150 mm = 860 N/m (1433 N/m²)
f) 600 x 200 mm = 1000 N/m (1666 N/m²)

Apart from self weight a live load of 1500 N/m² and weathering course load of 2000 N/m² have been considered in case of residential buildings and a live load of 3000 N/m² and weight of flooring of 1000 N/m² have been considered for office/ school buildings. In case of three or more equal continuous spans the moments and shear forces have been calculated as per the maximum values given by the formulas given above. The reinforcement to be provided in different size of units (with or without deck concrete) is given in the Tables 1 to Table 13. The reinforcement in the units is indicated in the sketch and the reinforcement in the support should be provided for a distance of one fourth the span on either side of the intermediate support.

APPENDIX - I

Channel Unit Roof

Illustrative Example of Design

Roof continuous over three equal spans of 3.0 metres:

Self weight of unit (300 x 150)	=	580 N/m
Live load (1500 N/m²)	=	450 N/m
Weather proof course (2000 N/m²)	=	600 N/m

Keeping in view the loads, checking for stage I loading is superfluous.

Design for Stage II loading:

Centre span moment in the middle of end span

$= 1.5x \{(580/8)+(450/10)+(600/12)\}x3^2$ = 2261 Nm

Support moment

$= 1.5 x \{(600/10) + (450/9)\}x 3^2$ = 1485 Nm

Shear force $= \{(1630 \times 1.5 \times 2.869)/ 2\}$ = 3507 N

Mid Span Section:

Assume 2 # 8 bars in the unit

$d = 150 - 15 - 8/2 = 131$ mm

$$X_u = \frac{0.87 f_y A_{st}}{0.36 f_{ck} b} = \frac{0.87 \times 415 \times 100}{0.36 \times 20 \times 300}$$

$= 16.8$ mm < 0.48 d
(flange thickness of the unit)

Where,

f_y = Yield stress of reinforcement (N/mm²)
f_{ck} = Characteristic strength of concrete (N/mm²)
A_{st} = Area of reinforcement (mm²)
b = Nominal width of each channel unit (mm)
d = Effective depth of channel unit (mm)
x_u = depth of neutral axis (mm)

$$M_u = 0.87 f_y A_{st} d \left(1 - \frac{A_{st} f_y}{bd f_{ck}}\right)$$

$$= \frac{0.87 \times 415 \times 100 \times 131}{1000} \left(1 - \frac{100 \times 415}{300 \times 131 \times 20}\right)$$

$= 4480$ Nm > 2261 Nm.

where, M_u is the moment of resistance of the channel unit. Hence, the section is safe at mid span.

Support Section:

Assume 1 # 8 bar

$$\frac{x_u}{d} = \frac{0.87 \times 415 \times 0.5 \times 100}{0.36 \times 20 \times 100 \times 131} = 0.192 < 0.48.$$

$$M_u = \frac{0.87 \times 415 \times 0.5 \times 100 \times 131}{1000} \left(1 - \frac{0.5 \times 100 \times 415}{100 \times 131 \times 20}\right)$$

$= 2178$ Nm > 1485 Nm

The section at support is safe for the negative moment with 1#8 bar.

The mid span moments in interior span and at interior support are less than the above moments. The reinforcement as obtained above should be provided in all bays and supports.

Shear Resistance:

$$\frac{100A_s}{bd} = \frac{100 \times 0.5 \times 100}{100 \times 131} = 0.3816$$

Design shear strength τ_c = 0.423 N/mm² *(Table 19, IS 456)*

$\tau_c bd$ = 0.423x100x131 = 5541 N < 3507 N.

Hence the section is safe in shear.

PRECAST CHANNEL UNITS WITH DECK CONCRETE

The Structural System

The system consists of precast channel units as explained earlier. The depth of the unit in this case will be 130 mm while the width will be 300 mm or 600 mm. A 35-40 mm thick layer of deck concrete with a nominal reinforcement of 6 mm dia bars 150 mm c/c at both ways is provided above the units. This system is recommended for areas where the rainfall is high or for areas prone to high seismicity.

Assembly of Floor/Roof

The units are placed side by side across the span to be covered. These are then aligned and leveled properly. The negative reinforcement in case of continuous floor/ roof slab and also the mesh reinforcement of the deck concrete are then placed in position. The concrete of the joints of the units and the deck concrete are laid at one stretch to achieve monolithicity between precast units and in-situ concrete.

Apart from self weight a deck concrete of 1000 N/m2 (for 40 mm thickness) has been considered. A live load of 1500 N/m2 and weight of weathering course of 2000 N/m2 have been considered for the residential buildings and a live load of 3000 N/m2 and weight of flooring 1000 N/m2 have been considered for non-residential buildings. The reinforcement in the units and at the support in the joints for different spans, loadings and support conditions are given in Table 7 to Table 12.

SEISMIC RESISTANCE MEASURES (AS PER IS 4326: 1993-SECOND REVISION)

All floors and roofs to be constructed with small precast components shall be strengthened as specified for various categories of buildings in following Table. The strengthening measures are detailed in from i) to iii).

Strengthening Measures for Floors/ Roofs with Precast Channel Units

Building Categories for Earthquake Resistant Features (Clause 7.1.1)	No. of Storeys	Strengthening to be provided in Floor/ Roof with Channel Units
B	1 to 3	a
	4	a, c
C	1 & 2	a, b
	3 & 4	a, b, c
D	1 to 4	a, b, c
E	1 to 3	a, b, c

Where
a = Tie beam as per i),
b = Reinforcing bars of channel unit and tied to tie beam reinforcement as per ii)
c = Reinforced deck concrete as per iii)

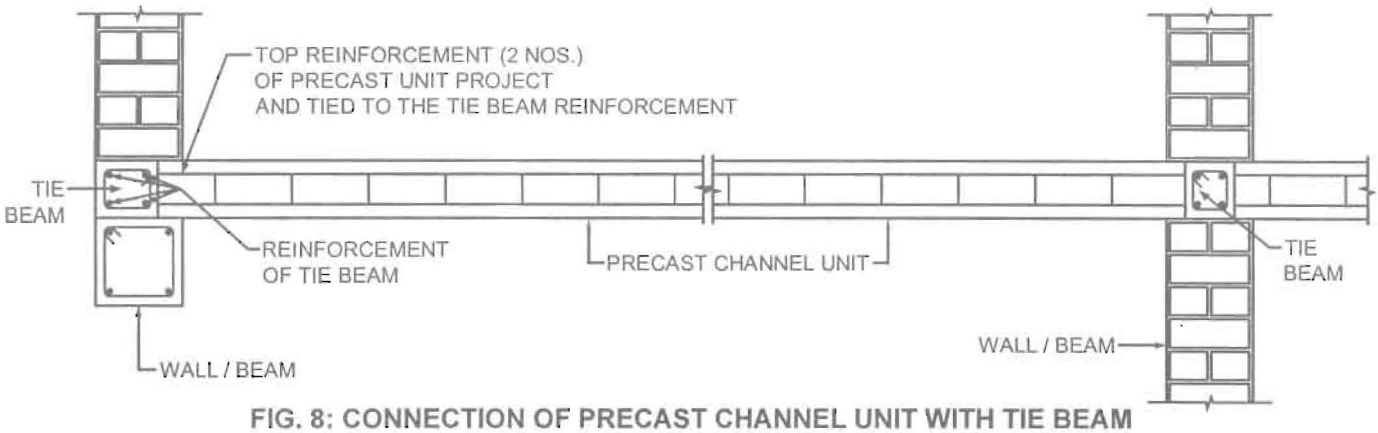

FIG. 8: CONNECTION OF PRECAST CHANNEL UNIT WITH TIE BEAM

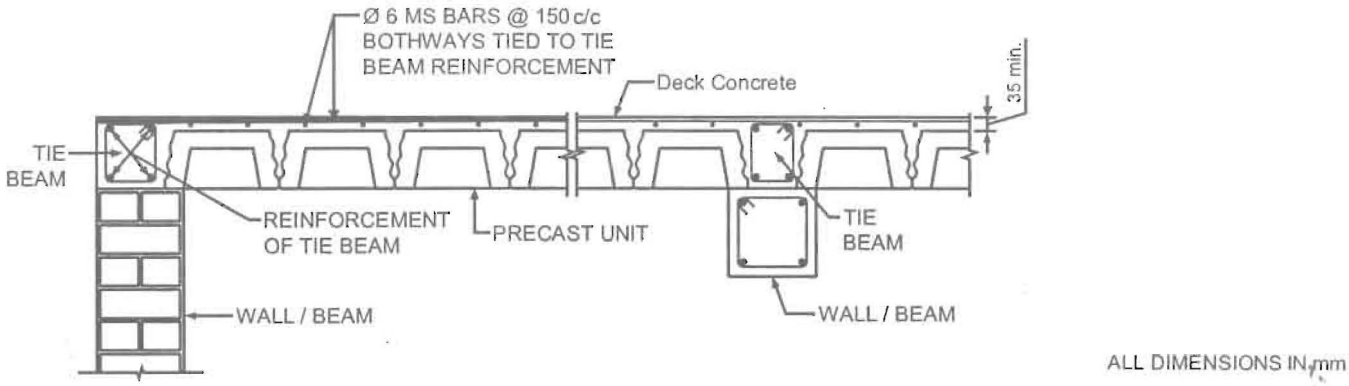

FIG. 9: CONNECTION OF CHANNEL UNIT FLOOR/ROOF (WITH DECK CONCRETE) WITH TIE BEAM

i) Tie beam (termed a in above Table) is a beam provided all round the floor or roof to bind together all the precast components to make it a diaphragm. The beams shall be to the full width of the supporting wall or beam less the bearing of the precast components. The depth of the beam shall be equal to the depth of the precast components plus the thickness of structural deck concrete, where used over the components. The beam shall be made of cement concrete grade not leaner than M 20 and shall be reinforced as indicated in Table (below). If depth of tie is more than75 mm equivalent reinforcement shall be provided with one bar of minimum diameter 8 mm at each corner. Tie beams shall be provided on all longitudinal and cross walls. Typical details of the beams are shown in Fig. 8 to 9.

Recommended Longitudinal Steel in Reinforced Concrete Bands

Span	Building Category B		Building Category C		Building Category D		Building Category E	
in m	Nos.	Dia mm	Nos.	Dia mm	Nos.	Dia mm	Nos.	Dia mm
5 or less	2	8	2	8	2	8	2	10

NOTES

1. Span of wall will be distance between centre lines of its cross walls or buttresses.
2. The number and diameter of bars given above pertain to high strength deformed bars.
3. Width of RC band is assumed same as the thickness of the wall. Wall thickness shall be 200 mm minimum. A clear cover of 20 mm from face of wall will be maintained.
4. The vertical thickness of RC band be kept 75 mm minimum, where two longitudinal bars are specified, one on each face.
5. Concrete mix shall be of grade M20 of IS 456:2000 or 1:1.5:3 by volume. (in accordance with IS 456:2000)
6. The longitudinal steel bars shall be held in position by steel links or stirrups 6 mm dia spaced at 150 mm apart.

ii) Top reinforcement in the channel units (termed b in above Table) shall be projected out at both the ends for full anchorage length and tied to tie beam reinforcement.

iii) Structural deck concrete (termed c in above Table) of grade not leaner than M 20 shall be provided over precast components to act monolithic with wherever, deck concrete is to be provided, the top surface of the components shall be finished rough. Cement slurry with 0.5 kg of cement per sq.m of the surface area shall be applied over the components immediately before laying the deck concrete and the concrete shall be compacted using plate vibrators. The minimum thickness of deck concrete shall be 35 or 40 mm reinforced with 6 mm dia bars @ 150 mm apart in both-ways and anchored into the tie beam placed all round. The maximum size of course aggregate used in deck concrete shall not exceed 12 mm.

Shear Keys

Vertical castellation, called shear keys, shall be provided on the longitudinal faces of the channel to enable them to transfer horizontal shear force from one unit to the adjacent unit through the in-situ concrete filled in the joints between the units. The minimum percentage of area of shear keys as calculated below, on each face of the unit, shall be fifteen.

Shear key shall have a minimum width of 40 mm at its root with the body of the component and shall be to the full height of the component and preferably at uniform spacing. Percentage of area of shear keys shall be calculated as:

$$\frac{\text{No. of shear keys on one face of the component} \times 40}{\text{Length of the face of the component in mm}} \times 100$$

Some Construction Details

Projection for Balcony

This can be achieved depending on its location in relation

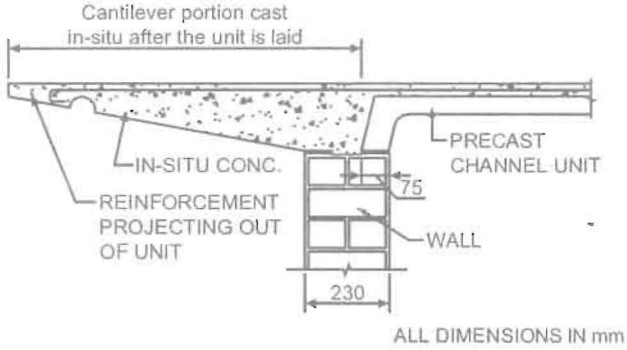

Fig. 10: BALCONY CHAJJA PROJECTION CONTINUOUS WITH UNIT

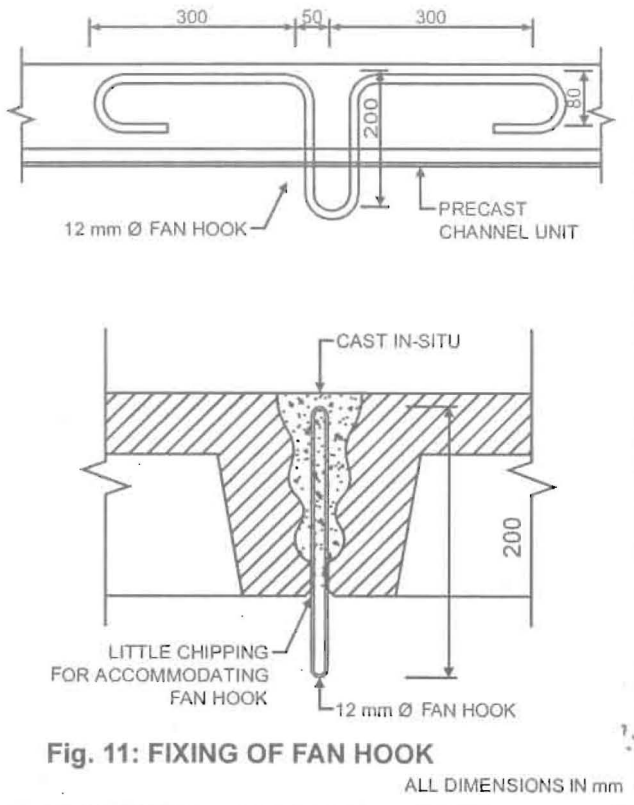

Fig. 11: FIXING OF FAN HOOK

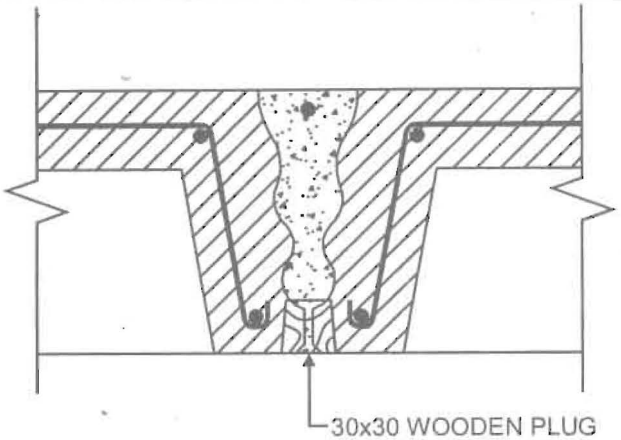

FIG. 12: FIXING OF WOODEN PLUG

to channel units. In case of projection in the same direction as the length of units, the unit itself can be projected out for short cantilever by proper design and by providing necessary reinforcement for cantilever moment.

However, care should be taken to see that the projecting part of the precast channel unit is supported till in-situ concrete in the joint hardens. Alternatively the cantilever can be cast in-situ with reinforcement kept projecting out (Fig. 10) from units or from the joints between the units.

Fitting of Fixtures

Various fixtures like fan hooks, electric conduits etc. should be fixed in the following manner:

Fan Hooks - These can be provided in the cast-in-situ concrete of the units by slightly chipping off the edges of the units at the location of the fan (Fig. 11).

Electric conduits - These may be embedded in the cast-insitu concrete of the joint. At right angles to the units, these can be placed only in lime concrete or other cushioning material.

Electric Junction Boxes - These may be fixed with raw plugs in the cast-in-situ joint between units or embedded during filling of the joint.

Wooden plugs - These may be provided as shown in Fig. 12.

Precautions in Construction

(1) During all stages of erection, handle the units so that the main reinforcement is on the under-side only.

(2) Position the slings near ends for erection of unit.

(3) No portion of the unit should be broken or chipped, once it is cast, except as indicated in this text.

(4) Only fully cured units, free from damage and cracks and sound in all respects, should be used in laying floor or roof.

(5) During construction, no heavy loading should be permitted over the units until the cast-in-situ concrete filled in the joints attains full strength.

ANALYSIS OF RATE FOR CALCULATION OF COST

Description of Item of Work

Providing and laying floor/ roof slab consisting of precast reinforced cement concrete channel units and 40 mm thick layer of deck concrete with a nominal reinforcement of 8 mm dia bars 300 mm c/c at both ways is provided above the units as per design and shape with cement concrete 1: 1.5: 3 (1 cement : 1.5 coarse sand: 3 graded stone aggregate 12 mm nominal size) including casting, staking, curing, erecting and placing the units in position, cost of mould, mould oil, casting platform, props, scaffolding, centring and shuttering for haunches, deck concrete etc. all necessary equipment as needed and including filling the joints and haunches with cement concrete 1: 1.5: 3 (1 cement : 1.5 coarse sand: 3 graded stone aggregate 12 mm nominal size) and finishing the joints underneath with cement mortar 1:4 (1 cement : 4 fine sand) in V-shaped groove but excluding the cost of reinforcement complete as per design & drawing in all respect.

Sl. No.	Description	Unit	Quantity	Rate (in Rs.)	Amount (in Rs.)
1.	2.	3.	4.	5.	6.
	Total area covered (3.6 m x 3.6 m) = 12.96 sq.m Size of channel unit (3.6 m x 0.285 m x 0.13 m) Number of channel units (12 x 1) = 12 Nos. *(One continuous span)* Quantity of concrete in one channel unit = 0.059 cu.m Quantity of conc. in 12 channel units (12 x 0.059) = 0.708 cu.m				
	Cost of 12 channel units				
1)	**Mould** *Materials:* Timber	cu.m	0.105		

1.	2.	3.	4.	5.	6.
	Carriage of timber	cu.m	0.105		
	M.S. Angle iron (40x40x5 mm) for fixing the trough to mould 4.5 m @ 3.0 kg/m = 13.50 kg M.S. Angle iron (75x50x5 mm) for U-clamp 0.52 m @ 4.7 kg/m = 2.44 kg Total = 15.94 kg	kg	15.94		
	M.S. Flat (30 x 5 mm) 7.2 m @ 1.2 kg/m = 9.36 kg	kg	8.64		
	G.I. Sheet (30 gauge) 1.7 m^2 @ 3.14 kg/m^2 = 5.34 kg	kg	5.34		
	10 mm dia bolts 90 mm long with nuts & washers 8 Nos. @ 0.085 kg each= 0.68 kg	kg	0.68		
	Labour:				
	Fitter	each	1.50		
	Carpenter	each	3.00		
	Unskilled	each	3.00		
	Sundries including nails, welding charges etc		L.S.	(as per actual requirement)	
				TOTAL Rs.	X1
	Considering number of reuse of the mould as 100 times Cost of mould for one unit = Rs. X1/100 Cost of mould for 12 units =	each	12	Rs. X1/100	X2
2)	Cement Concrete 1: 1.5: 3 (1 cement: 1.5 coarse sand: 3 graded stone aggregate 12 mm nominal size) for 12 units (i.e. 12 x 0.059 = 0.708 cu.m)				
	Materials:				
	Cement	tonne	0.28		
	Carriage of cement	tonne	0.28		
	Coarse sand	cu.m	0.30		
	Carriage of sand	cu.m	0.30		
	Graded stone aggregate	cu.m	0.60		
	Carriage of stone aggregate	cu.m	0.60		
	Labour:				
	Mason	each	1.20		
	Unskilled	each	4.80		
3)	Miscellaneous Expenditure (for 12 units)				
	i) Casting platform ii) Mould oil, kerosene oil, paper etc. iii) Vibrator, mixer etc. (including the cost of fuel & electricity)		L.S.	(as per actual requirement)	
4)	Carriage of units (for 12 units)				
	i) Within a radius of about 200 m from casting platform Unskilled	each	1.20		
	ii) Cost of trolley		L.S.	(as per actual requirement)	
5)	Hoisting and placing units in position up to floor 2 level (for 12 units)				
	Mason	each	0.24		
	Unskilled	each	2.40		
	Scaffolding charges Add 5% of scaffolding charges for every extra floor level to the value given for floor 2 level.		L.S.	(as per actual requirement)	

1.	2.	3.	4.	5.	6.
6)	Cement Concrete 1: 1.5: 3 (1 cement: 1.5 coarse sand: 3 graded stone aggregate 12 mm nominal size) in haunch filling = 0.24 cu.m				
	Materials:				
	Cement	tonne	0.09		
	Carriage of cement	tonne	0.09		
	Coarse sand	cu.m	0.10		
	Carriage of sand	cu.m	0.10		
	Graded stone aggregate	cu.m	0.20		
	Carriage of stone aggregate	cu.m	0.20		
	Labour:				
	Mason	each	0.20		
	Unskilled	each	0.56		
	Hire and running charges of mechanical Mixer & vibrator		L.S.	(as per actual requirement)	
7)	Finishing of joints below in V-shape groove with cement mortar 1:4 (1 cement: 4 fine sand)				
	Materials:				
	Cement mortar 1:4 (1 cement: 4 fine sand)	cu.m	0.02		
	Labour:				
	Mason	each	0.60		
	Unskilled	each	1.20		
	Scaffolding etc.		L.S.	(as per actual requirement)	
8)	Deck Concrete 1: 1.5: 3 (1 cement: 1.5 coarse sand: 3 graded stone aggregate 12 mm nominal size) above the channel units = 3.6 m x 3.6 m x 0.04 m = 0.52 cu.m				
	Materials:				
	Cement	tonne	0.21		
	Carriage of cement	tonne	0.21		
	Coarse sand	cu.m	0.22		
	Carriage of sand	cu.m	0.22		
	Graded stone aggregate	cu.m	0.44		
	Carriage of stone aggregate	cu.m	0.44		
	Labour:				
	Mason	each	0.40		
	Unskilled	each	1.20		
	Hire and running charges of mechanical Mixer & vibrator		L.S.	(as per actual requirement)	
	Sundries including T & P		L.S.	(as per actual requirement)	
				TOTAL Rs.	X3
	Add for water charges @ 1%			Rs.	
				TOTAL Rs.	X4
	Add for contractor's profit and overhead @ 15%			Rs.	
	Total cost of 12.96 sq.m [i.e. from 1) to 8)]			G. TOTAL Rs.	X5
	Total cost of 1.0 sq.m			Rs.	X5/12.96

DESIGN TABLES

TABLE No. 1 : Channel Units Simply Supported, Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 1500 N/m2	Weather Proof Tre. 2000 N/m2	Span in m	Depth of Unit in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span	
								Nos.	Dia (in mm)
1	580	450	600	Upto 3.6	150	300	15	2	8
2	750	450	600	Upto 4.2	200	300	15	2	8
3	860	900	1200	> 2.7 to 3.3	150	600	15	2	8
4	860	900	1200	>2.7 to 3.3	150	600	15	2	10
5	860	900	1200	>3.3 to 3.9	150	600	15	2	12
6	1000	900	1200	Upto 3.9	200	600	15	2	10
7	1000	900	1200	>3.9 to 4.2	200	600	15	2	12
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)									
1	580	450	600	Upto 3.0	150	300	15	2	6
2	580	450	600	>3.0 to 3.6	150	300	15	2	8
3	750	450	600	Upto 4.2	200	300	15	2	8
4	860	900	1200	Upto 2.1	150	600	15	2	6
5	860	900	1200	>2.1 to 3.0	150	600	15	2	8
6	860	900	1200	>3.0 to 3.6	150	600	15	2	10
7	860	900	1200	>3.6 to 3.9	150	600	15	2	12
8	1000	900	1200	Upto 3.6	200	600	15	2	8
9	1000	900	1200	>3.6 to 4.2	200	600	15	2	10

TABLE No. 2 : Channel Units Continuous Over Two Equal Spans, Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 1500 N/m2	Weather Proof Tre. 2000 N/m2	Span in m	Depth of Unit in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia in mm	Nos.	Dia in mm
1	580	450	600	Upto 3.3	150	300	15	2	8	1	8
2	580	450	600	>3.3 to 3.9	150	300	15	2	8	1	10
3	580	450	600	>3.9 to 4.2	150	300	15	2	8	1	12
4	750	450	600	Upto 3.9	200	300	15	2	8	1	8
5	750	450	600	>3.9 to 4.2	200	300	15	2	8	1	10
6	860	900	1200	Upto 2.1	150	600	15	2	8	1	8
7	860	900	1200	>2.1 to 2.7	150	600	15	2	8	1	10
8	860	900	1200	>2.7 to 3.3	150	600	15	2	8	1	12
9	860	900	1200	>3.3 to 4.2	150	600	15	2	10 *	1	16
10	1000	900	1200	Upto 3.9	200	600	15	2	8	1	12
11	1000	900	1200	>3.9 to 4.2	200	600	15	2	10 *	1	16
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	580	450	600	Upto 2.7	150	300	15	2	6	1	6
2	580	450	600	>2.7 to 3.6	150	300	15	2	6	1	8
3	580	450	600	>3.6 to 4.2	150	300	15	2	8	1	10
4	750	450	600	Upto 4.2	200	300	15	2	8	1	8
5	860	900	1200	Upto 2.4	150	600	15	2	6	1	8
6	860	900	1200	>2.4 to 2.7	150	600	15	2	6	1	10
7	860	900	1200	>2.7 to 3.0	150	600	15	2	8	1	10
8	860	900	1200	>3.0 to 3.3	150	600	15	2	8 *	1	12
9	860	900	1200	>3.3 to 3.9	150	600	15	2	8 *	1	16
10	860	900	1200	>3.9 to 4.2	150	600	15	2	10 *	1	16
11	1000	900	1200	Upto 3.6	200	600	15	2	8	1	10
12	1000	900	1200	>3.6 to 4.2	200	600	15	2	8	1	12

TABLE No. 3 : Channel Units Continuous Over Three Equal Spans, Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 1500 N/m2	Weather Proof Tre. 2000 N/m2	Span in m	Depth of Unit in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia in mm	Nos.	Dia in mm
1	580	450	600	Upto 3.6	150	300	15	2	8	1	8
2	580	450	600	>3.6 to 4.2	150	300	15	2	8	1	10

3	750	450	600	Upto 4.2	200	300	15	2	8	1	8
4	860	900	1200	Upto 2.4	150	600	15	2	8	1	8
5	860	900	1200	>2.4 to 3.0	150	600	15	2	8	1	10
6	860	900	1200	>3.0 to 3.6	150	600	15	2	10	1	12
7	860	900	1200	>3.6 to 3.9	150	600	15	2	10 *	1	16
8	860	900	1200	>3.9 to 4.2	150	600	15	2	12 *	1	16
9	1000	900	1200	Upto 3.6	200	600	15	2	8	1	10
10	1000	900	1200	>3.6 to 4.2	200	600	15	2	10	1	12
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	580	450	600	Upto 3.0	150	300	15	2	6	1	6
2	580	450	600	>3.0 to 3.3	150	300	15	2	6	1	8
3	580	450	600	>3.3 to 3.9	150	300	15	2	8	1	8
4	580	450	600	>3.9 to 4.2	150	300	15	2	8	1	10
5	750	450	600	Upto 3.6	200	300	15	2	8	1	6
6	750	450	600	>3.6 to 4.2	200	300	15	2	8	1	8
7	860	900	1200	Upto 2.1	150	600	15	2	6	1	6
8	860	900	1200	>2.1 to 2.4	150	600	15	2	6	1	8
9	860	900	1200	>2.4 to 2.7	150	600	15	2	8	1	8
10	860	900	1200	>2.7 to 3.3	150	600	15	2	8	1	10
11	860	900	1200	>3.3 to 3.6	150	600	15	2	10 *	1	12
12	860	900	1200	>3.6 to 4.2	150	600	15	2	10 *	1	16
13	1000	900	1200	Upto 3.9	200	600	15	2	8	1	10
14	1000	900	1200	>3.9 to 4.2	200	600	15	2	10	1	12

TABLE No. 4 : Channel Units Simply Supported, Non-Residential Buildings (f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 3000 N/m2	Weight of Flooring 1000 N/m2	Span in m	Depth of Unit in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span	
								Nos.	Dia (in mm)
1	580	900	300	Upto 3.6	150	300	15	2	8
2	750	900	300	Upto 3.9	200	300	15	2	8
3	750	900	300	>3.9 to 4.2	200	300	15	2	10
4	860	1800	600	Upto 2.7	150	600	15	2	8
5	860	1800	600	>2.7 to 3.3	150	600	15	2	10
6	860	1800	600	>3.3 to 3.9	150	600	15	2	12
7	1000	1800	600	Upto 3.9	200	600	15	2	10
8	1000	1800	600	>3.9 to 4.2	200	600	15	2	12
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)									
1	580	900	300	Upto 3.0	150	300	15	2	6
2	580	900	300	>3.0 to 3.6	150	300	15	2	8
3	750	900	300	Upto 4.2	200	300	15	2	8
4	860	1800	600	Upto 2.1	150	600	15	2	6
5	860	1800	600	>2.1 to 3.0	150	600	15	2	8
6	860	1800	600	>3.0 to 3.6	150	600	15	2	10
7	860	1800	600	>3.6 to 3.9	150	600	15	2	12
8	1000	1800	600	Upto 4.2	200	600	15	2	10

TABLE No. 5 : Channel Units Continuous Over Two Equal Spans, Non-Residential Buildings (f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 3000 N/m2	Weight of Flooring 1000 N/m2	Span in m	Depth of Unit in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia In mm	Nos.	Dia In mm
1	580	900	300	Upto 3.0	150	300	15	2	8	1	8
2	580	900	300	>3.0 to 3.6	150	300	15	2	8	1	10
3	580	900	300	>3.6 to 4.2	150	300	15	2	8	1	12
4	750	900	300	Upto 3.6	200	300	15	2	8	1	8
5	750	900	300	>3.6 to 4.2	200	300	15	2	8	1	10
6	860	1800	600	Upto 2.1	150	600	15	2	8	1	8
7	860	1800	600	>2.1 to 2.4	150	600	15	2	8	1	10
8	860	1800	600	>2.4 to 3.0	150	600	15	2	8	1	12
9	860	1800	600	>3.0 to 3.3	150	600	15	2	8 *	1	16
10	860	1800	600	>3.3 to 4.2	150	600	15	2	10 *	1	16
11	1000	1800	600	Upto 3.6	200	600	15	2	8	1	12
12	1000	1800	600	>3.6 to 3.9	200	600	15	2	8 *	1	16
13	1000	1800	600	>3.9 to 4.2	200	600	15	2	10 *	1	16

(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	580	900	300	Upto 2.4	150	300	15	2	6	1	6
2	580	900	300	>2.4 to 3.3	150	300	15	2	6	1	8
3	580	900	300	>3.3 to 3.6	150	300	15	2	6	1	10
4	580	900	300	>3.6 to 3.9	150	300	15	2	8	1	10
5	580	900	300	>3.9 to 4.2	150	300	15	2	8	1	12
6	750	900	300	Upto 3.9	200	300	15	2	6	1	8
7	750	900	300	>3.9 to 4.2	200	300	15	2	8	1	10
8	860	1800	600	Upto 2.1	150	600	15	2	6	1	8
9	860	1800	600	>2.1 to 2.7	150	600	15	2	6	1	10
10	860	1800	600	>2.7 to 3.3	150	600	15	2	8 *	1	12
11	860	1800	600	>3.3 to 3.6	150	600	15	2	8 *	1	16
12	860	1800	600	>3.6 to 4.2	150	600	15	2	10 *	1	16
13	1000	1800	600	Upto 3.9	200	600	15	2	8	1	12
14	1000	1800	600	>3.9 to 4.2	200	600	15	2	8 *	1	16

TABLE No. 6 : Channel Units Continuous Over Three Equal Spans, Non-Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 3000 N/m2	Weight of Flooring 1000 N/m2	Span in m	Depth of Unit in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia In mm	Nos.	Dia In mm
1	580	900	300	Upto 3.3	150	300	15	2	8	1	8
2	580	900	300	>3.3 to 3.9	150	300	15	2	8	1	10
3	580	900	300	>3.9 to 4.2	150	300	15	2	10	1	12
4	750	900	300	Upto 3.9	200	300	15	2	8	1	8
5	750	900	300	>3.9 to 4.2	200	300	15	2	8	1	10
6	860	1800	600	Upto 2.1	150	600	15	2	8	1	8
7	860	1800	600	>2.1 to 2.7	150	600	15	2	8	1	10
8	860	1800	600	>2.7 to 3.0	150	600	15	2	8	1	12
9	860	1800	600	>3.0 to 3.3	150	600	15	2	10	1	12
10	860	1800	600	>3.3 to 3.6	150	600	15	2	10 *	1	16
11	860	1800	600	>3.6 to 4.2	150	600	15	2	12*	1	16
12	1000	1800	600	Upto 3.9	200	600	15	2	10	1	12
13	1000	1800	600	>3.9 to 4.2	200	600	15	2	10 *	1	16
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	580	900	300	Upto 2.7	150	300	15	2	6	1	6
2	580	900	300	>2.7 to 3.3	150	300	15	2	6	1	8
3	580	900	300	>3.3 to 3.6	150	300	15	2	8	1	8
4	580	900	300	>3.6 to 4.2	150	300	15	2	8	1	10
5	750	900	300	Upto 3.6	200	300	15	2	6	1	8
6	750	900	300	>3.6 to 4.2	200	300	15	2	8	1	8
7	860	1800	600	Upto 2.4	150	600	15	2	6	1	8
8	860	1800	600	>2.4 to 3.0	150	600	15	2	8	1	10
9	860	1800	600	>3.0 to 3.3	150	600	15	2	8 *	1	12
10	860	1800	600	>3.3 to 3.9	150	600	15	2	10 *	1	16
11	860	1800	600	>3.9 to 4.2	150	600	15	2	12 *	1	16
12	1000	1800	600	Upto 3.6	200	600	15	2	8	1	10
13	1000	1800	600	>3.6 to 4.2	200	600	15	2	10	1	12

TABLE No. 7 : Channel Units with 40 mm Deck Concrete above; Simply Supported, Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 1500 N/m2	Weather Proof Tre.+ Deck Conc. 2000+1000 N/m2	Span in m	Depth of Unit + Deck Conc. in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span	
								Nos.	Dia (in mm)
1	500	450	900	Upto 3.6	170	300	15	2	8
2	500	450	900	>3.6 to 3.9	170	300	15	2	10
3	825	900	1800	Upto 2.7	170	600	15	2	8
4	825	900	1800	>2.7 to 3.3	170	600	15	2	10
5	825	900	1800	>3.3 to 3.9	170	600	15	2	12
6	825	900	1800	>3.9 to 4.2	170	600	15	2	16
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)									
1	500	450	900	Upto 3.0	170	300	15	2	6
2	500	450	900	>3.0 to 3.9	170	300	15	2	8

3	825	900	1800	Upto 2.1	170	600	15	2	6
4	825	900	1800	>2.1 to 3.0	170	600	15	2	8
5	825	900	1800	>3.0 to 3.6	170	600	15	2	10
6	825	900	1800	>3.6 to 4.2	170	600	15	2	12

TABLE No. 8 : Channel Units with 40 mm Deck Concrete above; Continuous Over Two Equal Spans, Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 1500 N/m2	Weather Proof Tre.+ Deck Conc. 2000+1000 N/m2	Span in m	Depth of Unit + Deck Conc. in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia In mm	Nos.	Dia In mm
1	500	450	900	Upto 3.0	170	300	15	2	8	1	8
2	500	450	900	>3.0 to 3.6	170	300	15	2	8	1	10
3	500	450	900	>3.6 to 4.2	170	300	15	2	8	1	12
4	825	900	1800	Upto 2.1	170	600	15	2	8	1	8
5	825	900	1800	>2.1 to 2.7	170	600	15	2	8	1	10
6	825	900	1800	>2.7 to 3.0	170	600	15	2	8	1	12
7	825	900	1800	>3.0 to 3.3	170	600	15	2	8 *	1	16
8	825	900	1800	>3.3 to 3.9	170	600	15	2	10 *	1	16
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	500	450	900	Upto 2.4	170	300	15	2	6	1	6
2	500	450	900	>2.4 to 3.3	170	300	15	2	6	1	8
3	500	450	900	>3.3 to 3.9	170	300	15	2	6	1	10
4	500	450	900	>3.9 to 4.2	170	300	15	2	8	1	12
5	825	900	1800	Upto 2.4	170	600	15	2	6	1	8
6	825	900	1800	>2.4 to 2.7	170	600	15	2	6	1	10
7	825	900	1800	>2.7 to 3.0	170	600	15	2	6	1	12
8	825	900	1800	>3.0 to 3.3	170	600	15	2	8	1	12
9	825	900	1800	>3.3 to 3.9	170	600	15	2	8 *	1	16

TABLE No. 9 : Channel Units with 40 mm Deck Concrete above; Continuous Over Three Equal Spans, Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 1500 N/m2	Weather Proof Tre.+ Deck Conc. 2000+1000 N/m2	Span in m	Depth of Unit + Deck Conc. in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia	Nos.	Dia
1	500	450	900	Upto 3.3	170	300	15	2	8	1	8
2	500	450	900	>3.3 to 4.2	170	300	15	2	8	1	10
3	825	900	1800	Upto 2.4	170	600	15	2	8	1	8
4	825	900	1800	>2.4 to 2.7	170	600	15	2	8	1	10
5	825	900	1800	>2.7 to 3.0	170	600	15	2	8	1	12
6	825	900	1800	>3.0 to 3.3	170	600	15	2	10 *	1	12
7	825	900	1800	>3.3 to 3.9	170	600	15	2	10 *	1	16
8	825	900	1800	>3.9 to 4.2	170	600	15	2	12 *	1	16
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	500	450	900	Upto 2.7	170	300	15	2	6	1	6
2	500	450	900	>2.7 to 3.6	170	300	15	2	6	1	8
3	500	450	900	>3.6 to 4.2	170	300	15	2	8	1	10
4	825	900	1800	Upto 2.4	170	600	15	2	6	1	8
5	825	900	1800	>2.4 to 3.0	170	600	15	2	8	1	10
6	825	900	1800	>3.0 to 3.3	170	600	15	2	8	1	12
7	825	900	1800	>3.3 to 3.6	170	600	15	2	10	1	12
8	825	900	1800	>3.6 to 4.2	170	600	15	2	10 *	1	16

TABLE No. 10 : Channel Units with 40 mm Deck Concrete above; Simply Supported, Non-Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 3000 N/m2	Weather Proof Tre.+ Deck Conc. 1000+1000 N/m2	Span in m	Depth of Unit + Deck Conc. in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span	
								Nos.	Dia
1	500	900	600	Upto 3.6	170	300	15	2	8
2	500	900	600	>3.6 to 3.9	170	300	15	2	10
3	825	1800	1200	Upto 2.4	170	600	15	2	8
4	825	1800	1200	>2.4 to 3.3	170	600	15	2	10
5	825	900	1200	>3.3 to 3.9	170	600	15	2	12
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)									
1	500	900	600	Upto 3.0	170	300	15	2	6
2	500	900	600	>3.0 to 3.9	170	300	15	2	8
3	825	1800	1200	Upto 2.1	170	600	15	2	6
4	825	1800	1200	>2.1 to 2.7	170	600	15	2	8
5	825	1800	1200	>2.7 to 3.6	170	600	15	2	10
6	825	1800	1200	>3.6 to 3.9	170	600	15	2	12

TABLE No. 11 : Channel Units with 40 mm Deck Concrete above; Continuous Over Two Equal Spans, Non-Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 3000 N/m2	Weather Proof Tre.+ Deck Conc. 1000+1000 N/m2	Span in m	Depth of Unit + Deck Conc. in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia	Nos.	Dia
1	500	900	600	Upto 2.7	170	300	15	2	8	1	8
2	500	900	600	>2.7 to 3.6	170	300	15	2	8	1	10
3	500	900	600	>3.6 to 4.2	170	300	15	2	8	1	12
4	825	1800	1200	Upto 2.1	170	600	15	2	8	1	8
5	825	1800	1200	>2.1 to 2.4	170	600	15	2	8	1	10
6	825	1800	1200	>2.4 to 3.0	170	600	15	2	8 *	1	12
7	825	1800	1200	>3.0 to 3.3	170	600	15	2	8 *	1	16
8	825	1800	1200	>3.3 to 3.9	170	600	15	2	10 *	1	16
(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	500	900	600	Upto 2.4	170	300	15	2	6	1	6
2	500	900	600	>2.4 to 3.0	170	300	15	2	6	1	8
3	500	900	600	>3.0 to 3.9	170	300	15	2	6	1	10
4	500	900	600	>3.9 to 4.2	170	300	15	2	8	1	12
5	825	1800	1200	Upto 2.1	170	600	15	2	6	1	8
6	825	1800	1200	>2.1 to 2.7	170	600	15	2	6	1	10
7	825	1800	1200	>2.7 to 3.0	170	600	15	2	8	1	12
8	825	1800	1200	>3.0 to 3.6	170	600	15	2	8 *	1	16
9	825	1800	1200	>3.6 to 3.9	170	600	15	2	10 *	1	16

TABLE No. 12 : Channel Units with 40 mm Deck Concrete above; Continuous Over Three Equal Spans, Non-Residential Buildings
(f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2)

Sl. No.	Self Wt. N/m2	Live-Load 3000 N/m2	Weather Proof Tre.+ Deck Conc. 1000+1000 N/m2	Span in m	Depth of Unit + Deck Conc. in mm	Width of Unit in mm	Effective Cover in mm	Assume Bars Mid Span		Assume Bars Support Sec.	
								Nos.	Dia	Nos.	Dia
1	500	900	600	Upto 3.0	170	300	15	2	8	1	8
2	500	900	600	>3.0 to 3.9	170	300	15	2	8	1	10
3	500	900	600	>3.9 to 4.2	170	300	15	2	10	1	12
4	825	1800	1200	Upto 2.1	170	600	15	2	8	1	8
5	825	1800	1200	>2.1 to 2.7	170	600	15	2	8	1	10
6	825	1800	1200	>2.7 to 3.0	170	600	15	2	10	1	12
7	825	1800	1200	>3.0 to 3.6	170	600	15	2	10 *	1	16
8	825	1800	1200	>3.6 to 3.9	170	600	15	2	12 *	1	16

(f_{ck} = 20 N/mm^2, f_y = 500 N/mm^2)											
1	500	900	600	Upto 2.7	170	300	15	2	6	1	6
2	500	900	600	>2.7 to 3.3	170	300	15	2	6	1	8
3	500	900	600	>3.3 to 4.2	170	300	15	2	8	1	10
4	825	1800	1200	Upto 2.4	170	600	15	2	6	1	8
5	825	1800	1200	>2.4 to 3.0	170	600	15	2	8	1	10
6	825	1800	1200	>3.0 to 3.3	170	600	15	2	8	1	12
7	825	1800	1200	>3.3 to 3.9	170	600	15	2	10 *	1	16

Table No. 13 : Stirrups & Reinforcement for Channel Units

Stirrups for 300 wide units are 3 mm dia bars @ 300 mm c/c
Stirrups for 600 wide units are 6 mm dia bars @ 150 mm c/c
Reinforcement for 300 wide units is 2 Nos. 6 mm dia bars
Reinforcement for 600 wide units is 2 Nos. 8 mm dia bars

NOTE : * Bottom bars of units of adjacent spans to be projected out and to be welded together. When the actual moment is greater than the moment of resistance due to the support reinforcement, the section has to be designed as a doubly reinforced section. The bottom reinforcement in the units are to be welded at support to act as compression reinforcement, and they are designated by (*) in the tables. Once they are welded the section will be safe for the support moment.

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