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(Reaffirmed 1998)

Indian Standard

SPECIFICATION FOR PRECAST REINFORCED CONCRETE DOOR AND WINDOW FRAMES

(First Revision)

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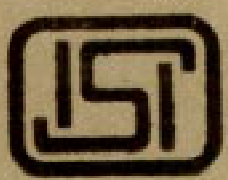

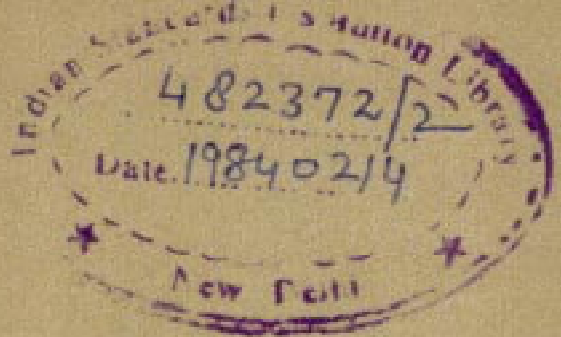

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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November 1983

Indian Standard

SPECIFICATION FOR PRECAST REINFORCED CONCRETE DOOR AND WINDOW FRAMES

(First Revision)

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(*Continued on page* 19)

Indian Standard

SPECIFICATION FOR PRECAST REINFORCED CONCRETE DOOR AND WINDOW FRAMES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 28 February 1983, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The increasing scarcity and high cost of good timber has considerably increased the utility of precast reinforced cement concrete door and window frames, which are not only durable but also appreciably economical and easy to manufacture. Precast reinforced concrete frames for doors and windows will be found specially useful where provisions for such frames have to be made on a mass scale as in the case of large residential housing colonies.

0.3 This standard was first published in 1972 to provide guidance in the manufacture and supply of precast reinforced concrete door and window frames of suitable finish and quality and with reliable fixing arrangements for door and window shutters.

0.3.1 This revision has been prepared with a view to modifying some of the requirements in the light of experience gained in the use of this standard both by the manufacturers and the users. The major modifications in this revision include covering an additional method of fixing hinges to frames, specifying tolerances for the cross-section of the frames and giving reference to latest Indian Standards in the related provisions.

0.4 The use of precast reinforced concrete door and window frames is recommended to be restricted to a maximum opening width of 2·25 m.

0.5 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements for precast reinforced concrete door and window frames.

2. SHAPE AND DIMENSIONS

2.1 Precast reinforced concrete door and window frames shall be 60 × 100 mm or 70 × 75 mm in cross-section for single shutter door and 60 × 120 mm for double shutter door, the cross-section being generally in accordance with Fig. 1 and 3. The overall sizes (width and height) of the frames shall conform to the requirements of IS : 4021-1976†.

NOTE 1 — Suitable adjustment in cross-sectional shape may be made by agreement between the purchaser and the supplier to provide suitable groove for wall plaster, etc, provided the overall dimensional requirements given above are not affected.

NOTE 2 — For overall dimensions of the frame, the width of the frame shall be the total length of the horizontal piece measured out-to-out; the height of the frame shall be the total height measured from the lowest end of the vertical piece (in case of three member frame or the outer edge of the lower horizontal member in case of four member frame) to the outer edge of the top horizontal piece (*see* Fig. 2).

2.1.1 *Tolerances* — A tolerance of ±2 mm shall be permitted on the cross-sectional dimensions of the frames.

3. MATERIALS

3.1 The materials used for the manufacture of precast reinforced concrete door and window frames shall comply with the requirements given in Table 1.

3.2 Aggregates — The aggregates used shall consist of well-graded mixture of clean coarse and fine aggregates. The nominal maximum size of coarse aggregates shall not exceed 10 mm.

3.2.1 Where specified, a sample of the aggregates shall be submitted to the purchaser for approval.

3.3 Concrete — The mix proportion of the concrete shall be determined by the manufacturer and shall be such as to produce a dense concrete not weaker than grade M 20 (*see* IS : 456-1978‡).

*Rules for rounding off numerical values (*revised*).
†Specification for timber door, window and ventilator frames (*first revision*).
‡Code of practice for plain and reinforced concrete (*third revision*).

3.4 Reinforcement — Steel reinforcement shall be minimum of 3 bars of 6 mm dia or equivalent of about 1·5 percent of the sectional area of the concrete member (*see* Fig. 1).

3.4.1 Reinforcement shall be clean and free from loose millscale, loose rust, mud, oil, grease or any other coating which may reduce the bond between the concrete and steel. A slight film of rust may not be regarded as harmful but the steel shall not be visibly pitted by rust.

4. MANUFACTURE

4.1 Construction and Finish

4.1.1 Each frame shall be made of concrete proportioned, mixed, placed and compacted by vibration/pressing to give a dense concrete free from voids and honeycombing.

NOTE — Compaction by vibration may be done using a vibrating table or a shutter vibrator.

4.1.2 Each member of the frame shall have a dense surface finish showing no coarse aggregate and shall have no crevices likely to assist in the disintegration of concrete or rusting of steel by the action of natural agencies.

TABLE 1 REQUIREMENTS FOR MATERIALS

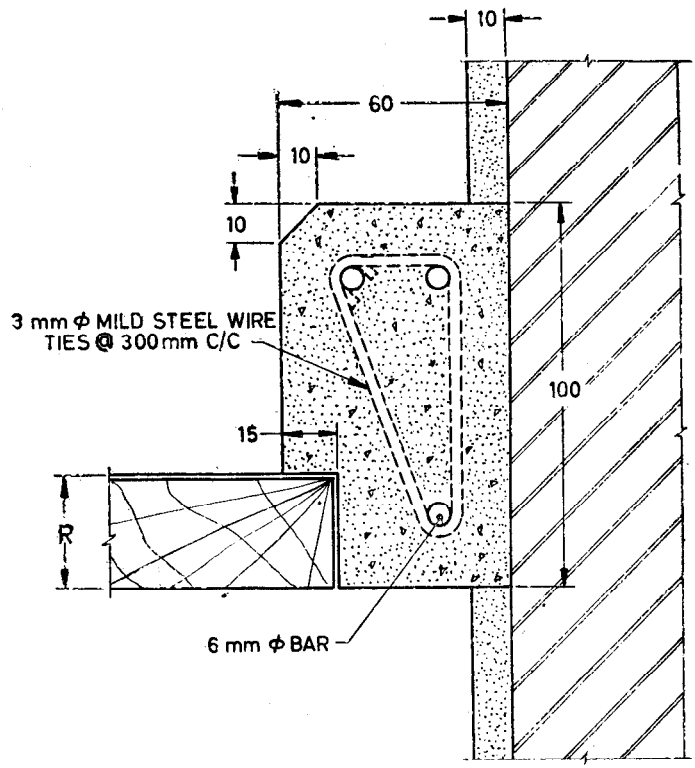
(*Clause* 3.1)

SL NO.	MATERIAL	REF TO INDIAN STANDARD*
i)	Cement shall be ordinary Portland cement or Portland slag cement or Portland pozzolana cement or rapid-hardening Portland cement or high strength ordinary Portland cement	IS : 269-1976, IS : 455-1976, IS : 1489-1976, IS : 8041-1978 and IS : 8112-1976
ii)	Water	IS : 456-1978
iii)	Concrete aggregate	IS : 383-1970 and IS : 456-1978
iv)	Concrete	IS : 456-1978, IS : 516-1959 and IS : 1199-1959
v)	Reinforcement	IS : 432 (Part I)-1966, IS : 1139-1966 and IS : 1786-1979
vi)	Mild steel wire	IS : 280-1978

*For titles of Indian Standards, *see* Appendix A.

4.1.3 While a good finish may generally be obtained by using smooth surface moulds and proper vibration of concrete, any small defects remaining may be removed by rubbing with carborundum stone before erection of the frame. Plastering or touching shall not be done under any circumstances.

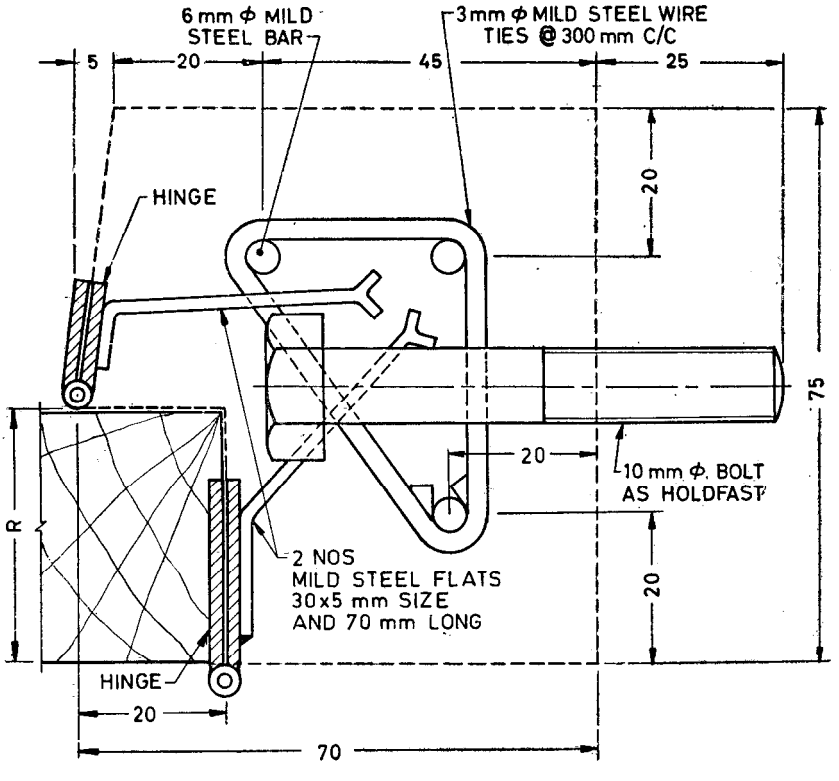
4.1.4 By mutual agreement between the purchaser and the supplier decorative treatment, such as painting or terrazzo finish may be given to the three exposed surfaces of the frame; the terrazzo finish shall be given while casting the frame.



R = 30, 35 or 40 mm depending upon the thickness of shutter

1A Typical Cross Section of Precast Reinforced Concrete Door and Window Frame Showing Reinforcement

FIG. 1 REINFORCED CONCRETE DOOR AND WINDOW FRAME — *Contd*



R = 30, 35 or 40 mm depending upon the thickness of shutter.

NOTE — Instead of bolts for holdfast, mild steel rod 10 mm dia may be embedded in concrete and the projected pieces may be bent after casting.

1B Alternative Details of Precast Reinforced Concrete Door and Window Frame Showing Arrangement for Reinforcement, Holdfasts and Hinges

All dimensions in millimetres.

FIG. 1 REINFORCED CONCRETE DOOR AND WINDOW FRAME

4.2 Positioning of Reinforcement — The vertical as well as the horizontal members of the frame shall be reinforced with longitudinal bars as in **3.4**. The longitudinal reinforcement for each of the vertical or horizontal member shall be in one piece. The longitudinal bar shall be firmly held by means of at least 3 mm dia steel ties spaced at not more than 300 mm centre to centre.

4.2.1 *Cover* — The longitudinal reinforcement shall have a minimum clear cover of 12 mm or twice the diameter of the main bar, whichever is more.

4.3 Casting

4.3.1 The entire frame may be cast complete in one piece or each of the vertical and horizontal members of the frame may be cast separately to be assembled into the complete frame at site. The former method has the advantage of reducing the work at site but introduces difficulties in fabrication of the moulds, and also in transporting and handling of the complete frame; there is likelihood of damage to the frame during transit. Since damage to even one member will result in the rejection of the whole frame, the latter method is relatively simple and economical.

4.3.1.1 When the frame is cast in separate parts (*see* Fig. 2), one of the reinforcing bars of the vertical members of the frame shall be kept projecting so as to tennon into the corresponding holes in the horizontal member. The hole in the horizontal member for taking the projecting reinforcement from the vertical members shall be slightly larger than the bar diameter to facilitate easy insertion of the projecting bar. After assembly at site the holes shall be grouted with cement slurry 1:1½ (cement : sand).

4.3.2 *Mould* — The mould for casting shall be of steel or of good quality timber suitably lined with iron sheet or of any other suitable material which shall ensure adequate surface finish of the cast frame. Provision shall be made in the mould to accommodate fixing devices for hinges and the holdfasts. If required, suitable rebate may also be provided to act as plaster groove.

4.4 Curing — After placing, the concrete shall be adequately protected, during setting and in the first stages of hardening, from shocks, running or surface water and the harmful effects of sunshine, drying winds and cold. The concrete shall be cured for at least 7 days unless special curing methods are adopted. Steam curing of concrete may be adopted if so desired by the manufacturer, provided the requirements of pressure or non-pressure steam curing are fulfilled.

NOTE — For non-pressure steam curing, the frames shall be subjected to the action of saturated steam at a temperature of 60 to 80°C for a period of 16 to 18 h; or for such additional time as may be necessary to enable the frame to meet the strength requirements. When a curing chamber is not available, frames shall be placed in an enclosure of canvas or other closely woven material and subjected to saturated steam at the temperature and for the time specified above. The enclosure shall be so erected as to allow full circulation of steam around the entire frame. The interior surface of the curing room or canvas jacket and the surface of the frames shall be entirely moist at all times.

4.4.1 *Maturing* — From the date of casting, the frames shall be matured for the following period (including the period of curing) depending on the type of cement used for manufacture of the frames before testing or despatch:

Ordinary Portland cement or Portland slag cement or Portland pozzolana cement	28 days
Rapid-hardening Portland cement or high-strength ordinary Portland cement	14 days

4.4.2 *Minimum Strength of Concrete for Handling of Frames* — The concrete shall have sufficient strength to prevent damage to units when first handled.

5. ARRANGEMENTS FOR FIXING OF HINGES TO FRAMES

5.1 Suitable arrangements for fixing of hinges shall be provided in the frame by any one of the methods described in **5.2** to **5.6** or any other equally suitable method approved by the purchaser. If so required by the purchaser, the frames supplied shall be complete with the required number of hinges fixed in position.

5.1.1 All the exposed area of hinges, holdfast and other steel fixtures shall be painted with anti-corrosive paint, before casting, to prevent rusting.

5.2 Fixtures for Hinges

5.2.1 *Aluminium Tube Fixture* — Aluminium tube sleeve having internal threading and length to suit 5 mm machine screw (*see* IS : 1365-1978*) shall be taken and the rear end of the tube sleeve shall be pressed flat. Threading in the tube may be done by holding the tube in a vice. A number of such sleeves shall be made, one sleeve for each screw hole of the hinge (*see* Fig. 2). The sleeves shall be inserted in the moulds from the inner side and the flattened ends of adjacent tubes shall be kept facing in different directions for better bond. Screws shall be inserted in the tubes from outside of the mould to keep the fitting in position during pouring of concrete and also to prevent concrete from getting into the tube. After

*Specification for slotted countersunk head screws (*third revision*).

completion of casting, curing and maturing of the frame, the screws shall be withdrawn from the frame, the hinges placed in position and screws tightened in position to fix the hinges (*see* Fig. 3A).

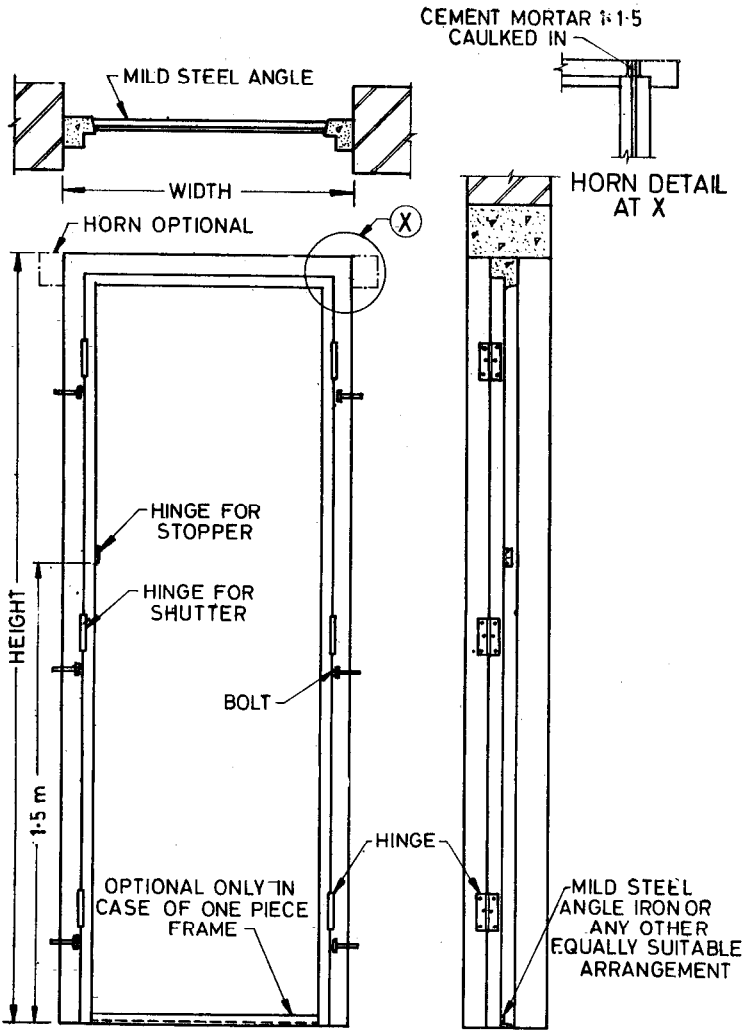
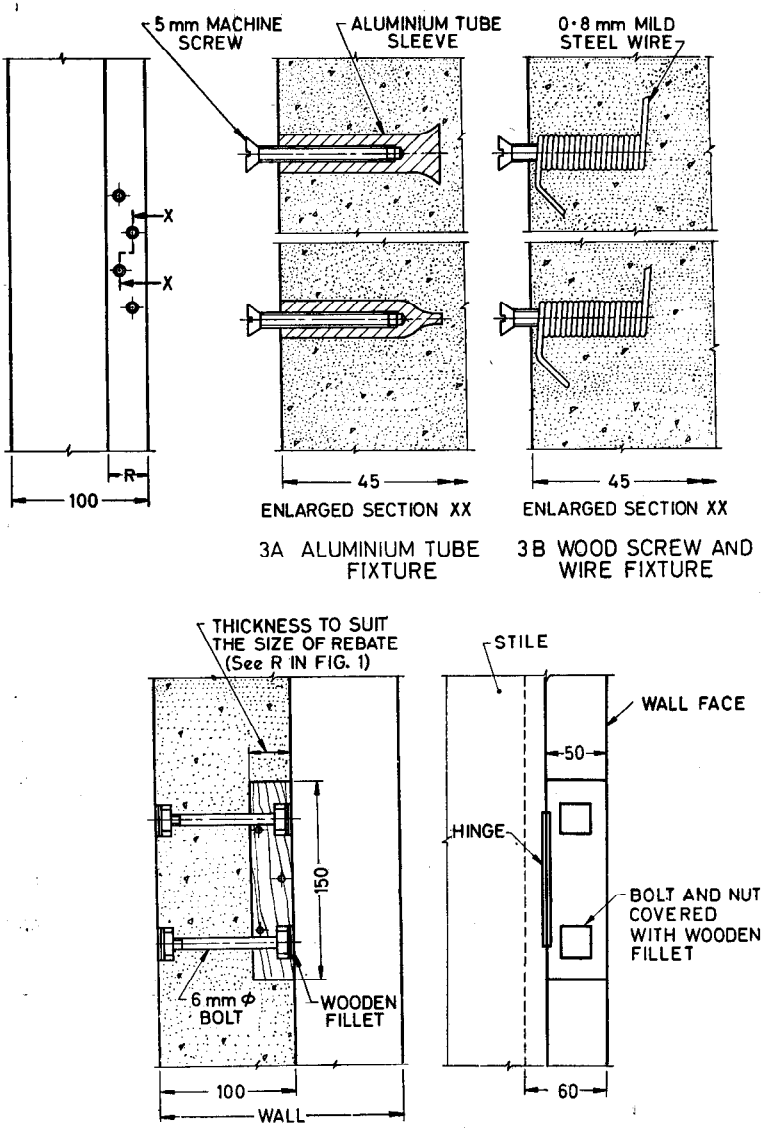
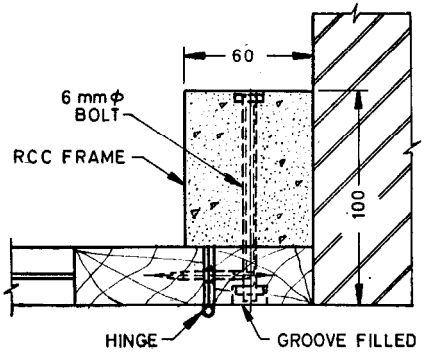


FIG. 2 OVERALL DIMENSIONS OF PRECAST REINFORCED CONCRETE DOOR FRAME

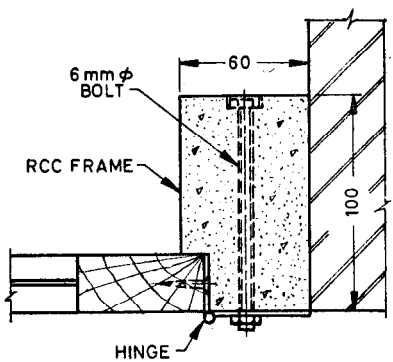


All dimensions in millimetres.

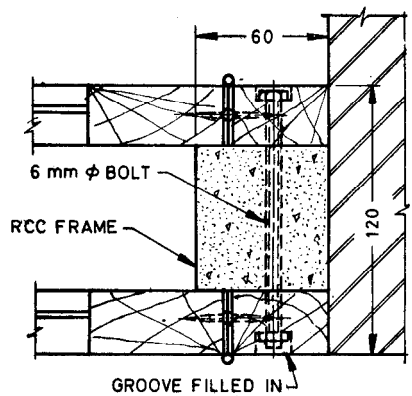
FIG. 3 ARRANGEMENTS FOR FIXING HINGES TO PRECAST REINFORCED CONCRETE DOOR AND WINDOW FRAMES — *Contd*



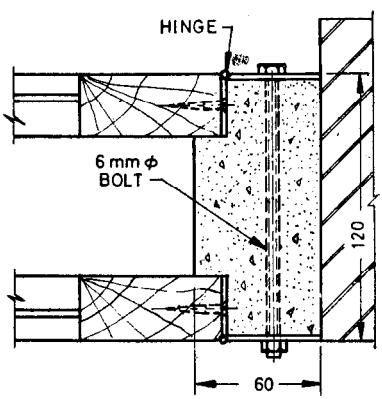
3D HINGE FIXED ON TIMBER FRAME



3F HINGE FIXED DIRECTLY ON RCC FRAME



3E HINGE FIXED ON TIMBER FRAME (DOUBLE SHUTTER RCC FRAME)



3G HINGE FIXED DIRECTLY ON RCC FRAME (DOUBLE SHUTTER RCC FRAME)

All dimensions in millimetres.

FIG. 3 ARRANGEMENTS FOR FIXING HINGES TO PRECAST REINFORCED CONCRETE DOOR AND WINDOW FRAMES

5.2.2 For facilitating proper and easy fixing of hinges, the hinges may be supplied by the manufacturer alongwith the frame.

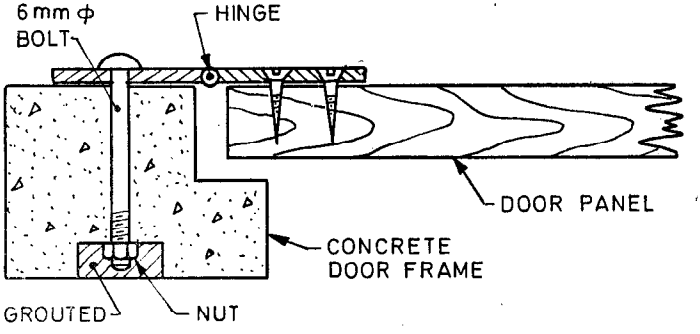
5.3 Wire Fixture — Mild steel wire conforming to IS : 280-1978* and of thickness 0·8 mm shall be helically wound on a wood screw, the size of the wood screw being selected to suit the hinges (*see* IS : 1341-1976† and

*Specification for mild steel wire for general engineering purposes (*third revision*).
†Specification for steel butt hinges (*third revision*).

IS : 451-1972*). For this purpose, the screw shall be held in a vice and the wire wound around it till the wire covers the screw and trails out by about 15 mm on either end of the screw. The wire along with the screw (one fixture for each screw hole of the hinge) shall be left in position in the mould at the place where hinges are to be fixed to the frame (*see* **5.2.1**). After completion of casting, curing and maturing of the frame, the screws shall be withdrawn from the frame, the hinges placed in position and screws tightened in position to fix the hinges (*see* Fig. 3B).

5.4 Hardwood Block Fixture — Hardwood blocks of suitable timber such as well seasoned teak wood 150 mm long, 45 or 50 mm × 30 to 40 mm in cross-sections with suitable holes to allow for insertion of two 6 mm mild steel bolts shall be used. Suitable spacers shall be kept in the mould while casting the frame so that one block for each of the hinge can be fixed in position with 6 mm mild steel bolts, nuts and washers, after the frame has been cast, cured and matured. After tightening the nuts, the bolt heads and the nuts shall be suitably covered with hard wood fillets, finished flush with concrete surfaces of the frame (*see* Fig. 3C). Alternative arrangement of wooden framing as shown in Fig. 3D and 3E may be adopted.

5.5 Hinge Directly Attached to Frame — *L* type flap hinge may be attached directly to the reinforced cement concrete frame with the help of 6 mm ϕ mild steel bolt (*see* Fig. 3F, 3G and 3H).



3H HINGE FIXED DIRECTLY ON RCC FRAME

All dimensions in millimetres.

FIG. 3 ARRANGEMENTS FOR FIXING HINGES TO PRECAST REINFORCED CONCRETE DOOR AND WINDOW FRAMES

*Specification for technical supply conditions for wood screws (*second revision*).

5.6 Hinge Welded to Frame — The hinge may be welded to 2 numbers mild steel flat 30 × 5 mm size and 70 mm long, embedded in the reinforced concrete frame (*see* Fig. 1B). Gas welding is recommended in the case of welding of hinges to the mild steel plates.

6. ARRANGEMENTS FOR DOOR AND WINDOW FIXTURES

6.1 Suitable arrangements shall be provided in the frame for receiving tower bolts, sliding bolts and other door and window fixtures; one such arrangement is shown in Fig. 4.

7. ERECTION

7.1 When a three-piece frame is used, the vertical members shall be held in position as in case of timber frames and they shall be plumbed and aligned, and firmly supported till the concrete around the holdfasts in the masonry has properly set and hardened. The concrete frames being heavier require little extra care in handling, the joints are liable to give way, if not handled carefully.

7.1.1 Alternatively, the vertical members may be held in position and the top member placed over the vertical members. The whole frame is plumbed and aligned, and supported temporarily till the concrete around holdfasts has properly set and hardened.

7.2 Where a four-piece frame as in the case of window frames or door frames having sills, is used, the bottom members shall be first placed in position and the others erected on this base.

7.3 Cement slurry 1:1½ (cement : sand) shall be used in grouting the joints between the vertical and horizontal members of door frame (*see* Fig. 2). Alternatively, chemical loading agents such as epoxy resins may be used.

8. SAMPLING AND INSPECTION

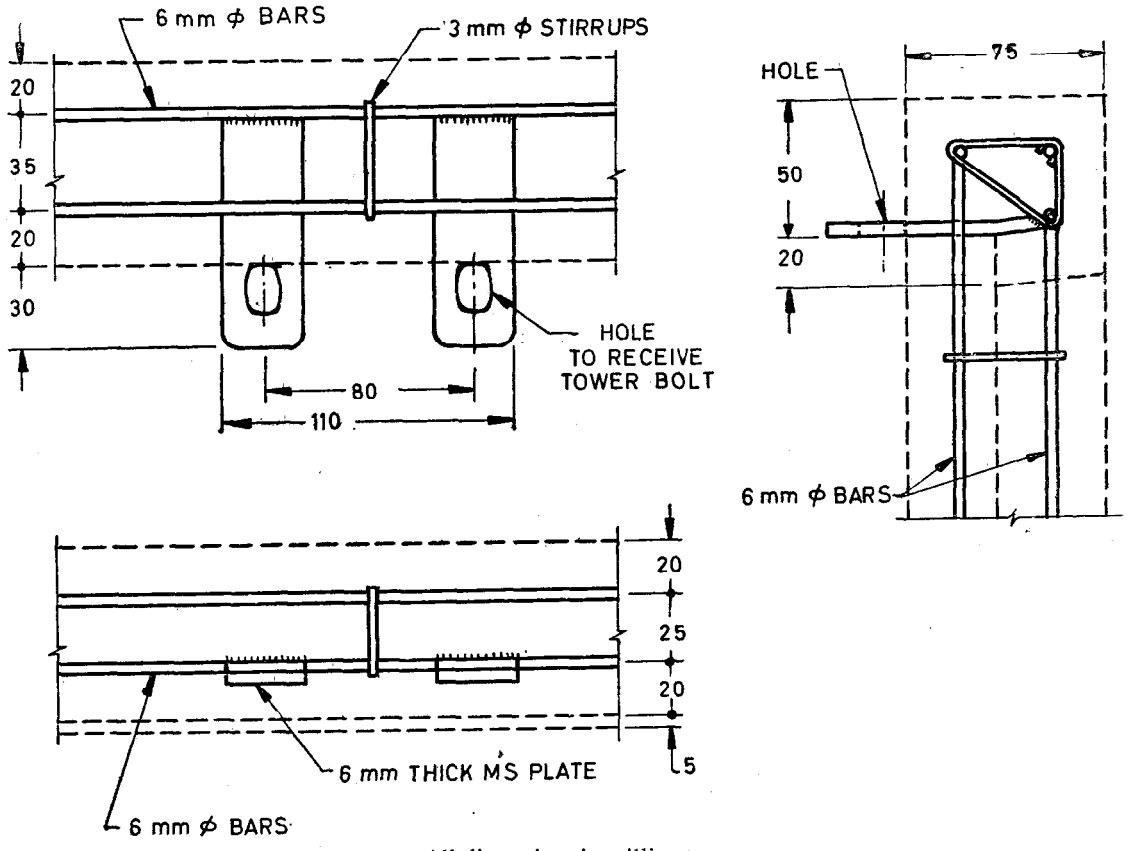
8.1 The method of drawing representative samples and the criteria for conformity shall be as described in Appendix B.

9. MANUFACTURER'S CERTIFICATE

9.1 The manufacturer shall satisfy himself that the frames conform to the requirements of this specification and if requested, shall supply a certificate to this effect to the purchaser or his representative.

10. MARKING

10.1 The frame shall be clearly and indelibly marked with the following information on the face of the frame coming in contact with the masonry:



All dimensions in millimetres.

FIG. 4 METHOD OF FIXING TOWER BOLTS TO RCC FRAMES

a) Manufacturer's name or trade-mark,

b) Year of manufacture, and

c) Overall height and width of frame.

10.1.1 Each frame may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(*Table* 1)

TITLES OF INDIAN STANDARDS

IS : 269-1976 Specification for ordinary and low heat Portland cement (*third revision*)

IS : 280-1978 Specification for mild steel wire for general engineering purposes (*third revision*)

IS : 383-1970 Specification for coarse and fine aggregates from natural sources for concrete (*second revision*)

IS : 432 (Part I)-1966 Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement : Part I Mild steel and medium tensile steel bars (*second revision*)

IS : 455-1976 Specification for Portland slag cement (*third revision*)

IS : 456-1978 Code of practice for plain and reinforced concrete (*third revision*)

IS : 516-1959 Methods of test for strength of concrete

IS : 1139-1966 Specification for hot rolled mild steel, medium tensile steel and high yield strength steel deformed bars for concrete reinforcement (*revised*)

IS : 1199-1959 Methods of sampling and analysis of concrete

IS : 1489-1976 Specification for Portland-pozzolana cement (*second revision*)

IS : 1786-1979 Specification for cold-worked steel high strength deformed bars for concrete reinforcement (*second revision*)

IS : 8041-1978 Specification for rapid hardening Portland cement (*first revision*)

IS : 8112-1976 Specification for high strength ordinary Portland cement

APPENDIX B

(*Clause* 8.1)

SAMPLING AND CRITERIA FOR CONFORMITY

B-1. SCALE OF SAMPLING

B-1.1 Lot — In any batch, all frames of the same type and same dimensions shall be grouped together to constitute a lot.

B-1.1.1 *Sub-lot* — If the number of frames in a lot exceed 500, the lot shall be divided into a suitable number of sub-lots such that the number of frames in any sub-lot shall not exceed 500. The acceptance or otherwise of a sub-lot shall be determined on the basis of sample selected from it.

B-1.1.2 The number of frames to be selected from a lot or a sub-lot shall depend upon its size and shall be in accordance with col 1 and 2 of Table 2.

B-1.1.3 The frames shall be selected at random. In order to ensure randomness, all the frames in the lot or the sub-lot may be arranged in a serial order and starting from any frame, every rth frame may be included in the sample, r being the integral part of N/n, where N is the size of the lot or the sub-lot and n the sample size.

B-2. NUMBER OF TESTS

B-2.1 All the frames as selected in **B-1.1.2** shall be tested for overall length, cross-section and uprightness.

B-3. CRITERIA FOR CONFORMITY

B-3.1 A lot or a sub-lot shall be considered as conforming to this specification if the conditions under **B-3.2** are satisfied.

B-3.2 The number of frames which do not satisfy the requirements of overall length, cross-section and uprightness shall not exceed the corresponding number given in col 3 of Table 2. If the number of such frames exceed the corresponding number; all frames in the lot or sub-lot shall be tested for these requirements and those not satisfying the requirements shall be rejected.

TABLE 2 SAMPLE SIZE AND CRITERIA FOR CONFORMITY

(*Clauses* B-1.1.2 and B-3.2)

Size of Lot or Sub-lot	Dimensional Requirements	
	Sample Size	Permissible
N	*n*	No. of Defects
(1)	(2)	(3)
Up to 100	10	1
101 to 200	15	1
201 to 300	20	2
301 to 500	30	3

(*Continued from page* 2)

Precast Concrete Products Subcommittee, BDC 2 : 9

Convener	*Representing*
SHRI G. K. MAJUMDAR	Hindustan Prefab Ltd, New Delhi
Members	
DEPUTY DIRECTOR, STANDARDS (B&S)	Research, Designs & Standards Organization, (Ministry of Railways), Lucknow
ASSISTANT DIRECTOR, STANDARDS (B&S-II) (*Alternate*)	
DIRECTOR	Central Soil and Materials Research Station, New Delhi
DEPUTY DIRECTOR (*Alternate*)	
SHRI Z. GEORGE	Structural Engineering Research Centre (CSIR), Madras
DR A. G. MADHAVA RAO (*Alternate*)	
SHRI V. G. GOKHALE	Bombay Chemicals Pvt Ltd, Bombay
SHRI B. K. JINDAL	Central Building Research Institute (CSIR), Roorkee
DR S. S. REHSI (*Alternate*)	
SHRI L. C. LAI	In personal capacity (*B/17, West End, New Delhi*)
SHRI S. NAHEROY	Engineering Construction Corporation Ltd, Madras
SHRI A. RAMAKRISHNA (*Alternate*)	
SHRI D. B. NAIK	Engineer-in-Chief's Branch, Army Headquarters
SHRI SUCHA SINGH (*Alternate*)	
SHRI K. K. NAMBIAR	In personal capacity (*'Ramanalaya' 11 First Crescent Park Road, Gandhinagar, Adyar, Madras*)
SHRI B. V. B. PAI	The Concrete Association of India, Bombay
SHRI P. SRINIVASAN (*Alternate*)	
SHRI H. S. PASRICHA	Hindustan Prefab Ltd, New Delhi
DR N. RAGHAVENDRA	Cement Research Institute of India, New Delhi
SHRI V. RAMALINGAM	Neyveli Lignite Corporation Ltd, Neyveli
SHRI K. A. RAMABHADRAN (*Alternate*)	
DR A. V. R. RAO	National Buildings Organization, New Delhi
SHRI J. SEN GUPTA (*Alternate*)	
SHRI B. G. SHIRKE	B. G. Shirke & Co Ltd, Pune
SHRI U. S. DURGAKERI (*Alternate*)	
SHRI C. N. SRINIVASAN	C. R. Narayana Rao, Madras
SHRI C. N. RAGHAVENDRAN (*Alternate*)	
SUPERINTENDING ENGINEER (P&S)	Tamil Nadu Housing Board, Madras
PROJECT OFFICER (*Alternate*)	
SUPERINTENDING SURVEYOR OF WORKS (NZ)	Central Public Works Department, New Delhi
SURVEYOR OF WORKS (NZ) (*Alternate*)	

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2