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*Indian Standard*

CODE OF PRACTICE FOR  
CONSTRUCTION OF JACK-ARCH TYPE OF  
BUILT-UP FLOOR OR ROOF

( *First Revision* )

UDC 69·023·6 : 69·024·4 + 69·025·4 : 006·76



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*Indian Standard*

**CODE OF PRACTICE FOR  
CONSTRUCTION OF JACK-ARCH TYPE OF  
BUILT-UP FLOOR OR ROOF**

*( First Revision )*

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*Indian Standard*

**CODE OF PRACTICE FOR  
CONSTRUCTION OF JACK-ARCH TYPE OF  
BUILT-UP FLOOR OR ROOF**

*( First Revision )*

**0. FOREWORD**

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 24 November 1980, after the draft finalized by the Building Construction Practices Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** This standard was first published in 1962. The present revision was taken up with a view to incorporating the modifications necessary as a result of experience gained during the use of this standard and publication of separate standards on materials used in this type of construction. The important changes made in the revision are given below:

- a) A suitable cement mortar mix for laying of bricks on edge in jack-arch has been specified. A smaller rise of the jack-arch has been permitted based on the existing practice.
- b) The method of preparation of lime concrete for laying over the jack-arch has been laid down. An alternate lime concrete mix as well as method of its preparation has also been included to recognize the existing practice in some parts of the country.
- c) The method for finishing such roof or floor with tiles has been dealt in detail. The specification of a suitable waterproofing additive and its method of use has also been specified.
- d) The requirement of hand beater necessary for compaction of the roof or floor has been included.

**0.3** The 'jack-arch' floor or roof is a type of composite construction consisting of a row of brick arches with a small rise and having lime concrete layer over it. In addition to the strength of the arches, the jack-arch floor or roof derives strength from the lime concrete layer by

virtue of the latter's bond development with the bricks. It occupies a depth a little more than flat terrace construction and, therefore, may be suited only where the ceiling heights are enough to permit such encroachments.

**0.4** The Sectional Committee responsible for the preparation of this standard has taken into consideration the views of builders and technologists and has related the standard to the building practice in this country.

**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.

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## 1. SCOPE

**1.1** This standard covers the design and construction of jack-arch type of built-up floor or roof.

**1.2** This standard covers only the construction practices that are in general use in this country.

## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Brick Jack-Arch** — This is a low arch constructed with bricks laid on edge, springing from the lower flanges of 'I' shaped joists spaced suitably and tied with mild steel rods at suitable intervals.

**2.2 Broken Brick Coarse Aggregate** — Aggregate prepared from the well burnt broken bricks conforming to IS : 1077-1976†.

**2.3 Hand Beater** — A wooden piece of triangular cross section used manually for beating and compacting lime concrete.

**2.4 Jack-Arch Floor or Roof** — A type of built-up floor or roof supported by jack-arches, having a levelling course of lime broken brick aggregate concrete laid over them and finished with a suitable floor or roof finish.

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

†Specification for common burnt clay building bricks (*third revision*).

**2.5 Lime** — For definitions relating to building lime, reference may be made to IS : 6508-1972\*.

**2.6 Lime Broken Brick Aggregate Concrete** — A mixture of lime mortar or lime pozzolana mortar and coarse aggregates.

**2.7 Tie Rod** — A mild steel tension rod with its ends fixed to two consecutive joist sections so as to pull them together and relieve the thrust of the jack-arch coming on them.

### 3. MATERIALS AND TOOLS

**3.1 Bricks** — These shall conform to IS : 1077-1976†.

NOTE — Bricks of size 190 × 90 × 40 mm will be found suitable for jack-arch construction.

**3.2 Broken Brick Coarse Aggregate** — This shall conform to the requirements given in IS : 3068-1975‡ (see also 2.2).

### 3.3 Fine Aggregate

**3.3.1** Sand for use in lime concrete shall conform to IS : 383-1970§.

**3.3.2** Fine brick aggregate shall conform to IS : 3182-1975||.

**3.4 Cement** — This shall conform to either IS : 269-1976¶ or IS : 455-1976\*\* or IS : 1489-1976††.

**3.5 Crude Oil** — The crude oil used for waterproofing lime concrete shall comply with the requirements given in Appendix A.

**3.6 Lime** — This shall conform to IS : 712-1973‡‡.

\*Glossary of terms relating to building lime.

†Specification for common burnt clay building bricks (*third revision*).

‡Specification for broken brick (burnt clay) coarse aggregate for use in lime concrete (*first revision*).

§Specification for coarse and fine aggregates from natural sources for concrete (*second revision*).

||Specification for broken brick (burnt clay) fine aggregate for use in lime mortar (*first revision*).

¶Specification for ordinary and low heat Portland cement (*third revision*).

\*\*Specification for Portland slag cement (*third revision*).

††Specification for Portland-pozzolana cement (*second revision*).

‡‡Specification for building lime (*second revision*).

**3.7 Lime Concrete** — Lime concrete for use in jack-arch type floor or roof shall be prepared either as given in Appendix B or according to IS : 2541-1974\*.

### **3.8 Pozzolanic Materials**

**3.8.1 Burnt Clay Pozzolana** — This shall conform to IS : 1344-1968†.

**3.8.2 Fly Ash** — This shall conform to IS : 3812 ( Part I )-1966‡ or IS : 3812 ( Part II )-1966§.

**3.9 Precast Reinforced Concrete and Prestressed Concrete Sections** — The materials and construction shall conform to IS : 456-1978|| and IS : 1343-1960¶.

### **3.10 Rolled Steel Section**

**3.10.1** Rolled steel sections shall be selected from those given in IS : 808-1964\*\*. Steel used in the manufacture of these sections shall conform to IS : 226-1975††.

**3.10.2** Steel tie rods shall be selected from those covered by IS : 432 ( Part I )-1966‡‡. Steel for tie rods shall conform to IS : 226-1975††.

### **3.11 Sand**

**3.11.1** Sand for jack-arch floor or roof shall conform to IS : 2116-1980§§.

**3.11.2** Sand for plaster shall conform to IS : 1542-1977|||.

**3.12 Water** — Water used for making mortars and concrete shall conform to the requirements given in IS : 456-1978||.

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\*Code of practice for preparation and use of lime concrete (*first revision*).

†Specification for burnt clay pozzolana (*first revision*).

‡Specification for fly ash: Part I For use as pozzolana.

§Specification for fly ash: Part II For use as admixture for concrete.

||Code of practice for plain and reinforced concrete (*third revision*).

¶Code of practice for prestressed concrete.

\*\*Specification for rolled steel beam, channel and angle sections (*revised*).

††Specification for structural steel ( standard quality ) (*fifth revision*).

‡‡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*).

§§Specification for sand for masonry mortars (*first revision*).

|||Specification for sand for plaster (*first revision*).

**3.13 Hand Beater** — The hand beater used for compacting lime broken brick aggregate concrete shall conform to the requirements given in Appendix C.

#### **4. NECESSARY INFORMATION**

**4.1** For the efficient design and construction of the work, detailed information with regard to the following is necessary:

- a) Surface area to be covered and loading conditions;
- b) Type of supporting elements and restrictions, if any, to their arrangements;
- c) Level to which the terrace should be brought to receive floor or roof finish;
- d) Treatment of junctions with adjacent floors, walls, etc;
- e) Provisions to be made in the terrace for roof slope and other requirements for drainage; and
- f) Provisions for fixing of services, ceiling, etc.

**4.2** All information as in **4.1** shall be made available to those who are responsible for designing and laying the terrace. Necessary drawings and instructions for preparatory work shall be given.

**4.3** Arrangements shall also be made for proper exchange of informations between those engaged in laying the terrace and all others whose work will affect or will be affected.

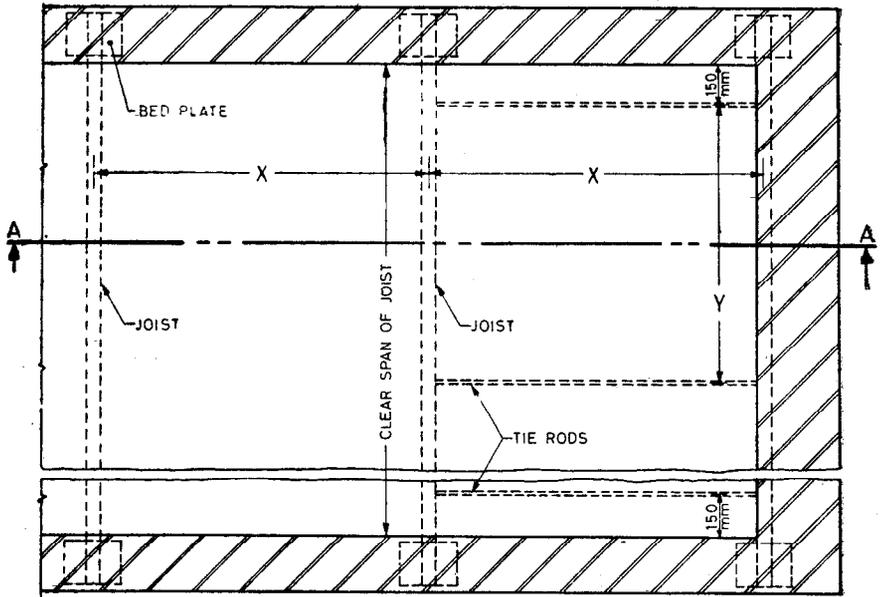
#### **5. DESIGN CONSIDERATIONS**

##### **5.1 General**

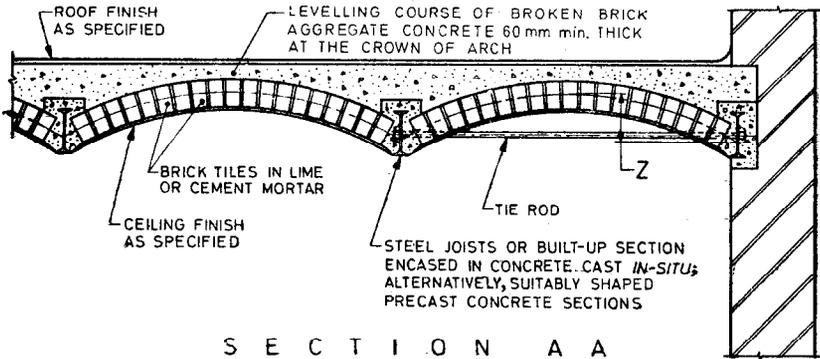
**5.1.1** The jack-arch built-up floor or roof shall consist of the following components:

- a) Jack-arches constructed with bricks laid on edge in a single course with lime mortar or cement mortar of specified mix and supported over steel or concrete I-shaped joists, and having a suitable ceiling finish applied on to its soffit.
- b) A course of lime concrete laid and compacted to specified thickness over the brick arches and having the required floor or roof finish.

**5.1.2** Typical details of jack-arch floor or roof construction are shown in Fig. 1.



P L A N



S E C T I O N A A

- $X$  = spacing of joists
- $Y$  = spacing of tie rods
- $Z$  = rise of arch

FIG. 1 TYPICAL DETAILS OF JACK-ARCH FLOOR OR ROOF CONSTRUCTION

## 5.2 Strength and Stability

**5.2.1** The spacing of joists supporting jack-arch terrace shall normally be 1 to 1.4 m, but shall never exceed 2 m. The joists shall be designed as beams supporting the portion of terrace coming over them.

**5.2.2** The deflection of the joists shall not exceed 1/480 of the span.

**5.2.3** The jack-arch shall be built in the form of a segment of a circle with a rise of 1/6 to 1/8 of the span.

**5.2.4** Tie rods shall be provided at designed spacing. The rods shall be not less than 12 mm in diameter.

**5.2.4.1** The thrust of the arch which is to be resisted by the tie rods may be determined as follows:

$$T = \frac{125 WL^2}{R}$$

where

$T$  = thrust of arch in N(kgf) per running metre,

$W$  = live and dead load on the arch in N/m<sup>2</sup>( kgf/mm<sup>2</sup> ) on end span and live load only for intermediate spans,

$L$  = span of arch in m, and

$R$  = rise in mm.

**5.2.4.2** The tie rods shall be placed generally at 75 mm above the bottom of the joist and their spacing shall not exceed 20 times the width of the flange of joist. These rods shall be properly anchored with stout mild steel washers or angle irons. The tie rods may also be partially concealed in the jack-arch. For anchoring tie rods into the end wall, a separate encased beam may be used in case the thickness of the wall is not sufficient to afford full anchorage by other means.

**5.2.4.3** In a series of jack-arch spans, tie rods shall be provided in the end spans. For the interior spans, the thrust of the arch will be generally taken up safely by the arches in the adjacent spans, but any local concentrations of load shall be suitably taken care of in the design, and tie rods shall be provided in the central span also, if necessary. When the end spans are less than the central spans, the tie rods shall be provided for at least two or more spans near the end; so that the end spans provide a rigid lateral support capable of taking the horizontal thrust from the central spans even under the most unfavourable loading conditions.

**5.2.5** The design of steel joists shall be in accordance with IS : 800-1962\*.

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\*Code of practice for use of structural steel in general building construction (*revised*).

## IS : 2118 - 1980

**5.2.6** The design of precast reinforced concrete and prestressed concrete sections shall be in accordance with IS : 456-1978\* and IS : 1343-1960†.

**5.3 Durability** — Brickwork and concrete work in contact with steel joists and the tie rods shall be done with cement mortar. Periodical white washing of the ceiling and painting of the exposed parts of the joists shall be carried out.

**5.4 Fire Protection** — This kind of construction does not require any special treatment for fire protection.

**5.5 Thermal Insulation and Acoustic Properties** — As the minimum thickness of the terracing at crown is about 220 mm, thermal insulation and allied properties are quite satisfactory for this type of terrace and no special provision is, therefore, necessary for this purpose.

**5.5.1** No acoustic treatment for jack-arch terrace is required for ordinary domestic and office buildings. However, where required in special cases suitable ceiling finishes may be fixed to the underside of the joists.

**5.6 Provision for Service Installations** — All service installations may be fixed to the joists. When crossing from floor to floor the pipes, conduits, etc, shall be conducted along the side of a wall parallel to the span of the arch.

## 6. FACILITIES FOR THE WORK

**6.0** The following facilities are necessary and shall be provided to the person entrusted with the jack-arch terrace construction for carrying out his work satisfactorily.

**6.1 Completion of Preceding Work** — All supporting elements like walls, pillars, main beams, frames, etc, shall be completed sufficiently early and cured well before the terracing work is taken up. The top surface of supporting elements shall be level finished.

### 6.2 Time Schedule

**6.2.1** In preparing the time schedule for the construction of the whole building work due attention shall be paid in connection with the particular work with regard to:

- a) completion of laying of services, and
- b) strength development in supporting elements.

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\*Code of practice for plain and reinforced concrete (*third revision*).

†Code of practice for prestressed concrete.

**6.2.2** The time schedule shall be so arranged that other items of constructions do not interfere with this work. The work shall preferably not be taken up during rainy season.

## 7. PREPARATORY WORK

**7.1 Storage, Transport and Handling of Materials** — Necessary precautions shall be observed in storage, transport and handling of cement, lime, sand, broken brick aggregate, tiles and the supporting joists as given in the relevant Indian Standard specifications for the materials ( *see* 3 ). The materials shall be stored on the building site in such a way as to prevent deterioration or loss or the impairment of their structural and other essential properties ( *see* IS : 4082-1977\* ).

**7.2 Mixing of Mortars and Concrete** — Mortars shall be prepared in accordance with IS : 2250-1980†. Lime broken brick aggregate concrete shall be prepared as given in Appendix B or as specified in IS : 2541-1974‡.

**7.3 Preparation of Bricks** — The bricks shall be kept immersed in water for 24 hours before use. The skin shall then be allowed to dry so as to give the necessary adhesion with mortar required for laying the brickwork.

**7.4** The tie rods shall have a protective finish as described under **7.4.1**.

**7.4.1** The portion of the tie rod to be encased shall be coated with bituminous paint by means of dip-coating technique and the coat may extend 10 to 20 mm beyond the required length in the portion to be exposed.

## 8. JOIST WORK

**8.1** The joists may be rolled steel beam sections, or made up of two rolled steel rail sections, or precast reinforced or prestressed concrete sections.

**8.2** All steel joist work shall be encased in cement concrete with a minimum cover of 40 mm.

**8.3** The joists shall be fixed in position at the designed spacing over the supporting elements, such as walls, columns, etc. When fixed over masonry the joists shall rest over cement concrete or stone bed blocks, or over steel bearing plates, designed to spread the load sufficiently for safe bearing by the masonry.

\*Recommendations on stacking and storage of construction materials at site ( *first revision* ).

†Code of practice for preparation and use of masonry mortars ( *first revision* ).

‡Code of practice for preparation and use of lime concrete ( *first revision* ).

## 9. CONSTRUCTION OF JACK-ARCHES

**9.1 Erection of Centering** — Centering shall be erected to support the jack-arch work coming over it in between the joists. The centering shall be smooth and to the correct curvature. The centering may be supported either from the joists themselves or independently from the floor below. Centering shall not bear on tie rods.

**9.1.1** Temporary supports may be given to the joists so as to prevent sagging of the joists during laying of the jack-arch work.

**9.2** The bricks prepared as in **7.3** shall be laid on edge in cement mortar of mix not less than 1 : 4 ( cement : sand, by volume ) or equivalent lime mortar to form the arch over the centering, springing from the bottom flange of the joists. The joints shall not exceed 10 mm in thickness at the bottom. The brickwork shall then be cured by keeping moist and allowed to set for a period of not less than 10 days before laying the lime broken brick aggregate concrete over it.

**9.3** The centering for the jack-arches shall be eased at the end of 7 days for arch constructed with cement mortar and 10 days for arch constructed with lime mortar, and before laying of lime broken brick aggregate concrete ( *see 10* ).

## 10. LAYING OF LIME-CONCRETE

**10.1** After the brick arch has hardened, a layer of lime-broken brick aggregate concrete of mix  $1:2\frac{1}{2}$  ( slaked lime: broken brick aggregate by volume ) or a layer of lime, pozzolanic material and fine aggregate of mix 1:1:1 ( lime : pozzolanic material : fine aggregate, by volume ) and prepared according to the requirements given in Appendix B, or as specified in IS: 2541-1974\* shall be laid and spread so as to have an initial thickness of 75 mm over the crown of the arch.

**10.2** The lime-broken brick aggregate concrete shall then be consolidated with wooden rammers of weight not exceeding 2 kg so that its consolidated thickness over the crown is 60 mm. The concrete shall further be beaten with wooden hand beaters ( *see 2.3* ) till the beater makes no impression and readily rebounds from the surface when struck on it.

**10.2.1** Hand beating shall be done by workers sitting closely together and beat the surface lightly and in rhythm and move forward gradually. During compaction by hand beating, the surface shall be wetted by sprinkling lime water and sugar solution ( *see Note 1* ) or a solution prepared by soaking in water the dry nuts of *Terminalia chebula*

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\*Code of practice for preparation and use of lime concrete ( *first revision* ).

(*KADUKAI* or *HARARH*) (*see* Note 2) or a solution of jaggery and *GUGAL* (*see* Note 3).

NOTE 1 — The sugar solution may be prepared in the Northern parts of this country by mixing about 3 kg of jaggery and  $1\frac{1}{2}$  kg of 'BAEL' fruit to 100 litres of water.

NOTE 2 — The solution of *KADUKAI* or *HARARH* may be prepared as follows:

The dry nuts shall be broken to small pieces and allowed to soak in water. The general practice is to have a proportion of 60 g of *KADUKAI* or *HARARH*, 200 g of jaggery and 40 litres of water for 10 m<sup>2</sup> work. The solution is brewed for 12 to 24 hours. The resulting liquor is decanted and used for the work.

NOTE 3 — The solution of jaggery and *GUGAL* may be prepared as follows:

Jaggery shall be broken to pieces and allowed to soak in water. The general practice is to have a proportion of 50 g of jaggery, 50 g of *GUGAL* and 40 litres of water for 10 m<sup>2</sup> work.

**10.3** If the surface, during the process of compaction, becomes so uneven that water collects in pools, the surface shall be pricked up and fresh concrete spread and consolidated as necessary to obtain an even surface.

**10.4** The concrete shall then be cured by sprinkling water and allowed to harden for a period of not less than six days before laying the floor or roof finish.

## 11. FINISHING

**11.1** The completed terrace as in **10** shall be further finished with the specified roof or floor finish.

**11.2** For tiled roof finish, two courses of flat clay tiles shall be laid in cement mortar 1 : 3 (cement : sand, by volume) mixed with crude oil which shall be 10 percent by mass of cement. The flat clay tiles shall be immersed in water for two hours before being used. The tiles of first course shall be laid diagonally and the second course square to the parapet thus breaking the joint. The side joint of the tiles shall be more than 6 mm thick set full in mortar. The mortar layer bed over the roof slab shall not be less than 9 mm finished thickness after receiving the first layer of tiles and 9 mm thick mortar bed between the two layers of tiles. Before the work dries up completely, the tile joints shall be raked out and pointed with cement mortar 1 : 3 mixed with crude oil which shall be 10 percent by mass of cement. The joints shall be well rubbed over with thin bar trowel and the excess of mortar scrapped off until the surface of the pointing attains a black polish and becomes hard. As the work proceeds it shall be kept thoroughly wetted until the mortar has set firm and hard. Watering shall be continued for three weeks after construction (*see* Fig. 2).

11.2.1 Instead of two courses of flat clay tiles one course of pressed clay tiles may be used, the laying and finishing being similar to that of flat tiles ( see Fig. 3 ).

NOTE—When tiled roof finish is done with cement mortar, it may be necessary to render the mortar waterproof by a suitable additive. In existing practice crude oil has been found to be a satisfactory additive; and the requirements for crude oil for use in this connection is given in Appendix A. The addition of the crude oil to the mortar shall be 10 percent by mass of cement. The crude oil shall be added to the mixed mortar and not to the dry ingredients.

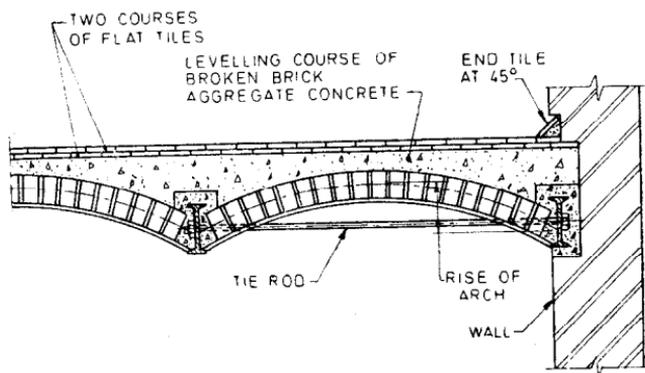


FIG. 2 TYPICAL DETAILS SHOWING THE METHOD OF LAYING TWO COURSES OF FLAT TILES FOR ROOF

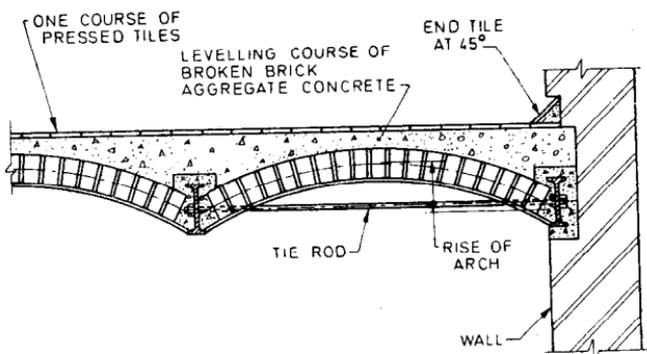


FIG. 3 TYPICAL DETAILS SHOWING THE METHOD OF LAYING ONE COURSE OF PRESSED TILES FOR ROOF

**11.3** The ceiling shall be finished with lime plaster of mix 1 : 2 (slaked lime : sand) or cement plaster of mix 1 : 3 (cement : sand) as specified. The plaster shall be in a single coat of 12 mm thick and shall be done in accordance with IS : 1661-1972\*.

**11.4** The finished surface of the terrace and ceiling shall be cured with water for a period of not less than 3 weeks.

**11.5** The exposed length of the tie rod shall be painted.

**11.5.1** The painting of steel and iron work shall be done in accordance with IS : 1477 (Part I)-1977† and IS : 1477 (Part II)-1971‡.

## 12. TREATMENT OF JUNCTIONS

**12.1** Along the junction of the terrace with the parapet wall, tiles shall be laid inclined at 45° to the face of the parapet after laying necessary broken brick aggregate concrete in the sloping portion. The inclined tiles shall also be taken inside the parapet wall for a depth of 50 mm (see Fig. 2 and 3). Plastering of parapet wall shall be done only after the tiles are laid.

## 13. INSPECTION

**13.1** Inspection shall be done to avoid unsatisfactory construction, which may result in one or more of the following defects in the jack-arch construction:

<i>Sl No.</i>	<i>Stage</i>	<i>Particulars of Inspection</i>	<i>Type of Failure that May Occur if col 3 is not Satisfactory</i>
(1)	(2)	(3)	(4)
i)	Before laying of arch-work	Supporting the joists and centering with wedged uprights	Cracking
ii)	During laying of arch-work	Soaking of bricks and general inspection	Improper adhesion

\*Code of practice for application of cement and cement-lime plaster finishes (*first revision*).

†Code of practice for painting of ferrous metals in buildings: Part I Pretreatment (*first revision*).

‡Code of practice for painting of ferrous metals in buildings: Part II Painting (*first revision*).

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<i>Sl No.</i>	<i>Stage</i>	<i>Particulars of Inspection</i>	<i>Type of Failure that May Occur if col 3 is not Satisfactory</i>
(1)	(2)	(3)	(4)
iii)	After laying lime broken brick aggregate concrete	Amount of beating	Sagging
iv)	Curing	Number of days to be cured and general inspection	Lesser strength and cracking

### 14. MAINTENANCE

**14.1** The only maintenance required for jack-arch roof is whitewashing of the ceiling and painting of the exposed surfaces of the steel joists and tie rods. The whitewashing shall be done every year. The painting shall be done once in five years or earlier as required.

## A P P E N D I X A

( *Clauses 3.5 and 11.2.1* )

### SPECIFICATION FOR CRUDE OIL FOR USE IN JACK-ARCH CONSTRUCTION

#### A-1. GENERAL

**A-1.1** The crude oil shall be a petroleum oil conforming to the requirements of **A-2** to **A-7**.

#### A-2. SPECIFIC GRAVITY

**A-2.1** The specific gravity shall be between 0.930 and 0.940 at a temperature of 25°C.

#### A-3. SOLUBILITY

**A-3.1** The solubility of the crude oil in carbon disulphide shall be not less than 99.9 percent.

**A-4. BITUMEN CONTENT**

**A-4.1** The content of bitumen, insoluble in 36°Be' paraffin naphtha shall be between 1.5 and 2.5 percent by mass.

**A-5. RESIDUAL COKE CONTENT**

**A-5.1** The content of residual coke in the crude oil shall be between 2.5 and 4 percent by mass.

**A-6. VISCOSITY**

**A-6.1** When tested by the procedure given in **A-6.1.1** the viscosity number of the crude oil shall be between 40 and 45.

**A-6.1.1** The viscosity shall be tested in Engler's viscometer at 50°C. Take 240 ml of the oil in the container maintained at 50°C for at least 3 minutes, and then allow to flow out through the nozzle. The period of flow for the first 100 ml shall be noted as the viscosity number.

**A-7. LOSS OF IGNITION**

**A-7.1** When tested in accordance with the procedure given in **A-7.1.1**, the loss in mass in the crude oil shall not exceed 2 percent by mass.

**A-7.1.1** Heat 20 g of the material for 5 hours in cylindrical tin dish 80 mm in diameter and 25 mm deep. The temperature of ignition shall be 163°C.

**A P P E N D I X B**

( *Clauses 3.7, 7.2 and 10.1* )

**PREPARATION OF LIME-CONCRETE FOR USE  
IN JACK-ARCH CONSTRUCTION****B-1. MATERIALS FOR LIME-CONCRETE**

**B-1.1** The lime may be either class B or C conforming to IS : 712-1973\*.

**B-1.2** Broken brick aggregate shall be conforming to the requirements given in IS : 3068-1975†.

\*Specification for building limes (*second revision*).

†Specification for broken brick (burnt clay) coarse aggregate for use in lime concrete (*first revision*).

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**B-1.3** Water shall be in accordance with **3.12**.

## **B-2. PREPARATION**

**B-2.1** The broken brick aggregate shall be cleaned, thoroughly soaked for sufficiently long period and placed on a water-tight platform and spread to an even thickness.

**B-2.2** Lime shall then be spread over the aggregate and the whole thoroughly mixed sprinkling water in just enough quantities. The mixing shall be done by turning the material backwards and forwards at least four times. The mixing shall be done until all the pieces of aggregates are covered with lime and a concrete of uniform appearance and consistency is obtained.

## **B-3. STORAGE**

**B-3.1** The lime concrete may be temporarily stored on a water-tight platform, covering it with a water-tight membrane.

**B-3.2** The lime concrete shall be used within 2 hours after mixing.

# **A P P E N D I X C**

*( Clause 3.13 )*

## **SPECIFICATION FOR HAND BEATER FOR USE IN JACK-ARCH CONSTRUCTION**

### **C-1. GENERAL**

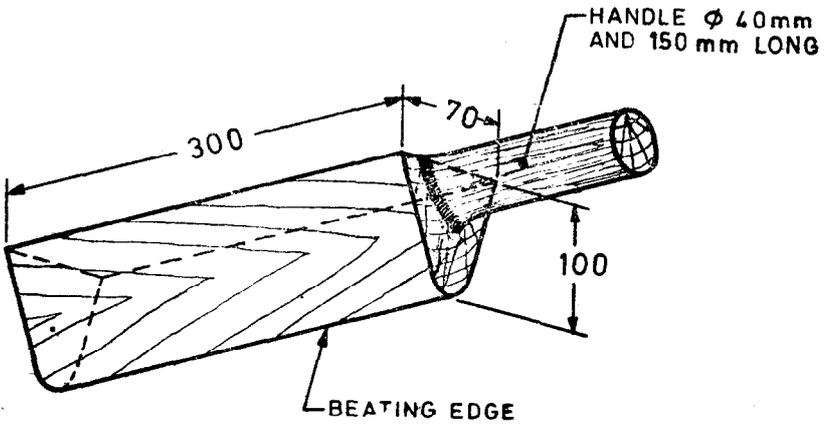
**C-1.1** The hand beater shall be of triangular section of the shape shown in Fig. 4. It shall be made of hard durable timber. The beating edge of the triangular cross section shall be rounded off.

### **C-2. SIZE**

**C-2.1** The hand beater shall be 300 mm long excluding the handle which shall be 150 mm long and 40 mm in diameter. The depth of the hand beater shall be 100 mm as shown in Fig. 4.

### **C-3. WEIGHT**

**C-3.1** The weight of the hand beater shall be between 1 to 2 kg.



All dimensions in millimetres.

FIG. 4 HAND BEATER

( Continued from page 2 )

<i>Members</i>	<i>Representing</i>
SHRI S. C. CHAKRABARTI	Central Building Research Institute ( CSIR ), Roorkee
SHRI N. C. MAJUMDAR ( <i>Alternate</i> )	
SHRI K. DEVARAJAN	Engineer-in-Chief's Branch, Army Headquarters
MAJ V. B. ARORA ( <i>Alternate</i> )	
DEPUTY CHIEF ENGINEER ( GENERAL ), SOUTHERN RAILWAY, MADRAS	Railway Board ( Ministry of Railways ), New Delhi
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SHRI F. B. PITHAVADIAN ( <i>Alternate</i> )	
SHRI R. L. KUMAR	Institution of Surveyors, New Delhi
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SHRI B. V. B. PAI	Concrete Association of India, Bombay
SHRI N. C. DUGGAL ( <i>Alternate</i> )	
SHRI R. RAJAPPA	Tata Consulting Engineers, Bombay
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SHRI G. K. MAJUMDAR	Hindustan Prefab Ltd, New Delhi
SHRI H. S. PASRICHA ( <i>Alternate</i> )	
SHRI K. S. SRINIVASAN	National Buildings Organisation, New Delhi
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SUPERINTENDING ENGINEER, ( RD & BLDGS ), HYDERABAD	Public Works Department, Government of Andhra Pradesh, Bhopal
SENIOR DEPUTY CHIEF ENGINEER ( BLDGS )	Public Works Department, Government of Tamil Nadu, Madras
EXECUTIVE ENGINEER, ( PLANNING ) ( <i>Alternate</i> )	
SURVEYOR OF WORKS, MADRAS CENTRE CIRCLE	Central Public Works Department, Madras