IS 6042 (1969): Code of practice for construction of lightweight concrete block masonry [CED 53: Cement Matrix Products]

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Indian Standard

CODE OF PRACTICE FOR CONSTRUCTION OF LIGHT-WEIGHT CONCRETE BLOCK MASONRY

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

Gr 6

October 1971

Indian Standard

CODE OF PRACTICE FOR CONSTRUCTION OF LIGHT-WEIGHT CONCRETE BLOCK MASONRY

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Indian Standard

CODE OF PRACTICE FOR CONSTRUCTION OF LIGHT-WEIGHT CONCRETE BLOCK MASONRY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 December 1969, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Light-weight concrete block is an important addition to the types of masonry units available to the builder. The specification for load bearing light-weight concrete blocks are given in IS:3590-1966*. With the development of light-weight aggregates from industrial wastes, the light-weight concrete blocks made therefrom will be increasingly used for masonry work in India. Some of the advantages of light-weight concrete block construction are greater speed of execution, better thermal insulation and saving in foundation work, compared to conventional brick masonry. This code is intended to offer guidance to help the builders in correct use of light-weight concrete blocks for masonry construction.

0.3 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.4 This standard is one of a series of Indian Standards on precast concrete products. Other standards published so far in the series are:

IS:2185-1967 Hollow cement concrete blocks (*first revision*)

IS:3590-1966 Load bearing light-weight concrete blocks

IS:4996-1968 Reinforced concrete fence posts

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.

*Specification for load bearing lightweight concrete blocks.

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

1. SCOPE

1.1 This standard covers the construction of walls and partitions with precast light-weight concrete solid blocks conforming to IS : 3590-1966* and lime cement cinder blocks conforming to IS : 3115-1965†.

2. TERMINOLOGY

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

2.1 Block — A precast concrete masonry unit either solid or hollow.

2.1.1 *Light-weight Concrete Blocks* — Solid or hollow concrete blocks, density of which does not exceed 1 000 kg/m^3 conforming to IS : 3590-1966*.

2.1.2 *Lime-Cement Cinder Solid Blocks* — Precast solid blocks made from lime, Portland cement and cinder, conforming to IS : 3115-1965†.

2.2 Bond Beam

2.2.1 *Structural Bond Beam* — A reinforced concrete beam built integrally with a masonry wall as a structural member and designed in accordance with structural engineering practice, primarily to transmit lateral loading on the wall to other connecting structural elements.

2.2.2 *Nominal Bond Beam* — A beam made of reinforced concrete or of U-shaped precast concrete elements subsequently filled solid with reinforced concrete, built integrally with a masonry wall, but intended only as a continuous tension member.

2.3 Drying Shrinkage — The difference between the length of a specimen cut from a block, which has been matured and subsequently saturated and its length when dried to constant length. It is usually expressed as a percentage of the dry length.

2.4 Moisture Movement — The difference in length of a specimen then dried to constant length and that when subsequently saturated with water. It is usually expressed as a percentage of the dry length.

3. NECESSARY INFORMATION

3.1 For efficient planning, design and execution of the work, detailed information with regard to the following shall be furnished to those responsible for the work:

a) Layout plans showing the walls, position of doors, windows and other openings, stairs and columns, etc;

*Specification for load bearing light-weight concrete blocks.
†Specification for lime-cement cinder solid blocks.

b) Detailed dimensions of the structure with details of sections;

c) Details of architectural features, mouldings and other special work, such as fittings attached to or embedded in the masonry; and

d) Details of electrical conduits sanitary and water supply pipes, air-condition ducts, etc, to be embedded in the wall.

4. PROGRAMMING OF WORK

4.1 In preparing a time schedule, the work shall be considered in relation to other works and so ordered that the work of the various tradesmen do not interfere with each other.

4.2 Arrangements shall be made for the following items:

a) The timing of the erection of adjacent structural work shall correspond to the erection of the walls and partitions where the various operations are inter-dependent;

b) The installation of conduits and services within, on the face of or through the walls and partitions;

c) The application of finishes to adjacent walls, floors and ceilings which may be required before the application of finishes to the walls and partitions concerned; and

d) Time intervals as and when necessary, to allow parts of the work and finishes to dry out and mature before the commencement of subsequent operation.

4.3 The time schedule shall include dates for:

a) The supply of drawings and specifications;

b) The delivery of materials, masonry units and accessories; and

c) The commencement and completion of the various operations involved in the construction and finish of the walls and partitions.

4.4 Internal walls and partitions of non-load-bearing and bonded or tied to the flanking frame work shall preferably be erected concurrently with it but where it is not practicable to do so, they may be erected afterwards, the necessary provision for their support and for bonding or tying their ends to the main structure being made at the appropriate time.

5. MATERIALS

5.1 Cement — Cement shall conform to IS : 269-1967* or IS : 455-1967† or IS : 1489-1967‡.

*Specification for ordinary, rapid hardening and low heat portland cement (*second revision*).

†Specification for portland blast furnace slag cement (*second revision*).

‡Specification for portland-pozzolana cement (*first revision*).

5.2 Lime — Lime shall conform to IS : 712-1964*. The lime shall be of class C, unless otherwise specified. All lime other than dry hydrated lime shall be fully slaked in accordance with IS : 1635-1960†.

5.3 Water — Water shall be clean and free from injurious amounts of deleterious materials and of a quality fit for drinking purposes.

5.4 Sand — Sand shall generally conform to the requirement of IS : 383-1963‡ except for particle size grading which shall be specified in **5.4.1.**

5.4.1 The sand for mortar shall generally have particle size gradings as specified in IS : 2116-1965§.

5.5 Flyash — Flyash shall conform to IS : 3812 (Part I)-1960‖.

5.6 Burnt Clay Pozzolana — Burnt clay pozzolana shall conform to IS : 1344-1968¶.

6. MORTAR

6.1 Cement lime sand mortar, cement sand mortar or lime pozzolana sand mortar generally conforming to IS : 2250-1965** or lime sand mortar or lime pozzolana sand mortar generally conforming to IS : 1625-1962†† shall be used.

6.2 Light-weight concrete blocks shall be embedded with a mortar, the strength of which is relatively lower than that of the mix used for making blocks in order to avoid the formation of cracks. A 1 : 2 : 9 cement, lime, sand mortar may generally be used for normal work, but where either the intensity of load is high or wall is exposed to severe condition 1 : 1 : 6 mortar shall be used. If good quality lime is not available 1 : 6 cement sand mortar may be used.

6.3 All mortar shall be prepared in accordance with IS : 2250-1965**

NOTE — All mortar when mixed shall have a slump of 75 mm when tested in accordance with the method described in IS : 1199-1959‡‡.

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*Specification for building limes (*revised*).
†Code of practice for field slaking of lime and preparation of putty.
‡Specification for coarse and fine aggregates from natural sources for concrete (*revised*).
§Specification for sand for masonry mortars.
‖Specification for flyash: Part I For use as pozzolana.
¶Specification for burnt clay pozzolana (*first revision*).
**Code of practice for preparation and use of masonry mortars.
††Code of practice for preparation and use of lime mortar in buildings.
‡‡Methods of sampling and analysis of concrete.

7. DESIGN CONSIDERATIONS

7.1 Choice of Type of Wall — The type of wall for different situations of use of light-weight concrete block masonry shall be as given below:

a) External and internal load bearing walls shall be of load bearing lightweight concrete blocks of appropriate thickness. Exposed walls shall be rendered externally with composite mortar in accordance with **11.1**.

b) In special cases where high thermal insulation is required, cavity walls having inner leaf of lightweight concrete blocks and the outer leaf of dense concrete block may be used. Each leaf of the cavity wall shall not be less than 100 mm thick. To ensure adequate impermeability for the walls the exterior surface of external walls shall be plastered with composite mortar in accordance with **11.1**.

7.1.1 From considerations of durability lightweight concrete blocks shall not be used below damp-proof course.

7.2 Strength and Stability

7.2.1 *Thickness of Walls*

7.2.1.1 The minimum nominal thickness of external walls in framed construction shall preferably be not less than 200 mm. However, depending upon the local conditions and the desired effect of thermal transmission and sound reduction, 100 mm thick walls may be used provided they are suitably braced and reinforced by lateral or vertical supports.

7.2.1.2 The minimum nominal thickness of non-load bearing internal partitions shall be 100 mm.

7.2.2 *Parapet Walls* — Parapet walls shall be designed to withstand lateral pressure specified in IS : 875-1964*.

7.2.2.1 Unless adequately braced at intervals not exceeding three metres, the height of the wall shall be limited to five times its thickness in case of parapet walls.

7.2.3 *Lateral Supports*

7.2.3.1 Lightweight concrete block masonry walls shall be provided with horizontal or vertical lateral supports at right angles to the faces of the wall. Lateral supports may be obtained by cross-walls, pilasters, sealed bonds, or butteresses where the limiting distance will be measured horizontally, and by floors and roofs where the limiting distance will be measured vertically.

*Code of practice for structural safety of buildings: Loading standards (*revised*).

7.2.3.2 The limiting horizontal distance for load bearing wall shall be 24 times the nominal thickness of the wall, while its limiting vertical distance shall be 18 times the nominal thickness of the walls; the maximum storey height permitted for a 200 mm thick wall shall, therefore, be 3·6 m.

7.2.3.3 The limiting horizontal or vertical dimension of a partition wall shall not be more than 36 times the thickness of wall.

7.3 Bond Beams and Studs Used as Structural Members

7.3.1 Reinforced concrete bond beams shall be used in concrete masonry construction to meet the requirements of unusual stress conditions. These arise:

a) in buildings in earthquake — prone regions,

b) in buildings in areas where severe wind storms occur,

c) in buildings in areas where unfavourable soil movements and soil subsidence occur, and

d) in buildings where walls are subject to excessive vibration or to very heavy loads.

In all such cases it is necessary to provide more than ordinary stability for all types of masonry walls.

7.3.2 Bond beams may be normal reinforced concrete beams built integrally with block masonry, or they may be built with special U-shaped lintel blocks which are strung together, reinforcing steel placed in the cores, and the cores filled solid with concrete. The reinforcement shall satisfy structural requirements, but in no case it should be less than two 12 mm diameter steel bars. The beams are always discontinuous at expansion joints, but the joints should be designed to transfer lateral forces along the wall.

7.3.3 Bond beam shall be placed:

a) at floor level,

b) at the head of all door and window openings (in which case they serve as lintels over them),

c) below the sill in all openings, and

d) at plinth level.

7.3.4 Apart from continuously reinforced bond beams, concrete masonry walls under the conditions outlined in **7.3.1** may also be reinforced vertically be reinforced concrete studs at corners, at wall openings, and at regular intervals between wall openings. The vertical alignment of the hollow cores in concrete masonry units facilitates the construction of such

vertical studs. The studs shall be tied in with the bond beams. The quantity of the reinforcement for studs shall be according to the structural requirements.

7.3.5 The non-structural use of bond beams for the purpose of providing a continuous tension member to resist excessive tensile stresses is referred to in **7.5.4**.

7.4 Modular Co-ordination

7.4.1 Lightweight concrete block walls shall preferably be planned on the basis of modular co-ordination with a view to making the maximum use of full and half length units.

7.4.2 The cutting of units at the site shall be restricted to the minimum. Attention shall be paid to modular co-ordination while fixing the overall length and height of the wall, width and height of door, window and other openings; and wall dimensions between doors, windows and corners. All horizontal and vertical dimensions shall be multiples of half length and full height units respectively.

7.5 Avoidance of Crack Formation

7.5.1 The major causes of cracks in the structure of lightweight concrete block wall or partitions and measures for their prevention are described in **7.5.2** to **7.5.3**.

7.5.2 *Structural Movements* — Cracks may occur due to alterations in length, curvature or orientation of the structural members enclosing a wall or partition due to load settlement, thermal expansion or changes in moisture content. The precautions to be taken for prevention shall be as described in **7.5.2.1** to **7.5.2.4**.

7.5.2.1 In the case of framed structures, erection of partitions and panel walls shall be delayed wherever possible until the frame has taken up, as much as possible, any deformation occuring due to structural movements.

7.5.2.2 *For floor deformation and movement* — The floor upon which a partition is built may deflect under load brought upon it after the partition is built. Where such deflections tend to create non-continuous bearing, the partition shall be strong enough to span between the points of least floor deflection or shall be capable of adapting itself to the altered conditions of support without cracking. This may be achieved by embedding 6 mm diameter bars at every 400 mm height.

7.5.2.3 *Ceiling deflection or movement* — A ceiling above a partition wall may deflect under loads applied after its erection, or through thermal or other movements. The partition wall shall be separated from the ceiling

by a gap, or by a layer of resilient material, to avoid cracking as a result of such deflection. Where this cannot be done as in the case of plastered finishes, the risk of cracking may be diminished by forming a cut between the ceiling plaster and the wall plaster.

7.5.2.4 *Deflection or movement of structural abutments* — Walls, columns or other structural elements against which a wall or partition abuts may deflect or move because of load, settlement, shrinkage or thermal effects. In order to avoid cracking of walls or partitions as a result of such movements, a slip joint shall be provided where possible, preferably packed with a resilient material.

7.5.3 *Control of Wall Movement Accompanying Temperature and Moisture Changes* — Cracking in concrete masonry walls is often due to tensile stresses which develop when wall movements accompanying temperature and moisture change are restrained by other elements of the building, or when concrete masonry places restraint on the movement of adjoining elements.

7.5.3.1 There are three methods of controlling cracking in concrete masonry structures:

a) specifying a limit on the moisture content of masonry units at the time of delivery and construction (**11.1.5.1** of IS : 3590-1966*),

b) incorporating steel reinforcement either in the form of bond beams or horizontal joint reinforcement, and

c) providing control joints to accommodate the movement.

In all concrete masonry construction it is essential to employ only moisture controlled units. Their use, combined with the provision of control joints, is generally adequate to prevent cracking in concrete masonry walls. However, bond beams or joint reinforcement, or both in different locations as considered suitable, may also be used in addition to the above.

7.5.4 *Bond Beams* — Bond beams, the use of which as structural members has been referred to in **7.3**, also serve as a means of crack control. Their value for this purpose is due to the increased strength and stiffness they provide to a masonry wall They shall be built in the same manner as the structural bond beams, with a minimum reinforcement of two 12 mm diameter steel bars. As a means of crack control, the area of influence of a bond beam shall normally be presumed to extend 600 mm above and below its location in the wall. In walls without openings they shall be spaced 1 200 mm apart and may be of any length up to a maximum of 18 m (*see* Table 1).

*Specification for load bearing lightweight concrete blocks.

TABLE 1 RECOMMENDED LENGTH TO HEIGHT RATIO FOR LIGHTWEIGHT CONCRETE BLOCK MASONRY WALLS

(*Clauses* 7.5.4, 7.5.5.2, 7.5.5.3 *and* 7.5.6)

Sl No.	Wall Panel	Vertical Spacing of Joint Reinforcement		
		600 mm	400 mm	200 mm
(1)	(2)	(3)	(4)	(5)
i)	Length L of the panel (irrespective of the height H of the panel), *Max*	12·5 m	15 m	18 m
ii)	Ratio $\frac{L}{H}$, *Max*	2·5	3	4

NOTE 1 — When bond beams spaced 1 200 mm vertically are employed in place of joint reinforcement, control joints may be spaced at 18 m maximum.

NOTE 2 — Where reinforcement has not been provided, the length of the panel shall not exceed 12 m and the ratio of L/H shall not exceed 2.

7.5.4.1 Bond beams shall be discontinuous at control joints, but practice here varies depending upon structural requirements. Dummy joints shall be formed when a bond beam is continuous at a control joint.

7.5.5 *Joint Reinforcement* — Horizontal joint reinforcement serves much the same purpose in crack control as bond beams — it increases the tensile resistance to cracking. Due to the generally closer spacing adopted, joint steel may be more effective in crack control than bond beams.

7.5.5.1 Joint reinforcement shall be fabricated from galvanized steel wire conforming to IS : 280-1962* and shall consist of two or more smooth or deformed longitudinal wires of 4 mm dia or larger, weld connected with 2·8 mm dia or larger cross wires. The out-to-out spacing of the longitudinal wires shall be 40 mm less than the width of the masonry units. The distance between the welded contacts of the cross wires with each longitudinal wire shall not exceed 150 mm for smooth wires and 400 mm for deformed wires. The joint reinforcement shall be available in flat sections 3 to 6 m in length. Where a splice is necessary, the joint reinforcement shall be lapped. At corners, special corner pieces shall be used. The laps shall be of sufficient length to develop the tensile strength of the longitudinal reinforcement, or 300 mm, whichever dimension is the greater.

*Specification for mild steel wire for general engineering purposes (*revised*).

7.5.5.2 The reinforcement shall be embedded in horizontal joints at intervals of 200, 400 and 600 mm depending upon panel length L (*see* Note), height H, and the number and type of wall openings. Table 1 gives the L/H ratios recommended for masonry walls constructed with moisture-controlled units and containing different amounts of joint reinforcement. The ratios are approximate and provide an adequate margin of safety against cracking when employed in walls without openings.

NOTE — A panel is a wall portion in one plane which lies between (1) wall ends, (2) control joints, or (3) a control joint and a wall end.

7.5.5.3 Joint reinforcement shall be used in conjunction with mortar not weaker than 1 : 1 : 6 cement, lime, sand mix. In walls exposed to the action of weather, the reinforcement shall have a mortar cover of not less than 15 mm. The following points in the location of joint reinforcement shall be noted:

a) Place the joint reinforcement in the first and second bed joints immediately above and below wall openings. It shall not extend less than 600 mm beyond the opening, or to the end of the panel, whichever is the smaller;

b) Place joint reinforcement in the two or three courses immediately below the top of the wall;

c) Joint reinforcement shall not be located closer to a bond beam than 600 mm;

d) Joint reinforcement shall be interrupted at control joints; and

e) Joint reinforcement shall not be required where the ratio L/H is not more than given in Note 2 in Table 1.

7.5.6 *Control Joints* — These are employed to reduce restraint by accommodating movement of the masonry wall, or movement of structural elements adjacent to the wall, and thus to control cracking. They are, in fact, vertical separations built into the wall at locations where cracking is likely due to excessive horizontal stresses. The spacing along the wall length depends upon:

a) the expected movements of the wall and other elements;

b) the resistance of the wall to horizontal tensile stresses; and

c) the extent and location in the wall of doors, windows, recesses, chases and other causes of stress concentration.

Table 1 gives ratio between the panel length and wall height, L/H, recommended for walls without openings constructed with moisture-controlled units (*see* Note).

NOTE — A panel is a wall element in one plane which lies between (a) wall ends, (b) control joints, or (c) a control joint and a wall end.

7.5.6.1 The common methods of constructing control joints are illustrated in Fig. 1 and 2. The joints permit free horizontal movement, but they shall have sufficient shear and flexural strength to resist lateral loads. Particular care shall be taken to make the joints weather tight when located in exterior walls.

7.5.6.2 Apart from spaced control joints in long walls, control joints shall be placed:

a) at changes in wall height or thickness;

b) at construction joints in foundations, floors, and roof;

c) at recesses and chases;

d) at abutments of walls and columns;

e) at return angles in L-, T- and U-shaped structures; and

f) at one or both sides of wall openings (generally a control joint is placed at one side of an opening less than 2 m in width and at both jambs of openings over 2 m wide).

8. STORAGE AND HANDLING OF MATERIALS

8.1 The blocks shall be stored in such a way as to avoid any contact with moisture on the site. They shall be stock piled on planks or other supports free from contact with the ground and covered to protect against wetting.

8.2 Cement, lime aggregates and other masonry materials shall be stored and hauled as laid down in the relevant Indian Standards.

9. PREPARATORY WORK

9.1 Wetting of Blocks — The blocks need not be wetted before or during laying in the walls. In case the climatic conditions so require, the top and the sides of the blocks may only be slightly moistened so as to prevent absorption of water from the mortar and ensure the development of the required bond with the mortar.

10. LAYING CONCRETE BLOCK MASONRY IN SUPERSTRUCTURE

10.1 Use of Mortar in Masonry

10.1.1 Lightweight concrete block masonry in superstructure shall be laid either in 1:2:9 or 1:1:6 cement-lime, sand mortar as explained in **6.1**. If good quality lime is not available, 1:6 cement sand mortar may be used.

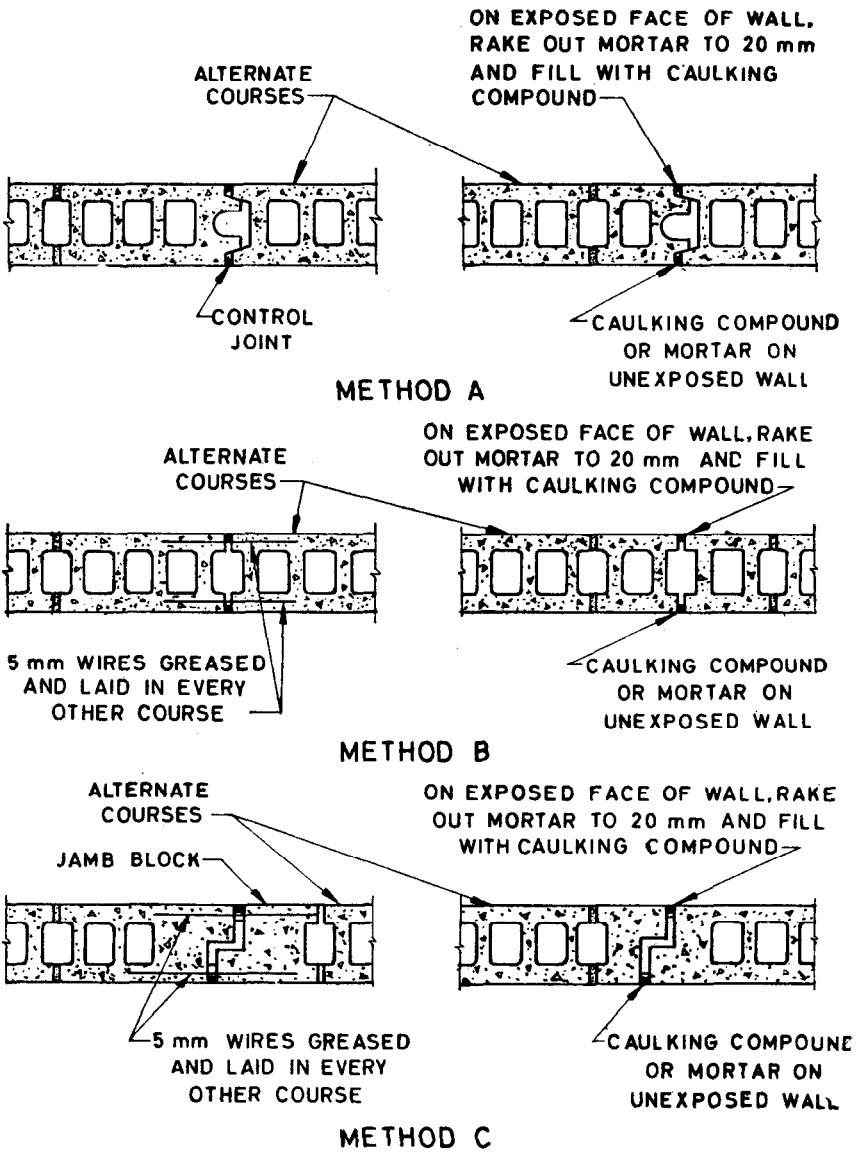
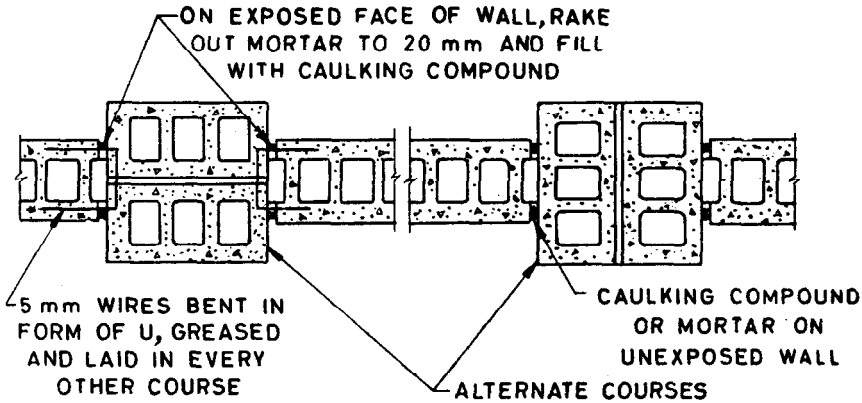
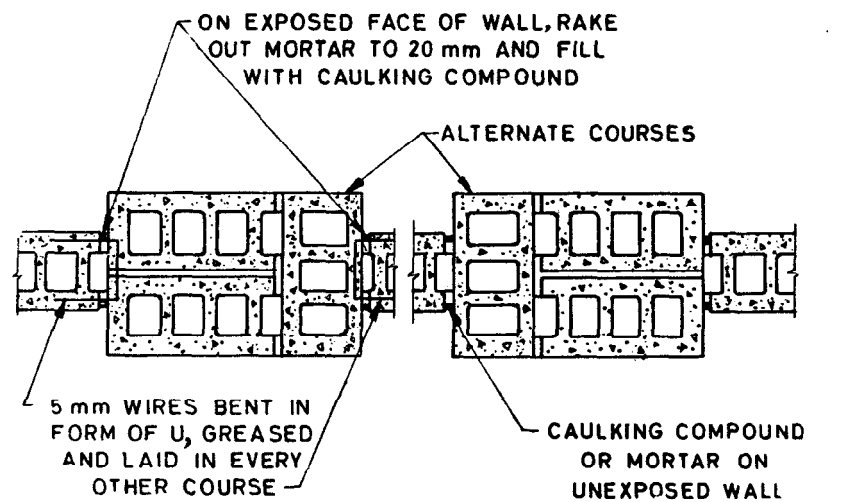


FIG. 1 CONTROL JOINTS IN CONCRETE BLOCK MASONRY CONSTRUCTION

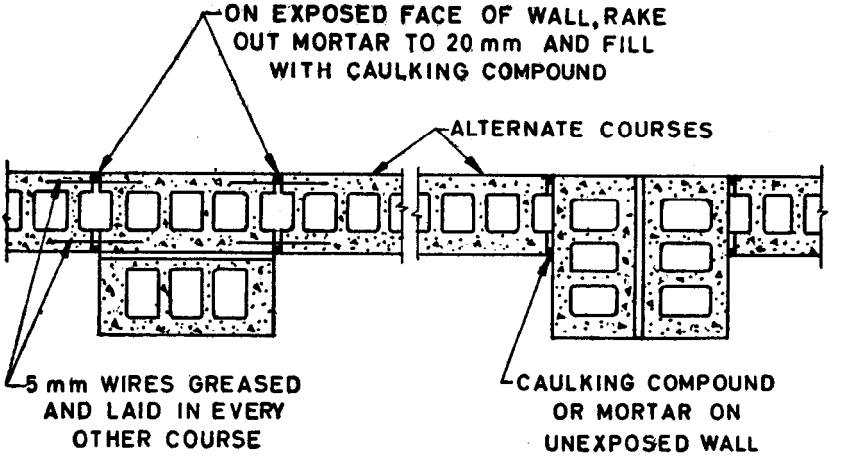


METHOD A

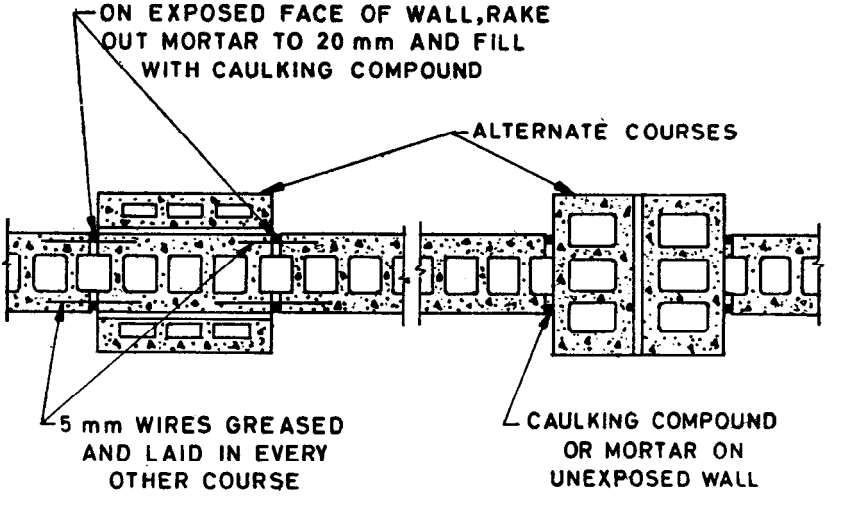


METHOD B

FIG. 2 PILASTERS WITH CONTROL JOINTS IN CONCRETE BLOCK MASONRY CONSTRUCTION — *Continued*

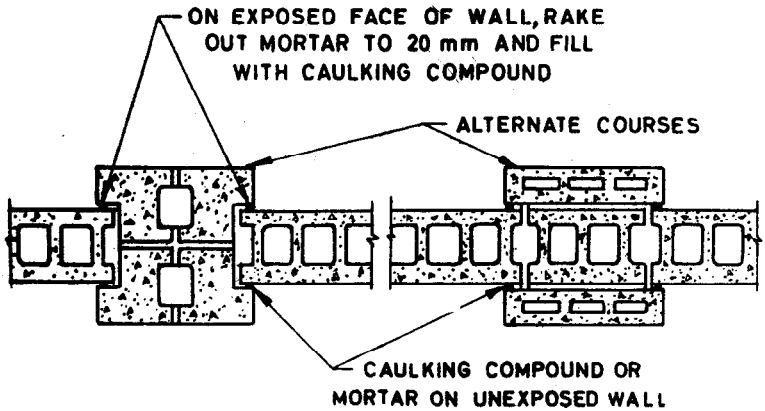


METHOD C

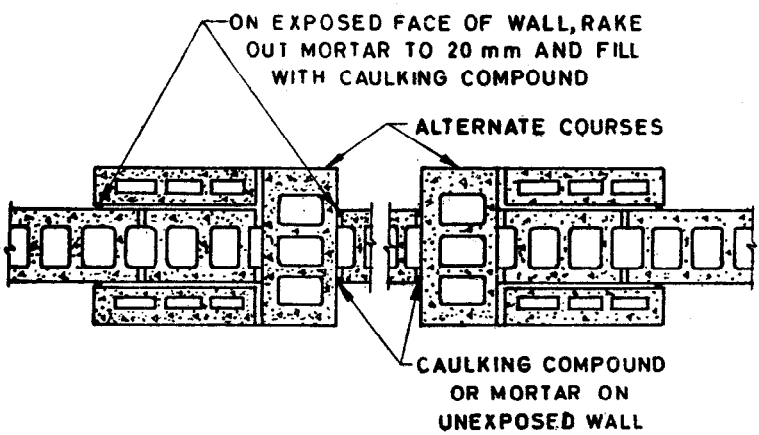


METHOD D

FIG. 2 PILASTERS WITH CONTROL JOINTS IN CONCRETE BLOCK MASONRY CONSTRUCTION — *Continued*



METHOD E



METHOD F

FIG. 2 PILASTERS WITH CONTROL JOINTS IN CONCRETE BLOCK MASONRY CONSTRUCTION

10.1.2 Mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and lose its plasticity, thereby resulting in poor bond. For most of the work, the joints, both horizontal and vertical, shall be 10 mm thick. Except in the case of extruded joint construction described in **10.2.3**, the mortar joints shall be struck off flush with wall surface and when the mortar has started stiffening, it shall be compressed with a rounded or U-shaped tool. This compaction is important, since mortar, while hardening, has a tendency to shrink slightly and thus pull away from the edges of the block. The mortar shall be pressed against the units with a jointing tool after the mortar has stiffened to effect intimate contact between the mortar and the masonry unit and obtain a weather-tight joint.

10.2 Operations for Laying Block Masonry

10.2.1 *First Course* — The first course of concrete block masonry shall be laid with great care, making sure that it is properly aligned, levelled and plumbed, as this may assist the mason in laying succeeding courses to obtain a straight and truly vertical wall.

10.2.1.1 Before laying the first course, the alignment of the wall shall be marked on the damp-proof course. The blocks for this course shall first be laid dry, that is without mortar along a string stretched between properly located corners of the wall in order to determine the correct position of the blocks including those of the cross walls jointing it and also adjust their spacing. When the blocks are set in proper position, the two corner blocks shall be removed, a mortar bed spread and these blocks laid back in place truly level and plumb. The string shall then be stretched tightly along the faces of the two corner blocks and the faces of the intermediate ones adjusted to coincide with the line. Thereafter, each block shall be removed and relaid over a bed of mortar. After every three or four blocks have been laid, their correct alignment level and verticality shall be carefully checked.

10.2.2 The construction of walls may be started either at the corners first or started from one end proceeding in the other direction. If the corners of the wall are built first, they shall be built four or five courses higher than the centre of the wall. As each course is laid at the corner, it shall be checked for alignment and level and for being plumb. Each block shall be carefully checked with a level or straight edge to make certain that the faces of the block are all in the same plane. This precaution is necessary to ensure truly straight and vertical walls.

10.2.2.1 The use of a storey-rod or course pole which is simply a board with markings 200 mm apart, provides an accurate method of finding the top of the masonry for each course. Each course, in building the corners, shall be stepped back by a half-block and the horizontal spacing

of the block shall be checked by placing a mason's level diagonally across the corners of the block.

10.2.3 When filling in the wall between the corners, a mason's line shall be stretched from corner to corner for each course and the top outside edge of each block shall be laid to this line. The manner of handling or gripping the block shall be such as to position the block properly with minimum adjustment.

10.2.3.1 To assure satisfactory bond, mortar shall not be spread too far ahead of actual laying of the block as it will stiffen and lose its plasticity. As each block is laid, excess mortar extruding from the joints shall be cut off with the trowel and thrown back on the mortar board to be reworked into the fresh mortar. If the work is progressing rapidly, the extruded mortar cut from the joints may be applied to the vertical face shells of the blocks just laid. If there be any delay long enough for the mortar to stiffen on the block, the mortar shall be removed to the mortar board and reworked. Dead mortar that has been picked up from the scaffold or from the floor shall not be used.

10.2.4 *Closure Block* — When installing the closure block, all edges of the opening and all four edges of the closure block shall be buttered with mortar. The closure block shall be carefully lowered into place. If any mortar falls leaving an open joint, the closure block shall be removed, fresh mortar applied and the operation repeated.

10.3 Provisions for Doors and Window Frames — Mild steel bar holdfasts should be so fastened to the door or window frames that these occur at block course level.

10.4 Provisions for Lintels — Lintels may be either precast or cast *in situ* with appropriate reinforcement. Where openings occur close to one another, a continuous lintel shall be provided.

10.5 Provision for Roof

10.5.1 The top of the roof course shall be finished smooth with a thin layer of 1 : 3 cement mortar and covered with a coat of crude oil or craft or oil paper to ensure free movement of the roof.

10.5.2 Where the roof slab projects beyond the external wall face, it shall be provided with a drip.

10.6 Intersecting Walls — All walls wherever they meet or intersect shall be bonded or tied securely in accordance with **10.6.1** and **10.6.2.**

10.6.1 *Bearing Walls* — When two bearing walls meet or intersect and the courses are to be laid up at the same time, a true masonry bond between at least 50 percent of the units at the intersection is necessary.

When such intersecting bearing walls are laid up separately, pockets with 200 mm maximum vertical spacings shall be left in the first wall laid. The corresponding course of the second wall shall be built into these pockets.

10.6.2 *Non-load Bearing Walls* — Meeting or intersecting non-load bearing walls shall be bonded by either of the two methods recommended for bearing walls or provided with adequate lateral supports.

10.6.3 The side walls of long buildings shall be stiffened at regular intervals with *pilasters* or by sealed bonds which are about twice the thickness of the wall.

11. RENDERING AND OTHER FINISHES

11.1 External Renderings — Lightweight concrete blocks are almost invariably not impervious and will become damp when exposed to rain. The exterior surface of all lightweight concrete blocks shall, therefore, be made water-proof by treating the walls with different types of renderings as explained in **11.1.1** to **11.1.4** depending upon the intensity of rainfall, nature of exposure of other seasons. Some other points that should be considered are given below:

a) Renderings shall not be applied to the walls when these are wet or in monsoon. The walls shall be treated only after they are dried.

b) Satisfactory performance of any rendering depends entirely on the efficiency of the bond developed between the rendering and the wall surface. Extreme care shall, therefore, be taken to ensure effective bond with the wall by preparing the surface, cleaning the surface of all loose particles and dust, and lightly moistening it with water just prior to applying the rendering to prevent absorption of water from it.

c) The plaster finishes shall be applied in accordance with IS : 2402-1963*.

d) The sand used for the plaster finish shall be graded from 3 mm downwards. The plaster shall not be finished smooth, but provid ed with a coarse finished by means of a wooden float.

11.1.1 In localities where rainfall is heavy or the walls are exposed to sea weather, concrete block masonry shall be rendered with two coats of plaster. First coat (backing coat) shall be of 15 mm thickness of 1 : 1 : 6 cement lime sand mortar or 1 : 6 cement sand mortar. Second coat (finishing coat) shall be of 5 to 10 mm thickness of 1 : 1 : 6 to 1 : 2 : 9 cement lime sand mortar.

*Code of practice for external rendered finishes.

11.1.2 In moderate rainfall areas, concrete block masonry shall be rendered with at least one coat of 10 to 15 mm thickness of 1 : 1 : 6 cement lime sand mortar (or 1 : 6 cement sand mortar) or two coats of cement paint may be applied directly on concrete block masonry to provide a reasonably impervious surface to withstand rain.

11.1.3 In areas of scarce rainfall, where it is desired from aesthetic considerations, the exterior surface of concrete block masonry need only be pointed with 1 : 1 : 6 cement lime sand mortar.

11.1.4 Where for architectural or other reasons it is necessary to have the concrete block surface exposed, the walls shall either be built with block having richer facing mixture or treated with two coats of approved quality of cement based paint. In either case the walls in heavy or moderate rainfall areas shall be pointed with 1 : 3 cement mortar.

11.2 Internal Renderings — As machine made concrete blocks are of uniform size, walls built with them provide an even surface. Where it is desired to have the block surface exposed, the walls may only be flush pointed and painted with an approved quality of cement paint, emulsion paint or chlorinated rubber paint. Oil based paints are liable to be attacked by alkali from the blocks and mortar. Otherwise the interior surface on walls shall be plastered with one coat of 6 to 12 mm thickness of 1 : 2 : 9 cement lime sand mortar. Where a very smooth finish is desired, a second coat of 2 to 3 mm thickness of lime finish may be applied.

12. MAINTENANCE

12.1 The exposed walls shall be inspected closely every year before monsoons, and cracks, if any, shall be sealed properly with a cement grout and painted with two coats of cement paints.

(*Continued from page* 2)

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