

Chapter 5

BLOCK WORK

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CHAPTER 5: BLOCK WORK**List of Relevant Bureau of Indian Standard Codes to be followed****5.0 DEFINITIONS**

Bond: The arrangement of the bricks in successive courses to tie the brick work together both longitudinally and transversely. The arrangement is usually designed to ensure that no vertical joint of one course is exactly over the one in the next course above or below it, and there is greatest possible amount of lap.

Bed Joint: Horizontal joint in brick work or masonry.

Closer: Any portion of a brick used in constructing a wall, to close up the bond next to the end brick of a course.

Coping or weathering: The cover applied over or the geometrical form given to a part of structure to enable it to shed rain water.

Corbel: A cantilever projecting from the face of a wall to form a bearing.

Cornice: Horizontal or ornamental feature projecting from the face of a wall.

Course: A layer of bricks including bed mortar.

Cross joint: A joint other than a bed joint normal to the wall face.

Efflorescence: A powdery encrustment of salts left by evaporation. This may be visible on the surface or may be below surface. In the latter case, this is termed as crypto efflorescence.

Frog: A defined depression made in the flat side of brick while burning it.

Header: A brick laid with its length across the wall.

Indenting: The leaving recesses into which future work can be bonded.

Jamb: The part of the wall at the side of an opening.

Joint: A junction of bricks.

Jointing: The operation of finishing joints as the masonry work proceeds.

Pier: A thickened section forming integral part of the wall placed at intervals along the wall primarily to increase the stiffness of the wall or carry a vertical concentrated load. The thickness including the thickness of the pier is the overall thickness including the thickness of the wall, or when bonded into one leaf of a cavity wall the thickness obtained by treating this leaf as independent wall.

Pillar: Pillar means a detached masonry support. This can be rectangular, circular, elliptical etc. In case rectangular pillar, the breadth shall not exceed three times the thickness and thickness itself shall not exceed more than thrice the length of brick.

Quoin: An external corner in brick work, the term may also denote the brick used to form the quoin.

Scaffolding: A temporary erection of timber or steel work used in the construction, alteration, demolition or repairs of a building to support or to attend of the hoisting or lowering of workmen, their tools and materials.

Sill: A brick work forming the lower boundary door or window opening.

Spandrel: The space between the haunches and the decking of an arch.

Stretcher: A brick laid with its length in the direction wall.

String course: A horizontal course projecting from a wall usually introduced at every

floor level or windows or parapet for imparting architectural appearance to the structure and also keeping off the rain water.

Template: A pattern of sheet metal used as a guide for setting out specific section and shape.

Tooththing: Bricks left projecting in alternate courses to bond with future work.

Wall joint: A joint parallel to the wall face.

5.1 POROTHERM THERMO HOLLOW BRICK

Providing and constructing 200mm, 150mm thick Porotherm Thermo hollow brick with Thermal Insulation (400X200X200mm) (400X200X150mm) blocks from Wienerberger or equivalent as approved), masonry for external walls in cement mortar CM 1:4 (1 cement : 4 sand) mixed with approved non-shrinking compound as per manufacturer's instruction, including required formwork complete with raking out joints, curing, doing independent double legged scaffolding as per specifications etc. at heights, depths and leads as directed by PMC/Employer to his entire satisfaction. Blocks should be Listed by IGBC (Indian Green Building Council) in the 'Green Product Category' under-energy efficient product, material with recycled content & use of regional material and to withstand fire naturally as it fired at 1000 degrees and has a fire rating of F240 for 240minutes.

5.2 BRICKS/BRICK TILES/BRICK BATS

Bricks used in the masonry may be of the following type.

- (a) Common burnt clay bricks: Shall be hand moulded or machine moulded. They shall be free from nodules of free lime, visible cracks, flaws, warpage and organic matter, have a frog 100 mm in length 40mm in width and 10 mm to 20 mm deep on one of its flat sides. Bricks made by extrusion process and brick tiles may not be provided with frogs. Each brick shall be marked (in the frog where provided) with the manufacturer's identification mark of initials.
- (b) Tile Brick: The bricks of 4 cm height shall be moulded without frogs. Where modular tiles are not freely available in the market, the tile bricks of F.P.S. thickness 44 mm (1-3/4") shall be used unless otherwise specified.
- (c) Brick Bats: Brick bats shall be obtained from well burnt bricks.

5.2.1 Dimensions: The brick may be modular or non-modular. Sizes for both types of bricks/tiles shall be as per Table 5.1. While use of modular bricks/tiles is recommended, non-modular (FPS) bricks/tiles can also be used where so specified. Non-modular bricks/tiles of sizes other than the sizes mentioned in Table 5.1 may also be used where specified.

TABLE 5.1: Dimensions of Bricks

Type of Bricks/Tiles	Nominal Size, mm	Actual Size, mm
Modular Bricks	200×100×100mm	190×90×90mm
Modular Tile Bricks	200×100×40mm	190×90×40mm
Non-modular tile bricks	229×114×44mm	225×111×44mm
Non-modular bricks	229×114×70mm	225×111×70mm

- 5.2.2 Classification:** Bricks/Brick tiles shall be classified on the basis of their minimum compressive strength as given below:

TABLE 5.2: Classification of Bricks

Class Designation	Average compressive strength			
	Not less than		Less than	
	N/mm ²	(kgf/cm ²)	N/mm ²	(kgf/cm ²)
10(100)	10	(100)	12.5	125
7.5(7.5)	7.5	(75)	10	100
5(50)	5	(50)	7.5	75
3.5(35)	3.5	(35)	5.0	50

The bricks shall have smooth rectangular faces with sharp corner and shall be uniform in colour and emit clear ringing sound when struck.

- 5.2.3 Sampling and Tests:** Samples of bricks shall be subjected to the following tests

- Dimensional tolerance.
- Water absorption.
- Efflorescence.
- Compressive strength.

- 5.2.3.1 Sampling:** For carrying out compressive strength, water absorption, efflorescence and dimensional tests, the samples of bricks shall be taken at random according to the size of lot as given in Table 5.3 below. The sample thus taken shall be stored in a dry place until tests are made. For the purpose of sampling, the following definition shall apply.

- Lot: A collection of bricks of same class and size, manufactured under relatively similar conditions of production. For the purpose of sampling a lot shall contain a maximum, of 50,000 bricks.

In case a consignment has bricks more than 50,000 of the same classification and size and manufactured under relatively similar conditions of production, it shall be divided into lots of 50,000 bricks or part there of.

- Sample: A collection of bricks selected for inspection and / or testing from a lot to reach the decision regarding the acceptance or rejection of the lot.
- Defective: A brick failing to meet one or more of the specified requirements.

- 5.2.3.2 The samples shall be taken as below:**

- Sampling from a Stack: When it is necessary to take a sample from a stack, the stack shall be divided into a number of real or imaginary sections and the required number of bricks drawn from each section. For this purpose bricks in the upper layers of the stacks shall be removed to enable units to be sampled from places within the stack.

Note: For other methods of sampling i.e., sampling in motion and sampling from lorries or trucks, IS: 5454 may be referred

Scale of sampling and criteria for conformity for visual and dimensional characteristics:

Visual characteristics: The bricks shall be selected and inspected for ascertaining the conformity to the requirements of the relevant specification.

The number of bricks to be selected from lot shall depend on the size of lot and shall be in accordance of Col. 1 and 2 of Table 5.3 for visual characteristics in all cases and dimensional characteristics, if specified, of individual bricks.

- (ii) **Visual Characteristics:** All the bricks selected above in accordance with Col. 1 and 2 of Table 5.3 shall be examined for visual characteristics. If the number of defective bricks found in the sample is less than or equal to the corresponding number as specified in Col. 3 of Table 5.3 the lot shall be considered as satisfying the requirements of visual characteristics, otherwise the lot shall be deemed as not having met the visual requirements.
- (iii) **Dimensional Characteristics:** The number of bricks to be selected for inspecting the dimensions and tolerance shall be in accordance with Col. 1 and 4 of Table 5.3. These bricks will be divided into groups of 20 bricks at random and each of the group of 20 bricks thus formed will be tested for all the dimensions and tolerances. A lot shall be considered having found meeting the requirements of dimensions and tolerance if none of the groups of bricks inspected fails to meet the specified requirements.

TABLE 5.3: Scale of sampling and permissible number of defectives for visual and dimensional characteristics

No. of bricks in the lot	For characteristics specified for individual bricks		For dimensional characteristics for group of 20 bricks — No. of bricks to be selected
	No. of bricks to be selected	Permissible no. of defective in the sample	
2001—10000	20	1	40
10001—35000	32	2	60
35001—50000	50	3	80

Note: In case the lot contains 2000 or less bricks the sampling shall be as per decision of the Engineer.

- (iv) **Scale of sampling and criteria for physical characteristics**

The lot which has been found satisfactory in respect of visual and dimensional requirements shall be next tested for physical characteristics like compressive strength, water absorption, efflorescence as specified in relevant material specification. The bricks for this purpose shall be taken at random from those already selected above. The number of bricks to be selected for each of these characteristics shall be in accordance with relevant columns of Table 5.4.

TABLE 5.4: Scale of sampling for physical characteristics

Lot size	Sample size for compressive strength, water absorption and efflorescence	Permissible No. of defectives for efflorescence
2001—10000	5	0
10001—35000	10	0
35001—50000	15	1

Note: In case the lot contains 2000 or less bricks, the sampling shall be as per decision of Engineer.

- (v) A lot shall be considered having satisfied the requirements of physical characteristics if the condition stipulated here in are all satisfied.
- (a) From the test results for compressive strength, the average shall be

calculated and shall satisfy the requirements specified in relevant material specification.

Note: In case any of the test results for compressive strength exceeds the upper limit for the class of bricks, the same shall be limited to the upper limit of the class for the purpose of averaging.

- (b) Wherever specified in the material specification, the compressive strength of any individual brick tested in the sample shall not fall below the minimum average compressive strength specified for the corresponding class of brick by more than 20 per cent.
- (c) From the test results for water absorption, the average for the bricks in the sample shall be calculated and shall satisfy the relevant requirements specification in material specification.
- (d) The number of bricks failing to satisfy the requirements of the efflorescence specified in the relevant specification should not be more than the permissible no. of defectives given in Col.3 of Table 5.4.

5.2.3.3 Dimensional tolerance: The dimensions of modular bricks when tested as described above shall be within the following limits per 20 bricks.

Length 372 to 388 cm (380 ± 8 cm)

Width 176 to 184 cm (180 ± 4 cm)

Height 176 to 184 cm (180 ± 4 cm) for 90 mm high bricks

5.3 BRICK WORK

5.3.1 Classification: The brick work shall be classified according to the class designation of bricks used.

5.3.2 Mortar: The mortar for the brick work shall be as specified, and conform to accepted standards. Specifications on mortar are given in Chapter-11- Building works

5.3.3 Soaking of Bricks: Bricks shall be soaked in water before use for a period for the water to just penetrate the whole depth of the bricks. Alternatively bricks may be adequately soaked in stacks by profusely spraying with clean water at regular intervals for a period not less than six hours.

5.3.4 Laying

5.3.4.1 Bricks shall be laid in English Bond unless otherwise specified. For brick work in half brick wall, bricks shall be laid in stretcher bond.

5.3.4.2 All loose materials, dirt and set lumps of mortar which may be lying over the surface on which brick work is to be freshly started, shall be removed with a wire brush and surface wetted. Bricks shall be laid on a full bed of mortar, when laying, each brick shall, be properly bedded and set in position by gently pressing with the handle of trowel. Its inside face, shall be buttered with mortar before the next brick is laid, and pressed against it. Joints shall be fully filled and packed with mortar such that no hollow space are left inside the joints.

5.3.4.3 The walls shall be taken up truly in plumb or true to the required batter where specified. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Vertical joints in the alternate course shall come directly one over the other. Quoin, Jambs and other angles shall be properly plumbed as the work proceeds. Care shall be taken to keep the perpend properly aligned within following maximum permissible tolerances :

- (a) Deviation from vertical within a storey shall not exceed 6 mm per 3 m height.

- (b) Deviation in verticality in total height of any wall of building more than one storey in height shall not exceed 12.5 mm.
- (c) Deviation from position shown on plan of any brick work shall not exceed 12.5 mm.
- (d) Relative displacement between load bearing wall in adjacent storeys intended to be vertical alignments shall not exceed 6 mm.
- (e) A set of tools comprising of wooden straight edge, masonic spirit levels, square, 1 meter rule line and plumb shall be kept on the site of work for every 3 masons for proper check during the progress of work.

5.3.4.4 All quoins shall be accurately constructed and the height of brick courses shall be kept uniform. This will be checked using graduated wooden straight edge or storey rod indicating height of each course including thickness of joints. The position of damp proof course, window sills, bottom of lintels, top of the wall etc. along the height of the wall shall be marked on the graduated straight edge or storey rod. Acute and obtuse quoins shall be bonded, where practicable in the same way as square quoins. Obtuse quoins shall be formed with squint showing three quarters brick on one face and quarter brick on the other.

5.3.4.5 The brick work shall be built in uniform layers.

No part of the wall during its construction shall rise more than one metre above the general construction level. Parts of wall left at different levels shall be raked back at an angle of 45 degrees or less with the horizontal. Toothing shall not be permitted as an alternative to raking back. For half brick partition to be keyed into main walls, indents shall be left in the main walls.

5.3.4.6 All pipe fittings and specials, spouts, hold fasts and other fixtures which are required to be built into the walls shall be embedded, as specified, in their correct position as the work proceeds unless otherwise directed by the Engineer.

5.3.4.7 Top courses of all plinths, parapets, steps and top of walls below floor and roof slabs shall be laid with brick on edge, unless specified otherwise. Brick on edge laid in the top courses at corner of walls shall be properly radiated and keyed into position to form cut (maru) corners. Where bricks cannot be cut to the required shape to form cut (maru) corners, cement concrete M.20 equal to thickness of course shall be provided in lieu of cut bricks.

5.3.4.8 Bricks shall be laid with frog (where provided) up. However, when top course is exposed, bricks shall be laid with frog down. For the bricks to be laid with frog down, the frog shall be filled with mortar before placing the brick in position.

5.3.4.9 In case of walls one brick thick and under, one face shall be kept even and in proper plane, while the other face may be slightly rough. In case of walls more than one brick thick, both the faces shall be kept even and in proper plane.

5.3.4.10 To facilitate taking service lines later without excessive cutting of completed work, sleeves (to be paid separately) shall be provided, where specified, while raising the brick work. Such sleeves in external walls shall be sloped down outward so as to avoid passage of water inside.

5.3.4.11 Top of the brickwork in coping and sills in external walls shall be slightly tilted. Where brick coping and sills are projecting beyond the face of the wall, drip course/throating (to be paid separately) shall be provided where indicated.

5.3.4.12 Care shall be taken during construction that edges of jambs, sills and projections are not damaged in case of rain. New built work shall be covered with gunny bags or tarpaulin so as to prevent the mortar from being washed away. Damage, if any, shall be made good to the satisfaction of the Engineer.

5.3.5 Joints

The thickness of all types of joints including brick wall joints and cross joints shall be such that four course and three joints taken consecutively shall measure as follows.

- (i) In case of modular bricks conforming to IS: 1077 specification for common burnt clay buildings bricks, equal to 39 cm.
- (ii) In case of non-modular bricks, it shall be equal to 44.4 cm.

Note: Specified thickness of joints shall be of 1 cm. Deviation from the specified thickness of all joints shall not exceed one fifth of specified thickness

5.3.5.1 Finishing of Joints

The face of brick work may be finished flush or by pointing. In flush finishing either the face joints of the mortar shall be worked out while still green to give a finished surface flush with the face of the brick work or the joints shall be squarely raked out to a depth of 1 cm while the mortar is still green for subsequently plastering. The faces of brick work shall be cleaned with wire brush so as to remove any splashes of mortar during the course of raising the brick work. In pointing, the joints shall be squarely raked out to a depth of 1.5 cm while the mortar is still green and raked joints shall be brushed to remove dust and loose particles and well wetted, and shall be later refilled with mortar to give ruled finish. Some such finishes are 'flush', 'weathered', ruled, etc.

- 5.3.6** Curing: The brick work shall be constantly kept moist on all faces for a minimum period of seven days. Brickwork done during the day shall be suitably marked indicating the date on which the work is done so as to keep a watch on the curing period.

5.3.7 Measurements

- 5.3.7.1** Brick work shall be measured in cubic metres unless otherwise specified. Any extra work over the specified dimensions shall be ignored. Dimensions shall be measured correct to the nearest 0.01 m. i.e. 1 cm. Areas shall be calculated to the nearest 0.01 sq m. and the cubic contents shall be worked out to the nearest 0.01 cubic metres.

- 5.3.7.2** Brick work shall be measured separately in the following stages :

- (a) From foundation to floor one level (Plinth level)
- (b) Plinth (floor one) level to floor two level
- (c) Between two specified floor levels above floor two level

- 5.3.7.3** No deductions or additions shall be done and no extra payment made for the following:

Note: Where minimum area is defined for deduction of an opening, void or both, such areas shall refer only to opening or void within the space measured.

- (a) Ends of dissimilar materials (that is, joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps, etc.); up to 0.1 sq.m. in section;
- (b) Opening up to 0.1 sq.m. in area (see Note);
- (c) Wall plates, bed plates, and bearing of slabs, chajjas and the like, where thickness does not exceed, 10 cm and bearing does not extend over the full thickness of wall;
- (d) Cement concrete blocks as for hold fasts and holding down bolts;
- (e) Chases of section not exceeding 50 cm in girth.
- (f) Bearing portion of drip course, bearing of moulding and cornice.

Note: In calculating area of an opening, any separate lintel or sills shall be included with the size of the opening but end portions of lintel shall be excluded. Extra width of rebated reveals, if any, shall also be excluded.

- 5.3.7.4** Walls half brick thick and less shall each be measured separately in square metres stating thickness.

5.3.7.5 Walls beyond half brick thickness shall be measured in multiples of half brick which shall be deemed to be inclusive of mortar joints. For the sizes of bricks specified in 5.1.1, half brick thickness shall mean 100 mm for modular and 115 mm for non-modular bricks.

Where fractions of half brick occur due to architectural or other reasons, measurement shall be as follows:

- (a) up to 1/4th brick - actual measurements and
- (b) exceeding 1 /4 brick-full half bricks.

5.3.7.6 String courses, projecting pilasters, aprons, sills and other projections shall be fully described and measured separately in running metres stating dimensions of each projection.

5.3.7.7 Square or rectangular pillars shall be measured separately in cubic metres in multiple of half brick.

5.3.7.8 Circular pillars shall be measured separately in cubic metres as per actual dimensions.

5.3.7.9 Brick work curved on plan shall be measured like the brick work in straight walls and shall include all cutting and wastage of bricks, tapered vertical joints and use of extra mortar if any. Brick work curved on plan to a mean radius not exceeding six metres shall be measured separately and extra shall be payable over the rates for brick work in straight walls. Nothing extra shall be payable if the mean radius of the brick work curved in plan exceeds six metres.

5.3.7.10 Tapered walls shall be measured net as walls and extra payment shall be allowed for making tapered surface for brick work in walls.

5.3.7.11 Brick work with brick tiles shall be measured and paid for separately.

5.3.8 Rate

The rate shall include the cost of materials and labour required for all the operations described above except the vertical reinforcement and its encasement in cement mortar or cement concrete.

TABLE 5.5: List of Mandatory Tests

Material	Clause	Test	Field/ laboratory Test	Minimum Qty. of material for carrying out test
Bricks	5.1.3	Testing of Bricks/ Brick Tiles for dimensions compressive strength, water absorption and efflorescence	Laboratory	As per Table 5.3 and 5.4