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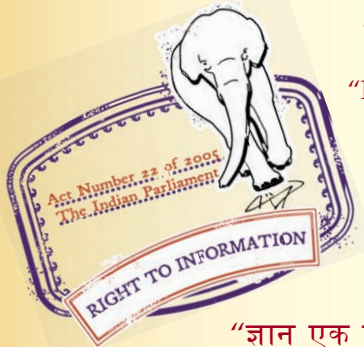
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IS 13612-1 (1993): Modular co-ordination for normal brickwork - Recommendations, Part 1: Burnt clay bricks [CED 51: Planning, Housing and pre-fabricated construction]



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“Knowledge is such a treasure which cannot be stolen”



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IS 13612 ( Part 1 ) : 1993

भारतीय मानक

सामान्य ईटकीय का मडयूली समन्वय — सिफारिशें

भाग 1 पक्की ईटें

*Indian Standard*

**MODULAR CO-ORDINATION FOR NORMAL  
BRICKWORK — RECOMMENDATIONS**

**PART 1 BURNT CLAY BRICKS**

UDC 721.013 : 006.78 : 666.71

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

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Planning, Bye-laws and Dimensional Co-ordination Sectional Committee had been approved by the Civil Engineering Division Council.

Bricks are one of the most common building components for a variety of uses in the construction industry. These are manufactured from locally available clays. In India, non-modular bricks are available in different dimensions.

The metric system became effective in early sixties in the country through legislation. With this legislation, the Bureau recommended the use of modular bricks in place of non-modular burnt clay building bricks. The Bureau of Indian Standards has brought out a number of standards on dimensions, quality, strength, classifications, grading and methods of test for metric bricks. IS 1077 : 1986 and IS 2180 : 1985 suggest two sizes of common building burnt clay bricks, namely 200 mm × 100 mm × 100 mm and 200 mm × 100 mm × 50 mm. The bond arrangements are similar to the well known bonds, but are based on third bonding; that is, overlap is one third of the brick and not one fourth as in the case of non-modular brick.

The adoption of modular co-ordination system in construction industry has been advocated by many national organizations. A number of committees have reported the advantages of metric/modular bricks and suggested incentive measures for metric-brick manufacturers. In spite of these efforts, nearly 50,000 million non-modular size bricks continue to be manufactured in this country.

Designers are very apprehensive, because of non-availability of modular size bricks, to adopt modular co-ordination in a project. The manufacturers have some reservation to produce modular bricks since they claim to face manufacturing and marketing problems. In spite of best efforts and encouragement given, the production of modular bricks remained insignificant. As a result, modular co-ordination and metric system have not yet been able to replace the non-modular brick in the country.

This standard has been formulated with a view to accelerating the adoption of modular co-ordination in the construction industry using the available non-modular size of bricks for a project by the designers. It is intended to be a working reference for the dimensional control of brickwork.

This standard has been formulated with considerable assistance from the National Building Organization, New Delhi.

In 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. This has been met by deriving assistance from the following documents:

- a) Industrialised Building and Modular Design: Henrik Nissen. Cement and Concrete Association, London ( 1972 ).
- b) DS 1048-1966 Normal Brickwork and Modular Co-ordination. Dansk Standardiseringrad.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# MODULAR CO-ORDINATION FOR NORMAL BRICKWORK — RECOMMENDATIONS

### PART 1 BURNT CLAY BRICKS

#### 1 SCOPE

**1.1** This standard deals with the application of modular co-ordination in brickwork using modular and non-modular bricks.

**1.2** This standard covers recommendations for achieving modular co-ordination in brickwork using modular and non-modular brick sizes, and preferred horizontal and vertical controlling dimensions in all types of buildings. This is intended to be a working reference for the dimensional control of all types of brickwork.

#### 2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

#### 3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 4993 : 1983, IS 7921 : 1987 and IS 7922 : 1987 shall apply.

#### 4 GENERAL CONCEPT

**4.1** Dimensional co-ordination amongst different building components is very important to reduce the cost in a construction project. Brickwork being a basic component of any building, needs dimensional co-ordination. Modular bricks have been introduced and internationally accepted for achieving modular co-ordination in brickwork. But as the modular bricks have not yet been able to replace the non-modular bricks in the country, it is felt necessary to devise ways to achieve modular co-ordination in brickwork, using non-modular brick size and bond dimensions, in addition to modular bricks. A modular system using 100 mm as basic module; and 50 mm, 25 mm and 20 mm as sub-modular increments ( *see* IS 10316 : 1986 ) may be adopted.

#### 5 FIELD OF APPLICATION

**5.1** For the application of modular co-ordination, IS 6820 : 1987, IS 7921 : 1987 and IS 7922 : 1987 shall be referred. These standards recommend use of planning module of 3M or multiples thereof for horizontal dimensions and a planning module of 2M or multiples thereof for vertical dimensions.

**5.2** These dimensions fit the controlling dimensions for brickwork using modular as well as non-modular size of bricks and are also suitable to determine the dimensions of floor height, wall thickness, staircase dimensions, doorsets and windowsets ( *see* IS 12073 : 1987 ) etc. These dimensions are suitable for space planning in buildings.

#### 6 MODULAR BRICKWORK

##### 6.1 Controlling Dimensions of Bricks

**6.1.1** The controlling dimensions, converted to equivalents in mm, for modular and non-modular bricks with values rounded off to nearest mm shall be in accordance with dimensions given in Fig. 1.

**6.1.2** The controlling dimensions and ratio thereof ( converted to equivalents in mm ) of bricks shall be:

a) Modular brick

$$L \times B \times H = 200 \times 100 \times 100$$

$$\left( \frac{L}{L} = 1, \frac{L}{B} = 2, \frac{L}{H} = 2 \right)$$

b) Non-modular bricks

$$L \times B \times H = 240 \times 120 \times 80$$

$$\left( \frac{L}{L} = 1, \frac{L}{B} = 2, \frac{L}{H} = 3 \right)$$

These ratios establish further relationship for controlling dimensions for length, height and thickness of brickwork and bonds as shown in Fig. 2 and Fig. 3 for modular and non-modular bricks.

##### 6.2 Controlling Dimensions for Brickwork

###### 6.2.1 Modular Bricks

The modular bricks with actual measurement of 190 mm × 90 mm × 90 mm fits in modular planning with controlling dimensions of brickwork,  $n \times 50$  mm, as shown below ( *see also* Fig. 4A ):

$$4 \times 50 \text{ mm} = \text{Full brick} = 200 \text{ mm}$$

( Nominal size )

$$3 \times 50 \text{ mm} = 3/4 \text{ brick} = 150 \text{ mm}$$

$$2 \times 50 \text{ mm} = 1/2 \text{ brick} = 100 \text{ mm}$$

$$1 \times 50 \text{ mm} = 1/4 \text{ brick} = 50 \text{ mm}$$

6.2.1.1 For modular bricks, using sub-modular increments of  $\frac{M}{2}$ , the controlling dimensions for brick walls, which are multiples of  $\frac{M}{2}$  (50 mm) for both, horizontal and vertical dimensions, match with the modular dimensions (see Fig. 5A).

6.2.2 Non-modular Bricks

The non-modular bricks with the measurement 240 mm × 120 mm × 80 mm fits in modular planning with controlling dimensions of brickwork,  $n \times 60$  mm, as shown below (see also Fig. 4B):

- 4 × 60 mm = Full brick = 240 mm (Nominal size)
- 3 × 60 mm = 3/4 brick = 180 mm
- 2 × 60 mm = 1/2 brick = 120 mm
- 1 × 60 mm = 1/4 brick = 60 mm

6.2.2.1 For non-modular bricks, using sub-modular increments of  $\frac{M}{5}$  the controlling dimensions for brick walls, which are multiples of 60 mm (= 3 × 20 mm) for horizontal and 80 mm (= 4 × 20 mm) multiples of 80 mm (= 4 × 20 mm) for vertical direction, match with the modular dimensions (see Fig. 5B).

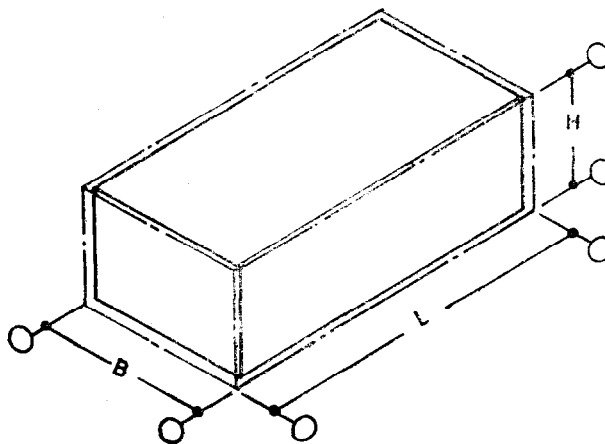
6.3 Horizontal Co-ordination

6.3.1 Considering the length and breadth of modular bricks, the horizontal controlling dimension of 3M can be achieved as follows:

$$\begin{aligned} & \text{Six times (50 mm or 1/4 brick interval)} \\ & = 6 \times 50 = 3M \end{aligned}$$

6.3.2 Considering the length and breadth of non-modular bricks, the horizontal controlling dimensions of 3M can be achieved as follows:

$$\begin{aligned} & \text{Five times (60 mm or 1/4 brick interval)} \\ & = 5 \times 60 = 3M \end{aligned}$$



Type		Controlling Dimensions					
		Nominal			Actual		
		L	B	H	L	B	H
Modular	Bricks	200	100	100	190	90	90
	Tiles			50			40
Non-Modular (Conventional)	Bricks	240	120	80	230	110	70
	Tiles			40			35

FIG. 1 CONTROLLING DIMENSIONS OF BRICK

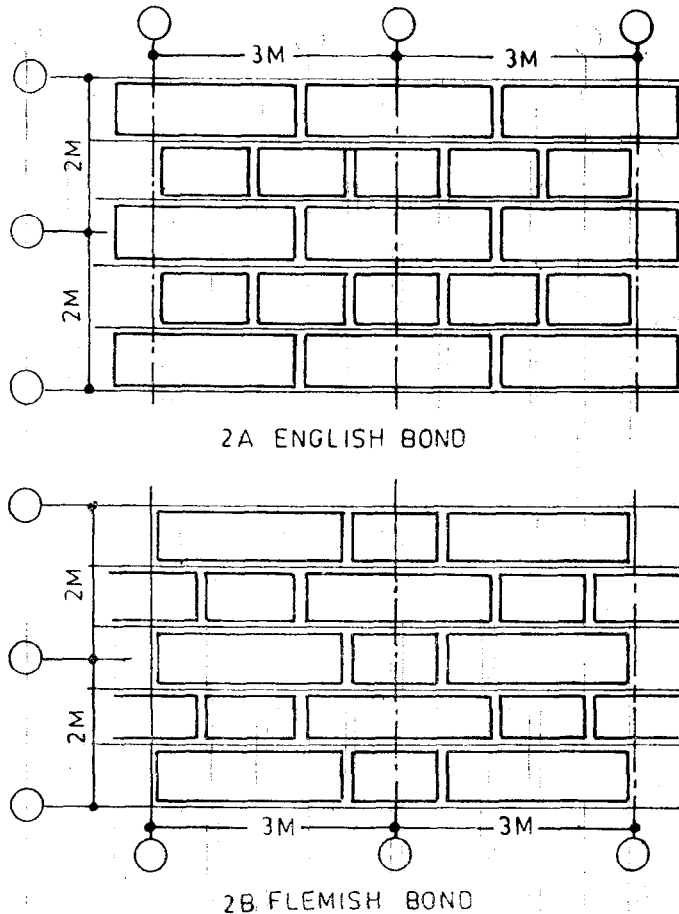


FIG. 2 BOND ARRANGEMENT FOR NON-MODULAR BRICKS

**6.4 Vertical Co-ordination**

6.4.1 Considering the height of modular bricks, the vertical controlling dimensions of 2M can be achieved as follows:

$$\text{Brick on edge} + 1 \text{ course} = 100 + 100 = 2M$$

6.4.2 Considering the height of conventional bricks, the vertical controlling dimensions of 2M can be achieved as follows:

$$\text{Brick on edge} + 1 \text{ course} = 120 + 80 = 2M$$

**7 TOLERANCE ON BRICKS**

7.1 Application of tolerances in brickwork shall be in accordance with IS 6408 (Part 2) : 1990.

7.2 In order to maintain the brickworks own controlling dimension, that is, equal to one nominal brick length [ 240 mm for non-modular and 200 mm for modular brick ], the joint dimensions have to be controlled within limits [ see IS 6408 (Part 2) : 1990 ].

7.3 The one-brick length, height, width and brick cuttings ( that is closers, bats etc ) shall have 5 mm deduction on all surfaces for joint dimensions.

*Example:*

a) for modular bricks:

	Nominal	Actual
For 1/4 stretcher	1 × 50 mm = 50 mm	50 – 10 = 40 mm
For 1/2 stretcher	2 × 50 mm = 100 mm	100 – 10 = 90 mm
For 3/4 stretcher	3 × 50 mm = 150 mm	150 – 10 = 140 mm
For 1 stretcher	4 × 50 mm = 200 mm	200 – 10 = 190 mm

b) For non-modular conventional bricks:

	Nominal	Actual
For 1/4 stretcher	1 × 60 mm = 60 mm	60 – 10 = 50 mm
For 1/2 stretcher	2 × 60 mm = 120 mm	120 – 10 = 110 mm
For 3/4 stretcher	3 × 60 mm = 180 mm	180 – 10 = 170 mm
For 1 stretcher	4 × 60 mm = 240 mm	240 – 10 = 230 mm

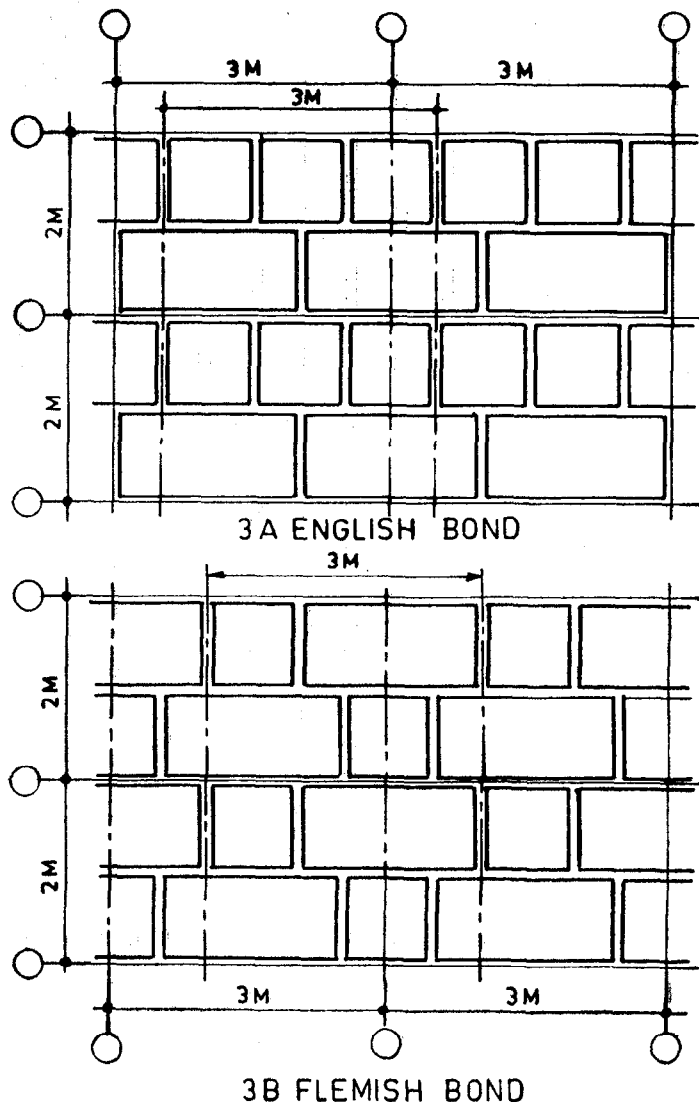


FIG. 3 BOND ARRANGEMENT FOR MODULAR BRICKS

**8 HORIZONTAL DIMENSIONS OF WALL**

**8.1 Modular Bricks**

8.1.1 The basic co-ordinating dimension for brickwork in horizontal plane shall be multiple of  $\frac{M}{2}$  sub-modular increment ( 50 mm ), minus joint dimension, that is  $n \times 50 \text{ mm} - \text{joint dimension}$  ( see Fig. 6 ).

**8.2 Non-modular Bricks**

8.2.1 The basic co-ordinating dimension for brickwork in horizontal plane shall be multiple of 60 mm (  $= 3 \times \frac{M}{5}$  that is, multiple of  $\frac{M}{5}$  sub-modular increments ), minus joint dimension, that is  $n \times 60 \text{ mm} - \text{joint dimension}$  ( see Fig. 6 ).

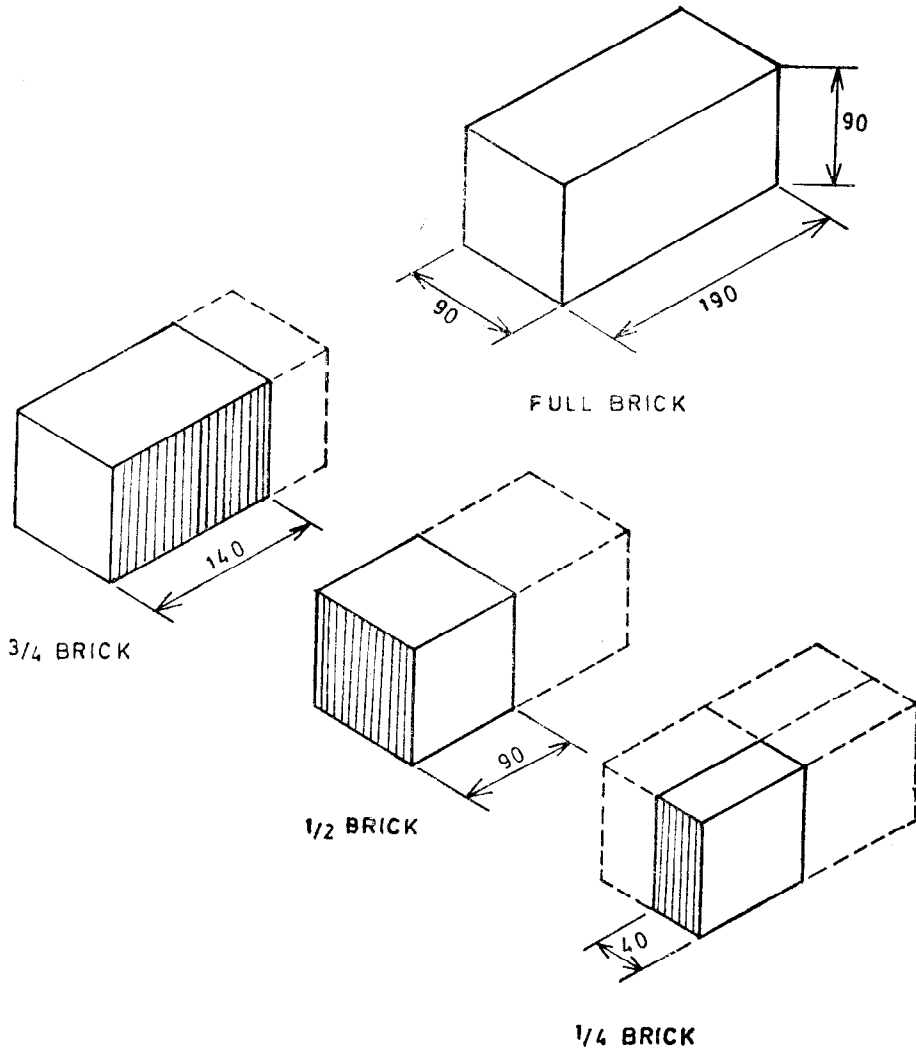
8.3 The preferred horizontal dimensions for brickwork shall be selected for controlling the length of the wall ( see 6.4 ).

8.4 The '5-mm Rule' shall be applied to specify the horizontal dimension of wall and other related measurement of openings in the wall ( see IS 7921 : 1987 ).

**9 VERTICAL DIMENSIONS OF WALL**

**9.1 Modular Brick**

9.1.1 The basic co-ordinating dimension for brickwork using modular bricks, in vertical plane shall be  $\frac{M}{2}$  sub-modular increment ( 50 minus joint dimension, that is,  $n \times 50 \text{ mm} - \text{joint dimension}$  ( see Fig. 6 and Fig. 7A ).

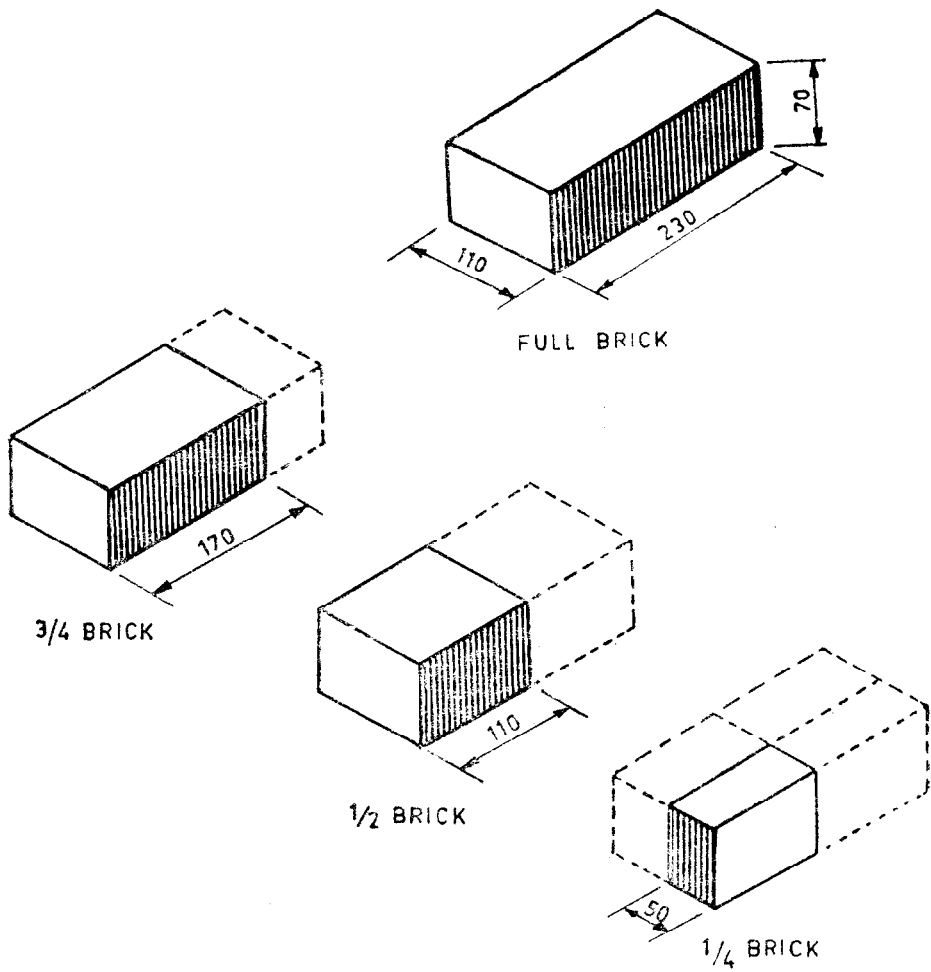


Length	$n \times 1/2 M$	Reduction Due to 5-mm Rule	Actual
1/4*	1 × 50	50-10	40
1/2†	2 × 50	100-10	90
3/4	3 × 50	150-10	140
4/4‡	4 × 50	200-10	190
5/4	5 × 50	250-10	240
6/4	6 × 50	300-10	290

\*Quoin closer or 1/2 header  
 †Width of brick or 1 header  
 ‡Length of brick or 2 headers

All dimensions in millimetres.

FIG. 4A CUTTING OF MODULAR BRICKS

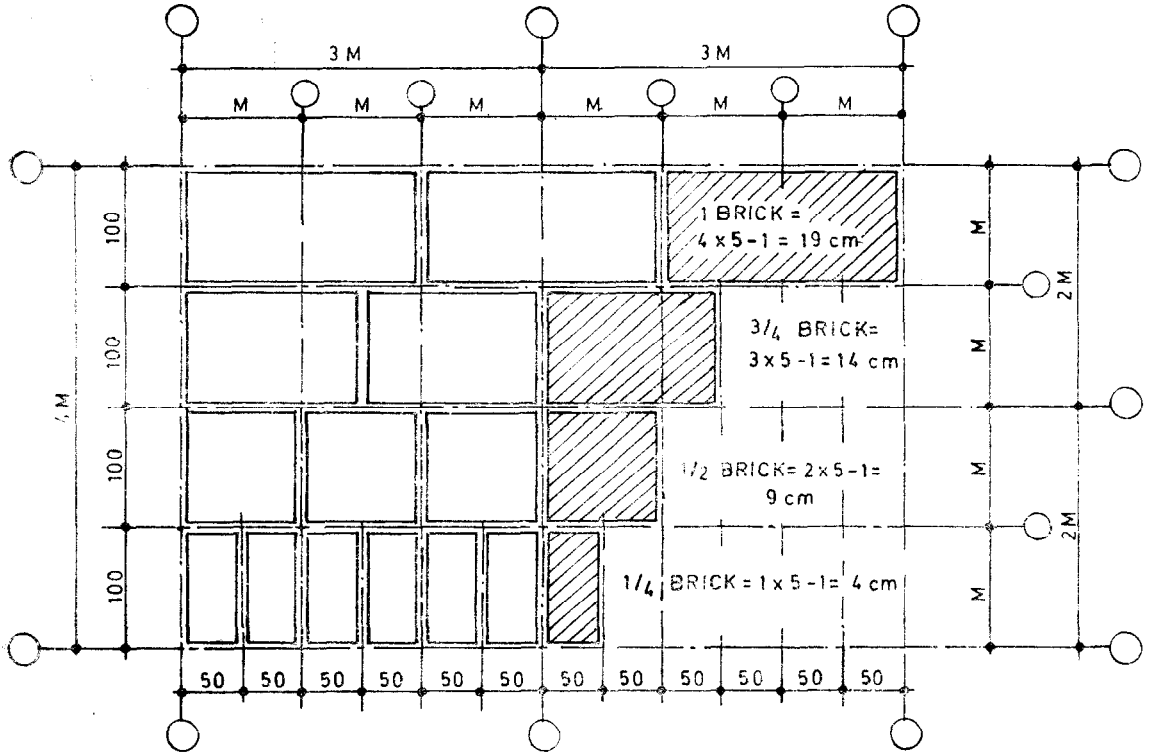


Length	$n \times 1/5 M$	With 5-mm Rule	Actual
1/4*	1 × 60	60-10	50
1/2†	2 × 60	120-10	110
3/4	3 × 60	180-10	170
4/4‡	4 × 60	240-10	230
5/4	5 × 60	300-10	290
6/4	6 × 60	360-10	350

\*Quoin closer or 1/2 header  
 †Width of brick or 1 header  
 ‡Length of brick or 2 headers

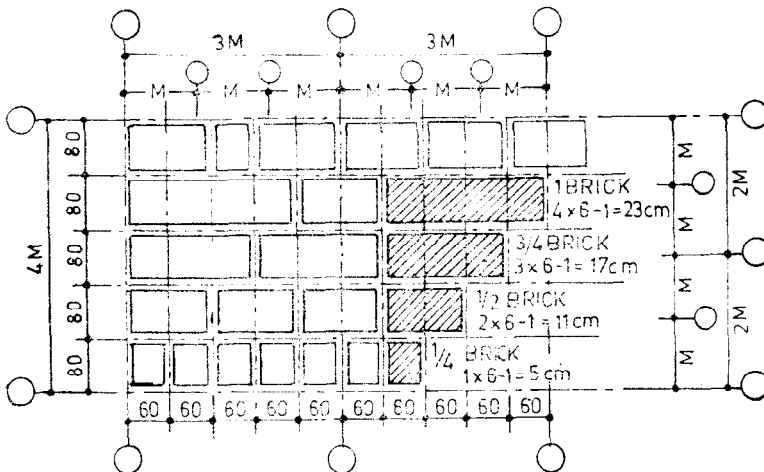
All dimensions in millimetres.

FIG. 4B CUTTING OF NON-MODULAR BRICKS



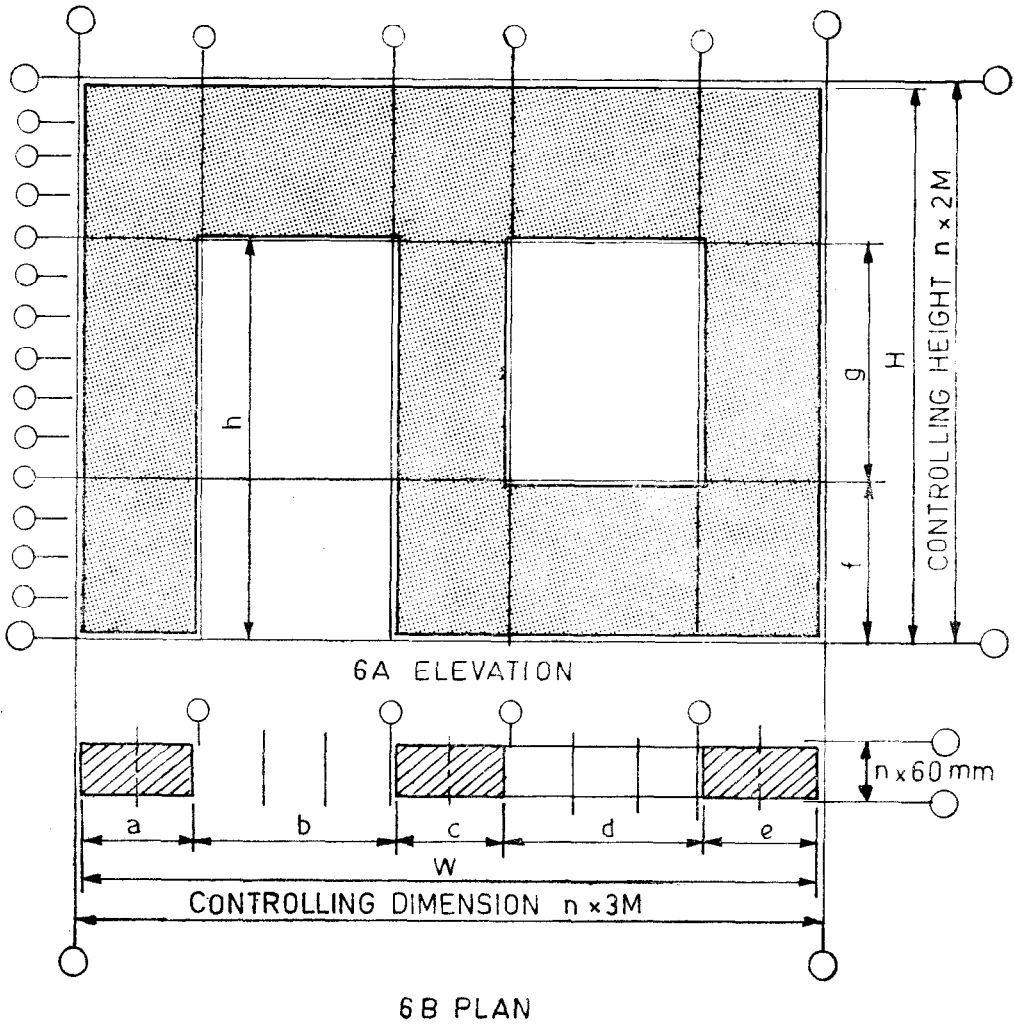
All dimensions in millimetres.

FIG 5A BOND DIMENSIONS FOR MODULAR BRICKS



All dimensions in millimetres.

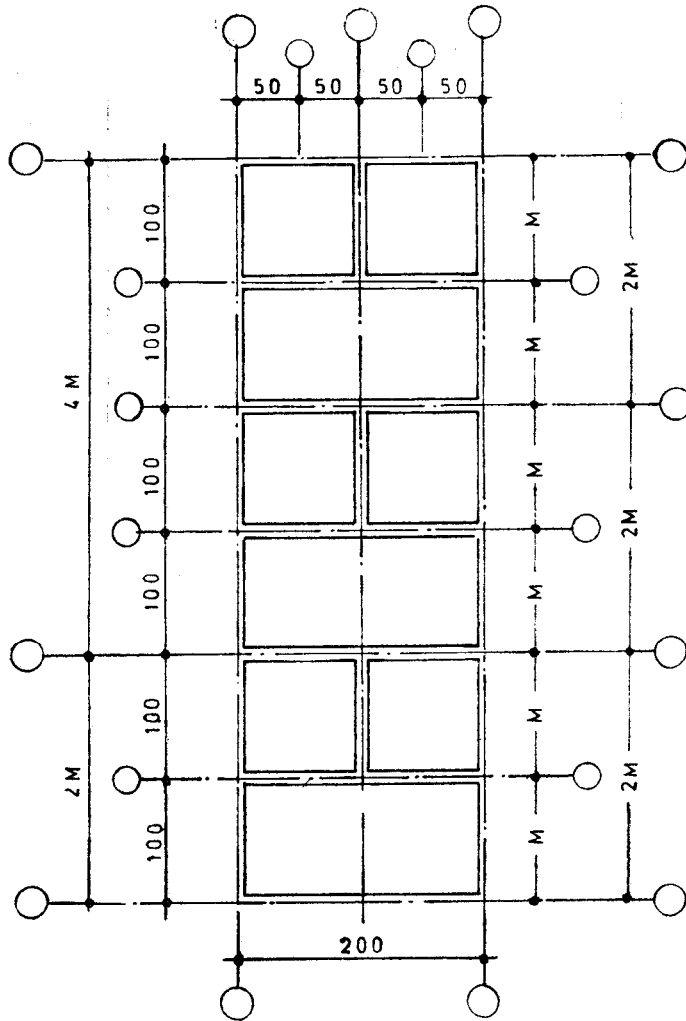
FIG. 5B BOND DIMENSIONS FOR NON-MODULAR BRICKS



Brick Size	Co-ordinating Dimensions			
	Horizontal		Vertical	
Non-modular ( Conventional )	$a, c$ and $e$	$= n \times 60 \text{ mm} - 10 \text{ mm}$	$f$	$= n \times 80 \text{ mm} - 10 \text{ mm}$
	$b$ and $d$	$= n \times M + 10 \text{ mm}$	$g$ and $h$	$= n \times M + 10 \text{ mm}$
	$a + b + c + d + e = W$	$= n \times 3M - 10 \text{ mm}$	$H$	$= n \times 2M - 10 \text{ mm}$
Modular	$a, c$ and $e$	$= n \times 50 \text{ mm} - 10 \text{ mm}$	$f$	$= n \times 50 \text{ mm} - 10 \text{ mm}$
	$b$ and $d$	$= n \times M + 10 \text{ mm}$	$g$ and $h$	$= n \times M + 10 \text{ mm}$
	$a + b + c + d + e = W$	$= n \times 3M - 10 \text{ mm}$	$H$	$= n \times 2M - 10 \text{ mm}$

All dimensions in millimetres.

FIG. 6 BRICKWORK CONTROLLING DIMENSIONS



All dimensions in millimetres.

FIG. 7A VERTICAL DIMENSIONS FOR MODULAR BRICKS

## 9.2 Non-modular Brick

9.2.1 The basic co-ordinating dimension for brickwork using non-modular bricks, in vertical plane shall be  $80 \text{ mm} \left( = 4 \times \frac{M}{5} \right)$ , that is multiple  $\frac{M}{5}$  sub-modular increment) minus joint dimension, that is  $n \times 80 \text{ mm} - \text{joint dimension}$  ( see Fig. 6 and 7B ).

9.3 The preferred vertical dimensions for brickwork shall be selected for controlling sill, lintel, room and floor heights.

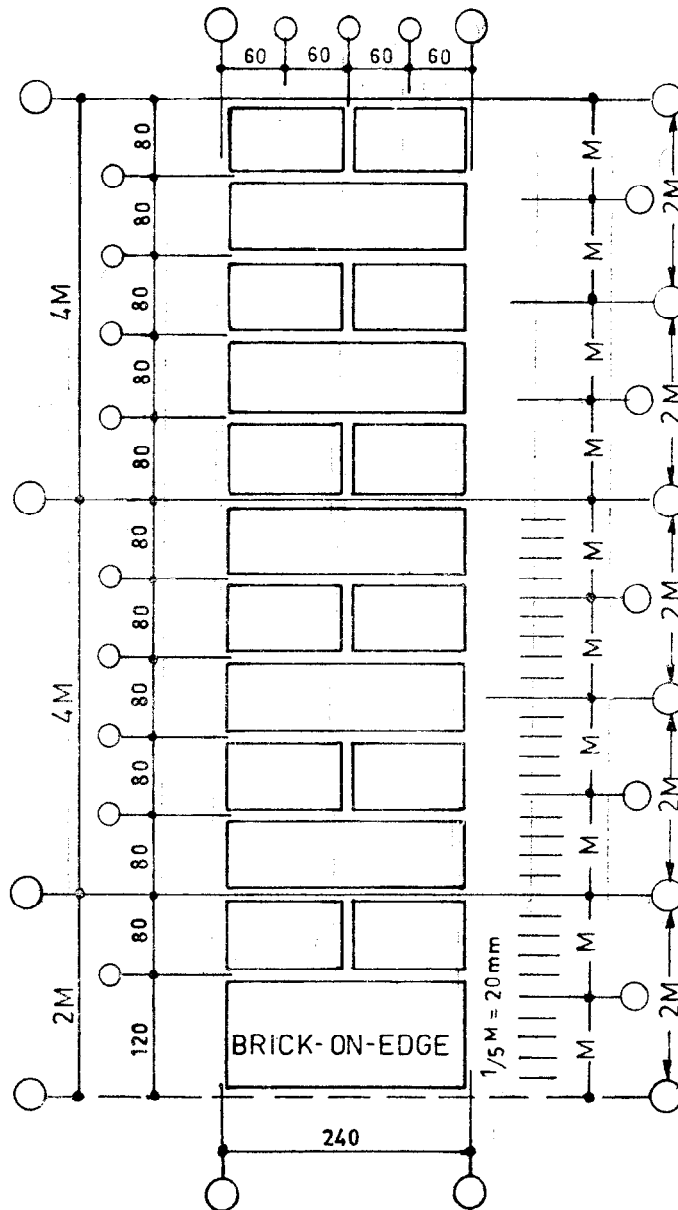
9.4 The '5-mm Rule' shall be applied to specify the vertical dimension of walls and other related measurements of openings in the wall ( see IS 7922 : 1987 ).

9.5 Due to some reasons, need may arise to accommodate non-modular sizes of elements/components/assemblies. One such reason may be to fulfil specific functional needs of structure. These may be met by introducing brick-on-edge course at desired levels.

## 10 THICKNESS OF WALL

### 10.1 Modular Brick

10.1.1 The basic controlling dimension for brickwork, using modular bricks, in thickness shall be based on  $\frac{M}{2}$  sub-modular increments ( First preference in accordance with Table 1 of IS 10316 : 1986 ), that is, having increments of  $n \times 50 \text{ mm} - \text{joint dimension}$  ( see Fig. 8A ).



All dimensions in millimetres.

FIG. 7B VERTICAL DIMENSIONS FOR NON-MODULAR BRICKS

**10.2 Non-modular Brick**

10.2.1 The basic controlling dimension for brickwork using non-modular bricks, in thickness shall be based on  $\frac{M}{5}$  sub-modular increments (Third preference in accordance with Table 1 of IS 10316 : 1986), that is, having increments of  $n \times 20$  mm — joint dimension (see Fig. 8B-).

**10.3 Sizes for Bricks and Tiles**

10.3.1 For modular bricks and tiles the sizes (in mm) shall be as follows:

	Nominal	Actual
Tile	50	40
Brick on edge/half brick	100	90
One brick	200	190
One and a half brick	300	290
Two bricks	400	390

10.3.2 For non-modular bricks and tiles, the sizes are (equivalent in mm) shall be as follows:

	Nominal	Actual
Tile	60 mm	50 mm
Brick on edge	80 mm	70 mm
Half brick	120 mm	110 mm
Half brick + brick on edge	200 mm	190 mm
One brick	240 mm	230 mm
One and a half brick	360 mm	350 mm
Two bricks	480 mm	470 mm

### 11 CO-ORDINATE DIMENSIONING

11.1 Dimensions of brick wall shall be represented on measurement line with actual

dimensions of wall for length, width/thickness and heights.

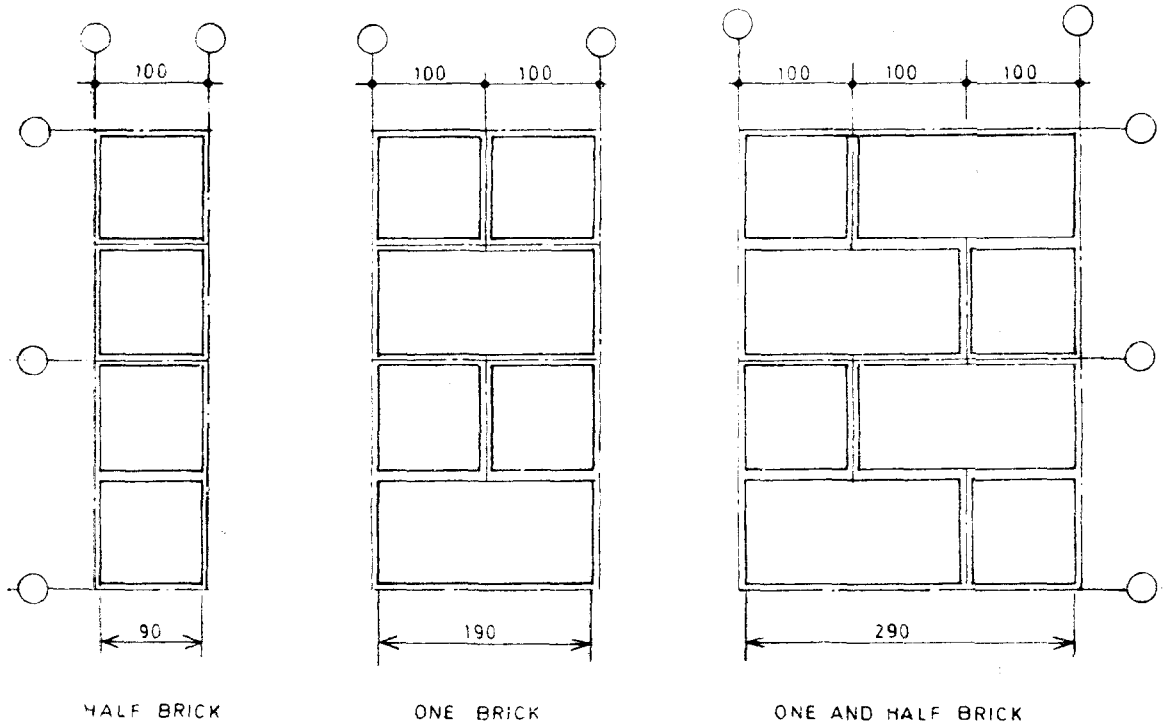
11.2 The actual dimensions of the wall openings shall be determined from the controlling dimensions plus one joint dimension.

11.3 The modular lines of openings in the wall shall be located along the centre line of joints.

11.4 Co-ordinating dimensions of actual openings shall be 10 mm more and wall dimensions shall be 10 mm less than modular dimensions.

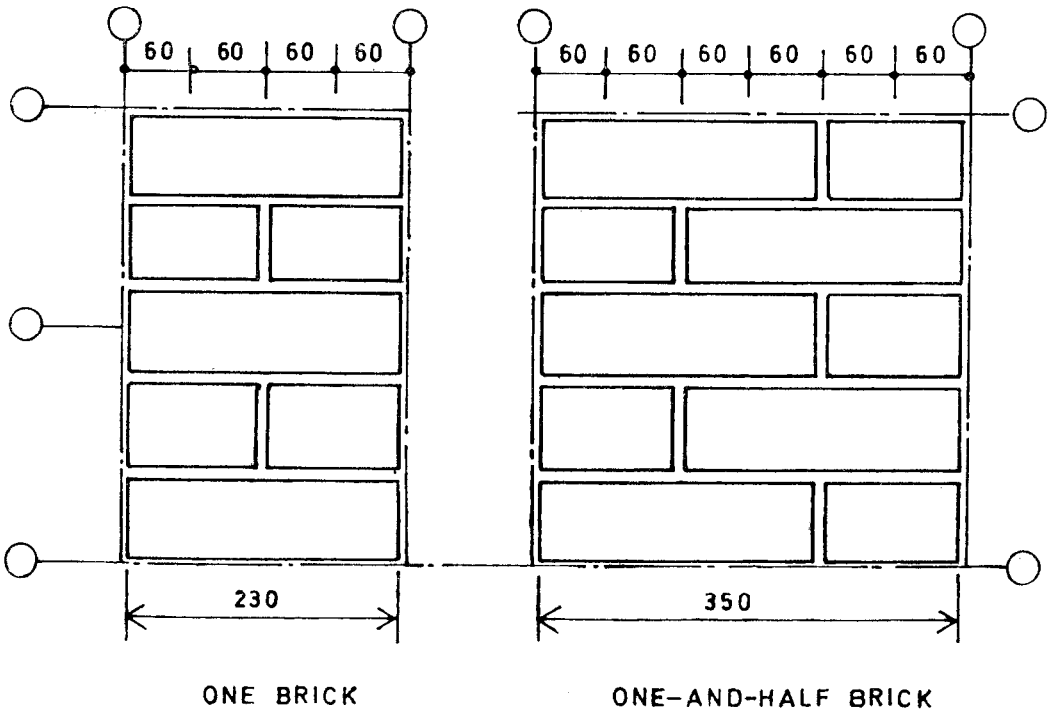
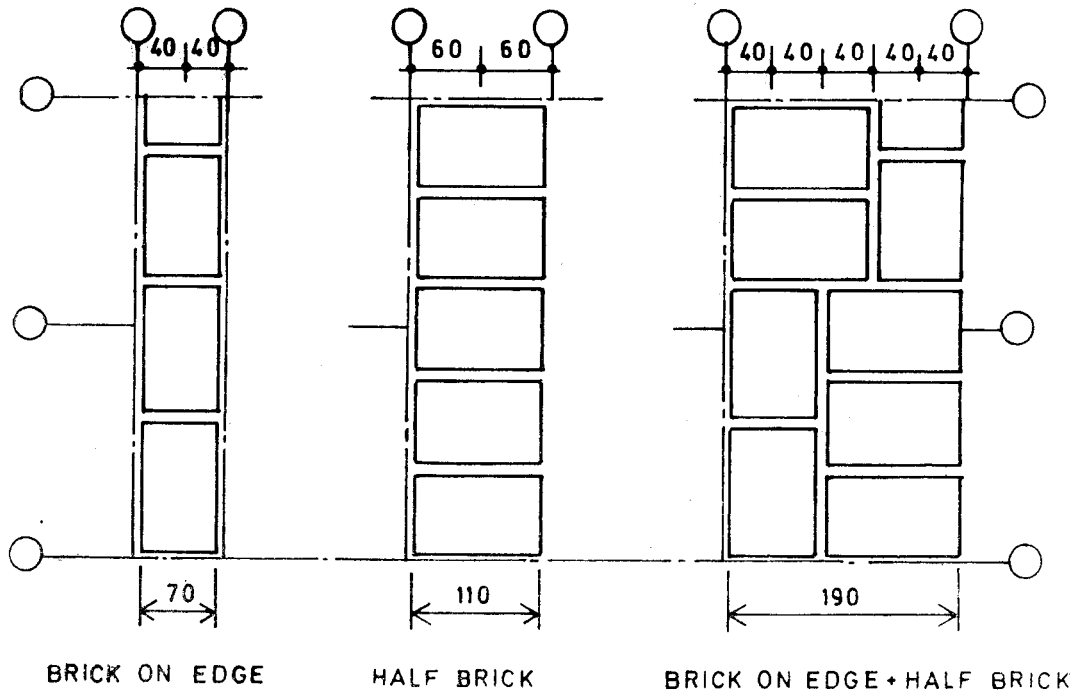
### 12 LOCATION OF WALL

It shall be in accordance with Indian Standard Recommendations for modular co-ordination in building industry : location of structural walls and floor slabs ( *under preparation* ).



All dimensions in millimetres.

FIG. 8A BRICK WALL THICKNESSES WITH MODULAR BRICKS



All dimensions in millimetres.

FIG. 8B BRICK WALL THICKNESS WITH NON-MODULAR BRICKS

**ANNEX A**

( Clause 2 )

**LIST OF REFERRED INDIAN STANDARDS**

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
1077 : 1986	Specification for common burnt clay building bricks ( <i>fourth revision</i> )	6820 : 1987	Recommendations for modular co-ordination in building industry : Applications ( <i>first revision</i> )
2180 : 1988	Specification for heavy-duty burnt clay building bricks ( <i>third revision</i> )	7921 : 1987	Recommendations for modular co-ordination in building industry : Horizontal co-ordination ( <i>first revision</i> )
4993 : 1983	Glossary of terms relating to modular co-ordination ( <i>second revision</i> )	7922 : 1987	Recommendations for modular co-ordination in building industry : Vertical co-ordination ( <i>first revision</i> )
6408 ( Part 2 ) : 1990	Recommendations for modular co-ordination tolerances in building industry : Part 2 Principles and applications ( <i>first revision</i> )	10316 : 1986	Recommendations for modular co-ordination basic module and sub-modular increments

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Doc : No. CED 10 ( 4232 )

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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