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## 9. CEMENT CONCRETE BLOCK MASONRY

### 9.1 SCOPE

The work under this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and performing all operations in any floor and at any height in connection with the supply and installation of ordinary cement concrete solid and hollow block masonry work including wall ties, anchors, damp-proof courses, complete in strict accordance with this section of the Specifications and applicable drawings, and subject to the terms and conditions of the Contract.

### 9.2 MATERIALS

#### 9.2.1 FOR BLOCK

Cement, aggregates and water for concrete blocks shall conform to the requirements as specified in Section 5 for Plain and Reinforced Concrete.

#### 9.2.2 FOR MORTAR

The mortar for concrete block masonry shall be cement and mix as specified.

##### 9.2.2.1 SAND

Sand for mortar shall comply with the requirements for BS-1200. It shall be graded in accordance with the following table and the various sizes of particles shall be uniformly distributed. Sand that has been in contact with seawater shall not be used unless it has been thoroughly washed to the satisfaction of the Engineer-in-Charge.

**Table 9.2.2(a)**  
**Grading of Sand**

Sieve Size Number	Percent Passing by Weight	
	min.	max.
# 4	100	Not Applicable
# 8	95	100
# 16	70	100
# 30	40	75
# 50	10	35
# 100	2	15
# 200	0	0

The sand shall conform to the provisions of 5.3.1.3 – Plain & Reinforced Concrete for limits of deleterious material.

##### 9.2.2.2 CEMENT

Cement shall be Ordinary Portland Cement conforming to BS-12.

##### 9.2.2.3 WATER

Water shall be clean and free from any harmful impurity. Where the quality of the water is doubtful, it shall be tested in accordance with BS- 3148. The water shall comply with the provisions of Clause 5.3.1.6 - Plain & Reinforced concrete.

#### **9.2.2.4 ADDITIVES**

Additives where used, shall be proprietary products used in the proportions and manner recommended by the manufacturer. The additives shall in no way adversely affect the mortar strength or contain chemicals, which may be harmful to other building materials. To add gypsum to cement is strictly forbidden.

#### **9.2.2.5 MORTARS AND GROUT**

Materials for mortar, sand binding agent and water, shall be mixed by volume or by weight as specified for at least 3 minutes with the minimum amount of water to produce a correctly mixed mortar or grout of workable consistency in a mechanical batch mixer. For small jobs, hand mixing may be permitted, the ingredients being mixed with sufficient water to produce a correctly mixed workable mortar.

Mortar shall be as strong, but no stronger than the materials it bonds together: Mortars shall be mixed in batches, which can be used within a period before the setting process commences. Once a mix begins drying off, it shall be rejected. No ingredients shall be added to it once the setting process has begun

### **9.3 CONCRETE BLOCK MAKING**

The Solid and Hollow blocks shall be factory manufactured/fabricated and be machine moulded. The block making machines shall be of the standard approved by the Engineer-in-Charge. They shall be operated according to the instructions laid down by the manufacturers. The contractor shall submit samples/literature of various manufacturers for Engineer-in-Charge's approval. The contractor should note that only blocks supplied by the approved manufacturer(s) shall be allowed to be used in the work.

The blocks shall be continuously water cured by sprinkling water for a minimum of 10 days and covered between sprinkling operations with 4 mils thick polyethylene sheeting. After 10 days water curing period the blocks shall be air-dried. Under no circumstances blocks will be used in the work until they are completely dry. During curing period no surfaces of the block will be allowed to dry.

Cured concrete blocks shall be stored off the ground, stacked on level platforms which allow air circulation under stacked units. Units shall be covered and protected against wetting.

Care shall be exercised in the handling of all concrete blocks. No damaged blocks shall be used in the work.

The hollow blocks shall be manufactured as per pattern shown on the drawing. These block units shall be provided by the Contractor for use where required in building structures from approved type of materials. Units shall have uniformly fine smooth surfaces of uniform colour. These shall be free of any honey combing or other imperfections or deformations, all edges true and straight, and at right angles with each other and without any chipped or otherwise broken edges.

The blocks cast on different dates shall be stacked separately and must be labelled showing the date on which they were cast.

Reinforced cement concrete hollow block masonry shall be provided where shown on the drawings. Hollow block manufactured by moulding machine shall have well formed cavities, sharp and well defined edges and corners, smooth surfaces without any imperfections or deformations.

#### 9.4 PROPERTIES OF BLOCKS

All blocks shall be of the size and shape required to complete the work shown in the Drawings or as instructed by the Engineer-in-Charge.

The cement, sand and coarse aggregate shall be volume batched and their proportion may be adjusted so as to provide the concrete of the required strength when tested and shall be mixed in a concrete mixer in accordance with the provisions of Section 5 - 'Plain and Reinforced Concrete.

All blocks shall comply with ASTM C-55-03 edition. The compressive strength of various solid and hollow blocks shall be as follows:

Sr. #	Type of Concrete Masonry	Compressive Strength (Psi)		Location
		Average of 3 Units	Individual Unit	
1.	Solid load bearing Masonry units (ASTM-C-145-85)	2000 psi minimum	2000	Exposed to frost action
2.	Solid/Hollow non-load bearing Masonry units	600	500	Not exposed to moisture & weather
3.	Hollow load bearing Masonry units	1900	800	Exposed to moisture & weather
4.	(ASTM-C-90-85)	700	600	Not exposed to moisture & weather

Normally 1:3:6 concrete mix should meet the above strength requirement as per Clause 5.3.2.2 Section 5 – Plain & Reinforced Concrete. The specific gravity should be between 2.3 to 2.4.

The proportion shall however be confirmed by contractor by trial mix and approved by Engineer-in-Charge for actual site conditions.

The Contractor shall provide test certificates providing the average minimum crushing strength of the blocks prior to the commencement of the construction. Further test certificates shall be provided as required by the Engineer-in-Charge to ensure that all batches of blocks have the minimum specified crushing strength.

A laboratory approved by the Engineer-in-Charge shall carry out the test. Evidence shall be produced that the block manufacturer has an efficient method of quality control. The Engineer-in-Charge will require to test samples of blocks periodically and the Contractor shall make necessary arrangements accordingly. The method of sampling for all tests shall be in accordance with ASTM standards referred in Section 9.4.3.

#### 9.5 SUCTION RATE

The Contractor shall, at his own cost, satisfy the Engineer-in-Charge that the suction rate of the block when determined in accordance with Appendix "A" of BS 3921 does not exceed 20 g/dm<sup>2</sup>/min. or that the Contractor is able to adjust it so that it does not exceed this value on site.

#### 9.6 SOLUBLE SALT CONTENT

For exposed blockwork, the contents by weight percent of soluble sulphate, calcium, magnesium, potassium and sodium radicals, shall not exceed 0.30, 0.10, 0.30, 0.03 and 0.03, percent respectively when ascertained in accordance with BS 3921, at the cost of the Contractor.

## 9.7 REINFORCING AND ANCHORS OF BLOCK MASONRY

Unless otherwise stated reinforcing and anchors shall conform to under-mentioned sizes:

Joint reinforcing shall be 1.32mm (0.05-inch) diameter mild steel wire mesh design, galvanized after fabrication. Steel wire woven into 12mm mesh 75mm wide. Reinforcing bar anchors shall be 250mm dia. deformed bar minimum 10 inch long.

Two 6mm dia bar shall be provided at every fourth course for anchoring of block masonry to columns. Two 10 mm bars at every fourth horizontal course shall be provided for anchoring masonry walls to plinth beam/floor beam, as shown on the drawings.

Dovetail anchors and slots (if used as an alternate anchorage) shall be not less than 18 gauge galvanized steel.

## 9.8 ERECTION

Blocks shall be laid true to line, level and laid in accurately spaced courses in stretcher bond with vertical joints of each course located at centre of units in alternate courses below. Vertical joints shall be buttered in the entire height of blocks. Each course shall be bonded at corners and at intersections of walls and shall be properly bonded. Courses of block shall be kept plumb throughout and corner reveals shall be true and in plumb.

Standard width of mortar joints for both horizontal and vertical joints shall be 10mm (maximum). Mortar joints in walls shall have full mortar coverage on vertical and horizontal faces between the blocks. Mortar joints on wall including struck joints, shall be thoroughly compacted and pressed tight against the edges of the blocks with proper tools. Blocks terminating against soffits of beam or slab construction shall be wedged tight with wedges and the joints shall be packed solidly with mortar between the top of the block and the bottom of slab or beam. Control expansion joints shall be kept free from mortar or other debris.

Unless otherwise shown on the drawings or specified by the Engineer-in-Charge, the spaces around doorframes and other material or built in items shall be solidly filled with mortar. Spaces around the door and window holdfasts shall be filled in with 1:3:6 concrete. Work required to be built in with masonry including doorframe anchors, wall plugs, and dovetail anchors and accessories shall be built in as the erection progresses.

The block work shall be carried up in a uniform manner and no portion shall be carried more than one metre above the adjoining one at any time. All masonry shall be kept strictly true and square and the whole properly bonded together and levelled round each floor.

Sleeves, Chases, holes, sinking and mortices for other trades shall be correctly located and formed to the sizes as required by the relevant trades. Chiselling of completed walls or the formation of holes shall only be carried out as per design drawings with the approval of the Engineer-in-Charge.

Walls of blocks indicated, as being non-load bearing shall be constructed on the insitu concrete floor slab unit after the floor formwork is struck and the concrete has obtained sufficient strength to support their-weight. Toothing into load-bearing walls shall not be permitted.

All bolts, anchors, ties, pipe sleeves, flushing metal attachments, lintels and the like required to be built into the work shall be correctly inserted and executed as the work proceeds.

Walls or partitions abutting concrete columns or walls shall be securely anchored and tied with metal anchors or ties at not more than 450mm vertical centres. Wall ties cast in with concrete shall be bent down after the removal of formwork and shall be securely jointed into the mortar beds of walling.

Care shall be taken during construction of cavity walls so as to avoid the filling up of cavity with mortar. G.I. flashing and weep holes shall be provided wherever specified on the drawings or as per the instructions of the Engineer-in-Charge. Weep holes will be formed by oiled rods, removed after the mortar is set, at specified locations.

#### **9.9 SCAFFOLDING**

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expense. Scaffolding which is unsafe in the opinion of the Engineer-in-Charge shall not be used until it has been strengthened and made safe for use of workmen. Cost of scaffolding etc. shall be included by the Contractor in the unit rate for masonry items.

Damage to masonry from scaffolding or from any other object shall be repaired by the Contractor at his own cost.

#### **9.10 JOINTING**

Jointing is the forming of joints as work proceeds. Joints shall be as follows:

- Exterior exposed joints shall be tightly formed to a weather joint with the point of the trowel.
- Interior exposed joints shall be tightly formed to a concave joint.
- Joints which are subsequently covered with plaster or other finish materials shall be struck flush.

#### **9.11 TOLERANCES**

All block work shall be erected plumb and true to line and level with the maximum variation in any storey height or any length of wall being one mm in one metre. The maximum tolerance in the length, height or width of any single masonry unit shall be  $\pm 3$ mm.

#### **9.12 DAMP PROOF COURSE**

Damp-proof course shall be laid on an even mortar bed, free from projections, which may puncture the material. Where the damp-proof course is to be stepped, only flexible membrane shall be used. All damp proof course, unless otherwise specified, shall consist of 1:2:4 cement concrete 50mm thick, mixed with 2.5 kg. Of pudlo per bag of cement or other approved quality water proofing compound as per manufacturer's specifications and shall be laid at required levels as per drawings and instructions of the Engineer-in-Charge. The D.P.C shall be tamped consolidated, levelled, edges and corners made to the requirements of concerned drawings including finishing and curing complete.

#### **9.13 SOLID BLOCK WORK AROUND OPENING OF HOLLOW MASONRY**

Around all openings in hollow block masonry, the Contractor shall provide solid block work of same thickness as that of hollow block masonry wall and of width as indicated on the Drawings. Solid block shall be laid around openings in such a manner that these are bonded integrally with hollow block masonry.

#### **9.14 REINFORCED HOLLOW BLOCK MASONRY**

Where specified on the Drawings, reinforced hollow block masonry shall be provided. Horizontal and vertical reinforcement shall be cold worked deformed bar. Two bars of (8mm) diameter shall be provided at every third horizontal course at 600 mm centres, while the vertical reinforcement shall be two bars of (12mm) diameter at 800mm centres. Bars shall be anchored and held firmly vertical in respective beams and columns in the manner shown in shop

Drawings. The reinforced hollow part of the block wall shall be solidly filled with Class 'D' concrete at intervals of one meter maximum height as the laying of block masonry work proceeds. The filled concrete shall be consolidated thoroughly by rodding to avoid formation of voids. Contractor shall submit shop drawings of anchoring and placing of reinforcement in hollow block masonry for approval of the Engineer-in-Charge.

#### **9.15 REINFORCED MASONRY WALLS (Quetta Bond)**

The reinforced pocket type walls are common for engineered structural masonry construction. Vertical wall reinforcement can be placed in vertical ducts (pockets) formed between solid or hollow masonry units. This is the case when so called "quetta bond"(a brick and a half wall thickness bond) is constructed. In "quetta bond" close spacing of vertical re-bars is possible. The reinforced pocket type masonry also allows for forming reinforced masonry columns, where ducts (pockets) of bigger size can accommodate multiple bars as well as stirrups for concrete infill or grout confinement.

For this type of reinforced masonry the vertical re-bars are placed into position ideally before the laying of masonry units. Horizontal reinforcement is placed in the bed joints at vertical spacing maximum 600 mm. The vertical reinforced ducts are filled with concrete or grout as the construction of the wall progresses. Contractor shall submit shop drawings of anchoring and placing of reinforcement in hollow block masonry for approval of the Engineer-in-Charge.

Reinforced pocket cavity masonry wall construction is shown on Figure 9.1

#### **9.16 CURING AND REPAIRS**

All block masonry shall be water cured and shall be kept wet for at least seven days, by an approved method, which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements of the specifications for water used in the manufacture of blocks.

If, after the completion of any block masonry, the work is not in alignment or level, or does not conform to the lines and grades shown on the Drawings or shows a defective surface, it shall be removed and replaced by the Contractor at his expense unless the Engineer-in-Charge grants permission, in writing, to patch or replace the defective area.

#### **9.17 MASONRY SHORT OF HEIGHT**

In case of different thickness of slab in different areas or rooms or for any other reasons, whatsoever if chiselling of masonry is required, the Contractor shall do so at his own cost. Where for any reason whatsoever, the height of the wall is short of ceiling height, the actual height shall be made good with 1:3:6 nominal mix concrete. This concrete shall neither be measured nor be paid under item of concrete but will be paid for under the item of wall masonry. Similarly where the lintel heights are such that the Contractor has to chisel the masonry or provide cast-in-place concrete to make up the height of the course, no payment will be made for chiselling, but where such cast-in-place concrete is provided, payment for the same will be made at the unit rate of masonry.

#### **9.18 MEASUREMENT AND PAYMENT**

##### **9.17.1 COMPOSITE RATE**

The measurement and payment for the items of the work of Brickwork hereof shall be made corresponding to the applicable CSR items as provided in Contract Agreement and shall constitute full compensation, for procurement, transportation, performance in all respects and

completion of work as specified including the site clearance as approved by the Engineer-in-Charge.

### 9.17.2 LABOUR RATE

The measurement and payment for the items of the work of Brickwork hereof shall be made corresponding to applicable CSR item as provided in Contract Agreement and shall constitute full compensation for procurement transportation, performance in all respects and completion of work as specified including site clearance, as approved by the Engineer-in-Charge except the cost of materials to be provided by Department at designated location as defined in the Contract Agreement.

### 9.17.3 QUANTIFACTION

The unit of measurement shall be measured as mentioned below in accordance with corresponding CSR items.

1. For Volumetric items, the unit of measurement shall be cubic meter or cubic foot.  
Following items of CSR are measured in the above mentioned criteria;  
Item No.: 9-1 to 9-8 and 9-12 to 9-23
2. Following items shall be measured as %age;  
Item No.: 9-9 and 9-10

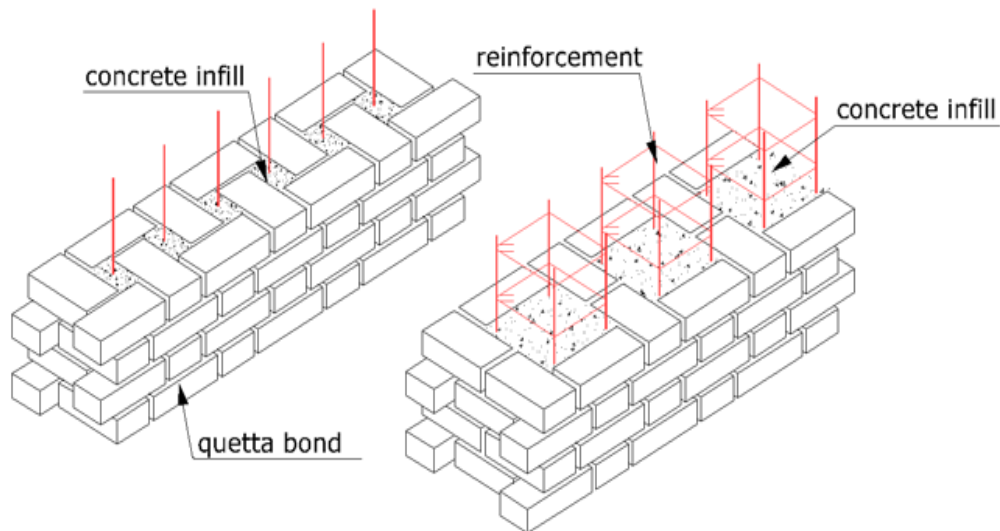


Fig 9.1: Reinforced Masonry Walls (Quetta Bond)