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5 MASONRY LAYING

5.1 INTRODUCTION

5.1.1 Scope

- 1 This Part specifies workmanship and setting out of masonry works.
- 2 Related Parts and Sections are as follows:

This Section

Part 2 Mortar and grout

Part 4 Unit Masonry

Section 5 Concrete

5.1.2 References

- 1 The following standards and/ or supersede as approved by the Engineer are referred to in this Part:
BS 743 Specification for materials for damp-proof courses
BS 6398 Specification for bitumen damp-proof courses for masonry
BS 6515 Specification for polyethylene damp-proof courses for masonry
BS 8215 Code of practice for design and installation of damp-proof courses in masonry construction

5.2 WORKMANSHIP

5.2.1 General Requirements

- 1 Work is to be performed by experienced workers under the direction of a qualified supervisor who is fully aware of the Project requirements. Final work is to be equal to any sample panels submitted to, and approved by, the Engineer.

5.3 BLOCKWORK

5.3.1 Setting Out of Blockwork

- 1 All blockwork is to be fully set out before laying commences to ensure:
 - (a) correct bonding over all lengths of wall particularly at openings and piers
 - (b) minimum cutting
 - (c) compliance with Table 5.1
- 2 The average thickness of both vertical and horizontal mortar joints is to be 10 mm exclusive of any key in the joint surfaces of the unit.

Table 5.1
Setting Out of Blockwork

Item of Construction	Type of Dimensions	Permissible Deviation (mm)
Space between walls	At floor	20
	At Soffit	30
Size and shape of wall elements	Height up to 3,000 mm	40
	Straightness in 5,000 mm	8
	Verticality up to 2,000 mm	15
	Level of bed joints in 3,000 mm	15
Walls	Position in plan of any point or specified face in relation to nearest grid line on the same level	15
Door, window and other openings	Position in elevation from design position	15
	Level of sill or soffit for each 1,000 mm of width	5
	with maximum of	15
	Verticality of any point for each 1,000 mm of height	5
	with maximum of	15

5.3.2 Wetting Blockwork Units

- 1 All blocks are to be adequately wetted with water before they are laid and the tops of walls left off from the previous day's work are to be similarly wetted before the new work commences.

5.3.3 Laying of Blockwork

- 1 Block walls are to be built from undamaged blocks in stretcher bond unless otherwise specified.
- 2 All bed and vertical joints are to be spread with mortar to ensure complete and solid bedding and grouting through the full thickness of the wall. All keys in jointed surfaces must be completely filled.
- 3 Mortar extending into the cavities of hollow blocks which are to be reinforced and filled shall be removed.
- 4 Each block is to be adjusted to its final position in the wall whilst the mortar is still plastic. Any block which is moved after the mortar has stiffened shall be removed and relaid with fresh mortar.
- 5 Half blocks and special blocks are to be used as required to ensure correct bonding.
- 6 All perpend, quoins and joints are to be kept true and square, other angles are to be plumbed and bed joints levelled as the work proceeds.

- 7 The work is to be carried out course by course not leaving any part more than 800 mm lower than another. Work, which is left at different levels, is to be racked (stepped) back to the approval of the Engineer.
- 8 In cavity wall construction both leaves are to be carried up together, not leaving any leaf more than 400 mm below the other.
- 9 Partitions shall be 100 mm thick unless otherwise noted. Partitions having lavatories or other plumbing fixtures secured to them back-to-back (or approximately so) are to be a minimum of 150 mm thick. Solid concrete masonry units shall be built in where full units cannot be used or where needed for the fixing of accessories. Bells or hubs of pipes must be completely enclosed.
- 10 Reinforced masonry partitions are to fully extend to the underside of slabs.
- 11 When pipes or conduits or both occur in plastered partitions, at least one web of the hollow masonry units must be retained.
- 12 When new masonry partitions start on existing floors, the existing floor finish material is to be cut down to the concrete surface. New masonry partitions are not to abut any existing plastered surfaces, except suspended ceilings.

5.4 BRICKWORK

5.4.1 Brickwork Wetting and Brick Wetting Test

- 1 Bricks shall be laid dry unless the following test indicates the need for wetting:
 - (a) draw a 30 mm circle with wax crayon on bed surface of dry brick. Using a medicine dropper, place 20 drops of water inside the circle and measure the time required for absorption of the water
 - (b) if water is absorbed in less than 1½ minutes the brick must be wetted before being laid.
- 2 Bricks are to have no visible moisture when laid.

5.4.2 Brickwork Laying

- 1 Unless otherwise specified elsewhere in the Project Documentation, bricks are to be laid in a running bond with each course of masonry bonded at the corners. The bond of facing bricks in existing buildings shall be matched. Before starting work, facing bricks shall be laid on the foundation wall and the bond adjusted as needed for openings, angles, corners, etc. Exposed brickwork joints are to be symmetrical about centre lines of openings. No brick smaller than a half-brick shall be used at any angle, corner, break, or jamb. The bond pattern shall be maintained plumb throughout. Jumping of the bond is prohibited. Brickwork shall be anchored to concrete columns, beams and walls, to steel stud construction and to masonry backup with ties and anchors in accordance with the relevant provisions of BS 5628.

- 2 Bricks shall be laid in a full bed of mortar. The mortar shall be spread over a few bricks at a time and shall not be furrowed. The mortar bed shall be slightly levelled to incline towards the cavity. The brick shall be placed before the mortar has had chance to stiffen. Head joints in stretcher courses are to be completely filled with mortar. Bricks shall be pushed into place so that the mortar oozes out at the top of the joints.
- 3 Before connecting new masonry with masonry previously laid masonry, loose bricks or mortar shall be removed, and the previously laid masonry shall be cleaned and wetted. New work is to be toothed into unfinished work.
- 4 Brick headers are not to project into the grout space.
- 5 Cleaning holes are to be left in double cavity walls during construction by omitting units at the base of one side of the wall. In general, clean-out holes are to be provided at each location of vertical reinforcement.
- 6 Cavities shall be kept clean of mortar and debris. The cavity shall be cleaned every day using a high pressure jet stream of water, compressed air, industrial vacuum, or by laying wood strips on the metal ties as the wall is built. If wood strips are used, lift strips with wires or heavy string as the wall progresses and before placing each succeeding course of wall ties.
- 7 Exterior walls shall be built with 100 mm of facing brick, backed-up with inner leaf of brick or concrete masonry units. Solid brick jambs shall be constructed not less than 200 mm wide at exterior wall openings and at recesses.
- 8 Joints are not to be tooled until mortar has stiffened enough to retain a thumb print when the thumb is pressed against the mortar, however, mortar is to be soft enough to be compressed into joints. Joints in exterior face brick work shall be finished with a jointing tool to produce smooth, watertight concave joints. Exposed interior joints in finished work shall be tooled to a concave profile.

5.5 REINFORCEMENT

5.5.1 General Requirements

- 1 Expanded stainless steel mesh joint reinforcement, if specified, will be embedded in the horizontal mortar joints not closer than 20 mm from the external face of the wall and, except at movement joints, is to be continuous and lapped at least 75 mm at all passings. Full lap joints are to be provided at angles.
- 2 Vertical bar reinforcement is to be properly positioned and secured against displacement. The cavities containing the reinforcement are to be completely and solidly filled with the specified concrete. The whole surface of the reinforcement is to be in contact with the mortar or concrete. The minimum clear distance between the vertical bars and the block is to be 12 mm.

5.5.2 Placing Reinforcing

- 1 At the time of placement, steel reinforcement is to be free from loose flaky rust, mud, oil, or other coatings that will destroy or reduce the bond.

- 2 Steel reinforcement is to be in place at the time of grouting. Horizontal reinforcement shall be placed as the masonry work progresses.
- 3 The minimum clear distance between reinforcing and masonry units shall be 12mm.
- 4 The minimum clear distance between parallel bars shall be one bar diameter.
- 5 Vertical steel reinforcement shall be held in place by centring clips, caging devices, or other approved methods.
- 6 Vertical bars shall be supported near each end, and at intermediate intervals not exceeding 80 bar diameters.
- 7 Horizontal reinforcement shall be set in a full bed of grout.
- 8 Reinforcement shall be spliced or attached to dowels by placing in contact and wiring together.
- 9 Splices shall be staggered in adjacent reinforcing bars. Reinforcing bars shall be lapped at splices at a minimum of 40 bar diameters.

5.5.3 High Lift Grouting of Cavity Walls

- 1 Grout shall be placed by hand bucket, concrete hopper, or grout pump. Each lift of grout shall be consolidated after free water has disappeared but before plasticity is lost.
- 2 When placing grout by the high lift method, the Contractor shall:
 - (a) not pour grout until the masonry wall has properly cured for a minimum of 72 hours
 - (b) close cleaning holes with masonry units
 - (c) place grout in one continuous operation (grouting of any section of a wall between control barriers is to be completed in one day with no interruptions greater than one hour)
 - (d) provide vertical solid masonry dams across the grout space for the full height of the wall at intervals of not more than 9 m
- 3 High lift grouting of double cavity walls should be undertaken in a single, continuous pour of grout to the top of the wall in 1 m layers or lifts in the same working day, with a minimum waiting period of 10 minutes between each 1 metre layer or lift. Each layer or lift of grout is to be vibrated. The vibrator is to be extended 300 mm to 450 mm into the preceding lift to close any shrinkage cracks or separation from the masonry units.
- 4 Grout for cavities of double cavity walls less than 50 mm wide should not be poured from a height exceeding 300 mm.

5.5.4 Low Lift Grouting of Cavity Walls

- 1 Grout shall be placed by hand bucket, concrete hopper, or grout pump. Each lift of grout shall be consolidated after free water has disappeared but before plasticity is lost.
- 2 Double cavity masonry walls are to be constructed and grouted in lifts not to exceed 200 mm. Slushing with mortar will not be permitted.

- 3 The grout space shall be kept clean from mortar droppings and clean the space before placing the grout.
- 4 All grout is to be puddled with a grout stick during and immediately after placing.
- 5 The cores of concrete masonry units containing reinforcing bars shall be grouted as the masonry work progresses. Slushing with mortar will not be permitted.

5.5.5 Water Penetration Testing

- 1 Seven days before plastering or painting, the Contractor shall test exterior masonry walls for water penetration. The number and location of tests shall be as stated in the Project Documentation or as directed by the Engineer.
- 2 Water shall be directed at masonry for a period of one hour at a time when wind velocity is less than eight kilometres per hour.
- 3 The areas showing moisture on the inside of the walls shall be corrected and re-tested to insure that moisture penetration has been stopped.
- 4 Unless otherwise instructed, testing shall take place in the presence of the Engineer.

5.6 FAIR FACED BLOCK WALLS

5.6.1 General Requirements

- 1 Fair faced block walls and walls built of facing blocks are to be constructed generally as Clause 5.3.3 with particular care being taken to ensure:
 - (a) the specified bonding or joint pattern is consistent
 - (b) the perpends are truly plumb for the full height
 - (c) the blocks used are of the same texture and appearance to avoid a patchy effect
 - (d) the colour of the mortar is consistent.
- 2 When a block has been placed in the wall, the extruded mortar is to be struck off flush, extra care being taken to avoid smearing the mortar on the face of the block.
- 3 Joints are to be left to stiffen slightly (thumb print hard) and then be firmly compacted with a jointing tool to the required profiles. The tooling of wet mortar will not be permitted.
- 4 If mortar droppings have struck to the blocks it must be allowed to dry and the surplus removed by a trowel. The remaining residue shall be cleaned by rubbing with a small piece of block and subsequent brushing down.
- 5 Where the cutting of blocks in fair face work is unavoidable, this should be done using a mechanical saw.
- 6 The cutting of facing blocks will only be permitted where this can be achieved without a visible alteration to the facing pattern.

5.7 OPENINGS

5.7.1 General Requirements

- 1 Openings are to be square and the jambs, vertical and formed with the uncut faces of the blocks.
- 2 If door and window frames are to be built-in the requirements of Clause 5.3.4 of Section 18 shall be complied with and the fixing cramps built-in solid in the mortar joints.
- 3 The jamb walling is to be built up against the frame all round as the work proceeds.

5.8 INTERSECTING WALLS AND PARTITIONS

5.8.1 General Requirements

- 1 Walls and partitions are to be bonded or tied to one another at junctions, unless movement joints are indicated.
- 2 If ties are used they should consist of 3 x 20 mm stainless or galvanized steel as directed by the Engineer fully embedded in the horizontal mortar joints at vertical spacings not exceeding 600 mm.
- 3 The ends of the ties are to project a minimum of 75 mm into each wall or partition.

5.9 CONNECTIONS BETWEEN WALLS OR PARTITIONS AND COLUMNS

5.9.1 General Requirements

- 1 All connections between block walls or partitions and concrete or steel columns are to be reinforced at maximum 400 mm centres by means of stainless steel or zinc coated expanded metal as directed by the Engineer or approved proprietary ties shot fired to the column and built into and fully embedded in the mortar joints of the block walls or partitions.
- 2 Stainless steel or expanded metal ties as directed by the Engineer are to be a width that will allow 20 mm clearances from each face of the wall or partition and be embedded for a minimum distance of 200 mm in the mortar joint.

5.10 JOINTS BETWEEN PARTITIONS AND FLOOR SOFFITS

5.10.1 General Requirements

- 1 Non-load bearing internal walls and partitions shall be built-up to leave a 20 mm joint between the top of the wall or partition and the soffit of the slab.
- 2 After the walling has thoroughly dried out and after the expected deflection in the slab due to dead load has taken place, the joint is to be filled solid with a Class M7 mortar in accordance with the relevant provisions of Part 2 of this Section.
- 3 Where concrete slabs are supported on blockwork, a layer of polythene sheet is to be provided between the top of the wall and the slab for the full width of the wall.

5.11 FILLING HOLLOW BLOCK WALLS

5.11.1 General Requirements

- 1 In the following situations, the cavities of hollow block walls are to be filled solid with either Class M6 mortar in accordance with the relevant provisions of Part 2 of this Section or concrete Grade 15 N/mm²:
 - (a) jambs of all openings
 - (b) ends, angles and junctions of walls and partitions
 - (c) junctions of walls and partitions with columns
 - (d) at sills
 - (e) at tops of partitions, if so specified
 - (f) to provide a solid fixing for false ceiling perimeters
- 2 The filling to courses is to be supported on a strip of expanded metal lathing embedded in the joint below.
- 3 Walls which are to be filled solid are to be built up in lifts not exceeding 1,200 mm and be filled after allowing a minimum period of 24 hours to elapse to enable the mortar to harden. The initial compaction of the concrete is to be carried out by hand using a 25 x 50 mm wooden rod or by vibrator. The final compaction shall take place 10-15 minutes after initial compaction.

5.12 CAVITY WALLS

5.12.1 General Requirements

- 1 Cavity walls are to consist of two walls separated by a minimum space of 50 mm and bonded together with stainless steel or approved other cavity wall ties.
- 2 The air space between the walls is to be kept clear and clean of mortar droppings by the use of laths drawn up the cavity as the work proceeds or by other approved methods.
- 3 Any mortar which inadvertently falls on wall ties is to be removed.
- 4 Wall ties are to be spaced at the intervals given in the Table 5.2 unless otherwise indicated elsewhere in the Project Documentation. Additional ties are to be provided in each course within 250 mm of openings or at end wall situations and on each side of movement joints.

Table 5.2
Spacing of Wall Ties in Cavity Walls

Cavity Width (mm)	Maximum Horizontal Spacing (mm)	Maximum Vertical Spacing (mm)
50 - 75	1,000	400
75 - 100	800	400
100-150	500	400

Notes:

- (a) The spacing of ties may be varied providing that the number per unit area is maintained.
- (b) The Table is applicable to cavity walls constructed of two blockwork skins.

5.13 SERVICES

5.13.1 General Requirements

- 1 Where walls are constructed of hollow blocks, the mechanical and electrical services are to be run in the cavities of the blocks wherever possible. No services are to run within the cavity of a cavity wall.
- 2 Where chases have to be cut, suitable power tools, as approved by the Engineer, are to be used.

5.13.2 Fixings

- 1 Where fixing blocks, anchors, accessories, wall ties, etc., are specified they are to be built into the walls or partitions and solidly bedded in mortar.
- 2 Fixings which are not built-in are to be drilled or shot fired to the blockwork.
- 3 Expanded bolt fixings are only to be drilled into solid blocks or blocks having their cavities filled solid.

5.14 DAMP-PROOF COURSES

5.14.1 General Description

- 1 Damp-proof courses shall comply with the relevant provisions of BS 743 or one of the other references mentioned in 5.1.2.
- 2 Damp-proof courses are to extend through the full thickness of the wall, including pointing, applied rendering or any other facing material.
- 3 The mortar bed upon which the damp-proof course is to be laid is to be even and free from projections liable to cause damage to the damp proof course.
- 4 Where the damp-proof course is situated in a hollow block wall, the blocks are to be filled solid in the course below the damp proof course.
- 5 All damp-proof courses are to be solidly bedded in mortar.
- 6 Joints of all damp-proof courses shall be lapped a minimum of 100 mm at all passings and sealed.

5.15 PROTECTION OF FINISHED WALLING

5.15.1 General Description

- 1 All newly or partially built walls are to be protected against drying out too rapidly in the sun's heat by covering with hessian or other approved material which is to be kept wet for a minimum of 3 days.

END OF PART