O'CONNOR SUTTON CRONIN

TECHNICAL SPECIFICATIONS MANUAL

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CONTROLLED DOCUMENTATION

LOADBEARING MASONRY SPECIFICATION

OCSC
O'CONNOR · SUTTON · CRONIN
MULTIDISCIPLINARY CONSULTING ENGINEERS

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1. STRUCTURAL REQUIREMENTS

1.1. General

1.1.1. THIS DOCUMENT

This specification gives the structural requirements for blockwork and brickwork and shall be read in conjunction with the Architect's requirements.

1.1.2. CODES OF PRACTICE

All brickwork and blockwork shall comply with the requirements of this Specification and the Codes of Practices IS EN 1996-1-1, and all relevant Building Regulations.

In addition, all brickwork and blockwork works shall comply with the Health and Safety Regulations and Guidelines.

Copies of the latest issues of these documents are to be kept on site.

Recommendations in IS EN 1996-1-1 are requirements of this Specification.

In cases of conflict the most onerous aspects of the Codes of Practices and this specification should take preference.

1.2. Related Works Required

1.2.1. BUILT-IN WORKS OR FIXINGS

The following structural items are to be incorporated in the Works:

- Padstones.
- Mortar Bedding for Precast Elements.
- Wind Posts.
- Parapet Posts.
- Service Conduits.
- Mechanical and Electrical Access Holes.
- Lintels.
- Service Openings.
- Service Trenches.
- Drainage Layer (Delta Drain) Fixing.
- Tie Down Straps and Ties.
- Corner Angles.
- Shot Fixed Ties to Steelwork.
- Pull Out Ties.
- Remedial Ties to Existing Masonry.
- Connections to Existing Structure.
- Fire Sealing to Junctions.
- Lifting Beams in Lift Shafts.

- Chases for Services.
- Retaining Walls.
- Weepholes in Retaining Structure.

Note: Brick slips are not to be incorporated into any part of the Works.

1.3. Quality Assurance

1.3.1. GENERAL — Materials and suppliers are to have been assessed and certified by an approved independent third party quality assurance scheme. Details to be supplied when requested.

1.4. Responsibilities

1.4.1. THIRD PARTIES

i) The location and specification of all damp proof courses (DPC) is to the Architect's detail.

ii) The insulation specification and u-value of the materials / structure to be detailed by the Architect and/or Mechanical and Electrical Consultant.

1.4.2. FIRE STOPPING AND ACOUSTIC MEASURES — Fire stopping and acoustic measures between walls / cladding and the main structure to be to Architect's and Fire Consultant's detail.

1.4.3. NON-LOADBEARING MASONRY — All non-load bearing blockwork illustrated on the Architect's drawings to Architect's details.

1.4.4. TEMPORARY WORKS — The Contractor is responsible for the design, detail and installation of steel framing to the blockwork for builders' work openings.

1.4.5. LINTELS — The Contractor is responsible for the design, detailing and installation of all masonry/blockwork lintels to form openings in masonry/blockwork walls.

1.4.6. RELIEVING ANGLES — The Contractor is responsible for the design, detail and installation of proprietary stainless steel relieving angels and associated connections to the primary structure to support the external cladding and systems. Loadings from connections onto the primary structure are to be confirmed to the Contractor's Engineer in advance of the erection of the primary structure to which the support is required.

2. MATERIALS

2.1. Masonry Units Generally

2.1.1.	PRODUCT STANDARD	Masonry units shall comply with all current versions of EN 771 as appropriate.
2.1.2.	TEST METHOD	Masonry unit's compressive strength shall be tested to EN 772-1.
2.1.3.	DECLARATION OF COMPRESSIVE STRENGTH	The compressive strength of masonry units shall be stated in terms of normalised mean compressive strength in compliance with EN 772-1 Annex A.
2.1.4.	STANDARD PROPERTIES	Unless otherwise directed by the Engineer the standard properties for bricks and blocks shall be in accordance with the values presented in Table 1.
2.1.5.	UNIT CATEGORY	Unless otherwise stated or approved by the Engineer the masonry units are to be Category 1 units as defined by EN 1996-1-1.

2.2. Concrete Masonry Units

2.2.1.	PRODUCT STANDARD	Masonry units shall comply with harmonized Standard BS EN 771-3.
2.2.2.	DIMENSIONS	Dimensions to be declared in the order: Length, width & height. Tolerance shall comply with BS EN 771-3 Class D1 (+3, -5mm on all dimensions). Tolerance D4 shall be complied with for blocks to be laid with thin joint mortar. The test method for dimensions is BS EN 772-16.
2.2.3.	CONFIGURATION	Masonry units shall comply with the following groupings: **Group 1** < 25% formed vertical voids **Group 2** > 25% < 60% formed vertical voids **Group 3** > 25% < 70% formed vertical voids **Group 4** > 25% < 50% formed horizontal voids "Solid" blocks shall comply with the requirements of Group 1.

		Cellular and hollow blocks will, depending on void content, comply with the requirements of Group 1 or 2 units. Group 3 and 4 units are not to be used unless specific approval is requested from the Engineer and received. Flatness requirements for the bed surfaces of units to be used with thin layer mortar shall comply with D4 tolerance category. For such facing units a procedure must be implemented of site approval of the appearance of unit prior to their use.
2.2.4.	DENSITY	The gross dry density of the blocks has to be declared by the manufacturer in accordance with BS EN 772-13. Where specifically requested by the Engineer the net dry density shall also be provided.
2.2.5.	THERMAL PROPERTIES	Thermal resistance values of products using values from CIBSE Guide A will be accepted. For cellular/hollow units the thermal resistance can be calculated to BS EN ISO 6946 taking off the surface resistance values.
2.2.6.	WATER ABSORPTION	For facing units with no applied finish water absorption shall be tested to BS EN 772-11.
2.2.7.	MOISTURE MOVEMENT	The appropriate test method is BS EN 772-14
2.2.8.	WATER VAPOUR PERMEABILITY	Tabulated values shall be in accordance with BS EN 1745, BS 5250 & CIBSE Guidebook. If tested, values can be determined to BS EN ISO 12572.
2.2.9.	REACTION TO FIRE (SPREAD OF FLAME)	If the manufacturer uses materials that result in a unit containing more than 1% by mass or volume of organic material, then he is responsible for the following tests to be carried out: BS EN ISO 1182 Reaction to fire tests for building materials. Non- combustibility test. BS EN ISO 1716 Reaction to fire test for building materials – Determination of the heat of combustion. The results need to be classified according to BS EN 13501-1.

2.2.10. SHEAR BOND STRENGTH

A value of shear bond strength shall be declared. The bond shall be not less than 0.15 N/mm in compliance with Annex C of BS EN 998-2.

2.2.11. CE MARKING

Product identification details and means of identification of the date of manufacture will be given on delivery documentation and on the product where appropriate.

2.3. Clay Masonry Units

2.3.1. PRODUCT STANDARD

Masonry units shall comply with harmonized Standard BS EN 771-3.

2.3.2. DURABILITY

Masonry units shall generally comply with exposure class F1 (suitable for moderate exposure).

Where any regions are defined on the drawings as passive exposure the class may be reduced to F0.

For any regions are defined on the drawings as severe exposure the class will be increased to F2.

2.3.3. ACTIVE SOLUABLE SALTS

Masonry units shall generally comply with exposure class S1 (suitable for normal exposure applications).

Where any regions are defined on the drawings as subject to completely dry applications, and for all fully internal applications the class may be reduced to S0.

For any regions are defined on the drawings as subject to prolonged saturation applications the class will be increased to S2.

2.3.4. WATER ABSORPTION

The water absorption should not be greater than that stated by the manufacturer. There is no maximum or minimum requirement for facing bricks not used as part of a damp proof course.

Units to be used for damp course use in walls of habitable buildings shall have water absorption rate of less than 4.5%.

Units to be used for damp course use in garden walls shall have water absorption rate of less than 7%.

2.3.5.	COMPRESSIVE STRENGTH	The normalised compressive strength as defined in EN 772-1 shall not be less than that stated by the manufacturer. The minimum strength is 5N/mm².
		However, Class A Engineering Bricks (water absorption less than 4.5%) must have a minimum strength of 70 N/mm² and Class B Engineering Bricks (water absorption less than 4.5%) must have a minimum strength of 50N/mm²
2.3.6.	DIMESIONAL TOLERANCE	Masonry units shall have dimensional tolerance T2 and range tolerance R2.
2.3.7.	CONFIGURATION	Perforated clay bricks shall have a void ratio limited to a maximum of 25%. The volume of frogs in a frogged brick shall be limited to a maximum of 20% of the gross volume of the brick.
2.3.8.	TYPE AND TEXTURE	Type and texture shall be in accordance with architectural details and clients' brief.
2.3.9.	SPECIAL UNITS	To match unit type and to the size and shape shown on the drawings.
		Dimensional tolerance and quality are to be compatible with standard bricks.
2.3.10.	PROCUREMENT	The Contractor shall obtain an undertaking from the suppliers of all masonry units that sufficient supplies of the type and quality approved are available to complete the Contract.

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Table 1: Standard Block Properties

1	2	3	4			5	6	7	8
Unit Type	EN 772-16 Tolerance	Location[1] in The works	Nominal Dimensions			Mean Compressive Strength (N/mm²)	EN 772-1 Conditioning Method	Frequency of Sampling (per 20 m³ of units)	Other Requirements
			Length (mm)	Width (mm)	Height (mm)				
5NB	D1	5N (Non loadbearing)	440	100	215	3.6	Cl 7.3.2/Cl 7.3.4	EN 771-3	Fair faced blockwork
10NB	D1	10N (Non loadbearing core walls)	440	100	215	10.4	Cl 7.3.2/Cl 7.3.4	EN 771-3	Fair faced blockwork

[1] Or as shown on the drawings.

2.4. Admixtures

2.4.1. APPROVAL — Admixtures may only be used subject to prior approval in writing by the Engineer. Admixtures shall be in compliance with EN 934.

2.5. Mortars Generally

2.5.1. GENERAL — Mortars are to comply with the latest edition of I.S. EN 998 and I.S. EN 1996.

2.5.2. CEMENT — Cement shall comply with I.S. EN 197-1. All cement shall be delivered to the site in sealed containers or bulk cement lorries of suitable design.

2.5.3. RATIO — Unless otherwise specified on the drawings mortars shall be Cement : Lime : Sand mixed in the ratio 1:1:5-6 by volume of dry material except in masonry retaining walls where the mortar mix shall be in the ration 1:0:3. Mortars for reinforced blockwork shall be as specified hereunder of "Reinforced Blockwork".

2.5.4. LIME — Lime shall be non-hydraulic or semi-hydraulic and delivered to the site in sealed containers of suitable design.

Hydrated lime shall comply with EN 459-1 and BS 6463 semi-hydraulic or non-hydraulic Class "B" calcium limes.

2.5.5. AGGREGATES — Marine sand shall not be used with sulphate-resisting or super-sulphated cement.

2.5.6. WATER — The mixing water shall be of potable quality. Where the quality of water is doubtful the water shall be tested in accordance with I.S. EN 1008.

The Contractor shall arrange for any required tests to be carried out in accordance with I.S. EN 1008.

2.5.7. SAND — Sand and mortar shall comply with BS 1199 and BS 1200.

2.5.8. ADMIXTURES — Admixtures, where specified or approved, shall be in accordance with manufacturer's instructions unless otherwise directed.

2.6. Mortar Mixes

2.6.1. GRADE OF MORTAR

The grade of mortar is as shown on the structural notes, drawings and shall be type M4 mortar (designation Class iii).

2.6.2. TRIAL MIXES

Trial mixes and tests shall be carried out for all mortar grades to be used in the structure to demonstrate the requirement of compliance with this Specification.

2.6.3. UNIFORMITY

Each of the materials in all mortar grades used in the structure shall be obtained from a single source unless otherwise approved.

2.6.4. PREMIXED MORTARS

Ready-mixed mortars complying with EN 998 may be used, subject to approval.

The Contractor shall obtain and keep on site delivery notes for ready-mix wet mortars for inspection throughout the duration of the Contract.

If at any time the Architect is not satisfied that the mortar complies with this Specification he may withdraw approval for its use.

2.6.5. MORTAR CONSTITUENTS

The Contractor shall provide written confirmation that any proprietary mortars used in the works do not contain high alumina cement.

2.6.6. MIXING

Mortar shall be machine mixed and used within 2 hours of mixing the cement and water. Ready mixed sand lime mortars shall comply with the requirements of EN 998. Testing of mortars shall be in accordance with EN 1015.

2.7. Mixing

2.7.1. MIXING

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2.8. Admixtures

2.8.1.	APPROVAL	Admixtures may only be used subject to prior approval in writing by the Engineer.

2.9. Wall Ties / Anchors / Dowels

2.9.1.	WALL TIES	Wall ties shall be the vertical twist type, of stainless steel, complying with the Irish Standard for Wall Ties and cavity wall construction; dowels, dovetail anchors and similar fitting shall also be stainless steel. Stainless steel shall be austenitic stainless-steel complying with EN 845
2.9.2.	TORQUE CONTROLLED EXPANSION ANCHORS AND BONDED ANCHORS IN CONCRETE	Unless otherwise specified expanding bolts are to be follow-up expansion type as approved by the Engineer. The specifier will ensure that all anchors selected shall have a current ETA.
2.9.3.	STEEL WASHERS	Steel washers shall comply with BS 4320.
2.9.4.	STEEL WASHER FINISH	All steel washers shall be sheradised in accordance with EN 13438.
2.9.5.	PRELOADED BOLTS	High strength friction grip bolts (HSFG) and associated nuts and washers shall comply with BS EN 14399.
2.9.6.	CAVITY BOLTS	Cavity bolts to be manufactured from mild steel in grade 8.8 and is electro-zinc plated with the addition of a 1000-hour salt spray corrosion protection. Minimum size unless otherwise stated shall be 16mm with rubber collapse mechanism under collar.

2.10. Expanded Metal Reinforcement

2.10.1.	GENERAL	Refer to OCSC Concrete Specification and structural drawings.
2.10.2.	COATINGS	Expanded metal shall be galvanised and shall be 10mm to 20mm mesh complying BS 405 and EN ISO 1461.
2.10.3.	IN MORTAR BED JOINTS	Approved proprietary bed join reinforcement to be installed as illustrated on the structural drawings.

2.11. Steel beams and lintels

2.11.1.	STANDARD	Material Specification for all proprietary beams and lintels to be as per EN 845-2.
2.11.2.	STEEL GENERALLY	Material Specification for all rolled steel elements incorporated in the Works to be as per the OCSC Steel Specification.
2.11.3.	PROTECTION	Rolled steel and proprietary beams and lintels shall have steel corrosion protection on all surfaces including those in contact with the units and mortar.

2.12. Joint Fillers and Sealants

2.12.1.	JOINT FILLERS	Resilient packing in : i) Expansion Joints : Foam Filler ii) Compression Joints : Foam Filler iii) Suppliers : Fosroc Expandite or equivalent
2.12.2.	JOINT SEALANTS	i) External expansion joint : Polysulphide Sealant ii) External compression joint : Polysulphide Sealant iii) Colour: To Architects Specification iv) Supplier: Fosroc Expandite or equivalent.
2.12.3.	CAVITY FILL THERMAL INSULATION	The material properties for all cavity fill thermal insulation to Architect's and/or Mechanical and Electrical Engineers details.

2.13. Other Materials

2.13.1.	GENERAL	The Engineer's approval in writing in suppliers of prestressed or pressed metal units must be obtained. The suppliers must provide load test results from an independent testing laboratory and detailed written recommendations which shall be compiled with by the contractor. Prestressed lintel units shall conform to IS 240.
2.13.2.	CAVITY TRAYS	The Material Specification for all cavity trays to Architects details.
2.13.3.	DAMP PROOF COURSES	The Material Specification for all damp-proof courses to Architects details.
2.13.4.	TIMBER	All fixing blocks, inserts and bearing plates shall have an appropriate protective treatment on all surfaces in contact with the walling units and mortar.

2.13.5.	STEEL ANGLE SUPPORTS	All steel angles supporting external masonry shall be austenitic stainless-steel Grade 316 to the dimensions and thickness shown on the drawings.

3. Workmanship and Construction

3.1. General

3.1.1.	HOLES, CHASES, INSERTS AND FIXINGS	Where permitted they shall be cut with a mechanical tool made for the purpose. Horizontal or diagonal chases will not be permitted, nor will the chasing of hollow or cellular walling, unless otherwise agreed.
3.1.2.	SCAFFOLDING	Scaffolding should be erected and maintained in accordance with EN 12811 and current Health and Safety Documents and Guidance. Edge protection shall be in compliance with EN 13374.
3.1.3.	EXPANSION JOINTS	Expansion joint locations are not generally indicted on contract drawings but are required at a maximum 6.0 m c/c to allow for the shrinkage of panels. Sleeved de-bonding type ties at 225mm c/c vertically are required at these joints. The location of these joints is to be agreed with the Architect.

3.2. Mortar

3.2.1.	MORTAR MIXING	The volume of mixed material in each batch shall comply with the mixer manufacturer's written recommendations.
3.2.2.	MORTAR JOINT	Unless otherwise directed the regular thickness of mortar joints to suit the size of walling panels shall be determined by the Contractor and submitted for the Architect's agreement before starting the construction of any panel. All mortar joints shall be of a consistent appearance and density and shall be left flush with the face of the walling unit unless otherwise specified.
3.2.3.	POINTING	Raking and pointing of mortar joints will not be permitted in loadbearing construction or in mortar beds containing reinforcement without approval.

3.3. Construction

3.3.1. GENERAL

Unless otherwise agreed all connected walls and partitions shall rise together.

Indentations shall not be left in load bearing walls for the later insertion of adjoining walls, weaker blocks bonded into loadbearing walls shall not be permitted.

Where walls or partitions are not required to support direct loads, any structural propping within the storey height shall be removed before the wall or partition is completed.

Non-loadbearing walls may be stepped back at the intersection with load-bearing walls.

The construction of any portion of the Works shall not rise more than 1.2 m in any one day nor shall the difference in height of two leaves exceed the specified vertical spacing of the wall ties in any construction incorporating ties unless otherwise approved.

i) Walling shall not be constructed on supporting members until any supporting props have been removed.
ii) Reinforced and pre-stressed masonry shall comply with IS EN 1996, Part 1 - 3.

3.3.2. BACKFILLING

The Contractors proposed methods and sequence of backfilling behind or against foundations or behind retaining walls shall be such as to cause no damage or distress to the permanent structure.

3.3.3. PREPARATION

Preparation of work, materials and components to IS EN 1996, Parts 1 – 3.

3.4. Laying of Units

3.4.1. GENERAL

Units of fired clay and autoclaved concrete shall not be built into the Works until at least 7 days have elapsed from the time of manufacture. Non-autoclaved units shall be stored for at least 4 weeks before being built into the Works.

Damaged units shall not be used in any walls exposed in the finished Works.

3.4.2. TYPES OF FINISHED WORK

Comply with Table 2 of this Specification unless otherwise shown on the drawings.

3.4.3. LAYING OF UNITS

i) The laying of single frog unit's frog down shall not be permitted in loadbearing walling. Double frogged units shall be laid with the larger frog uppermost unless otherwise directed.
ii) Unless stated otherwise on the drawings the voids in perforated or hollow units shall not be filled.
iii) Cellular units shall be laid with their cavities downwards except where stated otherwise on the drawings.
iv) Where the voids in hollow units are required to be filled, the mortar or concrete shall be placed and solidly compacted in the voids as the work proceeds unless otherwise approved. The filling material shall only fill the void to a depth of three-quarters of the height of the unit before the next course is laid.
v) Shell bedding of horizontal and vertical joints in walling constructed of hollow or cellular units will not be permitted in loadbearing construction.

TABLE 2

1	2	3	4	5	6
Location in Works	Unit Type	Mortar Grade	Bond Type	Mortar Joint or Pointing	Other Requirements
All blockwork	All	M4	To Architects details	"Bucket handle" joint finish	All exposed blockwork shall be fairfaced finished.

3.4.4. BONDING

Unless otherwise agreed all bricks and blocks shall be properly bonded as shown on the drawings.

Where for uniformity of bond snap headers are required in single leaf or cavity walls they shall be prepared in an agreed manner.

3.4.5. WALL TIES

Spacing for two leaf walls, without a cavity:

Horizontally: 900mm
Vertically: 450mm

Spacing for two leaf walls, with a cavity – See Clause 3.10.1.

All walls which return around corners shall be fully bonded together.

3.4.6. DAMP-PROOF COURSES

Details and location of damp proof courses to Architects Specification.

3.4.7. REINFORCEMENT

i) The reinforcement in bed joints shall be completely surrounded by mortar and the cover shall not be less than 25mm from the external face of the worked joint.

The thickness of any mortar bed joint containing reinforcement shall not exceed the agreed thickness.

ii) The Contractor shall obtain agreement for his methods of maintaining vertical reinforcing bars in their correct position.

3.4.8. MOVEMENT JOINTS

Movement joint fillers shall be built in as the work proceeds. The filler shall be accurately placed in the thickness of the wall or leaf and not less than 12 mm nor more than 20 mm from the face of the work unless otherwise shown on the drawings. The raking out of joint fillers will not be permitted.

Movement joint sealants shall be applied in accordance with the manufacturer's written instruction to clean, dry surfaces.

Where open joints are specified, they shall be kept free of mortar and debris.

3.4.9. METHODS OF CONSTRUCTION FOR LOADBEARING WALLS

The heads of loadbearing walls shall be laid to provide true and even bearing surfaces.

i) The Contractor shall obtain agreement to his methods of ensuring the bearing surfaces are true and level.
ii) The Contractor shall supply the Architect with details of his proposed methods of forming horizontal movement joints at the heads of walls.
iii) Where cavity walls are to be spanned with in situ concrete, they shall be sealed with one course of slate, or other acceptable material, bedded in mortar of the grade specified for the surrounding work.

3.4.10. TOP COURSE OF WALLS

The top course of walls and parapets shall be laid to a true and even line.

i) Coping units of fired clay, concrete or stone shall be laid on a mortar bed, of the grade specified for the surrounding work, over an approved damp-proof material. Unless otherwise specified all vertical joints between units shall be completely filled with mortar and finished flush with the unit.
ii) Unless otherwise specified or approved all fixing blocks, plates or anchorages for attaching metallic copings shall be built in as the work proceeds.

3.5. Built-In Terms

3.5.1. GENERAL

Subject to the Contractor providing full details he may be permitted to incorporate built-in items at a later stage.

Where in facing work the units require cutting and shaping to trim built-in items the method of forming the units shall be subject to approval.

3.5.2. PRECAST CONCRETE PADSTONES, LINTELS AND FLOORS

Padstones and lintels and planks of precast concrete shall be laid on a mortar bed of thickness not greater than 15mm. Unless otherwise specified the mortar shall be the same grade specified for the surrounding work.

3.5.3. STEEL BEAMS AND LINTELS

They shall be laid on a stiff, smooth and level mortar bed not exceeding 15mm thickness.

Levelling shims and steel packing, where used, shall not remain permanently within the bearing area of the member.

3.5.4. FIXINGS

All fixings, holding down bolts, joist hangers, anchorages and ties required for stabilising the walls or columns, or locating other parts of the Works, or for transferring loads to the walling, shall be incorporated as the work proceeds.

3.5.5. TIMBER

Unless shown on the drawings the Contractor shall obtain approval for the size and position of any timber fixing blocks or bearing plates required in the Works.

3.6. Cold Weather Working

3.6.1. GENERALLY

The Contractor shall take precautions to ensure that the temperature of new work is maintained above freezing point for a period of at least 3 days after laying.
Any work damaged by frost will not be accepted.
The Contractor shall submit the methods he proposes to use to maintain the temperature of the work.

3.6.2. ADDITIONS

Calcium chloride shall not be used.

3.6.3. UNACCEPTABLE WORK

No frozen materials or materials containing ice shall be used in the Works.

3.7. Trial Panels

3.7.1. GENERALLY

Trial panels shall be subject to approval by both Architect and Engineer, shall be constructed on site and approved before similar construction is begun in the Works.

Unless otherwise directed the sample shall incorporate all typical features which may contribute to the final appearance of the Works.

The size of the panels shall be 1.35m high by 1.8m wide.

3.8. Fixing of Cavity Fill Insulation

3.8.1. GENERALLY

The fixing of all cavity fill insulation is to the Architects / Mechanical and Electrical Engineers detail.

3.9. Protection of the Works

3.9.1. GENERALLY

In line with the recommendations of IS EN 1996, Parts 1 – 3, the following clauses are applicable:

- General

Care should be taken to anticipate and prevent damage or disfiguration to the finished work due to weather, subsequent building or other operations. Care should also be taken over the siting of hoists. Temporary support to walls may be required during construction to prevent damage by winds.

Work below ground poses particular problems. It is essential to prevent contact with strong salt solutions, e.g. those used for clearance of snow and ice.

- Protection Against Rain

Newly erected masonry should be protected to prevent the risk of the mortar being washed out of the joints by rain.

- Work in Cold Conditions

When masonry construction is carried out during freezing weather, proper facilities should be made available for preparing / temporary storage of the mortar, protecting the materials and protecting the fresh masonry work against frost damage.

3.10. Wall Ties

3.10.1. GENERALLY

The walls shall be built with cavities widths shown on the Architect's or Engineer's drawings and tied together with ties fully embedded in mortar to a depth of at least 50mm. Unless otherwise detailed the ties shall be staggered in alternate courses and spaced in accordance with the following table (figures in brackets for modular sized blockwork) – diagrammatic sketch appended also.

Additional ties shall be provided in every course within 225mm of openings and on each side of control joints. Ties shall be laid falling to the external leaf.

Table 3

Spacing of Ties			
Cavity Width	*Horizontally*	*Vertically*	*Number of Ties per Sq.M*
50 – 75	900 (1000)	450 (400)	2.5
76 – 100	750 (800)	450 (400)	3.0
101 – 150 Max	450 (400)	450 (400)	4.9

3.11. Cavities

3.11.1. The cavity and ties shall be kept clear of mortar droppings or other materials during construction and any extruding mortar shall be struck off flush. No cavity shall be sealed off without the Architect's approval.

3.11.2. Cavities in rising walls shall be filled to 225m below DPC level with core-filling (see "Reinforced Blockwork" below).

3.12. Weep Holes

3.12.1. SIZE AND LOCATION

Weep holes 10mm wide x 75mm high at 900mm c/c and extending through the vertical mortar joint (cavity walls) of the outer leaf shall be provided at ground level and at positions where the cavity is bridged or at locations indicated on the Architect's drawings.

3.13. LINTELS

3.13.1. BEARING

Lintels shall have 200mm minimum bearing coursing arranged to allow a full block to be positioned directly beneath the lintel bearing (or alternatively provide 400mm min bearing). Lintels shall be mortar bedded at supports.

3.13.2. POSITIONING

The prestressed unit shall be laid with roughened surface upwards; the required height of masonry for Manufacturer; no joists, inserts DPCs etc. shall come within this required masonry. Composite lintels shall be propped as specified by the manufacturer until matured.

3.13.3. JOINTS

All perpend joints must mortar filled.

3.14. Weather

3.14.1. MINIMUM TEMPERATURE

No work shall be carried out when the temperature is at or below 3 degrees centigrade without approval.

3.14.2. GENERALLY

In frosty weather special precautions shall be agreed involving the use of air-entraining plasticizers. Each lift shall be kept dry, including the top surface until the next lift commences.

3.14.3. REMEDIAL WORKS

Any wall damaged by frost shall be pulled down and made good at the Contractor's expense.

3.14.4. ADDITIONS

Calcium chloride may not be used to control weather working.

3.15. Partitions

3.15.1. PROPPING

Partitions shall not be built on suspended slabs until after the props of the slabs have been removed.

3.16. Forming of Holes and Chases

3.16.1. SIZING

Forming of holes and chases shall be carried out only when approved by the Architect and shall be done in accordance with EN 1996-1-1. Notwithstanding the above, the depth of chase shall not exceed 1/3 thickness for vertical chases or 1/6 thickness for horizontal chases. No chases shall be cut in hollow blockwork.

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3.18. Setting out and Tolerances

3.18.1. GENERAL

Unless otherwise directed by the Architect structural members shall be set out from the references and constructed such that the dimension between any two points on the structure as built or between any point on the structure and any reference shall agree with the required dimension, whether shown on or calculable from the drawings, within the degree of accuracy indicated in Table 4.

3.18.2. EXCEPTIONS

The Contractor shall advise the Engineer when the tolerances in Table 4 are exceeded.

3.18.3. NON-COMPLIANCE

Work will be taken down and re-built at the contractor's expense where tolerances exceed the limits of the specification.

Table 4: Setting Out and Tolerances

Maximum deviation in millimetres from required dimension						
Position to Member	**Up to 300mm**	**Over 300mm to 2m**	**Over 2m to 5m**	**Over 5m to 10m**	**Over 10m to 30m**	**Add for each additional 30m**
In foundations	10	15	25	25	25	10
Other than in Foundations	3	5	10	15	20	10

The figures given in Table 4 apply to such variables as:

a) Position on plan of any point from nearest grid line.
b) Plumb.
c) Cross section and other linear dimensions of member.
d) Clear dimension between members.
e) Twist (the distance of any corner from a plane containing the other three corners).
f) Squareness of corners (the longer of two adjacent sides shall be taken as the base line). Deviation is related to the length of the shorter side.
g) Level (measured from the nearest datum).

4. QUALITY CONTROL

4.1. Site Apparatus

4.1.1. REQUIRED APPARATUS

The Contractor shall maintain on site the following apparatus which shall be kept in good repair throughout the Contract and shall remain the property of the Contractor.

a) A maximum and minimum thermometer to be kept in position close to the Works for measuring the atmospheric shade temperature.
b) Soil thermometer for measuring the mortar and ground temperatures.
c) Apparatus for making mortar cubes or prisms in accordance with BS 4551.
d) Apparatus for carrying out the 'dropping ball' consistency test as described in BS 4551.

4.1.2. APPARATUS FOR MORTAR

If the mortar to be used on site is to be prepared on site, the following apparatus will be required on site:

i) Syphon can Gammon Morgan or Speedy apparatus for measuring the moisture content of aggregate.
ii) Apparatus for measuring the air content of the mortar in accordance with EN 1015-7.

4.2. Aggregates for Mortars

4.2.1. GENERAL

All aggregates to conform to IS EN 13139 and associated referenced standards.

4.2.2. PRELIMINARY TESTS

The Contractor shall obtain samples of the proposed aggregates and arrange for the following tests to be carried out:

a) Sieve analysis.
b) Tests for clay, silt and dust.
c) Tests for salts and minerals.

Tests (a) and (b), with the moisture content of the aggregate, shall also be carried out on the samples used for each trial mix.

4.2.3. WORK TESTS — The Contractor shall carry out such tests on the aggregate as are necessary for the production of the specified mortar.

4.3. Testing of Mortars

4.3.1. GENERAL — All tests on wet or hardened mortar specimens shall be carried out in accordance with BS 4551.

4.3.2. SAMPLE TIMING — Samples shall be taken at the point of mixing or use as directed. At least two samples shall be taken each week from each grade of mortar used in each building.

4.3.3. SAMPLING FREQUENCY — The frequency of sampling should be six 100mm x 25mm x 25mm prisms or four 75mm or 100mm cubes for every 150m² or wall, using any one designation of mortar, or for every storey of the building, whichever is the more frequent.

The Contractor shall allow for additional tests.

4.3.4. TRAIL MIXES — Subject to the test results the specified nominal mix proportions may be adjusted, and tested, as directed.

i) The approved mortar mix and test results will become a requirement of this Specification.

4.3.5. CRUSHING STRENGTH — Half of the samples shall be tested at 7 days. The remainder at 28 days.

The minimum 28 day crushing strength of the cubes shall not be less than that given in Table 5. The test results shall not exceed 1.5 times the relevant specified strength.

TABLE 5: CRUSHING STRENGTHS OF MORTAR GRADES

Preliminary Test (N/mm²)	Work Test (N/mm²)
17.5	12
8.38	6
5.9	4
3.0	2

4.3.6. CONSISTENCY — Unless the Contractor can provide satisfactory evidence to the contrary the consistency of fresh mixed mortar shall be the standard of consistency recommended in BS 4551.

4.3.7. AIR CONTENT — The air content of each sample shall be checked and compared with the results of the trial mix for that mortar grade.

4.3.8. SALTS — Tests for soluble salt content, carried out in accordance with BS 4551. shall be made on wet or hardened mortar specimens or samples of aggregate if so directed.

4.3.9. NON-COMPLIANCE — Any work containing mortar which does not comply with the requirements of the tests will not be accepted.

If the results of any 28 day test fail to comply with this Specification the mix proportions shall be modified.

4.4. Testing of Bricks and Blocks

4.4.1. GENERAL — All sampling and testing of walling units shall be carried out in accordance with the relevant National Standard or Eurocode Standard.

i) The frequency of sampling for blocks shall not be less than that specified in Table 1 of this specification.

The Contractor shall allow for additional testing and frequency of sampling should the walling units not fully comply with this Specification.

4.4.2. TESTS ON BRICKS AND BLOCKS — As soon as the sources of the units have been approved, the Contractor shall obtain from the supplier certificates of recent tests carried out in accordance with the relevant manufacturing Standards to ensure compliance with this

specification and those standards. The Engineer will be supplied, for each type of unit with the following information:

a) Compressive strength.
b) Absorption percentage.
c) Soluble salt content.
d) Drying shrinkage or moisture expansion.
e) Density and tolerance in dimensions.

As soon as the sources of the units have been approved the Contractor shall instruct the Testing Authority to carry out the tests for compressive strength and the following tests when directed.

a) Absorption percentage.
b) Soluble salt content.
c) Drying shrinkage or moisture expansion.
d) Density and tolerance in dimensions.

4.4.3. CHEMICAL TESTING OF BLOCKS

Chemical testing shall also be carried out on concrete block units at a rate of 5No. per 1000 blocks of each type of block used to determine the following properties;

- Total Sulphur Content S, % by Mass of Sample
- Sulphate Content SO3, % by Mass of Cement
- Cement Content, % by Dry Mass

4.4.4. SMAPLE PREPARATION FOR CHECMICAL TESTING OF BLOCKS

Samples shall be prepared and analysed in accordance with IS 1881-124:2015" Testing Concrete-Part 124: Methods for Analysis of Hardened Concrete" including the determination of sulphate.

Total Sulphur shall be determined using the method given in BS EN 1744-1:2009+A1:2012 "Tests for chemical properties of aggregates - Part 1: Chemical analysis"

Cement content shall be expressed as % by weight of dry hardened concrete as kg/m^3 using an assumed bulk density.

The following limits shall apply;

a) S <= 0.25%
b) SO_3 <= 5%
c) Cement Content >= 5%

4.4.5. PETROGRAPHIC TESTING

If the limits specified in Clause 4.4.4 are not met the contractor must arrange for Petrographic Testing of the samples to be carried out by a suitably qualified professional. The testing shall determine the presence of pyrite and if sulphate attack has already occurred. The testing should also categorise the risk of any future sulphate attack.

4.4.6. WORK TESTS

The average crushing strength of the units shall not be less than the values specified in Table 1.

5. STABILITY

5.1.1. CONTRACTORS RESPONSIBILITY

The Contractor shall provide temporary propping as necessary to ensure the overall stability of the structure and of individual walls during construction and to prevent movement of any damage by winds or other causes. (Freestanding walls shall have a slate DPC at 150mm above ground level using a double layer of slate; a DPC shall be provided below copings).

6. MOVEMENT CONTROL JOINTS

6.1.1. PROVISION

Movement control joints shall be provided in accordance with the details given on the drawings. Masonry must also be constructed in accordance with any instructions or recommendations issued with any instructions or recommendations issued by the Manufacturer; if these conflict with this specification, refer to the Engineer.

6.1.2. UNCOMMON SUPPORT

Sections of walls not supported on the structural element shall not be bonded; a joint type M3 or otherwise as instructed shall be provided over the change of support type.

6.1.3. SEALING

Unless specified otherwise on exposed faces and elsewhere as directed by the Architect's movement joints shall be raked out and sealed with two part polysulphide complying with EN ISO 11600 and used in accordance with the manufacturer's recommendations including priming and backing strips.

7. REINFORCED BLOCKWORK

7.1.1. GENERAL

This section specifies requirements for reinforced masonry additional to those given above.

7.1.2.	RELEVANT CODES	Comply with the requirements of EN 1996-1-1.
7.1.3.	BLOCKS	Blocks shall be as described in Section 2.2 of this specification.
7.1.4.	REINFORCEMENT	Reinforcement shall comply with the requirements for concrete reinforcement of the Engineer's specification for Cast Insitu concrete.
7.1.5.	MORTAR	Constituent materials shall be as specified above for non-reinforced structural masonry, mix to be (M4) 1:1:5-6 cement:lime:sand by volume of dry material except for retaining walls where the mortar mix shall be (M12) 1:0-¾:3.
7.1.6.	CONCRETE	Concrete for core filling shall be in accordance with EN 206-1. The sand and coarse aggregate shall comply with EN 12620 and the coarse aggregate shall be 10mm maximum size. The concrete shall be mixed to have a slump of 125 – 150mm.
7.1.7.	COVER	Reinforcement shall be accurately located and positively fixed to ensure the specified cover to reinforcement.
7.1.8.	MOVEMENT CONTROL	Unless noted otherwise, contraction joints shall be provided at 6m centres. The ratio of length to height of the panels should not exceed 3:1.