SECTION 13

This Section specifies the products, erection and all associated accessories for the construction of concrete and clay masonry unit blockwork as well as requirements glass block units, gypsum units and stoneworks, as applicable to the Project.

All work indicated herein, including all other incidental works as may be necessary or required for the completion of the Project, shall be taken in conjunction with the Drawings and other parts of the Contract Document. Unless indicated otherwise, codes and standards specified in, and referenced by, the Authority Local Authority Rules and Regulations and other such publication by the Authorities Having Jurisdiction over the works in the location of the Project, apply to this Section.

SECTION 13 MASONRY

PART 1 MASONRY UNIT ASSEMBLIES

1.1 GENERAL

1.1.1 Summary

A. This Part includes the general requirements necessary for, and incidental to, the complete supply and installation of the following masonry units and other related materials necessary to complete the Works:

1. Concrete Masonry Unit, Hollow and Solid Block.
2. Pre-Insulated Masonry Unit.
3. Lightweight Concrete Masonry Unit.

1.1.2 Performance Requirements

A. Provide unit masonry that achieves the 28-day minimum compressive strength requirement upon shipment to the Project site, as determined according to BS 6073: Part 1 or ASTM C 90.

1.1.3 Submittals

A. Product Data: For each type of product indicated.

B. Sustainability Submittals:

1. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Show fabrication and installation details for the following:

1. Masonry Units: Show sizes, profiles, coursing and location of special shapes.
2. Joint Reinforcement: Detail corners, tee intersections, reinforcement at control and expansion joints, and other special wall conditions.
3. Reinforcing Detail: Detail bending and placement of unit masonry reinforcing bars.
4. Method Statement for Lightweight Concrete Blocks: Including quality control procedures, as recommended in writing by manufacturer.

D. Samples: Submit 3 samples for each type of masonry units and accessories, before delivery to the Project site.

1. Identify all samples with project name, date, Manufacturer’s name, and product name and type.
2. Approved samples shall be retained in site for use as acceptance standard until completion of Works.

E. Qualification Data: For qualified testing agency and Manufacturer.

1. For Lightweight Concrete Masonry: Submit qualification data for Installer.

F. Material Certificates: Signed by Manufacturers; certifying that each item indicated complies with requirements:

1. Masonry Units: Include material test reports substantiating compliance with requirements. Include certification for compressive strength and unit density.
2. Each cementitious product required for mortar and grout, including name of manufacturer, brand, type and weight at time of delivery.
3. Each material and grade indicated for reinforcing bars.
4. Each type and size for joint reinforcement.
5. Each type and size of anchor, tie and metal accessory.
6. Damp proofing membrane.

G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

H. Field Quality Control Test Report.

1.1.4 Quality Assurance

A. Manufacturer’s Qualification: Manufacturer shall be 9001:2000 certified or one certified as employing an equivalent or higher system of quality management; having a minimum of 10 years documented experience in the manufacture of product/s specified in this Part.

B. Installer's Qualification: For lightweight concrete masonry assemblies; certified by the Manufacturer as authorized Installer of lightweight concrete masonry products specified in this Part; highly-experienced; with a successful in-service record in the installation of products similar in material and scope as those required for the Project.

C. Source Limitation for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, by a single Manufacturer from a single source, for each product required.

D. Source Limitation for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one Manufacturer for each cementitious component, and from a single source or producer for each aggregate.

E. Acoustical Performance: Where indicated, provide masonry assemblies complying with sound insulation rating per ISO 717 "Acoustics-Rating of Sound Insulation in Buildings and of Building Elements"; when measured for Weighted Sound Reduction Index (Rw) according to ISO 140 "Acoustics-Measurement of Sound Insulation in Buildings and of Building Elements".

1.1.5 Delivery, Storage and Handling

A. Store masonry units on elevated platform in a dry location. If units are not stored

in an enclosed location, securely tie and cover with heavy-duty, waterproof sheeting. If unit becomes wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained; avoid contamination.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store containers on elevated platforms, under cover and in a dry location.

E. Store masonry accessories including metal items in an enclosed and dry location to prevent corrosion and accumulation of dirt and oil.

1.1.6 Project Conditions

A. Protection of Masonry: During construction, cover tops of walls, projection and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry work when construction is not in progress.

B. Stain Prevention: Prevent grout, mortar and soil from staining, or immediatel remove those that come in contact, with the face of masonry to be left exposed or painted.

1. Protect base of wall from water or mortar splatter by spread covering with waterproof sheet.

1.2 PRODUCT

1.2.1 Manufacturer: Subject to full compliance with the requirements of this Specification and other parts of the Contract Document.

1.2.2 Masonry Units, General:

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for jambs, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Defective Units: Referenced masonry unit standard may allow a certain percentage of units to contain defect within stated standard limits. Masonry units to be exposed in the completed Works however, shall be free from cracks, splits, spalls, chippages and other such defects.

C. Fire-Resistance Rating: Where indicated or required, provide masonry units that comply with requirements, as determined according to ASTM E 119, by testing specimen units having the minimum required equivalent thickness per ASTM C-140, for fire-resistance rating indicated.

1. Fire-Resistance Rating: As indicated on Drawings.

D. Tolerances: Dimension of masonry units in any direction (length, height and thickness) shall not vary from nominal size by more than 3mm.

1.2.3 Concrete Masonry Units: To BS EN 771-3 OR ASTM C 90:

A. Regional Materials: Provide CMUs that have been manufactured within 800 km of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 800 km of Project site.

B. Compressive Strength: When tested per BS EN 772 or ASTM C 140:

1. For Load-Bearing Walls:

a. Average for 10 Blocks: Not less than 10.4 MPa.
b. Lowest for Individual Block: Not less than 8.3 MPa.

2. For Load-Bearing Walls, Below Ground:

a. Average for 10 Blocks: Not less than 17.4 MPa.
b. Lowest for Individual Block: Not less than 14.0 MPa.

3. For External Walls, Non-Load-Bearing:

a. Average for 10 Blocks: Not less than 7.0 MPa.
b. Lowest for Individual Block: Not less than 5.6 MPa.

4. For Internal Walls, Non-Load-Bearing:

a. Average for 10 Blocks: Not less than 4.0 MPa.
b. Lowest for Individual Block: Not less than 3.6 MPa.

5. For Roof Blocks and Protective Foundation Skins:

a. Average for 10 Blocks: Not less than 4.0 MPa.
b. Lowest for Individual Block: Not less than 3.6 MPa.

C. Density: Provide concrete masonry units complying with the minimum net dry density requirements as specified below and in the Detailed Design Acoustic Report; when tested per BS EN ISO 772-13:

1. For Hollow Blocks: 200mm Thickness and ≤ 20 Percent Formed Void: 1,600 kg/m^3, minimum.

2. For Hollow Blocks: 150mm Thickness and ≤ 20 Percent Formed Void: 2,000 kg/m^3, minimum.

3. For Hollow Blocks: 100mm Thickness and ≤ 20 Percent Formed Void: 1,600 kg/m^3, minimum.

4. For Solid Blocks: 200mm Thickness: 2,000 kg/m^3, minimum.

5. For Solid Blocks: 150mm Thickness: 2,000 kg/m^3, minimum.

6. For Solid Blocks: 100mm Thickness: 2,000 kg/m^3, minimum.

D. Size: Unless indicated otherwise, provide 400mm (Nominal Length) x 200mm (Nominal Height) blocks; complying with the following requirements for Nominal Thickness indicated:

Nominal Thickness	Minimum Thickness (mm)	
	Wall	Web
100mm	19	19
150mm	25	25
200mm	32	30

E. Exposed Face: Provide color and texture matching the range represented by the Engineer's sample.

1.2.4 Pre-Insulated Concrete Masonry Units (Where Applicable): Provide pre-insulated masonry units complying with the following requirements:

Size	: 400L x 200H x thickness indicated in the Drawing
Compressive Strength	: 7.5 MPa, minimum.
U-Value	: 0.5 W/m^2K, maximum.
Insulation Material	: Molded polystyrene.
Insulation, Density	: 24 Kg/m^3, minimum.
Insulation, Thickness	: Not less than 60mm.

1.2.5 Lightweight Concrete Masonry Units (As Applicable): Provide Autoclaved Aerated Concrete (AAC) masonry units/assemblies as follows:

A. To BS EN 771-4 or ASTM C 1386; proprietary square-edged solid rectangular block units; mixed from quartz sand, cement, lime, water and expanding agent to produce lightweight, thermal- and acoustically-sound concrete masonry units with extremely narrow dimensional tolerances; suitable for thin-bed mortar (glue) method, and having the following characteristics:

Nominal Density	: 500 kg/m^3.
Thickness	: As indicated on Drawings.
Compressive Strength	: 4.0 MPa, or More.
U-Value	: 0.2 W/m^2K, or Less.
Fire Rating	: To comply with fire resistance rating of fire-rated assemblies indicated on Drawings, but not less than 1 Hour.

1.2.6 Mortar and Grout Materials

A. Regional Materials: Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 800 km of Project site.

B. General: To BS 5628, and as follows:

1. Portland Cement: Provide natural color or white cement as required to produce mortar color indicated, and as follows:

   a. Portland Cement: To BS EN 197-1.
   b. Where required or indicated for mortar in contact with the ground, provide sulfate-resisting portland cement complying with BS 4027.

2. Masonry Cement: To BS 5224.
3. Limes: To BS EN 459-1.
4. Mortar Pigments: To BS EN 12878; mineral-based.
5. Aggregate:

   a. Natural Aggregates: To BS EN 13139.
   b. Lightweight Aggregates: To BS EN 13055-1.
   c. For exposed masonry works, use washed aggregate consisting of natural sand or crushed stone.
   d. White Mortar Aggregates: Natural white sand or ground white stone.
   e. Colored Mortar Aggregates: Natural-colored sand or ground marble, granite or other colored stone with color matching brick units.

C. Epoxy Pointing Mortar (As Applicable): To BS 5980; color to match approved mock-up.

D. Glue Mortar for Lightweight Concrete Blocks (As Applicable): Proprietary product recommended in writing by aerated concrete block manufacturer.

E. Water: Potable, clean and free of deleterious chemical.

1.2.7 Insulation Materials

A. Insulation, Pre-Insulated Masonry Unit: To ASTM C 578; rigid, cellular thermal insulation formed by the expansion of polystyrene resin bead or granule in a closed mold specially shaped for installing in cores of pre-insulated masonry unit.

1.2.8 Steel Reinforcement

A. Reinforcing Steel Bars:

1. Weldable Reinforcing Steel Bars: To BS 4449 or ASTM A 706, deformed.
2. Welded Steel Wire Fabric: To BS 4483 or ASTM A 951, ladder- or truss-type block reinforcement made of 4mm diameter deformed bars; for horizontal mortar joint reinforcement.

   a. External and Below-Grade Walls: To BS EN 10088; stainless steel, grade 304.
   b. Internal Walls: To BS EN 1461; hot-dip galvanized steel (Z275).

B. Expanded Steel Mesh Reinforcement: To BS 13658; 0.5mm nominal thickness; for reinforcement of horizontal mortar joints and masonry walls and columns/concrete wall connections.

1. External and Below-Grade Walls: To BS EN 10088; stainless steel, grade 304.
2. Internal Walls: To BS EN 10143 and BS EN 10346; hot-dip galvanized steel (Z275).

1.2.9 Ties and Anchors

A. General: Comply with BS EN 845-1 and BS 5628-3, and as follows:

1. External and Below-Grade Walls: To BS EN 10088; stainless steel, grade 304.
2. Internal Walls: To BS EN 10143 and BS EN 10346; hot-dip galvanized steel (Z275).

B. Ties and Brackets: For wind load- and shear-resistance; provide manufacturer's standard plates, angles, or other suitable-type of wall tie; 1.5mm minimum thickness; in profiles and sizes recommended in writing by the manufacturer for applications indicated.

1. For Masonry Wall/Partitions Junctions: Use fishtail or corrugated-type tie.
2. For Connecting Masonry Walls/Partitions and Structural Walls/Columns: Use fishtail-angle- or corrugated-angle-type ties.
3. For Cavity Walls (As Applicable): Use double triangle-, butterfly-, or fishtail-type ties.
4. Ties and Anchor for Lightweight Concrete Blocks: As recommended in writing by lightweight concrete block manufacturer.

C. Adjustable Anchor for Connecting to Steel Frame (As Applicable): Provide proprietary two-piece assemblies that allow vertical and horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

D. Miscellaneous Anchors:

1. Anchor Bolts: Steel bolt per ASTM F 568M, Property Class 4.6; with hex nuts to ASTM A 563M and, where indicated, flat washers; hot-dip galvanized per ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

a. Headed bolts.
b. Non-headed bolts, bent in manner indicated.

E. Post-Installed Anchors: Where indicated or required, provide anchors as described below, with capability to sustain, without failure, loads imposed within factors of safety indicated, as determined by testing per ASTM E 488 by a qualified independent testing agency.

1. Type: Expansion anchors.
2. For interior location, provide materials made of carbon steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941M, Class Fe/Zn, unless otherwise indicated.
3. For exterior location or where indicated, provide materials made of alloy Group A1 or A4 stainless steel bolts to ASTM F 738M, and nuts to ASTM F

836M.

4. Safety Factor for Post-Installed Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the load imposed.

1.2.10 Miscellaneous Materials

A. Damp proofing Membrane: Refer to Part “Bituminous Damp proofing” of this Specification.

B. Compressible Filler: Non-extruding, bitumen-impregnated fibreboard; complying with BS 6093 or ASTM D 1751.

C. Polyethylene Sheet: To BS EN ISO 7214 or ASTM D 3575; semi-rigid, non-absorbent, cellular polyethylene joint filler; where required for use as low-density movement joint filler between masonry blockwork and concrete.

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcement bars in center of cells. Units are formed from 4 to 5mm steel wire, hot-dip galvanized (Z275) after fabrication.

E. Sealants: Approved-type as specified in Part “Joint Sealants” of this Specification.

1.2.11 Lintels

A. Concrete Lintels: Cast-in-place or precast concrete; in sizes suitable for load requirements of masonry openings indicated and complying with Part “Cast-In-Place Concrete”, of this Specification.

B. Steel Lintels (Where Indicated): To BS 5977-2; pre-fabricated unit with bracket seat angles; in sizes suitable for load requirements of masonry openings indicated, and as follows

1. For External Masonry Openings: To BS EN 10088; stainless steel, grade 304.
2. For Internal Masonry Openings: To BS EN 10143 and BS EN 10346; hot-dip galvanized steel (Z275).

1.2.12 Other Materials

A. Provide other materials, not specifically described but required for a complete and proper installation of masonry assemblies, subject to review and approval by the Engineer; ensuring compliance to the performance criteria, codes, standards and authorized local authority rules and regulations; with the provision of necessary guarantee/ warranties.

1.2.13 Mortar and Grout Mixes

A. Masonry Mortar Mix: Provide mix proportions complying with BS EN 998-2.

1. Unless directed otherwise by Engineer, mortar mix application shall be as follows:

a. For Load-Bearing Walls: Class M6.
b. For Load-Bearing Walls, Below Ground: Class M12.
c. For External Walls, Non-Load-Bearing: Class M6.
d. For Internal Walls, Non-Load-Bearing: Class M6.
e. For Roof Blocks: Class M4.
f. For Protective Foundation Skins: Class M6.

B. Masonry Grout Mix: Mix proportions to achieve minimum compressive strength of 17.5 MPa at 28 days.

C. Do not use admixtures, including accelerators, retarders, water repellants, or other admixtures, unless indicated otherwise.

D. Mixing shall be carried out by means of an approved mechanical batch mixer except in the case of small quantities of mortars not containing plasticizers, subject to Engineer's approval. Hand-mix mortar on a clean watertight platform. The mortar shall be mixed dry until a uniform mix is obtained. Sufficient water shall then be added and the mixing continued until a homogenous mix is obtained. Excess water shall not be used in the mix.

1.3 EXECUTION

1.3.1 Examination

A. Examine conditions, with Installer, present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Verify that foundations are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.
3. Before installation, examine roughing-in and built-in construction to verify actual locations of piping connections.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1.3.2 Installation, General

A. Thicknesses: Build cavity and composite walls and other masonry construction to the full thickness shown in the Drawing. Build single-wythe walls to the actual widths of masonry units, using units having width indicated.

B. Build chases and recesses required to accommodate itams specified in this Part and in other part of the Contract Document.

C. Leave openings for equipment to be installed befor completing masonry. After installing equipment, complete masonry with units matching construction adjacent to opening. Where possible, use full-size units without cutting. Allow units cut with water-cooled saw to dry before placing, unless otherwise specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Fire-Rated Assemblies (Where Required):

1. Fire Rating: As indicated on Drawings.
2. Solidly fill and pack horizontal and vertical joints with mortar.
3. Opening and penetrations shall be treated with prefabricated firestop systems rated for same fire rated as walls:

    a. Comply with requirements of Parts “Fire-Resistive Joint System” and “Penetration Firestopping” of this Specification.

4. Head of wall joint shall be proprietary head-of-wall joint system comprising mineral fiber insulation of 100 kg/m³ minimum density and low-modulus silicone-based fire-rated joint sealant as a minimum.
5. Control joints shall have joint system rated for same fire rating as wall.

E. Acoustically-Rated Masonry Assemblies (Where Required):

1. Horizontal and vertical masonry joints shall be solidly filled with mortar. Hollow metal frames trams shall be filled with mortar.
2. Joints between masonry jambs and door frames shall be filled with suitable materials to satisfy same acoustical rating as the masonry assembly.
3. Head of wall joint system shall satisfy same acoustical rating as masonry assembly.
4. When filling or treating any opening, penetration or cut through a masonry assembly with specified materials, care shall be taken that completed fill or treatment satisfies same acoustical rating as of the masonry assembly.
5. When fixing or setting any equipment, fixture, fitting or boxing to the assembly, care shall be taken that selected materials and details and completed work satisfy same acoustical rating as of the masonry assembly.
6. Acoustic Rating: Refer to Detailed Design Acoustic Report.

F. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

1. Where ambient temperature exceeds 35 deg. C, or 32 deg. C with a wind velocity greater than 13km/h, do not spread mortar beds more than 1200mm ahead of masonry. Set masonry units within one minute of spreading mortar.

1.3.3 Construction Tolerances

A. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 6mm in 6 meters, with the maximum line thickness of 12mm.

B. For vertical alignment of exposed head joints, do not vary from plumb by more than 6mm in 3 meters.

C. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 6mm in 6 meters, with the maximum line thickness of 12mm.

D. For exposed bed joints, do not vary from thickness indicated by more than 3mm, plus or minus, with the maximum line thickness of 12mm. Do not vsry from bed

joint thickness of adjacent courses by more than 3mm.

E. For exposed head joints, do not vary from thickness indicated by more than 3mm, plus or minus. Do not vary from adjacent bed joint and head joint thicknesses by more than 3mm.

1.3.4 Laying Masonry Walls

A. General: Comply with BS 5628-3.

B. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using units cut less than half its original size, particularly at corners and jambs.

C. Units shall be laid in running (stretcher) bond with vertical joints in successive courses centering on midpoint of the unit below. Joints to be dead level and uniform in width.

D. Bond pattern for exposed masonry: Lay exposed masonry in running (stretcher) bond, unless indicated otherwise in the Drawing.

E. Bond and interlock each course of each wythe at corners. Do not use units with less than 100mm horizontal face dimension at corners or jambs.

F. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond, or one-third-unit on one-third running bond; do not tooth courses. Clean exposed masonry units and mortar before laying fresh masonry.

G. Built-in Works: As construction progresses, build in items specified under this and other Parts. Solid-fill masonry units around location of built-in items.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill space between hollow metal frames and masonry solidly with mortar, unless indicated otherwise.

J. Build non-load bearing interior partitions in full height of storey to underside of solid floor or roof structure, above, unless indicated otherwise.

1. Install compressive filler in joint between top of partition and underside of structure above.
2. Wedge non-load bearing partitions against structure above with small pieces of tile, slate or metal. Fill joint with mortar after dead-load deflection of structure above attains final position.
3. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above, as specified in Part, “Fire-Resistive Joint System”.

1.3.5 Mortar Bedding and Jointing

A. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells; with head joints of equal depth to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.

1.3.6 Reinforcement

A. General: Comply with BS EN 845-1 and BS 5628-3.

1. Horizontal Joint Reinforcement: Provide expanded steel mesh or reinforcement ladder/truss; fully embedded in every 3 courses of blockwork.

    a. Provide horizontal joint reinforcement at every 2 courses of blockwork for the following:

        1) Where no beam support under masonry wall or partition.
        2) Where beam or slab deflection is expected under masonry wall or partition.
        3) Where indicated to receive mechanical fixing for installation of wall cladding, provide horizontal joint reinforcement at every 2 courses of blockwork.

2. Vertical Bar Reinforcement: Shall be properly positioned, secured against displacement, and supported near each end and at intermediate intervals not exceeding 80 bar diameter.
3. Joint Reinforcement: Shall be as follows:

    a. Masonry Wall/Partitions Junctions: Unless movement joins are indicated, intersecting masonry walls/partitions shall be bonded or secured with suitable-type wall ties as follows:

        1) Ties to be fully-embedded in the horizontal mortar joints at vertical spacing not exceeding 600mm.
        2) Tie ends to project a minimum of 75mm into each intersecting walls/partitions.

    b. Connection Between Masonry Walls/Partitions and Structural Walls/Columns: Secured with suitable-type wall ties at maximum vertical spacing of not more than 400mm and as follows:

        1) Secure ties to structural walls/coulumns and embed to minimum of 200mm into horizontal mortar joints. Allow clearance of not less than 20mm from each face of masonry/partition.

4. Cavity Wall Reinforcement (As Applicable): Provide suitable-type ties for cavity masonry wall as follows:

    a. Maximum Spacing of Wall Tie: Comply with the following:

        1) 50mm to 75mm Wide Cavity: 1,000mm, horizontal; 400mm, vertical.
        2) 75mm to 100mm Wide Cavity: 800mm, horizontal; 400mm, vertical.
        3) 100mm to 150mm Wide Cavity: 500mm, horizontal; 400mm, vertical.

    b. Provide additional tie in each course for the following:

        1) Within 250mm of wall openings.
        2) At end walls.
        3) On each sides of movement joints.

1.3.7 Movement Joints

A. General: Provide control and expansion joints in masonry walls/partitions as required or where indicated on Drawings. Build-in related items including. But not limited to, compressible filler and sealants as masonry progresses.

1. Width of Movement Joint: 12mm, unless indicated otherwise.
2. Movement joints to be provided where indicated or where runs of block wall exceed 8 meters.

B. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

1.3.8 Grouting

A. Use fine grouts for filling spaces less than 100mm in both horizontal and vertical directions.

B. Use coarse grout for filling spaces 100mm or larger in both horizontal and vertical directions.

C. Prior to grouting, clean and inspect grout spaces and close cleanout holes. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position as required. Clean top surface of structural members supporting masonry to ensure bond. After all final cleaning and inspection, close cleanout holes and brace closures as required to resist grout pressures.

D. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shoes and bracing, if required, before starting grouting operations.

E. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place pour in lifts not exceeding 1.2 meters in height. Allow not less than 30 minutes or not more than 1 hour between lifts of a given pour. Rod or vibrate each grout lift during pouring.

F. When more than 1 hour is required to complete a given section of masonry,

extend reinforcing beyond as required for splicing. Pour grout to within 37mm of top course of first pour. After grouted masonry is cured, lay masonry units to and place reinforcing for second pour section before grouting. Repeat sequence if more pour is required.

1.3.9 Lintels

A. Provide lintel where shown and where opening of openings of more than 305mm for brick-size units and 610mm for block-size units are shown without structural steel or other supporting lintels.

1.3.10 **Damp proofing** (Where required)

A. General: Install dampproofing membrane according to BS EN 1996-3 and membrane manufacturer's written recommendations.

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by manufacturer.

1.3.11 **Reinforced Masonry Installation** (Where Required)

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line and dimensions shown. Make it sufficiently tight to prevent leakage of mortar ang grout. Brace, tie and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements of BS 5628-2.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1.3.12 **Installation of Lightweight Concrete Masonry Units** (As Applicable)

A. Installation shall be strictly carried out as per the Manufacturer's written recommendations. Utilize skilled labours having the know-how in the proper installation of the system and use of special tools and equipment's necessary for the application indicated.

B. Follow all proper workmanship requirements and procedures for provision of services openings, piping and duct penetration and door and window openings on external and internal wall. After service installation, carry out proper patching procedures to Manufacturer's written instructions.

C. Use mechanical/chemical anchors and methods recommended by Manufacturer in the fixation of service pipes and other fixings on the masonry wall.

1.3.13 Field Quality Control

A. Testing and Inspecting: Contractor will engage an independent testing laboratory acceptable to the authorities having jurisdiction to perform tests and inspections and prepare reports. Re-test materials that fail to comply with specified requirements at Contractor's expense.

1. Testing Prior to Construction: 12 units of each type of masonry unit to be selected by Engineer from first batch delivered.

2. Testing Frequency: As required by the Engineer.

B. Masonry Unit Test: For each type of unit provided, according to BS 5628-1 and/or BS 5628-2, as applicable; for compressive strength.

C. Grout Test: For each mix provided, according to BS 5628-1; for compressive strength.

1.3.14 Repairing, Pointing and Cleaning

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or do not match adjoining units. Install new units to match adjoining units; applyl fresh mortar, pointed to eliminate any indication of replacement.

B. Pointing: During tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, smooth, solid, watertight, compacted joint.

1. Prepare joints for sealant application where indicated.

C. In-Progress Cleaning: Clean masonry unit as work progresses by dry brushing to remove mortar fins and smear before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer’s approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clean water.
5. Clean concrete masonry by cleaning method applicable to type of stain on exposed suface.

1.3.15 Masonry Waste Disposal

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, and other masonry waste, and legally dispose of off Project site.

END OF PART