DIVISION 4

MASONRY

BUILDING WORK

DIVISION 4

MASONRY

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SECTION 04200

MASONRY

PART 1: GENERAL

1.01 SCOPE OF WORK

A Furnish all labor, materials, equipment and incidentals required to construct all masonry work as shown and as specified herein.

B The work under this Section is limited to the Concrete Reinforcement Section and, with the exception of items embedded in concrete, is to be installed under this section.

C The work under this section includes, but is not necessarily limited to, the following:

1. Blockwork
2. Masonry joint reinforcement, ties, and anchors
3. Buildings-in required precast components

1.02 RELATED WORK NOT INCLUDED

A Other sections directly related to work covered in this section include the following:

1. Section 03300 - Concrete.
2. Section 03600 - Grout.
3. Section 05500 - Miscellaneous Metal
4. Section 07005 - Waterproofing and Dampproofing.
5. Section 07900 - Caulking.

1.03 SUBMITTALS

A Submit to the Engineer, as provided in the Submittals Section, sample of block, joint reinforcing, dovetail anchors, slots, blocks fixing ties, cavity trays, and proprietary cavity closures.

B Resubmit as required until acceptable.

C Before commencing with the laying of any architectural masonry, construct on the Site, where directed by the Engineer, one sample exterior wall panel, minimum dimension, 2 meters by 1.3 meters of block showing type and tooling of mortar and bond, block fixing ties, and movement joint for the Engineer's review. Reconstruct until acceptable.

Sample panels shall remain in place for the duration of the masonry work. Remove sample panel at the completion of the work as directed by the Engineer.

D Certificates: Before commencing work submit agreement from manufacturers of blocks that movement joints are located at positions recommended by them.

1.04 MATERIAL DELIVERY, HANDLING AND STORAGE

A General: deliver store and handle in accordance with manufacturer's recommendations.

B Transport: Transport materials in cool containers and do not allow to stand in sun: especially ensure that metal barrows and containers and boards for mortar and mortar materials are cool.

C Storage: keep blocks dry at all times; store on prepared areas free from clinker or ashes or sulphate bearing soils; cover block stacks and sand piles with tarpaulins; allow air circulation.

D Storage: Store cement and lime above ground in dry structures and use in order of delivery.

1.05 PROTECTION OF MATERIALS

A All masonry materials for the work of this Section shall be delivered stored and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the Site.

B All masonry shall be shipped stacked with hay or straw protection or other suitable protective device and shall be similarly stacked off the ground on the site. Masonry shall be unloaded with suitable equipment or manually in manner to prevent damage. Masonry units shall not be dumped from trucks. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering acceptable to the Engineer.

1.06 PROJECT ENVIRONMENTAL CONDITIONS

A Work in Adverse Weather: Except where precautions are taken to maintain materials and ambient temperatures above 4°C do not mix mortar or lay blocks or dpc material when temperature on falling thermometer reaches 4°C or until temperature on ascending thermometer in shade reaches 4°C .

B Take all necessary measures to ensure that block laying continues without interruption during adverse weather.

C Hot Weather Work: take all necessary steps to keep mortar and blocks and dpc and other materials cool including:

1 Do not mix mortar or lay units while shade temperature is above 40°C in a rising thermometer or above 43°C on a falling thermometer.

2 Do not allow temperature of fresh mixed mortar to exceed 30°C. Take suitable measures to ensure this.

D Contractor is deemed to have allowed in his Tender for all steps necessary for compliance with above.

1.07 ADJUSTMENT AND CLEANING OF COMPLETED WORK

A Clean off mortar splashes and other stains from wall surfaces by scrubbing and washing down with clean water. Do not use acids.

1.08 PROTECTION DURING PROGRESS OF WORKS

A Protect work from damage by heat, rain and frost. When humidity is less than 50% and wind speed exceeds 4m/second provide shelter for wet mortar for at least 24 hours after mixing to avoid dehydration.

B In any period of interruption and in hot weather protect from damage; use approved coverings that extend down both sides of exposed walls to cover work done in previous 24 hours and permit free air flow and prevent heat build up.

C Prevent all blocks from becoming wet.

1.09 PROTECTION OF COMPLETED WORK

A Keep completed wall clean and protect from staining.

PART 2: PRODUCTS

2.01 MATERIALS - GENERAL

A Aggregates-General: Obtain from sources approved by the engineer.

2.02 MATERIALS - BLOCKS

A Concrete Blocks Except as otherwise described, provide blocks complying in all respects with BS 6073: Part 1 in accordance with Blockwork Schedule. Where a described size differs from that in BS all other provisions of BS apply, manufactured from ordinary Portland cement to ASTM C150, Type I and natural aggregates to ASTM C-33, and shall meet the following compressive strengh classes:

1 - Hollow blocks: 30 kg/cm^2 of gross area

2 - Solid blocks: 35 kg/cm^2

B Do not use tongued and grooved blocks without the Engineer's permission.

C Surfaces of blocks that are to receive plaster or render to be suitably textured and capable of receiving plaster or tender without addition of bonding measures.

D Blocks must be dry and properly cured when delivered to site.

2.03 MATERIALS - TIES

A Cavity Walls: Use approved galvanized vertical twist type wall ties complying with the requirements of BS 1243, or others having at least equivalent strength and stiffness, all in accordance with the minimum spacing and embodiment requirements of BS 5628 Pt. 1.

B Double Leaf (Collar Jointed Walls) : Use approved galvanized flat metal wall ties in accordance with the requirements of BS 5628 Pt1 clause 29.5 and the requirements of BS 1243.

C Single Skin Walls: Use approval galvanized ties in accordance with the requirements of BS 1243 & BS 5628.

2.04 MATERIALS - MOVEMENT JOINTS

A Movement Joint Sealant: Movement joint sealant shall be suitable for the purpose intended & used in accordance with manufacturers instructions.

B Movement Joint Filler: For vertical joints, shall be expanded polystyrene.

C Suitable ties provisions to be made for transfer of lateral shear across all movement joints.

D Sleeved sliding ties to be used to laterally support tops of blockwork walls to ensure no vertical load is transferred from the structural elements on to the blockwork walls.

E For all movement joint spacing refer to architect drawings and the manufactures specification.

2.05 MORTAR MATERIALS

A Portland cement shall conform to ASTM C150, Type I for mortar above ground.

B Lime for Brick masonry mortar shall be hydrated, conforming to ASTM C207, Type S, non air-entrained.

C Sand shall be clean, durable particles, free from injurious amounts of organic matter. The sand shall conform to the limits of ASTM C144.

D Water shall be free from injurious amounts of oils, acids, alkalis or organic matter, and shall be clean and fresh.

E White Cement: to BS 12.

F Coloured Mortar: shall obtain its colour from pigments complying with BS 1014 and colour of mortar shall be approved by the Engineer as part of a sample panel.

G Admixtures: do not use admixtures, other than plasticiesers, without prior approval. Do not use calcium chloride or any admixtures containing calcium chloride.

H Plasticisers: to BS 4887 or ASTM C494 Type A.

2.06 MORTAR MIXES

A Mortar for block shall be one part Portland cement, two parts lime and 8parts sand, where block is reinforced lime should not be used.

B Mortar for brick shall conform to ASTM C270, Type S. Provide test data as required to substantiate strength requirements of 130 kg/cm^2 at 28 days. Ingredients shall be accurately measured by volume in boxes especially constructed for the purpose by the Contractor. Measurement by shovel will not be allowed. Measure materials in a damp, loose condition.

C Mortar for frames and elsewhere as required shall be one part portland cement, one part sand.

PART 3: EXECUTION

3.01 MORTAR

A Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than 5 minutes, approximately 2 minutes of which shall be for mixing the dry materials and not less than 3 minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring a lime content, the Contractor will have the option of using the dry-mix method or first converting the hydrated lime into a putty.

Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious material has been thoroughly distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.

B Mortar boxes shall cleaned out at the end of each day's work, and all tools shall be kept clean. Mortar that has begun to set shall not be used.

3.02 MASONRY - INSTALLATION

A All block shall be laid in full beds of mortar with shoved joints and with all joints shushed solidly in each course. Block shall be damp when laid. All block shall be laid up from an outside scaffold and shall be carried up simultaneously at an approximate level. Bricks receiving minor handling defects, if allowed to be used, shall be used in surfaces to be plastered.

B All masonry shall be laid a full bed of mortar, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well-compacted vertical mortar joint for the full shell thickness. Units shall set with all cells in a vertical position. The moisture content of the units when laid shall not exceed 35 percent of the total absorption as determined by laboratory test.

C All masonry shall be laid in stretcher (running) bond. Fill all joints with mortar dense and neat. Joints shall be 10 mm wide with all joints uniform.

D Sizes shall be as specified and called for on the drawings, and the space between face and the backup material shall be shushed full of mortar.

E Coordinate with the work of installing pressed metal frames. Fill frames fully with mortar.

F All masonry slots, chases, or openings required for the proper installation of the work of other sections shall be constructed as indicated on the drawings or in accordance with information furnished before the work is started at the points affected. No chase shall cut into any wall constructed of hollow units after it is built, except as directed and acceptable to the Engineer.

G Build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, precast concrete and ties, electrical panel boxes, sleeves vents, grilles, anchors, grounds, and electric conduits and fixtures. Cooperate with other trades whose work is to be coordinated with the work under this section.

H All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar.

I All ties and reinforcing for masonry shall be furnished and installed under this section.

J Space ties as follows:

To columns (Abutting or not exceeding 450 mm centres vertically, pasing walls) placing on each side of any movement joint.

To Edge Beams not exceeding 450 centres horizontally in one row along face of edge beam at each floor level.

To Openings and at Vertical provide additional ties within 150 mm of Movement joints edges at not exceeding 450 mm vertical centres.

K Install vertical masonry reinforcement where indicated on the drawings or specified herein.

L Aluminium: Any aluminium surface that will be in contact with block or mortar is to be painted with black bitumen coating solution to BS 3416 Type 1. Ensure that protective coating is adequate and if not arrange of a further coat of bitumen to be applied.

M Concrete Blocks: Protect and keep dry at all times.

N Concrete Blocks: Where items requiring strong solid fixings are to be fixed to blockwork e.g. radiators hanging cupboards provide solid (100%) blocks of fixing bricks to receive fixings

O Block Nibs Against Steel or Concrete: Where nibs less than 200mm in length occur against steel or concrete surfaces tie nibs to, steel or concrete using dovetail anchors at not exceeding 230 mm vertical centres placed in vertical metal slots cast in concrete, or shot fired into steel.

P Reinforcement: Where length of an internal partition wall exceeds 5m in unbroken length provide continuous horizontal reinforcement in each alternative course of blockwork: bed on and surround with mortar and keep back 12 mm from faces. Provide for.

Q Non-Load Bearing Walls: Tie across control joints with strips of expanded metal mesh or 6 mm rod mesh placed across joint in alternate courses. Provide at least 25 mm of cover to all metal.

R Metal in Walls: All metal in external walls to be hot-dip galvanized. Part 1 including preliminary and site tests at 7 days and 28 day. Arrange for copies of test report to be sent directly on to the Engineer from laboratory within 7 days of completion of test.

3.03 CLEANING

A All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar of same color as that of the original and adjoining work.

B Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.

C All exposed masonry shall be thoroughly cleaned. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 2 square meters in a location approved by the Engineer. Use only those cleaning agents recommended by the brick manufacturer. No further cleaning work may proceed until the sample area is acceptable to the Engineer, after which time the same cleaning materials and method shall be used on the remaining wall area.

3.04 FIELD QUALITY CONTROL

A Tests: take samples of fresh or hardened mortars when directed, and submit to approved testing laboratory for testing of compressive strength to BS 5628: Part 1 including preliminary and site tests at 7 days and 28 days. Arrange for copies of test report to be sent directly o to the Engineer from laboratory within 7 days of completion of test.

B Testing solid concrete blocks: ten blocks from each batch are to be selected by the engineer for testing for compressive strength. Results are to be as follows:

Individual block	not less than 30 kg/cm2
Average of 10 blocks	not less than 35 kg/cm2

C Testing hollow concrete blocks: ten blocks from each batch are to be selected by the Engineer for testing for compressive strength. Results are to be as follows:

Individual block	not less than 25 kg/cm2 of gross area
Average of 10 blocks	not less than 30 kg/cm2 of gross area

End of Section

DIVISION 5

METALS

BUILDING WORK

DIVISION 5

METALS

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SECTION 05500

MISCELLANEOUS METAL

PART 1: GENERAL

1.01 SCOPE OF WORK

A Furnish all labor materials, equipment and incidentals required to provide all miscellaneous metal as indicated and as specified herein.

B Miscellaneous metal work include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not specified in other sections of these specification.

C This Section cover the following miscellaneous metal items:

1. Steel Screen.

2. Floor channels and gratings.

1.02 RELATED WORK NOT INCLUDED

A Installation of embedded miscellaneous metal items is included in Division 3 and 4.

B Masonry reinforcement, masonry ties and anchor slots are included in Division 4.

1.03 SUBMITTALS

A Submit detail drawings, as provided for in special conditions, showing sizes of members, method of assembly, anchorage, and connection to other members.

B Field measurements shall be taken at the site to verify or supplement indicated dimensions and to insure proper fitting of all items.

C Samples: Submit 2 sets of representative samples of materials and finished products as may be requested by Engineer.

1.04 COORDINATION

A The work of this Section shall be completely coordinated with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.

B Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.05 REFERENCE SPECIFICATIONS

A. Unless otherwise specified, materials shall conform to the following:

Structural Steel	ASTM A36
Structural Tubing	ASTM A500, Grads B
Welded and Seamless Steel pipe	ASTM A53
Gray Iron Castings	ASTM A48, Class 30
Galvanizing, general	ASTM A123
Galvanizing, hardware	ASTM A153
Galvanizing. assemblies	ASTM A386
Aluminum (Extruded Shape)	6061 T6
Aluminum (Extruded Pipe)	6063 T6
Aluminum sheet, Plate and Rolled Shapes	6061 T6
Anchor Bolts and Nuts	ASTM A320,Grade B8
Stainless Steel Bolts, Bars, & Shapes	AISI, Type 304
Stainless Steel Plate and Sheet	AISI, Type 302
Welding Rods for Steel	AWS Spec. for Arc Welding (Type E70XX)
High Strength Steel Bolts, Nuts & Washers	ASTM A325 mechanically galvanized per ASTM B454
Screws	Stainless Steel, IFI-04, Grade 303 or 305

PART 2: PRODUCTS

2.01 MATERIALS

A Ferrous Metals

1. Metal Surfaces, General: for fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes and including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, shapes and bars: ASTM A 36 or BS 1449 .

3. Steel bar grating: ASTM A 569 or ASTM A 36 .

4. Steel tubing: cold formed, ASTM A500; or hot-rolled, ASTM A 501, BS 4848, or BS 2994 .

5. Structural steel sheet: hot-rolled, ASTM A 570; or cold-rolled ASTM A611, class 1; of grade required for design loading.

6. Galvanized structural steel sheet: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.

7. Steel pipe: ASTM A 53 or BS 4848. Type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.

8. Grey iron castings: ASTM A 48, Class 30, or BS 1452.

9. Malleable Iron castings: ASTM A 47, grade as selected by fabricator.

10. Brackets, flanges and anchors: cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete inserts: threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B Grout

1. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls select fasteners for the type, grade and class required.

2. Bolts and Nuts: Regular-hexagon head type, ASTM A 307, Grad A, or BS 1768.

   Lag Bolts: square head type, FS FF-B-561.

   Machine Screws: cadmium plated steel, FS FF-S-92, or BS 4183.

   Wood screws: flat head carbon steel, FS FF-S-111, or BS 1210.

   Plain washers : round, carbon steel, FS FF-W-92, or BS 3410.

   Masonry anchorage devices: expansion shields, FS FF-S-325, or BS 5050.

   Toggle bolts: tube-wing type, FS FF-S-589, type, class and style as required.

   Lock washers: helical spring type carbon steel, FS FF-W-84.

D Paint

1. Shop primer for ferrous metal: Manufacturer's or fabricator's standard, fast-curing, lead-free primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.

2. Shop primer for ferrous metal: fast-curing, lead-free, abrasion-resistant, rust-inhibitive primer selected for compatibility with substrates and with types of alkyd-type finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements only of FS TT-P-86, Types I, II, and III.

3. Galvanizing repair paint: high zinc dust content paint for regalvanizing welds in galvanized steel.

4. Polyester Powder Coat Finish:

   a. Is to be polyester resin powder electrostaticlly applied and baked to give minimum thickness of 70 microns, to meet the requirements of BS 6496. Colour to be select by the Engineer. Manufacturer is to provide a 10 year warranty, agreeing to repair or replace defective coating, defined as abnormal deterioration, aging or weathering or loss of adhesion.

2.02 STEEL ITEMS

A General:

1 Steel Items shall be fabricated of steel bars, shapes, plates and pipe required, ground smooth as approved. Galvanize after fabrication. Securing of components shall be stainless steel.

2 Miscellaneous sleeves not specified in other Sections shall be steel or cast iron pipe in walls and floors with end joints as shown on the Drawing. All pipe sleeves shall have center anchor around circumference.

3 Miscellaneous steel shall be fabricated and installed as shown and shall include anchor bolts, lifting hooks, porous checkered plate, miscellaneous steel called for on the Drawings and not otherwise specified.

B Floor Channels and gratings: cast iron floor channels and straight bar gratings with zinc coated finish, of medium duty, as shown on the Drawings.

C Flat and projected Mashrabeya type screens: are to be constructed of galvanized steel hollow tubes and solid steel bars sections of sizes and dimensions shown on the drawings. Units are to be complete with opening portions and bolt fixings; all finished with coloured electostaticlly baked applied polyester finish.

PART 3: EXECUTION

3.01 FABRICATION

A All miscellaneous metal work shall be formed true to detail with clean, straight, sharply defined profiles and smooth surface of uniform color and texture and free from defects impairing strength or durability.

B Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.

C Welded joints shall be rigid and continuously welded or spot welded as specified or shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be close fitting and jointed where least conspicuous.

D Welding of parts shall be in accordance with the standard AWS practices for arc and gas welding. All welding shall be done only by welders certified as to their ability to perform welding in accordance with the requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

E All non-galvanized steel miscellaneous metal work shall be prepared and primed in shop after fabrication as specified in Section 09901. Abrasions and welding damage of primer in the field shall be touched up with the primer used immediately after erection.

F All steel items not specified to be painted shall be galvanized.

3.02 INSTALLATION

A Install all items furnished except items to be embedded in concrete or other masonry which shall be installed under Division 3 and Division 4 respectively. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown or suitable alternate method. Fastening to wool plugs in masonry will not be permitted. All dimensions shall be verified at the site before fabrication is started.

B All steel surfaces to come in contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

C Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc.chromate primer followed by two coats of aluminum metal and masonry point to the dissimilar metal.

E Where items are cast into concrete, backpaint with the above paint the contact areas before setting.

F Anchor bolts and expansion bolts shall be set accurately. Where indicated on Drawings, specified, or required, anchor bolts shall be provided with head or nut embedded in concrete or suitable pipe sleeves, or both. Where indicated on the Drawings, specified, or required, anchor bolts shall be provided with square plates or shall have square heads and washers to be set in the concrete forms with suitable pipe sleeves, or both. If anchor or expansion bolts are set after the concrete had been placed, all necessary drilling and grouting or caulking shall be done and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the drilling and caulking. Minimum distance between the center of any expansion anchor and an edge or exterior corner of concrete shall be not less the 4-1/2 times the diameter of the hole in which it is installed.

G Where galvanizing is damaged by field welding or other erection process, an approved 95 % zinc dust primer shall be applied to the properly prepared damaged areas.

H Welding

1. Ferrous Metal Welding. Permissible weld stress for all structural fillet welding provided under these specifications shall be as tabulated in AWS D1.1 except as specified herein. The allowable shear stress on the effective throat of a fillet weld shall not exceed 124 MPa for ASTM A36, ASTM A441, and ASTM A588 steels. "Effective throat" shall be the shortest distance form the root to the face of the diagrammatic weld regardless of weld size.

    a. Except as otherwise specified, welding shall be performed using only those joint details which have a prequalified status when performed in accordance with the AWS code and the AISC specification.

    b. Welds that are not dimensioned on the construction drawings shall be sized to develop the full strength of the least strength component involved in the connection.

End of Section