

DIVISION 4

MASONRY

BUILDING WORK

DIVISION 4

MASONRY

INDEX

SECTION 04200 : Masonry
SECTION 04400 : Natural Stone Slab Cladding

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 strength classes:
 - 1 - Hollow blocks: 30 kg/cm² of gross area
 - 2 - Solid blocks: 35 kg/cm²

- 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 block work walls to ensure no vertical load is transferred from the structural elements on to the block work 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 plasticisers, 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/cm² 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, passing 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 Aluminum: Any aluminum 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 block work 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 block work 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 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

SECTION 04400**NATURAL STONE SLAB CLADDING****PART 1: GENERAL****1.01 SCOPE OF WORKS**

- A Work to be done under this section includes, but is not limited to, the following items including all labor, materials, equipment and incidental to Extents of interior and exterior stonework as indicated on the drawings and as specified herein.
1. Exterior and Interior stone and granite includes the following:
 - a. Wall and Column Facing.
 - b. Soffits.

1.02 RELATED WORK

- A Other sections directly related to work covered in this section include the following:
1. Section 03300.

1.03 QUALITY ASSURANCE

- A Obtain stone from quarry with consistent colour range and texture throughout the works.
- B Fabrication of stone shall be carried out by operatives or sub-contractor which has successfully fabricated stone similar to the quality specified for a period of not less than 5 years and is equipped to provide the quantity shown.
- C Stone shall match appearance of agreed samples held by the Engineer.
- D Job Mock-up: Prior to installation of stonework, provide sample panels of stonework indicated with proposed range of colour, texture and workmanship to be expected in completed work, and to size directed by the Engineer. Build mock-up at site, as directed, using stone, anchors, jointing, insulation and waterproofing as applicable as shown and specified in accordance with final shop drawing.
- E Obtain the Engineer's acceptance of visual qualities of sample panels before start of stonework. Replace unsatisfactory mock-up work, as directed, until acceptable to the Engineer. Retain sample panels during construction as a standard for judging completed stonework. Do not alter, move or destroy mock-up until work is completed.

F Allowable Installed Tolerances:

- 1- Variations from Plumb: For surfaces of columns and walls as well as for arises, external corners, joints and other conspicuous lines do not exceed 6 mm in any story, or in 6.0m maximum, nor 12 mm in 12.0m or more.
- 2- Variation in level: For grades shown on lintels, stools, horizontal joints and other conspicuous lines do not exceed 6 mm in 6. mm in 6.0m maximum nor 12 mm in 12.0 m or more.
- 3- Variation in linear Building line: For positions shown in plan and related portion of columns, and wall facing, do not exceed 12 mm in any bay or 6.0 m maximum, nor 12 mm in 12.0 m or more.
- 4- Variations in Cross-Sectional dimensions: For columns and thickness of walls from dimension shown, do not exceed minus 3 mm, nor plus 3 mm.
- 5- Variations in stone dimensions, do not exceed + or – 3 mm.

1.04 SUBMITTALS**A Samples**

- 1- Stonework: Submit sets of samples not less than 400mmx250mm in size of each different type, colour, grade and finish of stonework required. Include in each set full range of exposed colour and texture to be expected in completed work.
- 2- Mortar: Submit samples of mortar to match colour of each type of stonework required. Replace unsatisfactory samples as directed until acceptable to the Engineer.

- B Shop drawings:** Submit cutting and setting out drawings showing sizes, dimensions, sections and profiles of stonework units, arrangements and provisions for jointing (Including movement and construction joints) anchoring, and fastening, supports and other necessary details for lifting devices and reception of other work. Indicate block size from base to top of wall elevations, by showing extent of each typical block size in zones, as indicated on the Owner's drawings. Show, location of inserts (for stone anchors and supports) which are to be built into concrete anchors and supports) which are to be built into concrete or masonry. Show large size details of special features.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A.** Protect stone during storage and construction against moisture, soiling, staining and physical damage.
- B.** Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials.

- Lift with wide-belt type slings wherever possible; do not use wire rope or ropes containing tar or other substances which might cause staining. If required, use wood rollers and provide cushion at end of wood slides.
- C. Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.
 - D. Protect mortar materials and stonework accessories from weather, moisture and contamination with earth and other foreign materials.

1.06 JOB CONDITIONS

- A Installer must review installation procedures and coordination with other work, with contractor, and other contractors and subcontractors whose work will be affected by stonework.
- B During all seasons, protect partially completed stonework when work is not in progress. Cover top of walls with strong waterproof, non-staining membrane extending at least 600 mm down both sides of walls and anchor securely in place.
- C Installation Temperature limits: Do not set stone when air temperature or temperature of materials is below 7 degrees C.

PART 2: PRODUCTS

2.01 QUALITY OF STONE

- A To be first quality, each type obtained from one strata, from one quarry and delivered in one shipment. Slabs are to be hard and free from cracks and other defects to surfaces and edges which may impair structural integrity, function or appearance and are to be cut square and true with clean edges and uniform in shape and thickness. Submit supplier's test results for each type of stone for the following tests, which must meet the following:

	Unit	Stone	
Weight per unit of volume	ton/m ³	2.5	not less
Absorption coefficient	Wt %	3	not more
Modules of rupture	N/mm ²	6.9	not less
Abrasion resistance	%	10%	not more

2.02 MATERIALS

- A Ajlon lime stone:

To be obtained from quarries having sufficient quantities to complete the works as indicated on the drawings. The color variation shall be within the limits established on the mock-up and approved by the Engineer. Minor natural markings which are characteristic of the material which do not impair strength or appearance will be permitted.

All cladding stone shall be 40 mm thick after finishing. Corners, balustrade copings and special shapes shall be cut from the solid to the dimensions indicated on the drawings. The finish for exposed surfaces shall be fine mechanical bush hammered, as stated on the drawings. No visible saw marks shall be evident. All blocks shall be plane, square and true to sizes indicated on the drawings. Corners and special shapes shall be finished to sizes indicated on the drawings.

Generally all stone work shall be cut to size, finished and prepared for fixing in the shop.

- B Fixings: 8 mm diameter steel bar 200 mm both sides net, to be fixed to backing wall by anchors, expanding bolts and sockets to avoid problems of misplaced pockets or channels.
- C Mortar: to the requirements of Section 04200 of the Specification, comprising 4 parts ordinary Portland cement and 1 part sand.

Sealant for movement joints: one-part moisture cured silicone sealant to ASTM C920 or BS 5889 type A, or two-part polysulphide sealant to BS 4254.

PART 3: EXECUTION

3.01 GENERALLY

- A Design: complete the design and detailing of the work and provide for approval structural design calculation and complete information based on information provided. Drawings are to show each stone unit and type and location of each fixing.

3.02 CUTTING OF STONE

- A stones are to be cut so that the bedding is appropriate to its position in the building finished dimensions of stone units including minimum thickness are to be such that the cladding, when erected, complies with the requirements for accuracy of erection
- B when details on drawings show stone corner as one piece, two pieces may be used cut at 45° and glued together with approved non stain epoxy adhesive complying with ANSI A136.1 and as recommended by the Stone supplier. Provide stainless steel dowels as necessary, and joints are to be tested to ensure complete rigidity.
- C In order to accommodate permissible deviations within the building structure, selected stone units must be left oversize for cutting to precise dimensions taken on site; units are to be selected and clearly identified as such on the shop drawings.
- D Use a suitable bench saw for cutting on site.

3.03 INSPECTION OF STONE UNITS

- A Completed units must be carefully inspected and checked for match with approved samples and compliance with the Specification before dispatch to site. Inform the Engineer at appropriate stages in production of units so that he may inspect them before delivery to site.

3.04 FIXING AND JOINTING

- A Before commencing erection, survey the building structure, including any fixing inserts, and report to the Engineer immediately any inaccuracy preventing proper positioning of units.

- B Accuracy of erection:

- 1 - average width of any joint must not deviate from average of all nominally identical joints by more than $\pm 20\%$
- 2 - within the length of any joint (including in-line continuations across transverse joints) the greatest width must not exceed the least width by more than 40%, any variation being evenly distributed with no sudden changes
- 3 - offset in elevation between nominally in-line edges across a transverse joint must not be more than 20% of the width of the transverse joint
- 4 - offset in plan or section between flat faces of adjacent panels across any joint must not be more than 20% of the width of that joint
- 5 - widths of joints must be such as to ensure that joints perform as intended and are within recommendations of joint material manufacturer
- 6 - finished work must have a satisfactory appearance, being square, regular, true to line, level and plane with satisfactory fit at all junctions, all to approval.

- C Fixings

- 1 - do not exceed torque figures or shim dimensions recommended by manufacturer,
- 2 - grout dowel bars with fairly dry mortar or suitable epoxy or polyester mix, well tamped in,
- 3 - give reasonable notice to the Engineer to allow inspection to take place before covering up load bearing fixings,
- 4 - give reasonable notice to the Engineer, as required, of the completion of stone courses to allow inspection of restraint fixings and cavity before proceeding with the next course,
- 5 - anchors or ties must not be subjected to any loading until complete curing or hardening has taken place,

- 6 - cramp holes and mortices shall be carefully drilled or cut to avoid fracture of the stone slab,
- 7 - patching will not be permitted and any damaged slab shall be removed and replaced.

3.05 JOINT AND SEALANTS

- A Basic joints: all joints to be flush closed type. Wood or plastic joint spacers may be used but remove and make good to match as soon as mortar has set.
- B Movement joints: in addition to basic joints, the following sealant filled joints is required:
 - 1 - horizontal movement joints at floors, to coincide with support fixings
 - 2 - vertical movement joints at intervals to accommodate relative movement between cladding and structure
 - 3 - structural movement joints
 - 4 - joints between cladding and windows or doors.
- C Where the width of any type of joint is not shown on the Drawings, it is to be determined by the Contractor, and is to be as small as practicable having regard to shrinkage, thermal and other movements which may be expected in the building structure and cladding.
- D Application of sealants backing strip, bond breaker and primer are to be types recommended by sealant manufacturer, preparation of joint, depth of sealant and application are to be strictly as sealant manufacturer's recommendations, joint must be thoroughly clean, dry and free from oil; finely abrade and/or prime as appropriate; mask edges of joint with tape before priming and remove immediately after sealing, insert backing strip and apply sealant ensuring maximum adhesion to sides of joint and a neat, smooth and clean finish.

End of Section

DIVISION 5

METALS

BUILDING WORK

DIVISION 5

METALS

INDEX

SECTION 05500 : Miscellaneous Metal

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 electrostatically 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 years 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 electrostatically 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, back paint 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, spilling, 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 from 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

DIVISION 6
WOODS AND PLASTICS

BUILDING WORK

DIVISION 6

WOODS AND PLASTICS

INDEX

SECTION 06100 : Rough Carpentry
SECTION 06200 : Finish Carpentry

SECTION 06100**ROUGH CARPENTRY****PART 1: GENERAL****1.01 SCOPE OF WORK**

- A Furnish all labor, materials, equipment, and incidentals necessary to install all items of carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated complete as shown and as specified herein.
- B Set in place, all pressed metal frames which are to be built into masonry. Install all other pressed metal and aluminum doorframes as specified in Division 8. Install doors, louvers and finish hardware furnished under other Sections.

1.02 RELATED WORK

- A Other Sections directly related to work covered in this section include the following:
 - 1. Section 03300 - Concrete
 - 2. Section 05500 - Miscellaneous Metals
 - 3. Section 08120 - Aluminum Doors and Frames.

PART 2: PRODUCTS**2.01 MATERIALS**

- A All lumber shall be sound stock, delivered dry, and shall be fully protected at all times from injury and dampness. Split, broken, or otherwise damaged pieces will not be allowed in the work.
- B Wood for blocking, shims, framing and nailers shall be Construction Grade. Wood members that will contact masonry or concrete shall be pressure treated with chromated copper arsenate or fluorochrome arsenate phenol. Minimum net retention of solid preservative shall be 4.6 kg per m³ (0.40 lb per cu ft).
- C All treatment shall be performed in accordance with the requirements of the Standard Specifications of the American Wood Preservers Association for treating wood. Apply a heavy coat of the same preservative used in treating to all surfaces cut after treatment.
- D Nails, spikes, bolts, nuts and washers where sizes are not indicated or specified, shall be of suitable size and number to securely fasten and hold members in place and to develop the structural strength of the members. Hot dip galvanize after fabrication, except bolts and nuts shall be mechanically galvanized to provide for ease of installation.

PART 3: EXECUTION

3.01 INSTALLATION

- A All carpentry shall be accurately cut, fitted, and installed as detailed on the Drawings.
- B Anchors shall be installed, where indicated or required, to anchor carpentry or other items securely to masonry or concrete.
- C Forms for structural concrete work shall be as specified under Division 3. Provide all other miscellaneous wood formwork as may be required for the completion of the work.
- D Temporary wood doors and cloth or transparent plastic covered frames shall be provided for exterior wall openings when and as required for sun, sand and dust control.
- E Installation of Doors, Windows, Louvers, and Finish Hardware

End of Section

SECTION 06200

FINISH CARPENTRY

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install finish carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections.

1.02 RELATED WORK

- A. Section 06100-Rough Carpentry.
- B. Section 08211-Wood Doors and Frames.
- C. Section 08610-Wood Windows and Screens.
- D. Section 09902-Painting.

1.03 REFERENCES

- A. ANSI A135.4-Basic Hardboard.
- B. ANSI A208.1-Mat Formed Wood Particleboard.
- C. ASTM E84-Test Method for Surface Burning Characteristics of Building Materials.
- D. AWI-Quality Standards.
- E. AWPA (American Wood Preservers Association) C2-Lumber, Timbers, Bridge Ties and Mine Ties-Preservative Treatment by Pressure Processes.
- F. AWPA (American Wood Preservers Association) C20-Structural Lumber Fire Retardant Treatment by Pressure Process.
- G. BHMA A156.9-Cabinet Hardware.
- H. FS MMM-A-130-Adhesive, Contact.
- I. HPM (Hardwood Plywood Manufacturer's Association) HP-American Standard for Hardwood and Decorative Plywood.
- J. NEMA (National Electric Manufacturers Association) LD3-High Pressure Decorative Laminates.

- K. NHLA (National Hardwood Lumber Association).
- L. NWWDA (National Wood Window and Door Association) I.S.4–Water Repellant Preservative Treatment for Millwork.
- M. PS 1-Construction and Industrial Plywood.
- N. PS 20-American Softwood Lumber Standard.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, and fixing, to a minimum scale of (1:10).
- B. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storage, installation, and finish of treated material.
- C. Provide instructions for attachment hardware and finish hardware.
- D. Samples: Submit two samples of finish plywood, (200 x150 mm) in size illustrating wood grain and specified finish.
- E. Submit two samples of wood trim (300 mm) long.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver finish carpentry materials until painting, wet work; grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.
- C. Protect work from moisture damage.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings and instructed by the manufacturer.

1.07 COORDINATION

- A. Coordinate the work with plumbing and electrical rough-in, installation of associated and adjacent components.

PART 2: PRODUCTS**2.01 LUMBER MATERIALS**

- A. Softwood Lumber: Comply with PS 20; and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated, maximum moisture content of (8) percent.
- B. Hardwood Lumber: Graded in accordance with AWI Premium; maximum moisture content of (8) percent; with vertical grain, of quality suitable for transparent finish.

2.03 SHEET MATERIALS

- A. Softwood Plywood: Comply with PS 1 Grade C-D; Graded in accordance with AWI Custom; lumber core.
- B. Hardwood Plywood: Graded in accordance with AWI Premium; lumber core, type of glue recommended for application.
- C. Wood Particleboard: Comply with AWI standard, composed of wood chips, medium density, made with high waterproof resin binders; of grade to suit application; sanded faces.
- D. Hardboard: Pressed wood fiber with resin binder, standard grade, smooth two sides.

2.04 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: Comply with AWI, colour and surface texture as selected.
- B. Laminate Backing Sheet: Comply with NEMA LD-3 BK20 backing grade, undecorated plastic laminate.

2.05 ADHESIVE

- A. Adhesive: Type recommended by AWI to suit application.

2.06 FASTENERS

- A. Fasteners and anchorages: Provide nails, screws and other anchoring devices of the type, size, material and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable specifications.
 - 1. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).
- B. Concealed Joint Fasteners: Threaded steel.

2.07 ACCESSORIES

- A. Lumber for Shimming, and Blocking: Softwood lumber.
- B. Plastic Edge Trim: Extruded flat shaped; smooth finish; self-locking serrated tongue; of width to match component thickness; colour as selected.
- C. Float Glass: Clear, top quality; (6 mm) thick minimum.
- D. Primer: Alkyd primer sealer type.
- E. Wood Filler: Solvent or Oil base as suitable, tinted to match surface finish colour.

2.08 WOOD TREATMENT PROCESSES

- A. Preservative treatment: following basic fabrication, provide 3 minute dip treatment of finish carpentry items indicated to receive preservative treatment in 5 percent solution of pentachlorophenol, with vehicle which will not interfere with finish application and will produce minimum effect upon appearance. Apply brush coat on surfaces cut after treatment.

2.09 FABRICATION

- A. Fabricate to AWI Premium.
- B. Shop assemble work for delivery to site, permitting passage through building openings.
- C. Fit exposed sheet material edges with (9.5 mm) matching hardwood edging. Use one piece for full length only.
- D. Cap exposed plastic laminate finish edges with plastic trim.
- E. Shop prepare and identify components for book match grain matching during site erection.
- F. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- G. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
- H. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

2.10 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.
- D. Finish work in accordance with AWI-Section 1500 applicable System.
- E. Seal and varnish semi-exposed to view surfaces. Brush apply only.
- F. Seal surfaces in contact with cementitious materials.

PART 3: EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Install work in accordance with AWI Premium Quality Standard.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of (1 mm). Do not use additional overlay trim to conceal larger gaps.
- D. Install hardware in accordance with manufacturer's instructions.

3.03 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment in accordance with manufacturer's instructions.
- B. Brush applies two coats of preservative treatment on wood in contact with cementitious materials.
- C. Allow preservative to dry prior to erecting members.

3.04 SCHEDULE

- A Refer to the Drawings and B. O.Q.

End of Section

DIVISION 7

THERMAL AND MOISTURE PROTECTION

BUILDING WORK

DIVISION 7

THERMAL AND MOISTURE PROTECTION

INDEX

SECTION 07005	: Waterproofing and Dampproofing
SECTION 07500	: Roofing System
SECTION 07900	: Caulking

SECTION 07005**WATERPROOFING AND DAMPPROOFING****PART 1: GENERAL****1.01 SCOPE OF WORK**

- A Furnish all materials, labor, and equipment required to perform all waterproofing of cast-in-place concrete, damp proofing, protection board and related work necessary for the proper completion of the project as required by the drawings and as specified herein.

1.02 GUARANTY

- A As a condition of this Section furnish the Employer with a written guaranty that the damp proofing membrane and the liquid waterproofing work upon completion will be waterproof for a period of ten (10) years and that during this time all defects in the waterproofing or bonding, or leaks which may develop through the surface, shall be promptly repaired at no expense to the Employer, provided such leaks and defects are not due to causes beyond control of this section.

1.03 APPLICATION SCHEDULE

- A Damp proof the all surfaces of all cast-in-place concrete walls, foundations, columns and ground beams in contact with soil from the bottom of the footings up to floors damp proofing layer.
- B Floors damp proofing membrane shall be applied below ground slabs and Raft foundation, wet areas and planters, as shown on drawings.

1.04 SUBMITTALS

- A Submit to the Engineer, as provided in Submittals Section for shop drawings, detailed information on materials proposed & installation methods.
- B Submit two sets of representative samples of any or all proposed materials required for the work of this Section as requested by the Engineer.
- C Submit to the Engineer for review, the manufacturer's specifications and instructions for materials and installation. These specifications and instructions shall be as required to provide the detailed drawings.

1.05 DELIVERY, STORAGE AND HANDLING

- A All perishable materials for the work of this Section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials 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.

1.06 JOB CONDITIONS

A Hot Weather Requirements

1. Protect fresh membrane from hot sun as approved.
2. Provide artificial shade, wind breaks and use cooled materials, as required.

PART2: PRODUCTS

2.01 MATERIALS

- A Material for walls of basement, floors, wet areas and planter waterproofing shall be 3mm thick torch applied polyester membrane, complying with the following particular specification:

Description	Test Method
Thickness : 3mm	ASTM D751
Reinforcement (base): 180g/m2 woven non-woven polyester	-----
Coating material: Mixture of bitumen modified with APP and additives	-----
Softening point: 150° C	ASTM D36
Water absorption: less than 0.15 %	ASTM D570
Upper surface: flammable polyethylene film	-----
Tensile strength: 950 N/5 cm long, 700 N/5 cm trans.	ASTM D146

Man: DERMABIT
 DW1, Dermabit water proofing industries CO.
 P.O. Box 5945-Riyadh 11432
 Saudi Arabia
 Tel: (01) 4645988
 Fax: (01) 4634100

Man: BITUMAT
 Bituminous Materials Factory
 P.O. Box 7487-Dammam 31462
 Saudi Arabia
 Tel : 8424842

Or other equal and approved.

- B Material for concrete surfaces in contact with soil, shall be two coats of cold applied black bitumen coating solution to BS 3416, Class A as manufactured by:

Man: CRODA PAINTS Ltd.
Bankside
Hull
North Humberside HU5 1SQ
England
Tel: (0482) 41441
Tlx: 52536

Ref.: Bituminous Blach High Build.

Man: FOSROC INTERNATIONAL Ltd.
(Middle East Division)
United Arab Emirates

Ref. : Nitoproof 120.

Or other equal and approved.

- C Primers, bonding compounds, adhesives and the like are to be types recommended for purpose by sheet manufacturer.
- D Protection sheet for Sur faces of contact with soil: shall be 20 mm thick expanded pltyrne.

PART 3: EXECUTION

3.01 GENERAL

- A All installation shall conform to the acceptable shop drawings and the system and materials manufacturer's specifications and instructions as submitted and reviewed.

3.02 SUBSTRATE SURFACE

- A Concrete surfaces shall be free of roughness or projections, with a clean surface, finished as specified under concrete finishes section which will allow an even application of the membrane and insulation.
- B Surfaces shall not contain any grease, oil or any other contaminants which could affect the complete bonding of the membrane to the concrete surface.
- C Surfaces shall be visibly dry and thoroughly cleaned, (remove all dust, dirt, and loose materials) immediately prior to application of membrane. Compressed air, vacuum cleaner or other suitable means shall be used.

3.03 INSTALLATION

1. Single layer bituminous sheet: lay with 75 mm side laps and 100mm end laps, torch lower surface of sheet and seal to base by firm pressure and seal laps by torching in accordance with manufacturer's instructions.

2. Pipes Etc.: where pipes etc. pass through sheeting make junctions completely watertight by forming collars fully bonded or sealed to both pipes and sheeting.
 3. Inspection: inform the Engineer a reasonable length of time before covering any part of membrane with overlying construction to allow inspection.
 4. Protect finished sheeting and prevent puncturing during following work. Cover sheeting with permanent overlying construction as soon as possible. Immediately prior to covering check for damage and repair as necessary.
- B Installation of Coatings**
1. Dry surfaces: dampen before applying water based bitumen emulsion.
 2. Apply coatings generally in accordance with manufacturer's recommendations to clean, dry surfaces, in dry atmospheric conditions, after primer has dried and after previous coats have hardened.
 3. Ventilation: spaces in which coatings are to be applied are to be well ventilated.
 4. Cold and Hot applied bitumen: apply number of coats to thickness and at rate of application recommended by coating manufacturer or as stated in bill of quantities.
 5. Chemical waterproof coating: mix dry powder with water on site and apply mixture to pre-wetted surfaces in number of coats and at rate of application recommended by coating manufacturer.
 6. Brushing: work coating into recesses, edges, joints, inter sections and over surfaces generally to obtain uniform and continuous film.
 7. Intersections: ensure continuity of coatings including at junctions with other membranes.
 8. Covering: final covering is to be laid/applied as soon as possible after coating has hardened.

End of Section

SECTION 07500**ROOFING SYSTEM****PART 1: GENERAL****1.01 SCOPE OF WORK**

- A Furnish all labor, materials, equipment and incidentals required to install membrane roofing system and all roofing system accessories and finishing materials as shown on the drawing and specified herein.

1.02 SUBMITTALS

- A Submit to the Engineer as provided in special conditions of contract shop drawings showing details of construction and erection of roofing system and components and detailed technical data on membrane and other materials proposed. Include independent laboratory testing results certifying that submitted components and materials meet this Specification.
- B Provide, with shop drawings, certification that the roofer who will execute the work is an experienced applicator of the roofing system proposed.
- C Submit to the Engineer for review, two representative samples of all roofing components and materials. Board and sheet stock samples shall be 300 mm square or long, minimum.
- D Submit to the Engineer for review, the manufacturer's specifications and instructions for materials and installation of the insulated roofing system. These specifications and instructions shall be as required to provide the detailed roofing system.

1.03 DELIVERY, STORAGE AND HANDLING

- A All perishable 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 base sheets, felts, 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.

1.04 PRE-ROOFING CONFERENCE

- A Well in advance of commencement of roofing operations but after roofing substrate has been constructed and prepared for roofing, a pre-roofing conference shall be held to inspect the substrate. All parties having an interest in the roofing or work on the roofs shall be informed of the conference.

- B The conference shall include an inspection by all parties of the substrate and its conformance with the drawings, the approved shop drawings and the roofing system manufacturer's approved specifications, and instructions. All objections to approval of the substrate shall be submitted in writing to the Engineer. Coordinate efforts to remedy objections and prepare substrate properly to receive roofing.

1.05 JOB CONDITIONS

- A Hot Weather Requirements
1. Protect fresh membrane from hot sun as approved.
 2. Provide artificial shade, wind breaks and use cooled materials, as required.

1.06 GUARANTY

- A As a condition of this Section furnish the Employer with a written guaranty that the roofing system work upon completion will be waterproof for a period of ten (10) years and that during this time all defects in the waterproofing or bonding, or leaks which may develop through the surface, shall be promptly repaired at no expense to the Employer, provided such leaks and defects are not due to causes beyond control of this section.

PART 2 : PRODUCTS

2.01 WATERPROOFING MATERIALS

- A Waterproofing shall be single layer high performance torch applied polyester membrane complying with the following particular specification:
1. Description:

Thickness	:	4 mm
Reinforcement (base)	:	260 grms/m ² woven non woven polyester with continuous thread.
Coating material	:	APP modified bitumen, modified with plastomers and elastomers
Upper surface	:	Film finish/ or slated.
Method of application	:	Torchy apply on concrete surface.

2. Characteristics of the membrane:

<u>Characteristic</u>	<u>Minimum requirement</u>	<u>Test Method</u>
Flexibility at low temperature (-4°C to 10°C)	No cracking	ASTM D146
Softening point	Minimum 150°C	ASTM D36
water absorption	less than 0.15%	ASTM D570
Tensile strength N/50 mm longitudinal direction.	1200	ASTM D146
transverse direction	950	ASTM D146
Elongation longitudinal direction	55%	ASTM D146
transverse directions	60%	ASTM D146

- B Skirtings and upstrands material shall be two layer bituminous sheet similar to paragraph A above but capsheet layer shall be 4mm thick slate finished.
- C Primers and adhesives, types recommended for purpose by roof covering manufacturer.
- D Cant strip shall be asphalt impregnated fiberboard by Manville, Celotex or equal.
- E Portland cement shall conform to ASTM C150 Type I.
- F Water for mortar and grout shall be fresh, clean, potable and free from organic matter, acids and alkalis.
- G No lime will be allowed to be added to cementitious mixes used under this Section.

2.02 ACCESSORIES AND FASTENINGS MATERIALS

- A Aluminum for Flashings and the like: to BS 1470, designation S1B, 0.8 mm thick, temper grade H2.
- B Channel (Regret): aluminum alloy to BS 1470, designation S1B-H2, 0.8 mm thick, dovetailed channel section for casting into concrete or surface fixing, as shown on the Drawings, to receive top edges of flashings, upstands and sealants.
- C EDGE TRIM: extruded aluminum section to BS 1474, designation 6063, condition TF.
- D Black Bitumen Coating Solution for painting backs of flashings is to be to BS 3416, Type 1.

E Pointing Sealant shall be polysulphide rubber based compound:

Man: Expandite Ltd
Chase Road
London NW10 6PS
England
Tel: (01) 965 8877

Ref. : Thiofle 600

Or other equal and approved.

PART 3: EXECUTION

3.01 GENERAL

A All installation shall conform to the acceptable shop drawings and the system and materials manufacturer's specifications and instructions as submitted and reviewed.

3.02 SUBSTRATE SURFACE

A Concrete surfaces to receive roofing shall be free of roughness or projections, with a smooth clean surface, finished as specified under concrete finishes section which will allow an even application of the membrane and insulation. Concrete shall have damp cured for 28 days minimum before application of roofing.

B Surfaces shall not contain any grease, oil or any other contaminants which could affect the complete bonding of the membrane to the concrete surface.

C Concrete shall be free from surface laitance, loose aggregate, form release agents, curing compounds or other surface treatments.

D Surfaces shall be visibly dry and thoroughly cleaned, (remove all dust, dirt, and loose materials) immediately prior to application of membrane. Compressed air, vacuum cleaner or other suitable means shall be used.

E Notify the Engineer at least 48 hours before application of roofing commences. A representative of the roofing manufacturer shall be present while roofing is being applied to assure conformance to drawings, specifications, and good workmanship requirements.

F Notify the Engineer in writing if, when instructed to proceed with work, the surfaces to be covered are not satisfactory.

G Commencement of the installation of any material shall be considered as acceptance of the conditions of all the surfaces to be covered, and no subsequent claim on account of previous condition of surface will be entertained.

3.03 SCREEDING

- A Flat roof slabs shall receive Class 18 screeding concrete cast to falls as indicated on the Drawings. The surfaces of the screeding concrete shall be even and free from any depressions and other defects with reasonably smooth surface finish and ready to receive waterproofing works.

3.04 ROOFING MEMBRANE INSTALLATION

- A The time of roofing operations with respect to adverse weather conditions, shall be subject to the approval of the Engineer.
- B The Manufacturer shall certify that the membrane meets or exceeds the individual requirements set forth herein.
- C The following tests shall be carried out by an independent laboratory on specimens from supplied material on site, cost of tests to be included in the Contractor rates:
- Low temperature flexibility.
 - Softening point.
 - Breaking strength and elongation at break for both directions.
- D Antidust priming asphalt shall comply with ASTM-D41.
- E Application shall be according to manufacturer's printed and approved instructions.
- F Sheets to be arranged to give a minimum of 75 mm overlap with adjacent end sheet.

3.05 EXTERNAL AND INTERNAL CORNERS

- A Internal corners shall be two layers of roofing sheet applied as following:
1. cant strip shall be applied as manufacturer instructions.
 2. 300 mm wide underlayer sheet applied first.
 3. Capsheet applied to primed vertical or horizontal face with 50mm overlaps.
- B External corners shall be three layers of roofing sheet as following:
1. 25 mm chamfer formed in concrete assist in dressing roofing sheet around angle
 2. 300 mm wide underlayer sheet applied first.
 3. Roofing sheet applied to horizontal primed surfaces with 50 mm overlaps.
 4. Roofing sheet applied to vertical surface with 50 mm overlaps on to primed surfaces.

End of Section

SECTION 07900**CAULKING****PART 1: GENERAL****1.01 SCOPE OF WORK**

- A Furnish all materials, labor & equipment required to install caulking materials as required by the drawings and as specified herein.
- B The terms "caulking" and "sealing" as used on the drawings and in these specifications are synonymous, and either or both terms shall indicate the materials specified herein.

1.02 RELATED WORK

- A Other sections directly related to work covered in this section include the following:
 - 1. Section 03300-Concrete.
 - 2. Section 04200-Masonry.
 - 3. Section 04400-Natural stone slab cladding

1.03 SUBMITTALS

- A Submit to the Engineer, as provided in the Submittals Sections, detailed information on materials proposed and installation methods.
- B Submit two sets of representative samples of any or all proposed materials required for the work of this section as requested by the Engineer.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A Sealants shall be stored in unopened containers, under cover, in a cool dry place.

PART 2: PRODUCTS**2.01 MATERIALS**

- A Concelaed Joint Sealant for movement joints is to be oil based mastic compound unless otherwise specified.

Man: Dunlop Ltd.
Chester Road
Erdington
Birmingham B35 7AL
England
Tel: (021) 373 8101
Ref: Caulking compound DP 247-43

- Man: Expandite Ltd.
Chase Road
London NW10 6PS
England
Tel: (01) 965 8877
Tlx: 25420
- Ref: Secomastic
- Or other equal and approved.
- B** Exposed Joint Sealant for movement joints is to be approved two-part polysulphide rubber based compound unless otherwise specified.
- Man: Dunlop Ltd.
- Ref: High butyl mastic 421.8
- Man: Fosroc International Limited (Middle East Division)
U.A.E - Dubai
Tel : 310567
Fax : 310379
- Ref: Thioflex 600
- Or other equal and approved.
- C** Joint Sealant for movement joints in car park decks and sewage treatment works is to be two-part, compound of chemically resistant elastomeric polymers, cold applied, resistant to fuel and oil spillage.
- Man: Serviced Ltd.
Ajax Avenue
Slough
Berkshire SL1 4BH
England
Tel: 0753 692929
Tlx: 846966 Servcd G.
- Ref: Vertigard
- Man: Forsroc International Limited
U.A.E - Dubai
- Ref. : Expofelx 800
- Or other equal and approved.
- D** Joint Sealant for movement joints in retaining walls and basements is to be bitumen based compound.

- Man: Expandite Ltd.
Chase Road
London NW10 6PS
England
Tel: (01) 965 8877
Tlx: 25420
- Ref: Plastiseal
- Man: Servicised Ltd.
Ajax Avenue
Slough
Berkshire SL1 4BH
England
Tel: 0753 692929
Tlx: 846966 Servcd G.
- Ref: Servijoint
- Or other equal and approved.
- E Joint Sealant for movement joints in drinking water reservoirs and for damp conditions is to be sulphate resistant olymeric ompound or use with cement.
- Man: Servicised Ltd.
Ajax Avenue
Slough
Berkshire SL1 4BH
England
Tel: 0753 692929
Tlx: 846966 Servcd G.
- Ref: Servi-gard
- Or other equal and approved.
- F Primer shall be as recommended by the sealant manufacturer.
- G Backup Material shall be Polyethylene or polyurethane foam as recommended by the sealant manufacturer.
- H Bondbreaker Tape Adhesive-backed polyethylene tape as recommended by the sealant manufacturer.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

- A Colors. Colors of sealants shall be as selected by the Engineer from the manufacturer's standard line of colors. Different colors may be required for different locations.
- B Backup Material. Backup material shall be provided as necessary to control the depth of sealant and shall be of suitable size so that, when compressed 25 to 50 percent, the space will be filled.

PART 3: EXECUTION**3.01 JOINT PREPARATION**

- A All surface to receive sealant shall be clean, dry, and free from dust, grease, oil, or wax. Concrete surfaces which have been contaminated by form oil, paint, or other foreign matter which would impair the bond of the sealant to the substrate shall be cleaned by sandblasting. All surfaces shall be wiped with a clean cloth saturated with xylol or other suitable solvent and primed before the sealant is applied.
- B Unless otherwise recommended by the sealant manufacturer and permitted by the Engineer, the depth of sealant in a joint shall be equal to the width of the joint, but not more than 20 mm.
- C Backup material shall be rolled or pressed into place in accordance with the manufacturer's installation instructions, avoiding puncturing and lengthwise stretching. If depth of the joint does not permit use of backup material, bondbreaker tape shall be placed at the bottom of the joint to prevent three-sided adhesion.

3.02 SEALING

- A Sealing work shall be done before any field painting work is started. The air temperature and the temperature of the sealed surfaces shall be above 10 C when sealing work is performed.
- B Upon completion of the sealing work, each sealed joint shall have a smooth, even, tooled finish, flush with the edges of the sealing recess, and all adjacent surfaces shall be clean. Sealant shall not lap onto adjacent surfaces. Any sealant so applied as to prevent the painting of adjacent surfaces to a clean line, or with an excess of material outside the joint and feathered onto surfaces, shall be removed and the joint resealed.

End of Section