
Rehabilitation of Mufti Hassan Khaled Garden Beirut - Lebanon

TENDER DOCUMENTS

Technical Specifications

Part 2 of 4

Landscape Hardscape & Architectural Works

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SECTION 02620

SUBDRAINAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Drainage system of building perimeter, retaining wall, slab-on-grade, base slabs and raft foundations.
 - 2. Filter aggregate, drainage pipes and filter fabric.
- B. Related Sections:
 - 1. Section 02320 - Backfill: Backfilling over filter aggregate.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
 - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN.m/m³).
 - 3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN.m/m³).
 - 4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate dimensions and layout of filter aggregate and filter fabric.
- C. Product Data: Submit data on filter aggregate and filter fabric products.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for submittals.
- B. Operation and Maintenance Data: Procedures for submittals.

1.5 QUALITY ASSURANCE

- A. Furnish aggregate material and filter fabric from single source throughout the Work.
- B. Perform Work in accordance with the drawings and to the approval of the Engineer.

PART 2 PRODUCTS

2.1 AGGREGATE

- A. Filter aggregate (Gravel): Natural stone; washed, structurally and chemically stable; free of clay, shale, organic matter; graded to ASTM C136; to the following limits:
 - 1. $19.0 \text{ mm} < D_{85} < 35.0 \text{ mm}$.
 - 2. $11.2 \text{ mm} < D_{15} < 19.0 \text{ mm}$.

2.2 DRAINAGE PIPES

- A. Corrugated; perforated; PVC pipe factory; wrapped with coconut fiber (coco-fiber protection); as per approved standards.

2.3 ACCESSORIES

- A. Filter Fabric (Geotextile): Non-woven; non-biodegradable; made from polyolefin, polyester, or polyamide; 200 g/m²; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength (ASTM D 4632) 900 N.
 - 2. Tear Strength (ASTM D 4533) 310 N.
 - 3. Puncture Resistance (ASTM D 4833) 490 N.
 - 4. Water Flow Rate (ASTM D 4491) 75 L/s/m².
 - 5. Apparent Opening Size (ASTM D 4751) 0.095 mm.

2.4 SOURCE QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services.
- B. Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, AASHTO T180, ASTM D4318, or ASTM C136.
- C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, AASHTO T180, ASTM D4318, or ASTM C136.
- D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.

- B. Verify trench cut and/or excavated base is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with lean concrete and/or aggregate type as directed by the Engineer.
- B. Remove large stones or other hard matter which could damage drainage piping or impede consistent backfilling or compaction.

3.3 STOCKPILING

- A. Stockpile materials on site at locations indicated or designated by the Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.4 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.5 INSTALLATION

- A. Install Work in accordance with the drawings, to the manufacturer's instructions and to the satisfaction of the Engineer.
- B. Refer to Section 02320 for compaction requirements.

3.6 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.

3.8 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 02768

STAMPED PATTERN CONCRETE PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes stamped pattern concrete pavement.
- B. Related Sections:
 - 1. Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. ASTM International.

1.3 PERFORMANCE REQUIREMENTS

- A. Stamped concrete shall be designed to suit project requirements and environmental conditions. Specifications shall be given by the manufacturer to the Engineer for approval; only well proven stamped concrete system applied by an experienced supplier shall be allowed for use on site. The Contractor shall supply all relevant documents, tests, etc. to ensure the above, all to the approval of the Engineer.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data on stamped pattern concrete pavement, admixtures and curing compounds.

1.5 QUALITY ASSURANCE

- A. Perform Work as shown on drawings and to the satisfaction of the Engineer.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.7 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mockup 1500x1500mm including paving, joints, surface texture and finish.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

PART 2 PRODUCTS

2.1 STAMPED PATTERN CONCRETE PAVEMENT

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 MATERIALS

- A. Aggregate Base Course: As specified in Section 02721.
- B. Concrete: Ordinary Portland cement to ASTM C150 Type I, or sulphate resistant cement to ASTM C150 type V, as directed by the Engineer and in accordance with Section 03300.

2.3 ADMIXTURES

- A. Suitable admixtures may be used only with the prior written approval of the Engineer. Both the proposed dosage and method of use shall be submitted to the Engineer together with the following data:
 - 1. The typical dosage and detrimental effects of under-dosage and over-dosage.
 - 2. The chemical name(s) of the main active ingredient(s) in the admixtures.
 - 3. Whether or not the admixtures contain chlorides and, if so, the chloride content of the admixture expressed as a percentage of equivalent anhydrous calcium chloride by weight of admixture.
 - 4. Whether or not the admixture leads to the entrainment of air when used at the manufacturer's recommended dosage.
- B. Admixtures shall be to manufacturer's recommendations in accordance with approved codes and standards.

2.4 ACCESSORIES

- A. All accessories shall be to manufacturer's recommendations.

2.5 CONCRETE MIX

- A. Prepare and submit Mix Design and Test Results of Mix Trials to the approval of the Engineer for stamped pattern concrete pavement to meet performance requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.
- B. Verify compacted substrate is acceptable and ready to receive work.
- C. Verify gradients and elevations of base are correct.

3.2 INSTALLATION

- A. Install work as specified, as shown on approved shop drawings, as per manufacturer's instructions and to the satisfaction of the Engineer.

3.3 TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation of Surface Flatness: 6 mm in 3 m.
- C. Maximum Variation from True Position: 6 mm.

3.4 PROTECTION

- A. Immediately after placement, protect stamped pattern concrete pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian and vehicular traffic over pavement for 7 days minimum after finishing and until 75 percent design strength of concrete has been achieved.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 02783

PRECAST CONCRETE PAVERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete paver units and concrete curbs.
 - 2. Interlock pavers.
 - 3. Sand bed and sand joint.
 - 4. Cementitious bed and mortar joints.
 - 5. Bedding and grouting for pavers with medium/heavy traffic areas.
 - 6. Edging.
- B. Related Sections:
 - 1. Section 02320 - Backfill: Compacted fill for pavers.
 - 2. Section 03200 - Concrete Reinforcement
 - 3. Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 2. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 - 3. ASTM C150 - Standard Specification for Portland Cement.
 - 4. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - 5. ASTM C936 - Standard Specification for Solid Concrete Interlocking Paving Units.

1.3 SYSTEM DESCRIPTION

- A. Paving and Setting Bed: To accommodate pedestrian traffic and to support gross vehicular loads.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate on shop drawings layout of pavers, special design layout, dimensions of paved areas, control joints, expansion joints, elevations and affected adjacent construction.
- C. Product Data: Submit characteristics of paver/curb dimensions and special shapes.
- D. Samples: Submit two samples of each type and size of pavers and curbs, illustrating style, size, color range and surface texture of units being provided.
- E. Manufacturer's Installation Instructions: Submit substrate requirements and installation methods.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.6 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mockup, 10 sq m, including setting bed, pavers, curbs, edging, joint sealers, control joint, expansion joint and accessories to pattern indicated.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements for environmental conditions affecting products on site.
- B. Maintain cementitious materials and substrate surface to minimum of 10°C prior to, during, and 48 hours after completion of Work.
- C. At end of working day or during rainy weather, cover work exposed to weather with waterproof coverings, securely anchored.

1.8 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Supply 10 of each paver type and size.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 CONCRETE PAVERS AND CONCRETE CURBS

- A. Pavers: Precast concrete; 30MPa on cylinder (38MPa on cube); 5 to 7% air entrained; 7% moisture content; type and size as per drawings; color as selected by Engineer.
- B. Curbs: Cast-in-situ or precast concrete; 30 MPa on cylinder (38 MPa on cube); size and shape as per drawings; color as selected by Engineer.

- C. The fine aggregate (passing 5 mm sieve to BS 410) shall not contain more than 25% by mass of acid-soluble material in either the fraction retained on or the fraction passing a 600 μm sieve. The percentage of acid-soluble material shall be determined by an approved test method.
- D. Skidding Resistance: Fine aggregates used should contain a minimum of 25% natural siliceous sand.

2.3 INTERLOCK BLOCK PAVERS

- A. Precast interlock block pavers shall be formed by homogeneous elements 60 mm thick (6mm top surface layer + 54mm lower base layer) to be used in sidewalk, and 80 mm (6mm top surface layer + 74mm lower base layer) to be used in drive way.
- B. The maximum dimension deviations from the stated work sizes as follows:
 - 1. Length $\pm 2\text{mm}$.
 - 2. Width $\pm 2\text{mm}$.
 - 3. Thickness of top surface layer $\pm 1\text{ mm}$.
 - 4. Thickness of lower base layer $\pm 2\text{ mm}$.
- C. The finished product shall be of solid appearance with clean face, be free of segregation, honeycombing and no evidence of internal rendering.
- D. Materials:
 - 1. Materials shall conform to the requirements of BS 6717 and to ASTM C936 unless otherwise specified.
 - 2. The aggregate used shall be of two different types of natural crushed aggregates conforming to the appropriate British Standard.
 - 3. The interlock block pavers shall consist of two layers. The first is the surface layer which shall be formed as an integral part of block and will be of black basalt aggregates with thickness of (6mm $\pm 1\text{mm}$). The lower layer will be of common type aggregates used for concrete works with suitable size. Retarding, color and any admixtures shall not have adverse effect on properties of interlock block pavers.
 - 4. Interlock block pavers shall be made using one or more of binders conforming to the appropriate British Standards.
- E. Compressive Strength Test:
 - 1. Test shall be carried out on interlock block pavers according to BS 6717 to ascertain the strength.
 - 2. Before laying interlock block pavers, 16 samples shall be collected; each 2 sample shall represent 5000 blocks. All samples shall be stored for (24 ± 4) hours in water maintained at temperature of (20 ± 5) $^{\circ}\text{C}$. The average compressive strength of 16 samples shall be not less than 490 kg/cm², and crushing strength of any individual block shall not be less than 400 kg/cm².
- F. Abrasion Test:
 - 1. Test shall be carried out to ascertain surface requirement using Bohme machine to DIN 52108 with natural abrasion material or artificial corundum.
 - 2. The average Abrasion of 16 samples shall not exceed 5 mm and not exceed 6mm for each individual sample after 440 revolution of abrasion machine.

2.4 SAND BED MATERIALS

- A. Sand for Setting Bed and Joint Filler: ASTM C33 or ASTM C144, clean washed river or bank sand.

2.5 CEMENTITIOUS MATERIALS

- A. Portland Cement: ASTM C150 Type I, unless otherwise stated, white or grey color.
- B. Sand: ASTM C144 and ASTM C33; sharp, coarse, clean, screened sand, free of organic material.
- C. Premixed Grout Mortar: As per manufacturer's recommendations.
- D. Water: Potable, not detrimental to mix.
- E. Admixtures: As per manufacturer's recommendations.
- F. Color: Mineral type, non-fading, color as selected.

2.6 BEDDING AND GROUTING FOR PAVERS WITH MEDIUM/HEAVY TRAFFIC AREAS

- A. Dry-Mix Concrete Bedding:
 - 1. Portland Cement: ASTM C150 Type I, unless otherwise stated, white or grey color.
 - 2. Aggregate: 2/3 sand and 1/3 crushed stone powder; to ASTM C144 and ASTM C33; sharp, coarse, clean, screened sand, free of organic material.
 - 3. Aggregate-Cement Mix Ratio: (2:1).
 - 4. Water: 3 to 5%; potable, not detrimental to mix.
 - 5. Admixtures: As per manufacturer's recommendations.
 - 6. Color: Mineral type, non-fading, color as selected.
 - 7. Bedding Thickness: 120 mm thick.
- B. Aggregate-Cement Grout for Joints:
 - 1. Aggregate: 9/10 sand and 1/10 filler.
 - 2. Water to Cement Ratio: 0.50.
- C. Junction between Pavers and Other Types of Materials:
 - 1. Curb: Concrete to match pavers, 200 mm wide, height as per drawings.
 - 2. Tie Beam under Curb: 200 mm wide x 200 mm high reinforced concrete tie beam in accordance with Section 03300, reinforced in accordance with Section 03200.
 - 3. Slab on Grade under Pavers Bedding at Junction: 2500 mm wide x 120 mm thick reinforced concrete slab on grade in accordance with Section 03300, reinforced with 5/m Φ 10 mm in both directions as per Section 03200.
 - 4. Polyethylene Sheet: 0.25 mm thick under reinforced concrete slab on grade and tie beam in accordance with Section 07260.
- D. Aggregate Base Course: As specified in Section 02721.
 - 1. 200 mm thick under reinforced concrete tie beam and slab on grade.
 - 2. 200 mm thick under pavers bedding.

- E. Aggregate Sub-Base Course: As specified in Section 02721.
 - 1. 200 mm thick under reinforced concrete tie beam and slab on grade.
 - 2. 200 mm thick under pavers bedding.

2.7 ACCESSORIES

- A. Edging: Formed galvanized steel.
- B. Cleaning Solution: As per manufacturer's recommendations.

2.8 MIXES

- A. Cementitious Bed: Portland cement mix conforming to the following:
 - 1. Compressive Strength (28 day): 15 MPa.
 - 2. Slump: 75 to 100 mm.
 - 3. Air Entrainment: 5 to 7 percent.
- B. Joint Mortar: Portland cement mix conforming to the following:
 - 1. Compressive Strength (28 day): 20 MPa.
 - 2. Slump: 25 to 50 mm.
 - 3. Air Entrainment: 5 to 7 percent.
- C. Add admixtures to cementitious mixes.
- D. Thoroughly mix ingredients in quantities needed for immediate use.
- E. Use cementitious mixes within two hours after mixing. Do not re-temper.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.
- B. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive Work of this section.
- C. Verify concrete substrate has cured at least 28 days.
- D. Verify gradients and elevations of substrate are correct.

3.2 PREPARATION

- A. Treat soil with herbicide to retard plant growth.

3.3 INSTALLATION OF PAVERS WITH SAND SETTING BED

- A. Spread sand evenly over prepared substrate to a maximum thickness of 100 mm.
- B. Dampen and roller compact sand to level and even surface.

- C. Screed and scarify top 12 mm of sand.
- D. Place paver units in pattern as indicated on drawings, from straight reference edge.
- E. Place half units, special shaped units or edging at edge and interruptions. Maintain evenly spaced joints of 9 mm, unless otherwise indicated on the drawings.
- F. Place topsoil over paver surface and sweep into joints and hollow areas of pavers. Moisten joints and recover with additional soil until firm placement is achieved. Remove excess soil.
- G. Tamp and level paver units with mechanical vibrator until units are firmly bedded, leveled and to correct elevation and gradients. Do not tamp unrestrained edges.
- H. Recover with additional sand or topsoil, sweep into joints and hollow areas of pavers. Remove excess sand or soil.

3.4 INSTALLATION OF PAVERS WITH MORTAR SETTING BED

- A. Set curbs/pavers in full cementitious mortar bed of indicated thickness, to support curbs/pavers over full bearing surface.
- B. Place curbs/pavers in pattern as indicated on drawings.
- C. Maintain uniform joint width of 9 mm between curbs/pavers, unless otherwise indicated on drawings, and at abutting vertical surfaces and protrusions. To accommodate mortar, rake out joints 6 to 9 mm deep.
- D. Fill joints with mortar. Pack and work into voids. Neatly tool surface to concave or flush joint. Wet cure.
- E. Form control and expansion joints as detailed on approved shop drawings.

3.5 INSTALLATION OF INTERLOCK BLOCK PAVERS

- A. Interlock block pavers shall be set on to location and grades shown on the Drawings and shall be laid directly on a granular material. Granular material shall be placed on the top of a crushed aggregate base course layer to adjust the final level of the interlock block pavers and to fill the joints between the blocks.
- B. All interlock block pavers shall be thoroughly cleaned of all extraneous material prior to approval.
- C. All interlock block pavers shall be laid within a tolerance of plus or minus three (3) millimeters, at each end of an element, to the lines and grades given on the Drawings. All spaces between interlock block pavers shall be filled with clean sand.
- D. All interlock block pavers shall be compacted by a compactor plate to the satisfaction of the Engineer. No interlock block pavers shall be paved during heavy rains.

3.6 INSTALLATION OF PAVERS WITH MEDIUM/HEAVY TRAFFIC AREAS

- A. Aggregate Sub-Base Course: Place and compact to required density in accordance with Section 02721.
- B. Aggregate Base Course: Place and compact to required density in accordance with Section 02721.
- C. Polyethylene Sheet: Install as shown on drawings.
- D. Reinforced Concrete Slab on Grade and Tie Beam at Junction: Install in accordance with Section 03200 and Section 03300.
- E. Curb Installation at Junction: Place curbs on top of the reinforced concrete tie beams with 20 mm thick sand-cement mortar bed, (3:1) mix ratio, to the required level.
- F. Dry-Mix Concrete Bedding: Spread loosely over the aggregate base course and over the reinforced concrete slab on grade at junction.
- G. Pavers Installation: Install pavers as specified.
- H. Jointing:
 - 1. Jointing of pavers shall start 24 hours after the first wetting.
 - 2. Before the start of the grouting process, paved surfaces shall be wetted generously (second wetting) in order to minimize absorption by the bedding of the water present in the grout.
 - 3. The grout shall be poured into the gaps by means of a nozzled containers in order to minimize staining the pavers surfaces.
 - 4. A second application of the grout over the joints may be needed in case settlement of the grout level is observed. The final level of the grout shall be 5 mm below the edges of pavers surfaces.
- I. Curing: Grouted surface shall be cured twice daily and for a period of 7 days. Curing shall be performed once in the morning (before 10:30 am) and once in the evening (after 17:30 pm)
- J. Protection of Paved Surfaces from Traffic: The finished paved surfaces shall not be subjected to traffic loading before 7 days from the final setting of the grout. This period may be reduced in case an approved strength accelerator admixture is used in the grout mix.

3.7 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Do not clean pavers and curbs until pavers, curbs and mortar are dry.
- C. Clean soiled surfaces using cleaning solution. Do not harm pavers, curbs, joint materials, or adjacent surfaces.
- D. Use non-metallic tools in cleaning operations.

E. Rinse surfaces with clean water.

F. Broom clean paving surfaces. Dispose off excess sand or mortar.

3.8 SCHEDULES

A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 02821

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. PVC coated galvanized steel chain link fence with painted steel posts and all necessary accessories.
 2. Manual painted steel gates; swing or sliding; with related hardware.
 3. Privacy slats.
- B. Related Sections:
1. Section 02315 - Excavation.
 2. Section 02320 - Backfill.
 3. Section 03300 - Cast-in-Place Concrete.
 4. Section 05500 - Metal Fabrication.

1.2 REFERENCES

- A. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 3. ASTM A121 - Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
 4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 6. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 7. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
 8. ASTM A585 - Standard Specification for Aluminum-Coated Steel Barbed Wire.
 9. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 10. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 11. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 12. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 13. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
 14. ASTM F668 - Standard Specification for Poly Vinyl Chloride (PVC)-Coated Steel Chain Link Fence Fabric.

15. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
16. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
17. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
18. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
19. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.

- B. Chain Link Fence Manufacturers Institute:
1. CLFMI - Product Manual.

1.3 SYSTEM DESCRIPTION

- A. Fence Height: As directed or indicated on Drawings.
- B. Fence Post and Rail Strength: To ASTM F1043 Heavy Industrial Fence quality.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.
- D. Samples: Submit two 300 x 300 mm in size samples of fence fabric with slat infill illustrating construction and colored finish.
- E. Manufacturer's Installation Instructions: Submit installation requirements.

1.5 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Project Record Documents: Accurately record actual locations of property perimeter posts and posts foundations.
- C. Operation and Maintenance Data: Procedures for submittals.

1.6 QUALITY ASSURANCE

- A. Supply material in accordance with CLFMI - Product Manual.
- B. Perform installation in accordance with ASTM F567.
- C. Perform Work in accordance with the drawings and to Engineer's satisfaction.
- D. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.
- D. Store fence fabric and accessories in secure and dry place.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 MATERIALS

- A. Steel: Steel sections to ASTM A36/A36M. Steel pipe to ASTM A53/A53M, Grade B, Schedule 40.
- B. Fabric Wire (Steel): ASTM A392 zinc coated wire fabric, and/or ASTM F668 PVC coated steel chain link fence fabric, as per drawings.
- C. Perforated steel: Hole size 3mm; Pitch size 5mm; Open area 33%; Sheet size 2mx1m; Sheet thickness 3mm.
- D. Concrete: As specified in Section 03300.

2.3 COMPONENTS

- A. Posts: Painted steel posts in equal angles or pipes, with inclined top part, as per drawings and/or as directed by the Engineer including closing/sealing all steel tube edges.
- B. Post Spacing: At intervals not exceeding 3 m, unless otherwise shown on drawings.
- C. Concrete Foundations for Posts: Dimension as shown on drawings.
- D. Plates for Fixing on Top of Walls or Parapets: Painted steel; size 150 x 150, thickness to be designed by the Contractor, but not less than 3 mm thick.

- E. Top and Brace Rail: 42 mm diameter, plain end, sleeve coupled.
- F. Fabric: 50 mm diamond mesh interwoven wire, 4 mm thick, top selvage twisted tight, and bottom selvage knuckle end closed.
- G. Tension Wire: 5 mm thick steel, at top, center and bottom of fabric.
- H. Tie Wire: Aluminum alloy steel wire.

2.4 ACCESSORIES

- A. Caps: Galvanized pressed steel or Malleable iron galvanized; sized to post size, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners, etc.; galvanized steel.
- C. Extension Arms: Galvanized steel, to accommodate 3 strands of barbed wire, sloped, single or double arm as per drawings.
- D. Swing Gate Hardware: Fork latch with gravity drop; 3x180° gate hinges for each leaf.

2.5 GATES

- A. General:
 - 1. Gate Types, Opening Widths and Directions of Operation: As per drawings.
 - 2. Design and factory assemble gates.
- B. Swing Gates:
 - 1. Fabricate gates to permit 180 degree swing.
 - 2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

2.6 FINISHES

- A. Components and Fabric: Galvanized to ASTM A123/A123M; ASTM A153/A153M for components; ASTM A392 for fabric; 600 g/sq m coating.
- B. Hardware: Galvanized to ASTM A153/A153M, 600 g/sq m coating.
- C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate and conditions under which the fences and gates shall be installed.
- B. Verify substrate is ready to receive the fence.
- C. Establish elevations and complete grading work.

- D. Correct any unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

3.2 INSTALLATION

- A. Excavate holes for posts to size indicated on Drawings without disturbing underlying materials.
- B. Set posts in concrete footings with top of footing as per drawings; either above or below finish grade. For extended concrete footings above grade, trowel and form crown to shed water.
- C. Center and align posts; verify vertical and top alignment; make necessary corrections.
- D. Backfill with selected excavated fill materials and compact in layers.
- E. Install posts as shown on the drawings.
- F. Opening from end posts to fences or to other structures shall not exceed 150 mm.
- G. Center and align posts; verify vertical and top alignment of posts and make necessary corrections.
- H. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.
- I. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- J. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods if required. Install brace rail one bay from end and gate posts.
- K. Install top rail through line post tops and splice with 150 mm long rail sleeves.
- L. Install center and/or bottom brace rail on corner gate leaves.
- M. Place fabric on inside of posts and rails.
- N. Do not stretch fabric until concrete substrate has cured 28 days.
- O. Stretch fabric between terminal posts or at intervals of 30 m maximum.
- P. Position bottom of fabric 50 mm above substrate.
- Q. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 400 mm on centers.
- R. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- S. Install bottom tension wire or strap stretched taut between terminal posts.
- T. Install support arms sloped as per drawings; attach barbed wire; tension and secure.

- U. Install gate with fabric and barbed wire overhang to match fence. Install three hinges on each gate leaf, latch, catches, etc. Plumb, level and secure for full opening without interference. Adjust hardware for smooth operation and lubricate where necessary.
- V. Remove and dispose off surplus materials to approved dumping area.

3.3 PRIVACY SLATS

- A. Install slat inserts in vertical or diagonal pattern woven through fence fabric.
- B. Fasten slats according to manufacturer's instructions.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Plumb: 6 mm.
- C. Maximum Offset from Indicated Position: 25 mm.
- D. Minimum distance from property line: 150 mm.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 02826

METAL BAR FENCES AND GATES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Painted steel metal bar fence fixed to concrete parapet/foundation with all necessary accessories.
 2. Electrically or manually operated painted steel bar gates; swing or sliding; with painted steel posts and related hardware.
- B. Related Sections:
1. Section 02315 - Excavation.
 2. Section 02320 - Backfill.
 3. Section 03300 - Cast-in-Place Concrete.
 4. Section 05500 - Metal Fabrication.
 5. Section 09900 - Paints and Coatings.
 6. Division 16: Electrical.

1.2 REFERENCES

- A. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 5. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 7. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
 8. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
 9. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittals.
- B. Shop Drawings: Indicate plan layout, spacing of components, parapets, foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on posts, accessories, fittings and hardware.

- D. Samples: Submit two samples of metal fence illustrating construction and finish.
- E. Manufacturer's Installation Instructions: Submit installation requirements.

1.4 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Project Record Documents: Accurately record actual locations of parapet and foundations.
- C. Operation and Maintenance Data: Procedures for submittals.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with approved standards, as shown on the drawings and to the satisfaction of the Engineer.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Metal Fence: As specified in Section 05500.
- B. Concrete for Foundations and Parapet: As per Section 03300.
- C. Painting: As specified in Section 09900.

2.3 ACCESSORIES

- A. All accessories including fasteners and anchors, adhesive, sealer, etc., shall be to manufacturer's recommendations.

2.4 GATES

- A. General:
 - 1. Gate Types, Opening Widths and Directions: As per approved shop drawings.
 - 2. Design and factory assemble gates.
- B. Swing Gates:
 - 1. Fabricate gates to permit 180 degree swing.
 - 2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.
- C. Sliding Gates:
 - 1. Framing and Posts: ASTM F1184, Class 2 for internal rollers.
 - 2. Rollers for overhead and cantilever sliding gates: Bearing type. Furnish non-sealed bearings with grease fitting for periodic maintenance.
 - 3. Secure rollers to post or frame without welding.
- D. Electrical Characteristics: Refer to drawings, and as specified in Division 16.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate and conditions under which the fences and gates shall be installed.
- B. Verify substrate is ready to receive the fence.
- C. Establish elevations and complete grading work.
- D. Correct any unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

3.2 INSTALLATION

- A. Install work as specified, as shown on approved shop drawings, as per manufacturer's instructions, in accordance with local relevant authorities' standards, and to the satisfaction of the Engineer.

3.3 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Plumb: 6 mm.
- C. Maximum Offset from Indicated Position: 25 mm.
- D. Minimum distance from property line: 150 mm.

END OF SECTION

SECTION 02870
SITE FURNISHINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete Benches.
 - 2. Concrete Dustbins.
 - 3. Outdoor Tables and Chairs.
 - 4. Wooden Boxes.
- B. Related Sections:
 - 1. Section 02783 - Precast Concrete Pavers.
 - 2. Section 03300 - Cast-in-Place Concrete.
 - 3. Section 05500 - Metal Fabrication.
 - 4. Section 06200 - Finish Carpentry.

1.2 REFERENCES

- A. Standards stated under the related specification sections.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: For each type of product indicated, include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
- C. Samples for Verification: For each type of exposed finish required, submit two samples of size directed by the Engineer.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishings through one source from a single manufacturer.
- B. Perform Work in accordance with the drawings, to the instructions of the supplier and manufacturer, and to the approval of the Engineer.
- C. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Manufacturer / Fabricator: Company specializing in manufacture of site furnishings with ten years documented experience.

- B. Erector: Company specializing in erection of this Work with five years documented experience.

1.6 WARRANTY

- A. General Requirements: Execution requirements for warranties.
- B. Furnish five year manufacturer warranty for each type of site furnishings.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.
- B. Concrete Benches:
 - 1. Material: Concrete as specified in Section 03300.
 - 2. Size and Shape: As shown on drawings.
 - 3. Foundations/Support: Reinforced concrete as specified in Section 03300.
 - 4. Precast Concrete Tiles: As shown on the drawings, and as specified in Section 02783.
- C. Concrete Dustbins:
 - 1. Material: Concrete as specified in Section 03300.
 - 2. Size and Shape: As shown on drawings.
 - 3. Foundations/Support: Reinforced concrete as specified in Section 03300.
 - 4. Painting: As specified in Section 09900.
- D. Outdoor Tables and Chairs:
 - 1. Material: As specified in Section 05500, and as selected by the Engineer.
 - 2. Size and Shape: As shown on drawings.
- E. Wooden Boxes:
 - 1. Material: As specified in Section 06200, and as selected by the Engineer.
 - 2. Size and Shape: As shown on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.
- B. Examine areas and conditions for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings, level, plumb, true and positioned at locations indicated on the Drawings.
- D. Install work as shown on the drawings and to the satisfaction of the Engineer.

3.3 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. After completion of site furnishings installation, inspect components; remove spots, dirt and debris; repair damaged finishes to match original finish and/or replace damaged components.

3.4 SCHEDULES

- A. As indicated on the drawings and where directed by the Engineer.

END OF SECTION

SECTION 02923
LANDSCAPE GRADING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes final grade planting soil and sand-based structural planting soil for landscaping.
- B. Related Sections:
 - 1. Section 02320 - Backfill.

1.2 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures
- B. Samples: Submit, in air-tight containers, 4.5 kg sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials source.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

- A. Furnish each topsoil material from single source throughout the Work.
- B. Perform Work in accordance with the drawings and to the approval of the Engineer.
- C. Maintain one copy on site.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Agricultural Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 6.5 and maximum 8.0; organic matter to exceed 1.5%, magnesium to exceed 100 units; phosphorus to exceed 150 units; potassium to exceed 120 units; soluble salts/conductivity not to exceed 900 ppm/0.9 mmhos/cm in soil.
 - 1. Refer to "Annex 3 - Specifications for Structural Planting Soil and for Planting Top Soil".
- B. Sand-Based Structural Planting Soil:
 - 1. Refer to "Annex 3 - Specifications for Structural Planting Soil and for Planting Top Soil".

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.
- B. Verify building and trench backfilling have been inspected.
- C. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

- A. Protect landscaping and other features remaining as final Work.
- B. Protect existing structures, fences, sidewalks, utilities, paving and curbs (if any).

3.3 SUBSTRATE PREPARATION

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, stones, in excess of 13 mm in size. Remove contaminated subsoil.
- C. Scarify surface to depth of 150 mm where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

- A. Place topsoil in areas where seeding, sodding and planting is required and to the required thickness. Place topsoil during dry weather.
- B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
- C. Remove roots, weeds, rocks and foreign material while spreading.
- D. Manually spread topsoil close to plant material or to building to prevent damage.
- E. Lightly compact or roll placed topsoil as directed by the Engineer.
- F. Remove surplus subsoil and topsoil from site.
- G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Top of Topsoil: Plus or minus 13 mm.

3.6 PROTECTION OF INSTALLED WORK

- A. General Requirements: Execution requirements for protecting finished Work.
- B. Prohibit construction traffic over topsoil.

END OF SECTION

SECTION 02930

EXTERIOR PLANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes excavation for landscaped areas and for tree pits; filter gravel materials and filter fabric (geotextile); agricultural topsoil; trees, shrubs, plants, ground cover and lawn plantation; mulch; fertilizer; pruning; and maintenance.
- B. Related Sections:
 - 1. Section 02315 - Excavation.
 - 2. Section 02320 - Backfill: Rough grading of site.
 - 3. Section 02620 - Subdrainage: Gravel materials under landscaped areas.
 - 4. Section 02923 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A300 - Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices.
 - 2. ANSI Z60.1 - Nursery Stock.

1.3 DEFINITIONS

- A. Plants: Living trees, plants and ground cover specified in this Section, shown on the drawings, and as described in ANSI Z60.1.
- B. Height of tree shall mean the trunk height of the tree.
- C. Each shrub and ground cover shall have multiple branches (at least five branches).

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit list of plant material sources, data for fertilizer and other accessories.
- C. Submit minimum 280 g sample of topsoil proposed. Forward sample to testing laboratory in sealed containers to prevent contamination.

1.5 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for submittals.
- B. Operation and Maintenance Data: Include pruning objectives, types and methods; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

- A. Tree Pruning: ANSI A300 Pruning Standards for Woody Plants.
- B. Perform Work in accordance with the drawings, to the instructions of the supplier and manufacturer, and to the approval of the Engineer.
- C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Nursery: Company specializing in growing and cultivating plants with ten years documented experience.
- B. Installer: Company specializing in installing and planting plants with five years documented experience.
- C. Tree Pruner: Company specializing in performing work of this section with minimum five years documented experience.
- D. Maintenance Services: Performed by installer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for transporting, handling, storing and protecting products.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.
- C. Protect and maintain plant life until planted.
- D. Deliver plant life materials immediately prior to placement. Keep plants moist.
- E. Plant material damaged as a result of delivery, storage or handling will be rejected.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements for environmental conditions affecting products on site.
- B. Do not install plant life when ambient temperatures may drop below 5°C or rise above 35°C.
- C. Do not install plant life when wind velocity exceeds 48 km/hr.

1.11 COORDINATION

- A. General Requirements: Administrative requirements for coordination.
- B. Install plant life after installation of underground landscaping irrigation system piping and watering heads.
- C. Coordinate with installation of landscaping irrigation system.

1.12 WARRANTY

- A. General Requirements: Execution requirements for warranties.
- B. Furnish one-year manufacturer warranty for trees, shrubs, ground covers and lawn plantations.

1.13 MAINTENANCE SERVICE

- A. General Requirements: Execution requirements for maintenance service.
- B. Maintenance to Certificate of Completion:
 - 1. All planted areas within the contract boundary shall be maintained and guaranteed from the time of planting until the issue of Certificate of Completion.
 - 2. Maintenance shall include but not be limited to watering, weeding, cultivating, control of insects, or diseases by means of spraying with approved insecticides, herbicide, fungicide, pruning, adjustment and repair of anchors and wire, repair of minor washouts and other horticultural operations necessary for the proper growth of plants and for keeping the contract area neat in appearance.
 - 3. Where planting is extended over more than one season, during summer months or at any other period when weather conditions do not permit planting to be carried out, all areas where planting soil mix has been spread shall be maintained. This shall include, where necessary, watering and shall apply to all incomplete work.
- C. Maintenance after Certificate of Completion:
 - 1. After Certificate of Completion has been issued, all planted areas shall be maintained and guaranteed through the maintenance period.
 - 2. Maintenance operations shall be performed during this period as specified and as required, and to the satisfaction of the Engineer.
- D. Tree Maintenance Operations:
 - 1. Irrigation:
 - a. Water as necessary at approved rate and time, preferably at night or early or late in the day. Avoid inadequate and excessive applications of irrigation water and limit to quantities required for plant development. Leach as necessary at approved timing and rate subject to site and species. Maintain irrigation basins by removing all debris, weeds, and blown material.

2. Pruning:
 - a. Under the direction of the Engineer allow for cutting back of certain types of trees to encourage formation of crown. Limit amount of pruning to minimum necessary to encourage proper growth, to remove dead or injured twigs and branches, and to compensate for result of transplanting operations. Prune in such a manner as not to change natural habit or shape of tree unless otherwise authorized. Make cuts flush leaving no stub.
- E. Shrub, Vine and Ground Cover Maintenance Operations:
1. Irrigation:
 - a. Water as necessary at approved rate and timing, preferably at night or early or late in the day. Avoid excess applications of irrigation water and limit to quantities required for plant development. Leach as necessary at approved timing and rate subject to site and species. Maintain irrigation equipment to required standard.
 2. Fertilizer Application:
 - a. Apply balanced liquid fertilizer and if necessary combine with a slow release fertilizer. Apply to manufacturer's instructions in September and December.
 - b. Give annual application of 25g/m² of approved phosphate fertilizer and if necessary, combined fertilizer each at specified rate. Apply dry and water in well. To be applied in February or March each year.
 3. Weeding and Hoeing:
 - a. All vine pockets and shrubs borders shall be hoed, forked or hand weeded where appropriate and all areas kept clear of weeds. Remove all debris or other refuse. Trodden ground to be hoed, forked or raked over as necessary.
 4. Pruning:
 - a. Cut back shrubs in early Spring to encourage bushiness. With the exception of hedges and ground cover plants, shrubs shall be pruned to maintain natural shape. Shrub species with a significant display of flowers shall not be pruned after the formation of lower buds until completion of the flowering season.
 - b. Shrubs will generally be pruned to encourage a good bushy effect in keeping with their natural characteristics. Where there is a tendency, natural or otherwise, for the plant to develop leggy, coarse growth, it can generally be hard pruned at the outset of the main growing season, all to encourage strong new growth. Consideration must be given to situations where shrubs are fulfilling a screening purpose and here they should be pruned less hard. In general, all dead growth must be removed as it appears.
 - c. On all cuts over 25mm in diameter and on bruises or scars on bark, trace back injured cambium to living tissue and remove. Smooth wounds with a sharp knife to avoid retention of water and coat treated area with approved tree sealant to BS 3998 or equal.
 - d. Pruning shall generally be carried out in the winter or in period of dormancy, and only by skilled horticulturists or under their direct supervision. At no time shall the terminal leader of trees be removed and if this is damaged, the Contractor should endeavor to train a replacement.

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- e. Climbing plants will usually only be pruned to remove dead wood and to control their growth in the direction/manner that is required. Where growth is too vigorous, plants can usually be pruned hard to control them and to encourage fresh new growth.
5. Protection:
 - a. Maintain all fencing around plantations, screens or protection to individual trees as necessary. Maintain Hessian wrapping to trees as necessary.
 6. Hard Areas Bordering Trees:
 - a. Maintain paving or other hard surfaces that may become removed or loosened by growth of trunk or root system of trees.
 7. Tree Ties:
 - a. Loosen or remove tree ties in accordance with growth of trunk to avoid constriction of growth.
 8. Replacement Stakes, Canes or Ties:
 - a. Replace stakes and fix new ties to climbers as described.
 9. Pest and Disease Control:
 - a. Specific checks for pests and disease to be carried out every month by a trained member of staff.
 - b. All equipment should be surface sterilized (with methylated spirits) after use on the plants which are known, or suspected to be diseased. All diseased wood, fungi, prunings, etc., to be burned after removal from diseased plants. (Methods and location of burning must be approved by the Owner).
 10. Micro-Nutrients:
 - a. Corrective foliar sprays of the micro-nutrients shall be applied to plants on the identification of deficiency symptoms. 1/12 kg/ha of manganese or manganese sulphate to be sprayed to deficient plants and sprays re-applied at intervals of approximately two weeks until deficiency is alleviated. 100g of chelated iron/100 liters of water to be sprayed to counteract iron deficiency and be repeated at two-weekly intervals. A foliar spray of zinc at 265 g of zinc /100 liters of water shall be sprayed at intervals only with proper safeguard and at such times to ensure that there is no human contact with the spray. The Contractor shall ensure that the spray does not contaminate any food crops. The Contractor shall be responsible for ensuring that the micro-nutrient concentrations and methods of application are not hazardous to human or animal health and shall present his Spraying Programme and necessary precautions to the Owner for approval prior to commencement of operations.
 11. Herbicide:
 - a. Contact herbicide shall be based on paraquat/ diaquat and systemic herbicide based on glyphosphate, for all planted areas.
 12. Chemicals:
 - a. Fertilizers, pesticides, herbicides and fungicides to be used must have Owner approval. Products must conform with the agricultural chemicals and the agricultural departments of the country of manufacture. Chemicals will be applied according to the manufacturer's recommendations ensuring safety at all times to humans and animals and to avoid contamination to any water source, food crops or surrounding areas.

13. Irrigation Maintenance:
 - a. Irrigation equipment shall be maintained. Each emitter and sprinkler head shall be checked after planting and then weekly for first six months of maintenance period and thereafter monthly until the end of the maintenance period.

- F. Maintenance Operations of Grass Areas:
 1. General:
 - a. Maintenance shall consist of watering, weeding, cutting, repair to all erosion and settlement, and replanting as necessary to establish a uniform and healthy stand of the specified grasses.
 2. Mowing:
 - a. Mow grass with an approved machine at intervals, not less than every 14 days. In the summer the interval between mowing shall be 5-7 days or as required to avoid sun scorch. Cutting height shall avoid a scalped appearance and minimize thatch build-up. Grass height as approved or directed by Engineer. All grass clipping should be collected.
 3. Replanting:
 - a. All grassed areas, subject to die back from tree shading as trees mature, shall be re-sodded.
 4. Fertilizer Application:
 - a. Prior to irrigation, give top dressing of 25g/m² every three months of approved quantities of nitrogen fertilizer applied dry, evenly and mixed with fine washed sand. Apply, in alternation, approved compound fertilizer every three months.

- G. General Maintenance:
 1. Fertilizer Application:
 - a. Apply fertilizer as necessary to particular site. Normally give annual application of phosphate fertilizer and if necessary combined slow release fertilizer each at specified rate. Apply dry and water well. To be applied in February or March.
 - b. The following rates and timings are subject to adjustment based on analysis and the Contractor's judgment. Analysis is to be carried out quarterly starting in January of each year. Soil samples will be taken in the accepted manner and at interval distances as necessary to provide a true picture of nutrient levels over a given area.
 - c. Compound Fertilizers:
 - 1) Compound Slow Release Fertilizer (drilled) 18/11/10, 9 month formulation, or similar. Applied in February and September at rate of 50 grams per m² and lightly cultivated into top 50mm of soil.
 - 2) Compound Slow Release planting tablets (urea formaldehyde base) placed directly into soil at 100-200 mm depth in direct vicinity of irrigation emitters. One 10 gram tablet per 1 cm of tree diameter and two 10 gram tablets per m² of foliage cover for shrubs, flowers and groundcover. Tablets should be 10/10/5 (or similar), two year formulation and shall be applied in March.

- d. Nitrogen Supplements:
 - 1) Urea formaldehyde, minimum 50% water soluble, broadcast as required at rate of 30 grams per m² and cultivated into surface soil. Alternatively applied as a foliar spray at rate of 2 grams per liter.
 - 2) Ammonium sulphate 21/0/0, broadcast as required at rate of 40 grams per square meter and watered in by hosepipe. Alternatively applied as a liquid feed at rate of 2 grams per liter.
- e. Phosphatic Fertilizer:
 - 1) Single superphosphate 0/18/0, applied at rate of 120 g/m².
- f. Iron Supplement:
 - 1) Sequestrene applied overall in February and June at rate of 2 grams per m² or as a foliar spray at 1 gram per liter.
 - 2) Iron chelate applied as a solution to chlorotic plants as required.
- g. Zinc Supplement:
 - 1) As foliar spray of zinc at 265gm of zinc per 100 liters of water as required.
- h. Management Supplement:
 - 1) 1.12kg/ha of manganese or manganese sulphate to be sprayed to deficient plants and sprays re-applied after intervals of approximately two weeks until deficiency is alleviated.
- 2. Weeding and Hoeing:
 - a. Maintain areas close to base of trees from weed within one meter of plants. Maintain soil surface and control weeds by regular cultivation at approximately 3 month intervals.
 - b. Paths and areas to be kept free of all vegetation can be controlled by weedkiller based on "Simazine" or equal.
 - c. Pesticides and Fungicides:
 - 1) Pest control sprays must contain only chemicals acceptable for use in amenity horticulture (e.g. Pyrethrum).
 - 2) Fungicide sprays must contain only chemicals acceptable for use in amenity horticulture, such as copper or sulphate. This need not apply to fungicide drenches.
 - d. Disease and Pest Control:
 - 1) The Contractor will instigate a pest control programme from the beginning of his contract. Spraying is advisable only very early in the day, to prevent damage to plants. It is also a time when movement of people is at minimum. Due consideration must be given at all times to protecting people and surfaces from ill effects of spraying.
 - 2) Specific checks for pests and disease shall be carried out every month by a trained member of staff.
 - 3) All equipment should be surface sterilized (using an approved disinfectant such as methylated spirit) after use on the plants which are known, or suspected to be diseased. All diseased wood, fungi, pruning, etc., shall be burned after removal from diseased plants. (Methods and location of burning shall be submitted to the Engineer for approval).

- 4) Approved fertilizers, pesticides, herbicides and fungicides only shall be used. Chemicals will be applied according to manufacturer's recommendations, ensuring safety at all times to humans and animals, and shall avoid contamination of any water source, food crops or surrounding areas.
 - 5) Control of disease will be largely affected by general cleanliness in operations and by consistent observation of plants.
 - 6) As soon as any disease symptoms are noted the Contractor should carry out drenching or spraying to prevent the disease spreading to healthy plants.
 - 7) All plants which do not respond to treatment shall be removed and burned at a location approved by the Engineer, and the soil mix excavated and replaced before replanting. Pruning, rubbish and suspect plant material should be removed from site quickly at all times and burned at a location approved by the Engineer.
- e. Weed Control:
- 1) Areas close to base of plants shall be kept free from weeds within 1m of plants. Maintain soil surface and control weeds by regular cultivation at approximately one monthly interval.
 - 2) Generally, Contractor will rely on hand cultivations close to and round trees and plants and throughout close planted areas. In the lawn area, like shelter-belts, chemical weed control can be carried out if permitted.
- f. Mulch:
- 1) Control by mulching is an integral part of the landscape programme and all mulches must be kept up to specification.
3. Removal of Shoots and Dead Twigs:
- a. Remove any dead twigs or shoots occurring on all trees, shrubs and ground cover plants.
 - b. Remove all water shoots.
- H. Replacements:
1. Replacement plants shall be of the same size (girth and height) and species as originally specified, and shall be planted as specified and shown on drawings.
 2. The Contractor shall be responsible for replacing all plant material that is dead, dying or not in vigorous condition at the beginning of the planting season following practical completion. At this time a schedule shall be prepared by the Contractor of all dead and dying material. This shall be submitted for approval to the Engineer.
 3. Replacements, with the exception of palm trees, shall be planted only between the start of November and the end of March. If the final inspection at the end of the maintenance period occurs between these dates and additional replacement planting is directed by the Engineer, the planting shall be done between mid and the end of October, and be maintained six months from November.
- I. Cleanup and Protection:
1. During planting, keep pavements clean and work area in an orderly condition.

2. Protect planting and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged planting as directed.
- J. Final Planting Inspection and Acceptance:
1. Final inspection for acceptance shall be made at the conclusion of the period of maintenance and guarantee provided that all project improvements and corrective work has been completed. If improvements are not completed, maintenance shall be continued until completion of such work.
 2. Prior to being considered ready for inspection, Contractor shall have done a final weeding and raking of all planted areas, replenishing of all mulch where necessary, removing all debris, leaving the site in a clean orderly appearance.

PART 2 PRODUCTS

2.1 PLANTING - GENERAL

- A. Planting shall take place only before 10:00 O'clock and after 16:30 O'clock.
1. The normal planting season for trees, shrubs and herbaceous plants will be between November and March inclusive, except for date palms which will be planted in March or April. Alternative planting times may be allowed only with the approval of the Engineer.
 2. Before beginning planting complete grading & ripping, finish paving, laying of services and other siteworks; ensure irrigation system is in good working order, and complete soiling of shrub, herbaceous and annual planting areas.
 3. Planting shall not be done in excessively windy conditions.
- B. Layout:
1. Lay out individual tree and shrub locations for multiple plantings by scaling from the landscape site plans and stake locations and outline areas. Make minor adjustments as may be requested.
 2. The Engineer reserves the right to approve the setting out of plants before planting: see planting schedule and setting out drawings. He also reserves the right to alter the position of any which is planted.
 3. Space ground covers and vines as shown on schedule and drawings.
 4. The Engineer is to be notified 3 days minimum for the planting layout to be approved prior to planting.
- C. Planting is to be carried out in accordance with the specification and drawings. The number of each species and variety is to be distributed over the area allocated in an even manner, making due allowance for adjacent groups.
- D. Plants shall be set plumb and at such a level or elevation that after the settlement they will bear same relation to level of surrounding ground as they bore to ground from which they were dug. All plants shall be planted on and in soil mix. The soil mix will be properly compacted before the placement of trees with a heavy root ball.
- E. Earthballed and Hessian covered plants shall have all cloth, ropes, etc., removed from tops of the earthballs but no cloth shall be pulled out from under the earthballs.

- F. Bare-rooted plants shall have their roots spread out in a natural position and prepared top soil shall be carefully placed under and among them to fill all voids. Any roots which are broken or frayed shall be cleanly cut off from the plant.
- G. Disturbance to the roof system or ball of earth shall be prevented in removing plants from containers. Can cutters shall be used on metal containers.
- H. Dig planting pits to sizes as specified allowing for the depth of gravel drainage layer and cart away excavated material ensuring no interference with irrigation lines; removal of soil to approved designated waste disposal site.
- I. Lay the anti-capillary liner where specified over gravel taking care that 150mm overlaps occur and that the hole for the stake is no larger than necessary.
- J. Spread 200 mm layer of planting soil mix over the bottom of the pit and firm by foot. Place the plant and fill around it with planting soil mix in layers of 200 mm each separately firmed until final soil level is reached. The area of the plant pit should then be firmed around so the plant is stable. Apply slow release fertilizer where specified, at the rate of 300 gm/tree, 100 gm/plant, and 35 gm/m² of grass.
- K. During and after planting, the plants shall be thoroughly watered in to eliminate air voids around the roots and watered regularly as required for the planting to become established.
- L. Apply a 50mm deep layer of stone mulch as specified to planting beds and tree pits, using barrows to avoid interference with irrigation lines. Depth of stone mulch to be 50mm only.
- M. Check all plants one week after planting for wind shake and loosening due to soil subsidence and firm and make good soil as necessary. Then check all plants at a maximum of two weekly intervals until the end of the maintenance period, making good as necessary.

2.2 TREE PLANTING

- A. Trees of all species and of size specified on plans shall be planted in locations shown. Trees shown on plans at spacing shall be accurately and evenly spaced in true lines.
- B. The tree pits for Standard Trees generally shall allow for a 1000 x 1000 x 1500 mm depth of growing medium unless otherwise shown, plus a 200 mm deep gravel drainage layer. Where such tree pits are located above rock, bore holes will be drilled by the main Contractor prior to planting to a depth of 1m.
- C. After planting, a tree stake shall be inserted into the tree pit with a minimum of one third below ground and two thirds above ground. The stake shall be located on the windward side of the tree. For balled-root trees and those grown-on and in containers, a crowbar or similar tool should be used to probe through the root system, to make a pilot hole, into which the stake can be driven with minimum disturbance. Care shall be taken not to puncture the semi-permeable membrane. The tree shall be secured to the tree stake by two rubber tree ties.
- D. Apply slow release tablet fertilizer as specified herein.

2.3 PALM TREE PLANTING

- A. Large palms shall be planted during the period of optimum root growth from March to April unless otherwise agreed upon with the Engineer. All palms scheduled to be planted on the site shall be inspected in their original growing location before lifting is authorized for delivery to the site.
 - 1. Prior to transporting for transplanting, palm fronds are to be sprayed with anti-desiccant during transplanting and shall be wrapped with burlap to enclose the growing tip and upper trunk. The roots shall be balled and the Hessian tied with wire.
 - 2. Palms shall be planted in prepared pits, size as specified, and backfilled and firmed in.
 - 3. Fertilizer shall be applied as for trees.
 - 4. Trunk burlap, frond wrapping and dead fronds to be removed again after new growth indicates adequate recovery or after second growing season.
 - 5. Guy palms immediately after planting.
 - 6. The tree pits for palms generally shall allow for a 1500 x 1500 x 2000 mm depth of growing medium unless otherwise indicated on the drawings plus a 200 mm deep gravel drainage layer.

2.4 SHRUB PLANTING

- A. Shrubs shall be positioned in the location and numbers shown on plan and placed to achieve even spacing and proper matching of shapes related in a random fashion at approximately equal centers to obtain a natural dense cover.
 - 1. Pits for shrubs and small trees generally shall allow for a depth of 900mm of growing medium, unless otherwise shown, plus a 200 mm deep gravel drainage layer.
 - 2. Planting pits shall be backfilled with planting soil mix, thoroughly firmed around the roots to eliminate air voids.
 - 3. Tablets fertilizer shall be applied.

2.5 VINE PLANTING

- A. Vines shall be planted in a similar manner to shrubs, all as described above.
- B. Pits for vines shall allow for a 900 x 900 x 600 mm depth of growing medium plus a 200 mm deep gravel drainage layer.

2.6 GROUND COVER PLANTS

- A. Ground cover plants shall be planted in beds of growing medium 500 mm deep plus a 200 mm deep gravel drainage layer. Planting should be done with a hand trowel, taking care to firm soil around the roots.
- B. Herbaceous plants should be set out according to the planting plan to ensure correct spacing.
- C. Smaller plants and annuals should be planted with a hand trowel, taking care to firm around the roots. Larger plants will require a spade to excavate hole, and firming should be done by treading. The depths of planting will depend upon the species.

2.7 GRASS

- A. Grass shall be planted in beds of growing medium 500 mm deep plus a 200 mm deep gravel drainage layer.
- B. Previously established grades shall be on the areas to be treated in a true and even condition, and necessary repairs shall be made to previously graded areas. All surfaces shall be left in a smooth condition to prevent formation of depressions. Areas having inadequate drainage as indicated by the ponding of water near foundations, walks, driveways, or on other areas shall be filled or graded to drain as directed by the Engineer. Ruts, deep tracks, dead furrows, and ridges shall be eliminated and the necessary replanting accomplished prior to acceptance of the completed work. The finished grade shall be such that after sodding operations, the sodded grade will be level with the adjacent surface grade of walks, drives and curbs. All debris and stones larger than 25mm remaining on the surface after grading and tillage operations shall be removed.
- C. After the areas have been brought to the previously established grades, tillage shall be accomplished in such manner as to prepare an acceptable sod bed. Contractor shall utilize a tractor-mounted or walk behind root-tiller type machine capable of tilling the soil and incorporating the soil amendments to the specified depth. After completion of tillage, lawn areas shall be raked smooth and stone and debris removed.
- D. Prior to commencing tillage operation, Contractor shall spread organic matter to a uniform depth of 25mm. Organic matter shall then be incorporated into the top 15cm of the turf bed to establish a uniform planting soil consisting of 5 parts existing topsoil and 1 part organic matter.
- E. Prior to tillage for planting NPK fertilizer shall be applied at the rate of 560 kg per hectare. Fertilizer shall be distributed with a fertilizer distributor equipped with baffle plates to prevent downward movement of fertilizer when operated on a slope. Fertilizer shall be uniformly distributed.
- F. Installation of sod shall be done by experienced staff. Each sod-roll will be hand held till laid down; no sod-rolls shall be accepted when thrown to the ground from truck or wheel barrow. When rolls are laid out, they shall be "tucked in" close, no gaps (space) to be left between rows of sod. A "walk-behind" water-filled metal roller shall be utilized to press the sod firmly down on the soil, to the Engineer's approval.
- G. The sodded areas shall be refertilized three weeks after commencement of maintenance operations and thereafter at four week intervals throughout the growing season. Fertilizer for refertilizing shall be applied at the rate of 280kg of 16-16-16 per hectare. Fertilizer shall be applied only when vegetation is dry. The refertilized areas shall be irrigated within 4 hours following refertilizing operation.
- H. Sodding shall not be done:
 - 1. when the ground is in an unsatisfactory condition for planting or when the sod is not acceptable to Engineer;
 - 2. In Winter: when soil is too wet, or too cold, top 10cm of soil should not be less than 20°C.

3. In Summer: when soil is too dry; no installation of sod between 10 am and 3 pm unless approved by Engineer, in both cases, Engineer's approval to commence is required.
 - I. Sod shall be installed as soon as possible after delivery to site.
 - J. Sod shall be transported during night time, up to 8 am, or late afternoon after 5 pm.
 - K. All sod shall be inspected and approved by Engineer before unloading. It is the Contractors responsibility if the sod is inspected after unloading and rejected.
 - L. Sod shall originate from approved regional sod farms and each load shall have a certificate of the approved sod farms indicating time of lifting and loading and the type of grass (e.g. Cynadon & Variety).
 - M. Irrigation shall commence within 2 to 4 hours of completing sodding planting. The irrigation system installed on the site shall be used; however any failure of this system does not eliminate the Contractor's responsibility of maintaining the desired level of moisture necessary to promote establishment of the grass. In the event of irrigation system failure, irrigation water shall be applied using portable rotating sprinklers. Irrigation water shall be applied as necessary to maintain the top 4 inches (10cm) of soil in a moist condition. Irrigation shall be accomplished in a manner that will not create erosion or runoff. All areas damaged shall be repaired immediately at no cost to the Owner.
 - N. After the sod is installed, irrigation shall be applied daily to maintain soil moisture between 100 percent and 70 percent of field capacity. Irrigation shall be applied in early morning or evening to enable the soil to absorb a maximum of water with minimum evaporation. The Contractor shall continue to irrigate and maintain the turf during the Establishment Period, until final acceptance.

2.8 SOIL MATERIALS

- A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0; organic matter to exceed 1.5%, magnesium to exceed 100 units; phosphorus to exceed 150 units; potassium to exceed 120 units; soluble salts/conductivity not to exceed 900 ppm/0.9 mmhos/cm in soil.

2.9 SOIL AMENDMENT MATERIALS

- A. When soil tests indicate soil amendment, apply soil conditioners or fertilizers to amend soil to specified conditions.
 1. Tree Fertilizer: Containing fifty percent of elements derived from organic sources; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis.
- B. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight, pH range of 4 to 5; moisture content of 30 percent.

- C. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.
- D. Lime: Ground limestone, dolomite type, minimum 95 percent carbonates.
- E. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of plants.
- F. Herbicide: As instructed by the supplier.
- G. Pesticide: As instructed by the supplier.

2.10 MULCH MATERIALS

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

2.11 ACCESSORIES

- A. Wrapping Materials: Burlap.
- B. Stakes: Softwood lumber, pointed end, or mild steel angle, galvanized, pointed end.
- C. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.
- D. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.
- E. Plant Pot: As indicated on drawings.
- F. Grates: As indicated on drawings.
- G. Decorative Cover: As indicated on drawings.
- H. Membrane: 0.5 mm thick, clear or black polyethylene, and/or water permeable polyolefin fabric.
- I. Wrapping: Waterproof fabric.
- J. Tree Protectors: Metal or Plastic with galvanized rings.

2.12 TOPSOIL AND/OR PLANT SOIL MIX

- A. Topsoil and/or Plant Soil Mix: Uniform mixture of 1 part peat and 3 parts topsoil by volume.

2.13 SEPARATORS

- A. Junction between Different Types of Softscaping: Flexible PVC/rubber, 5 mm thick, width to cover the full depth of topsoil.

- B. Junction between Hardscaping and Softscaping: Flexible PVC/rubber with aluminum facing on both sides, 3.2 mm thick, width to cover the full depth of topsoil.

2.14 SOURCE QUALITY CONTROL

- A. General Requirements: Quality requirements for testing, inspection and analysis.
- B. Test and analyze imported and existing topsoil.
- C. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter; and pH value.
- D. Provide recommendation for fertilizer and soil amendment application rates for specified planting as result of testing.
- E. Testing is not required when recent tests are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.
- B. Verify prepared subsoil and planters are ready to receive work.
- C. Saturate soil with water to test drainage.
- D. Verify required underground utilities are available, in proper location, and ready for use.

3.2 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.
- C. Scarify subsoil to depth of 75 mm where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.
- D. Dig pits and beds three times wider than plant root system.

3.3 EXCAVATION

- A. Excavate for tree and shrub plantation, and for ground cover as per Section 02315.

3.4 PLACING DRAINAGE LAYER

- A. Fill and spread gravel materials as a drainage layer at bottom of pits and under ground cover to required thickness.
- B. Place geotextile on top of drainage layer.

3.5 PLACING TOPSOIL

- A. Spread topsoil to minimum depth of 150 mm over area to be planted. Rake smooth.
- B. Place topsoil during dry weather and on dry subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install topsoil into pits and beds intended for plant root balls, to minimum thickness of 150 mm.

3.6 FERTILIZING

- A. Apply starter fertilizer at rate instructed by supplier.
- B. Apply after initial raking of topsoil.
- C. Mix thoroughly into upper 50 mm of topsoil.
- D. Lightly water soil to aid dissipation of fertilizer.

3.7 PLANTING

- A. Place plants for best appearance for review and final orientation by the Engineer.
- B. Set plants vertical.
- C. Remove non-biodegradable root containers.
- D. Set plants in pits or beds, partly filled with prepared plant mix, at minimum depth of 150 mm unless otherwise indicated on Drawings under each plant. Remove loosen burlap, ropes and wires from top half of root ball.
- E. Place bare root plant materials so roots lie in natural position. Backfill soil mixture in 150 mm layers. Maintain plant life in vertical position.
- F. Saturate soil with water when pit or bed is half full of topsoil and again when full.

3.8 PLANT RELOCATION AND RE-PLANTING

- A. Relocate plants as indicated on drawings and/or directed by the Engineer.

- B. Ball or pot removed plants when temporary relocation is required.
- C. If a tree has to be transplanted in fall, it should be root-pruned in the spring before new buds appear. Plants to be transplanted in spring should be root-pruned the previous fall after the leaves drop. When transplanting time arrives, the basic steps are:
1. Contractor should Water the soil the day before to soften the ground, reduce stress to plant roots and help keep the root ball intact.
 2. Contractor should Dig the new planting hole and have it ready for the transplant. Dig the hole two to three times as wide as the root ball but no deeper. The Contractor should Moisten the hole before installing the root ball to help reduce transplant shock
 3. The Contractor should Tie the lower branches up to protect them and keep them out of your way while digging.
 4. The Contractor should Gently remove the topsoil from the top of the roots near the trunk and mark the area to be dug. To include newly grown roots, The Contractor should mark 4 to 6 inches further out from the trench where the roots were pruned. Begin digging outside of this mark.
 5. The Contractor should begin digging with a flat spade, keeping the face turned away from the plant. Continue digging around the plant. Dig progressively deeper, shaping the root ball as you go. If the contractor encounters large roots, He should cut them with loppers.
 6. When The Contractor have cut around the plant down to the proper level to include the roots, begin digging underneath the root ball.
 7. Before cutting the root ball completely, The Contractor should place a tarp or sheet of burlap into the hole beside the ball. Dig under the ball and cut any last remaining roots below. Tilt the root ball over onto the tarp for wrapping and moving.
 - Root ball Size: Minimum 10inches in diameter per 1inch tree caliper. (If applicable) Root ball Depth: Around 80-100 cm
 - Upon award of contract, the contractor should prune trees back about 1/4th. Prune side branches only the contractor should not cut leaders.
 - Watering after transplanting is essential
 - The newly transplanted tree shouldn't be fertilized. The stress to acclimate to a new site is enough; fertilizing will stimulate unwanted new growth. We should wait one year before fertilizing a newly transplanted tree or shrub.
 - We expect a transplanted tree to take several years to fully recover from being moved. The plant may not bloom or produce new growth until it adjusts to its new home.
 - In General Ficus trees (and all type of trees) do not like to be removed, most Ficus trees will go into shock after transplanting. However, In our case the environment surrounding the trees (Sunlight, wind, altitude...) will remain the same , if the transplanting process will be carefully done the shock effect will be minimized and the trees will survive the relocation.
 - We recommend that stress on the tree be minimized by refraining from fertilizing or pruning the tree until it has recovered to its normal growth state, which can be weeks or up to several months.

3.9 INSTALLATION OF ACCESSORIES

- A. Place decorative cover, membrane, gravel, or stone as indicated on Drawings.
- B. Place grates with frames and reinforced concrete border support, at base of trees where indicated on Drawings.
- C. Wrap deciduous shade and flowering tree trunks and place tree protectors.

3.10 PLANT SUPPORT

- A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:

<u>Tree Caliper</u>	<u>Tree Support Method</u>
25 mm	1 stake with one tie
25 - 50 mm	2 stakes with two ties
50 - 100 mm	3 guy wires with eye bolts and turn buckles
Over 100 mm	4 guy wires with eye bolts and turn buckles

3.11 TREE PRUNING

- A. When pruning trees is required and permitted, lightly prune trees in accordance with ANSI A300 Maintenance Pruning Type: Crown Cleaning.

3.12 SEPARATORS

- A. Install separators at junction between different types of softscaping, and at junction between hardscaping and softscaping.

3.13 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Plants will be rejected when ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.14 PROTECTION

- A. Immediately after planting, the area shall be protected against traffic and others by erecting barricades, as required, and placing approved signs at appropriate intervals until final acceptance.
- B. Excess and waste material shall be removed daily to approved waste disposal site. When planting in an area has been completed, the area shall be cleaned of all debris and excess materials. Adjacent paving shall be cleaned when work in adjacent areas is completed.

3.15 SCHEDULES - PLANT LIST

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 03350
CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Finishing concrete floors and floor toppings.
 - 2. Floor surface treatment.
- B. Related Sections:
 - 1. Section 03300 - Cast-in-Place Concrete.
 - 2. Section 03390 - Concrete Curing.
 - 3. Section 07900 - Joint Sealers.

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM E1155 - Standard Test Method for Determining Floor Flatness and of Levelness Using the F-number System.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data on concrete hardener, sealer, curing compounds and slip resistant treatment, compatibilities, and limitations.

1.4 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1.
- B. Perform Work in accordance with the drawings and to the satisfaction of the Engineer.
- C. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum ten years documented experience.
- B. Applicator: Company specializing in performing work of this section with minimum five years documented experience.

1.7 MOCK-UP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up area under conditions similar to those which will exist during actual placing, 3000 mm long by 3000 mm wide, with specified finishes, and coatings applied.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Deliver materials in manufacturer's packaging including application instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements for environmental conditions affecting products on site.
- B. Temporary Lighting: Minimum 200 W light source, placed 2500 mm above floor surface, for each 40 m² of floor being finished.
- C. Temporary Heat: Ambient temperature of 10 degrees C minimum.
- D. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.10 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate the Work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPOUNDS - HARDENERS AND SEALERS

- A. Chemical Hardener: Magnesium fluorosilicate and zinc fluorosilicate blend, dry powder or liquid type.
- B. Metallic Hardener: Premixed, dry powder, colored, static disseminating, light reflective, oxidizable metallic, and/or spark resistant hardener.
- C. Non-Metallic Hardener: Premixed or dry powder, colored or clear, emery aggregate or quartz aggregate, abrasion resistant hardener.
- D. Colored Sealer: type as per manufacturer's recommendations.
- E. Exposed Aggregate Retarder for Flat Surfaces: color as selected from manufacturer's standard range, type as per manufacturer's recommendations.

2.3 SLIP RESISTANT TREATMENT

- A. Slip Resistant Finish: Aluminum oxide or Silica sand type, color as selected from manufacturer's standard range.
- B. Abrasive Aggregate: 95 percent minimum fused homogeneous aluminum oxide, Crushed emery, minimum 45 percent aluminum oxide, ferric oxide, minimum 25 percent, and/or Silicone carbide.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify floor surfaces are acceptable to receive the Work of this section.

3.2 FLOOR FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.
- B. Wood float surfaces receiving quarry tile, ceramic tile and cementitious terrazzo with full bed setting system.
- C. Steel trowel surfaces receiving carpeting, resilient flooring, seamless flooring, and thin set terrazzo, quarry tile and ceramic tile.

- D. Power float surfaces which are indicated to be exposed and all surfaces which are directed by the Engineer:
 - 1. Consolidate surface with power driven floats as soon as topping can support equipment and operator.
 - 2. Re-straighten, cut down high spots, and fill low spots.
 - 3. Repeat float passes and re-straightening until surface is smooth and uniform in texture, and to the satisfaction of the Engineer.

- E. Brush or roll concrete surfaces shown on drawings, or directed by the Engineer:
 - 1. Apply first trowel finish.
 - 2. Apply a hardener type "carborandum" or similar approved on fresh poured concrete surfaces.
 - 3. Brush or roll concrete topping by appropriate tools when concrete surface is hard enough and as soon as topping can support equipment and operator.
 - a. Brushing ribs to be perpendicular to traffic, unless otherwise stated.
 - b. Rolling stamped pattern to be as shown on drawings or as directed by the Engineer.

- F. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on Drawings.

3.3 FLOOR SURFACE TREATMENT

- A. Apply dry shake or liquid hardener on floor surfaces where indicated on drawings.
- B. Apply slip resistant finish on floor surfaces where indicated on drawings.
- C. Apply sealer on floor surfaces where indicated on drawings.
- D. Apply retarder to exposed aggregate or troweled finish on floor surfaces where indicated on drawings.

3.4 TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation of Surface Flatness for Exposed Concrete Floors: 3 mm in 3 m.
- C. Maximum Variation of Surface Flatness under Seamless Resilient Flooring: 3 mm in 3 m.
- D. Maximum Variation of Surface Flatness under Carpeting: 3 mm in 3 m.

3.5 DEFECTIVE WORK

- A. Correct defects in defined traffic floor by grinding or removal and replacement of defective Work.
- B. Areas requiring corrective Work shall be identified.

3.6 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 04065

MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes mortar and grout for masonry.
- B. Related Sections:
 - 1. Section 04810 - Unit Masonry Assemblies: Installation of mortar and grout.
 - 2. Section 04812 - Glass Masonry Assemblies.
 - 3. Section 04852 - Metal-Supported Stone Assemblies.
 - 4. Section 04853 - Mortar Placed Stone Assemblies.
 - 5. Section 04900 - Masonry Restoration and Cleaning.
 - 6. Section 08115 - Standard Steel Frames.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C5 - Standard Specification for Quicklime for Structural Purposes.
 - 2. ASTM C91 - Standard Specification for Masonry Cement.
 - 3. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 - 4. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 5. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 - 6. ASTM C150 - Standard Specification for Portland Cement.
 - 7. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars.
 - 8. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 - 9. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - 10. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 - 11. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
 - 12. ASTM C476 - Standard Specification for Grout for Masonry.
 - 13. ASTM C595M - Standard Specification for Blended Hydraulic Cements (Metric).
 - 14. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 15. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
 - 16. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
 - 17. ASTM C1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.
 - 18. ASTM C1329 - Standard Specification for Mortar Cement.
 - 19. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.

- B. The Masonry Society:
 - 1. TMS MSJC - Building Code for Masonry Structures (ACI 530/ASCE 5/TMS 402), Specification for Masonry Structures (ACI 530.1/ASCE 6/TMS 602) and Commentaries.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- C. Design Data: Submit design mix when Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.
- D. Test Reports:
 - 1. Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270 mortar to requirements of ASTM C1142 component mortar materials to requirements of ASTM C270 and test and evaluation reports to ASTM C780 for aggregate ratio and water content, air content, consistency and compressive strength.
 - 2. Submit reports on grout indicating conformance of grout to property requirements of ASTM C476, component grout materials to requirements of ASTM C476 and test and evaluation reports to ASTM C1019.
- E. Manufacturer's Installation Instructions: Submit premix mortar manufacturer's installation instructions.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.
- B. Maintain one copy of each document on site.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Hot and Cold Weather Requirements: TMS MSJC Specification.

PART 2 PRODUCTS

2.1 MORTAR AND MASONRY GROUT

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Portland Cement: ASTM C150, Type I, gray color.

- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Grout Aggregate: ASTM C404, fine and/or coarse.
- D. Water: Clean and potable.
- E. Calcium chloride is not permitted.

2.3 MIXES

- A. Mortar Mixes:
 - 1. Mortar for Structural Masonry: ASTM C270, Type M, S, or N, using Proportion specification.
 - 2. Mortar for Non-Structural Masonry: ASTM C270, Type M, S, N, or O, using Proportion specification.
 - 3. Pointing Mortar: ASTM C270, Type N or O, using Proportion specification.
 - 4. Stain Resistant Pointing Mortar: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.
 - 5. Mortar for Glass Unit Masonry: ASTM C270, Type S or N, using Proportion specification.
 - 6. Pointing Mortar for Glass Unit Masonry: ASTM C270, Type O, using Proportion specification; with maximum 2 percent ammonium stearate or calcium stearate per cement weight with beach or silica sand aggregate.
- B. Mortar Mixing:
 - 1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
 - 2. Achieve uniformly damp sand immediately before mixing process.
 - 3. Add admixtures in accordance with manufacturer's instructions to achieve uniformity of mix and coloration.
 - 4. Re-temper only within two hours of mixing.
- C. Grout Mixes:
 - 1. Grout for Non-Structural Masonry: 14 MPa strength at 28 days; 200 to 280 mm slump; mixed in accordance with ASTM C476 fine or coarse grout.
 - 2. Grout for Structural Masonry: 14 MPa strength at 28 days; 200 to 280 mm slump; mixed in accordance with ASTM C476 fine or coarse grout.
 - 3. Application:
 - a. Coarse Grout: For grouting spaces with minimum 100 mm dimension in every direction.
 - b. Fine Grout: For grouting other spaces.
- D. Grout Mixing:
 - 1. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.
 - 2. Add admixtures as per manufacturer's instructions and mix uniformly.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Request inspection of spaces to be grouted.

3.2 PREPARATION

- A. Apply bonding agent to existing concrete surfaces in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install mortar and grout in accordance with TMS MSJC Specification.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, execution requirements for testing, adjusting and balancing.
- B. Testing of Mortar Mix: In accordance with ASTM C780 for aggregate ratio and water content, air content, consistency and compressive strength.
- C. Testing of Grout Mix: In accordance with ASTM C1019 for compressive strength, and in accordance with ASTM C143/C143M for slump.
- D. Test flexural bond strength of mortar and masonry units to ASTM C1357; test in conjunction with masonry unit sections specified.
- E. Test compressive strength of mortar and masonry to ASTM C1314; test in accordance with masonry unit sections specified.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 04810

UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Concrete masonry units.
 2. Fairfaced concrete blocks.
 3. Lightweight blocks.
 4. Lightweight thermal insulating clay blocks.
- B. Related Sections:
1. Section 03200 - Concrete Reinforcement.
 2. Section 03300 - Cast-in-Place Concrete.
 3. Section 04065 - Masonry Mortar and Grout.
 4. Section 04853 - Mortar-Placed Stone Assemblies.
 5. Section 05120 - Structural Steel.
 6. Section 05500 - Metal Fabrications.
 7. Section 07212 - Board Insulation: Insulation for cavity spaces.
 8. Section 07260 - Vapor Retarders.
 9. Section 07270 - Air Barriers.
 10. Section 07620 - Sheet Metal Flashing and Trim.
 11. Section 07900 - Joint Sealers.

1.2 REFERENCES

- A. ASTM International:
1. ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 2. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.
 3. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 4. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 5. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 6. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 7. ASTM A951 - Standard Specification for Masonry Joint Reinforcement.
 8. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.
 9. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile.
 10. ASTM C55 - Standard Specification for Concrete Brick.
 11. ASTM C56 - Standard Specification for Structural Clay Non-Load-Bearing Tile.
 12. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).

13. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
14. ASTM C73 - Standard Specification for Calcium Silicate Face Brick (Sand-Lime Brick).
15. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
16. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
17. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
18. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
19. ASTM C150 - Standard Specification for Portland Cement.
20. ASTM C212 - Standard Specification for Structural Clay Facing Tile.
21. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
22. ASTM C315 - Standard Specification for Clay Flue Linings.
23. ASTM C530 - Standard Specification for Structural Clay Non-Loadbearing Screen Tile.
24. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
25. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
26. ASTM C1261 - Standard Specification for Firebox Brick for Residential Fireplaces.
27. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

B. The Masonry Society:

1. TMS MSJC - Building Code for Masonry Structures (ACI 530/ASCE 5/TMS 402), Specification for Masonry Structures (ACI 530.1/ASCE 6/TMS 602) and Commentaries.

1.3 PERFORMANCE REQUIREMENTS FOR BLOCKWORKS

A. Construction Details:

1. Walls shall be built from structural floor to underside of the structural soffit.
2. The cavity between the two wall leaves shall not be bridged, except by means of butterfly wall ties.
3. The separating wall shall have no chases or sockets cut into it.
4. Vertical and horizontal joints within blocks and between blockwork and other constructions shall be filled with mortar to full the depth of the blockwork. There shall be no cavities or holes in the mortar.
5. Where builders work holes are to be created, the Contractor shall ensure that the opening is finished no greater than 50 mm from the service penetration. It must be ensured that the penetration is suitably sealed in order that the acoustic performance of the wall construction is not degraded.
6. Following award of Tender, the Contractor shall submit to the Engineer for approval, all necessary shop drawings of proposed construction details, including all necessary stiffening columns and tie beams for masonry, and

including lintel, jambs and sill detail for each opening whether it is shown on drawings or not, and showing all service penetrations and all other details.

1.4 SEISMIC REQUIREMENTS

- A. Masonry walls shall comply with Uniform Building Code (UBC) 1997 requirements as concerns resistance to seismic forces and shall have at least the descriptions stated in these Specifications and shown on the Drawings.

1.5 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data for concrete masonry units and fabricated wire reinforcement, wall ties, anchors and all other accessories.
- C. Samples: Submit four samples of concrete masonry units to illustrate color, texture and extremes of color range.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.
- B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.8 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct masonry wall mockup into a panel sized 2800 x 2000 mm high complete including masonry, mortar, accessories, structural backup, wall openings, flashings, wall insulation, air barrier, vapor retarder, parging and all other related items.
- C. Locate where directed by the Engineer.
- D. Remove mockup where directed by the Engineer.

1.9 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Accept concrete masonry units on site. Inspect for damage.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Hot and Cold Weather Requirements: TMS MSJC Specification.

1.12 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate masonry work with stone cut veneer, installation of window and door anchors.

1.13 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.

PART 2 PRODUCTS

2.1 UNIT MASONRY ASSEMBLIES

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Hollow or Solid Load-Bearing or Non-Load Bearing Concrete Masonry Units: To ASTM C90 or ASTM C129, Type I - Moisture Controlled, or Type II - Non-moisture Controlled; normal, medium, or light weight.
 - 1. Size and Shape: Of nominal modular size as shown on drawings, or as directed by the Engineer. Furnish special units for 90° corners, bond beams, lintels, coved base and bullnosed corners.
- B. Hollow or Solid Fairfaced Concrete Blocks: Type "Best" or similar approved.
- C. Hollow or Solid Lightweight Blocks: Type Siporex or similar approved, made up of "Pumice" aggregates or other light construction material; excellent insulating properties; excellent sound buffer; very fire resistant; meant for the construction of carrying and non-carrying walls.

- D. Lightweight Thermal Insulating Clay Blocks: Cellular clay blocks with polystyrene inserts for external walls; excellent insulating properties; very fire resistant; meant for the construction of carrying and non-carrying walls.

1. Block Characteristics:

- a. Block Density: 820 kg/m³, tested in accordance with ASTM C67.
- b. Maximum Thermal Conductivity of Clay Material @ 35°C and 60% RH: 0.18 W/m/°K, tested in accordance with ASTM C518.
- c. Maximum Thermal Conductivity of Block with the Polystyrene Inserts @ 35°C & 60% RH: 0.11 W/m/°K, tested in accordance with ASTM C177, or ASTM C1363.
- d. Type, Size, Weight and Compressive Strength: Refer to the following table, tested in accordance with ASTM C67.

Type	Size (mm)	Weight (kg)	Compressive Strength (kg/cm ²)
1) External Load Bearing	400x200 x 200	14.0	176
2) External Non-Load Bearing	400x250 x 200	16.4	52
3) External Non-Load Bearing	400x200 x 200	13.2	57
4) Internal	400x200 x 200	12.0	50
5) Internal	400x150 x 200	9.2	64
6) Internal	400x100 x 200	6.6	72

2. Polystyrene inserts shall conform to the following:

- a. Type: Molded
- b. Density: 22 kg/m³.
- c. Maximum Thermal Conductivity @ 35°C & 60% RH: 0.037W/m/°K.

2.3 ACCESSORIES

- A. Single Wythe Joint Reinforcement: Truss and/or ladder type; stainless steel type 316, conforming to ASTM A580/A580M, 4.8 mm side rods.
- B. Multiple Wythe Joint Reinforcement: Truss or ladder type; with moisture drip; adjustable type, stainless steel type 316, to ASTM A580/A580M, 4.8 mm side rods.
- C. Reinforcing Steel: As specified in section 03200.
- D. Head Restraints: Austenitic stainless steel Ancon Head Restraints Type IHR-V or approved equal.
- E. Strap Anchors: Hot dip galvanized to ASTM A153/A153M "B2" finish.
- F. Wall Ties: Corrugated formed sheet metal, hot dip galvanized to ASTM A153/A153M "B2" finish.
- G. Wall Ties: Formed steel wire, adjustable and/or eye and pintle type, hot dip galvanized to ASTM A153/A153M "B2" finish.
- H. Dovetail Anchors: Bent steel strap, galvanized to ASTM A153/A153M "B2" finish.
- I. Anchor Bolts: Headed, J-shaped or L-shaped.
- J. Mortar and Grout: As specified in Section 04065.

- K. Stainless Steel: ASTM A666, Type 316, soft temper, smooth finish.
- L. Lap Sealant: As specified in Section 07900.
- M. Preformed Control Joints: Rubber, neoprene or polyvinyl chloride material. Furnish with corner and tee accessories, and fused joints.
- N. Joint Filler: Closed cell polyvinyl chloride, polyethylene, polyurethane and/or rubber; oversized 50 percent to joint width; self expanding.
- O. Building Paper: ASTM D226, No. 15 or 30, asphalt saturated felt.
- P. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
- Q. Weeps: Preformed plastic tubes cotton wick filled and/or hollow, vents with sloping louvers, and/or cotton rope.
- R. Cavity Vents: Molded polyvinyl chloride grilles and/or Aluminum; insect resistant.
- S. Chimney Cap: Precast concrete, sized to cover chimney construction plus additional overhang for drip on four sides, slope from flue opening to edges for natural drainage.
- T. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
- U. Precast or Cast-in-situ Reinforced Concrete Lintels: Concrete shall be using Ordinary Portland cement to ASTM C150, Type I, 25 MPa strength at 28 days, and as specified in Section 03300; size as indicated on Drawings.
- V. Steel Lintels (if any): Size as indicated on Drawings, hot-dip galvanized.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. Verify items provided by other sections of work are properly sized and located.
- D. Verify built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other sections.
- B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.3 INSTALLATION

- A. Establish lines, levels and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.
- C. Coursing of Concrete Masonry Units:
 - 1. Bond: Running or stacked.
 - 2. Coursing: One unit and one mortar joint to equal 200 mm.
 - 3. Mortar Joints: Concave, raked, flush or beveled.
- D. Placing and Bonding:
 - 1. Lay solid masonry units in full bed of mortar, with full head joints.
 - 2. Lay hollow masonry units with face shell bedding on head and bed joints.
 - 3. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
 - 4. Remove excess mortar as work progresses.
 - 5. Interlock intersections and external corners.
 - 6. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
 - 7. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
 - 8. Cut mortar joints flush where wall tile is scheduled, cement parging is required, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen dampproofing is applied.
 - 9. Isolate masonry from vertical structural framing members with movement joint as indicated on Drawings and/or as directed by the Engineer.
 - 10. Isolate top of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.
- E. Weeps and Vents: Furnish weeps and vents in outer wythe at 600 and/or 800 mm oc horizontally above through-wall flashing, above shelf angles and lintels, and/or at bottom of walls.
- F. Cavity Wall: Do not permit mortar to drop or accumulate into cavity air space or to plug weeps. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.
- G. Joint Reinforcement and Anchorage - Single Wythe Masonry:
 - 1. Install horizontal joint reinforcement 400 mm oc.
 - 2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.
 - 3. Place joint reinforcement continuous in 1st and 2nd joint below top of walls.
 - 4. Lap joint reinforcement ends minimum 150 mm.
 - 5. Reinforce stack bonded unit joint corners and intersections with strap anchors 400 mm oc.
- H. Joint Reinforcement and Anchorage - Masonry Veneer:
 - 1. Install horizontal joint reinforcement 400 mm oc.

2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.
 3. Place joint reinforcement continuous in 1st and 2nd joint below top of walls.
 4. Lap joint reinforcement ends minimum 150 mm.
 5. Embed wall ties in masonry backing to bond veneer for every 0.25m². Place at maximum 75mm oc each way around perimeter of openings, within 300mm of openings.
 6. Coordinate following with typical stud spacing of 16 or 24 inch oc.
 7. Secure wall ties and rod or strap anchors to stud framed backing and embed into masonry veneer at maximum 400 mm oc vertically and 900 mm oc horizontally. Place at maximum 75 mm oc each way around perimeter of openings, within 300 mm of openings.
 8. Reinforce stack bonded unit joint corners and intersections with strap anchors 400 mm oc.
- I. Joint Reinforcement and Anchorages - Cavity Wall Masonry:
1. Install horizontal joint reinforcement 400 mm oc.
 2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.
 3. Place joint reinforcement continuous in 1st and 2nd joint below top of walls.
 4. Lap joint reinforcement ends minimum 150 mm.
 5. Embed anchors in concrete. Attach to structural steel members.
 6. Reinforce stack bonded unit joint corners and intersections with strap anchors 400 mm oc.
- J. Reinforcement and Anchorages - Multiple Wythe Unit Masonry:
1. Install horizontal joint reinforcement 400 mm oc.
 2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.
 3. Place joint reinforcement continuous in 1st and 2nd joint below top of walls.
 4. Lap joint reinforcement ends minimum 150 mm.
 5. Support and secure reinforcing bars from displacement. Maintain position within 13 mm of dimensioned position.
 6. Embed anchors embedded in concrete or attached to structural steel members. Embed anchorages in every second block and/or sixth brick joint.
 7. Reinforce stack bonded unit joint corners and intersections with strap anchors 400 mm oc.
- K. Masonry Flashings:
1. Extend flashings horizontally through outer wythe at foundation walls, above ledge or shelf angles and lintels, under parapet caps, and/or at bottom of walls, and turn down on outside face to form drip.
 2. Turn flashing up minimum 200 mm and bed into mortar joint of masonry, seal to concrete, or to sheathing over wood, steel stud or framed backing.
 3. Lap end joints minimum 150 mm and seal watertight.
 4. Turn flashing, fold, and seal at corners, bends, and interruptions.
- L. Lintels:
1. Install loose steel or precast or cast-in-situ concrete lintels over openings.
 2. Reinforcing bars for lintels shall be as indicated on drawings.
 3. Do not splice reinforcing bars.

4. Support and secure reinforcing bars from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. Allow lintels to attain the specified strength before removing temporary supports.
7. Bearing on each side of opening shall be as indicated on drawings, but in no case shall be less than 200 mm.
8. Fill gap beneath bearing plates with high strength grout. Minimum allowable gap 5 mm and maximum allowable gap 20 mm.

M. Grouted Components:

1. Reinforce bond beam as indicated on drawings.
2. Lap splices bar diameters required by code.
3. Support and secure reinforcing bars from displacement.
4. Place and consolidate grout fill without displacing reinforcing.
5. At bearing locations, fill masonry cores with grout for minimum 300 mm both sides of opening.

N. Reinforced Masonry:

1. Lay masonry units with core and/or cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
2. Place reinforcement bars as indicated on Drawings.
3. Splice reinforcement in accordance with Section 03200.
4. Support and secure reinforcement from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. Place grout in accordance with TMS MSJC Specification.

O. Control and Expansion Joints:

1. Do not continue horizontal joint reinforcement through control and expansion joints.
2. Install preformed control joint device in continuous lengths. Seal butt corner joints.
3. Size control joint in accordance with Section 07900 for sealant performance.
4. Form expansion joint by omitting mortar and cutting unit to form open space.

P. Built-In Work:

1. As work progresses, install built-in metal door and/or glazed frames, fabricated metal frames, window frames, wood nailing strips, fireplace accessories, anchor bolts, plates, and all other items to be built in the work and furnished by other sections.
2. Install built-in items plumb and level.
3. Bed anchors of metal door and/or glazed frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum 300 mm from framed openings.
4. Do not build in materials subject to deterioration.

Q. Cutting and Fitting:

1. Cut and fit for chases, pipes, conduit, sleeves, grounds, etc. Coordinate with other sections of work to provide correct size, shape and location.
2. Obtain Engineer's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

- R. Parging:
 - 1. Dampen masonry walls prior to parging.
 - 2. Scarify each parging coat to ensure full bond to subsequent coat.
 - 3. Parge masonry walls in two uniform coats of mortar to 19 mm total thickness.
 - 4. Steel trowel surface smooth/flat with maximum surface variation of 1mm/m.
 - 5. Strike top edge of parging at 45°.
- S. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Alignment of Columns: 6 mm.
- C. Maximum Variation from Unit to Adjacent Unit: 1.6 mm.
- D. Maximum Variation from Plane of Wall: 6 mm/3 m and 13 mm/6 m or more.
- E. Maximum Variation from Plumb: 6 mm per story non-cumulative; 13 mm in two stories or more.
- F. Maximum Variation from Level Coursing: 3 mm/m and 6 mm/3 m; 13 mm/9 m.
- G. Maximum Variation of Joint Thickness: 3 mm/m.
- H. Maximum Variation from Cross Sectional Thickness of Walls: 6 mm.
- I. Maximum Variation for Steel Reinforcement:
 - 1. Plus or minus 13 mm when distance from centerline of steel to opposite face of masonry is 200 mm or less.
 - 2. Plus or minus 25 mm when distance is between 200 and 600 mm.
 - 3. Plus or minus 32 mm when distance is greater than 600 mm.
 - 4. Plus or minus 50 mm from location along face of wall.

3.5 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Concrete Masonry Units: Test each type in accordance with ASTM C140.

3.6 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.7 SCHEDULES

A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes shop fabricated metal items.
- B. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete.
 - 2. Section 07140 - Fluid Applied Waterproofing.
 - 3. Section 09900 - Paints and Coatings.

1.2 REFERENCES

- A. Aluminum Association:
 - 1. AA DAF-45 - Designation System for Aluminum Finishes.
- B. American Architectural Manufacturers Association:
 - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 6. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
 - 7. ASTM A297/A297M - Standard Specification for Steel Castings, Iron-Chromium and Iron-Chromium-Nickel, Heat Resistant, for General Application.
 - 8. ASTM A283/283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 9. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.

10. ASTM A312/A312M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
11. ASTM A325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).
12. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
13. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
14. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
15. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
16. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.
17. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings.
18. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.
19. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
20. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric).
21. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire (Metric).
22. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
23. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.

D. American Welding Society:

1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.
3. AWS D1.6 - Structural Welding Code - Stainless Steel.

E. National Ornamental & Miscellaneous Metals Association:

1. NOMMA Guideline 1 - Joint Finishes.

F. The Society for Protective Coatings (SSPC):

1. SSPC - Steel Structures Painting Manual.
2. SSPC SP 1 - Solvent Cleaning.
3. SSPC SP 2 - Hand Tool Cleaning.
4. SSPC SP 10 - Near-White Blast Cleaning.
5. SSPC Paint 15 - Steel Joist Shop Paint.
6. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and/or Type II - Organic).

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.

- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- C. Shop Drawings for Slab Edge Panels: Indicate dimensions, panel profile and layout, spans, joints, expansion joints, construction details, methods of anchorage, method and sequence of installation and interface with adjacent materials.
- D. Samples: Submit two samples of each metalwork type, size as directed by the Engineer, illustrating factory finishes.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.
- F. Design and Performance Data: Submit panel profile characteristics and dimensions, and structural properties. Submit design calculations.
- G. Manufacturer's Installation Instructions: Submit special handling criteria, installation sequence, and cleaning procedures.

1.4 QUALITY ASSURANCE

- A. Materials and work shall conform to the latest edition of reference specified herein and to applicable codes and requirements of local authorities having jurisdiction, including the following:
 - 1. The National Association of Architectural Metal Manufacturers (NAAMM)
 - a. Metal Finishes Manual
 - b. Metal Bar Grating Manual
 - c. Metal Products Outline Manual
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code – Steel," D1.3 "Structural Welding Code – Sheet Steel", and D1.2 "Structural Welding Code – Aluminum".
- C. Structural Performance: Design, engineer, fabricate and install metal fabrications to withstand structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Comply with the "Performance Criteria" specified hereinafter.
- D. Conflicting Requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.
- E. Design cold-formed framing to comply with ASCE-7-95 and Uniform Building Code.
 - 1. Design Load for Exterior Wall assembly: Not less than 146 kg/m².
 - 2. Increase size of individual members, including anchorage, or reinforce to resist loads without undue deflection.
- F. Maximum Horizontal Deflection at Mid-Plan
 - 1. At Ceramic Tile: 10mm or L/600 of span based on moment of inertia of stud cross section only, whichever is less.

2. Increase size of individual members, including anchorage, or reinforce to resist loads without undue deflection.
- G. Sloped Sills: Size to resist wind loads plus anticipated live loads of 195 kg/m², but not less than 1.5mm thick.
- H. Interior Locations Indicated as Structural Steel Stud: Size to resist anticipated loads, but not less than 0.9mm thick unless otherwise indicated.
- I. Differential Movement: Design and construct wall system to accommodate anticipated movement indicated herein, without damage or deterioration to studs or wallboards, without buckling, opening of joints, and cracking.
- J. Certifications: Work of this Section shall be performed under the direct supervision of a registered Professional Engineer.
- K. Perform Work in accordance with the drawings and to the approval of the Engineer.
- L. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Design under direct supervision of Professional Engineer experienced in design of this Work and approved by the Engineer.
- B. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- C. Installer: Company specializing in performing Work of this section with minimum five years documented experience.
- D. Welders' Certificates: Submit under provisions of the administrative requirements of the Specifications General Requirements, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

1.6 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- C. Protect metal fabrications from damage by exposure to weather.

1.7 FIELD MEASUREMENTS

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

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500, Grade B, and/or ASTM A501.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B, Schedule 40.
- E. Fasteners: as instructed by the manufacturer.
- F. Bolts, Nuts, and Washers: ASTM A325M, A307 and/or galvanized to ASTM A153/A153M for galvanized components.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.
- I. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic and/or Type II Organic zinc rich.

2.2 MATERIALS - STAINLESS STEEL

- A. Bars and Shapes: ASTM A276, and/or ASTM A479/A479M; Type 316.
- B. Tubing: ASTM A269, and/or ASTM A554; Type 316.
- C. Pipe: ASTM A312/A312M, seamless and/or welded; Type 316.
- D. Plate, Sheet and Strip: ASTM A167; Type 316.
- E. Bolts, Nuts, and Washers: ASTM A354.
- F. Welding Materials: AWS D1.6; type required for materials being welded.

2.3 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221M, Alloy 6063, Temper T5.
- B. Sheet Aluminum: ASTM B209M.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210M, Alloy 6063, Temper T6.
- D. Aluminum-Alloy Bars: ASTM B211M, Alloy 6063, Temper T6.
- E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.
- F. Aluminum-Alloy Die Castings: ASTM B85.

- G. Bolts, Nuts, and Washers: Stainless steel type 316.
- H. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 ISOLATING NON-CONDUCTIVE MATERIALS BETWEEN DISSIMILAR METALS

- A. Contacts between dissimilar metals should be avoided in order to prevent bi-metallic or galvanic corrosion.
- B. Dissimilar metals shall be isolated from each other with non-conductive materials. Generally, such isolating elements will take the form of washers and bushes.
- C. Isolated Non-Conductive Materials: Neoprene, synthetic resin bonded fiber (SRBF) such as tufnol, polytetrafluoroethylene (PTFE), or hard nylon, depending on fixing:
 - 1. Load Bearing Fixings: SRBF or PTFE (strong material).
 - 2. Restraint Fixings: Neoprene or nylon is acceptable.
- D. Electrical insulation tape and bitumen paint are considered in low risk short life application, and shall not be used as non-conductive materials unless directed by the Engineer.

2.5 LADDERS

- A. Steel, Aluminum and/or Stainless Steel Ladder: ANSI A14.3, steel, aluminum and/or stainless steel welded construction: Unless otherwise indicated on drawings:
 - 1. Side Rails: 9 x 50 mm side rails spaced at 500 mm.
 - 2. Rungs: 25 mm diameter solid and/or tubular rod spaced 300 mm on center.
 - 3. Mounting: Space rungs 175 mm from wall surface; with steel mounting brackets and attachments.
 - 4. Finish: Galvanized, enamel, anodized, satin chrome, or polished chrome finish, as selected.
- B. Ladder Safety Cage: Unless otherwise indicated on drawings, Steel and/or Aluminum bar sections, minimum 6 x 50 mm.
 - 1. Bottom hoop 455 mm radius maximum 1880 mm above finished floor.
 - 2. Other hoops 355 mm radius spaced maximum 1220 mm on center.
 - 3. Vertical bars spaced 250 mm on center.
 - 4. Finish: Match ladder finish.
- C. Ladder Security Enclosure: Unless otherwise indicated on drawings, Sheet steel minimum 1.5 mm thick, formed to enclose ladder side rails and rungs when closed and to swing free of ladder rungs and side rails with minimum 38 mm clear to side rails in open position.
 - 1. Provide continuous steel hinge full height of enclosure.
 - 2. Provide steel hasp for padlocking in closed and open position.
 - 3. Finish: Match ladder finish.

2.6 STRUCTURAL SUPPORTS

- A. Structural Supports for Miscellaneous Attachments: Steel sections, shape and size as indicated on Drawings, required to support applied loads (Dead & Live) with maximum deflection of 1/200 of the span; prime paint, one coat or mill finish.

2.7 ANCHOR BOLTS

- A. ASTM A307; steel bolt, standard J-hook, with nut and washer; unfinished.

2.8 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler and/or continuous welds.
- D. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with component design, except where specially noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.9 FACTORY APPLIED FINISHES - STEEL

- A. Prepare surfaces to be primed in accordance with SSPC SP 2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Do not prime surfaces in contact with concrete or where field welding is required.
- D. Prime paint items with one or two coats except where galvanizing is specified.
- E. Galvanized Structural Steel Members: Galvanize after fabrication to ASTM A123. Furnish minimum 380 g/sq m galvanized coating.
- F. Galvanized Non-structural Items: Galvanized after fabrication to ASTM A123. Furnish minimum 380 and/or 360 g/m² galvanized coating.
- G. Chrome Plating: ASTM B177, nickel-chromium alloy, satin and/or polished finish.

2.10 FACTORY APPLIED FINISHES - STAINLESS STEEL

- A. Satin Polished Finish: Number 4, satin directional polish parallel with long dimension of finished face. Color: As selected.
- B. Mirror Polished Finish: Number 8, mirror polish with preliminary directional polish lines removed. Color: As selected.

2.11 FACTORY APPLIED FINISHES - ALUMINUM

- A. Finish coatings to conform to AAMA 2603, 2604, 2605 and/or AAMA 611. Comply with AA DAF-45.

- B. Exterior and Interior Aluminum Surfaces: Advanced Durability Polyester Powder Coating System. Color: As selected. Minimum cover thickness 60 microns. Gloss Percentage: As selected.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.12 FABRICATION TOLERANCES

- A. Squareness: 3 mm maximum difference in diagonal measurements.
- B. Maximum Offset between Faces: 1.5 mm.
- C. Maximum Misalignment of Adjacent Members: 1.5 mm.
- D. Maximum Bow: 3 mm in 1.2 m.
- E. Maximum Deviation from Plane: 1.5 mm in 1.2 m.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply steel items required to be cast into concrete, or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

- A. Install work of this section square, plumb, straight, true to line or radius, accurately fitted and located, with flush tight hairline joints (except as indicated otherwise or to allow for thermal movement). Provide attachment devices as required for secure and rigid installation.
- B. Exposed joints shall be close fitting, and bolts and screws, where exposed, shall be cut off flush with nuts or other adjacent metal. Cutting, drilling, punching and tapping required for the installation and attachment of other work to miscellaneous metal work, except where specified in connection with work under other sections, shall be performed as required.
- C. Metal work built-in with concrete or masonry shall be formed for anchorage, or be provided with suitable anchors, expansion shields or other anchoring devices shown

on the drawings, or required. Such metal work shall be furnished in ample time for setting and securing in place. Wherever possible fixings shall be built into concrete.

- D. Where indicated, install miscellaneous metal items in sleeves (furnished under this section) embedded in concrete with setting grout specified herein.
- E. Joints shall be as strong and rigid as adjoining sections. Welding shall be continuous along entire line of contact, except where spot welding is indicated or permitted. Where exposed, welds shall be ground smooth. Where bolted or riveted connections are indicated, such connections may be welded at the Contractor's option.
- F. Where welding is required, it shall conform to requirements for shielded metal arc welding of the Standard Code for Arc and Gas Welding of the American Welding Society. Exposed welds shall be flush and ground smooth.
- G. Threaded connections shall be made up tight so that threads are entirely concealed. Abutting bars shall be so shouldered and headed, doweled and pinned. Small bars shall pass through larger bars and pinned. Rivet, bolts and screw heads shall be flat and countersunk in exposed work and elsewhere as required. Removable members shall be carefully machined and fitted and secured, by means of screws or bolts of proper size and approved spacing.
- H. Bolts, brackets, sleeves and other items embedded in concrete shall be galvanized.
- I. Except where built in fixings cannot be used miscellaneous metal work may be fastened to concrete with expansion bolts and to hollow with toggle bolts. Fastening to wood plugs in concrete or masonry will not be permitted. Holes for plugs or bolts shall be drilled to the exact diameter of the plug or bolt, using a percussion drill for concrete and a rotary drill for masonry. Screws shall be threaded full length to the head of the screw.
- J. Provide for adjustments of miscellaneous metal items, with particular attention given to miscellaneous steel supporting the work of other sections, as required during the construction process.
- K. Install isolating non-conductive materials between dissimilar metals as per approved methodology.
- L. Setting Loose Plates:
 - 1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
 - 2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 3. Pack grout solidly between bearing surfaces & plates. Ensure no voids remain
- M. Butt welds or splice butt joints in track. Splices in axial loaded studs shall not be permitted. Welds shall be fillet, plug, butt, or seam.

1. Secure floor and ceiling runners to structure with power driven anchors spaced not over 400mm on center and 150mm maximum from ends. Closer spacing at discretion of stud manufacturer based on design loads.
 2. Provide elastomeric sealant or sill sealer material between concrete structure and ceiling and floor runner channels at exterior.
- N. Slide Clip Detail: Provide flexible connection between studs and building structure to accommodate slab edge deflection and long term building creep without transferring axial load to studs.
- O. Obtain approval of the Engineer prior to site cutting or making adjustments not scheduled.
- P. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Plumb: 6 mm per story or for every 3.65 m in height whichever is greater, non-cumulative.
- C. Maximum Offset from Alignment: 6 mm.
- D. Maximum Out-of-Position: 6 mm.
- E. Maximum Variation of Wall from Plumb, Level or True-to-Line: 3mm in 3m.

3.5 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Remove site cuttings from finish surfaces.
- C. Clean & wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 05510

METAL STAIRS AND LADDERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes steel stair frame of structural sections, with open and/or closed risers; open grate, checkered plate, pan to receive concrete fill, shop cast concrete, stair treads and landings; integral balusters and handrail covering; and metal ladders.
- B. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete: Concrete fill in stair pans and landings; or mesh reinforcement for landings; and Execution requirements for placement of metal anchors specified in this section in concrete.
 - 2. Section 04810 - Unit Masonry Assemblies: Execution requirements for placement of metal anchors specified in this section in masonry.
 - 3. Section 05500 - Metal Fabrications.
 - 4. Section 05520 - Handrails and Railings: Handrails and balusters other than specified in this section.
 - 5. Section 06200 - Finish Carpentry: Wood handrail.
 - 6. Section 09900 - Paints and Coatings: Paint finish.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- B. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM A283/283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 7. ASTM A325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).
 - 8. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 9. ASTM A501. - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 10. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

11. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
 12. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 2. AWS D1.1 - Structural Welding Code - Steel.
- D. National Association of Architectural Metal Manufacturers:
1. NAAMM AMP 510 - Metal Stairs Manual.
 2. NAAMM MBG 531 - Metal Bar Grating Manual.
- E. National Ornamental & Miscellaneous Metals Association:
1. NOMMA Guideline 1 - Joint Finishes.
- F. The Society for Protective Coatings (SSPC):
1. SSPC - Steel Structures Painting Manual.
 2. SSPC SP 1 - Solvent Cleaning.
 3. SSPC SP 2 - Hand Tool Cleaning.
 4. SSPC SP 10 - Near-White Blast Cleaning.
 5. SSPC Paint 15 - Steel Joist Shop Paint.
 6. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic, or II - Organic).

1.3 DESIGN REQUIREMENTS

- A. Fabricate stair assembly to support uniform live load of 4.7 kPa and/or concentrated load of 14 kPa with deflection of stringer or landing framing not to exceed 1/240 of span. Test in accordance with ASTM E935.
- B. Railing assembly, wall rails, and attachments to resist lateral force of 333 N at any point without damage or permanent set. Test in accordance with ASTM E935.
- C. Fabricate stair assembly to NAAMM AMP 510, Class Industrial, Service, Commercial and/or Architectural.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
- C. Shop Drawings: Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- D. Samples: Submit two samples of handrail covering, length as directed by the Engineer.
- E. Design Data: Submit design calculations.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings.
- B. Finish joints in accordance with NOMMA Guideline 1.
- C. Perform Work in accordance with the drawings and to the approval of the Engineer.
- D. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Prepare Shop Drawings under direct supervision of Professional Engineer experienced in design of this Work and approved by the Engineer.
- B. Welders' Certificates: Submit under provisions of the administrative requirements of the Specifications General Requirements, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

1.7 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 METAL STAIRS AND LADDERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500, Grade B and/or ASTM A501.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B, Schedule 40.
- E. Sheet Steel: ASTM A653/A653M, with 75 and/or 380 g/sq m galvanized coating.
- F. Tread and Landing Concrete Reinforcement: Mesh or Bar type, as detailed, galvanized.

- G. Bolts, Nuts, and Washers: ASTM A325M, ASTM A307, and/or galvanized to ASTM A153/A153M for galvanized components.
- H. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.
- I. Welding Materials: AWS D1.1; type required for materials being welded.
- J. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.
- K. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic and/or Type II Organic, zinc rich.
- L. Gratings: NAAMM MBG 531, Type as indicated on drawings.
- M. Handrail Cover: Type as indicated on drawings.
- N. Infill Panels: Tempered glass, Polycarbonate, Acrylic and/or as indicated on drawings; clear and/or as indicated on drawings.
- O. Stair Treads: Shop cast concrete in metal pan; smooth surface; non-slip.
- P. Shop Cast Concrete Treads: dimension, reinforcements and finish as indicated on drawings; radiused nosings.
- Q. Concrete for Treads and Landings: Unless otherwise indicated on drawings, Portland cement Type I, 25 MPa 28 day strength, 50 to 75 mm slump.

2.3 FABRICATION

- A. Fit and shop assemble components in largest practical sections, for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Continuously seal joined pieces by intermittent welds and plastic filler and/or continuous welds.
- D. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Accurately form components required for anchorage of stairs, landings and railings to each other and to building structure.
- H. Furnish continuous plastic handrail cover. Heat weld joints and trim smooth.

2.4 FABRICATION - PAN STAIRS AND LANDINGS

- A. Fabricate stairs and landings with closed and/or open risers and treads of metal pan construction, ready to receive concrete.
- B. Form treads and risers with sheet steel stock.
- C. Secure reinforced tread pans to stringers with clip angles; welded and/or bolted in place.
- D. Form stringers with rolled steel channels and/or rectangular hollow sections, 250 and/or 300 mm deep.
- E. Form landings with sheet stock. Reinforce underside with angles, metal T's, or as indicated on drawings to attain design load requirements.
- F. Form balusters with circular, square and/or rectangular steel sections, welded and/or bolted to stringers.

2.5 FABRICATION - CHECKERED PLATE STAIRS AND LANDINGS

- A. Form treads with checkered steel plate; prime paint and/or galvanized finish. Weld and/or Bolt to stringer support clips.
- B. Form stringers with rolled steel channels and/or rectangular hollow sections, 250 and/or 300 mm deep; prime paint and/or galvanized finish.
- C. Form landings with checkered steel plate; prime paint and/or galvanized finish. Reinforced underside with angles and/or metal T's to attain design load requirements.
- D. Form balusters with circular, square and/or rectangular steel sections, welded and/or bolted to stringers; prime paint and/or galvanized finish.

2.6 FABRICATION - OPEN GRATING STAIRS AND LANDINGS

- A. Fabricate treads in accordance with NAAMM MBG 531, of welded and/or mechanically clinched steel bars, welded and/or bolted to supports; prime paint and/or galvanized finish.
- B. Form hollow stringers with rolled steel channels and/or rectangular hollow sections prime paint and/or galvanized finish.
- C. Form landings in accordance with NAAMM MBG 531 and same as treads; prime paint and/or galvanized finish. Reinforce underside with angles and/or metal T's to attain design load requirements.
- D. Form balusters with circular, square and/or rectangular steel sections, welded and/or bolted to stringers; prime paint and/or galvanized finish.

2.7 FABRICATION - UNIT STAIR TOWERS

- A. Fabricate self-supporting steel stair towers with formed treads and risers; steel channel stringers; landing platforms; sectioned for transport; corner structural support members designed to support full weight of complete stair tower plus design live load; with steel railings, newel posts, and/or balusters.
- B. Fabricate stair towers to height not exceeding 12 m for transportation purposes; designed for stacking to height of building as self-supporting structure.

2.8 FABRICATION - LADDERS

- A. Steel, Aluminum and/or Stainless Steel Ladder: ANSI A14.3, steel, aluminum and/or stainless steel welded construction: Unless otherwise indicated on drawings,
 - 1. Side Rails: 9 x 50 mm side rails spaced at 500 mm.
 - 2. Rungs: 25 mm diameter solid and/or tubular rod spaced 300 mm on center.
 - 3. Mounting: Space rungs 175 mm from wall surface; with steel mounting brackets and attachments.
 - 4. Finish: Galvanized, enamel, anodized, satin chrome, or polished chrome finish, as selected.
- B. Ladder Safety Cage: Unless otherwise indicated on drawings, Steel and/or Aluminum bar sections, minimum 6 x 50 mm.
 - 1. Bottom hoop 455 mm radius maximum 1880 mm above finished floor.
 - 2. Other hoops 355 mm radius spaced maximum 1220 mm on center.
 - 3. Vertical bars spaced 250 mm on center.
 - 4. Finish: Match ladder finish.
- C. Ladder Security Enclosure: Unless otherwise indicated on drawings, Sheet steel minimum 1.5 mm thick, formed to enclose ladder side rails and rungs when closed and to swing free of ladder rungs and side rails with minimum 38 mm clear to side rails in open position.
 - 1. Provide continuous steel hinge full height of enclosure.
 - 2. Provide steel hasp for padlocking in closed and open position.
 - 3. Finish: Match ladder finish.

2.9 SHOP FINISHING

- A. Prepare surfaces to be primed in accordance with SSPC SP 2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Do not prime surfaces in direct contact with concrete or where field welding is required.
- D. Prime paint items with one coat.
- E. Galvanize items to minimum 380 and/or 600 g/sq m zinc coating and/or in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete and/or embedded in masonry with setting templates.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Install anchors, plates, angles, hangers and/or struts required for connecting stairs to structure.
- C. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.
- D. Field weld components indicated on shop drawings. Perform field welding in accordance with AWS D1.1.
- E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- G. Obtain approval of the Engineer prior to site cutting or creating adjustments not scheduled.
- H. After erection, prime welds, abrasions, and surfaces not shop primed and/or galvanized, except surfaces to be in contact with concrete.
- I. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Plumb: 6 mm per story, non-cumulative.

C. Maximum Offset from Alignment: 6 mm.

3.5 SCHEDULES

A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 05520

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes painted steel, galvanized steel, stainless steel or aluminum pipe or tube railings, balusters, and fittings; and handrails with covers.
- B. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete: Execution requirements for placement of anchors specified in this section in concrete.
 - 2. Section 04810 - Unit Masonry Assemblies: Execution requirements for placement of anchors specified in this section in masonry.
 - 3. Section 05510 - Metal Stairs and Ladders: Other Handrails.
 - 4. Section 06200 - Finish Carpentry: Wood handrail.
 - 5. Section 08800 - Glazing: Glass baluster infill.
 - 6. Section 09900 - Paints and Coatings: Paint finish.

1.2 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 4. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 5. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.
 - 6. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire (Metric).
 - 7. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

8. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
9. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tubes for General Purpose Applications.
10. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
11. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

C. National Ornamental & Miscellaneous Metals Association:

1. NOMMA Guideline 1 - Joint Finishes.

D. The Society for Protective Coatings (SSPC):

1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 15 - Steel Joist Shop Paint.
3. SSPC Paint 20 - Zinc-Rich Primers Type I - Inorganic or Type II - Organic.

1.3 DESIGN REQUIREMENTS

- A. Fabricate railing assembly, wall rails, and attachments to ASTM E985 and to UBC relevant codes and standards.
- B. Glass balustrade shall pass the pendulum test with a 50 kg side impact.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- C. Samples: Submit two samples of handrail, length as directed by the Engineer. Submit two samples, of elbow, Tee, wall bracket, escutcheon, end stop and all other fittings and accessories.

1.5 QUALITY ASSURANCE

- A. Finish joints in accordance with NOMMA Guideline 1.
- B. Perform Work in accordance with the drawings and to the approval of the Engineer.
- C. Maintain one copy of each document on site.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 HANDRAILS AND RAILINGS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 PAINTED OR GALVANIZED STEEL RAILING SYSTEM COMPONENTS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500, Grade B, and/or ASTM A501.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B, Schedule 40.
- E. Fasteners: as instructed by the manufacturer.
- F. Bolts, Nuts, and Washers: ASTM A325M, A307 and/or galvanized to ASTM A153/A153M for galvanized components.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Rails and Posts: Type, size and shape as indicated on drawings; welded and/or threaded joints.
- I. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast and/or machined steel.
- J. Mounting: Adjustable brackets and flanges, with steel inserts for casting in concrete and/or with steel brackets for embedding in masonry. Prepare backing plate for mounting in wall construction.
- K. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- L. Splice Connectors: Steel, concealed spigots, welding collars and/or threaded collars.
- M. Handrail Cover: As indicated on drawings.
- N. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.
- O. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic and/or Type II Organic zinc rich.

2.3 ALUMINUM RAILING SYSTEM COMPONENTS

- A. Rails and Posts: extruded tubing, size and shape as indicated on drawings, conforming to B211M, B221M, B241/B241M and/or B483/B483M.
- B. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast and/or machined aluminum.

- C. Mounting: Adjustable brackets and flanges, with aluminum and/or steel inserts for casting in concrete and/or with aluminum and/or steel brackets for embedding into masonry. Prepare backing plate for mounting in wall construction.
- D. Splice Connectors: Concealed spigot, Collar with locking set screws and/or Welding collars; cast and/or machined aluminum.
- E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- F. Finish coatings to conform to AAMA 611, AAMA 2603, AAMA 2604 and/or AAMA 2605.
- G. Exterior Aluminum Surfaces: AAMA A41, A42, A43 and/or A44 anodized, prepared with mechanical and chemical pre-treatments, anodized to clear color.
- H. Interior Aluminum Surfaces: AAMA A41, A42, A43 and/or A44 anodized, prepared with mechanical and chemical pre-treatments, anodized to clear color.
- I. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.4 STAINLESS STEEL RAILING SYSTEM COMPONENTS

- A. Bars and Shapes: ASTM A276, and/or ASTM A479/A479M; Type 316.
- B. Tubing: ASTM A269, and/or ASTM A554; Type 316.
- C. Pipe: ASTM A312/A312M, seamless and/or welded; Type 316.
- D. Plate, Sheet and Strip: ASTM A167; Type 316.
- E. Bolts, Nuts, and Washers: ASTM A354.
- F. Welding Materials: AWS D1.6; type required for materials being welded.
- G. Rails and Posts: Type, size and shape as indicated on drawings; welded and/or threaded joints.
- H. Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast and/or machined steel.
- I. Mounting: Adjustable brackets and flanges, with steel inserts for casting in concrete and/or with steel brackets for embedding in masonry. Prepare backing plate for mounting in wall construction.
- J. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- K. Splice Connectors: Steel, concealed spigots, welding collars and/or threaded collars.
- L. Handrail Cover: As indicated on drawings.

2.5 GLASS BALUSTRADES SYSTEM COMPONENTS

- A. Refer to Section 08800.
- B. Handrail Cover: As indicated on drawings.

2.6 WOOD HANDRAIL

- A. Wood: Type as per drawings and in accordance with Section 06200.

2.7 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.
- B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.
- C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler and/or continuous welds. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.
- F. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler and/or continuous welds.
- G. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish.
- H. Accurately form components to suit stairs and landings, to each other and to building structure.
- I. Accommodate for expansion and contraction of members and building movement without damage to connections or members.
- J. Furnish continuous plastic handrail cover. Heat weld joints and trim smooth.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify field conditions are acceptable and are ready to receive work.

- C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal and/or aluminum where site welding is required.
- B. Supply items required to be cast into concrete, embedded in masonry and/or placed in partitions with setting templates, to appropriate sections.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Anchor railings to structure with anchors, plates and/or angles.
- C. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
- D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.
- F. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Plumb: 6 mm per story, non-cumulative.
- C. Maximum Offset from Alignment: 6 mm.
- D. Maximum Out-of-Position: 6 mm.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes finish carpentry items; wood door frames, glazed frames; wood casings and moldings; and hardware and attachment accessories.
- B. Related Sections:
 - 1. Section 06410 - Custom Cabinets: Shop fabricated custom cabinet work.
 - 2. Section 08212 - Flush Wood Doors.
 - 3. Section 08262 - Sliding Wood Doors.
 - 4. Section 08800 - Glazing.
 - 5. Section 09900 - Paints and Coatings: Finishing of finish carpentry items.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A135.4 - Basic Hardboard.
 - 2. ANSI A156.9 - Cabinet Hardware.
 - 3. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. APA-The Engineered Wood Association:
 - 1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.
- C. ASTM International:
 - 1. ASTM C1036 - Standard Specification for Flat Glass.
 - 2. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. Architectural Woodwork Institute:
 - 1. AWI - Quality Standards Illustrated.
- E. American Wood-Preservers' Association:
 - 1. AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.
- F. Federal Specification Unit:
 - 1. FS A-A-1936 - Adhesive, Contact, Neoprene Rubber.
- G. Hardwood Plywood and Veneer Association:
 - 1. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

- H. National Institute of Standards and Technology:
 - 1. NIST PS 20 - American Softwood Lumber Standard.
- I. National Electrical Manufacturers Association:
 - 1. NEMA LD 3 - High Pressure Decorative Laminates.
- J. Window and Door Manufacturers Association:
 - 1. WDMA I.S.4 - Water-Repellent Treatment for Millwork.
- K. Woodwork Institute of California:
 - 1. WIC - Manual of Millwork.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories to minimum scale of (1:8).
- C. Product Data:
 - 1. Submit data on fire retardant treatment materials and application instructions.
 - 2. Submit data on attachment hardware and/or finish hardware.
- D. Samples:
 - 1. Submit two samples of finish plywood, 200 x 250 mm in size illustrating wood grain and specified finish.
 - 2. Submit two samples of wood trim 250 mm long.
 - 3. Submit two samples of laminates, pre-finished paneling, synthetic surfacing, hardware items, and/or shop finishes.
- E. Certification: Submit copy of fabricator's authorization to use AWI Grade Stamps, AWI Quality Certification Program license and Project specific letters and/or WIC certified compliance certificate.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with AWI (Architectural Woodwork Institute) Architectural Woodwork Quality Standards Illustrated, or WIC (Woodwork Institute of California) Manual of Millwork; economy, custom or premium grade.
- B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Fabricator: Company specializing in fabricating Products specified in this section with minimum ten years documented experience.

1.6 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mockups, full size including all hardware and attachment accessories.

- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.7 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Protect work from moisture damage.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 SEQUENCING

- A. Sequence work to ensure utility connections are achieved in orderly and expeditious manner.

1.11 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Softwood and/or Hardwood Lumber: NIST PS 20, or AWI grade III, II or I, WIC economy, custom or premium grade; maximum moisture content of 6 to 8 %.
- B. Softwood and/or Hardwood Plywood: APA/EWA PS 1 Grade (C-D) softwood plywood, HPVA HP-1 hardwood plywood, AWI grade B, A, or AA veneer; and/or WIC economy, custom or premium veneer; with particleboard, medium density fiberboard, veneer or lumber core; type of glue recommended for application.

- C. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, CL20 for cabinet liner surfaces, BK20 for undecorated backing sheets, PF42 for post forming, FR50 for fire-retardant surfaces; color, pattern, and surface texture as selected and indicated.
- D. Pre-finished Paneling: As indicated on drawings.
- E. Wood Particleboard: ANSI A208.1 type 1 or 2; composed of wood chips or sawdust, medium density, made with water resistant adhesive; sanded faces.
- F. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, standard and/or tempered grade, 6 mm thick, smooth one and/or two sides.
- G. Pegboard: Pressed wood fiber with resin binder, standard and/or tempered grade; 3 mm thick 4 mm diameter holes at 25 mm on center and/or 6 mm thick with 7 mm diameter holes at 25 mm on center.
- H. Sheet Metal Components: Stainless steel, Type 316 with #4 satin and/or #8 polished finish.
- I. Synthetic Surfacing: Synthetic marble of polyester or proprietary resins, with color and design as indicated on drawings, stain resistant to domestic chemicals and cleaners.

2.3 ACCESSORIES

- A. Adhesive for High Pressure Decorative Laminates: FS A-A-1936 contact adhesive and/or Type recommended by laminate manufacturer to suit application.
- B. Fasteners: Of size and type to suit application; galvanized finish in concealed locations and stainless steel type 316 finish in exposed locations.
- C. Concealed Joint Fasteners: Threaded steel.
- D. Lumber for Shimming and Blocking: Softwood lumber as indicated.
- E. Veneer Edge Band: Standard wood veneer edge band matching face veneer.
- F. Plastic Edge Trim: Extruded convex and/or flat shaped; smooth and/or ridged finish; self locking serrated tongue; of width to match component thickness; color as selected.
- G. Aluminum Edge Trim: Extruded convex and/or flat shape; smooth and/or ridged surface finish; self locking serrated tongue; of width to match component thickness; natural mill, clear anodized and/or bronze anodized finish.
- H. Glass: Type as specified in Section 08800.
- I. Float and/or Patterned Glass: ASTM C1036 and/or C1048, type, color, pattern, quality and thickness as indicated on drawings.

- J. Safety Glass: ASTM C1036 and/or C1048, type, color, pattern, quality and thickness as indicated on drawings.
- K. Primer: Alkyd primer sealer.
- L. Wood Filler: Solvent and/or oil base, tinted to match surface finish color.
- M. Wood Treatment:
 - 1. Fire Retardant (FR-S Type): Chemically treated and pressure impregnated; capable of providing maximum flame spread/smoke development rating in accordance with ASTM E84.
 - 2. Wood Preservative by Pressure Treatment (PT Type): AWWA Treatment C1 using water borne preservative with 0.25 lb/cu ft retention.
 - 3. Water Repellant Preservative Treatment by Dipping Method: WDMA I.S.4, with 0.25 cubic lb/in/ft of chromated copper arsenate.
 - 4. Wood Preservative (Surface Application): color and type as indicated.
 - 5. Shop pressure treat, dip and/or brush apply treatment to wood materials requiring fire rating and/or preservatives to concealed wood blocking.
 - 6. Provide identification on fire retardant treated material.
 - 7. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.
 - 8. Redry and/or Kiln dry wood after pressure treatment to maximum moisture content percentage as instructed by the manufacturer.
- N. Hinges: As indicated on drawings.
- O. Pulls: As indicated on drawings.
- P. Latches: As indicated on drawings.
- Q. Shelf Standards: As indicated on drawings.
- R. Shelf Brackets: As indicated on drawings.
- S. Drawer Slides: As indicated on drawings.

2.4 FABRICATION

- A. Fabricate to AWI Economy, Custom and/or Premium standards and/or WIC Economy, Custom and/or Premium standards.
- B. Shop assemble work for delivery to site, permitting passage through building openings.
- C. Fit exposed sheet material edges with matching hardwood, matching veneer, plastic and/or aluminum edging. Use one piece for full length only.
- D. Cap exposed high pressure decorative laminate finish edges with material of same finish and pattern.
- E. Shop prepare and identify components for book match grain matching during site erection.

- F. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.
- G. Apply high pressure decorative laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 600 mm from sink cut-outs.
- H. Apply laminate backing sheet to reverse face of high pressure decorative laminate finished surfaces.

2.5 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 matching surrounding surfaces and of types recommended for applied finishes.
- D. Finish work in accordance with AWI - Section 1500 Finish System Transparent and/or Opaque.
- E. Finish work in accordance with WIC - Section 25 System (#1) (#2) (#3) (#4) (#5) (#6) (#7) (#8).
- F. Stain, seal, and varnish exposed to view surfaces.
- G. Seal internal surfaces and semi-concealed surfaces.
- H. Prime paint and/or Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify adequacy of backing and support framing.
- C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 EXISTING WORK

- A. Modify and extend existing finish carpentry installations using materials and methods as specified.

3.3 INSTALLATION

- A. Install work in accordance with AWI, or WIC economy, custom or 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 components and/or trim with nails, screws and/or bolts with blind fasteners as instructed by the manufacturer, and/or wall adhesive by gun application.
- E. Install pre-finished paneling with full bed contact adhesive applied to substrate, and/or nails, screws and/or wall adhesive by bead method as instructed by the manufacturer.
- F. Install hardware.
- G. Site Applied Wood Treatment:
 - 1. Apply preservative treatment.
 - 2. Brush apply one coat of preservative treatment on wood in contact with cementitious materials, and roofing and related metal flashings. Treat site-sawn cuts.
 - 3. Allow preservative to dry prior to erecting members.
- H. Preparation for Site Finishing:
 - 1. Site Finishing: Refer to Section 09900.
 - 2. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Indicated Position: 1.5 mm.
- C. Maximum Offset from Alignment with Abutting Materials: 0.7 mm.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 06410
CUSTOM CABINETS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes custom-fabricated cabinet units; counter tops; cabinet hardware; preparation for installing utilities in cabinets; and shop and/or site finishing.
- B. Related Sections:
 - 1. Section 06200 - Finish Carpentry: Related trim not specified in this section.
 - 2. Section 08800 - Glazing: Glass for casework.
 - 3. Section 09900 - Paints and Coatings: Site finishing of cabinet, exterior and interior.
 - 4. Division 15 - Mechanical: Under-top stainless steel sink, mixers, robinet, angle valves and all required mechanical installations.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A156.9 - Cabinet Hardware.
 - 2. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. Architectural Woodwork Institute:
 - 1. AWI - Quality Standards Illustrated.
- C. Federal Specification Unit:
 - 1. FS A-A-1936 - Adhesive, Contact, Neoprene Rubber.
- D. National Electrical Manufacturers Association:
 - 1. NEMA LD 3 - High Pressure Decorative Laminates.
- E. Woodwork Institute of California:
 - 1. WIC - Manual of Millwork.
- F. ASTM International:
 - 1. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Submit data for hardware accessories.

- D. Samples:
 - 1. Submit two samples, each size 200 x 250 mm illustrating cabinet finish.
 - 2. Submit two samples each size 200 x 250 mm illustrating counter top finish.
 - 3. Submit two samples of drawer pulls, hinges, etc. illustrating hardware finish.
- E. Certification: Submit copy of fabricator's authorization to use AWI Grade Stamps, AWI Quality Certification Program license and Project specific letters and/or WIC certified compliance certificate.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with AWI (Architectural Woodwork Institute) Architectural Woodwork Quality Standards Illustrated, Economy, Custom and/or Premium Grade, and/or WIC (Woodwork Institute of California) Manual of Millwork, Economy, Custom and/or Premium Grade.
- B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Fabricator: Company specializing in performing Work of this section with minimum ten years documented experience.

1.6 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mockup of full size base cabinet and upper cabinet including plumbing and electrical fixtures, hardware, accessories and fitments.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.7 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Protect units from moisture damage.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 CUSTOM CABINETS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Softwood and/or Hardwood Lumber: AWI Grade III, II and/or I; and/or WIC Economy, Custom and/or Premium Grade; maximum moisture content of 6-8 percent;
- B. Softwood and/or Hardwood Plywood: AWI Grade B, A and/or AA veneer; and/or WIC Economy, Custom and/or Premium veneer; with particleboard, medium density fiberboard, veneer and/or lumber core; type of glue recommended for application;
- C. Wood Particleboard: ANSI A208.1 Type 1 and/or 2; composed of wood chips or sawdust, medium density, made with water resistant adhesive; sanded faces.
- D. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, CL20 for cabinet liner surfaces, BK20 for undecorated backing sheets, PF42 for post forming, and/or FR50 for fire-retardant surfaces; Color, pattern, and surface texture as selected and/or indicated on drawings.
- E. Sheet Metal Components: Stainless steel, Type 316 with #4 satin and/or #8 polished finish;
- F. Synthetic Surfacing: Synthetic marble of polyester and/or proprietary resins, stain resistant to domestic chemicals and cleaners and as per approved codes and standards.
- G. Counter Tops, Back Splash and Side Splash: As per schedule stated hereinafter or as shown on drawings.
- H. Service Fittings for Kitchen Cupboards: As per schedule stated hereinafter or as shown on drawings.
- I. Electrical Built-in Appliances in Kitchen Cupboards: As per schedule stated hereinafter or as shown on drawings.

2.3 ACCESSORIES

- A. Adhesive for High Pressure Decorative Laminates: FS A-A-1936 contact adhesive. Type recommended by laminate manufacturer to suit application.
- B. Veneer Edge Band: Standard wood veneer edge band matching face veneer.

- C. Plastic Edge Trim: Extruded convex and/or flat shaped; smooth and/or ridged finish; self locking serrated tongue; of width to match component thickness; color as selected and/or as indicated on drawings.
- D. Aluminum Edge Trim: Extruded convex and/or flat shape; smooth and/or ridged surface finish; self locking serrated tongue; of width to match component thickness; natural mill, clear anodized and/or bronze anodized finish.
- E. Glass: As specified in Section 08800.
- F. Fasteners: Size and type to suit application.
- G. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized finish in concealed locations and stainless steel type 316 finish in exposed locations.
- H. Bolts: Steel and comply with BS916
- I. Washers: to BS3410, part 2.
- J. Screws:
 - 1. All steel screws shall be finished to resist corrosion by sherardizing, cadmium plating, nickel plating or other approved finish.
 - 2. Screws shall be protected steel, stainless steel type 316, brass silicone bronze, nickel/copper alloy or aluminum as specified on drawings or as appropriate to the work. Screws for fixing hardware shall match the items being fixed.
 - 3. Screw heads shall be for the generality of the work, countersunk slotted. Screw heads in the finished work shall, unless otherwise described, be brass, bronzed finish with matching fully countersunk brass cups. Phillips crosshead screws or pozidrive screws shall be used where so described on drawings.
- K. Concealed Joint Fasteners: Threaded steel.
- L. Grommets: Plastic, Metal and/or Rubber material for cut-outs.
- M. Hardware:
 - 1. Hinges: Plain bearing two knuckle stainless steel type 316 hinges (3 № per door leaf), with soft close.
 - 2. Knob for door panels as selected (1 № per door leaf).
 - 3. Perforations: 25mm diameter to act instead of knobs where indicated.
 - 4. Lock: Cabinet lock for each door panel or couple of panels as appropriate with security cylinder and with two keys for each lock.
 - 5. Knob for drawer as selected (1 № per drawer).
 - 6. Drawer runners: Steel telescopic runners (full width of drawer on both sides).
 - 7. Chrome pins for adjustable shelves.
 - 8. Chrome hanging rods.
- N. Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced as indicated; chrome and/or satin finish.
- O. Shelf Brackets: Formed steel brackets, formed for attachment with lugs; chrome and/or satin finish.

- P. Drawer and Door Pulls: Extruded aluminum pull, full width of drawer, polished and/or satin finish, "U" shaped pull, steel with chrome and/or satin finish, aluminum with polished and/or satin finish, bronze with satin finish, and/or plastic of color as selected.
- Q. Catches: Type as indicated on drawings.
- R. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.

2.4 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Fit shelves, doors, and exposed edges with matching veneer, plastic and/or aluminum edging. Use one piece for full length only.
- C. Cap exposed high pressure decorative laminate finish edges with material of same finish and pattern.
- D. Door and Drawer Fronts: 19 mm thick; flush, overlay and/or reveal overlay style.
- E. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.
- F. Apply high pressure decorative laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 600 mm from sink cut-outs.
- G. Apply wood laminate by grain matching adjacent sheets to book, slip, random and/or end matching.
- H. Apply laminate backing sheet to reverse side of plastic and/or wood laminate finished surfaces.
- I. Fabricate metal counter top surfaces pressure glued to plywood or particle board core backing with butt or welded joints, or without visible joints.
- J. Mechanically fasten back splash to counter tops with steel brackets at 400 mm on center.
- K. Fabricate cabinets and counter tops with cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint and/or Seal cut edges.
- L. Shop glaze glass materials using Interior Dry, Combination and/or Wet method specified in Section 08800.

2.5 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 matching surrounding surfaces and of types recommended for applied finishes.
- D. Finish work in accordance with AWI - Section 1500 Finish System Transparent and/or Opaque.
- E. Finish work in accordance with WIC - Section 25 System (#1) (#2) (#3) (#4) (#5) (#6) (#7) (#8).
- F. Stain, seal and varnish exposed to view surfaces. Brush and/or Spray apply only.
- G. Seal and/or stain and varnish internal exposed to view and semi-concealed surfaces.
- H. Seal internal surfaces of cabinets.
- I. Prime paint and/or Seal surfaces in contact with cementitious materials.
- J. Finish in accordance with Section 09900.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify adequacy of backing and support framing.
- C. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Set and secure casework in place; rigid, plumb and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units, counter tops etc.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1 mm. Do not use additional overlay trim for this purpose.
- E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- G. Site glaze glass materials using Interior Dry, Combination or Wet method specified in Section 08800.

3.3 ADJUSTING

- A. General Requirements: Execution requirements for testing, adjusting and balancing.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Clean casework, counters, shelves, hardware, fittings and fixtures.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 06610

GLASS-FIBER-REINFORCED PLASTIC

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes shop fabrication of custom sized and shaped glass-fiber reinforced epoxy or polyester resin components.
- B. Related Sections:
 - 1. Section 06112 - Framing and Sheathing: Framing of openings.
 - 2. Section 07900 - Joint Sealers: Perimeter sealant to adjacent construction.

1.2 REFERENCES

- A. FM Global:
 - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- B. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.
- C. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.

1.3 DESIGN REQUIREMENTS

- A. Design Live and Dead Loads: As per approved codes and standards with deflection limited to 1/240 of span.
- B. Design items with sufficient strength for handling stresses.

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to UL, FM or Intertek Testing Services (Warnock Hersey Listed) Assembly. Design No. to suit fire resistance rating.
- B. Conform to applicable code for flame/smoke rating in accordance with UL, FM or Intertek Testing Services (Warnock Hersey Listed) requirements.

1.5 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate design load parameters, dimensions, adjacent construction, materials, thicknesses, fabrication details, required clearances, field jointing, tolerances, colors, finishes, methods of support, integration of plumbing and electrical components, and anchorages.

- C. Product Data: Submit data on specified component products.
- D. Design Data: Submit design calculation.
- E. Samples: Submit two samples, 300 x 300 mm in size illustrating color, texture, and finish.

1.6 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Operation and Maintenance Data: Submit instructions for stain removal, and for surface and gloss restoration.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.
- C. Shop and/or Site Fabricator: Company specializing in architectural glass fiber and resin components with minimum five years documented experience.
- D. Design structural elements under direct supervision of Professional Engineer experienced in design of this work and licensed at Project location.

1.8 MOCKUP

- A. General Requirements: Quality requirements for mockup requirements.
- B. Construct mockup, 2000 m long by 600 m wide.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 GLASS FIBER AND RESIN FABRICATIONS

- A. Manufacturers/Fabricators: Any internationally recognized manufacturer/fabricator having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Fabric Reinforcement: Glass fiber woven fabric, type and size required to suit resin being used.
- B. Roving:
 - 1. Continuous glass fiber strands, chemically sized, wound into tubeless packaging, chopped glass content to manufacturer's recommendations (up to 24, 24 to 30, or 30 to 40 percent), for epoxy or polyester resin; or
 - 2. Continuous strand reinforcement for filament winding or continuous impregnation, single end, wound into tubeless packaging, for epoxy or polyester resin.
- C. Mat: Chopped fine glass fiber strand, sized into mat form, 300 g/sq m, for polyester resin gel coat backup or laminate reinforcement.
- D. Resin: Polyester or epoxy type, fire resistant and corrosion resistant, high workability characteristics, with integral coloring additives.
- E. Polishing Cream: Compatible gel coat polishing cream to restore gloss surface finish.
- F. Core Framing: Softwood or balsa lumber, clear and free of knots.

2.3 FABRICATION

- A. Mold Material: Metal, wood with resin coating or GRP type.
- B. Mold Surface: Smooth or textured to achieve the required finish.
- C. Fabricate components with open mold hand lay-up or spray-up method.
- D. Finish other surfaces not in contact with mold to match molded surfaces in appearance.
- E. Finish trim corners and edges.
- F. Coat exposed surfaces and surfaces in contact with moisture or earth with gel coat of resin, color as selected by the Engineer.
- G. Cure components prior to shipment and remove materials toxic to plant or animal life and incompatible with adjacent building materials.

2.4 SHOP FINISHING

- A. Color: As selected by the Engineer.
- B. Exposed to View Surface Texture: As shown on the drawings, or as selected by the Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify surfaces and substrate are ready to receive work and dimensions are as indicated on approved shop drawings and as instructed by fabricator.

3.2 INSTALLATION

- A. Install Work as specified, as shown on the drawings, in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer.

3.3 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Indicated Position: **6 mm**.
- C. Maximum Offset from Alignment Adjacent Components: **3 mm**.

3.4 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Clean components of foreign material without damaging finished surface.
- C. Hand rub smooth surfaces with polishing cream.
- D. Clean fabrications.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 06620

CAST PLASTIC FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes shop fabrication of custom sized and shaped cast plastic components including washroom vanities with or without integral sink, counter tops, window stools, contoured bath tubs, shower stalls, and other building finishing or furnishing components.
- B. Related Sections:
 - 1. Section 06610 - Glass-Fiber-Reinforced Plastic.
 - 2. Section 06410 - Custom Cabinets: Cabinets with cast plastic counter top, integral sink, and backsplash.
 - 3. Section 07900 - Joint Sealers: Perimeter sealant to adjacent construction.
 - 4. Division 15 - Mechanical: Plumbing drains and fixture trim.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.
- C. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.

1.3 DESIGN REQUIREMENTS

- A. Design Live and Dead Loads: As per approved codes and standards with deflection limited to 1/240 of span.
- B. Design items with sufficient strength for handling and placement stresses.

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for the required flame/smoke rating, in accordance with ASTM E84 requirements.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., or testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and indicated.

1.5 SUBMITTALS

- A. General Requirements: Requirement for submittal procedures.

- B. Shop Drawings: Indicate design load parameters, dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, integration of plumbing and electrical components, and anchorages.
- C. Product Data: Submit data on specified component products, electrical characteristics and connection requirements.
- D. Design Data: Submit design calculation.
- E. Samples: Submit two samples, 300 x 300 mm in size illustrating color, texture, and finish.
- F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- G. Manufacturer's Installation Instructions: Submit preparation of opening required, rough-in sizes; furnish templates for cast-in or placed frames or anchors; tolerances for item placement, temporary bracing of components, etc.
- H. Material Test Reports: Submit material test reports.

1.6 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Operation and Maintenance Data: Submit list of approved cleaning materials and procedures required; list of substances harmful to component materials. Include instructions for stain removal, and surface and gloss restoration.

1.7 QUALITY ASSURANCE

- A. Perform work in accordance with approved codes and standards.
- B. Acquire plastics from sources approved by the Engineer for Work.
- C. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.
- C. Shop and/or Site Fabricator: Company specializing in architectural glass fiber and resin components with minimum five years documented experience.
- D. Design structural elements under direct supervision of Professional Engineer experienced in design of this work and licensed at Project location.

1.9 MOCKUP

- A. General Requirements: Quality requirements for mockup requirements.
- B. Construct mockup, 2000 m long by 600 m wide, for each type of unit.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 SEQUENCING

- A. General Requirements: Requirement for Work sequence.
- B. Sequence Work to permit installation of adjacent affected construction, plumbing and electrical rough-in.
- C. Coordinate installation with partition erection and plumbing work.

1.12 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish five-year manufacturer warranty for each type of unit.

1.13 MAINTENANCE EXTRA MATERIAL

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Furnish two containers of ½ L of polishing cream.

PART 2 PRODUCTS

2.1 PLASTIC FABRICATIONS

- A. Manufacturers/Fabricators: Any internationally recognized manufacturer/fabricator having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Resin: Polyester or epoxy type, fire resistant and corrosion resistant, high workability characteristics, with integral coloring additives.
- B. Polishing Cream: Compatible gel coat polishing cream to restore gloss surface finish.
- C. Core Framing: Softwood lumber, clear and free of knots.

- D. Adhesive: Type as recommended by manufacturer, cartridge dispensed.

2.3 FABRICATION

- A. Fabricate components by mold to achieve shape and configuration.
- B. Finish trim corners and edges.
- C. Coat exposed surfaces and surfaces in contact with moisture or earth with gel coat of resin, color as selected by the Engineer. Polish to gloss, flat, or low sheen.
- D. Cure components prior to shipment and remove materials toxic to plant or animal life and incompatible with adjacent building materials.

2.4 SHOP FINISHING

- A. Color: As selected by the Engineer.
- B. Exposed to View Surface Texture: As shown on the drawings, or as selected by the Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify joint preparation and affected dimensions are acceptable.
- C. Verify surfaces and substrate are ready to receive work and dimensions are as indicated on approved shop drawings and as instructed by fabricator.

3.2 PREPARATION

- A. Provide anchoring devices for installation and embedding.
- B. Provide templates and rough-in measurements.

3.3 INSTALLATION

- A. Align work plumb and level.
- B. Rigidly anchor to substrate to prevent misalignment.
- C. Seal to adjacent construction in accordance with Section 07900.
- D. Install Work as specified, as shown on the drawings, in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Indicated Dimension: 3 mm.
- C. Maximum Offset from Indicated Position: 3 mm.

3.5 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Clean components of foreign material without damaging finished surface.
- C. Hand rub smooth surfaces with polishing cream.
- D. Clean and polish fabrication surfaces.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Protect finish work from damage.
- C. Repair or replace damaged plastics.

3.7 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07130

SHEET WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes waterproofing membrane, drainage panels and protective cover.
- B. Related Sections:
 - 1. Section 02320 - Backfill.
 - 2. Section 07212 - Board Insulation.
 - 3. Section 07620 - Sheet Metal Flashing and Trim.
 - 4. Section 07900 - Joint Sealers.
 - 5. Division 15 - Mechanical: Plumbing fixtures and plumbing specialties.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers -Tension.
 - 2. ASTM D449 - Standard Specification for Asphalt Used in Dampproofing and Waterproofing.
 - 3. ASTM D450 - Standard Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing.
 - 4. ASTM D471 - Standard Test Method for Rubber Property-Effect of Liquids.
 - 5. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 6. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - 7. ASTM D822 - Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.
 - 8. ASTM D1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 9. ASTM D2240 - Standard Test Method for Rubber Property-Durometer Hardness.
 - 10. ASTM D2581 - Standard Specification for Polybutylene (PB) Plastics Molding and Extrusion Materials.
 - 11. ASTM D4068 - Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane.
 - 12. ASTM D4551 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.
 - 13. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
 - 14. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

- B. National Roofing Contractors Association:
 - 1. NRCA - The NRCA Waterproofing and Dampproofing Manual.

1.3 SYSTEM DESCRIPTION

- A. Waterproofing System: Capable of resisting existing water head with the required factor of safety and preventing moisture migration to interior.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- C. Product Data: Submit data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- D. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Waterproofing Manual.
- B. Test material samples in accordance with ASTM D449 and ASTM D450.
- C. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with minimum fifteen years documented experience.
- B. Applicator: Company specializing in performing work of this section with minimum ten years documented experience.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct Mockup, 10 m² of horizontal and vertical panels; to represent finished work with internal and external corners, seam jointing, attachment method, counterflashing cover, drainage panel, base flashings, control/expansion joints, and protective cover.
- C. Locate where directed by the Engineer.

- D. Remove mockup when directed by the Engineer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Maintain ambient temperatures above 5°C for 24 hours before and during application and until liquid or mastic accessories have cured.

1.10 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Provide ten year warranty for each waterproofing system including coverage of materials and installation, and all resulting damage resulting from failure to resist penetration of moisture.
- C. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 SHEET MEMBRANE WATERPROOFING

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Modified Bituminous Membrane: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS), and/or atactic polypropylene (APP) type, reinforced with non-woven polyester, fiber glass, polyethylene and/or polypropylene; smooth surfaced; thickness and roll width as per manufacturer's recommendations; with compatible seam tape and termination bar; conforming to following below criteria.

- B. Criteria:

1.	<u>Properties</u>	<u>Test</u>
a.	Tensile Strength	ASTM D412
b.	Elongation	ASTM D412
c.	Hardness - Shore A	ASTM D2240
d.	Tear Strength	ASTM D624 and/or D1004
e.	Water Absorption	ASTM D471
f.	Moisture Vapor (perms)	ASTM E96
g.	Exposure at Low Temperature	ASTM D822
h.	Brittleness	ASTM D746

- C. Seaming Materials: As recommended by membrane manufacturer.
- D. Flexible Flashings: As recommended by membrane manufacturer.

2.3 ACCESSORIES

- A. Surface Conditioner: type compatible with membrane, as recommended by membrane manufacturer.
- B. Adhesives: As recommended by membrane manufacturer.
- C. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.
- D. Battens: As recommended by membrane manufacturer.
- E. Disc Washers and Screws: As recommended by membrane manufacturer.
- F. Circular Membrane Discs: As recommended by membrane manufacturer.
- G. Reglet Strip Devices: As recommended by membrane manufacturer.
- H. Sealant: As stated in Section 07900 and as recommended by membrane manufacturer.
- I. Mortar Beveled Corners (Fillet) at Intersections:
 - 1. Portland Cement: ASTM C150, Type I, gray color.
 - 2. Fine Aggregate: ASTM C144 and/or C404.
 - 3. Water: Clean and potable.
 - 4. Calcium chloride is not permitted.
 - 5. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
 - 6. Achieve uniformly damp sand immediately before mixing process.
 - 7. Add admixtures in accordance with manufacturer's instructions to achieve uniformity of mix and coloration.
 - 8. Re-temper only within two hours of mixing.
- J. Protective Covers:
 - 1. For Horizontal Surfaces: Unless otherwise stated or shown on the drawings, heavy duty rigid polypropylene protection boards specified in Section 07212, or cement sand screed, mix (1:3).
 - 2. For Vertical Surfaces: Unless otherwise stated or shown on the drawings, heavy duty rigid polypropylene protection boards specified in Section 07212.
- K. Cant Strips: Premolded composition material and/or Bitumen impregnated fiberboard.
- L. Flexible Flashings: As recommended by membrane manufacturer.
- M. Counterflashings: as specified in Section 07620.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify items penetrating surfaces to receive waterproofing are securely installed.
- D. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.2 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Execute cement sand mortar at all intersections to make beveled corners (fillet) of size 50 x 50 mm.
- C. Clean and prepare surfaces to receive waterproofing.
 - 1. Surfaces shall be clean and without any holes, lips, angular ridges, unstable sandy areas, and the like (holes shall be flush filled, and lips, aggressive ridges, projections, etc. shall be flushed by grinding).
- D. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.
- E. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer and in accordance with Section 07900.
- F. Apply surface conditioner at rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.3 INSTALLATION - GENERAL

- A. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.4 INSTALLATION - LOOSE LAID MEMBRANE WATERPROOFING

- A. Roll out membrane. Minimize wrinkles and bubbles.
- B. Overlap edges and ends and seal by solvent welding, heat welding, contact tape and/or contact adhesive, minimum 75 mm. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- C. Reinforce membrane with multiple thicknesses of membrane material over static or moving joints.
- D. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.

- E. Install flexible flashings. Seal watertight to membrane.
- F. Seal flashings to adjoining surfaces.
- G. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 200 mm above horizontal surface for first ply and as recommended by the manufacturer at subsequent plies laid in shingle fashion.
- H. Terminate top edge of membrane and flexible flashing under counterflashings, seal with mastic. Coordinate with metal flashing installation specified in Section 07620.
- I. Particular Requirements for Loose Laid PVC Membrane Waterproofing:
 - 1. The overlapping and assembly of PVC membrane shall be carried out by heated wedge thermal welding as instructed by the manufacturer.
 - 2. Each stop end (casting edge) shall be fitted with a rear guard type PVC waterstop. The axis of the stop end shall correspond to the waterstop axis.
 - 3. Where two or more stop ends meet, the waterstops shall be mitered and welded together in a manner to form an approved continuous profile even at right angle corners perpendicular to each other. The rear guard type waterstops will themselves be continuously welded on the PVC membrane to compartmentalize the waterproofing membrane between waterstops.
 - 4. Additional longitudinal and transverse partitioning shall be installed to limit compartments to under 150 m² as per manufacturer's recommendations.
 - 5. A stainless steel device shall be provided above each dewatering well (if any), to enable the termination of PVC membrane, and later, to allow the removal of pumps and well closure in accordance with a methodology approved by the Engineer.
 - 6. A control / injection pipes and stainless steel or inox covers system as per manufacturer's recommendations shall be provided to allow repair of damaged waterproofing section (Layout of injection pipes and covers to be approved by the Engineer).
 - 7. Two layers of anti-punching geotextile fabrics shall be provided as per manufacturer's recommendations; 500 to 700 g/m² each for horizontal surfaces, and 1000 g/m² each for vertical surfaces.
 - 8. Polyethylene sheet, 0.25 mm thick, shall be provided for horizontal surfaces.
 - 9. PVC protective sheet to membrane shall be provided, 1.5 or 2 mm thick.

3.5 INSTALLATION - ADHESIVE BONDED, SELF ADHERED AND TORCH APPLIED MEMBRANE WATERPROOFING

- A. Roll out membrane. Minimize wrinkles and bubbles.
- B. Remove release paper layer. Roll out on substrate with mechanical roller to encourage full contact bond.
- C. Apply adhesive at rate recommended by manufacturer, Bond sheet to substrate except those areas directly over or within 75 mm of control or expansion joint.
- D. Apply membrane by torch application, coated side down.
- E. Lap sides and ends.

- F. Overlap edges and ends and seal with contact adhesive, or by heat sealing, minimum 75 mm. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- G. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- H. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams. Coordinate with drain installation, Division 15 - Mechanical.
- I. Install flexible flashings. Seal watertight to membrane.
- J. Seal membrane and flashings to adjoining surfaces.
- K. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 200 mm above horizontal surface for first ply and as recommended by the manufacturer at subsequent plies laid in shingle fashion.
- L. Seal items protruding to or penetrating through membrane and install Counterflashing membrane material.

3.6 INSTALLATION - MECHANICALLY ATTACHED MEMBRANE WATERPROOFING

- A. Roll out membrane. Minimize wrinkles and bubbles.
- B. Install mechanical fasteners in accordance with applicable code.
- C. Bond sheet to membrane disc.
- D. Overlap edges and ends and seal by solvent welding, heat welding, contact tape and/or contact adhesive, minimum 75 mm. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.
- F. Install flexible flashings. Seal watertight to membrane.
- G. Seal membrane and flashings to adjoining surfaces.
- H. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 200 mm above horizontal surface for first ply and as recommended by the manufacturer at subsequent plies laid in shingle fashion.
- I. Seal items protruding to or penetrating through membrane and install Counterflashing membrane material.

3.7 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

- A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward.
- B. Place protection board directly against drainage panel and/or membrane; butt joints.

- C. Adhere protection board and drainage panel to substrate with mastic to tacky dampproofing surface. Scribe and cut boards around projections, penetrations, and interruptions.

3.8 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. On completion of horizontal membrane installation, dam installation area in preparation for flood testing.
- C. Flood to minimum depth of 25 mm with clean water. After 48 hours, inspect for leaks.
- D. When leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by the Engineer; repeat flood test. Repair damage to building.
- E. When area is proven watertight, drain water and remove dam.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Do not permit traffic over unprotected or uncovered membrane.
- C. Protect membrane from damage by adhering protection board over membrane surface. Scribe and cut boards around projections and interruptions.

3.10 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07140

FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes fluid applied rubberized asphalt and/or elastomeric membrane waterproofing, and polyurethane waterproof coating system; and surface dusting and/or protective covering.
- B. Related Sections:
 - 1. Section 02320 - Backfill.
 - 2. Section 07212 - Board Insulation: Perimeter and horizontal insulation protective cover.
 - 3. Section 07620 - Sheet Metal Flashing and Trim.
 - 4. Section 07900 - Joint Sealers.
 - 5. Division 15 - Mechanical: Plumbing fixtures and plumbing specialties.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - 2. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers -Tension.
 - 3. ASTM D429 - Standard Test Method for Rubber Property - Adhesion to Rigid Substrates.
 - 4. ASTM D471 - Standard Test Method for Rubber Property - Effect of Liquids.
 - 5. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 6. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - 7. ASTM D822 - Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.
 - 8. ASTM D1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 9. ASTM D2240 - Standard Test Method for Rubber Property-Durometer Hardness.
 - 10. ASTM D3468 - Standard Specification for Liquid-Applied Neoprene and Chlorosulfonated Polyethylene Used in Roofing and Waterproofing.
 - 11. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- B. National Roofing Contractors Association:
 - 1. NRCA - The NRCA Waterproofing and Dampproofing Manual.

1.3 SYSTEM DESCRIPTION

- A. Waterproofing System: Fluid applied material to prevent moisture migration to interior.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- C. Product Data: Submit data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- D. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Waterproofing Manual.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Waterproofing Material Manufacturer: Company specializing in waterproofing membrane with minimum fifteen years documented experience.
- B. Applicator: Company specializing in performing the work of this section with minimum ten years documented experience.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct Mockup, 10 sq m of horizontal and vertical waterproofed panel; to represent finished work including internal and external corners, jointing, attachment method, flashings, drainage panel, base flashings, control and expansion joints, and protective cover.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Maintain ambient temperatures above 5 °C for 24 hours before and during application and until liquid or mastic accessories have cured.

1.10 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish ten year manufacturer warranty for waterproofing failing to resist penetration of water.
- C. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 FLUID APPLIED WATERPROOFING

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 BITUMINOUS COLD APPLIED WATERPROOFING PAINT

- A. Waterproofing Membrane: Rubberized asphalt or elastomeric membrane; fluid applied, cold applied; quick setting.

- B. Cured Membrane Characteristics:

1.	<u>Properties</u>	<u>Test</u>
a.	Tensile Strength	ASTM D412
b.	Elongation	ASTM D412
c.	Hardness - Shore A	ASTM D2240
d.	Tear Strength	ASTM D624 and/or D1004
e.	Water Absorption	ASTM D471
f.	Moisture Vapor (perms)	ASTM E96
g.	Exposure at Low Temperature	ASTM D822
h.	Brittleness	ASTM D746
i.	Adhesion	ASTM D429

2.3 POLYURETHANE WATERPROOF COATING SYSTEM

- A. Polyurethane solvent-free waterproof flexible coating, 1.5 kg/m² in two coats minimum, unless otherwise directed.

2.4 ACCESSORIES

- A. Surface Conditioner and/or Primer: type compatible with membrane compound; as recommended by membrane manufacturer.
- B. Elastic Flashings: 1.2 mm thick, as recommended by membrane manufacturer.
- C. Joint Cover Sheet: Elastic sheet material designated for and compatible with membrane. Thickness as recommended by membrane manufacturer.
- D. Cant Strips: Premolded composition material, as recommended by membrane manufacturer.
- E. Drainage Panel: As recommended by membrane manufacturer.
- F. Joint and Crack Sealant: As recommended by membrane manufacturer.
- G. Back-up Material: As recommended by membrane manufacturer.
- H. Reglet Strip Devices: As recommended by membrane manufacturer.
- I. Counterflashings: As recommended by membrane manufacturer.
- J. Tack-free Surfacing: Type 1 Portland cement and/or Stone dust.
- K. Separation Sheet: As recommended by membrane manufacturer.
- L. Protection Board: 2mm thick polypropylene boards, as specified in Section 07212.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.
- C. Verify substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.
- D. Verify items penetrating surfaces to receive waterproofing are securely installed.
- E. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.2 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.

- B. Execute cement sand mortar at all intersections to make beveled corners (fillet) of size 50 x 50 mm.
- C. Clean and prepare surfaces to receive waterproofing.
 - 1. Surfaces shall be clean and without any holes, lips, angular ridges, unstable sandy areas, and the like (holes shall be flush filled, and lips, aggressive ridges, projections, etc. shall be flushed by grinding).
- D. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.
- E. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer and/or in accordance with Section 07900.
- F. Apply surface conditioner at rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.3 INSTALLATION

- A. Apply 300 mm wide strip of joint cover sheet over cracks, non-working joints, and expansion joints over 1.6 mm but not exceeding 13 mm in width.
- B. At expansion joints from 13 to 25 mm in width, loop cover sheet down into joint between 31 and 44 mm. Extend sheet 200 mm on both sides of expansion joint.
- C. Center cover sheet over crack or joints. Roll sheet into 3.2 mm coating of waterproofing material. Apply second coat over sheet extending minimum of 200 mm beyond sheet edges. Apply this procedure especially to expansion joints between horizontal and vertical surfaces.
- D. Apply waterproofing material.
- E. Apply and spread waterproofing material to a minimum cured thickness and averaging thickness as recommended by the manufacturer.
- F. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 200 mm above horizontal surface.
- G. Install cant strips at inside corners.
- H. Apply extra thickness of waterproofing material at corners, intersections, angles, and over joints.
- I. Seal items protruding to or penetrating through membrane and install counter-flashing membrane material.
- J. Extend waterproofing material and flexible flashing into drain clamp flange and apply adequate coating of liquid membrane to assure clamp ring seal. Coordinate with drain installation specified in Division 15 - Mechanical.
- K. Install membrane flashings and seal into waterproofing material.
- L. Conform to NRCA - Waterproofing Manual drawing details as noted:

- M. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward.
- N. Place protection board and/or panel directly against drainage panel and/or membrane; butt joints.
- O. Adhere protection board and/or drainage panel to substrate with mastic. Scribe and cut boards around projections, penetrations, and interruptions.
- P. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. On completion of membrane installation, dam installation area as directed by the Engineer, in preparation for flood testing.
- C. Flood to minimum depth of 25 mm with clean water. After 48 hours, verify no leaks with the Engineer.
- D. When leaking is found, remove water, patch leaking areas with new waterproofing materials as directed by the Engineer; repeat flood test. Repair damage to building.
- E. When area is proven watertight, drain water and remove dam.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Do not permit traffic over unprotected or uncovered membrane.
- C. After membrane has cooled and/or cured, but before it becomes dusty, apply separation sheet. Lap joints to ensure complete coverage.

3.6 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07161

CEMENTITIOUS WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes flexible high-performance cement-based waterproof coating.
- B. Related Sections include the following:
 - 1. Section 03300 - Cast-in-Place Concrete.

1.2 SUBMITTALS

- A. Product Data: For each type of product specified. Include recommendations for substrate preparation, method of application, number of coats and coverage.
 - 1. Sample Warranty: Copy of waterproofing Applicator's proposed warranty stating obligations, remedies, limitations, and exclusions.
- B. Shop Drawings: Show locations and details of waterproofing preparation and application. Show expansion joint details and waterproofing application at obstructions and penetrations.
- C. Material Certificates: For each product, signed by manufacturers.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: An experienced applicator who has completed cementitious waterproofing similar in material, design, and extent to that indicated for this Project and whose work has resulted in application with a record of successful in-service performance.
- B. Source Limitations: Obtain cementitious waterproofing products and materials through one source from a single manufacturer.

1.4 QUALIFICATIONS

- A. Waterproofing Material Manufacturer: Company specializing in waterproofing membrane with minimum fifteen years documented experience.
- B. Applicator: Company specializing in performing the work of this section with minimum ten years documented experience.

1.5 JOB CONDITIONS

- A. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after concrete and masonry substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

- B. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 5°C or above during work and cure period and space is well ventilated and kept free from water.

1.6 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Provide ten year warranty for each waterproofing system including coverage of materials and installation, and all resulting damage resulting from failure to resist penetration of moisture.
- C. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 FLEXIBLE HIGH-PERFORMANCE CEMENT-BASED WATERPROOF COATING

- A. Two-Component Product:
 - 1. A powder made of cements, fillers and admixtures
 - 2. A liquid based on resins and additives
- B. Cementitious waterproofing shall form, when applied to substrate like concrete, cement plaster, masonry, etc., a film that is waterproof, flexible, and resistant.
- C. The adhesion and sealing qualities of the cementitious waterproofing shall be outstanding, and it should be used for positive and/or negative hydrostatic pressures.
- D. Cementitious waterproofing shall be non-shrinking, and shall prevent the steel bar reinforcements from corrosion.
- E. Cementitious waterproofing shall be used on damp cement based substrates.
- F. Characteristics:
 - 1. Powder Appearance: White or grey
 - 2. Powder Density: 1.49
 - 3. Powder Grain Size: 0.6 mm
 - 4. Liquid Density: 1.04
 - 5. pH of the Mix: 12
 - 6. Application Temperature: 5 to 35°C
 - 7. Water Absorption (ASTM D 870): 91.75%
 - 8. Pull off Strength (ASTM D4541): 1 MPa @ 28 days on concrete substrate
 - 9. Elongation (Dry Film Thickness 2 mm ASTM D 412:98): 40%
 - 10. VOC & Formaldehyde Content (ISO/FDIS11890-2/GC-MS): None (<10µg/l)
- G. Consumption: 2 kg/m² to 4 kg/m² depending on the nature of the support.

- H. Storage: Can be stored up to 6 months from manufacturing date, in original packaging, non-open, protected from humidity, hot or freezing temperature.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and other surfaces where waterproofing is to be applied, for compliance with requirements for surface preparation, cleaning, and other conditions affecting waterproofing performance.
1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect other work from dripping or splatter from cementitious waterproofing during application. Provide temporary enclosure to confine operation, to prevent polluting the air, and to ensure adequate ambient temperatures and ventilation conditions for application.
- B. Substrate shall be perfectly sound, clean, free from grease, oil, dust or any friable matters. All corners should be saw-cut and filled with a non-shrink thixotropic mortar. All honeycombs or holes should be widened and filled with a non-shrink mortar. Before applying cementitious waterproofing, wet abundantly the substrate to be treated.

3.3 APPLICATION

- A. General: Comply with waterproofing manufacturer's written instructions.
- B. Mix waterproofing components according to waterproofing manufacturer's written instructions. Mix the two components by using a mechanical mixer in order to obtain a creamy coating which can be applied by brush.
- C. Protect all adjacent surfaces.
- D. Apply waterproofing coating evenly and fill voids and pores of substrate with waterproofing slurry. Keep tools clean and free from build-up.
- E. Apply the number of coats at rates recommended by the manufacturer for each coat:
1. Apply 1st layer of cementitious waterproofing with sufficient thickness to plug pores, cracks, and holes at 1kg/m².
 2. Apply 2nd and 3rd layers in the proportion of 0.5 to 1 kg/m². Always allow to dry between each layer.
 3. All corners, cracks or construction joints should receive 200 mm wide fiberglass mesh reinforcement between the 1st and 2nd layer.
 4. Wherever tiling is required, comply with manufacturer's recommendations. It is recommended that the tiling start after one week from the application of cementitious waterproofing. Flood-test on cementitious waterproofing shall be carried out prior tiles fixing. Allow one week curing before flood test.

- F. Cure waterproofing after application as recommended by the manufacturer.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Monitor quality of cementitious waterproofing.

3.5 SAFETY PRECAUTIONS

- A. The product contains cement powders which, when mixed with water, release alkalis that could be harmful to the skin. Thus, application should be done in a ventilated area. Moreover, applicator shall wear protective gear for hands, eyes and respiratory system and shall avoid breathing of the dust. Splashes on the skin should be washed away by cleaning with soap and water. In case of contact with eyes, wash thoroughly with clean water. If swallowed, seek medical attention. The product is non-flammable.

3.6 PROTECTION

- A. Protect applied cementitious waterproofing from severe weather exposure, water accumulation, etc. Comply with waterproofing manufacturer's written instructions and requirements. Maintain completed Work in a condition recommended by waterproofing manufacturer.

END OF SECTION

SECTION 07190

WATER REPELLENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes water repellent coating system applied to exterior and interior clay brick, concrete masonry, exposed fairfaced concrete, stone, or stucco surfaces.
- B. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete: Concrete surfaces.
 - 2. Section 07900 - Joint Sealers.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D1653 - Standard Test Method for Water Vapor Transmission of Organic Coating Films.
 - 2. ASTM D5703 - Standard Practice for Preparatory Surface Cleaning for Clay Brick Masonry.
 - 3. ASTM E514 - Standard Test Method for Water Penetration and Leakage Through Masonry.
 - 4. ASTM G154 - Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.

1.3 SYSTEM DESCRIPTION

- A. Applied Penetrant: Breathable colored or transparent water or solvent based liquid as penetrant sealer or film-forming type coating to retard and restrict moisture absorption when applied to above grade porous surfaces, and for stain or soil resistance when applied to interior surfaces, as recommended by manufacturer for each specific substrate.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit details of product description, tests performed, limitations to coating, and chemical properties including percentage of solids.
- C. Manufacturer's Installation Instructions: Submit special procedures and conditions requiring special attention, and cautionary procedures required during application.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum fifteen years documented experience.

- B. Applicator: Company specializing in performing Work of this section with minimum ten years documented experience.

1.6 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Prepare a nominal surface of 10 m² in size.
- C. Prepare brick surface in accordance with ASTM D5703.
- D. Testing: Test mockup with 16 mm garden hose with spray nozzle located approximately 3 m from wall and aimed upward so water strikes at 45 degree downward angle.
 - 1. Do not begin testing until mockup has fully cured, minimum 20 days unless longer period recommended by manufacturer.
 - 2. Run water continuously for minimum three hours and observe back side of mockup for water penetration and leakage.
 - 3. When leakage is detected make changes as needed and retest; retest until no leakage is detected.
- E. Locate where directed by the Engineer.
- F. Remove mockup when directed by the Engineer.

1.7 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Protect coating liquid from freezing.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Do not apply coating when ambient temperature is lower than 10°C or higher than 38°C.
- C. Do not apply coating when wind velocity exceeds manufacturer recommendations.

1.10 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish ten year manufacturer warranty for water repellents.

PART 2 PRODUCTS

2.1 WATER REPELLENTS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Siloxane Water Repellent: Siloxane and/or Siloxane blend penetrating type water repellent, with maximum 175 g/L VOC content.
 - 1. Moisture Vapor Transmission: Maximum 28.33 perms or 50% compared to untreated surfaces, ASTM D1653.
 - 2. Resistance to Accelerated Weathering: No loss in repellency after 2,500 hours, ASTM G154.
 - 3. Reduction of Leakage: Minimum 97 percent water penetration and leakage, ASTM E514.
 - 4. Apply to clay brick, concrete masonry, concrete, stone, and stucco.
- B. Silane Water Repellent: Silane penetrating type water repellent, containing 20 percent solids by weight, with maximum 175 g/L VOC content.
 - 1. Moisture Vapor Transmission: Maximum 28.33 perms or 50% compared to untreated surfaces, ASTM D1653.
 - 2. Resistance to Accelerated Weathering: No loss in repellency after 2,500 hours, ASTM G154.
 - 3. Reduction of Leakage: Minimum 97 percent water penetration and leakage, ASTM E514.
 - 4. Apply to clay brick, concrete masonry, concrete, stone, and stucco.
- C. Acrylic Film-Forming Water Repellent: Clear breathing coating of acrylic resin; with a water-based, solvent-based or acrylic emulsion solution containing less than 15% solids by volume, and with maximum 3.3 lb/gal VOC content.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of coating.

3.2 PREPARATION

- A. Delay Work until masonry mortar, concrete, and stucco substrate is cured minimum of 60 days.
- B. Remove loose particles and foreign matter.

- C. Remove oil or foreign substance with chemical solvent which will not effect coating.
- D. Scrub and rinse surfaces with water and let dry.

3.3 APPLICATION

- A. Apply by roller and/or airless spray at rates recommended by manufacturer.
- B. Apply in two continuous, uniform coats.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Monitor quality of water repellents.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Protect adjacent surfaces not scheduled to receive coating.
- C. Protect landscaping, property, and vehicles.
- D. When applied to unscheduled surfaces, remove immediately by methods as instructed by coating manufacturer.

3.6 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07212

BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes rigid and semi-rigid board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, exterior walls, etc.
- B. Related Sections:
 - 1. Section 07260 - Vapor Retarders: Vapor retarder materials to adjacent insulation.
 - 2. Section 07270 - Air Barriers: Air seal materials to adjacent insulation.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.
 - 2. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
 - 3. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 5. ASTM C1289 - Standard Specification for Faced Rigid Cellular Thermal Insulation Board.
 - 6. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 - 7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 8. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- B. National Fire Protection Association:
 - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- C. Underwriters Laboratories Inc.:
 - 1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

- A. Materials of this Section:
 - 1. Provide continuity of thermal barrier at building enclosure elements.
 - 2. Provide thermal protection to vapor retarder in conjunction with vapor retarder materials in Section 07260.
 - 3. Provide thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials in Section 07270.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria, limitations, and adhesives.
- C. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation techniques.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Do not install adhesives when temperature or weather conditions are detrimental.

1.6 SEQUENCING

- A. Sequence Work to ensure fireproofing, firestopping, vapor retarder, and air barrier materials are in place before beginning Work of this section.

1.7 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate Work with Section 07260 and Section 07270.

PART 2 PRODUCTS

2.1 BOARD INSULATION

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Polypropylene Protection Board: Two spaced layers, joined together with ribs:
 - 1. 1.5 mm thick; Unit weight: 250g/m².
 - 2. 5 mm thick; Unit weight: 650g/m².
- B. Extruded Polystyrene Insulation Board: ASTM C578, type VII, cellular type:
 - 1. Board Density: 35 kg/m³.
 - 2. Board Size and Thickness: 1200 mm x 2400 mm x 50 mm thick.
 - 3. Thermal Resistance: RSI of 0.87.
 - 4. Water Absorption: To ASTM D2842, 0.3 percent by volume maximum.
 - 5. Compressive Strength: Minimum 175 kPa.
 - 6. Board Edges: Square, shiplap, or tongue and groove edges.
 - 7. Flame/Smoke Properties: In accordance with ASTM E84.

- C. Rigid Glass Fiber Board Insulation:
1. Rigid Glass Board Insulation with Vapor Barrier: Glass fiber thermosetting resins complying with ASTM C612, Class 1 and 2; density not less than 48kg/m³; minimum R-value of 4.3 at 24°C; vapor barrier facing laminate of aluminum foil, Kraft paper, and glass scrim reinforcement, with perm rating of 0.02; manufacturer's standard sizes; thickness shown.
 2. Rigid Glass Fiber Board Insulation - Unfaced: Glass fibers and thermosetting resins to ASTM C612, Class 1 and 2: density not less than 48 kg/m³; minimum R-value of 4.3 at 24°C; non-combustible per ASTM E136.
- D. Fiberglass Acoustic Insulation: In flexible rolls and semi rigid slabs free from shot and course fibers faced with non woven dimensionally stable black glass tissue.
1. The acoustic insulation shall be 25mm and 50mm thick, 60 kg/m³ density and sound absorption coefficient (SAC) follows:

HZ	63	125	250	500	1k	2k	4k	8k
SAC	35	42	55	75	98	97	93	90
 2. The insulation shall be odorless, non hygroscopic, non toxic, rot proof and not sustain fungus or vermin. Moisture absorption shall not exceed 1% by weight when tested in accordance with ASTM C553.
- E. Isocyanurate Board: Polyisocyanurate foam core with aluminum foil facers and with standard square edges:
1. Federal Specification HH-1-1972/1, Class 2.
 2. Thickness: As indicated.
 3. Density: Nominal 32 kg/m³.
 4. Compressive strength: Not less than 1.7 kg/m².
 5. "R" value at 23.8°C per 25mm thickness: Not less than 7.2
- F. Glass Fiber Board: Fibrous glass board design for exposed application with flame spread of 25 or less and smoke development of 50 or less, with foil-reinforced-Kraft facing and standard square edges designed for Z-furring application:
1. Thickness: 50mm, unless otherwise indicated.
 2. "R" value at 23.8°C per 25mm thickness: Not less than 4.0.
- G. Glass Fiber Board: Fibrous glass board with aluminum foil face and with standard square edges:
1. To ASTM C612, Class 2.
 2. Thickness: As indicated.
 3. "R" value at 23.8°C per 25mm thickness: No less than 4.0.
- H. Curtain Wall Insulation: Rigid mineral fiber insulation with integral foil-faced vapor barrier specially designed for use with curtain wall applications:
1. Density: 96kg/m³.
 2. Thickness: 75mm, unless otherwise indicated.
- I. Dark Curtain Wall Insulation: Semi-rigid mineral fiber insulation with a dark face color for use behind dark colored spandrel panels:
1. Density: 96kg/m³.
 2. Thickness: 75mm, unless otherwise indicated.

2.3 ACCESSORIES

- A. Adhesive Type 1: Type recommended by insulation manufacturer for application.
- B. Adhesive Type 2: Vapor retarder type, trowel consistency; fire retardant compatible with insulation and substrate, as recommended by the manufacturer.
- C. Sheet Vapor Retarder: Specified in Section 07260.
- D. Tape: Bright aluminum, Polyethylene and/or Polyester self-adhering type, mesh reinforced, 50 mm wide.
- E. Insulation Fasteners: Impaling clip as recommended by the manufacturer to be adhered and/or mechanically fastened to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- F. Protective Boards: As recommended by the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.
- C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, and materials or substances affecting adhesive bond.

3.2 INSTALLATION

- A. Install Work in accordance with the drawings, to the manufacturer's instructions and to the satisfaction of the Engineer.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Do not permit damage to insulation prior to covering.

3.4 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07260

VAPOR RETARDERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sheet and sealant materials for controlling vapor diffusion.
- B. Related Sections:
 - 1. Section 07270 - Air Barriers.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- B. Sealant, Waterproofing and Restoration Institute:
 - 1. SWRI - Sealant Specification.

1.3 PERFORMANCE REQUIREMENTS

- A. Maximum Vapor Permeability (Perm): 1 ng/S/m/Pa measured in accordance with ASTM E96 Method E.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data indicating material characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Submit preparation and installation requirements, techniques.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SWRI - Sealant and Caulking Guide Specification requirements for materials and installation.

1.6 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up, size as directed by the Engineer, of exterior wall, ceiling and attic vapor retarder including vapor retarder installation at typical window, door and wall-ceiling intersection.

- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.7 SEQUENCING

- A. Sequence Work to permit installation of materials in conjunction with other retardant materials and seals, and air barrier assemblies specified in Section 07270.
- B. Do not install vapor retarder until items penetrating vapor retarder are in place.

PART 2 PRODUCTS

2.1 VAPOR RETARDERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Sheet Retarder: Polyethylene film for above grade application, minimum 0.25 mm thick.
- B. Sealant: Type recommended by the Manufacturer.
- C. Primer and Backer Rods: As recommended by sealant manufacturer to suit application.
- D. Cleaner: Non-corrosive type; as recommended by sealant manufacturer; compatible with adjacent materials.
- E. Mastic Adhesive: asphalt type, compatible with sheet retarder and substrate, as recommended by manufacturer.
- F. Adhesive: Compatible with sheet retarder and substrate, permanently non-curing, as recommended by manufacturer.

2.3 ACCESSORIES

- A. Thinner and Cleaner: As recommended by sheet material manufacturer.
- B. Tape: Bright aluminum, Polyethylene and/or Polyester self-adhering type, mesh reinforced, 50 mm wide, compatible with sheet material.
- C. Attachments: Stainless steel type 316 bars and anchors.

PART 3 EXECUTION

3.1 PREPARATION

- A. Remove loose or foreign matter capable of impairing adhesion.
- B. Clean and prime substrate surfaces to receive adhesive and sealants.

3.2 EXISTING WORK

- A. Clean and repair existing construction to provide positive and continuous seal for vapor retarders.

3.3 INSTALLATION

- A. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.4 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07270

AIR BARRIERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes air leakage criteria for primary air seal building enclosure materials and assemblies; materials and installation methods supplementing other and primary air seal materials and assemblies; and air seal materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.
- B. Related Sections:
 - 1. Section 07260 - Vapor Retarders: Vapor retarders.
 - 2. Section 07900 - Joint Sealers: Sealant materials and installation techniques.

1.2 REFERENCES

- A. American Society of Civil Engineers:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- B. ASTM International:
 - 1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 3. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
 - 4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- C. Sealant, Waterproofing and Restoration Institute:
 - 1. SWRI - Sealant Specification.

1.3 DEFINITIONS

- A. Air Barrier: Continuous network of materials and joints providing air tightness, with adequate strength and stiffness to not deflect excessively under air pressure differences, to which it will be subjected in service. It can be comprised of single material or combination of materials to achieve performance requirements.

1.4 DESIGN REQUIREMENTS

- A. Perform design work in accordance with ASCE 7.

1.5 PERFORMANCE REQUIREMENTS

- A. Static Test: Resist air leakage caused by static air pressure across exterior wall assemblies and other interruptions to integrity of building enclosure systems; in accordance with ASTM E283 and/or ASTM E330.
- B. Dynamic Test: Resist air leakage caused by dynamic air pressure across exterior wall assemblies and other interruptions to integrity of wall and roof systems; in accordance with ASTM E283 and/or ASTM E330.
- C. Provide continuity of air seal materials and assemblies in conjunction with materials described in Division 3, Division 7 and Division 8.

1.6 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate special joint conditions.
- C. Design Data: Submit design calculations.
- D. Product Data: Submit data on material characteristics, performance criteria and limitations.
- E. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, product storage and handling criteria.

1.7 QUALITY ASSURANCE

- A. Perform Work to SWRI - Sealant and Caulking Guide Specification requirements.
- B. Maintain one copy of each document on site.

1.8 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up of air barrier system, which is comprised of variety of materials.
- C. Construct typical exterior wall panel, size as directed by the Engineer, incorporating window frame and sill, insulation, building corner condition, junction with roof membrane air seal, and vapor retarder; illustrating materials interface and seals.
- D. Locate where directed by the Engineer.
- E. Remove mockup when directed by the Engineer.

1.9 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.

1.11 SEQUENCING

- A. Sequence Work to permit installation of materials in conjunction with related materials and seals.

1.12 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate the Work of this section with sections referencing this section.

PART 2 PRODUCTS

2.1 AIR BARRIERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Sheet Seal: Type as recommended by the manufacturer.
- B. Liquid Seal: Type as recommended by the manufacturer.
- C. Sealant: Type as recommended by the manufacturer.
- D. Polysulfide Sealant: Type as recommended by the manufacturer.
- E. Polyurethane Sealant: Type as recommended by the manufacturer.
- F. Silicone Sealant: Type as recommended by the manufacturer.
- G. Primer: As recommended by the manufacturer.
- H. Substrate Cleaner: Non-corrosive, type as recommended by sealant manufacturer, compatible with adjacent materials.
- I. Mastic Adhesive: Compatible with sheet seal and substrate, as recommended by the manufacturer.
- J. Adhesive: Type compatible with sheet seal and substrate, permanently non-curing; As recommended by the manufacturer.

2.3 ACCESSORIES

- A. Thinner and Cleaner for Sheet: As recommended by sheet material manufacturer.
- B. Tape: Bright aluminum, Polyethylene and/or Polyester self adhering type, mesh reinforced, 50 mm wide, compatible with sheet material.
- C. Attachments: Stainless steel type 316 bars and anchors.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean and prime substrate surfaces to receive adhesive and sealants.

3.2 INSTALLATION

- A. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Do not permit adjacent work to damage work of this section.

3.4 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes flashings and counterflashings, sheet metal roofing and fabricated sheet metal items, as indicated in Schedule.
 - 1. Provide reglets and accessories, precast concrete splash pads, and/or sheet metal splash pans.
- B. Related Sections:
 - 1. Section 03100 - Concrete Forms and Accessories: Placement of recessed flashing reglets and accessories.
 - 2. Section 04810 - Unit Masonry Assemblies: Thu-wall flashings in masonry.
 - 3. Section 07900 - Joint Sealers.
 - 4. Section 09900 - Paints and Coatings: Field painting.
 - 5. Division 15 - Mechanical: Hangers and Supports.

1.2 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM International:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 3. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 4. ASTM B32 - Standard Specification for Solder Metal.
 - 5. ASTM B101 - Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction.
 - 6. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - 7. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.

8. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
9. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
10. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
11. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

C. Copper Development Association Inc.:

1. CDA - Copper in Architecture - Handbook.

D. Federal Specification Unit:

1. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

E. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - Architectural Sheet Metal Manual.

1.3 DESIGN REQUIREMENTS

- A. Sheet Metal Flashings: Conform to the criteria of SMACNA "Architectural Sheet Metal Manual" and/or Copper Development Association "Copper in Architecture - Handbook".
- B. Gutter and Downspout Components: Conform to SMACNA Manual, CDA Handbook, SSINA Standard Practice, and/or NRCA Details for sizing components for rainfall intensity determined by storm occurrence of 1 in 5 years.
- C. Maintain one copy of each document on site.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.
- D. Samples:
 1. Submit two samples, size as directed by the Engineer, illustrating seam, external and/or internal corners, valley, ridge, junction to vertical dissimilar surface, material and finish.

1.5 QUALIFICATIONS

- A. Fabricator and Installer: Company specializing in sheet metal work with minimum ten years documented experience.

1.6 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.7 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials causing discoloration or staining.

1.8 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate with Work of Section 03100 and Section 04810 for installing recessed flashing reglets.

PART 2 PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.
- B. Aluminum Sheet: ASTM B209M, alloy and temper as required for application and finish; 1.2 mm thick unless otherwise stated; finish and color as selected by the Engineer.

2.2 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal.
- B. Underlayment: ASTM D4397, 0.25 mm polyethylene.
- C. Slip Sheet: As recommended by manufacturer.
- D. Primer: As recommended by manufacturer.
- E. Protective Backing Paint: As recommended by manufacturer.
- F. Sealant: Type as specified in Section 07900.
- G. Plastic Cement: ASTM D4586, Type I.
- H. Reglets: As recommended by manufacturer.

- I. Splash Pads: Precast concrete type, of sizes and profiles as indicated; minimum 29 MPa at 28 days, with minimum 5 percent air entrainment.
- J. Downspout Boots and/or Shoes: As recommended by manufacturer.
- K. Solder: ASTM B32; type suitable for application and material being soldered.

2.3 FABRICATION

- A. Form sections shape indicated on Drawings, accurate in size, square and free from distortion or defects.
- B. Fabricate cleats of same material as sheet metal, interlocking with sheet.
- C. Form pieces in single length sheets.
- D. Hem exposed edges on underside 13 mm; miter and seam corners.
- E. Form material with standing, batten and/or flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Tin edges of copper sheet to be soldered. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.
- G. Fabricate corners from one piece with minimum 450 mm long legs; seam and/or solder for rigidity, seal with sealant.
- H. Fabricate vertical faces with bottom edge formed outward 6 mm and hemmed to form drip.
- I. Fabricate flashings to allow toe to extend 50 mm over roofing gravel and/or paver. Return and brake edges.
- J. Fabricate guards as detailed on drawings.
- K. Fabricate gutters to profile and size indicated.
- L. Fabricate downspouts to profile and size indicated.
- M. Fabricate accessories in profile and size to suit gutters and downspouts.
 - 1. Anchorage Devices: Type recommended by fabricator.
 - 2. Gutter Supports: Type recommended by fabricator.
 - 3. Downspout Supports: Type recommended by fabricator.
- N. Fabricate splash pans of same metal type as downspouts, dimension as recommended by fabricator.
- O. Seal metal joints.

2.4 FACTORY FINISHING

- A. Factory Finish: as recommended by finish system manufacturer.
- B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets to lines and levels indicated on Drawings. Seal top of reglets with sealant.
- C. Paint concealed metal surfaces with protective backing paint to minimum dry film thickness of 0.4 mm.

3.3 INSTALLATION

- A. Install work in accordance with the drawings, to the manufacturer's recommendations and to the approval of the Engineer.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sealants and joint backing, precompressed foam sealers, hollow gaskets and accessories.
- B. Related Sections:
 - 1. Section 07260 - Vapor Retarders: Sealants required in conjunction therewith.
 - 2. Section 07270 - Air Barriers: Sealants required in conjunction therewith.
 - 3. Section 08800 - Glazing: Glazing sealants and accessories.
 - 4. Section 09260 - Gypsum Board Assemblies: Acoustic sealant.
 - 5. Section 09300 - Tile: Sealant used as tile grout.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C834 - Standard Specification for Latex Sealants.
 - 2. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
 - 3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
 - 5. ASTM D1056 - Standard Specification for Flexible Cellular Materials- Sponge or Expanded Rubber.
 - 6. ASTM D1667 - Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
 - 7. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit samples illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.
- E. Warranty: Include coverage for installed sealants and accessories failing to achieve airtight seal or watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.4 QUALITY ASSURANCE

- A. General Joint Sealer Performance Requirements: Select materials for compatibility with joint surfaces and other indicated exposures.
 - 1. Select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated.
 - 2. Where exposed to foot traffic, select materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.
- B. Color Selection: Provide colors indicated and if not, to match adjacent material or paint color; provide custom colors where required; colors to be selected by Engineer.
- C. Perform work in accordance with sealant manufacturers' requirements for preparation of surfaces and material installation instructions.
- D. Contractor shall require sealant manufacturer to review joint conditions and details, and shall submit to the Engineer written certification from the sealant manufacturer that joints are of the proper size and design, that the materials and backing will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.
 - 1. Certification shall include copies of manufacturer's test regarding adhesion and staining of adjacent surfaces.
- E. Perform acoustical sealant application work in accordance with ASTM C919.
- F. Maintain one copy of each referenced document on site.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum five years documented experience.

1.6 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mockup of sealant joints in conjunction with window, wall and other mockups specified in other sections.
- C. Construct mockup with specified sealant types and with other components noted.
 - 1. Determine preparation and priming requirements based on manufacturer's recommendations; take action necessary for correction of failure of sealant tests on mock-up.
 - 2. Verify sealants, primers and other components don't stain adjacent materials.
- D. Locate where directed by the Engineer.
- E. Remove mockup when directed by the Engineer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Products requirements.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.8 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate Work with sections referencing this section.

PART 2 PRODUCTS

2.1 JOINT SEALERS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.
- B. General:
 - 1. Provide a complete system of cleaners, primers, fillers, tapes, backer rods and tapes and sealants in accordance with the manufacturer's requirements and the standards specified herein.
 - 2. Color of Sealants:
 - a. For Concealed Joints: Provide the manufacturer's standard color which has the best overall performance quantities for the application shown.
 - b. For Exposed Joints: Provide custom colors as selected by the Engineer from the manufacturer's standard colors or other special custom colors.
- C. 1-Part Polyurethane Sealants: Polyurethane based 1-part elastomeric sealant, in accordance and complying with Fed. Spec. TT-S-00230C, Type II Class A, with elongation and compression of not less than 25 %; ASTM C920, Type S, Class 25, Grade NS.
 - 1. Location: Interior joints subject to movement.
 - 2. Acceptable Manufacturers and Product:
 - a. Sika Chemical Corporation: Sikaflex-1a.
 - b. Sonneborn Building Products: Sonolastic NP-1.
 - c. Tremco: Dymonic.
- D. 2-Part Polyurethane Sealant: Polyurethane based 2-part elastomeric sealant, in accordance and complying with Fed. Spec. TT-S-00227, Type II, Class A, with elongation and compression of not less than 25 %; ASTM C920, Type M, Class 25, Grade NS.
 - 1. Location: Exterior joints within masonry and concrete.
 - 2. Acceptable Manufacturers and Product:
 - a. Tremco: Dymeric.
 - b. Sonneborn Building Products: Sonolastic NP II.

- E. 2-Part Polyurethane Sealant for Horizontal Applications: Self leveling polyurethane based 2-part elastomeric sealant, complying with Fed. Spec. TT-S-00227E, Type I, Class A, with shore A hardness of not less than 30 and elongation and compression of not less than 25 %; ASTM C920, Type M, Class 25, Grade P.
1. Location: Joints subject to pedestrian or vehicle traffic.
 2. Acceptable Manufacturers and Product:
 - a. Tremco: THC900
 - b. Sonneborn Building Products: Sonolastic Paving Joint Sealant.
- F. Medium Modulus Silicone Rubber Sealant: Silicone rubber based 1-part neutral cure elastomeric sealant with plus 50 percent to minus 50 percent movement complying with ASTM C920 and Fed. Spec. TT-S-001543, Class A, and recommended by manufacturer for joints.
1. Location: Exterior joints subject to movement, NOT in contact with external insulation finishing system (EIFS).
 2. Acceptable Manufacturers and Product:
 - a. Dow Corning Corporation: 795 Building Sealant or DC 791.
 - b. Sonneborn, ChemRex Inc.: Sonolastic Omniseal or OmniPlus.
 - c. Tremco Construction Division: Spectrum 2.
- G. Medium Modulus Silicone Rubber Sealant to Reduce Bleeding and Mildew Growth: Silicone rubber based 1-part neutral cure elastomeric sealant with plus 50 percent to minus 50 percent movement specially designed for exterior application to reduce bleeding and mildew growth complying with ASTM C920.
1. Location: Exterior joints in metal panels and exterior ceramic tile.
 2. Acceptable Manufacturers and Product:
 - a. Dow Corning Corporation: 756 Building Sealant - HP.
- H. Ultra Low-Modulus Silicone Rubber Sealant: Silicone rubber based 1-part neutral cure elastomeric sealant with plus 100 percent to minus 50 percent movement complying with ASTM C920 and Fed. Spec. TT-S-001543, Class A.
1. Location: Joints in contact with external insulation finishing system (EIFS).
 2. Acceptable Manufacturers and Product:
 - a. Dow Corning Corporation: 790 Building Sealant, or DC 791 for non-fire rated, and FS 700 for fire rated.
- I. High Modulus Silicone Rubber Sealant: 1-part nonacid-curing silicone.
1. Location: Joints related to structural glazing.
 2. Acceptable Manufacturers and Product:
 - a. Dow Corning Corporation: Silicone 799, or DC 895.
 - b. General Electric: Ultraglaze SSG 4000.
- J. Mildew-Resistant Silicone Rubber Sealant: Silicone rubber based 1-part mildew resistance sealant with integral fungicide complying with Fed. Spec. TT-S-001543, Class A. Specifically recommended by manufacturer for interior joints in wet areas around plumbing fixtures and ceramic tile.
1. Location: Joints in ceramic tile walls and floors, around equipment, and around plumbing fixtures.
 2. Acceptable Manufacturers and Product:
 - a. General Electric: Sanitary 1700 Sealant.
 - b. Dow Corning Corporation: Silicone 786 mildew resistant, or DC 798.

- K. Acrylic Sealants: General purpose, paintable acrylic-emulsion sealant with plus 7.5 percent to minus 7.5 percent movement complying with ASTM C834.
1. Location: Interior joints NOT subject to movement.
 2. Acceptable Manufacturers and Product:
 - a. Tremco: Acrylic Latex 834.
 - b. Sonneborn Building Products: Sonolac.
 - c. Dow Corning Corporation: FS 400.
- L. 2-Part Polysulfide Sealant: Polysulfide based 2-part elastomeric sealant with plus 25 percent to minus 25 percent movement, complying with Fed. Spec. TT-S-00227, type II, class A, non-sag synthetic rubber formulated form "Thiokol LP" polymer and recommended by manufacturer for continuous submersion in chlorinated water.
1. Location: Joints submerged in water.
 2. Acceptable Manufacturers and Product:
 - a. Pecora Corporation: Synthacalk GC-5.
 - b. Sonneborn Building Products.
- M. Foam Gasket Seal: Precompressed, impregnated open-cell foam sealant incorporating permanently elastic open cell polyurethane foam, manufacturer's standard impregnating agent, and pressure sensitive backing.
1. Acceptable Manufacturers and Product:
 - a. Emseal Corporation: Emseal Greyflex.
 - b. Illbruck Inc.: Will-Seal 150.
 - c. York Manufacturing, Inc.: York-Seal 100.
- N. Foam Gasket Seal for Submerged Application: Precompressed, impregnated open-cell foam sealant incorporating permanently elastic open cell polyurethane foam, manufacturer's impregnating agent at higher levels than standard product, and pressure sensitive backing.
1. Specially designed for use in submerge application.
 2. Acceptable Manufacturers and Product:
 - a. Emseal Corporation: Emseal.
 - b. Illbruck Inc.: Will-Seal 200.
 - c. York Manufacturing, Inc.: York-Seal 200.
- O. Splice Adhesive for Foam Gasket Seal: 1-part urethane wet sealant as recommended by gasket seal manufacturer.

2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; or ASTM D1667, closed cell PVC; oversized 30 to 50 % larger than joint width.
1. Type: As recommended by manufacturer.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter impairing adhesion of sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193.
- B. Perform acoustical sealant application work in accordance with ASTM C919.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints as detailed.
- H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 3 to 6 mm below adjoining surface.
- I. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal joints with adhesive; install with face 3 to 6 mm below adjoining surface.

3.4 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Protect sealants until cured.

3.6 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 08114

STANDARD STEEL DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes non-rated and fire rated steel doors, panels and door louvers.
- B. Related Sections:
 - 1. Section 08115 - Standard Steel Frames.
 - 2. Section 08710 - Door Hardware.
 - 3. Section 08800 - Glazing: Glass for doors.
 - 4. Section 09900 - Paints and Coatings: Field painting of doors.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- B. ASTM International:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM C1363 - Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
 - 3. ASTM E413 - Standard Classification for Rating Sound Insulation.
- C. Hollow Metal Manufacturers Association:
 - 1. HMMA 810 - Hollow Metal Doors.
- D. National Fire Protection Association:
 - 1. NFPA 80 - Standard for Fire Doors, Fire Windows.
 - 2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- E. Steel Door Institute:
 - 1. SDI 108 - Recommended Selection and Usage Guide for Standard Steel Doors.
- F. Underwriters Laboratories Inc.:
 - 1. UL 10B - Fire Tests of Door Assemblies.
- G. Uniform Building Code:
 - 1. UBC Standard 7-2 - Fire Tests of Door Assemblies.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.

- B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, louvers, and finishes.
- C. Product Data: Submit door configurations, location of cut-outs for hardware reinforcement.
- D. Samples: Submit two samples of door face metal, 450 x 450 mm in size illustrating shop finish colors and surface texture.
- E. Manufacturer's Installation Instructions: Submit special installation instructions.
- F. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.
- B. Perform Work in accordance with ANSI A250.8.
- C. Fire Rated Door and Panel Construction: Conform to NFPA 252, UL 10B and/or UBC Standard 7-2.
- D. Fire Rated Door Construction: Rate of rise of 361 °C across door thickness for stairs.
- E. Installed Door and Panel Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.
- F. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Product requirements for transporting, handling, storing, and protecting products.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Break seal on site to permit ventilation.

1.7 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.

- B. Coordinate Work with door opening construction, door frame, and door hardware installation.
- C. Coordinate installation to accommodate door hardware electric wire connections.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.
- B. Steel Door: To SDI standard, extra heavy duty, reinforced steel door where indicated, full flush door with foamed-in-place polyurethane core insulation.
 - 1. Fabricate with watertight metal top channel and construct to receive weatherstripping indicated.
 - 2. Material and Finish: Cold-rolled sheet steel with shop primer for field finishing under Section 09900.
 - 3. Thickness: 50 mm approximately.
 - 4. Core: Structurally bonded resin impregnated honey comb filled core.
 - 5. Face Sheet: 1.25 mm thick each.
 - 6. Fire Rating: 120, 60 and 30 minutes, or non-fire rated, as shown on drawings.
- C. Astragals: Provide full length steel astragal for pairs, attached to secure side of opening, projecting not less than 20mm, unless hardware specified allows both doors, swinging in same direction, to be active.
- D. Wire Chases: Fabricate wireways within doors or transom panels for installation and connection of electrical devices.
- E. Glazing Stops: Flush type steel with removable stops on 1 side of glass. Install fixed stops on locked side of interior doors and outside of exterior doors. Fabricate to accommodate glass thickness as detailed.
- F. Minimum Door Reinforcement: Use 16 gauge spot welded plates for surface items and those not otherwise specified. Gauges specified are minimum.
 - 1. Hinges: Not less than 7 gauge, 32mm by 250mm with at least 3 electric spot welds staggered at each end.
 - 2. Floor Hinges and Pivots: Not less than 7 gauge, size per manufacturer's template recommendation.
 - 3. Mortise Lock: Not less than 12 gauge with centering clips for lock case alignment and 14 gauge reinforcement for escutcheons or roses.
 - 4. Cylindrical Lock: Not less than 12 gauge for lock front and 2 welded-in support clips.
 - 5. Flush Bolts: Not less than 12 gauge, size per manufacturer's template recommendation.
 - 6. Exit Devices: Not less than 14 gauge, size per manufacturer's template recommendation.

7. Surface Door Closer: Not less than 12 gauge channel type reinforcement not less than 100mm high by 450mm long with not less than 8 electric spot welds for application of door closers at any time on all doors.
 8. Mortise Door Closer: Not less than 14 gauge channel type reinforcement per manufacturer's template recommendation.
 9. Overhead Holders and Stops: Not less than 12 gauge channel type reinforcement per manufacturer's template recommendation. Mortise type reinforcing channel to receive holder in a snug fit.
 10. Pulls and Pull Bars: Not less than 16 gauge plate type reinforcement for concealed fastening and 12 gauge channel type for through-bolt mounting.
- G. Fire Rated Doors: All fire rated doors shall, in addition to what is stated above, comply with ANSI A250.8, and/or SDI 108.

2.2 COMPONENTS

- A. Face: Steel sheet in accordance with ANSI A250 and/or SDI 108.
- B. End Closure: Channel, 1.2 mm thick, flush and/or inverted.
- C. Core: Cardboard honeycomb, polyurethane, polystyrene foam, mineral fiberboard, steel channel grid and/or vertical steel stiffeners.
- D. Thermal Insulated Door: Total insulation RSI value measured in accordance with ASTM C1363.
- E. Sound Rated Door: STC measured in accordance with ASTM E413.

2.3 ACCESSORIES

- A. Louvers:
 1. Material and Finish: Roll formed; prime painted, color as selected.
 2. Louver Blade: Inverted V, Y or slat blade; fire rated with fusible link design to UL or FM requirements.
 3. Louver Free Area: As indicated on drawings.
 4. Frame: As indicated on drawings.
- B. Removable Stops: Rolled steel, channel shape, butted and/or mitered corners; prepared for countersink style tamper proof screws.
- C. Astragals for Double Doors: Steel or aluminum, Z or T shaped.
- D. Primer: ANSI A250.10 rust inhibitive type.

2.4 FABRICATION

- A. Fabricate doors with hardware reinforcement welded in place.
- B. Attach astragal to one leaf of pairs of doors.
- C. Attach fire rating label to each fire rated door. Indicate temperature rise rating for stair doors.

- D. Configure exterior doors with edge profile to receive recessed weatherstripping.

2.5 SHOP FINISHING

- A. Steel Sheet: Galvanized to ASTM A653/A653M Z120, Z180 and/or Z275.
- B. Primer: Air dried or baked.
- C. Shop Finish: Baked enamel or thermosetting epoxy of color as selected.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for verification of existing conditions before starting work.
- B. Verify opening sizes and tolerances are acceptable.

3.2 DOORS AND HARDWARE INSTALLATION

- A. Install doors in accordance with ANSI A250.8.
- B. Coordinate installation of glass and glazing specified in Section 08800.
- C. Coordinate installation of doors with installation of frames specified in Section 08115 and hardware specified in Section 08710.
- D. Doors shall be fitted with the specified hardware, hung and immediately before final completion of work, additional adjustments shall be made so that doors operate in perfect order.
- E. Location of hardware on doors and frames shall be in accordance with applicable standard of the National Association of Architectural Metal Manufacturers (NAAMM) and the Door Hardware Institute (DHI).
- F. Hardware shall be assorted and stored in space assigned and shall be kept under lock and key. The safety and preservation of delivered items will be the responsibility of the Contractor.
- G. Doors shall be installed with the following clearances unless otherwise indicated on the drawings:
 - 1. Jams: 3.75 mm each side; 7.5mm total.
 - 2. Head: 3.75 mm.
 - 3. Meeting edges, pairs of doors: 3.75 mm.
 - 4. Bottom: 9.5 mm, where no threshold or carpet occurs.
 - 5. Bottom: At threshold or carpet, 3.75mm above carpet or threshold.
 - 6. Place fire-rated doors with clearances as specified in NFPA No. 80 Standard.
- H. Install finishing hardware in accordance with manufacturer's written instructions. Do not modify finishing hardware. Set, fit, adjust and clean hardware according to

manufacturer's written instruction. After installation of hardware under this section, check opening units for correct fit and uniformity of space around perimeter of units, or between units. Ensure smoothly operating opening units free from binding.

- I. After installation, templates, instruction sheets, and installation details, shall be turned over to the Owner's representative at the project closeout.
- J. Do not use shims without Engineer's approval.
- K. Wrapping or other factory-applied protection furnished with finish hardware, installed under this section, shall be left on such hardware, or, if removed, replaced on completion of hardware installation, until final acceptance of the building by the Engineer, at which time protection shall be removed and work left in proper condition.
- L. Exposed surfaces shall be free of any tool marks, rust, or blemishes, and any damage to exposed surfaces shall be repaired or replaced at the Contractor's expense and to the satisfaction of the Engineer and Owner.
- M. Fasteners furnished with the hardware shall be used to secure the hardware in place for each type of substrate. Through-bolts shall in no case be permitted for the fastening of any hardware unless otherwise approved. Hardware shall be properly adjusted and checked out to ensure the hinges, locks, latches, bolts, holders and closers are in proper operational condition. After hardware has been checked, key shall be tagged, identified and delivered to the Owner. Any errors in cutting and fitting, keying or any damage to adjoining work shall be repaired at no extra cost to the Owner or Engineer. Drill and countersink units which are not factory prepared for anchorage.
- N. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hairline joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.
- O. Keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. Construction keys shall be returned to the Owner.
- P. Adjusting and Cleaning: Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer. Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made. Final adjustment of hardware is to be done after heating and ventilating has been balanced.
- Q. Rejection: Hollow metal work which in the opinion of the Engineer is defective, shall be removed and replaced with new at no additional cost. Rejection will additionally be considered for items including; hardware cutouts of improper size or location or which prevent proper installation of doors, hardware or work of other trades.

3.3 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.

- B. Maximum Diagonal Distortion: 1.5 mm measured with straight edge, corner to corner.

3.4 ADJUSTING

- A. General Requirements: Execution requirements for adjusting.
- B. Adjust door for smooth and balanced door movement.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 08115

STANDARD STEEL FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes fire rated and non-rated steel frames.
 - 1. Provide frames for interior and exterior glazed lights.
- B. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete: Placement of anchors into concrete wall construction.
 - 2. Section 04810 - Unit Masonry Assemblies: Masonry grout fill of metal frames and placement of anchors into masonry wall construction.
 - 3. Section 08114 - Standard Steel Doors.
 - 4. Section 08212 - Flush Wood Doors.
 - 5. Section 08710 - Door Hardware: Hardware, silencers and weatherstripping.
 - 6. Section 08800 - Glazing.
 - 7. Section 09900 - Paints and Coatings.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- B. ASTM International:
 - 1. ASTM A591/A591M - Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.
 - 2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. National Fire Protection Association:
 - 1. NFPA 80 - Standard for Fire Doors, Fire Windows.
 - 2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- D. Underwriters Laboratories Inc.:
 - 1. UL 10B - Fire Tests of Door Assemblies.
- E. Uniform Building Code:
 - 1. UBC Standard 7-2 - Fire Tests of Door Assemblies.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacing, location of cut-outs for hardware, and finish.

- C. Product Data: Submit frame configuration and finishes.
- D. Samples: Submit two samples of frame, size as directed by the Engineer, illustrating factory finished frame colors and surface texture.
- E. Manufacturer's Installation Instructions: Submit special installation instructions.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of ANSI A250.8.
- B. Fire Rated Frame Construction: Conform to NFPA 252, UL 10B and/or UBC Standard 7-2.
- C. Installed Frame Assembly: Conform to NFPA 80 for fire rated class same as door.
- D. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Accept frames on site in manufacturer's packaging. Inspect for damage.
- C. Break seal on-site to permit ventilation.

1.7 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate Work with frame opening construction, door, and hardware installation.
- C. Sequence installation to accommodate required door hardware electric wire connections.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Sheet Steel: Commercial quality, cold rolled, picked, annealed and stretcher leveled, entirely free from scale, pitting, wave or other defects. Gauges indicated on drawings and specified for sheet steel refer to the US Standard Gauge for Sheet Iron and Steel.
 - 1. Sheet Steel for Frames: ASTM A569 and ASTM A468, hot rolled prime quality carbon steel.
 - 2. Galvanized Steel: Treat with hot dip galvanizing (ASTM A 526) to ensure prime paint adhesion.
 - 3. Electrolytically Galvanized Steel: Electrolytically deposited zinc coating on cold-rolled steel sheet.

- B. Steel Shapes: Provide steel for supporting, reinforcing and attachment of work.
 - 1. Structural Steel: ASTM A36.
 - 2. Plates: ASTM A283, Grade C.

- C. Sound-Deadening and Heat Retarding Filler: Mineral wool or other inorganic insulating noncombustible non-settling material, verminproof and complying with labeling requirements.

- D. Accessories: Provide manufacturer's standard or custom units for supports, anchors, inserts and fasteners. Hot dip galvanized units to comply with ASTM A153, Class B.

- E. Shop Primer: Baked-on shop primer compatible with respective specified finish paint and complying with ANSI A224.

- F. Fasteners: Galvanized or cadmium plated steel.
 - 1. Bolts and Nuts: ASTM A307, Grade A
 - 2. Expansion Bolts: FS FF-S-325, Group III, expansion shield (self drilling tubular expansion shell bolt anchors), Type 1 or 2.
 - 3. Machine Screws: FS SS-S-92, carbon steel, Type III cross-recessed, design I or II recess, style 2C flat head.
 - 4. Use special bolts for fixing to aerated concrete.

- G. Bituminous Paint: "Bitumastic 50" (Kop Coat, Inc.) or equal approved.

2.2 PRODUCTS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

- B. Frames to comply with ANSI A250.8 Grade and to suit model of door specified.

- C. Fully Welded Frames: Fabricated with corners fully mitered including stop to hairline accuracy with face joints continuously welded from outside and ground smooth.
 - 1. Weld entire seam (including seams between head and jamb rabbets, stops, and soffits) from backside, with a continuous weld bead. If weld penetration occurs, file smooth and finish joints flush and smooth to produce invisible connections.
 - 2. Provide at exterior locations.

- D. Welded Frames: Fabricated with mitered corners, not including stop, to hairline accuracy with face joints continuously welded from outside and ground smooth.
 - 1. Weld seam (including seams between head and jamb face and soffits) from backside, with a continuous weld bead. If weld penetration occurs, file smooth and finish joints flush and smooth to produce invisible connections.
 - 2. Stops: Tight butt joint.
 - 3. Provide at locations, except as where indicated for fully welded frames.
- E. Knocked Down Frame: Rigid interlock between header and jambs, with miter joint, for field assembly.
- F. Drywall Slip-On Frame: Rigid interlock between header and jambs, with miter joint, for field assembly of frame in partition opening to lap over installed partition construction.
- G. Light Gauge Slip-On Frame with Snap-On Trim: Field assembly of frame in partition opening to lap over installed partition construction, including snap-on trim.

2.3 HOLLOW METAL FRAMES

- A. Floor anchors shall be 2.7 mm steel welded inside each jamb with 2 anchor holes; for 9.5 mm diameter fasteners.
- B. Construct end closure of same gauge as frame.
- C. Jamb Anchors:
 - 1. For Masonry Construction: Welded adjustable, 1.6mm steel jamb anchors, corrugated, with leg not less than 50mm wide by 250mm long. Furnish at least 3 anchors per jamb up to 2,290mm height; 4 anchors up to 2,400mm jamb height; one additional anchor for each 600mm or fraction thereof over 2440mm height.
 - 2. For Metal Stud Partitions: Furnish 1.6mm hat section anchors welded to back of frames. Furnish at least 3 anchors per jamb up to 2,290mm height, 4 anchors up to 2,400mm jamb height, one additional anchor for each 600mm or fraction thereof, over 2,400 mm height.
- D. Head Anchors and Reinforcing
 - 1. For frames in steel stud walls, provide a minimum of 2 anchors at head of frames.
 - 2. For frames over 1,200mm wide in masonry walls, provide continuous steel channel or angle stiffener, not less than 2.7mm thickness, for fully width of openings welded to back of frame at head. Reinforcing is not to act as lintel or load carrying members.
- E. Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions. Remove spreaders after frames are enclosed and built into adjacent work.
- F. Drill stop to receive silencers on doors frames. Install plugs to keep holes clear during construction.

- G. Provide .7mm steel plaster guards or dustcover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware installation.
- H. Head Reinforcement: Frame heads, unless otherwise indicated, shall be reinforced with bend plate channels of 3.5mm minimum, or heavier as required to sustain the imposed masonry loads. Return bends of frames shall be flanged as detailed.

2.4 REINFORCEMENT FOR HARDWARE

- A. Mortise, reinforce, drill and tap hollow metal work for hardware devices at the factory from fully templated hardware, in accordance with approved hardware schedule including electric hardware devices and templates provided by the other trades supplying the hardware. Where surface mounted hardware is to be applied, hollow metal work shall have reinforcing only; drilling and tapping shall be done in the field by trade installing doors and finish hardware. Provide cutouts and reinforcing as required for security hardware and electrical work, including providing of related coverplates. Reinforcement shall be concealed.
- B. Minimum thickness for hardware reinforcing shall be as follows:
 - 1. For butts and pivot hinges: 4.8 mm steel plate, 32 x 250 mm minimum size.
 - 2. For closers, overhead: 4.8mm steel plate, on holders and stops both sides of frame so closers, holders or stops can be applied to either side of frame.
 - 3. For strikes: 2.7 mm sheet steel.
 - 4. For lock face, latch face and flush bolts: 2.7mm sheet steel (interior doors) 30mm sheet steel (exterior doors). Lock and latch reinforcement at least 40mm by 80 mm.
 - 5. Dust cover boxes, mortar guards and electric devices (at hardware mortises on frames to be set in masonry or plaster): .7 mm sheet steel.
 - 6. For other surface-mounted hardware: 2.7mm gauge sheet steel.

2.5 ACCESSORIES

- A. Removable Stops: Rolled steel and/or aluminum channel shape, butted and/or mitered corners; prepared for countersink style tamper proof screws.
- B. Bituminous Coating: Non-asbestos fibered asphalt emulsion.
- C. Primer: ANSI A250.10 rust inhibitive type.
- D. Silencers: Specified in Section 08710.
- E. Weatherstripping: Specified in Section 08710.

2.6 FABRICATION

- A. Fabricate frames as welded unit.
- B. Mullions for Double Doors: Fixed and/or Removable type, of same profiles as jambs.
- C. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.

- D. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- E. Reinforce frames wider than 1 200 mm with roll formed steel channels fitted tightly into frame head, flush with top.
- F. Terminate door stops 150 mm above finished floor. Cut stop at 45° or 90° angle and close.
- G. Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- H. Configure exterior frames with special profile to receive recessed weatherstripping.
- I. Attach fire rated label to each fire rated frame.
- J. Fabricate frames to suit masonry wall coursing with 100 and/or 50 mm head member.

2.7 SHOP FINISHING

- A. Steel Sheet: Galvanized to ASTM A653/A653M Z120 Z180 and/or Z275.
- B. Primer: Air dried and/or baked.
- C. Factory Finish: Baked enamel and/or Thermosetting epoxy of color as selected.
- D. Coat inside of frame profile with bituminous paint to minimum thickness of 1.5 mm.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify opening sizes and tolerances are acceptable.

3.2 INSTALLATION

- A. Install frames in accordance with ANSI A250.8.
- B. Coordinate with masonry, gypsum board and/or concrete wall construction for anchor placement.
- C. Coordinate installation of glass and glazing specified in Section 08800.
- D. Coordinate installation of frames with installation of hardware specified in Section 08710 and doors in Section 08114 and Section 08212.

- E. Set hollow metal frames at locations shown, in perfect alignment and elevation, plumb, level, straight, true and free from rack. Brace frames to prevent displacement.
- F. Extend frame anchorages below sills and finishes, except over membrane waterproofed areas. Anchor bottom of frames to floors with anchor bolts or with power driven fasteners. Coordinate the installation of built-in anchors for wall and partition construction as required with other work.
- G. After wall construction has been completed, remove temporary braces. Leave surfaces smooth and undamaged.
- H. Apply hardware in accordance with hardware manufacturer's instructions and Section 08710 of these Specifications. Drill and tap for machine screws as required. Do not use self-tapping sheet metal screws.
- I. Anchor panels in place with concealed fasteners. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Remove and replace doors which are found to be warped, bowed or otherwise damaged and cannot be properly fitted in frames.

3.3 INSTALLATION METAL FRAMES

- A. Install frames in accordance with approved shop drawings, manufacturer's recommendations and as specified herein.
- B. Steel frames shall be set in the correct locations in perfect alignment, plumb, straight and true. Frames shall be substantially braced to prevent displacement until adjacent construction has been completed and anchors installed. Removable spreaders in frames shall not be removed until frame has been permanently anchored to floor and at jambs.
- C. Provide masonry anchorage devices where required for securing hollow metal frames to in-place concrete or masonry construction.
- D. Set anchorage devices opposite each anchor location, in accordance with details on final shop drawings and anchorage device manufacturer's instructions. Leave drilled holes rough, not reamed, and free from dust and debris.
- E. At in-place concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices.
- F. In masonry construction, building-in of anchors and grouting of frames is included in Section 04810.
- G. In steel stud partitions, attach wall anchors to studs with tapping screws.
- H. Place frames at fire-rated openings in accordance with NFPA Standard No. 80.
- I. Make field splices in frames as detailed on final shop drawings, welded and finished to match factory work.

- J. Remove spreader bards before installation of frames. Bucks shall be properly set and secured, plumb and level.
- K. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Diagonal Distortion: 1.5 mm measured with straight edges, crossed corner to corner.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 08212

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes flush wood doors and transom panels; flush and flush glazed configuration with louvers; fire rated and non-rated.
- B. Related Sections:
 - 1. Section 06200 - Finish Carpentry: Wood door frames.
 - 2. Section 08114 - Standard Steel Doors: Metal louvers.
 - 3. Section 08115 - Standard Steel Frames.
 - 4. Section 08710 - Door Hardware.
 - 5. Section 08800 - Glazing.
 - 6. Section 09900 - Paints and Coatings: Site finishing of wood doors.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A135.4 - Basic Hardboard.
- B. ASTM International:
 - 1. ASTM E413 - Standard Classification for Rating Sound Insulation.
- C. Architectural Woodwork Institute:
 - 1. AWI - Quality Standards Illustrated.
- D. Hardwood Plywood and Veneer Association:
 - 1. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
- E. National Electrical Manufacturers Association:
 - 1. NEMA LD 3 - High Pressure Decorative Laminates.
- F. National Fire Protection Association:
 - 1. NFPA 80 - Standard for Fire Doors, Fire Windows.
 - 2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- G. Underwriters Laboratories Inc.:
 - 1. UL 10B - Fire Tests of Door Assemblies.
 - 2. UL - Building Materials Directory.
- H. Uniform Building Code:
 - 1. UBC Standard 7-2 - Fire Tests of Door Assemblies.
- I. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, and factory finishing criteria, identify cutouts for glazing and louvers.
- C. Product Data: Submit information on door core materials and construction, and on veneer species, type and characteristics.
- D. Samples:
 - 1. Submit two samples of door construction, size as directed by the Engineer, cut from top and/or bottom corner of door.
 - 2. Submit two samples of door veneer cut and grain pattern, size as directed by the Engineer, cut horizontally across the entire width of the door, showing veneer slices, match pattern and joint.
 - 3. Submit two samples of door veneer, size as directed by the Engineer, illustrating wood grain, stain color, and sheen, and/or plastic laminate pattern and color.
- E. Manufacturer's Installation Instructions: Submit special installation instructions.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AWI Quality Standard Section 1300, Premium, Custom and/or Economy Grade.
- B. Finish doors in accordance with AWI Quality Standard Section 1500.
- C. Fire Door and Panel Construction: Conform to NFPA 252, and/or to UL 10B (for wood doors with steel frame) or UL 10C (for wood doors with wood frame), and/or to UBC Standard 7-2.
- D. Fire Rated Door Construction: Rate of rise of 361 °C across door thickness for stair doors.
- E. Installed Fire Rated Door and Transom Panel Assembly: Conform to NFPA 80 for fire rated class as indicated.
- F. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Package, deliver and store doors in accordance with AWI Section 1300.

1.7 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate Work with door opening construction, door frame and door hardware installation.

1.8 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
- C. Provide five year warranty for interior and exterior doors.

PART 2 PRODUCTS

2.1 FLUSH WOOD DOORS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 MATERIALS

- A. Particle Board Core: Single thickness slab of 3 ply particle board complying with ANSI A208.1, Grade 1-L-1, average density not less than between 448-512 kg/m³, hot pressed with synthetic resin glue. Linear expansion shall not exceed 0.03% in either direction when tested in accordance with ASTM D1037, Sections 76 through 79. Faces of core slab shall be of 0.254mm thick flakes, with resin content a minimum of 50% higher than core resin content. Face layer density shall be a minimum of 25% higher than core density.
- B. Plastic Laminate: 1mm thick; color as selected from manufacturer's standard patterns.
 - 1. Acceptable manufacturers:
 - a. Fromica Corporation or equal approved.
- C. Mineral Core: Incombustible mineral composition free of asbestos fiber.
- D. Top and Bottom Edge Bands: Thoroughly kiln dried hardwood, free from defects which will be visible when finished as specified herein.
- E. Blocking: Manufacturers standard for purpose intended.

- F. Side Edge Bands: Thoroughly kiln dried hardwood, free from defects which will be visible when finished as specified herein.
 - 1. Wood for side edge bands shall match face veneers for natural finish doors.
- G. Crossbands: Minimum 1.6 mm thick after sanding, properly dried hardwood.
- H. Face Veneer for Natural Finish: Standard thickness, thoroughly dried conforming to CS35, Premium Grade. Match faces of doors in pairs. Face veneer shall be tapeless spliced with grain running vertically, belt and polish sanded, of the following species:
 - 1. As described in the relevant sections of Division 6: Wood and Plastics.
- I. Face Veneer For Interior Painted Finish: Standard thickness sound grade hardwood veneer conforming to CS35, overlaid with medium density cellulose fiber sheets impregnated with phenolic resin.
- J. Type I Adhesive: CS35, Type I (fully waterproof bond).
- K. Type II Adhesive: CS35, Type II (water-resistant bond).
- L. Solid Core, Non-Rated: AWI Section 1300, Type PC - Particleboard.
- M. Solid Core, Fire Rated: AWI Section 1300, Type FD 1-1/2, FD 1, FD 3/4, FD 1/2 and/or FD 1/3.
- N. Solid Core, Special Function: AWI Section 1300.
- O. Hollow Core: AWI Section 1300, Type SHC - Standard and/or IHC - Institutional.
- P. Exterior Veneer Facing: AWI Premium, Custom and/or Economy quality wood, with matched grain and transoms. Pair match multiple door leaves in single opening.
 - 1. Wood: As indicated on drawings.
- Q. Interior Veneer Facing: AWI Premium, Custom and/or Economy quality wood, with matched grain and transoms. Pair match multiple door leaves in single opening.
 - 1. Wood: As indicated on drawings.
- R. Plastic Laminate Facing (Interior): NEMA LD-3, General and/or Special Purpose, Fire Rated Type, 1.3 mm thick, finish, color and pattern, as indicated on drawings.
- S. Cross Banding Behind Laminate Finish: as per manufacturer's standard construction.

2.3 PRODUCTS

- A. Internal Wood Doors:
 - 1. Door Frame: Solid FRAKKE wood.
 - 2. Door Leaf: 44 mm thick, fabricated in 8mm thick MDF wood panel and 29mm thick hollow core "SHOUH" reinforced with solid wood for lock and handle [8 + 29 + 8]; and edge leaf frame in solid wood.
 - 3. Door Leaf & Door Frame Finish: Oil paint, color as selected by the Engineer.
- B. Opaque Facing (MDO): ANSI A 135.4 Type S2S, composition face, 3mm thick, for paint finish.

- C. Facing and Crossband Adhesive: Type I, waterproof.
- D. Transoms: Match door construction, veneers, rating and finish.
- E. Vision Frames:
 - 1. Exterior doors: Aluminum flashing under wood lipped frames at opening sill.
 - 2. Non-rated doors: Flush wood frames, hardwood to match facing.
 - 3. Fire rated doors: Provide manufacturer's tested metal clip or comparable system with wood stop appearance.
 - 4. Fire-rated doors: UL approved slimline metal trim.
- F. Fabricate fire-rated doors in compliance with UL or WHI requirements.
- G. Laminate 5-ply door facing, cross banding and assembled core in a hot press.
- H. Factory sand assembled door leaf.
- I. Fire-rated Door Stiles: Manufacturer's tested reinforced stiles at doors with fire ratings greater than 60 minutes.
 - 1. Bond stiles and rails to core. Sand for uniform thickness.
- J. Fire Rated Pair of Doors; greater than 60 minutes: Provide full length steel astragal attached to secure side of opening, projecting not less than 19mm, unless hardware specified allows both doors to be active. Coordinate with Section 08710.
- K. Fire Rated Pair of Doors; greater than 60 minute: if an astragal is required, to comply with fire rated labeling requirements for pairs of fire rated doors, provide door manufacturer's standard tested astragal.
 - 1. Shop apply astragals.
 - 2. shop apply matching veneer wrap to conceal metal astragal at wood faced doors.
- L. Fire Rated Pair of Doors; 60 minutes: Door manufacturer's standard tested edge type.
- M. Meeting Edge at Non-rated Pairs: Fabricate edge type between pairs of non-fire doors with non bevel, unless otherwise indicated.
- N. Meeting Edge at Transoms: Fabricate with rabbeted edge on door and transom, unless otherwise indicated.
- O. At exterior doors, provide aluminum flashings at top and bottom rails, and at sill of glazed opening full thickness of door.
- P. Cut and configure exterior door edges to receive (surface or recessed) weather stripping devices.
- Q. Factory finish doors in conformance with AWI Quality Standards Section 1500.
 - 1. Apply finish to wood veneer face plys and wood edges.
 - 2. AWI Section 1500, satin-medium rubbed, System 3 transparent, conversion varnish alkyd-urea, premium quality.

2.4 ACCESSORIES

- A. Wood Louvers:
 - 1. Material and Finish: As indicated on drawings.
 - 2. Louver Blade: Flush, chevron or stock louver.
 - 3. Louver Free Area: As indicated on drawings.
- B. Metal Louvers:
 - 1. Material and Finish: Roll formed steel, galvanized or prime painted; or aluminum or extruded aluminum, pre-painted finish; color as selected.
 - 2. Louver Blade: Inverted V, Y or slat blade; fire rated with fusible link design to UL or FM requirements.
 - 3. Louver Free Area: As indicated on drawings.
 - 4. Frame: As indicated on drawings.
- C. Glazing Stops: Wood to match door facing, or wood with metal clips for rated doors.

2.5 FABRICATION

- A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.
- B. Fabricate fire rated doors in accordance with AWI Quality Standards and to UL or Intertek Testing Services (Warnock Hersey Listed) requirements. Attach fire rating label and temperature rise label to door.
- C. Astragals for Fire Rated Double Doors: Steel and/or Treated wood, T shaped, overlapping and recessed at face edge and/or at mid-door thickness, specifically for double doors.
- D. Sound Rating for Single Door Leaf and Frame Assembly: ASTM E413, STC 35.
- E. Furnish lock blocks at lock edge and top of door for closer for hardware reinforcement.
- F. Vertical Exposed Edge of Stiles: Of same species as veneer facing.
- G. Fit door edge trim to edge of stiles after applying veneer facing.
- H. Bond edge banding to cores.
- I. At exterior doors, furnish aluminum flashing at top and bottom rail and sill of glazed openings for full thickness and width of door.
- J. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Furnish solid blocking for through bolted hardware.
- K. Factory fit doors for frame opening dimensions identified on shop drawings.
- L. Cut and configure exterior door edge to receive recessed weather stripping devices.
- M. Provide edge clearances in accordance with AWI 1300.

2.6 SHOP FINISHING

- A. Factory finish doors in accordance with approved sample.
- B. Seal door top edge with color and/or clear sealer to match door facing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install fire rated and non-rated doors in accordance with AWI Quality Standard, NFPA 80, and to requirements for fire rating label by UL or Intertek Testing Services (Warnock Hersey Listed).
- B. Trim non-rated door width by cutting equally on both jamb edges.
- C. Trim door height by cutting bottom edges to maximum of 19 mm.
 - 1. Trim fire door height at bottom edge only, in accordance with fire rating requirements.
- D. Machine cut doors for hardware installation.
- E. Coordinate installation of doors with installation of frames specified in Section 08115 for wood doors having metal frames, and hardware specified in Section 08710.
- F. Install door louvers plumb and level.
- G. Coordinate installation of glass and glazing specified in Section 08800.
- H. Site finish doors in accordance with Section 09900.

3.3 INSTALLATION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Conform to AWI requirements for fit and clearance tolerances.
- C. Conform to AWI Section 1300 requirements for maximum diagonal distortion.
- D. Maximum Vertical Distortion (Bow): 3 mm measured with straight edge or taut string, top to bottom, over imaginary 915 x 2,130 mm surface area.

- E. Maximum Width Distortion (Cup): 3 mm measured with straight edge or taut string, edge to edge, over imaginary 915 x 2,130 mm surface area.

3.4 ADJUSTING

- A. General Requirements: Execution requirements for testing, adjusting and balancing.
- B. Adjust door for smooth and balanced door movement.
- C. Adjust closer for full closure.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 08520

ALUMINUM DOORS AND WINDOWS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes extruded aluminum windows and doors with fixed and operating sash, factory glazed panels, operating hardware and insect screens.
- B. Related Sections:
 - 1. Section 05500 - Metal Fabrications.
 - 2. Section 07260 - Vapor Retarders.
 - 3. Section 07270 - Air Barriers.
 - 4. Section 07900 - Joint Sealers.
 - 5. Section 08800 - Glazing.

1.2 REFERENCES

- A. Aluminum Association:
 - 1. AA DAF-45 - Designation System for Aluminum Finishes.
- B. American Architectural Manufacturers Association:
 - 1. AAMA 101 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
 - 2. AAMA 501.4 - Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Inter Story Drifts.
 - 3. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 4. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
 - 5. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 6. AAMA MCWM-1 - Metal Curtain Wall manual.
- C. American National Standards Institute:
 - 1. ANSI Z97.1 - Safety Glazing Materials Used in Buildings Safety.
- D. American Society of Civil Engineers:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- E. ASTM International:
 - 1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - 3. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

4. ASTM D1784 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds.
5. ASTM D3656 - Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
6. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
7. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
8. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
9. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
10. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.
11. ASTM F588 - Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing.

F. Glass Association of North America:

1. GANA - Glazing Manual.

G. National Fenestration Rating Council Incorporated:

1. NFRC 100 - Procedures for Determining Fenestration Product U-Factors.

H. SSPC: The Society for Protective Coatings:

1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
2. SSPC Paint 25 - Red Iron Oxide, Zinc Oxide, Raw Linseed Oil, and Alkyd Primer.

1.3 SYSTEM DESCRIPTION

- A. Doors and windows system shall provide the acceptable level of air tightness and water tightness against wind driven rain.
- B. Windows: Tubular or single thickness aluminum sections, factory fabricated, factory finished, factory glazed vision glass, related flashings, anchorage and attachment devices.
- C. Configuration: Conform to AAMA 101, designations for windows required for Project.
- D. Glazing: Interior and exterior.
- E. Forced Entry Resistance: Conform to ASTM F588.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Design Drawings and Calculations: Show that system is able to support applied loads.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related Work; and installation requirements.
- D. Product Data: Submit component dimensions, anchorage and fasteners, glass, internal drainage, and typical details.
- E. Samples: Submit two samples 600 x 600 mm in size, illustrating window frame section mullion section, screen and frame, factory finished aluminum surfaces, glass units, glazing materials. Submit two samples of operating hardware.
- F. Manufacturer's Certificates: Certify Product performance ratings by independent third party such as AAMA, CAWM, or NFRC as meeting specified requirements.
- G. Test Reports: Indicate substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and other supportive data.

1.5 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mockups, size 1200 x 1200 mm high for window and 1200 x 2400 mm high for door, including all hardware and attachment accessories.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.
- E. Test mock-ups according to relevant standards.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Aluminum Windows: Fabricate window assemblies in accordance with AAMA 101 for types of windows required.
 - 2. Insulated Glass: Fabricate insulated glass units in accordance with GANA (formerly FGMA) Glazing Manual.
 - 3. Safety Glass: Conform to ANSI Z97.1 and applicable codes.
 - 4. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing commercial and institutional aluminum windows with minimum ten years documented experience.

- B. Installer: Company specializing in installation of commercial and institutional aluminum windows with minimum five years documented experience.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE, AND PROTECTION

- A. General Requirements: Product requirements for product storage and handling.
- B. Handle Work of this section in accordance with AAMA MCWM-1 - Curtain Wall Manual #10.
- C. Protect factory finished aluminum surfaces with wrapping and/or strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Do not install glazing materials when ambient temperature is less than 10°C.
- C. Maintain this minimum temperature during and after installation of glazing materials.

1.11 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish ten year manufacturer warranty for system.
- C. Warranty: Include coverage for degradation of color finish and seal failure.

PART 2 PRODUCTS

2.1 ALUMINUM DOORS AND WINDOWS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Extruded Aluminum: ASTM B221M; 6063 alloy, T5 temper.
- B. Sheet Aluminum: ASTM B209M; 5005 alloy, H15 or H34 temper.
- C. Steel Sections: Profiled to suit mullion sections.

- D. Thermally broken aluminum frame where explicitly shown on drawings.
- E. Glass: Conforming to requirements of Section 08800.
- F. Hardware:
 - 1. Operator: Geared rotary handle fitted to projecting sash arms with limit stops.
 - 2. Projecting Sash Arms: Cadmium or zinc plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
 - 3. Pulls: Manufacturer's standard.
 - 4. Sash lock: Lever handle with cam lock.
 - 5. Bottom Rollers: Stainless steel type 316, adjustable.
- G. Sills: Extruded aluminum; sloped for positive wash; fit under sash leg 12 mm beyond wall face; one piece full width of opening jamb angles to terminate sill end.
- H. Operable Sash Weather Stripping: Wool pile, nylon pile or resilient plastic; permanently resilient, profiled to effect weather seal.
- I. Rolling Shutters (Where Indicated): Electrically operated unless otherwise stated; with aluminum tube to cover the gap between the frame and the rolling shutter rail.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Stainless steel type 316.
- B. Visual Glass Dividers: Formed aluminum, fitted against interior of glazed surface, secured with spring loaded steel pins into plastic sockets.
- C. Visual Glass Muntins: Formed aluminum, applied to interior and/or exterior glass surface.
- D. Bituminous Paint: Fibered asphaltic type.
- E. Limit Stops: Resilient rubber.

2.4 FABRICATION

- A. Wherever possible, the doors/windows should be prefabricated, transported to site and installed without scaffolding. This allows superior quality control during fabrication and quick installation.
- B. The panels will be transported to site and craned to the appropriate floor.
- C. All occupational health and safety issues should be adequately addressed for the installation.
- D. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- E. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

- F. Prepare components to receive anchor devices. Fabricate anchors.
- G. Arrange fasteners and attachments to ensure concealment from view.
- H. Prepare components with internal reinforcement for operating hardware.
- I. Furnish internal reinforcement in mullions with galvanized steel members to maintain rigidity.
- J. Permit internal drainage weep holes and channels to migrate moisture to exterior. Furnish internal drainage of glazing spaces to exterior through weep holes.
- K. Assemble insect screen frame, miter and reinforce frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
- L. Double and/or single weatherstrip operable units.
- M. Factory glaze window units. Install glass panels in accordance with Section 08800.

2.5 SHOP FINISHING

- A. Finish Coatings: Conform to AAMA 2603, AAMA 2604 or 2605 and/or AAMA 611.
- B. Exterior and Interior Aluminum Surfaces: Advanced Durability Polyester Powder Coating System. Color: As selected. Minimum cover Thickness 60 microns. Percent Gloss: As selected.
- C. If anodized finishes are adopted, Color Anodized Aluminum Surfaces: AA-M12C22A44 non-specular as fabricated mechanical finish, medium matte chemical finish and Architectural Class I, 0.018mm anodized coating; Color as selected.
- D. Locks, Operators, and Exposed Hardware: Enameled to match window finish and/or color as directed by the Engineer.
- E. Pull Handles: Prefinished wood with aluminum brackets, and/or Anodized aluminum. Color to match frames.
- F. Screens: Black, White, and/or Gray color.
- G. Apply coat of bituminous paint on concealed aluminum surfaces in contact with cementitious or dissimilar materials.
- H. Shop and Touch-Up Primer for Steel Components: SSPC Paint 25 red oxide.
- I. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.
- J. Concealed Steel Items: Galvanized in accordance with ASTM A123/A123M to thickness Grade 85, 610 g/sq m.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify openings and adjoining air and vapor seal materials are ready to receive Work.

3.2 INSTALLATION

- A. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- B. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent Work.
- C. Install sill and sill end angles.
- D. Install thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- E. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials with Section 07260 and Section 07270.
- F. Install operating hardware.
- G. Install rolling shutters where indicated, and install an aluminum tube to cover the gap between the frame and the rolling shutter rail.

3.3 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Level or Plumb: 1.5 mm/m non-cumulative, or 3 mm/3m, whichever is less.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Inspection to monitor quality of installation and glazing.
- C. Test to AAMA 502, ASTM E1105, and AAMA 501.
- D. Perform field water test in compliance with ASTM E 1105, on completed portions of Aluminum Doors and Windows.
- E. Perform one test each at 10%, 50% and 80% of Doors and Windows completion, with repeat tests when failures occur.

- F. When testing results in leakage, eliminate causes of leaks and retest until no leaks occur.

3.5 ADJUSTING

- A. General Requirements: Execution requirements for testing, adjusting and balancing.
- B. Adjust hardware for smooth operation and secure weathertight closure.

3.6 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Remove protective material from factory finished aluminum surfaces.
- C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
- D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

3.7 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Hardware for wood doors.
 2. Hardware for metal doors.
- B. Related Sections:
1. Section 06200 - Finish Carpentry: Wood door frames.
 2. Section 06410 - Custom Cabinets: Cabinet hardware.
 3. Section 08114 - Standard Steel Doors.
 4. Section 08115 - Standard Steel Frames.
 5. Section 08212 - Flush Wood Doors.
 6. Section 08310 - Access Doors and Panels.
 7. Section 08334 - Overhead Coiling Grilles.
 8. Section 08460 - Automatic Entrance Doors.
 9. Section 10165 - Plastic Laminate Toilet Compartments.
 10. Section 10440 - Interior Signage.
 11. Division 16 - Electrical (Power supply to electric hardware devices).
- C. General Requirements:
1. Door hardware and furniture shall be of approved types, suitable for the location and the intended function of the doors, in accordance with the Product Information and relevant Standards.
 2. Submit Product Information, and Control Samples when directed.
 3. Verify correct handing, internal external application, compliance to fire rating requirements, if applicable, and suitability of Hardware with the door type and door/frame construction, floor levels, door swinging and sliding limits for all hardware items before commencing.
 4. Include fixings, striker plates, shims, and escutcheons for a complete installation, whether indicated or not.
 5. Unless otherwise indicated, door hardware shall enable escape from the inside of the room or area contained by the door hardware.
 6. Door furniture shall be suitable for use with the lock or latch to which it is installed. Include key-ways, key-hole plates, turn-buttons, cut-outs, roses, plates and escutcheons required by the lock or latch type, for a complete installation, whether indicated or not.
 7. Unless the door furniture is indicated separately for each side of the door, supply furniture as a paired set for both side of the door. Furniture fixings on the outside face of doors shall be concealed by fixing through the door from inside or by other appropriate methods.
 8. Unless otherwise indicated, door hardware shall be manufactured from cast, forged or machined brass with electroplated finish or stainless steel, including corrosion-resistant components, in accordance with the relevant standards.

D. Related Trades:

1. Coordinate the work of this trade with the base-structure, services and adjacent work.
2. Coordinate with all types of doors, entrances and access panels, with all electrical services for power and control wiring for electric, electro-magnetic and electronic strikes, locks, detectors, controllers and similar devices, and with all security services used in the project.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI A156.1 - Butts and Hinges.
2. ANSI A156.2 - Bored and Preassembled Locks and Latches.
3. ANSI A156.3 - Exit Devices.
4. ANSI A156.4 - Door Controls - Closures.
5. ANSI A156.5 - Auxiliary Locks and Associated Products.
6. ANSI A156.6 - Architectural Door Trim.
7. ANSI A156.7 - Template Hinge Dimensions.
8. ANSI A156.8 - Door Controls - Overhead Holders.
9. ANSI A156.12 - Interconnected Locks and Latches.
10. ANSI A156.13 - Mortise Locks and Latches.
11. ANSI A156.14 - Sliding and Folding Door Hardware.
12. ANSI A156.15 - Closer Holder Release Devices.
13. ANSI A156.16 - Auxiliary Hardware.
14. ANSI A156.18 - Materials and Finishes
15. ANSI A156.19 - Power Assist and Low Energy Power Operated Doors.
16. ANSI A156.23 - Electromagnetic Locks.
17. ANSI A156.24 - Delayed Egress Locks.
18. ANSI A156 - Complete Set of 24 BHMA (A156 Series) with Binder.

B. Builders Hardware Manufacturers Association:

1. BHMA Directory of Certified Products.

C. National Fire Protection Association:

1. NFPA 80 - Standard for Fire Doors, Fire Windows.
2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

D. Underwriters Laboratories Inc.:

1. UL 10B - Fire Tests of Door Assemblies.
2. UL 305 - Panic Hardware.
3. UL - Building Materials Directory.

E. Intertek Testing Services (Warnock Hersey Listed):

1. WH - Certification Listings.

1.3 PERFORMANCE REQUIREMENTS

A. Fire Rated Openings: Provide door hardware listed by UL or Intertek Testing Services (Warnock Hersey Listed), or other testing laboratory approved by applicable authorities.

1. Hardware: Tested in accordance with NFPA 252.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Detailed Hardware Schedule: The Contractor shall provide a Detailed Hardware Schedule. Any hardware schedule furnished to the Contractor shall be for guidance.
 - 1. Prepare and supply 6 copies of a completely detailed hardware schedule. The schedule shall list all the doors by number, size, hand and degree of opening.
 - 2. Indicate the handling of each door and the degree of swing. In case of pairs of doors, indicate the active door. Schedule to indicate the material, finish, dimensions and details of fastenings for each hardware.
 - 3. The schedule shall indicate the manufacturer's name and the article numbers.
 - 4. Provide with hardware schedule, template information and original catalogue cuts of all the hardware scheduled.
- C. Shop Drawings:
 - 1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, electrical characteristics and connection requirements, and fixing details.
 - 2. Submit manufacturer's parts lists, and templates.
- D. Samples:
 - 1. Submit two samples for each hardware type (hinge, latchset, lockset, cylinder, closers, etc.), illustrating style, color and finish, with the appropriate fasteners.
 - 2. Approved samples might be incorporated into Work subject to Engineer's approval.
- E. Key Schedules: Submit key schedules for review with the Employer.
- F. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.
- G. Submit affidavits to verify that hardware in each case has been installed in the correct location and that it is operating correctly.

1.5 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Project Record Documents: Record actual locations of installed cylinders.
- C. Operation and Maintenance Data: Submit data on operating hardware, components, lubrication requirements, and inspection procedures related to preventative maintenance.
- D. Keys: Deliver with identifying tags to Employer by security shipment direct from hardware supplier.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI A156 series, NFPA 80 and UL 305.

- B. Furnish hardware marked and listed in BHMA Directory of Certified Products.
- C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. **Manufacturer:** Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. **Hardware Supplier:** Company specializing in supplying commercial and institutional door hardware with minimum five years documented experience. The supplier of hardware shall be regularly involved in the sale and distribution of all Hardware related to the project.
- C. **Hardware Consultant:** Employ a qualified Architectural Hardware Consultant to supervise the issues related to doors and hardware. The hardware consultant shall be responsible for hardware submittals, samples submission, to review hardware sets in conjunction with drawings, specifications, statutory rules, international standards such as Life Safety code and Disability Act. The hardware consultant should also look after material deliveries to site, making sure right material is delivered, marked and packed.
- D. **Products Requiring Electrical Connection:** Listed and classified by Underwriters' Laboratories, Inc., as suitable for purpose specified and indicated.

1.8 PRE-INSTALLATION MEETINGS

- A. **General Requirements:** Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.
- C. Include persons involved with installation of doors, frames and hardware.

1.9 DELIVERY, STORAGE AND HANDLING

- A. **General Requirements:** Product requirements for product storage and handling.
- B. The supply shall ensure that deliver of proprietary packaged products in the manufacturer's original packages and containers with labels intact and legible, including installation instructions, templates and detailed delivery dockets. Packaging of hardware shall be in:
 - 1. Complete individual sets for each door.
 - 2. Separate dust and moisture proof packages.
 - 3. Clearly labeled to show intended locations.
 - 4. Complete with required fixings.

1.10 COORDINATION

- A. **General Requirements:** Administrative requirements for coordination and project conditions.

- B. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
 - 1. Provide templates or actual hardware as required to ensure proper preparation of doors and frames.
- C. Sequence installation to accommodate required utility connections.
- D. Coordinate Employer's keying requirements during course of Work.

1.11 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish five-year manufacturer warranty for all hardware (hinge, latchset, lockset, cylinder, closers, etc.) from the date of issue of completion certificate.
- C. The warranty shall include particular reference to failure of, or due to, the following:
 - 1. Correct selection for required location performance.
 - 2. Correct functioning of moving parts.
 - 3. Structural adequacy.
 - 4. Chipping, fading, excessive wear or delamination or other deterioration of finishes.
 - 5. Fixing and connectors including stripped threads and damaged heads.
 - 6. Integrity of seals.
 - 7. Sagging, slackness or looseness of knobs and handles due to wear, relaxation of springs, stripped threads, or any other cause.
- D. The warranty shall include an undertaking that spare parts and replacement items will be available for sale off-the-shelf, or with a lead time not exceeding four weeks from date of order, for a period not less than the warranty period.
- E. Warranty shall be accompanied by a current retail price list properly identified and dated.
- F. The warranty shall include an undertaking with respect to price control for the following items:
 - 1. Replacement keys.
 - 2. Replacement cylinders.

1.12 MAINTENANCE MATERIALS

- A. General Requirements: Execution requirements for maintenance materials.
- B. Furnish special wrenches and tools applicable for each different and for each special hardware component.
- C. Furnish maintenance tools and accessories supplied by hardware manufacturer.
- D. Provide maintenance data, parts, lists and manufacturer's instructions for installation and maintenance for each type of hardware including door closer, lock case, exit devices, etc.

- E. Provide three copies of catalogues for all hardware used for incorporation into maintenance manual. Only original catalogue shall be used.

1.13 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Furnish five extra key lock cylinders for each master keyed group.

PART 2 PRODUCTS

2.1 DOOR HARDWARE MANUFACTURERS

- A. Hinge, Pivots, Lockset, Latch Set, Exit Device, Electric Strike and/or Lock, Cylinder, Closers, Door Controls and Overhead Holders, Sliding and/or Bi-Folding Door Hardware, Push/Pulls, Manual and/or Automatic Bolts, Protection Plates, Gaskets, Thresholds and Trim Manufacturers: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the products.

2.2 COMPONENTS

- A. General Hardware Requirements: Where not specifically indicated, comply with applicable ANSI A156 standard for type of hardware required. Furnish each type of hardware with accessories as required for applications indicated and for complete, finished, operational doors.
 - 1. Templates: Furnish templates or physical hardware items to door and frame manufacturers sufficiently in advance to avoid delay in Work.
 - 2. Reinforcing Units: Furnished by door and frame manufacturers; coordinated by hardware supplier or hardware manufacturer.
 - 3. Fasteners: Furnish as recommended by hardware manufacturer and as required to secure hardware. Finish to match hardware item being fastened.
 - 4. Fire Ratings: Provide hardware with UL or Intertek Testing Services (Warnock Hersey Listed) listings for type of application involved.
 - 5. Electrical Devices: Make provisions and coordinate requirements for electrical devices and connections for hardware.
- B. Hinges: To EN1935 class 13; 40 hours salt test; 3 mm thick stainless steel type 316 material; 5 knuckles; with stainless steel type 316 pin, removable at interior, non-rising pin housed in ball bearing.
 - 1. Width: Sufficient to clear trim projection when door swings 180 degrees.
 - 2. Number: Furnish minimum three hinges for each door leaf up to 2200 mm high, and four hinges for each door leaf not exceeding 3050 mm high.
 - 3. Size and Weight: 114 mm high heavy weight for door leaf up to 44 mm thick and up to 1200 mm wide, and 125 mm high extra heavy weight ball or iolite bearing hinges for door leaf exceeding 44 mm thick or 1200 mm wide.
- C. Pivots: ANSI A156.1 and A156.4, center or offset full mortise pivots.
 - 1. Size: As recommended by pivot manufacturer for size and weight of door.

- D. Locksets: Furnish locksets compatible with specified cylinders. Typical 70 mm backset. Furnish standard strikes with extended lips to protect trim from being marred by latch bolt, verify type of cutouts provided in metal frames.
1. Mortise Locksets: ANSI A156.13, Series 1000, Grade 1.
 2. Bored (Cylindrical) Locksets: ANSI A156.2, Series 4000, Grade 1.
 3. Preassembled (Unit) Locksets: ANSI A156.12, Series 2000, Grade 1.
 4. Interconnected Locksets: ANSI A156.12, Series 5000, Grade 1.
 5. Auxiliary Locksets: ANSI A156.5, Grade 1, mortise dead locks, bored dead locks, rim locks or narrow stile locks.
- E. Latch Sets: Match locksets.
1. Mortise Latch Sets: ANSI A156.13, Series 1000, Grade 1, 2 or 3.
 2. Bored (Cylindrical) Latch Sets: ANSI A156.2, Series 4000, Grade 1, 2 or 3.
- F. Exit Devices: ANSI A156.3, Grade 1, concealed vertical rod type or rim type, with push pad or cross bar. Furnish standard strikes with extended lips to protect trim from being marred by latch bolt, verify type of cutouts provided in metal frames, with dust-proof floor strikes.
1. Types: Suitable for doors requiring exit devices.
 2. Coordinators: Furnish overhead concealed in frame type at pairs of doors.
- G. Cylinders: To DIN V18254 and to ANSI A156.5, Grade 1, 5, 6, or 7, pin type removable cylinders, or interchangeable core type cylinders; Euro profile, length to suit door thickness; single, double or with turn where indicated; non copiable, protected with anti drill option from outside; nickel-plated finish or to suit finish of handle.
1. Locks and cylinders shall be keyed as per Engineer's instruction.
 2. Keys: Nickel silver finish. Provide three keys per lock.
- H. Lock: To BS 5872.
1. Sash Lock: 76mm lock case, 57mm backset centers to suit Euro profile cylinder, stainless steel type 316, for end plate and strike plate, brass latch and deadbolt, deadbolt with hardened steel rollers.
 2. Deadlock: Same as sash lock without latch.
 3. Latch lock: Same as sash lock without deadlatch.
 4. Bathroom Lock: Special cylinder with thumbturn lock system with normal deadbolt to suit 8 or 5mm indicator and turn spindle.
 5. Nightlatch: Same as sash lock, cylinder to withdraw latch.
- I. Electric Strikes and Locks: ANSI A156.5 mortised or rim mounted, semi rim mounted electric strikes, ANSI A156.23 electromagnetic locks, or ANSI A156.24 delayed egress locks.
- J. Closers: ANSI A156.4 modern type with or without cover, stainless steel type 316 or to match door hardware on same face of door, surface mounted, overhead concealed, concealed in door, or concealed in floor center pivot or offset pivot closers; full rack and pinion type with steel spring and non-freezing hydraulic fluid.
1. Adjustability: Furnish controls for regulating closing, latching, speeds, and back checking.
 2. Arms: Type to suit individual condition; parallel-arm closers at reverse bevel doors and where doors swing full 180 degrees.

3. Location: Mount closers on inside of exterior doors, room side of interior doors typical; mount on pull side of other doors.
 4. Operating Pressure: Maximum operating pressure as follows:
 - a. Interior Doors: Maximum 22 N.
 - b. Exterior Doors: Maximum 38 N.
 - c. Fire Rated Doors: As required for fire rating, maximum 65 N.
- K. Door Controls and Overhead Holders: Furnish with accessories as required for complete operational installation.
1. Manual Door Holders and Overhead Stops: ANSI A156.8, Grade 1 types as specified.
 2. Closer Holder Release Devices: ANSI A156.15 door mounted, jamb mounted, or concealed mounted closer holder release devices, or closers with single or multiple point hold open or free swinging release device designed to make swing doors close upon receiving electrical signal.
 3. Electro-Magnetic Door Holder: ANSI A156.15 wall or floor mounted type.
 4. Power Assist Door Operators: ANSI A156.19 power mechanism which reduces opening resistance of self-closing door.
 5. Low Energy Power Door Operators: ANSI A156.19 power mechanism which opens and closes door upon receipt of signal.
 6. Low Energy Power Open Door Operators: ANSI A156.19 power mechanism which opens self-closing door; closing of door independent of power operator.
- L. Sliding and Bi-Folding Door Hardware: ANSI A156.14; furnish complete hardware sets for operational installation.
- M. Door Stop: ANSI A156.1, Grade 1; stainless steel type 316 material, cylindrical or dome type with rubber and with no visible screws, to be fixed at minimum $\frac{2}{3}$ of door width from Hinge side. Furnish with accessories as required for applications indicated.
- N. Handles: Stainless steel type 316 satin finish, hollow type with bolt through fixing screws, return to door type.
- O. Pull handle: Stainless steel type 316; bolt through fixing type.
- P. Push/Pulls, Manual and Automatic Bolts, Protection Plates, Gaskets, Thresholds and Trim: Furnish with accessories as required for complete operational door installations.
1. Push/Pulls: ANSI A156.6; push plates minimum 1.27 mm thick. Furnish pulls with bolts to secure from opposite door face.
 2. Manual and Automatic Constant Latching Bolts: ANSI A156.16 Grade 1 top and bottom flush bolts, with dust-proof floor strike.
 3. Kickplates Mop Plate, Armor Plate and Door Edging: ANSI A156.6; height 25 mm less than door width; minimum 1.27mm thick stainless steel type 316.
 4. Weatherstripping: Continuous at top and sides of exterior doors.
 5. Fire Rated Gaskets: Continuous at top and sides of fire rated doors.
 6. Thresholds: Maximum 12 mm height.

2.3 ACCESSORIES

- A. Lock Trim: Furnish levers as selected from manufacturer's range of levers and roses.
- B. Through Bolts: Do not permit through bolts and grommet nuts on door faces in occupied areas unless no alternative is possible. Do not permit through bolts on solid wood core doors.
- C. Flush Bolt:
 - 1. All flush bolts for metal doors to be of type suitable for metal doors with rod length 305mm, size 25 x 172mm.
 - 2. All flush bolts for wood doors to be 19 x 200mm size, lever action type.
- D. Key Cabinet:
 - 1. Cabinet Construction: Aluminum or sheet steel construction, baked enamel finish; color as selected; piano hinged door.
 - 2. Cabinet Size: Size to suit project keys plus 10 percent.
 - 3. Horizontal metal or plastic strips for key hook labeling with clear plastic strip cover over labels.

2.4 FINISHING

- A. Finishing of Other Hardware Items: Furnish manufacturer's standard finishes to match similar hardware types on same door, and maintain acceptable finish considering anticipated use and BHMA category of finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify doors and frames are ready to receive door hardware and dimensions are as indicated on shop drawings and as instructed by manufacturer.
- C. Verify electric power is available to power operated devices and is of correct characteristics.

3.2 INSTALLATION

- A. Mounting Heights of Hardware Item:
 - 1. Coordinate mounting heights with door and frame manufacturers.
 - 2. Comply with manufacturer's recommendations, and applicable standards and codes where not otherwise stated.
- B. Install Work in accordance with the drawings, to the manufacturer's instructions and to the satisfaction of the Engineer.

3.3 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Primary hardware manufacturer's representatives shall inspect installation and certify that hardware has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

- A. General Requirements: Execution requirements for testing, adjusting and balancing.
- B. Adjust hardware for smooth operation.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Do not permit adjacent work to damage hardware or hardware finish.

3.6 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 08800

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes glass for cupboards, doors, windows, glazed walls, curtain wall, external glass cladding and glazed balustrades.
- B. Related Sections:
 - 1. Section 07260 - Vapor Retarders.
 - 2. Section 07270 - Air Barriers.
 - 3. Section 07900 - Joint Sealers.
 - 4. Section 08114 - Standard Steel Doors.
 - 5. Section 08212 - Flush Wood Doors.
 - 6. Section 08520 - Aluminum Windows.
 - 7. Section 08830 - Mirrors.
 - 8. Section 10800 - Toilet, Bath and Laundry Accessories: Metal framed mirrors.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z97.1 - Safety Glazing Materials Used in Buildings Safety.
- B. American Society of Civil Engineers:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International:
 - 1. ASTM C570 - Standard Specification for Oil and Resin-Base Caulking Compound for Building Construction.
 - 2. ASTM C669 - Standard Specification for Glazing Compounds for Back Bedding and Face Glazing of Metal Sash.
 - 3. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 - 4. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 5. ASTM C1036 - Standard Specification for Flat Glass.
 - 6. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 - 7. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
 - 8. ASTM C1193 - Standard Guide for Use of Joint Sealants.
 - 9. ASTM D4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.
 - 10. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - 11. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

12. ASTM E546 - Standard Test Method for Frost Point of Sealed Insulating Glass Units.
13. ASTM E576 - Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position.
14. ASTM E773 - Standard Test Methods for Seal Durability of Sealed Insulating Glass Units.
15. ASTM E2190 - Standard Specification for Sealed Insulating Glass Units.
16. ASTM E1425 - Standard Practice for Determining the Acoustical Performance of Exterior Windows and Doors.

D. EN Standards:

1. EN 12207: Windows and Doors - Air Permeability - Classification.
2. EN 12208: Windows and Doors - Watertightness - Classification.
3. EN 12210: Windows and Doors - Resistance to Wind Load - Classification.

E. DIN Standards:

1. DIN 18516: Part4 – Heat Soaked Testing for Tempered Glass.

F. Glass Association of North America:

1. GANA - FGMA Sealant Manual.
2. GANA - Glazing Manual.
3. GANA - Laminated Glass Design Guide.

G. National Fire Protection Association:

1. NFPA 80 - Standard for Fire Doors, Fire Windows.

H. Underwriters Laboratories Inc.:

1. UL - Building Materials Directory.

1.3 PERFORMANCE REQUIREMENTS

- A. Ensure that no glass or glazing combination develops stresses that may lead to damage of glass, glazing materials, components and/or framing systems.
- B. Conduct a thermal stress analysis, undertake thermal calculations and make due allowance for any heat treated glass which may be required. Shading stresses that might occur from adjacent components and buildings including shading devices shall be taken into account.
- C. For Impact Requirements: Conform to NF P01-013 and NF P01-012 standards.
- D. AEV (Air, Water and Wind) performance tests should be provided for all exterior windows and doors.
 1. Air Permeability (to EN 12207:1999-11): Class 4.
 2. Watertightness (to EN 12208:1999-11).
 3. Wind Resistance (to EN 12210:1999-11).

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.

- B. Design Drawings and Calculations: Demonstrate that glass is able to support the applied loads.
- C. Product Data:
 - 1. Glass: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 - 2. Glazing Sealants, Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.
- D. Samples:
 - 1. Glass: Submit three samples 600 x 600 mm in size, illustrating each glass and plastic units, color and design.
 - 2. Glazing Materials: Submit 300 mm long bead of glazing sealant and gaskets, color as selected by the Engineer.
- E. Certificates: Certify that products meet or exceed specified requirements.
- F. Manufacturer's Certificate: Certify that sealed insulated, environmental, laminated and/or acoustical glass meets or exceeds specified requirements and the IGMA certification.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, and GANA Laminated Glass Design Guide for glazing installation methods.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mock-up.
- B. Construct mockup size as directed by the Engineer, including glass and air barrier and vapor retarder seal.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.
- E. Test mock-ups according to relevant standards.

1.8 PRE-INSTALLATION MEETING

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week before starting Work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Do not install glazing when ambient temperature is less than 10 °C.
- C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.10 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish ten year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
- C. Furnish ten year warranty to include coverage for delamination of laminated glass and replacement of same.

1.11 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Supply two of each glass size and each glass type.

PART 2 PRODUCTS

2.1 GLAZING

- A. Glass, Glazing, Sealant, Gasket, Tapes Compounds and Glazing Accessories
Manufacturers: Any internationally recognized manufacturers having an official technical agreement to conformity with standards for the products.

2.2 COMPONENTS

- A. Safety Tempered and Laminated Glass Conform to ANSI Z97.1 and ASTM C1172.
- B. PVB Interlayer: Manufacturer's standard, minimum 0.76 mm thick.
- C. Insulated Glass Units: Double pane to ASTM E2190 Class A and E773; with glass elastomer, glass to mastic, and special acoustic edge seal; multifunctional solar E sputter coating; purge interpane space with dry hermetic air.
- D. All tempered glass to be heat soak tested.

- E. Obtain the total quantity of each glass material from the same material manufacturer. In the case of coated glasses, or other processed glass products, the Sub-Contractor shall ensure that all products are processed from 'raw' glass material obtained from one manufacturer.

2.3 ACCESSORIES

- A. Glazing Splines and Gaskets: ASTM C864 Option I, resilient neoprene, silicone, and/or polyvinyl chloride extruded shape to suit glazing channel retaining slot.
- B. Setting Blocks: ASTM C864 Option I, Neoprene, EPDM, or Silicone, 80 to 90 Shore A durometer hardness, length of 25 mm for each square meter of glazing or minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height to suit glazing method and pane weight and area.
- C. Spacer Shims: ASTM C864 Option I, Neoprene or Silicone, 50 to 60 Shore A durometer hardness, minimum 75 mm long x one half the height of glazing stop x thickness to suit application.
- D. Glazing Clips: Manufacturer's standard type.
- E. Fire-Resistant Glazing Materials: Materials used to obtain required fire-resistant rating.
- F. Smoke Removal Unit Targets: Adhesive targets affixed to glass to identify glass units destined for removal of smoke.

2.4 SOURCE QUALITY CONTROL AND TESTS

- A. General Requirements: Quality requirements for testing and analysis.
- B. Provide shop inspection and testing for safety insulated glass.
- C. Test samples to ANSI Z97.1, ASTM E2190, ASTM E773, ASTM E546, and ASTM E576.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify openings for glazing are correctly sized and within acceptable tolerance.
- C. Verify surfaces of glazing channels or recesses are clean, free of obstructions impeding moisture movement; weeps are clear and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

- A. Perform installation in accordance with GANA Glazing Manual.
 - 1. Glazing Sealants: Comply with ASTM C1193.
 - 2. Fire Rated Openings: Comply with NFPA 80
- B. Exterior Dry Method:
 - 1. Cut glazing spline to length; install on glazing pane. Seal corners by butting tape and sealing junctions with compatible butyl sealant.
 - 2. Place setting blocks at $\frac{1}{4}$ or $\frac{1}{3}$ points with edge block no more than 150 mm from corners.
 - 3. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
 - 4. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
 - 5. Trim protruding tape edge.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Monitor quality of glazing.
- C. Test to AAMA 502, ASTM E1105, and AAMA 501.
- D. Perform field water test in compliance with ASTM E 1105, on completed portions of glazing.
- E. Perform one test each at 10%, 50% and 80% of glazing completion, with repeat tests when failures occur.
- F. When testing results in leakage, eliminate causes of leaks and retest until no leaks occur.

3.5 MANUFACTURER'S FIELD SERVICES

- A. General Requirements: Quality requirements for manufacturers' field services.
- B. Glass and glazing product manufacturers to provide field surveillance of installation.
- C. Monitor and report installation procedures, and unacceptable conditions.

3.6 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is complete.

D. Clean glass and adjacent surfaces.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. General Requirements: Execution requirements for protecting installed construction.

B. After installation, mark pane with an 'X' by using removable plastic tape or paste. Don't mark heat absorbing or reflective glass units.

3.8 SCHEDULES

A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 08830

MIRRORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes glass and plastic mirrors for installation into wood and metal frames, or for frameless installation.
- B. Related Sections:
 - 1. Section 06410 - Custom Cabinets: Cabinets with requirement for mirror shelves and mirrors inside glass front cabinets.
 - 2. Section 07900 - Joint Sealers: Sealant and back-up material.
 - 3. Section 08800 - Glazing: Glass and glazing.
 - 4. Section 10800 - Toilet, Bath and Laundry Accessories.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z97.1 - Safety Glazing Materials Used in Buildings Safety.
- B. ASTM International:
 - 1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 - 2. ASTM C1036 - Standard Specification for Flat Glass.
 - 3. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 - 4. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
 - 5. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- C. Glass Association of North America:
 - 1. GANA - FGMA Sealant Manual.
 - 2. GANA - Glazing Manual.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data:
 - 1. Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 - 2. Glazing Materials: Submit chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- C. Samples: Submit two samples 300 x 300 mm in size, illustrating mirrors, coloration, edge detail, finish and design.
- D. Manufacturer's Certificate: Certify that mirrors meet or exceed specified requirements

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for mirror installation methods.
- B. Maintain one copy of each document on site.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Do not install glazing when ambient temperature is less than 10°C.
- C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing sealants.

1.6 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish five year warranty to include coverage for reflective coating on mirrors and replacement of same.

1.7 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Supply two of each mirror size.

PART 2 PRODUCTS

2.1 MIRRORS

- A. Mirror and Glazing Materials Manufacturers: Any internationally recognized manufacturers having an official technical agreement to conformity with standards for the products.

2.2 COMPONENTS

- A. Mirror Glass: ASTM C1036, type 1 transparent flat, Class 1 clear; type with copper and silver coating and organic overcoating.
 - 1. Type: As directed by the Engineer.
 - 2. Edges: Arrissed, beveled, polished or squared, as directed by the Engineer.
 - 3. Thickness: Minimum 6 mm, unless otherwise indicated.
 - 4. Size: As noted on Drawings.
- B. Laminated Safety Mirror Glass: ASTM C1172, Kind LM laminated mirror glass, ASTM C1036 Type 1 transparent flat, Class 1 clear.
 - 1. Type: As directed by the Engineer.
 - 2. Core: Manufacturer's standard laminated safety mirror glass core.

3. Edges: Arrissed, beveled, polished or squared, as directed by the Engineer.
 4. Thickness: Nominal total 6 mm, unless otherwise indicated.
 5. Size: As noted on Drawings.
- C. Tempered Safety Mirror Glass: ASTM C1048, Kind FT fully tempered, Type 1 transparent flat, Class 1 clear, type with copper and silver coating, and organic overcoating.
1. Type: As directed by the Engineer.
 2. Edges: Arrissed, beveled, polished or squared, as directed by the Engineer.
 3. Thickness: Minimum 6 mm, unless otherwise indicated.
 4. Size: As noted on Drawings.
- D. Back Coated Safety Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, type with copper and silver coating, organic overcoating, and special back coating as required to comply with ANSI Z97.1 safety glazing standard.
1. Type: As directed by the Engineer.
 2. Edges: Arrissed, beveled, polished or squared, as directed by the Engineer.
 3. Thickness: Minimum 6 mm, unless otherwise indicated.
 4. Size: As noted on Drawings.
- E. Polycarbonate Mirror: ANSI Z97.1; plastic compound, clear, translucent, gray tint, bronze tint, and/or light green; mirrored coating; silicone abrasion resistant coating and/or acrylate non-yellowing coating for scratch resistance; multiple layers for bullet resistance.
1. Type: As directed by the Engineer.
 2. Edges: Arrissed, beveled, polished or squared, as directed by the Engineer.
 3. Thickness: Minimum 6 mm, unless otherwise indicated.
 4. Size: As noted on Drawings.

2.3 ACCESSORIES

- A. Elastomeric Glazing Sealant: Materials compatible with mirrors and adjacent materials.
1. Silicone Sealant: ASTM C920, Type S, Grade NS, Class and Use as recommended by manufacturer for mirror installation; single component; chemical and/or solvent curing; capable of water immersion without loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25.
 - a. Type: As directed by the Engineer.
 - b. Color: As selected.
 2. Polysulfide Sealant: ASTM C920, Type M, Grade NS, Class and Use as recommended by manufacturer for mirror installation; two component; chemical curing, non-sagging type; cured Shore A hardness of 15 to 25.
 - a. Type: As directed by the Engineer.
 - b. Color: As selected.
 3. Polyurethane Sealant: ASTM C920, Type S, Grade NS, Class and Use as recommended by manufacturer for mirror glazing; single component, chemical curing, non-staining, non-bleeding, Shore A Hardness Range 20 to 35.
 - a. Type: As directed by the Engineer.
 - b. Color: As selected.

4. Acrylic Sealant: ASTM C920, Type S, Grade NS, Class and Use as recommended by manufacturer for mirror installation; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25.
 - a. Type: As directed by the Engineer.
 - b. Color: As selected.
- B. Setting Blocks: Neoprene, EPDM and/or Silicone, 80 to 90 Shore A durometer hardness.
- C. Spacer Shims: Neoprene and/or Silicone, 50 to 60 Shore A durometer hardness.
- D. Glazing Clips: Manufacturer's standard type.
- E. Mirror Attachment Accessories: Stainless steel type 316 clips or J-profile channels.
- F. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify openings for mirrored glazing are correctly sized and within tolerance.
- C. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive mirrors.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

- A. Perform installation in accordance with GANA Glazing Manual.
 1. Glazing Sealants: Comply with ASTM C1193.
 2. Set mirrors plumb and level, free of optical distortion.
 3. Set mirrors with edge clearance free of surrounding construction including counter tops and backsplashes.
- B. Sealant Installation: Comply with GANA Sealant Manual.
 1. Install mirrors resting on setting blocks. Install applied stop and center mirror by use of spacer shims at 600 mm centers, kept 6 mm below sight line.
 2. Locate and secure mirror using spring wire clips and/or glazers' clips.
 3. Fill gaps between mirror and stops with glazing sealant until flush with sight line. Tool surface to straight line.

- C. Frameless Mechanical Installation:
 - 1. Set mirrors with clips, J-profile channels and/or rosettes. Anchor rigidly to wall construction.
 - 2. Place plumb and level without visible distort.
- D. Frameless Adhesive Installation:
 - 1. Set mirrors with adhesive.
 - 2. Place plumb and level without visible distortion.

3.4 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Inspect for quality of glazing.

3.5 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Remove wet glazing materials from finish surfaces.
- C. Remove labels after Work is complete.
- D. Clean mirrors and adjacent surfaces.

3.6 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 09220

PORTLAND CEMENT PLASTER

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes Portland cement plaster system.
- B. Related Sections:
 - 1. Division 3 - Concrete.
 - 2. Division 5 - Metals.
 - 3. Division 8 - Doors and Windows.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C91 - Standard Specification for Masonry Cement.
 - 2. ASTM C150 - Standard Specification for Portland Cement.
 - 3. ASTM C206 - Standard Specification for Finishing Hydrated Lime.
 - 4. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 - 5. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 6. ASTM C847 - Standard Specification for Metal Lath.
 - 7. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
 - 8. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster.
 - 9. ASTM C932 - Standard Specification for Surface-Applied Bonding Agents for Exterior Plastering.
 - 10. ASTM C933 - Standard Specification for Welded Wire Lath.
 - 11. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
 - 12. ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases.
 - 13. ASTM C1032 - Standard Specification for Woven Wire Plaster Base.
 - 14. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
 - 15. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
 - 16. ASTM C1328 - Standard Specification for Plastic (Stucco) Cement.
 - 17. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Federal Specification Unit:
 - 1. FS UU-B-790 - Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant).

- C. National Terrazzo and Mosaic Association:
 - 1. NTMA - Terrazzo Specifications Guide.
- D. Portland Cement Association:
 - 1. PCA - Portland Cement Plaster (Stucco) Manual.
- E. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.
- F. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.

1.3 PERFORMANCE REQUIREMENTS

- A. Conform to ASTM E119 and applicable code for fire rated assemblies, and as follows:
 - 1. Fire Rated Partitions: Listed assembly by UL or WH.
 - 2. Fire Rated Ceilings Bulkheads and Interior Soffits: Listed assembly by UL or WH.
 - 3. Fire Rated Structural Column Framing: Listed assembly by UL or WH.
 - 4. Fire Rated Structural Beam Framing: Listed assembly by UL or WH.
- B. Fabricate vertical elements to limit finish surface to 1:360 deflection under lateral point load of 445 N.
- C. Fabricate horizontal elements to limit finish surface to 1:360 deflection under superimposed dead load and wind uplift loads.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data on plaster materials, characteristics and limitations of products specified.
- C. Samples: Submit two samples, size as directed, illustrating finish color and texture.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C926 and PCA Portland Cement Plaster (Stucco) Manual.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up, size as directed by the Engineer, including exterior and interior wall and ceiling system illustrating surface finish.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Exterior Plaster: Do not apply plaster when ambient temperature is less than 4°C.
- C. Interior Plaster: Do not apply cement plaster unless minimum temperature of 10°C has been and continues to be maintained in building for minimum 48 hours prior to plaster application, during application, and until cured.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT PLASTER

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS:

- A. Plaster Materials:
 - 1. Cement: ASTM C150, Type I Portland cement.
 - 2. Aggregate: Natural sand, within the following sieve sizes and percentage retained limits:

<u>Sieve Size</u>	<u>Percent Retained</u>
4.75 mm	0
2.36 mm	0 to 5
1.18 mm	5 to 30
0.60 mm	30 to 65
0.30 mm	65 to 95
0.15 mm	90 to 100
 - 3. Water: Clean, fresh, potable and free of mineral or organic matter capable of affecting plaster.
 - 4. Bonding Agent: ASTM C932; type recommended for bonding plaster to concrete and concrete masonry surfaces.

5. Admixtures: Type as per manufacturer instructions.
6. Glass Fibers: 13 mm nominal length; meeting requirements of ASTM C1116.
7. Color Pigment: ASTM C979 mineral oxide or synthetic type, color as selected by the Engineer.
8. Sand for finish coats shall be clean, graded silica sand, 100% passing a 30 mesh screen.

B. Furring and Lathing:

1. Expanded Metal Lath: ASTM C847, galvanized, to suit application.
2. Woven Wire Plaster Base: ASTM C1032, having 25 mm openings.
3. Welded Wire Lath: ASTM C933.
4. Backing Material: FS UU-B-790 Grade D.
5. Casing and Corner Beads, and Base Screed: Formed sheet steel, depth governed by plaster thickness, maximum possible lengths, expanded metal or solid flanges, with square, bullnosed, or beveled edges; galvanized.
6. Corner Mesh: Formed sheet steel, minimum 0.5 mm thick, perforated or expanded flanges shaped to permit complete embedding in plaster, minimum 50 mm size; galvanized.
7. Strip Mesh: Expanded metal lath, minimum 0.5 mm thick, 50 mm wide x 600 mm long; galvanized.
8. Control and Expansion Joint Accessories: Formed sheet steel, accordion profile, 50 mm expanded metal or solid flanges each side, galvanized.
9. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.
10. Fasteners: ASTM C1002, self drilling, self tapping screws.
11. Polyethylene Sheet: Clear, 0.15 mm thick.
12. Access Panels in Plaster on Metal Furring (If Any): Formed stainless steel type 316, one hour fire rating.

C. Acoustic Accessories:

1. Resilient Channels: Formed steel, minimum 0.5 mm thick; face, profile and width as indicated on drawings, splicing permitted; galvanized.
2. Acoustic Sealant: Non-hardening, non-skinning, for use with plaster system.

2.3 MIXES

- A. Except where hand-mixing of small batches is approved by the Engineer, mechanical mixers of an approved type shall be used for the mixing of plaster. Frozen, caked or lumped materials shall not be used.
- B. Mechanical mixers, mixing boxes and tools shall be cleaned after mixing each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water uniform in colour and consistency. Retempering will not be permitted and all plaster which has begun to stiffen shall be discarded.
- C. All tools, implements, vessels and surfaces shall at all time be kept scrupulously clean and strict precautions shall be taken to avoid the plasterer or other materials becoming contaminated by pieces of partially set material which would tend to retard or accelerate the setting time.

- D. Spartterdash Coat (Rasheh): 1 part Portland cement, 1 part of sand and 1 part of crushed powder sand, proportioned by volume.
- E. Internal plaster shall be (1:3) composed of 475 kg of cement per m³ of sand. Internal plaster shall be 20 mm thick for walls and ceilings.
- F. External plaster shall be (1:3) composed of 475 kg of cement per m³ of sand. External plaster shall be 20 mm thick.
- G. Internal and external plasters shall be executed in one single coat work in addition to the spartterdash (Rasheh). If more than one coat is required, approved galvanized wire mesh reinforcement shall be used.
- H. Mix and proportion cement plaster in accordance with approved methodology.
- I. Add glass fibers to plaster at rate of 8.0 kg per cubic meter of plaster.
- J. Add admixtures as instructed by the manufacturer.
- K. Mix only as much plaster as can be used prior to initial set.
- L. Mix materials dry, to uniform color and consistency, before adding water.
- M. Protect mixtures from freezing, frost, contamination, and excessive evaporation.
- N. Do not retemper mixes after initial set has occurred.

2.4 READY MIX PLASTER

- A. For External Applications: Fiber reinforced cementitious ready mix plaster.
 - 1. Appearance: Grey powder.
 - 2. Grain Size: 0.02 to 1.5 mm.
 - 3. Composition: Portland cement, selected sand, fibers and additives.
 - 4. Wet Mix Life: Less than 1 hour.
 - 5. Compressive Strength: 10 MPa.
 - 6. Mix: 50 kg bag with 9 to 10 liters of clean water.
 - 7. Coat Thickness: 20 mm.
 - 8. Consumption: Around 2.0 kg/m²/1mm thickness.
- B. For Internal Applications: Cementitious ready mix plaster.
 - 1. Appearance: Grey powder.
 - 2. Grain Size: 0.02 to 1.5 mm.
 - 3. Composition: Portland cement, selected sand and additives.
 - 4. Wet Mix Life: Less than 1 hour.
 - 5. Mix: 50 kg bag with 7 to 8 liters of clean water.
 - 6. Coat Thickness: 20 mm.
 - 7. Consumption: Around 1.7 kg/m²/1mm thickness.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Masonry: Verify joints are cut flush and surface is ready to receive work of this section. Verify no bituminous or water repellent coatings exist on masonry surface.
- C. Concrete: Verify surfaces are flat, honeycomb and are filled flush, and surfaces are ready to receive work of this section. Verify no bituminous, water repellent, or form release agents exist on concrete surface that are detrimental to plaster bond.
- D. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.
- E. Mechanical and Electrical: Verify services within surfaces to be plastered (walls, ceiling, etc.) have been tested and approved.

3.2 PREPARATION

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Clean concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.
- C. Roughen smooth concrete surfaces and apply bonding agent.
- D. Galvanized wiremesh reinforcement shall be provided wherever blockwalls abut against concrete columns, beams or slabs, and plaster finish is required to continue over both blockwork and concrete surfaces. The galvanized wiremesh reinforcement shall consist of 20 cm wide strips and shall cover the whole length of the joint, horizontally as well as vertically and shall be securely nailed, plugged or stapled in place to both surfaces at intervals not exceeding 40 cm at both edges.
- E. Plastering shall not be commenced until all mechanical and electrical services, conduits, pipes and fixtures have been installed complete and tested.
- F. All walls shall be wetted immediately prior to applying the first spatterdash coat (Rasheh) to provide key for subsequent coats.

3.3 EXISTING WORK

- A. Extend existing Portland cement plaster installations using materials and methods as specified.
- B. Repair existing damaged Portland cement plaster which remains or to be remodeled.

3.4 INSTALLATION

- A. Installation of Lathing Materials:
 - 1. Apply one or two layers of Grade D building paper over substrate; lap edges 50 mm minimum. Fasten in place.
 - 2. Install metal lath in accordance with ASTM C1063.

- B. Installation of Accessories:
1. Install accessories in accordance with ASTM C1063.
 2. Place corner bead at external wall corners; fasten at outer edges of lath only.
 3. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.
 4. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
 5. Install door and glazed frames plumb and level in opening. Secure rigidly in place.
 6. Position to provide convenient access to concealed work requiring access.
- C. Control and Expansion Joints:
1. Install interior control and expansion joints as indicated on Drawings.
 2. Install exterior contraction joints after initial set, scribed as indicated on Drawings by cutting through 2/3 of cement plaster depth, neatly, in straight lines.
 3. For horizontal exterior surfaces, install control and expansion joints as indicated on Drawings.
 4. For vertical exterior surfaces install control and expansion joints as indicated on Drawings.
 5. Establish control and expansion joints with specified joint device.
- D. Plastering:
1. Plaster shall be thoroughly mixed with the proper amount of water until uniform in colour and consistency. Retempering will not be permitted and all plaster which has begun to stiffen shall be discarded.
 2. All plastering shall be executed in a neat workmanlike manner and corners shall be true, straight and plumb.
 3. All tools, implements, vessels and surfaces shall at all times be kept scrupulously clean and strict precautions shall be taken to avoid the plaster or other materials becoming contaminated by pieces of partially set materials which would tend to retard or accelerate the setting time.
 4. The temperature before, during and after application of plaster shall be uniformly maintained above 12°C. The heat shall be well distributed in all areas, and concentration or irregular heat on plaster surfaces shall be prevented.
 5. Ventilation shall be provided to properly dry the plaster during and subsequent to its application. Plaster shall be prevented from too-rapid drying.
 6. All ingredients entering the several mixes shall be proportioned and measured by means of calibrated boxes or containers of such nature that the quantities can be accurately checked at any time. Ingredients shall be thoroughly mixed and then cleaned from the mixer and tools after each mix.
 7. Plaster shall be rodded and straight-edged to uniform thickness in true planes flush to the required surface and flush with outlet boxes, and similar details and steel-troweled smooth and level with sharp, straight arises and true angles. Plaster shall be free from laps, cracks, trowels marks, or other structural defects or surface imperfections.
 8. Where plaster finish is flush with adjoining surface or where tooled joint is indicated on the drawings, the plaster shall be grooved back with smallest available edging tool, to control any cracking at these points.

9. At doors and frames and other openings, all plaster shall be keyed in, except that across head of openings and 12 inches down each side plaster shall be cut free of frame, or grounds with edge of trowel, after stiffening but before setting, to allow for expansion.
 10. All pressed metal door frames in walls shall be grouted full with Portland cement fine concrete after being completely anchored in place and prior to application of plaster. Rake grout to allow plaster to enter jamb.
 11. Apply the spatterdash coat (Rasheh) and allow to dry before rendering is commenced.
 12. Moist cure each coat. Apply successive coat immediately following initial set of scratch coat.
 13. After curing, dampen previous coat prior to applying finish coat.
 14. Apply finish coat to indicated color and texture.
 15. Plumb, square and level.
 16. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.
 17. Moist cure finish coat for minimum period of 48 hours.
- E. Waterproof External Finishing Render:
1. All surfaces to be plastered shall be clean and free from dust, grease, loose or projecting mortar and all traces of salts and are to be thoroughly sprayed with water but all free water shall be allowed to disappear from the surface before the plaster is applied.
 2. Efflorescence shall be brushed off and all dust and foreign matter removed. All waterproof plastering shall be in two coats and shall contain 475 kg of cement per one meter cube of sand mixed with an approved waterproofing admixture compound and applied in accordance with manufacturer's instructions and shall be applied and allowed to dry before rendering is commenced. All walls shall be wetted immediately prior to applying the first coat of rendering and this shall be allowed to thoroughly dry out before the next coat is applied.

3.5 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Flat Surface: 3 mm in 3 m, non-cumulative.

3.6 ADJUSTING

- A. General Requirements: Execution requirements for testing, adjusting and balancing.
- B. Remove damaged or defective plaster by cutting and replace with specified materials to match adjacent plaster.
- C. Fog coat non-uniform or discolored plaster with finish coat materials spray applied to entire finish coat surface.

3.7 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 09260

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes metal stud wall framing; metal channel ceiling framing; shaft wall system; gypsum board and joint treatment; acoustic insulation; and textured finish.
- B. Related Sections:
 - 1. Division 5 - Metals.
 - 2. Division 6 - Wood and Plastics.
 - 3. Section 07212 - Board Insulation.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C36 - Standard Specification for Gypsum Wallboard.
 - 2. ASTM C79/C79M - Standard Specification for Gypsum Sheathing Board.
 - 3. ASTM C442 - Standard Specification for Gypsum Backing Board and Coreboard.
 - 4. ASTM C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 5. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board.
 - 6. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - 7. ASTM C630/C630M - Standard Specification for Water-Resistant Gypsum Backing Board.
 - 8. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
 - 9. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 10. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - 11. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - 12. ASTM C931/C931M - Standard Specification for Exterior Gypsum Soffit Board.
 - 13. ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases.
 - 14. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.
 - 15. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - 16. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Gypsum Association:

1. GA 214 - Recommended Levels of Gypsum Board Finish.
2. GA 216 - Application and Finishing of Gypsum Board.
3. GA 600 - Fire Resistance Design Manual Sound Control.

C. Underwriters Laboratories Inc.:

1. UL - Fire Resistance Directory.

D. Intertek Testing Services (Warnock Hersey Listed):

1. WH - Certification Listings.

1.3 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for fire rated assemblies and as follows:

1. Fire Rated Partitions: Listed assembly by UL or WH or GA File.
2. Fire Rated Ceiling and Soffits: Listed assembly by UL or WH or GA File.
3. Fire Rated Structural Column Framing: Listed assembly by UL or WH or GA File.
4. Fire Rated Structural Beam Framing: Listed assembly by UL or WH or GA File.
5. Fire Rated Shaft Wall Requirements: in accordance with UL or WH listed assembly or GA File.

B. Acoustic Attenuation for Interior Partitions: STC in accordance with ASTM E90.

C. Shaft Wall: Perform to the following:

1. Air Pressure within Shaft: and maximum mid-span deflection as per applicable code.
2. Acoustic Attenuation: STC in accordance with ASTM E90.

1.4 SUBMITTALS

A. General Requirements: Requirements for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Submit data on metal framing, gypsum board, joint; decorative finish, and acoustic accessories.

D. Samples: Submit two samples of each type of gypsum board, size 300 x 300 mm, illustrating finish color and texture.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840, ASTM C1280, GA-214, GA-216 and GA-600.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up, size as directed by the Engineer, including interior wall and ceiling system illustrating surface finish.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging. Store channels and studs to avoid damage.
- C. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.10 PROJECT CONDITIONS

- A. Monitor environmental conditions for application and finishing Gypsum Wallboard Systems to comply with Gypsum Wallboard Systems manufacturer's recommendations.
- B. For non adhesive attachment of gypsum board to framing, maintain temperature no less than 4.4 degrees C. For adhesive attachment and finishing of gypsum board, maintain temperature no less than 10 degrees C for 48 hours prior to application and continuously thereafter until adhesive is dry.
- C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

A. Framing Materials:

1. Studs and Tracks: ASTM C645; GA-216 and GA-600; galvanized sheet steel, thickness and shape as indicated on drawings.
2. Shaft Wall Studs and Accessories: As instructed by the manufacturer.
3. Furring, Framing, and Accessories: ASTM C645, GA-216 and GA-600.
4. Fasteners: ASTM C514, ASTM C1002, and GA-216.
5. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
6. Adhesive: ASTM C557, and GA-216.

B. Gypsum Board Materials:

1. Standard Gypsum Board: ASTM C36; 12 mm thick; ends square cut, tapered, beveled, square or round edges.
2. Fire Rated Gypsum Board: ASTM C36; fire resistive type, UL or WH rated; 12 mm thick; ends square cut, tapered, beveled, square or round edges.
3. Moisture Resistant Gypsum Board: ASTM C630/C630M; 12 mm thick; ends square cut, tapered, beveled, square, or round edges.
4. Exterior Gypsum Soffit Board: ASTM C931/C931M; standard or fire rated type, 12 mm thick; ends square cut, tapered, beveled, square, or round edges.
5. Gypsum Backing Board: ASTM C442; standard, fire rated or insulating type; 12 mm thick; square, round, V-grooved, or book tongue and grooved edges, ends square cut.
6. Length or Size: Maximum available length or size in place.
7. Batten Joints: Manufacturer's standard type.

2.3 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, un-faced, thickness as instructed by the manufacturer.
- B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
- C. Corner Beads: Metal and/or Metal and paper combination.
- D. Edge Trim: GA-216; Type LC, L, LK and/or U exposed reveal bead.
- E. Joint Materials: ASTM C475; GA-216; reinforcing tape, joint compound, adhesive, and water.
- F. Textured Finish Materials: As indicated on drawings.
- G. Fasteners: ASTM C1002, Type S12 or W, and GA-216.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify site conditions are ready to receive work and opening dimensions are as indicated on shop drawings and as instructed by manufacturer.

3.2 EXISTING WORK

- A. Extend existing installations of gypsum board using materials and methods as specified.
- B. Repair and remodel existing gypsum board assemblies which remain or are to be altered.

3.3 INSTALLATION

- A. Metal Stud Installation:
 - 1. Install studs in accordance with ASTM C754, GA-216 and GA-600.
 - 2. Metal Stud Spacing: 600 mm on center.
 - 3. Extend stud framing to ceiling only. Attach ceiling runner securely to acoustic ceiling track or ceiling framing, in accordance with details indicated.
 - 4. Refer to Drawings for indication of partitions extending stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
 - 5. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
 - 6. Blocking: Nail wood blocking to studs, or Bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame opening, toilet accessories, and/or hardware.
- B. Wall Furring Installation:
 - 1. Erect wall furring for direct attachment to concrete masonry and concrete walls.
 - 2. Erect furring channels horizontally and/or vertically; space maximum 600 mm oc, not more than 100 mm from floor and ceiling lines. Secure in place on alternate channel flanges at maximum 600 mm on center.
 - 3. Install thermal insulation in conjunction with Section 07212 directly attached to concrete masonry and concrete walls.
 - 4. Erect metal stud framing tight to concrete and/or concrete masonry walls, attached by adjustable furring brackets.
- C. Furring for Fire Ratings: Install furring as required for fire resistance ratings indicated and to GA-600 requirements.
- D. Shaft Wall Framing: To GA-600 requirements.

- E. Ceiling Framing Installation:
1. Install in accordance with ASTM C754 and GA-216.
 2. Coordinate location of hangers with other work.
 3. Install ceiling framing independent of walls, columns, and above ceiling work.
 4. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 600 mm past each end of openings.
 5. Laterally brace entire suspension system.
- F. Acoustic Accessories Installation:
1. Install resilient channels at maximum 600 mm on center. Locate joints over framing members.
 2. Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
 3. Install acoustic sealant within partitions or at gypsum board perimeter at:
 - a. Metal Framing: Two beads.
 - b. Base Layer.
 - c. Face Layer.
 - d. Seal penetrations of partitions by conduit, pipe, duct work, and rough-in boxes.
- G. Gypsum Board Installation:
1. Install gypsum board in accordance with GA-216 and GA-600.
 2. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 3. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
 4. Erect exterior gypsum soffit board in accordance with ASTM C931/C931M.
 5. Use screws when fastening gypsum board to metal furring or framing.
 6. Use nails or screws when fastening gypsum board to wood furring or framing. Staples may only be used when securing first layer of double layer applications.
 7. Double Layer Applications: Secure second layer to first with fasteners or adhesive and sufficient support to hold in place. Use fire rated gypsum backing board for fire rated partitions and ceilings. Place second layer perpendicular or parallel to first layer as indicated on drawings. Offset joints of second layer from joints of first layer.
 8. Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.
 9. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.
 10. Place control joints consistent with lines of building spaces as indicated on Drawings and/or as directed.
 11. Place corner beads at external corners as indicated on Drawings. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated on Drawings.
 12. Apply gypsum board to curved walls in accordance with GA-216.

- H. Joint Treatment:
 - 1. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 2. Feather coats on to adjoining surfaces so that camber is maximum 0.8 mm.
 - 3. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.
- I. Texture Finish: Spray, Trowel, Roller and/or Brush apply finish texture coating.
- J. Install Work in accordance with the drawings, to the manufacturer's instructions, and to the approval of the Engineer.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 3mm/3m.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 09300

TILE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes ceramic, ceramic mosaic, quarry, and paver, tile for floor and for wall applications; tile stair treads and risers using mortar bed and backing application method; cementitious backer board as tile substrate; thresholds at door openings; and tile accessories.
- B. Related Sections:
 - 1. Section 03350 - Concrete Finishes.
 - 2. Section 07130 - Waterproofing membrane.
 - 3. Section 07140 - Fluid Applied Waterproofing.
 - 4. Section 07900 - Joint Sealers.
 - 5. Section 09220 - Portland Cement Plaster.
 - 6. Section 10800 - Toilet, Bath and Laundry Accessories
 - 7. Division 15 - Mechanical: Plumbing Fixtures.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A108.1 - Installation of Ceramic Tile, A collection.
 - 2. ANSI A108.10 - Specifications for Installation of Grout in Tilework.
 - 3. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
 - 4. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
 - 5. ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
 - 6. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
 - 7. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
 - 8. ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
 - 9. ANSI A108.7 - Specifications for Electrically Conductive Ceramic Tile Installed with Conductive Dry-Set Portland Cement Mortar.
 - 10. ANSI A108.8 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.
 - 11. ANSI A108.9 - Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
 - 12. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.

13. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and - Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
14. ANSI A118.4 - Latex-Portland Cement Mortar.
15. ANSI A118.5 - Chemical-Resistant Furan Mortar and Grout.
16. ANSI A118.6 - Ceramic Tile Grouts.
17. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
18. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units.
19. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.
20. ANSI A137.1 - Ceramic Tile.

- B. ASTM International:
1. ASTM C847 - Standard Specification for Metal Lath.

- C. Tile Council of America:
1. TCA - Handbook for Ceramic Tile Installation.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- C. Product Data: Submit instructions for using grouts and adhesives.
- D. Samples: Submit for each type of tile and grout required, two samples on two plywood panels backing, 300 x 300 mm each, illustrating pattern, color variations, and grout type, color and joint size variations.
- E. Samples: Submit two samples for each type of tile and grout required, 300 x 300 mm each, on two plywood panels backing, illustrating pattern, color variations, and grout type and joint size variations.
- F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up, 10 m², with backer board, cleavage membrane, waterproofing, finish grout, and specified accessories.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Protect adhesives and grouts from freezing or overheating.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Do not install adhesives and grouts in unventilated environment.
- C. Maintain ambient and substrate temperature of 10 °C during installation of mortar materials.

1.11 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Supply 10 sq m of each type, size, color and surface finish of tile specified.

PART 2 PRODUCTS

2.1 TILE

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Ceramic and Mosaic Tile: ANSI A137.1, and conforming to the following:
1. Moisture Absorption: 0 to 0.5 percent.
 2. Size: As indicated on drawings.
 3. Shape: Square or rectangular, as indicated on drawings.
 4. Edge: Square or cushioned, as indicated on drawings.
 5. Surface Finish: Unglazed, matte glazed, mottle glazed, or slip resistant, as indicated on drawings.
 6. Color: As selected.
 7. Mounted Sheet Size: As indicated on drawings.
 8. Ceramic Type and Thickness: Unless otherwise stated, solid ceramic (plein masse), 10 mm thick minimum.
- B. Ceramic Wall Tile: ANSI A137.1, and conforming to the following:
1. Moisture Absorption: 0 to 0.5 percent.
 2. Size: As indicated on drawings.
 3. Shape: Square or rectangular, as indicated on drawings.
 4. Edge: Square or cushioned, as indicated on drawings.
 5. Surface Finish: Unglazed, matte or mottle glazed, as indicated on drawings.
 6. Color: As selected.
 7. Pattern: As indicated on drawings.
 8. Ceramic Type and Thickness: Unless otherwise stated, solid ceramic (plein masse), 8 mm thick minimum.
- C. Skirting or Base: To match floor tile for moisture absorption, surface type and finish, thickness and color:
1. Length: Tile length: As indicated on drawings.
 2. Height: As indicated on drawings.
 3. Top Edge: Bull nosed, unless otherwise indicated.
 4. Internal Corner: Coved, unless otherwise indicated.
 5. External Corner: Bullnosed, unless otherwise indicated.
 6. Moisture Absorption: 0 to 0.5 percent.
 7. Surface Finish: Unglazed, matte or mottle glazed, as indicated on drawings.
 8. Color: As selected.
- D. Wainscot Cap: Match mosaic wall tile for moisture absorption, surface finish, and color, tile length and height as indicated on drawings, bull nosed top edge, unless otherwise indicated.
- E. Stair Tread and Riser: Match quarry tile and paver tile for moisture absorption, surface finish, thickness and color:
1. Tread Length and Width: As indicated on drawings.
 2. Riser Length and Height: As indicated on drawings.

3. Nosing: Radiused or bull nosed, as indicated on drawings.
4. Tread Surface: Non-slip or ribbed, as indicated on drawings.

F. Exposed Edges: All exposed edges should be cut in factory to ensure straight alignment.

2.3 ACCESSORIES

A. Ceramic Accessories: Glazed and unglazed finish, size as indicated on drawings; same color and texture as adjacent wall tile.

B. Adhesive Materials:

1. Organic Adhesive: ANSI A136.1, thin-set bond type.
2. Epoxy Adhesive: ANSI A118.3, thin-set bond type.
3. Tile Setting Adhesive: Elastomeric, waterproof, and liquid applied.

C. Mortar Materials:

1. Mortar Bed Materials: Portland cement, sand, latex additive and water.
2. Mortar Bond Coat Materials:
 - a. Dry-Set Portland Cement type: ANSI A118.1.
 - b. Latex-Portland Cement type: ANSI A118.4.
 - c. Epoxy: ANSI A118.3.
 - d. Furan: ANSI A118.5.

D. Grout Materials:

1. Standard Grout: Portland cement type, Sand-Portland Cement type, Latex-Portland cement type, or Silicone Rubber type as specified in ANSI A118.6.
 - a. Color Admixture: Site mixed type as recommended by manufacturer.
 - b. Color: As selected.
2. Epoxy Grout: ANSI A118.8, modified epoxy emulsion grout, color as selected.
3. Furan Grout: ANSI A118.5, furan resin type, color as selected.
4. Silicone Rubber Grout: Silicone sealant, moisture and mildew resistant type, complying with ANSI A118.6, color as selected; use for wet floors and walls.
5. Grout Color: To match tile unless otherwise stated.

E. Cleavage Membrane: 6.9 kg asphalt saturated felt or 0.1 mm thick polyethylene film.

F. Waterproofing Membrane at Floors: As per Section 07130 or Section 07140.

G. Membrane at Walls: 6.9 kg asphalt saturated felt or 0.1 mm thick polyethylene film.

H. Reinforcing Mesh: 50 x 50 mm size weave of 16/16 wire size; welded fabric, galvanized.

I. Metal Lath: ASTM C847, Flat diamond mesh, of weight to suit application, galvanized finish.

J. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 13 mm thick; 50 mm wide coated glass fiber tape for joints and corners.

- K. Thresholds: Marble type, 20 mm thick unless otherwise stated, color and finish as indicated on drawings, size by full width of wall or frame opening, beveled both sides, radiused edges from bevel to vertical face.
- L. Toilet and Bath Accessories: Refer to Section 10800.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify surfaces are ready to receive work.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install cementitious backer board. Tape joints and corners, cover with skim coat of dry-set mortar to feather edge.
- E. Prepare substrate surfaces for adhesive installation.

3.3 EXISTING WORK

- A. General Requirements: Execution requirements for maintenance service.
- B. Prepare and remodel existing tile installations using materials and methods as specified.
- C. Clean and repair existing tile which remains.

3.4 INSTALLATION

- A. Install tile, skirting, thresholds, stair treads and risers, and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Place thresholds and edge strips at locations indicated and/or scheduled.
- D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base and wall joints.

-
- E. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
 - 1. Ceramic and Ceramic Mosaic Tile: 1.6 and 3 mm.
 - 2. Quarry and Paver Tile: 6 and 10 mm.
 - F. Form internal angles square or coved and external angles bullnosed or square, unless otherwise indicated.
 - G. Install ceramic accessories rigidly in prepared openings.
 - H. Sound tile after setting. Replace hollow sounding units.
 - I. Keep expansion and control joints free of adhesive or grout. Apply sealant to joints.
 - J. Allow tile to set for a minimum of 48 hours prior to grouting.
 - K. Grout tile joints. Use standard grout unless otherwise indicated.
 - L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
 - M. Installation - Floors - Thin-Set Methods:
 - 1. Over exterior concrete substrates, install in accordance with TCA Handbook Method F102, with standard grout.
 - 2. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-Portland cement bond coat or F116, organic adhesive, with standard grout, unless otherwise indicated.
 - a. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-Portland cement grout.
 - b. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.
 - c. Where furan bond coat and grout are indicated, install in accordance with TCA Handbook Method F133.
 - d. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F115.
 - 3. Over wood substrates, install in accordance with TCA Handbook Method F142, with standard grout, unless otherwise indicated.
 - a. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F143.
 - N. Installation - Floors - Mortar Bed Methods:
 - 1. Over exterior concrete substrates, install in accordance with TCA F101, bonded, with standard grout.
 - 2. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane and/or F112, bonded, unless otherwise indicated.
 - a. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.

- b. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.
 - c. Where conductive tile are indicated, install in accordance with TCA Handbook Method F125, bonded.
 - d. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with or without cleavage or waterproofing membrane.
3. Over wood substrates, install in accordance with TCA Handbook method F141, with standard grout, unless otherwise indicated.
 4. Cleavage Membrane: Lap and seal watertight, edges and ends.
 5. Waterproofing Membrane: Install as per Section 07130 or Section 07140.
 6. Mortar Bed Thickness: 15 mm, unless otherwise indicated.
- O. Installation - Showers and Bathtub Walls:
1. At tiled shower receptors install in accordance with TCA Handbook Method B414, mortar bed floor, and W201, mortar bed over concrete or masonry walls or B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.
 2. At bathtub walls install in accordance with TCA Handbook Method B411, mortar bed on studs with waterproofing membrane; B412, over cementitious backer units with waterproofing membrane; or W202, thin-set over masonry.
 3. Grout with silicone rubber grout.
 4. Seal joints between tile work and other work with sealant Type specified in Section 07900.
- P. Installation - Wall Tile:
1. On exterior walls install in accordance with TCA Handbook Method W244, thin-set over cementitious backer units with waterproofing membrane, W201, mortar bed over concrete and masonry with waterproofing membrane, or W202, thin-set over concrete and masonry with latex-Portland cement grout.
 2. Over cementitious backer units install in accordance with TCA Handbook Method W244, using membrane at toilet rooms and kitchens; or W223, organic adhesive.
 3. Over gypsum wallboard or wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-Portland cement bond coat, W223, thin-set with organic adhesive, unless otherwise indicated.
 - a. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
 - b. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.
 4. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-Portland cement bond coat, or W211, bonded mortar bed without membrane.
 5. Over wood studs without backer install in accordance with TCA Handbook Method W231, mortar bed, with membrane where indicated.
 6. Over metal studs without backer install in accordance with TCA Handbook Method W241, mortar bed, with membrane where indicated.

3.5 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Clean tile and grout surfaces.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. General Requirements: Execution requirements for protecting installed construction.
- B. Do not permit traffic over finished floor surface for 4 days after installation.

3.7 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 09510

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes suspended metal grid ceiling system and perimeter trim; tile or panel false ceilings; and supplementary acoustic insulation over system units.
- B. Related Sections:
 - 1. Section 06200 - Finish Carpentry.
 - 2. Section 07900 - Joint Sealers.
 - 3. Section 08830 - Mirrors.
 - 4. Section 09260 - Gypsum Board Assemblies.
 - 5. Division 15 - Mechanical: Air Outlets and Inlets.
 - 6. Division 16 - Electrical: Interior and External Luminaires.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 2. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - 3. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 4. ASTM E580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
 - 5. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
- B. Ceilings and Interior Systems Construction Association:
 - 1. CISCA - Acoustical Ceilings: Use and Practice.
- C. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.
- D. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.

1.3 PERFORMANCE REQUIREMENTS

- A. Installed System: Conform to UL or WH for ceiling and floor, and ceiling and roof assembly.
- B. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:360.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to the system. Indicate method of suspension where interference exists.
- C. Product Data: Submit data on metal grid system components, and acoustic units.
- D. Samples:
 - 1. Submit two full size samples, illustrating material and finish of units.
 - 2. Submit two samples each, 300 mm long, of suspension system main runner, cross runner, and perimeter molding.
- E. Manufacturer's Installation Instructions: Submit special procedures, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

- A. Conform to CISCA requirements.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.
- C. Provide seismic design of suspended ceiling under direct supervision of Professional Engineer experienced in design of this Work and approved by the Engineer.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mockup.
- B. Construct mock-up, 4000 x 4000 mm, including typical field and edge conditions.
- C. Locate where directed by the Engineer.
- D. Remove mockup when directed by the Engineer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Maintain uniform temperature of minimum 16°C and maximum humidity of 40% prior to, during, and after acoustic unit installation.

1.10 SEQUENCING

- A. Sequence Work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustic units after interior wet work is dry.

1.11 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Furnish one percent of total acoustic unit area of extra tiles or panels to Employer.

PART 2 PRODUCTS

2.1 SUSPENDED ACOUSTICAL CEILINGS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Acoustic Tile: ASTM E1264, conforming to the following:
 - 1. Size: As indicated on drawings.
 - 2. Thickness: 10 to 15 mm.
 - 3. Composition:
 - a. Gypsum with aluminum backing.
 - b. Acoustical calcium silicate or mineral.
 - 4. Density: As selected.
 - 5. Light Reflectance: As selected.
 - 6. NRC Range: As selected.
 - 7. STC Range: As selected.
 - 8. Fire Hazard Classification: As selected.
 - 9. Joint: Kerfed or Rabbeted, as selected.
 - 10. Edge: Square or beveled, as selected.
 - 11. Surface Color: As selected.
 - 12. Surface Finish: Perforated, Non-directional fissured, or Directional fissured, as indicated on drawings.
- B. Grid:
 - 1. Non-fire Rated Grid: ASTM C635, light, intermediate and/or heavy duty; exposed T, exposed T/one direction, concealed T and G, concealed H and T,

- paired access T, downward access removable T, concealed Z, concealed T, or metal panel T; components die cut and interlocking.
2. Fire Rated Grid: ASTM C635, light, intermediate and/or heavy duty, listed by UL for use, two directional concealed, exposed T and/or exposed T/one direction; components die cut and interlocking.
 3. Grid Materials: Commercial quality cold rolled steel with galvanized coating.
 4. Exposed Grid Surface Width: 24 mm.
 5. Grid Finish: color as selected.
 6. Accessories: Stabilizer bars, clips, splices, perimeter moldings, and hold down clips, required for suspended grid system.
 7. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

2.3 ACCESSORIES

- A. Acoustic Batt Insulation: ASTM C665, friction fit type, unfaced; 50 mm thick, size cut to fit acoustic system.
- B. Gypsum Board: Fire rated or standard type; specified in Section 09260.
- C. Acoustic Sealant for Perimeter Moldings: Specified in Section 07900.
- D. Gasket for Perimeter Moldings: Closed cell rubber sponge tape.
- E. Touch-up Paint: Type and color to match acoustic and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify layout of hangers will not interfere with other work.

3.2 EXISTING WORK

- A. Extend existing acoustical ceiling installations using specified materials and methods.
- B. Clean and repair existing acoustical ceilings which remain or are to be reinstalled.

3.3 INSTALLATION

- A. Lay-In Grid Suspension System:
 1. Install suspension system in accordance with ASTM C636 and as supplemented in this section.
 2. Install system in accordance with ASTM E580.
 3. Install system capable of supporting imposed loads to deflection up to 1/360.
 4. Lay out system to balanced grid design with edge units no less than 50 percent of acoustic unit size. Arrange system with long dimension of tile parallel or perpendicular to long dimension of the space.

5. Install after major above ceiling work is complete. Coordinate location of hangers with other work.
6. Install hanger clips during steel deck erection. Install additional hangers and inserts as required.
7. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
8. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers and related carrying channels to span extra distance.
9. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 150 mm of each corner; or support components independently.
10. Do not eccentrically load system, or produce rotation of runners.
11. Perimeter Molding:
 - a. Install edge molding at intersection of ceiling and vertical surfaces into bed of acoustic sealant or with continuous gasket.
 - b. Use longest practical lengths.
 - c. Miter or Overlap and rivet corners.
 - d. Install at junctions with other interruptions.
12. Form expansion joints as detailed. Form to accommodate plus or minus 25 mm movement. Maintain visual closure.
13. Install light fixture boxes constructed of gypsum board, or acoustic panel above light fixtures in accordance with UL or WH assembly requirements and light fixture ventilation requirements.

B. Concealed Grid Suspension System:

1. Install suspension system to ASTM C636 and as supplemented in this section
2. Install system in accordance with ASTM E580.
3. Install system capable of supporting imposed loads to deflection of 1: 360.
4. Lay out system to balanced grid design with edge units no less than 50 percent of acoustic unit size.
5. Install after major above ceiling work is complete. Coordinate location of hangers with other work.
6. Install hanger clips during steel deck erection. Install additional hangers and inserts as required.
7. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
8. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers and related carrying channels to span extra distance.
9. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 150 mm of each corner; or support components independently.
10. Do not eccentrically load system, or produce rotation of runners.
11. Perimeter Molding:
 - a. Install concealed edge molding at intersection of ceiling and vertical surfaces into bed of acoustic sealant or with continuous gasket.
 - b. Use longest practical lengths.
 - c. Miter or Overlap and rivet corners.

- d. Install concealed at junctions with other interruptions.
12. Form expansion joints as detailed. Form to accommodate plus or minus 25 mm movement. Maintain visual closure.

C. Acoustic Units:

1. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
2. Lay directional patterned units one way with pattern parallel to longest or shortest room axis, or in basket weave pattern. Fit border trim neatly against abutting surfaces.
3. Install units after above ceiling work is complete.
4. Install acoustic units level, in uniform plane, and free from twist, warp, and dents.
5. Cutting Acoustic Units:
 - a. Cut to fit irregular grid and perimeter edge trim.
 - b. Cut square reveal or bevel edges to field cut units.
 - c. Double cut and field paint exposed edges of tegular units.
6. Where bullnose concrete block corners or round obstructions occur, install preformed closures to match perimeter molding.
7. Lay acoustic insulation for distance of 1200 mm on both sides of acoustic partitions and as indicated on Drawings.
8. Install hold-down clips to retain panels tight to grid system within 6 m of exterior door.

3.4 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Flat and Level Surface: 3 mm in 3 m.
- C. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 °.

END OF SECTION

SECTION 09626

CEMENT SAND SCREED FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. This section specifies architectural sand cement screed casted as floor finish, or substrate to other floor finishes.
- B. Related Sections:
 - 1. Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 308 - Standard Practice for Curing Concrete.
 - 2. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 3. ACI 347 - Recommended Practice for Concrete formwork.
- B. American Standards for Testing and Materials (ASTM):
 - 1. ASTM C33 - Standard Specifications for Concrete Aggregates.
 - 2. ASTM C94 - Ready-Mixed Concrete.
 - 3. ASTM C150 - Portland Cement.
 - 4. ASTM C190 - Test Method for Tensile strength of Hydraulic Cement Mortars.
 - 5. ASTM C256 - Test Method for Flexural strength of Hydraulic Cement Mortars.
 - 6. ASTM C330 - Standard Specifications for Lightweight Aggregates for Structural Concrete.
 - 7. ASTM C1439 - Test Method for Compressive strength of Hydraulic Cement Mortars.
- C. BS EN Standards:
 - 1. BS EN 206-1 - Concrete, specification, performance, production and conformity.
 - 2. BS 8204 - Code of Practice for Screeds, Bases and In-Situ Floorings.
 - 3. BS EN 13318 - Screed material and floor screeds, definitions.
- D. Code of Practice:
 - 1. CP 202 - Code of Practice for Tile Flooring and Slab Flooring.
 - 2. CP 203 - Code of Practice for Sheet and Tile Flooring.
 - 3. CP 204 - Code of Practice for In-Situ Floor Finishes.
- E. DIN Standards:
 - 1. DIN 18353 - Contract Procedures for Building Works - Part C: General Technical Specifications for Building Works - Floor Screed Works.
 - 2. DIN 18560 - Floor Screeds in Building Construction.
- F. All applicable local codes, regulations, etc. of Authorities having Jurisdiction.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data on screed hardener, sealer, curing compounds and slip resistant treatment, compatibilities, and limitations.
- C. Design Data:
 - 1. Submit mix design.
 - 2. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 - 3. Identify mix ingredients and proportions, including admixtures.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with Referenced Standards.
- B. Acquire cement and aggregate from same source for all work.
- C. Use only 1 brand of cement and admixtures unless otherwise approved in writing by the Engineer.
- D. Provide the Engineer with delivery ticket for each load of screed.

1.5 REGULATORY REQUIREMENTS

- A. Comply with all requirements of applicable Standards and Codes.

PART 2 PRODUCTS

2.1 SAND CEMENT SCREED

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 MATERIALS

- A. Cement: To ASTM C150, type I, Portland cement, unless noted otherwise.
- B. Aggregate:
 - 1. For Normal Weight Screed: To ASTM C33.
 - 2. For Light Weight Screed: To ASTM C330.
- C. Reinforcement: To ASTM A706 / A706M, deformed low-alloy steel bars, or to ASTM A615 / A615M, deformed steel bars; Grade 60, 420 MPa minimum yield grade; unfinished.
- D. Water: Clear, clean, potable water complying with BS EN 1008.

2.3 CONCRETE MIX

- A. Screed Type:
1. Screed as Substrate for Other Floor Finishes: Lean concrete screed of at least 24 MPa on cylinder (30 MPa on cube), with a minimum thickness of 50mm.
 2. Screed as Floor Finish: Bonded lean concrete screed, crack free and shrink free with strength of at least 24 MPa on cylinder (30 MPa on cube), 100mm thick unless otherwise shown on drawings.
 3. Light Weight Screed: 700 kg/m³ dry density; to be used where indicated on drawings and where directed by the Engineer.

2.4 REINFORCEMENT

- A. For Screed Thickness 70 mm and Higher: 8 mm thick welded wire mesh, unless otherwise shown on drawings.
- B. For Screed Thickness less than 70 mm: Polymer fiber 19 mm long, unless otherwise shown on drawings.

2.5 JOINT FILLERS

- A. Refer to Section 03300 and Section 07900.

2.6 CURING MATERIALS

- A. Curing material shall be fresh potable water complying with BS EN 1008.

PART 3 EXECUTION

3.1 MIXING

- A. Plant Batched and Transit Mixed:
1. Batch at a central plant in compliance with ASTM C94.
- B. Hand Mixed:
1. Hand mixing on site is not permitted.

3.2 SCREED PLACEMENT

- A. Notify Engineer minimum 24 hours prior to placement.
- B. Convey screed from a mixer to the forms as near final position as practical in a manner which will prevent segregation or loss of materials.
- C. Place screed in bays of 3m to 4m wide.
- D. Immediately after placing, thoroughly compact and level screed.
- E. Do not drop screed freely from higher than 4 feet above the surface of being poured.

- F. Power float screed surfaces which are indicated to be exposed and all surfaces which are directed by the Engineer:
 - 1. Consolidate surface with power driven floats as soon as topping can support equipment and operator.
 - 2. Re-straighten, cut down high spots, and fill low spots.
 - 3. Repeat float passes and re-straightening until surface is smooth and uniform in texture, and to the satisfaction of the Engineer.
- G. Steel trowel screed surfaces then smooth by hand all other screed surfaces not indicated to be exposed and not indicated to be power floated.

3.3 CURING

- A. Commence curing and protection of screed immediately after placing, as instructed by the Engineer. Curing shall be done by potable water only.

3.4 CONCRETE REPAIR

- A. For any repair of sand cement screed, use products complying with BS EN 1504 (1-9) as applicable.

3.5 CLEANING AND PROTECTION

- A. General Requirements: Execution requirements for final cleaning.
- B. Clean and protect all surfaces on which sand cement screed was scheduled.
- C. Do not permit traffic over unprotected floor surface.

3.6 TOLERANCES OF SCREED SURFACE FLATNESS

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation of Screed Surface Flatness: 3 mm in 3 m.

3.7 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 09900

PAINTS AND COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings.
- B. Related Sections:
 - 1. Division 5 - Metals: Shop primed metal items.
 - 2. Division 8 - Doors and Windows: Shop finished doors, windows and panels.
 - 3. Division 15 - Mechanical: Mechanical Identification.
 - 4. Division 16 - Electrical: Electrical Identification.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
 - 2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
- B. Painting and Decorating Contractors of America:
 - 1. PDCA - Architectural Painting Specification Manual.
- C. SSPC: The Society for Protective Coatings:
 - 1. SSPC - Steel Structures Painting Manual.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.4 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data on finishing products and special coating.
- C. Samples:
 - 1. Submit two paper chip samples each 300 x 300 mm, illustrating color range and textures available for each surface finishing product scheduled.
 - 2. Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded.
- D. Manufacturer's Installation Instructions: Submit special surface preparation procedures, and substrate conditions requiring special attention.

1.5 CLOSEOUT SUBMITTALS

- A. General Requirements: Execution requirements for closeout procedures.
- B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Applicator: Company specializing in performing work of this section with minimum five years documented experience.

1.7 MOCKUP

- A. General Requirements: Quality requirements for mock-up.
- B. Construct mockup panel, size as directed by the Engineer, illustrating special coating color, texture, and finish.
- C. Construct door and frame assembly illustrating painting, stain and varnish, coating color, texture, and finish.
- D. Locate where directed by the Engineer.
- E. Remove mockup when directed by the Engineer.

1.8 PRE-INSTALLATION MEETINGS

- A. General Requirements: Administrative requirements for pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Product requirements for product storage and handling.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Storage of Paint Materials: Store at minimum ambient temperature of 7°C and maximum ambient temperature of 32°C in ventilated area, and as required by manufacturer's instructions.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. General Requirements: Product requirements.
- B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain/snow, or when relative humidity or moisture content of surfaces exceeds those required by paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 7°C for interiors; 10°C for exterior, unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 18°C for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 860 lx measured mid-height at substrate surface.

1.11 SEQUENCING

- A. General Requirements: Requirements for Work sequence.
- B. Sequence application to the following:
 - 1. Do not apply finish coats until paintable sealant is applied.
 - 2. Back prime wood trim before installation of trim.

1.12 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish ten year manufacturer warranty for paints and coatings.

1.13 EXTRA MATERIALS

- A. General Requirements: Execution requirements for spare parts and maintenance products.
- B. Supply 4 liters of each color, type and surface texture; store where directed.
- C. Label each container with color, type, texture and room locations in addition to manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Paint, Transparent Finishes, Stain, Primer Sealers, Block Filler, and Field Catalyzed Coatings Manufacturers: Any internationally recognized manufacturers having an official technical agreement to conformity with standards for the products.
- B. Furnish materials as specified, as shown on drawings and to Engineer's satisfaction.

2.2 COMPONENTS

- A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; prepare coatings for good flow and brushing properties, capable of drying or curing, and free of streaks or sags.
- B. Use products of the same manufacturer for succeeding coats. Where primer is shop applied to steel, subsequent coats may be the product of another manufacturer provided the coatings are mutually compatible.
- C. Colors, textures and degree of luster shall be as selected by the Engineer. Tint prime and undercoats approximately to the shade of the final coat but with sufficient variation to distinguish them from the preceding coat. Proprietary names used to designate colors or materials, are not intended to imply that products named are required, or to exclude equal products of other manufacturers.
- D. Colors of finishes shall not necessarily be manufacturer's stock colors. All materials for finishing coats shall be factory mixed and shall be of a standard quality equal to that of the standard colors of the material specified.

E. Specular Gloss Range:

- 1. Ranges determined in accordance with ASTM D523:

<u>Sheen</u>	<u>Geometry / Degree</u>	<u>Gloss / Range</u>
Flat	85	Below 15
Eggshell	60	5 to 20
Semi-Gloss	60	30 to 65
Gloss	60	Over 65

- 2. In locations where ambient temperature and humidity conditions encourage the ready formation of mildew, use paints with additional mildew inhibitive agent incorporate during the manufacturing process, of type and in concentration recommended by the paint manufacturer to withstand such mildew formation.

- F. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified.
- G. Patching Materials: Latex filler.
- H. Fastener Head Cover Materials: Latex filler.
- I. Putty:
 - 1. Putty shall comply with the following standards:
 - a. ASTM C321-83 and ASTM D2486-79
 - b. BS 2750, sound reduction.
 - c. BS 1191, 4551, 5270, 5492 and 6214 C and E.
 - d. NF T 30-606 and 30-608
 - e. US Federal TT C-555, textured coating.
 - 2. Putty material shall be as manufactured by "alltek", "TouPret" or approved equal.
 - 3. Putty shall be applied in four coats unless otherwise stated.

2.3 INTUMESCENT PAINT

- A. Approved Manufacturer: Any internationally recognized manufacturers having an official technical agreement to conformity with standards for the products.
- B. Types of Intumescent Coating Systems:
 - 1. Thin-Film Intumescent Coatings: Solvent or water based, for internal use
 - 2. Thick-Film Intumescent Coatings (Two component epoxy): epoxy based, for external and aggressive environment use.
- C. Thickness of Intumescent Coating Systems (Primer, basecoat & sealer/decorative coat): As per manufacturer's recommendations to reach the required Fire Resistance Period/Fire Resistance Level]
- D. Material Characteristics:
 - 1. Surface Burning Characteristics: Class A (ASTM E-84)
 - 2. Quality Control Requirements: FM approved and/or UL listed

2.4 HIGH-PERFORMANCE COATINGS COMPONENTS

- A. General: Furnish complete multi-coat systems formulated and recommended by manufacturer for applications indicated, in thicknesses indicated; number of coats specified does not include primer or filler coat.
 - 1. Lead content: None.
 - 2. Chromium content, as zinc chromate or strontium chromate: None.
 - 3. Maximum VOC content: As required by applicable regulations.
 - 4. Colors: As selected from manufacturer's standard colors or as per Drawings.
- B. Epoxy Coating: Polyamide, or polyester epoxy; complying with MIL C-22750; gloss, semi-gloss, or eggshell finish.
 - 1. Percentage of solids by volume: To manufacturer's recommendations to suit project requirements.
 - 2. Number of Coats and Dry Film Thickness per Coat: Two coats, 150 microns each, unless otherwise shown on drawings.
 - 3. Comply with performance requirements of MIL C-22750
- C. Epoxy Floor Coating: Two-part, polyamide or polyester epoxy, fuel oil resistant, non-skid finish.
 - 1. Percentage of Solids by Volume: To manufacturer's recommendations to suit project requirements.
 - 2. Number of Coats and Dry Film Thickness per Coat:
 - a. For Parking and Traffic Circulation Areas: Three coats, 250 microns each, without aggregates.
 - b. For Ramp: Three coats, 250 microns each, with aggregates.
 - c. Others: Two coats, 200 microns each, without aggregates.
 - 3. Comply with performance requirements of MIL C-22750.
- D. Primers: As recommended by coating manufacturer for specific substrate with a minimum of 50 microns dry film thickness.
- E. Shellac: Pure, white type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify surfaces and substrate conditions are ready to receive Work as instructed by product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following values:
 - 1. Plaster and Gypsum Boards: 12 percent.
 - 2. Masonry, Concrete and Concrete Unit Masonry: 12 percent.
 - 3. Wood: 15 percent, measured in accordance with ASTM D 4442.
 - 4. Concrete Floors: 8 percent.

3.2 PREPARATION

- A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium or tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- F. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply latex based, or compatible sealer or primer.
- G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- H. Concrete Floors: Remove contaminations, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Copper Surfaces Scheduled for Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.

- J. Copper Surfaces Scheduled for Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Clean and immediately apply vinyl etch primer.
- K. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- L. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with solution of sodium meta-silicate after thoroughly wetting with water. Allow for drying.
 - 1. Exposed concrete surfaces shall be clean and without any holes, lips, angular ridges, unstable sandy or granular areas, and the like, all to the satisfaction of the Engineer (Holes shall be flush filled. Lips, aggressive ridges, projections, etc. shall be flushed by grinding).
- N. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- O. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- P. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.
- Q. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
- R. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
- S. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior paintable caulking compound after prime coat has been applied.
- T. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied.
- U. Glue-Laminated Wood: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

V. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with clear sealer or tinted primer.

W. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 EXISTING WORK

A. Extend existing paint and coatings installations using materials and methods compatible with existing installations and as specified.

3.4 APPLICATION

A. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

B. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

C. Sand wood and metal surfaces lightly between coats to achieve required finish.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.

F. Prime concealed surfaces of interior and exterior woodwork with primer paint.

G. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

H. Finishing Mechanical and Electrical Equipment:

1. Refer to Divisions 15 and 16 for schedule of color coding and identification banding of mechanical and electrical equipment, duct, piping, conduit, etc.
2. Paint shop primed equipment.
3. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
4. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are shop finished.
5. Paint interior surfaces of air ducts and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
6. Paint exposed conduit and electrical equipment occurring in finished areas.
7. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
8. Color code equipment, piping, conduit and exposed duct work in accordance with requirements indicated or color schedule. Color band and identify with flow arrows, names and numbering.
9. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

- I. Install Work as specified, as shown on drawings, in accordance with manufacturer's instructions, and to the satisfaction of the Engineer.

3.5 FIELD QUALITY CONTROL

- A. General Requirements: Quality requirements for testing and inspection services, and execution requirements for testing, adjusting and balancing.
- B. Inspect and test questionable coated areas in accordance with applicable code.

3.6 CLEANING

- A. General Requirements: Execution requirements for final cleaning.
- B. Collect waste materials daily; place waste materials that may constitute fire hazard in closed metal containers; and remove daily from site.

3.7 SCHEDULES - SHOP PRIMED ITEMS FOR SITE FINISHING

- A. Shop primed items for site finishing are stated under Division 5.

3.8 SCHEDULES - EXTERIOR SURFACES

- A. Wood - Painted (Opaque):
 - 1. One coat of latex or alkyd primer sealer.
 - 2. Two coats of alkyd or latex enamel, gloss or semi-gloss.
- B. Wood - Transparent:
 - 1. Two coats of stain.
- C. Wood - Shingles and Shakes:
 - 1. One coat of stain or clear sealer.
 - 2. Two coats of clear sealer.
- D. Glue-Laminated Wood and Wood Timber Members:
 - 1. One coat of stain or sealer.
 - 2. Two coats of varnish, gloss or semi-gloss.
- E. Pavement Markings:
 - 1. Two coats of thermoplastic reflectorized paint, yellow or white.
- F. Concrete, Concrete Block, Restored Masonry and Cement Plaster:
 - 1. One coat of primer sealer latex or alkyd.
 - 2. Two coats of latex or alkyd, flat.
- G. Gypsum Board and Cement Plaster Soffits:
 - 1. One coat of primer sealer latex or alkyd.
 - 2. Two coats of latex or alkyd, flat.
- H. Structural Steelwork: Refer to individual specification sections of Division 5.

- I. Architectural Steel - Unprimed:
 - 1. One coat of latex or alkyd primer.
 - 2. Two coats of alkyd or latex enamel, gloss or semi-gloss.
- J. Architectural Steel - Shop Primed:
 - 1. Touch-up with zinc chromate or zinc rich primer.
 - 2. Two coats of alkyd or latex enamel, gloss or semi-gloss.
- K. Architectural Steel - Galvanized:
 - 1. One coat galvanized primer.
 - 2. One mordant coat.
 - 3. Two coats of alkyd or latex enamel, gloss or semi-gloss.
- L. Aluminum - Mill Finish:
 - 1. One coat etching primer.
 - 2. Two coats of alkyd enamel, gloss.
- M. Copper:
 - 1. One coat etching primer.
 - 2. Two coats of alkyd enamel, gloss.

3.9 SCHEDULES - INTERIOR SURFACES

- A. Wood - Painted:
 - 1. One coat of latex or alkyd prime sealer.
 - 2. Two coats of alkyd or latex enamel, gloss, semi-gloss, eggshell or flat.
- B. Wood - Intumescent Coating:
 - 1. One coat of prime sealer.
 - 2. Two coats of intumescent coating.
- C. Wood - Transparent:
 - 1. Filler coat (for open grained wood only).
 - 2. Two coats of stain.
 - 3. One coat sealer.
 - 4. Two coats of varnish, gloss, satin or flat.
- D. Cabinet Interior:
 - 1. One coat of latex or alkyd prime sealer.
 - 2. One coat of alkyd or latex enamel, semi-gloss or flat.
- E. Glue-Laminated Wood and Wood Timber Members:
 - 1. One coat of stain or sealer.
 - 2. Two coats of varnish, gloss, satin or flat.
- F. Concrete, Concrete Block, Restored Masonry and Cement Plaster:
 - 1. One coat of primer sealer latex or alkyd.
 - 2. Two coats of latex or alkyd, flat or semi-gloss.
- G. Structural Steelwork: Refer to individual specification sections of Division 5.

- H. Architectural Steel - Unprimed:
 - 1. One coat of alkyd or latex primer.
 - 2. Two coats of alkyd or latex enamel, gloss or semi-gloss.
- I. Architectural Steel - Primed:
 - 1. Touch-up with alkyd or latex primer.
 - 2. Two coats of alkyd or latex enamel, gloss or semi-gloss.
- J. Architectural Steel - Galvanized:
 - 1. One coat galvanized primer.
 - 2. One mordant coat.
 - 3. Two coats of alkyd or latex enamel, gloss or semi-gloss.
- K. Aluminum - Mill Finish:
 - 1. One coat etching primer.
 - 2. Two coats of alkyd enamel, gloss.
- L. Concrete Floors:
 - 1. One coat of alkali resistant or catalyzed epoxy primer.
 - 2. Two coats of alkyd floor enamel or catalyzed epoxy enamel, gloss.
- M. Gypsum Board and Plaster Walls and Ceiling:
 - 1. One coat of primer sealer latex or alkyd.
 - 2. Two coats of alkyd, latex or latex acrylic enamel or emulsion, gloss, semi-gloss, eggshell or flat.
- N. Wall Surfaces Under Vinyl Wall Covering:
 - 1. Two coats of alkyd primer sealer.
- O. Fire Retardant Finish:
 - 1. One coat of fire retardant primer.
 - 2. Two coats of fire retardant finish, gloss.
 - 3. Flame and smoke rating of 25/50.
- P. Insulated Coverings - Canvas and Cotton:
 - 1. One coat of alkyd primer sealer.
 - 2. Two coats of alkyd enamel, gloss, semi-gloss, eggshell or flat.

3.10 SCHEDULES - COLORS

- A. As indicated on drawings and/or as selected by the Engineer from manufacturer's range and samples.

END OF SECTION

SECTION 10165

PLASTIC LAMINATE TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes plastic laminate toilet compartments and urinal screens.
- B. Related Sections:
 - 1. Section 05500 - Metal Fabrications.
 - 2. Section 06200 - Finish Carpentry.
 - 3. Section 10800 - Toilet, Bath and Laundry Accessories.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. APA-The Engineered Wood Association:
 - 1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.
- C. ASTM International:
 - 1. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. National Electrical Manufacturers Association:
 - 1. NEMA LD 3 - High Pressure Decorative Laminates.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions and details of wall, floor and ceiling supports, and doors.
- C. Product Data: Submit data on panel construction, hardware, and accessories.
- D. Samples: Submit two samples 300x300mm in size illustrating finish, color and sheen.
- E. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.4 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Coordinate Work with placement of support framing and anchors in wall and ceiling.

PART 2 PRODUCTS

2.1 PLASTIC LAMINATE TOILET COMPARTMENTS

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.
- B. Product Description: Ceiling hung, floor mounted and overhead braced, wall mounted, and/or floor mounted.

2.2 COMPONENTS

- A. Plywood for Core: Softwood, PS 1 Grade B-B, exterior waterproof glue.
- B. Particleboard for Core: ANSI A208.1, with waterproof resin binder; grade, sanded faces.
- C. Plastic Laminate: NEMA LD 3 High pressure melamine laminate, General Purpose Type 1.3 mm thick.
- D. Adhesive: Contact and/or type recommended by manufacturer to suit application.
- E. Toilet Compartments: Plastic laminate finished, floor-mounted unbraced, floor-mounted headrail-braced, ceiling-hung, or wall-hung.
- F. Doors, Panels and Pilasters: Plastic laminate adhesive and pressure bonded to faces and edges of particleboard, solid phenolic or plywood core, with beveled corners and edges; edges of cut-outs sealed.
 - 1. Reinforce pilasters and panels with steel plate sandwiched in particleboard core at attachment points. Router cut openings as required.
 - 2. Plastic Laminate Color: as selected, gloss or suede finish.
- G. Door and Panel Dimensions: Thickness, door width, accessible door width, height, thickness of pilasters, etc. as shown on drawings.
- H. Urinal Screens: Wall mounted with two panel brackets, and floor-to-ceiling vertical upright consisting of pilaster or tubular headrail stock and sockets anchored to floor and ceiling.
- I. Framing Members: Aluminum channels and corners conforming to Section 05500; anodized finish; color as selected.

2.3 ACCESSORIES

- A. Pilaster Shoe: Formed chromed steel with polished or satin finish, to ASTM A666 Type 316 stainless steel with No. 4 finish, 175 mm high, concealing floor and ceiling fastenings. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.
- B. Head Rails: Hollow chrome plated steel, stainless steel, or anodized aluminum tube, 25 x 41 mm size, with anti-grip profiles and cast socket wall brackets.

- C. Brackets: Polished, Satin or chrome-plated non-ferrous cast metal, stainless steel, or anodized aluminum, color as selected.
- D. Attachments, Screws and Bolts: Stainless steel type 316.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts.
- E. Steel Plate Reinforcement: Carbon steel, prepared for fasteners, 3 mm thick.
- F. Hardware: Polished, Satin, chrome plated non-ferrous cast metal, or Stainless steel:
 - 1. Pivot hinges, gravity type, adjustable for door close positioning; two for each door.
 - 2. Nylon bearings.
 - 3. Thumb turn door latch with exterior emergency access feature.
 - 4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
 - 5. Coat hook with rubber bumper; one for each compartment, mounted on door or panel.
 - 6. Furnish door pull for outswinging doors.
 - 7. Furnish continuous channel brackets at walls.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify field measurements are as indicated on approved shop drawings.
- C. Verify correct spacing of plumbing fixtures.
- D. Verify correct location of built-in framing, anchorage and bracing.

3.2 INSTALLATION

- A. Maintain 9 to 13 mm space between wall and panels, and wall and end pilasters.
- B. Attach panel brackets securely to walls using anchor devices.
- C. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- D. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 ERECTION TOLERANCES

- A. General Requirements: Quality requirements for tolerances.
- B. Maximum Variation from Indicated Position: 6 mm.
- C. Maximum Variation from Plumb: 3 mm.

3.4 ADJUSTING

- A. General Requirements: Execution requirements for testing, adjusting and balancing.
- B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 5 mm.
- C. Adjust hinges to position doors in fully closed position when unlatched. Return out-swinging doors to closed position.
- D. Adjust adjacent components for consistency of line or plane.

3.5 SCHEDULES

- A. As indicated on drawings and where directed by the Engineer.

END OF SECTION

SECTION 10800

TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes vanity tops, mirrors and chrome plated accessories for toilets.
- B. Related Sections:
 - 1. Section 05500 - Metal Fabrication.
 - 2. Section 08800 - Glazing.
 - 3. Section 08830 - Mirrors.
 - 4. Section 09300 - Tile.
 - 5. Section 09750 - Stone Facing.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - 4. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 5. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - 6. ASTM C1036 - Standard Specification for Flat Glass.
- B. Federal Specification Unit:
 - 1. FS A-A-3002 - Mirrors, Glass.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.
- C. Samples: Submit two samples of each accessory, illustrating color and finish.
- D. Manufacturer's Installation Instructions: Submit special procedures, and conditions requiring special attention.

1.4 COORDINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.

- B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.5 WARRANTY

- A. General Requirements: Execution requirements for product warranties and bonds.
- B. Furnish five year manufacturer warranty for all mirrors and accessories.

PART 2 PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.

2.2 COMPONENTS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Furnish keys for each accessory to Owner.
- C. Stainless Steel Sheet: ASTM A666, Type 316.
- D. Stainless Steel Tubing: ASTM A269, stainless steel type 316.
- E. Galvanized Sheet Steel: ASTM A653, Z275 zinc coating.
- F. Mirror Glass: As specified in Section 08800.
- G. Adhesive: Two component epoxy type and/or contact type, waterproof.
- H. Fasteners, Screws, and Bolts: Hot dip galvanized.
- I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.
- J. Primer: As instructed by the manufacturer.

2.3 VANITY TOPS, MIRRORS AND CHROME PLATED ACCESSORIES

- A. Vanity Tops: Granite vanity top cut for lavatories and for mixers; with full back splashes and drop facing edges (aprons) and side vertical panels where shown on drawings, all as specified in Section 09750; type, size and thickness as shown on the drawings and/or as selected by the Engineer; with stainless steel structural supports as specified in Section 05500.

- B. Mirrors: Frameless, or metal-framed consisting of 1.3 mm angle or channel shapes, with mitered and welded ground corners, and tamperproof hanging system; all as shown on the drawings, and as specified in Section 08830.
1. Minimum 6 mm thick clear glass, abrasion-resistant coated mirror.
 2. Size: As indicated on Drawings.
 3. Backing: Full-mirror sized, minimum 0.8 mm galvanized steel sheet and non-absorptive filler material.
 4. Fixed Tilt Mirrors: Minimum 75 mm tilt from top to bottom.
 5. Adjustable Tilt Mirrors: Stainless steel type 316 L piano hinge full width of base and elbow hinges at sides of mirror, for minimum tilt forward from top of 150 mm.
 6. Shelves:
 - a. Frameless for frameless mirrors; and metal-framed for metal-framed mirrors, gage and finish to match mirror frame, with turned down edges, welded to frame;
 - b. 125 mm deep, full width of mirror, with concealed supports.
- C. Chrome Plated Accessories:
1. Soap Holder: Wall or deck mounted on vanity and lavatory, stainless steel type 316.
 2. Paper Towel Holder: Folded paper type, stainless steel type 316, with viewing slots on sides as refill indicator.
 3. Toilet Paper Holder: Single roll, surface mounted bracket type, or folded tissue type, hinged at bottom; stainless steel type 316; designed to prevent theft of tissue roll.
 4. WC Brush with Holder: Stainless steel type 316, wall mounted.
 5. Robe Hook: Heavy-duty stainless steel type 316, single-prong or double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin or bright polished finish.

2.4 TOILET ROOM ACCESSORIES

- A. Toilet Paper Dispenser: Folded tissue type, stainless steel type 316 unit, hinged at bottom.
1. Capacity: 1250 single-fold tissues, minimum.
- B. Paper Towel Dispenser: Folded paper type, stainless steel type 316, with viewing slots on sides as refill indicator.
1. Capacity: 300 C-fold, 400 multifold and/or 1000 single-fold minimum.
- C. Waste Receptacle: Stainless steel type 316, freestanding style with swing top.
1. Liner: Removable seamless stainless steel type 316 receptacle.
 2. Minimum Capacity: 38 and/or 75 liters.
- D. Soap Dispenser: Liquid soap dispenser, deck-mounted on vanity and lavatory, with polyethylene container concealed below deck; piston and 100 mm spout of stainless steel type 316 with bright polished finish; chrome-plated deck escutcheon.
1. Minimum Capacity: 0.5 liter.

- E. Grab Bars: Stainless steel type 316, 32 and/or 38 mm outside diameter, minimum 1.3 mm wall thickness, non-slip grasping surface finish, concealed or exposed flange mounting; 38 mm clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on Drawings and/or as schedule.

2.5 FACTORY FINISHING

- A. Stainless Steel: No. 4 satin brushed and/or No.8 mirror polished finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, Type SC 2, satin and/or polished finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy and/or electrostatic baked enamel.
- D. Galvanizing for Items Other than Sheet: ASTM A123/A123M to 380 g/sq m. Galvanize ferrous metal and fastening devices.
- E. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- F. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General Requirements: Administrative requirements for coordination and project conditions.
- B. Verify exact location of accessories for installation.
- C. Verify field measurements are as indicated and as instructed by manufacturer.
- D. See other related Sections for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3 EXISTING WORK

- A. Clean and repair existing toilet accessories which remain or are to be reinstalled.

3.4 INSTALLATION

- A. Install plumb and level, securely and rigidly anchored to substrate.
- B. Mounting Heights and Locations: As indicated on Drawings.
- C. Install work in accordance with the drawings and to the satisfaction of the Engineer.

END OF SECTION