

ARCHITECTURAL SPECIFICATIONS

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SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes structural steel framing members, support members, suspension cables, sag rods, and struts; base or bearing plates, shear stud connectors, and expansion joint plates; anchor bolts for structural steel; beams, girders, purlins, and girts; bearing of steel for girders, trusses or bridges; bracing; columns, posts; connecting materials for framing structural steel to structural steel; crane rails, splices, stops, bolts, and clamps; door frames constituting part of structural steel frame; expansion joints connected to structural steel frame; fasteners for connecting structural steel items; permanent shop bolts; shop bolts for shipment; field bolts for permanent connections; permanent pins; floor plates (checkered or plain) attached to structural steel frame; grillage beams and girders; hangers essential to structural steel frame; leveling plates, wedges, shims, and leveling screws; lintels, when attached to structural steel frame; trusses; and grouting under base plates.
- B. Related Sections:
 - 1. Section 04065 - Masonry Mortar and Grout.
 - 2. Section 05500 - Metal Fabrications.

1.2 REFERENCES *(Equivalent Equal Acceptable)*

- A. American Institute of Steel Construction:
 - 1. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges.
- B. ASTM International:
 - 1. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - 2. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 3. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 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 A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel.
 - 7. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 8. ASTM A325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).
 - 9. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
 - 10. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
 - 11. ASTM A500 - Standard Specification for Cold-Formed Welded and

12. Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 13. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
 14. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
 15. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric).
 16. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 17. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 18. ASTM A992 - Standard Specification for Steel for Structural Shapes.
- 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. Research Council on Structural Connections:
1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- E. 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 & Type II - Organic).
- F. Underwriters Laboratories Inc.:
1. UL - Fire Resistance Directory.

1.3 SUBMITTALS

- A. General Requirements: Requirements for submittals procedures.
- B. Fabrication Drawings:
1. Indicate profiles, sizes, spacing, location of structural members, openings, attachments and fasteners.
 2. Design and details of connections.
 3. Cambers and loads.
 4. Indicate welded connections with AWS A2.4 symbols and net weld lengths.
- C. Mill Test Reports: Submit indicating structural strength, and destructive and nondestructive test analysis.
- D. Manufacturer's Mill Certificate: Certify products meet the specified requirements.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.4 QUALITY ASSURANCE (*Equivalent Equal Acceptable*)

- A. Fabricate structural steel members in accordance with AISC S303.
- B. Perform Work in accordance with AISC S303, Section 10.
- A. Maintain one copy of each document on site.
- D. Fabricator: Company specializing in performing Work of this section with minimum twenty years documented experience and holding current AISC Certification.
- E. Erector: Company specializing in performing Work of this section with minimum ten years documented experience.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Support steel members off ground. Protect steel members and packaged materials from corrosion and deterioration. Materials showing evidence of damage will be rejected and shall be immediately removed from the site.
- B. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.
- C. Do not handle structural steelwork until paint has thoroughly dried. Care shall be exercised to avoid abrasions and other damage.
- D. All fasteners and washers shall be delivered to the site, where they will be installed, in unopened containers.

PART 2 PRODUCTS

2.1 MATERIALS (*Equivalent Equal Acceptable*)

- A. Manufacturer: Any internationally recognized manufacturer having an official technical agreement to conformity with standards for the product.
- B. Structural Steel Members: ASTM A36/A36M, ASTM A242/A242M, ASTM A514/A514M, ASTM A529/A529M, ASTM A568/A568M, and/or ASTM A572/A572M, Grade 40.
- C. Structural Tubing: ASTM A500 and/or ASTM A501.
- D. Pipe: ASTM A53/A53M, Grade B.
- E. Shear Stud Connectors: ASTM A449. Forged steel, headed, and/or unfinished.
- F. Suspension Cable: Wire rope.

- G. Sag Rods: ASTM A36/A36M.
- H. Bolts, Nuts, and Washers: ASTM A307, ASTM A325M bolts, ASTM A449 bolts, ASTM A490M bolts, ASTM A563 nuts, and/or galvanized to ASTM A123/A123M A153/A153M for galvanized structural members.
- I. Anchor Bolts: ASTM A307 for embedded anchors; and high strength bolts for chemically and mechanically anchored anchors.
- J. Welding Materials: AWS D1.1; type required for materials being welded.
- K. Sliding Bearing Plates: Teflon coated.
- L. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 48 MPa at 28 days.
- M. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.
- N. Touch-Up Primer for Galvanized Surfaces: SSPC 20, Type I: Inorganic, or Type II: Organic.

2.2 FABRICATION (*As Below Unless Agreed Otherwise With Owner*)

- A. General:
 - 1. Fabrication to be performed in accordance with Chapter M of AISC “Specification for Structural Steel Buildings” and the Drawings and Specifications.
 - a. Assume all thermally cut edges are subject to substantial stresses.
 - b. Paragraph M4.6 shall be considered deleted from Chapter M.
 - c. The last sentence of paragraph M5.1 shall be deleted.
 - 2. Provide holes and accessories required for securing other work to the work specified here.
 - 3. Where thickness of material exceeds 7/8 inch or the diameter of hole, drill or ream holes after punching even when punching is allowed by referenced standards. Flame cut holes for fasteners are not acceptable.
 - 4. Fabricate beams and girders with natural camber upward, unless otherwise shown or indicated on the Drawings.
 - 5. Splice members only where indicated on Structural Drawings or where accepted by the Architect.
 - 6. Remove burrs that would prevent solid seating of the connected parts.
- B. Architecturally Exposed Steel:
 - 1. All members exposed to view in the completed structure shall be classified as “Architecturally Exposed Structural Steel”.
 - 2. Comply with the provisions of the AISC Code of Standard Practice for Steel Buildings and Bridges regarding architecturally exposed structural steel.
 - a. Abutting cross sectional configurations shall match.
 - b. Remove backing bars.
 - c. Remove weld runoff tabs and grind smooth
 - d. All surfaces and welds exposed to view shall be treated as finished

- surfaces.
3. Exposed Welds:
 - a. All exposed fillet welds shall be made smooth of uniform convex contour, radius and dimension for their full length; grind smooth, if welds were not made to this criteria.
 - b. All other exposed welds shall be milled or ground smooth and flush with the surfaces of the adjoining materials welded.
 4. Weld show-through shall not be permitted.
 5. Remove weld splatter on architecturally exposed steel.
 6. All exposed corners shall be square and sharp, eased to a radius of 1/4 in.
- C. Bolting, General:
1. Bolts shall be of a length that will extend not less than 1/4 in beyond the nuts unless noted otherwise.
 2. Washers shall be used on Bolts. Use beveled washers where bolts bear on sloping surface.
 3. Bolts shall be installed such that no threads occur in the shear plane.
 4. Manufacturer's symbol and grade markings shall appear on all bolts and nuts.
 5. Product containers must be marked so that correspondence with mill reports can be established.
 6. Holes in column base-plates shall be no more than inch larger than the nominal bolt size.
 7. Circular and slotted holes shall be as per Specification for Structural Joints Using ASTM A325 or A490 Bolts.
 8. When bolt holes are subject to welding shrinkage stresses the holes shall be drilled.
- D. Unfinished Bolts and Anchor Bolts:
1. Install and tighten unfinished bolts in accordance with requirements for snug tightened bolts as defined in "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
 2. Mutilate bolt threads for unfinished bolts to prevent the nuts from backing off.
- E. High-Strength Bolts:
1. Install high-strength threaded fasteners in accordance with RCSC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts". Contact surfaces of bolted parts shall as a minimum comply with the class A requirements.
 2. Unless otherwise noted, all connections are "slip critical (friction) type".
 3. Tighten nuts using Direct Tension Indicator. Calibrated wrench and "Turn of Nut" methods are not acceptable.
 4. When connection has bolts and welds, tighten bolts prior to welding with the exception that in moment connections the flange welds are completed prior to final tightening of high strength bolts.
 5. When already tensioned bolts have had their tension relaxed, either re-torque the bolts using a calibrated wrench or replace the bolt and/or tension indicator and re-tighten.
- F. Welding:
1. Welding shall be in accordance with AWS D1.1 "Structural Welding Code".
 - a. Contractor is responsible for selection of specific materials and

- procedures except as specifically noted in contract documents.
- b. Connections have varying levels of restraint and thus necessary steps shall be taken by Contractor to control or accommodate the restraint.
- c. Welding and fabrication procedures shall incorporate measures necessary to eliminate cracking. These measures shall include but are not limited to additional preheat, postheat, or retarded cooling.
- d. When selecting materials and procedures, consideration shall be given to the need for materials and procedures in excess of code requirements.
- e. The need for pre-heat and other procedures are to be based on the actual chemistry and mechanical properties and not solely on the grade for which the steel was certified.
- f. Weld variables shall be consistent with the recommendations of the electrode manufacturer.
- g. Welding Procedure Specifications shall be readily available to all welders, inspectors, and supervisors.
- h. Welding procedures shall incorporate low hydrogen practices.
- i. Use stringer beads only (no weaving).
- 2. No tack welds not incorporated into a weld will be allowed on the finished structure with the exception of backing plates that are not removed.
- 3. All groove or butt welds shall be full penetration unless noted otherwise on the Drawings.
- 4. Do not weld into column flange to column web intersection.
- 5. Sequence the Work as necessary to accommodate testing.
- 6. Remove-run-off tabs and backup plates and grind surfaces smooth as required for inspection or testing.
- 7. At “special moment connection” or “eccentrically braced frame” connections:
 - a. Remove backing bars and apply reinforcing fillet weld per note J of figure 2.4 of AWS D1.1.
 - b. Remove weld runoff tabs and grind smooth.
 - c. Delete “...root and ...” from subsection 4.14.1.5 of AWS D1.1-94
 - d. Limit oscillation of FCAW electrodes to 3d, for $d \geq 3/32$ inches, and to 5d, for $d < 3/32$ inch (d = wire diameter).
 - e. Pay increased attention to uniform and adequate preheat.
 - f. Maximum interpass temperature not to exceed 550 degrees F when notch toughness properties are specified.
 - g. Complete individual weld layers prior to applying portions of subsequent layers. Ends of interrupted passes to be staggered. Minimize starts and stops within body of the weld.
- 8. Splices of members in tension, that are made from ASTM A6 Group 4 of 5 rolled shapes, and or plates more than 2 inches thick shall be made in conformance with Section J1.7 of “Specification for Structural Steel Buildings ASD”, 9th Edition.
- 9. Shear Studs: Install shear studs in accordance with the manufacturer’s recommendations and AWS D1.1
- 10. Where tubes, pipes or other closed sections are exposed to the weather, provide seal welds where other specified welds do not provide a complete seal of the enclosed space.

G. Finishes of Architecturally Exposed Steel:

- 1. All surfaces of architecturally exposed structural steel members shall be

uniform in appearance, including smoothness and texture, when viewed in direct sunlight at a distance of 10 feet, at angles of incidence 0 degree to 90 degree at completion of the following stages of work:

- a. "Surface Preparation" and "Shop Prime Painting".
2. Surface Appearance: The initial condition of steel to be exposed in use shall conform to SSPC-V is 1 Rust Grade A. The exposed surfaces, edges and ends of all plates and other components shall be free of any surface defects including weld splatter, burrs, dents, gouges, occlusions, streak, ridges and recesses. Such defects may be repaired and surface restored with weld or other approved filler material and machining (milling, grinding or sanding) to match appearance, including smoothness and texture, of parent surface.
3. All surfaces to be grit blasted to SA 2½ (Swedish Standards).

H. Shop Painting:

1. All structural steel exposed to the weather, classified as Architecturally Exposed Steel, or not completely concealed by interior finishes shall receive
 - a shop coat of primer except as follows:
 - a. Steel in contact with concrete.
 - b. Contact surfaces of welded connections and areas within 4 in on each side of field welds.
 - c. Machined surfaces.
 - d. Contact surfaces of high-strength bolted connections.
 - e. Reinforcing steel.
2. The following surfaces shall be temporarily protected by a thin coating of varnish or lacquer:
 - a. Unpainted areas around field welds.
 - b. Steel around high strength bolts.
 - c. Machined surfaces.

2.3 FINISH (*As Below Unless Agreed Otherwise With Owner*)

A. Finish of Painted Steel Surfaces:

1. Prepare structural component surfaces in accordance with SSPC.
2. Grit blast surfaces to SA 2½ (Swedish Standards).
3. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete or high strength bolted.
4. Apply an approved three-coat protective paint system; provide minimum ten (10) year maintenance free guarantee for the paint system.

B. Finish of Galvanized Steel Surfaces:

1. Prepare structural component surfaces in accordance with SSPC.
2. Galvanize structural steel members to ASTM A123/A123M. Furnish minimum 380g/m² galvanized coating.
3. Apply an approved mordant coat prior to receiving the protective paint system.
4. Apply an approved three-coat protective paint system; provide minimum ten (10) year maintenance free guarantee for the paint system.

2.4 SOURCE QUALITY CONTROL AND TESTS (*As Below Unless Agreed Otherwise With Owner*)

- A. Testing and inspection of structural steelwork will be performed by the independent testing agency cost of which shall be borne by Contractor. Provide the Inspector with the following.
 - 1. A complete set of accepted "Submittals"
 - 2. Cutting lists, order sheets, material bills, and shipping bills
 - 3. Representative sample pieces as requested by the testing agency
 - 4. full and ample means and assistance for testing all material
 - 5. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored or fabricated, and also in their erected position.
- B. Scheduling of Tests and Inspections
 - 1. The Contractor shall notify the Inspector in sufficient time prior to fabrication or erection work to allow testing and inspection without delaying the work.
 - 2. Shop welds will be inspected in the shop before the work is painted or shipped.
- C. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the Inspector can refer back to the person making the connection.
- D. Non-destructive Testing and Inspections
 - 1. As a minimum the inspector shall make all tests and inspections as required by the 1997 Uniform Building Code Inspector will make all the tests and inspections indicated in the Construction Documents.
 - 2. The Inspector shall make all verification tests and inspections as required by AWS D1.1 "Structural Welding Code".
 - 3. Do not reduce testing frequency unless permission is obtained from the Engineer.
 - 4. Inspector shall be present during all welding operations.
 - 5. Verify that welders are certified.
 - 6. Check materials, equipment and procedures. Verify meters on welding equipment are functioning and are accurate.
 - 7. Visual Inspection:
 - a. Visually inspect all welds.
 - b. Visual inspection of multi-pass welds to be continuous.
 - c. Visually inspect welds to Group 4 and 5 sections of at least 72 hours after completion of welding for the presence of cracks.
 - 8. Test Methods:
 - a. Butt welds will be tested using ultrasonic or radiographic test methods.
 - b. Butt welds to pipes and tubes to be tested using magnetic particle tests.
 - c. Use magnetic partial test methods for fillet welds and the supplement the testing requirements for butt welds.
 - d. At inspector's option dye penetrant testing, and resistance testing methods may be used in place of or to supplement magnetic particle testing.
 - e. For radiographic a double film technique will be used. One copy of

each film will be sent to the Architect, the other will be retained by the Inspector.

- f. In addition to the non-destructive testing specified other nondestructive test methods recognized by AWS D1.1 may be used at the Architects discretion and the results can be used to reject work under this contract.

9. Frequency of non-destructive examination is to be as follows:

- a. Full penetration butt welds: 100 percent.
- b. Partial penetration butt welds with a leg length greater than 1/2 in: 20 percent min. ultrasonic or radiographic inspection.
- c. Test 100 % of partial penetration butt welds used in column splices.
- d. Test 20 % of total length of all welds joining web plates to flanges.
- e. Fillet and other welds not otherwise addressed - a minimum of 10 %.
- f. Selection of welds to be examined: Where there is a requirement for less than 100% examination the method of selection of welds to be examined is to be agreed with the Engineer before commencement of the work. If the Engineer does not provide more specific criteria inspectors will select the welds to be tested. The inspectors will chose specific weld so as to obtain results that are representative of the conditions in the structure. In addition inspectors will emphasize those locations that experience has shown are more likely to have problems.
- g. On five percent of the full penetration butt welds as chosen by the inspector/engineer, after removing, run-off tabs, grind the end of the weld sufficiently to allow determination of number and sizes of weld passes.

10. Testing of Base Metal: These provisions are in addition to other applicable requirements.

- a. The edges of material to be welded will be ultrasonically examined for evidence of laminations, inclusions or other discontinuities.
- b. Ultrasonically test column flanges and webs at the location of all moment connections and brace connections. Test for a distance 3 inches around the location to be welded. The test procedure and acceptance criteria is defined by ASTM A898-91, "Standard Specification for Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes" Level I.
- c. Base metal thicker than 1½ inches, when subjected to throughthickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities behind and within a distance of 3 inches of such welds after joint completion. Any material discontinuities shall be accepted or rejected on the basis of the defect rating in accordance with flaw severity, Class B criteria in Table 8.2 in AWS D1.1.

11. Where inspection reveals unacceptable defects:

- a. The extent of inspection will be increased as much as necessary to assure that the full extent of the defects in a joint has been found and to assure that the same defects are not present elsewhere.
- b. As minimum, examine two additional joints in the group represented by the joint. If the non-destructive examination of the two additional joints reveals unacceptable defects, examine each joint in the group.

E. Take samples of all welding consumables and store in sealed containers.

- F. Tests of high strength bolts, nuts and washers:
1. The Inspector will make all tests and inspections of high strength bolt connections as required by RCSC “Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts”.
 2. Observe all Direct Tension Indicators to see if proper tightness was achieved.
 3. Confirm that the faying surfaces have been properly prepared before connections are assembled.

- G. Testing of End-Welded Studs:
1. End-welded studs shall be random sampled and tested from stock furnished to each project. Tests shall meet the requirements in Table 7.1 of AWS D1.1. The minimum number of tests of each required property shall be as follows:

**Number of Pieces to Be Used
from Identified Package**

Number of Specimens

150 and less	1
151 to 280	2
281 to 500	3
501 to 1200	5
1201 to 3200	8
3201 to 10000	13
10001 and over	20

A minimum of three pieces from each lot shall be tested.

2. Production control testing shall be in accordance with AWS D1.1 Chapter 7.
3. As a minimum test, in accordance with AWS D1.1 paragraph 7.8, ten percent of all welded studs.

- H. Inspection Records
1. Make systematic record of all welds, including:
 - a. Location and type of weld.
 - b. Identification marks of welders.
 - c. List of defective welds.
 - d. Manner of correction of defects.
 2. The Inspector will maintain a daily record of the work that has been inspected and its disposition. One copy of each of the report will be submitted to the Owner on a weekly basis. Test reports will be made on the form suggested in the AWS D1.1 “Structural Welding Code”.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 ERECTION

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of

permanent bracing.

- B. Field weld components and shear studs as indicated on fabrication drawings.
- C. Field connect members with threaded fasteners; torque to required resistance tighten to snug tight for bearing type connections.
- D. Do not field cut or alter structural members without approval of the Engineer.
- E. After erection, prime welds, abrasions and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
- F. Grout under base plates in accordance with Section 04065. Trowel grouted surface smooth, splay neatly to 45 degrees.

3.3 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.

3.4 FIELD QUALITY CONTROL

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

3.5 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 04810 - Unit Masonry Assemblies.
 - 3. Section 05510 - Metal Stairs and Ladders.
 - 4. Section 05520 - Handrails and Railings.
 - 5. Section 07140 - Fluid Applied Waterproofing.
 - 6. Section 07212 - Board Insulation.
 - 7. Section 07260 - Vapor Retarders.
 - 8. Section 07270 - Air Barriers.
 - 9. Section 07900 - Joint Sealers.
 - 10. Section 09900 - Paints and Coatings.
 - 11. Division 15 - Mechanical: Diffusers, registers and grilles.

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).
- 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 & 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.

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.
- B. 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 the 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 LINTELS

- A. Lintels: Steel sections, size and configuration as indicated on Drawings, length to allow 200 mm minimum bearing on both sides of opening.
 - 1. Exterior Locations: Galvanized, and/or prime paint, one coat.
 - 2. Interior Locations: Prime paint, one coat.

2.6 LEDGE AND SHELF ANGLES

- A. Ledge and Shelf Angles, Channels and/or Plates Not Attached to Structural Framing: For support of metal decking, joists, and/or masonry; galvanized and/or prime paint, one coat.

2.7 ELEVATOR SILL ANGLES AND HOIST AND DIVIDER BEAMS

- A. Sill Angles: Steel sections as indicated on Drawings for support of elevator sills; galvanized and/or prime paint, one coat.
- B. Hoist and Divider Beams: Steel wide flange sections, shape and size required to support applied loads with maximum deflection of 1/240 of the span; prime paint, one coat.

2.8 DOOR FRAMES

- A. Door Frames: Steel channel and/or angle sections, size as indicated on Drawings, with jamb anchors suitable for building into masonry and/or attachment to concrete, or steel framing, minimum 4 anchors per jamb; galvanized or prime paint, one coat.

2.9 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.

2.10 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.

2.11 ALUMINUM VENTILATION GRILL LOUVERS

- A. Coordinate Work with Division 15 - Mechanical and in particular Diffusers, Registers, and Grilles.

2.12 ANCHOR BOLTS

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

2.13 FOOT SCRAPERS

- A. Foot Scrapers: As detailed; aluminum, mill finish and/or steel galvanized, or prime paint, one coat.

2.14 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.

2.15 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.

2.16 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.

2.17 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.

2.18 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 and aluminum 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 and plates to ensure that 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. Tolerance: Wall construction to a maximum variation from plumb, level, or true-toline of 3mm in 3m.
- P. Obtain approval of the Engineer prior to site cutting or making adjustments not scheduled.
- Q. 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.

3.5 CLEANING

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

3.6 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 08800 - Glazing.
 - 4. 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. AWPAC1 - 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 sitesawn 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 No. per door leaf).
 - 2. Knob for door panels as selected (1 No. 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 No. 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. Sliding Door Pulls: Circular, Oval and/or Elongated shape, 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.
- R. Catches: Type as indicated on drawings.
- S. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type.
- T. Sliding Door Track Assemblies: Galvanized steel construction, ball bearing carriers fitted within tracks, multiple pendant suspension attachments for door.

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 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. Rubber Membrane: Butylene conforming to ASTM D2581, EPDM conforming to ASTM D4637 Type I and/or Chloroprene/neoprene conforming to ASTM D4637 Type II; 1.8 mm thick; Class SR: Scrim or fabric internal reinforced, exposed face color and roll width as per manufacturer's recommendations; with compatible seam tape and termination bar; conforming to following below criteria:
- B. Plastic Membrane: PVC conforming to ASTM D4551, HDPE, Ethylene Copolymer, CPE conforming to ASTM D4068, CSPE conforming to ASTM D4068, and/or Hypalon; thickness and roll width as per manufacturer's recommendations; with compatible seam tape and termination bar; conforming to following below criteria.
- C. Modified Bituminous Membrane: Asphalt and polymer modifiers of styrenebutadiene-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.

- D. Composite HDPE/Bentonite Sheet Membrane: Comprised of black/grey or clear HDPE and granular bentonite with spun polypropylene fabric facing; minimum thickness of 3.8 mm; 1200 mm wide roll; with compatible water stop devices, 100 mm wide rubberized asphalt seam tape, and extruded aluminum termination bar; conforming to following below criteria.
- E. 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 |
- F. Seaming Materials: As recommended by membrane manufacturer.
- G. 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. Clean and prepare surfaces to receive waterproofing.
- C. Execute cement sand mortar at all intersections to make beveled corners (fillet) of size 50 x 50 mm.
- 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 150 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.

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.
- C. 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 150 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 150 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 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 COMPONENTS

- A. Waterproofing Membrane: Fluid; cold applied; quick setting.
- B. Cured Membrane Characteristics:

<u>1. 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 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: Rigid insulation 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. Clean and prepare surfaces to receive waterproofing.
- C. Do not apply waterproofing to surfaces unacceptable to manufacturer.
- D. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer and/or in accordance with Section 07900.

3.3 INSTALLATION

- A. Apply surface conditioner at rate recommended by manufacturer. Protect conditioner from rain or frost until dry.
- B. 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.
- C. At expansion joints from 13 to 25 mm in width, loop cover sheet down into joint between 31 and 44 mm. Extend sheet 150 mm on both sides of expansion joint.
- D. 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 150 mm beyond sheet edges. Apply this procedure especially to expansion joints between horizontal and vertical surfaces.
- E. Apply waterproofing material.
- F. Apply and spread waterproofing material to a minimum cured thickness and averaging thickness as recommended by the manufacturer.
- G. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 150 mm above horizontal surface.
- H. Install cant strips at inside corners.
- I. Apply extra thickness of waterproofing material at corners, intersections, angles, and over joints.
- J. Seal items protruding to or penetrating through membrane and install counter-flashing membrane material.
- K. 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.
- L. Install membrane flashings and seal into waterproofing material.
- M. Conform to NRCA - Waterproofing Manual drawing details as noted:
- N. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward.
- O. Place protection board and/or panel directly against drainage panel and/or membrane; butt joints.
- P. Adhere protection board and/or drainage panel to substrate with mastic. Scribe and cut boards around projections, penetrations, and interruptions.
- Q. Install Work in accordance with the drawings, to the manufacturer's instructions and to the approval of the Engineer.