



**Construction of Additional Court / Record Room
for District West and Extension of Bar Room
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UNIT MASONRY ASSEMBLIES

SECTION 21 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section covers the work of concrete masonry assemblies and includes:
 - 1. Non-fire rated masonry assemblies.
 - 2. Fire rated masonry assemblies.
 - 3. Reinforced masonry assemblies.
- B. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete Masonry Units.
 - 2. Mortar and Grout Materials.
 - 3. Ties and Anchors.
 - 4. Miscellaneous Masonry Accessories.
 - 5. Mortar and Grout Mixes.
 - 6. Joint Reinforcement.
 - a. Horizontal reinforcement.
 - b. Vertical reinforcement.
- C. Related Sections include the following:
 - 1. Division 3 Section "Cast-In-Place Concrete" for cast-in-place reinforced concrete lintels and other work items as indicated on Drawings.
 - 2. Division 5 Section "Steel Structural" for coordinating welding requirements with steel alloy used for structural steel works.



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3. Division 5 Section "Metal Fabrications" for steel lintels.
 4. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
 5. Division 7 Section "Through-Penetration Firestop Systems" for sealing systems of penetrations and opening in fire rated masonry assemblies.
 6. Division 7 Section "Joint Sealants".
 7. Division 9 Section "Portland Cement Plaster" for Portland Cement Plaster finish.
- D. Products installed, but not furnished, under this Section include the following:
1. Hollow-metal frames in unit masonry openings, furnished under Division 8, Section "Custom Steel Doors and Frames."
 2. Steel Lintels for Unit Masonry Specified in Division 5 "Metal Fabrications".
 3. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "Sheet Metal Flashing and Trim."

1.3 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the net-area compressive strengths ($f'm$) at 28 days indicated in part 2.
1. For Concrete Unit Masonry: As follows, based on net area:
 - a. $f'm = 10.3 \text{ MPa}$.

1.4 SUBMITTALS

- A. **Product Data:** For each different masonry unit, accessory, and other manufactured product specified.
- B. **Shop Drawings:** Shop drawings including full details of masonry works for different assemblies and covering anchorage to concrete elements cavity walls and flashings, masonry reinforcement, bond pattern, joints, horizontal joint reinforcement, openings, lintels and other details as the Engineer may require.
- C. **Samples:** For the following:



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1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
 2. Accessories embedded in the masonry.
 3. Reinforcing bars and accessories.
- D. **Qualification Data:** For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. **Material Test Reports:** From a qualified independent testing agency employed and paid by contractor or manufacturer indicating and interpreting test results relative to compliance of the following proposed masonry materials for compliance with requirements indicated:
1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
 2. Mortar complying with property requirements of ASTM C 270.
 3. Grout mixes, Include description of type and proportions of grout ingredients.
- F. **Material Certificates:** Signed by manufacturers certifying that each of the following items complies with requirements:
1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
 2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area



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compressive strength of masonry determined according to test methods stated in Clause 1.5/F of this Section.

4. Each material and grade indicated for reinforcing bars.
5. Each type and size of anchor, tie, and metal accessory.
6. Each type and size of joint reinforcement.

1.5 QUALITY ASSURANCE

- A. Contractor shall perform a survey and inspection of foundations for compliance with dimensional tolerances. Full comprehensive report shall be submitted to the Engineer prior to commencing building masonry assemblies on foundations.
- B. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Engineer and the Employer.
- C. **Testing Agency Qualifications:** To qualify for acceptance, an independent testing agency shall demonstrate to Engineer's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM C 1093, that it has the experience and compatibility to satisfactorily conduct the testing indicated without delaying the work.
- D. **Preconstruction Testing:** Employ and pay a qualified independent testing agency to perform the following preconstruction testing to establish compliance of proposed materials and construction with specified requirements:
 1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, test units for strength, absorption, and moisture content per ASTM C 140.
 2. Prism Test: For each type of wall construction indicated, test masonry prisms per ASTM E 447, Method B.
 3. Mortar Test: For mortar properties per ASTM C 270.
 4. Grout Test: For compressive strength per ASTM C 1019.
 5. Evaluate mortar composition and properties per ASTM C780.
- E. **Fire-Resistance Ratings:** Where indicated on Drawings, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to Engineer.
- F. Minimum fire rating for concrete unit masonry assemblies, including 15 mm cement plaster facing on both sides shall be as follows:



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-
- a. 100 mm solid blocks: 2 hrs.
 - b. 150 mm solid blocks: 4 hrs.
 - c. 100 mm hollow blocks: 1 hrs.
 - d. 150 mm hollow blocks: 1-1/2 hrs.
 - e. 200 mm hollow blocks: 3 hrs.
- G. **Mockups:** Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of

materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Locate mockups in the locations indicated or, if not indicated, as directed by Engineer.
2. Build mockups of reinforced assembly, double walls, typical cavity wall and single-wythe wall areas as shown on Drawings.
3. Notify Engineer seven days in advance of dates and times when mockups will be constructed.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Engineer in writing.
7. Approved mockups will become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are in an air-dried condition.
 1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.



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- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

- A. **Protection of Masonry:** During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 600 mm down both sides and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 600 mm down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. **Stain Prevention:** Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.



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- D. **Hot-Weather Requirements:** Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 35 deg C, or 32 deg C with a wind velocity greater than 13 km/h, do not spread mortar beds more than 1200 mm ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. **General:** Provide shapes indicated and as follows for each form of concrete masonry unit required.
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 2. Provide square-edged units for outside corners, unless indicated as bullnose.
 3. Provide bullnose units for outside corners, unless otherwise indicated.
 4. Types of concrete masonry shall be as follows:
 - a. Use solid blocks for all below-grade assemblies.
 - b. Use solid blocks for walls, partitions or wythes to be finished with mechanically attached dimension stone cladding.
 - c. Use solid blocks or units for 4" thick partitions.
 - d. Use units open from both sides for reinforced masonry assemblies.
 - e. Use cellular blocks (open from one side) for other assemblies.
- B. **Concrete Masonry Units:** ASTM C 90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength specified in Clause 1.3/A of this Section.



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2. Weight Classification: Normal weight.
3. Provide moisture-controlled units. All masonry units shall be factory cured.
4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
 - a. Where units are to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.
5. Cement: ASTM C 150, Type I, Gray color.
6. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.

2.2 MORTAR AND GROUT MATERIALS

- A. **Portland Cement:** ASTM C 150, Type I. Provide gray color.
- B. **Hydrated Lime:** Do not use Lime.
- C. **Pre-Packaged Portland Cement Mix:** Pre-Packaged blend of Portland cement, water, and aggregate complying with requirements specified in this Article combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142. Compressive strength at 28 days shall not be less than 5 MPa (minimum cement sand ratio 1:3-4 by volume).
- D. **Aggregate for Mortar:** ASTM C 144.
 1. White-Mortar Aggregates: Natural white sand or ground white stone.
- E. **Aggregate for Grout:** ASTM C 404.
- F. **Water:** Potable.

2.3 REINFORCED STEEL BARS

- A. **Deformed High Yield Steel Bars:** BS 4449, Grade 460.
- B. **Reinforcing Bar Positioners:** Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 4.8-mm steel wire, hot-dip galvanized after fabrication.



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- a. Provide units with either two loops or four loops as needed for number of bars indicated or calculated.

2.4 TIES AND ANCHORS, GENERAL

- A. **General:** Provide ties and anchors, specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.
- B. **Wire:** As follows:
 1. Stainless-Steel Wire: ASTM A 580, Type 304.
 2. Wire Diameter: 6.4 mm.
- C. **Stainless Steel Sheet:** As follows:
 1. Stainless-Steel Sheet: ASTM A 167, Type 304.
 2. Stainless-Steel Sheet Thickness: 2.8 mm.
- D. **Stainless-Steel Plates, Bars, and Dowels:** ASTM A 167, ASTM A 276, or ASTM A 666, Type 304; temper as required to support loads imposed without exceeding allowable design stresses.

2.5 ADJUSTABLE ANCHORS FOR CONNECTING TO STRUCTURAL STEEL FRAME

- A. **General:** Provide two-piece assemblies as described below, allowing vertical or horizontal differential movement between wall and frame parallel to plane of wall but resisting tension and compression forces perpendicular to it.
 1. Manufacturer's standard anchors with crimped 6.4 mm diameter wire anchor section for welding to steel and triangular-shaped wire tie section sized to extend within 25 mm of masonry face and as follows:
 2. Welding to Steel Structural Framing: Comply with requirements specified in Division 5, Section "Structural Steel".
 3. Touch-Up Painting: Paint welds with two coats of zinc rich paint to ASTM A 780.
- B. **Wire Diameter:** 6.4 mm.

2.6 ANCHORS FOR CONNECTING TO CONCRETE



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- A. **General:** Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section: Dovetail anchor section formed from 1.6-mm thick, stainless-steel sheet.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 25 mm of masonry face, made from 6.4-mm diameter.

2.7 MISCELLANEOUS ANCHORS

- A. **Unit Type Inserts in Concrete:** Cast-iron or malleable-iron inserts of type and size indicated.
- B. **Anchor Bolts:** Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563M hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
1. Headed bolts.
 2. Nonheaded bolts, straight.
- C. **Postinstalled Anchors:** Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
1. Type: Expansion anchors.
 2. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
 3. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed by masonry.
 4. For Postinstalled Anchors in Grouted Concrete Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed by masonry.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. **Compressible Filler:** Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:
1. Urethane.



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- B. **Firestop Joint Filler:** UL classified R 9073, fire rating to match masonry assembly, smoke seal material in the form of boards, easy cut and fit and meeting the following requirements:

1. Service range: up to 1260 deg. C.
2. Melting point: 1760 deg. C
3. Flame spread: 5 to ASTM E 84
4. Smoke developed: 0 to ASTM E 84
5. Fuel contributed: 0 (non-combustible to ASTM E 136)
6. Compression strength: 2.46 kg/cm² minimum at 10% deformation.
7. Intensity: 224/256 kg/m³.

Thickness is to be manufacturer's standard to fit for thickness of joints indicated on Drawings.

- C. **Preformed Control-Joint Gaskets:** Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
2. PVC: ASTM D 2287, Type PVC-65406.

- D. **Bond-Breaker Strips:** Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

- E. **Rectangular Plastic Weep/Vent Tubing:** Clear butyrate, 9 by 40 by 90 mm.

2.9 MORTAR AND GROUT MIXES

- A. **General:** Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. All cement used shall be ordinary Portland (ASTM C 150, Type I).



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- B. **Pre-blended, Dry Mortar Mix:** Furnish dry mortar ingredients in the form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
1. Standard: ASTM C270, lime-free Portland cement based.
 2. Wet Mix Life: Less than 1.5 hours.
 3. Initial Adhesion at 28 days: Not less than 0.3 N/mm².
 4. Bending Strength: Around 1 N/ mm².
 5. Compressive Strength: Not less than 5 ±1 N/ mm².
 6. Minimum Cement Sand Mix: 1:3
 7. Testing: ASTM C 780.
- C. **Job-Mixed Mortar:** Comply with ASTM C 270 as follows:
1. Bending Strength: Around 1 N/ mm².
 2. Compressive Strength: Not less than 5 ±1 N/ mm².
 3. Minimum Cement Sand Mix: 1:3.
 4. Testing: ASTM C 780.
 5. Limit Cementitious materials in mortar to Portland cement and lime.
 6. Do not add lime to the mix. Approved liquid admixtures that substitute the performance of lime may be added to the mix.
- D. **Grout for Unit Masonry:** Comply with ASTM C 476. Unless otherwise specified, use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with ASTM C 476 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 200 to 275 mm as measured according to ASTM C 143.



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3. Use fine grout (maximum size of coarse aggregate is 10 mm) in grout spaces less than 100 mm in least horizontal dimension, unless otherwise indicated.
4. Use coarse grout in grout spaces 100 mm or more in least horizontal dimension, unless otherwise indicated.
5. The Contractor shall submit laboratory design mix of concrete grout to obtain performance specified in of this Sub-Clause. Minimum cement content shall be 300 kg/m³.
6. Compressive Strength: Minimum 17.5 MPa at 28 days.
7. Grout shall be mixed in proportions according to approved design mix to obtain compressive strength specified using the minimum quantity of water to ensure the necessary fluidity and to render it capable of penetrating the work.
8. Concrete grout shall be used or filling hollow cells in bond beams, under concrete lintels and bond beams, in window and door jambs and other locations for reinforced masonry assemblies as specified. Grout shall be mechanically mixed in drum mixers in volumetric proportions with only enough water shall be added to the mixture to produce a mixture which is flowable, but which will not show an excess of water when placed.

2.10 JOINT REINFORCEMENT

- A. **General:** Provide joint reinforcement formed from the following:
 1. Stainless-steel wire, ASTM A 580, Type 304.
- B. **Description:** Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 3 m, with prefabricated corner and tee units, and complying with requirements indicated below:
 1. Wire Diameter for Side Rods: 4.8 mm.
 2. Wire Diameter for Cross Rods: 4.8 mm.
- C. For single-wythe masonry, provide type as follows with single pair of side rods:
 1. Truss design with continuous diagonal cross rods spaced not more than 407 mm o.c.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with installer present for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. For the record, prepare written report, listing conditions detrimental to performance.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. **Thickness:** Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specification.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.



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- F. **Wetting of Brick:** Wet brick before laying. Allow units to absorb water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
1. **Variation from Plumb:** For vertical lines and surfaces of columns, walls, and arrises, do not exceed 3 mm in 3 m, nor 5 mm in 6 m, nor 6 mm in 12 m or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 3 mm in 6 m, nor in 12 m or more. For vertical alignment of head joints, do not exceed plus or minus 3 mm in 3 m, nor 6 mm maximum.
 2. **Variation from Level:** For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 3 mm in 6 m, nor 6 mm in 12 m or more. For top surface of bearing walls, do not exceed 2 mm in 3 m, nor 1.0 mm within width of a single unit.
 3. **Variation of Linear Building Line:** For position shown in plan and related portion of columns, walls, and partitions, do not exceed 6 mm in 6 m, nor 10 mm in 12 m or more.
 4. **Variation in Cross-Sectional Dimensions:** For columns and thickness of walls, from dimensions shown, do not exceed minus 5 mm nor plus 10 mm.

Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 3 mm, with a maximum thickness limited to 12 mm. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 3 mm. Do not vary from head-joint thickness indicated by more than plus or minus 3 mm. Do not vary head-joint thickness from adjacent head-joint thickness by more than 3 mm. Do not vary from collar-joint thickness indicated by more than minus 3 mm or plus 10 mm.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. **Bond Pattern for Exposed Masonry:** Lay exposed masonry in the following bond pattern; do not use units with less than nominal 100-mm horizontal face dimensions at corners or jambs.
1. One-half running bond with vertical joint in each course centered on units in courses above and below.



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- C. **Connection Between Walls And Partitions:** walls and partitions should generally be bonded, tied or dowelled to one another at angles and junctions. Where it is necessary for a partition to be connected to an adjacent wall, this should be done by toothing or block bonding unless otherwise specified
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 50 mm. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 100-mm horizontal face dimensions at corners or jambs.
- E. **Stopping and Resuming Work:** In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- F. **Built-in Work:** As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- G. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
 1. At exterior frames, insert extruded polystyrene board insulation around perimeter of frame in thickness indicated, but not less than 19 mm to act as a thermal break between frame and masonry.
- H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- I. Fill cores in hollow concrete masonry units with grout 600 mm under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 3. At fire-rated walls or partitions, install firestopping joint filler as specified in this Section in joint between top of partition and underside of structure. Fill joints at both faces with fire rated elastomeric silicone sealants to comply with a UL-



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listed joint system at head of wall. Comply with requirements of Division 7, Section "Joint Sealants".

- K. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
 - 4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 10-mm joints.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

- A. **General:** Provide continuous masonry joint reinforcement as indicated below. Install entire length of longitudinal side rods in mortar with a minimum cover of 16 mm on exterior side of walls, 13 mm elsewhere. Lap reinforcement a minimum of 150 mm.
 - 1. Space reinforcement not more than 406 mm o.c.
 - 2. Space reinforcement not more than 203 mm o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 305 mm beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.



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- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL JOINTS

- A. **General:** Install control joints in unit masonry at maximum intervals of 6.00 meters length and where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 - 1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete.

3.8 FIRE RATED MASONRY ASSEMBLIES

- A. **Fire Rating:** As indicated on Drawings.
- B. **Thickness:** As required to satisfy fire rating indicated but not less than thickness indicated on Drawings.
- C. **Unit Type:** As required to satisfy fire rating indicated in compliance with requirements specified in this Section.
- D. Care shall be exercised to solidly fill all joints, vertical and horizontal, with mortar.
- E. Joints: To structure above or adjoining are to be prefabricated, fire rated joint system comprising fire rated compressible filler and fire rated joint sealant on each face of the assembly, labeled by UL as rated for fire rating indicated.



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- F. Penetrations through fire rated masonry walls shall be sealed and treated with material systems as specified in Division 7, Section "Through Penetration Fire Stop Systems".
- G. Where required, expansion joints through fire rated concrete masonry walls or at the intersection between concrete masonry walls and other walls or partition shall be 60 or 120 minutes fire rated construction. Use firestop joint filler as specified in this Section and fire rated joint sealant on each face of the assembly. Comply with Division 7, Section "Joint Sealants".
- H. All accessories used in construction of fire rated assemblies shall be certified as suitable for use in fire rated masonry assemblies of rating indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

- A. **Temporary Formwork and Shores:** Construct formwork and shores to support reinforced masonry elements during construction.
 - 1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. **Placing Reinforcement:** Comply with requirements of requirements of Division 3, Section "Cast-In-place concrete".
- C. **Grouting:** Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
 - 1. Comply with requirements of ACI 530.1 or Section 2104.6 in the Uniform Building Code (UBC) for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.10 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:



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1. Provide an open space not less than 15 mm in width between masonry and structural member, unless otherwise specified. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 620 mm o.c. vertically and 920 mm o.c. horizontally.
4. Fill space with compressible joint filler and seal edges flush with joint sealant, unless otherwise indicated. Comply with Division 7, Section "Joint Sealants".

3.11 ANCHORING MASONRY TO CONCRETE COLUMNS AND WALLS

- A. Anchor masonry to concrete where masonry abuts or faces concrete columns or walls, comply with the following:
 1. Anchor masonry to concrete with metal anchors embedded as specified in masonry joints and attached to concrete.
 2. Space anchors as indicated, but not more than 420 mm o.c. vertically and 915 mm o.c. horizontally.

3.12 FIELD QUALITY CONTROL

- A. Engage a qualified independent testing agency to perform field quality-control testing indicated below.
 1. Retesting of materials failing to meet specified requirements shall be done also at Contractor's expense.
- B. **Concrete Masonry Unit Tests:** For each type of concrete masonry unit indicated, units shall be sampled and tested for strength and absorption, according to ASTM C 140.
- C. **Testing Frequency:** Tests and Evaluations listed in Sub-clause D, E and F of this Article will be performed during construction for each 460 sq. m of wall area or portion thereof.
- D. Mortar properties will be tested per ASTM C 270.
- E. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- F. **Prism-Test Method:** For each type of wall construction indicated, masonry prisms will be tested per ASTM E 447, Method B, and as follows:



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1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

- G. Mortar composition and properties will be evaluated per ASTM C 780.
- H. **Evaluation of Quality-Control Tests:** In the absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality-control tests comply with minimum requirements indicated.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. **Pointing:** During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. **In-Progress Cleaning:** Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

3.14 LINTELS

- A. **Steel Lintels:** As specified in division 5, Section "Metal Fabrications".
- B. **Concrete Lintels:**
 1. Precast lintels: Comply with requirements of Division 3, Section "Plant Precast Structural Concrete".
 2. Cast-In-Place Concrete lintels: Comply with requirements of Division 3, Section "Cast-In-Situ Concrete".
- C. Provide steel lintels where openings up to 610 mm wide are indicated.
- D. Provide reinforced concrete lintels where shown and where openings of more than 610 mm are shown without structural steel or other supporting lintels.
- E. Provide minimum bearing of 200 mm at each jamb, unless otherwise indicated.

END OF DOCUMENT



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ORNAMENTAL HANDRAILS AND RAILINGS

SECTION 23 - ORNAMENTAL HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Stainless steel ornamental handrails and railings.
- B. Related Sections include the following:
 - 1. Division 5 Section "Pipe and Tube Railings" for handrails and railings fabricated from pipe and tube components.
 - 2. Division 7 Section "Joint Sealants".

1.3 PERFORMANCE REQUIREMENTS

- A. **General:** In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:
 - 1. Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
- B. **Structural Performance of Handrails and Railings:** Provide handrails and railings capable of withstanding structural loads required by ASCE 7 without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections.
- C. **Structural Performance of Handrails and Railings:** Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
 - 1. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:



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- a. Concentrated load of 890 N applied at any point and in any direction.
 - b. Uniform load of 730 N/m applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
2. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 890 N applied to 0.09 sq. m at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
 - a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.
 3. Demonstrate capability of proposed handrail systems by:
 - a. Submission of structural calculations.
 - b. Submission of laboratory test report conducted on the proposed product during the last three years.
- D. **Thermal Movements:** Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 35 deg. C, ambient; 65 deg. C, material surfaces.
- E. **Control of Corrosion:** Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. **Product Data:** For manufacturer's product lines of handrails and railings assembled from standard components.
 1. Include Product Data for grout, anchoring cement, and paint products.
- B. **Shop Drawings:** Show fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other Work.



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1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. **Samples for Initial Selection:** Short sections of railing or flat sheet metal Samples showing available mechanical finishes.
- D. **Samples for Verification:** For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
1. 150 mm long sections of each different linear railing member, including handrails, top rails, posts, and balusters.
 2. Fittings and brackets.
 3. Welded connections.
 4. Assembled Samples of railings, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. Samples of exposed fasteners, where exposed fasteners are indicated.
- F. **Qualification Data:** For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects/engineers and owners, and other information specified.
- G. **Product Test Reports:** Indicating products comply with requirements, based on comprehensive testing of current products.
- 1.5 QUALITY ASSURANCE**
- A. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Engineer and the Employer.
- B. **Structural/Consulting Engineer Qualifications:** A structural consulting engineer who is legally qualified to practice, and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.



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- C. **Testing Agency Qualifications:** To qualify for acceptance, an independent testing agency shall demonstrate to the Engineer's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated.
- D. **Source Limitations:** Obtain each type of railing through one source from a single manufacturer.
- E. **Mockups:** Before installing handrails and railings, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in the location as directed by the Engineer.
 2. Build mockups for each form and finish of railing consisting of three posts, top rail, infill area, and anchorage system components that are full height and are not less than 600 mm in length.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Notify the Engineer seven days in advance of dates and times when mockups will be constructed.
 5. Obtain the Engineer's approval of mockups before fabricating ornamental handrails and railings.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed.
 8. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 STORAGE

- A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.7 PROJECT CONDITIONS

- A. **Field Measurements:** Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.



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Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

Coordinate installation of anchorages for handrails and railings. Furnish Setting Drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be

embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.9 SCHEDULING

- A. Schedule installation so that handrails and railings are mounted only on completed walls. Do not support temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS

- A. **General:** Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
- B. **Stainless Steel:** Grade or type designated below for each form required.
 - 1. Tubing: ASTM A 554, Grade MT 304.
 - 2. Pipe: ASTM A 312/A 312M, Grade TP 304.
 - 3. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
 - 4. Plate: ASTM A 666, Type 304.
- C. **Brackets, Flanges, and Anchors:** Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
 - 1. Provide formed steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

2.2 MISCELLANEOUS MATERIALS



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- A. **Filler Metal and Electrodes:** Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as required for color match, strength, corrosion resistance, and compatibility in fabricated items.

2.3 FASTENERS

- A. **Fasteners for Anchoring Handrails and Railings to Other Construction:** Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

1. For stainless-steel handrails and railings, use fasteners fabricated from Type 304 stainless steel.

- B. **Fasteners for Interconnecting Handrail and Railing Components:** Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless exposed fasteners are unavoidable or are standard fastening method for handrail and railing indicated.

- C. **Cast-in-Place and Postinstalled Anchors:** Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Chemical anchors.
2. Expansion anchors.

2.4 PAINT

- A. **Bituminous Paint:** Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 GROUT AND ANCHORING CEMENT

- A. **Nonshrink, Nonmetallic Grout:** Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION



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- A. **General:** Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than that required to support structural loads.
- B. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members as follows:
 1. By bending.
 2. By flush radius bends.
 3. By radius bends of radius indicated.
 4. By mitering at elbow bends.
 5. By inserting prefabricated flush elbow fittings.
 6. By any method indicated above, applicable to change in direction involved.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- E. **Welded Connections:** Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.



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4. At exposed connections, finish exposed surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- F. **Mechanical Connections:** Fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using epoxy structural adhesive where this is manufacturer's standard splicing method.
- G. **Brackets, Flanges, Fittings, and Anchors:** Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- H. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- I. For railing posts set in concrete, provide preset sleeves of steel not less than 150 mm long with inside dimensions not less than 13 mm larger than outside dimensions of post, and steel plate forming bottom closure.
1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- J. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- K. Ease exposed edges to a radius of approximately 1 mm, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- L. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. **Toe Boards:** Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.



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- O. **Fillers:** Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.
- P. Provide sleeves, inserts, and other anchorage devices to connect handrails and railing systems to concrete, masonry, embedded steel plates, and structural steel work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STAINLESS-STEEL FINISHES

- A. Remove or blend tool and die marks and stretch lines into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Mirrorlike Reflective, Nondirectional Polish: No. 8 finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.



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- B. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete, masonry, and terrazzo construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. **Cutting, Fitting, and Placement:** Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 2 mm in 1 m.
 - 3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 5 mm in 3 m.
- C. Adjust handrails and railings before anchoring to ensure alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- D. **Fastening to In-Place Construction:** Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.
- E. **Field Welding:**
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness or discoloration shows after finishing and welded surface matches contours and finish of adjoining surfaces.



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- F. **Non-welded Connections:** Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.
- G. **Welded Connections:** Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in shop or in field.
- H. **Expansion Joints:** Install expansion joints at locations indicated but not further apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 50 mm beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 150 mm of post.

3.3 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions.

- 1. Nonshrink nonmetallic grout.

Form or core-drill holes not less than 125 mm deep and 20 mm greater than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

- 2. Nonshrink, nonmetallic grout.

- B. Cover anchorage joint with a flange of same metal as post, attached to post as follows:

- 1. Welded to post after placing anchoring material.
- 2. By set screws.
- 3. Set flange in clear silicone sealant / adhesive flow surface.

- C. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 3 mm build-up, sloped away from post.

- D. Anchor posts to metal surfaces with flanges, angle or floor type as required by conditions, connected to posts and to metal supporting members as follows:



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1. For stainless-steel railings, weld flanges to post and bolt to metal supporting members.
 - E. Where shown on Drawings, fasten posts to face of spandrel construction as indicated and in accordance with manufacturer's instructions.
- 3.4 ANCHORING RAIL ENDS**
- A. Anchor rail ends to concrete and masonry with flanges connected to rail ends and anchored with postinstalled anchors and bolts.
- 3.5 CLEANING**
- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- 3.6 PROTECTION**
- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
 - B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF DOCUMENT



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INTERIOR ARCHITECTURAL WOODWORK

SECTION 24 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Pantry cupboard.
 - 2. Laboratory bench.
 - 2. Vanities constructed from solid surfacing.
 - 3. Wood base.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry".
 - 3. Division 9 Section "Painting" for field finishing of interior architectural wood works components that need finishing.

1.3 SUBMITTALS

- A. **Product Data:** For each type of product indicated, including finishing materials and processes.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. **Shop Drawings:** Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.



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- 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for items installed in architectural woodwork.
 - C. **Samples for Initial Selection:** Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 - 1. Shop-applied transparent finishes.
 - 2. Solid-surfacing materials.
 - D. **Samples for Verification:** For the following:
 - 1. Wood with or for transparent finish, 300 sq. cm, 125 mm wide by 600 mm long, finished on 1 side and 1 edge.
 - 2. Solid-surfacing materials, 150 mm square.
 - 3. Pantry hardware.
 - 4. Plastic-laminate-clad panel products, 200 by 250 mm, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
 - E. **Product Certificates:** Signed by suppliers of used woods and rigid sheets certifying that products comply with requirements specified.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. **Fabricator Qualifications:** A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. **Source Limitations:** Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.



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1.5 PROJECT CONDITIONS

- A. **Field Measurements:** Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 WOOD

- A. Softwood shall be free from decay and insect attack, except pinhole borers, with no knots wider than half the width of the section. Softwood shall comply with BS EN 942 softwood species to be used in external locations are to be recommended for the purpose.
- B. Hardwood shall comply with BS EN 942. Hardwood to be used in the works are to be recommended for the purpose.
- C. Wood shall be treated to prevent absorption of moisture.
- D. Plastic Laminate: to BS EN 438, color and pattern as follows:
1. Color and Pattern: Shall be selected by Engineer from manufacturer's full range of colors and patterns.
 2. Minimum Thickness: 1.20 mm.
 3. Where indicated, select plastic laminate type suitable for post forming application.



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2.2 RIGID SHEETS

- A. **Plywood:** BS EN 636: Part 1, face grade for general use. Bonding is to be to BS 1203, type WBP for external use and type MR or INT for internal use.

2.3 FASTENERS

- A. **Nails:** to BS 1202, Part 1, galvanized steel.
- B. **Wood Screws:** to BS 1210 generally, galvanized steel.
- C. **Self-Tapping Screws:** to BS 4174.
- D. **Dowels:** mild steel, 10 mm diameter, 100 mm long, galvanized to BS EN ISO 1461 after fabrication.
- E. **Cramps:** mild steel, 25 x 3 x 250 mm girth, turned up at one end and twice drilled for 3 mm screws, fish-tailed at other end for building in and galvanized to BS EN ISO 1461 after fabrication.
- F. **Plugs:** either traditional hardwood plugs, shaped to twist and grip when driven, or proprietary fiber or plastics plugs, or other approved type.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. **General:** Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to Engineer to produce products with fire-test-response characteristics specified.
 - 1. Do not use treated material that does not comply with requirements of referenced woodworking standard or that is warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. **Fire-Retardant-Treated Lumber and Plywood by Pressure Process:** Comply with BS 5589. Use the following treatment type:
 - 1. Type: Organic-resin-based formulation thermally set in wood by kiln-drying.
 - 2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and



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developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

3. Kiln-dry material before and after treatment to levels required for untreated material.
- C. All lumber, wood, fir, plywood or boards used in the works of this Section are to be preservative and fire-retardant treated.

2.5 SOLID SURFACE MATERIAL

- A. **Solid-Surfacing Material for Counter Top:** Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoated finish.

2.6 INSTALLATION MATERIALS, GENERAL

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

2.7 FABRICATION, GENERAL

- A. **General:** Comply with requirements of BS 1186-2.
- B. **Wood Moisture Content:** Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated.
- E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Notify Engineer seven days in advance of the dates and times woodwork fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as



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intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

- F. Fabricated; cabinets and similar items are to be of robust firm neat construction with:
1. Shutters, sashes, drawers and other opening or moving parts working smooth without bound conditions.
 2. Clearance between sashes and between jambs and sashes uniform.
 3. Level horizontal surfaces and plumb vertical surfaces when installed.

2.8 SHOP PRIMING

- A. **General:** Priming of interior architectural woodwork required to be performed at fabrication shop are specified in this Section. Refer to Division 9 Section "Painting" for final finishing of installed architectural woodwork and for priming materials to be used.
- B. **Preparations for Priming:** Comply with Division 9, Section "Painting" for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for priming woodwork, as applicable to each unit of work.
1. **Back-priming:** Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to end-grain surfaces.

2.9 PANTRY CUPBOARD AND BENCHES

- A. Base counters and upper cabinets units shall be pre-fabricated units constructed to dimensions and details indicated on Drawings.
- B. Construct units from the following materials so as to have all exposed or semi-exposed surfaces of plastic laminate finish:
1. 19 mm thick plywood with post-formed plastic laminate finish at both faces for front doors, bottoms and top of upper cabinet and shelves.



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2. 19 mm thick solid surfacing material with integral factory formed back splash top of base counter with integral back splash.
 3. 6 mm thick plywood of plastic laminate finish at one face for units backs and drawer base.
 4. 19 mm thick plywood with post-formed plastic laminate finish for drawers front, sides and back
- C. Plastic laminate sheet veneers shall be as specified in Clause 2.1 of this Section, color and pattern to the selection of the Engineer. Units are to be assembled in manufacturer's standard system to provide neat and robust construction.
- D. Construct socle of base counter, consisting of perimeter sides and intermediate struts, from hardwood solid blocks and finish exposed fronts to match finish of surrounding floors.
- E. Provide metal pre-slotted shelf holders of baked enamel finish complete with removable brackets for shelf supporting. Color is to be to the selection of the Engineer.
- F. Provide manufacturer's standard hardware including hinges, drawer slides, latches and knobs of finish to the selection of the Engineer. All hardware shall be manufactured from stainless steel, alloy 304, of satin finish.
- G. Blocking wood shall be from approved hardwood type.
- H. Construct top of base cabinet units integral with coved back splash from solid surfacing material as specified. Color or colors shall be selected by the Engineer from manufacturer's full range. To the maximum possible extent provide seamless construction. Where seams are unavoidable, align adjacent solid surfacing-material units and factory form seams. Joints are to be dressed smooth with surface scratches removed and entire surface cleaned.

2.10 WOOD BASES

- A. Are to be constructed from White Oak hardwood.
- B. Fabricate to dimensions and details indicated.
- C. Furnish in length as long as practice.
- D. Corners are to be mitred at 45 degrees.



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- E. Finish of bases shall be transparent stained varnish as specified in Division 9, section "Painting".

2.11 VANITIES

- A. Furnish vanities pre-fabricated in the workshop from solid surfacing material. Color(s) shall be selected by the Engineer.
- B. Fabricate vanities to dimensions indicated on Drawings and details indicated on approved shop drawings. Comply with the following sheet thickness:
 - Vanity: 20.0 mm
 - Aprons and backsplash: 13.0 mm.
- C. Provide seamless vanity construction with pre-opened holes for assembly of lavatories. Use approved samples of lavatories for fixing size of holes. Comply with manufacturer's printed instructions for fabrication of vanities.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. **Quality Standard:** Install woodwork to comply with BS 1186-2 and details indicated on Drawings and approved shop drawings.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.



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- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

Fix wood bases with pre-drilled, expansion-type wall plugs fabricated from hard nylon and galvanized-steel wood screws of suitable length and diameter at maximum intervals of 750 mm. Counter sink heads of screws in wood and overfill with approved wood filler of matching color as adjacent finished stained wood.

- F. Refer to Division 9 Section "Painting" for final finishing of installed architectural woodwork components that need finishing.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semi exposed surfaces.

END OF DOCUMENT



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LIQUID APPLIED WATERPROOFING

SECTION 25 – LIQUID APPLIED WATERPROOFING

PART 1 -GENERAL

1.01 RELATED WORK

- A. Section - Concrete.
- B. Section - Membrane Waterproofing for external application
- C. Division 15 - Drain flashing flanges.

1.02 WORK INCLUDED

- A. Fluid applied cold applied one or two component polyurethane membrane waterproofing. For internal application.
- B. Protective covering.

1.03 REFERENCES

- A. ANSI/ASTM D412 - Rubber Properties in Tension.
- B. ANSI/ASTM D746 - Test for Brittleness Temperature of Plastics and Elastomerics by Impact.
- C. ASTM C836 - High Solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane for Use With Separate Wearing Course.
- D. ASTM D624 - Rubber Property - Tear Resistance.
- E. ASTM D2240 - Rubber Property - Durometer Hardness.
- F. ASTM E96 - Water Vapour Transmission of Materials.

1.04 QUALITY ASSURANCE

- A. **Membrane Manufacturer:** Company specializing in liquid waterproofing membrane systems with eight years minimum experience.
- B. **Applicator:** Company specializing in application of specified waterproofing



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with five years minimum experience and approved by manufacturer.

1.05 FIELD SAMPLE

- A. Provide field sample of installed membrane.
- B. Field sample to represent conditions of finished work including internal and external corners, seam jointing, attachment method, sealing and counter flashing cover, and control and expansion joints.
- C. Approved sample may be incorporated as part of the Work.

1.06 SUBMITTALS

- A. Submit shop drawings and product data under provisions of General Requirements.
- B. Submit shop drawings detailing special joint or termination conditions and conditions of interface with other materials.
- C. Submit product data for liquid membrane compound, flexible flashing, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- D. Submit manufacturer's installation instructions under provisions Contract Documents

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply waterproofing during inclement weather or when air substrate temperature is below 5 degrees C.
- B. Liquid water proofing should be non toxic

1.08 WARRANTY

- A. Provide (10) ten years warranty under provisions of General Conditions of Contract.
- B. Warranty includes coverage of materials and installation and resultant damage from failure of installation to resist penetration of moisture.



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- C. Warranty includes coverage of waterproofing failure to resist penetration of water except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered as structural failure.

PART 2 -PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Carisle Corporation System Liquiseal
- B. Chevron USA (Asphalt Div)System C.I.M.
- C. Floorlite - Andek System Rooftex
- D. Tremco Ltd System Tremproof 60
- E. Fosroc Nitoproof 10
- F. Or approved equal.

Note: The products and manufacturer specified herein are specified for the purpose of establishing minimum quality standards. Products equal to or better than those specified will be considered acceptable. The decision of acceptability shall rest with Engineer/Engineer Representative.

2.02 MATERIAL

- A. **General:** Provide liquid applied waterproofing, and other required materials produced by one manufacturer.
- B. **Waterproofing Membrane:** Pitch Modified, High Polymer one part Polyurethane Elastomeric Membrane Type. Trowel apply membrane at areas indicated on Drawings to receive "Waterproofing", consisting of a high polymer and polyurethane applied in multiple layers forming a seamless waterproofing membrane to a minimum thickness of 1.5mm.
- C. The Physical properties of the membrane must satisfy the following criteria:
 - 1 Specific Gravity : 1.2



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- 2 Solid Contents : 92% minimum
- 3 Application Temperature : 5 degrees C to 45 degrees C
- 4 Cure Time : 4 – 6 Hour
- 5 Store "A" Hardness : 30 degrees C
- 6 Tensile Strength : 20N/mm^2
- 7 Ultimate Elongation : 680%
- 8 Accelerated Weathering: 12000 Hours. No appreciable deterioration.
- D. Sealer (For Substrate): As recommended by manufacturer.
- E. Cant Strips: As recommended by manufacturer.

2.03 ACCESSORIES

- A. Surface Conditioner: as recommended by membrane manufacturer.
- B. Elastic Flashings: 1.2 as recommended by membrane manufacturer.
- C. Joint and Crack Sealant: As recommended by membrane manufacturer.
- D. Cant: as detailed on drawings.

2.04 PROTECTIVE MATERIALS

- A. Protection Board: 3mm thick, asphalt impregnated board manufactured by W.R. Meadows.
- B. Tack-free Surfacer: Normal Portland Cement.
- C. Separation Sheet: Sheet polyethylene, 0.15 mm thick.

PART 3 - EXECUTION

3.01 EXAMINATION



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- A. Verify surfaces are solid, free of frozen matter, loose particles, cracks, pits, rough projections, and foreign matter detrimental to adhesion and application of waterproofing.
- B. Do not apply waterproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer and applicator.
- C. Verify items, which penetrate surfaces to receive waterproofing, are securely installed.
- D. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Clean and prepare surfaces to receive waterproofing, in accordance with manufacturer's instructions.
- B. Apply mastic to seal penetrations, small cracks, and honeycomb in substrate.
- C. Protect adjacent surfaces not designated to receive waterproofing.
- D. Apply surface conditioner at a rate recommended by membrane manufacturer.

3.03 APPLICATION

- A. Apply membrane in accordance with manufacturer's instructions.
- B. Apply and spread membrane to minimum 2mm thickness, averaging 2.5mm in thickness.
- C. Continue membrane up vertical surfaces minimum 150mm or as indicated on drawings.
- D. Seal items projecting through membrane.
- E. Install membrane flashing and seal into membrane.
- F. Reinforce membrane over static or moving joints.

3.04 FIELD QUALITY CONTROL



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- A. On completion of horizontal membrane installation, dam installation in preparation for flood testing.
- B. Flood to minimum depth of 30mm. with clean water. After 48 hours, check for leaks.
- C. If leaking is found, patch using new waterproofing materials; repeat flood-test. Repair damage to building.
- D. When area is proved watertight, drain water and remove dam.

3.05 PROTECTION

- A. Immediately after cooling, dust membrane with Portland Cement at rate of approximately 4 kg/10 sq m.
- B. Apply protection boards over cured membrane surface. Scribe boards around pipes and projections.
- C. Close off area to prevent un-authorized traffic or work over membrane until final concrete topping is applied.

PART 4 – LOCATION OF THE WORKS

1 - In toilets, pantries and preparation areas, below tiling 2 – Below screed at delivery yard area 3 – Below cold rooms flooring in structurally recessed areas.

END OF DOCUMENT



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WOODEN DOORS

SECTION 28 – WOODEN DOORS

PART 1 - GENERAL SECTION

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Non-fire-rated flush wood doors of semi-solid core.
 - 2. Shop priming flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
 - 4. Louvers for flush wood doors.
- B. Related Sections include the following:
 - 1. Division 8 Section "Steel Doors and Frames" for steel frames to receive flush wood doors.
 - 2. Division 8 Section "Door Hardware" hardware for flush wood doors.
 - 3. Division 8 Section "Glazing" for glass view panels in flush wood doors.
 - 4. Division 9 Section "Painting".

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, trim for openings, and louvers.
 - 1. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.



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- 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate doors to be factory finished and finish requirements.
 - C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of factory-finished doors with opaque finish. Show the full range of colors available.
 - D. Samples for Verification: As follows:
 - 1. Corner sections of doors approximately 200 by 250 mm with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
 - 2. Louver blade and frame sections, 150 mm long, for each material and finish specified.
 - 3. Frames for light openings, 150 mm long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Quality System: Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Consultant and the Employer.
- B. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
 - 1. Individually package doors in plastic bags or cardboard cartons.
 - 2. Individually package doors in cardboard cartons and wrap bundles of doors in plastic sheeting.
- B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.



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1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with requirements of the referenced quality standard for Project's geographical location.

1.7 WARRANTY

- A. Door Manufacturer's Warranty: Provide written Warranty, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 6.5 mm in a 1100-by-2100-mm section or that show telegraphing of core construction in face veneers exceeding 0.25 mm in a 75-mm span, or do not comply with tolerances in referenced quality standard.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time after the date of Substantial Completion:
 - a. Semi-solid-core Interior Doors: Two years.

PART 2 - PRODUCTS

2.1 WOODS, GENERAL

- A. Woods shall be marked-on as Class-1 stocks which shall be properly treated, adequately seasoned and free from rot or insect attack, splits, shakes or checks, warping, twisting, chipping, loose knots and warping. Provide woods of wane-free edges. Woods shall conform to the requirements of BS EN No. 942; plywood to BS EN No. 636.
- B. **Preservative Treatment:** All woods and plywood used shall be preservative treated. Application is to be carried out after cutting and machining, but before assembly, by a processor licensed by the treatment solution manufacturer. Solution strengths and treatment by pressure, vacuum or immersion process are to



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be selected to achieve service life and to suit wood treatability. Moisture content of wood at time of treatment is to be as specified for use in the work. After treatment, allow wood to dry before use. For each batch of wood, provide certificate of assurance that treatment has been carried out as specified.

C. Softwoods

1. Douglas Fir: Yellowish Brown wood of average intensity not less than 570 kg/m³ at 12% moisture content.
2. Whitewood: White/pale Yellowish Brown wood of average intensity of 470 kg/m³.
3. Or as directed by the Architect.

D. Hardwoods

1. White Oak Wood: Yellowish Brown, fine-grained wood of strong, compact, homogenous fibers and uniform texture. Average intensity shall not be less than 720 kg/m³ at 12% moisture content. Or as directed by the Architect.

E. Plywood

1. General: Shall be highest grade to BS EN 636, designated as veneer, with minimal imperfections as peeled. Moisture content shall not exceed 12%. Thickness shall be as specified. Employ plywood glued with INT glues to BS 1203.
2. Softwood Plywood: All layers shall be of softwood.
3. Hardwood Plywood: White Oak plywood; White-Oak veneer 0.90 mm thick minimum shall be factory hot-applied at exposed face of door, cut and match of veneer shall be selected by the Consultant.

2.2 ACCESSORY MATERIALS

- A. Preservative treatment: Type listed in BS 1282 (except coal tar creosote) obtained from approved manufacturer to provide protection against termites and other destroying organisms.
- B. Adhesives: Close contact type to BS EN 301 or BS EN 302, suitable for the purpose and compatible with preservative treatment.

2.3 NON-FIRE RATED SEMI-SOLID-CORE FLUSH WOOD DOORS

- A. **General:** Non-fire-rated flush wood doors shall be swinging-type side-hinged to jambs of frames with hand of doors as indicated on Drawings, fabricated to the



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general tolerances of BS No. 4787 and shall consist of a frame (door leaf frame) consisting of stiles and rails constructed of Douglas fir and a core constructed of a lower-density softwood (Whitewood). Core strips shall cover, at least, 67% of door leaf area (Semi-solid core).

- B. **Door Leaf Frame:** Stiles and rails shall be of dimensions as indicated on Drawings but in no case shall the width be less than 140 mm for mortise stile or less than 100 mm for other stile and rails, before lipping. Door-leaf-frame components shall be continuously lipped at outer edges with 20 mm thick lipping constructed of White Oak wood. Oak lipping shall be fixed to stiles and rails in continuous glued tongue-and-groove joints. Stiles, rails and lipping of door leaf frame shall be constructed in one piece, no jointing or splicing shall be permissible. Joints between stiles and rails shall be glued mortise-and-tenon.
- C. **Semi-Solid Cores:** Shall be horizontal rails of White wood, of uniform width. Ratio of solid to vacant shall be 2:1. Horizontal core rails shall be in one pieces. Throughout door leaf height, at least, two horizontal core rails shall be mortise-and-tenon jointed and glued to stiles.
- D. **Facing:** Facing material shall be 6 mm thick plywood glued with waterproof glue under pressure to both sides of core. Facing material shall extend flush and uniform, in both directions, between inner edges of lipping. Extend facing in one piece; no jointing or splicing shall be permissible. Type of facing material shall be as follows:
 - 1. Doors of Opaque Finish: Softwood plywood
- E. **Thickness of Doors:** Unless otherwise indicated on Drawings, finish thickness of flush non-fire-rated wood doors shall be 45 mm; thickness of stiles, rails and core strips shall be 33 mm and 45 mm wood lipping.

2.4 LOUVERS AND LIGHT FRAMES

- A. Metal Louvers: As follows:
 - 1. Blade Type: Vision proof, inverted V.
 - 2. Metal and Finish: Extruded aluminum with clear anodic finish, 25micron thick minimum.

2.5 HARDWARE

- A. Hardware shall be as indicated in Hardware Sets and Door Schedule and as specified in Division 8, Section "Door Hardware".



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2.6 FABRICATION, GENERALLY

- A. Flush wood doors shall be fabricated in accordance with details shown on Drawings, requirements of this Section, general tolerances of BS No. 4787 and other in-contradicting requirements of BS No. 1186: Part 2.
- B. Carefully plan and layout the work to erect wood doors and to accommodate the work of other trades.
- C. Finish wood shall be smoothly dressed and sanded prior to assembly of door inner frames and shall be free from open joints, hammer and machine marks and other defects or surface blemishes.
- D. Re-treat all treated wood which is sawn along the length, ploughed, thickness, planed or otherwise extensively processed. Treat wood surfaces exposed by minor cutting and drilling with two flood coats of solution recommended for the purpose by the treatment solution manufacturer.
- E. Finish and cut wood at exact dimensions as required. Stile and rails shall be connected only in glued mortise-and tenon joints with horizontal core strips assembled and jointed at their locations between rails, along stiles. The resulting frame shall be robust, firm and square.
- F. Facing material shall be glued to core and frame. No nail-fixing exposed or concealed, for facing material shall be permissible. The assembly shall be glued under pressure with waterproof casein glue and be thoroughly dried and seasoned.
- G. Join lipping at outer perimeter of frame in continuous tongue-and-groove joints with glue.
- H. Factory machine doors for hardware that is not surface applied. Locate hardware as indicated on approved shop drawings. Comply with final hardware schedules, door frame shop drawings, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- I. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.



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2.7 SHOP PRIMING

- A. Doors for Opaque Finish: Shop seal faces and edge of doors including cutouts with one coat of wood primer specified in Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors/ frames with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Clearances: Provide 3.2 mm at heads, jambs, and between pairs of doors. Provide 3.2 mm from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 6.4 mm from bottom of door to top of threshold.
 - 2. Bevel non-fire-rated doors 3-1/2 degrees at lock and hinge edges.
- D. Field-Finished Doors: Refer to the following for finishing requirements:
 - 1. Division 9 Section "Painting."



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3.3 ADJUSTING AND PROTECTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion by the Employer.

END OF DOCUMENT



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DOOR HARDWARE

SECTION 32 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following steel and wood doors:
 - a. Swinging doors.
 - 2. Cylinders for doors specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Sections include the following:
 - 1. Division 8 Section "Custom Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the time.
 - 2. Division 8 Section "Flush Wood Doors" for astragals provided as part of a fire-rated labeled assembly.
 - 3. Division 8 Section "Access Doors and Frames".
 - 4. Division 8 Section "Overhead Coiling Doors".
 - 5. Division 8 Section "Aluminum Framed Entrances And Storefronts".
 - 6. Division 8 Section "Sliding Automatic Entrance Doors" for entrance door hardware, except cylinders.
 - 7. Division 16 Electrical Specification Systems for coordination of electrical hardware and security hardware.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.



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1. Cylinders for locks on aluminum and glass entrance doors.

1.3 SUBMITTALS

- A. **Product Data:** Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. **Shop Drawings:** Details of electrified door hardware, indicating the following:
 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
 2. Detail interface between electrified door hardware and fire other building systems.
- C. **Samples for Initial Selection:** Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of door hardware indicated.
- D. **Samples:** For exposed door hardware of each type indicated below, in specified finish, full size. Tag with full description for coordination with the Door Hardware Schedule. Submit samples before, or concurrent with, submission of the final Door Hardware Schedule.
 1. Door Hardware: Each piece of hardware indicated in hardware schedule or on Drawings.
 2. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- E. **Door Hardware Schedule:** Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and



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related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - 1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
4. **Submittal Sequence:**
 - a. Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must



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precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

- b. Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit the final Door Hardware Schedule after

Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.

- F. **Keying Schedule:** Prepared by or under the supervision of supplier, detailing Employer's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- G. **Product Certificates:** Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
 1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- H. **Qualification Data:** For firms and persons specified in "Quality Assurance" Article.
 1. Include lists of completed projects with project names and addresses of architects/Consultants and owners, and other information specified.
- I. **Product Test Reports:** Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.
- J. **Maintenance Data:** For each type of door hardware to include in maintenance manuals specified in Division 1.
- K. **Warranties:** Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Consultant and the Employer.
- B. **Installer Qualifications:** A qualified firm specializing in performing the work of this Section and who has completed door hardware similar in material, design, and extent to that indicated for this Project with minimum three years documented experience and that is approved, authorized, or licensed by the product



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manufacturer to install his product and that is eligible to receive manufacturer's warranty. Include project names and addresses, names and addresses of Consultants and Employers, and other information specified

- C. **Supplier Qualifications:** A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying conventional and security door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Employer, Consultant, and Contractor, at reasonable times during the course of the Work, for

consultation. The supplier shall have access to adequate inventory of all hardware items to meet Project construction schedules and shall have the ability to submit samples, hardware data, templates, and hardware schedules in accordance with Project construction schedules.

1. Require supplier to meet with Employer to finalize keying
2. Electrified Door Hardware Supplier Qualifications: An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
 - a. Consulting Responsibility: Prepare data for electrified door hardware, including Shop Drawings, based on testing and Consulting analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
3. Scheduling Responsibility: Preparation of door hardware and keying schedules.

- C. **Architectural Hardware Consultant Qualifications:** A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

1. Electrified Door Hardware Qualifications: Experienced in providing consulting services for electrified door hardware installations.

- D. **Source Limitations:** Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.



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1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.
- E. Regulatory Requirements:** Comply with provisions of the following:
1. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 67 N to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 67 N for not more than 3 seconds.
 - c. Door Closers: Not more than 133 N to set door in motion and not more than 67 N to open door to minimum required width.
 - d. Thresholds: Not more than 13 mm high.
 2. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. Fire-Rated Door Assemblies:** Provide door hardware for assemblies complying with NFPA 80, or any approved equal international standard, that are listed and labeled by a testing and inspecting agency acceptable to Consultant, for fire ratings indicated, based on testing according to NFPA 252.
1. Test Pressure: Test at atmospheric pressure.
- G. Labels:** All hardware components of fire resisting doors assemblies including, but not limited hinges, locks, bolts, door closers shall carry the identifying labels of an approved independent testing and inspection agency or laboratory, confirming their fire resistance rating. The rating of all door components shall be equal to the rating of the door assembly.
- H. Door Closers on Fire Rated Doors:** Comply with requirements with specified in Clause 2.10 of this Section.
- I. Keying Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate keying



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conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

J. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver keys to manufacturer of key control system.
- D. Deliver keys to Employer by registered mail or overnight package service.

1.6 COORDINATION



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- A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- B. **Templates:** Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. **Electrical System Roughing-in:** Coordinate layout and installation of electrified door hardware with connections to power supplies and fire alarm system and detection devices and any other building system as indicated on Drawings.

1.7 WARRANTY

- A. **General Warranty:** Special warranties specified in this Article shall not deprive Employer of other rights Employer may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. **Special Warranty:** Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of operators and door hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. **Warranty Period:** Three years from date of Substantial Completion, unless otherwise indicated.
- D. **Warranty Period for Electromagnetic and delayed-Egress Locks:** Five years from date of Substantial Completion.
- E. **Warranty Period for Manual Closers:** 10 years from date of Substantial Completion.
- F. **Warranty Period for Concealed Floor Closers:** Five years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE



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- A. **Maintenance Tools and Instructions:** Furnish a complete set of specialized tools and maintenance instructions as needed for Employer's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. **Maintenance Service:** Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. **General:** Provide door hardware for each door to comply with requirements in this Section, and the Door and Hardware sets Schedule annexed at the end of Part 3.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. **Designations:** Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door and Hardware sets Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. International hardware manufactures have to establish their compliance with these specifications and with international fire codes for fire rated hardware.
 - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

2.2 HINGES AND PIVOTS

- A. **Standards:** Comply with the following:
 - 1. Butts and Hinges: BHMA A156.1.
 - 2. Template Hinge Dimensions: BHMA A156.7.
 - 3. Self-Closing Hinges and Pivots: BHMA A156.17.
 - 4. Pivots: BHMA A156.4.



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- B. **Size:** Provide the following minimum sizes, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (mm)	Hinge Height (mm)	Metal Thickness (mm)	
		Standard Weight	Heavy Weight
800 by 2125 by 35	88	3.1	-
900 by 2125 by 35	100	3.3	-
900 by 2285 by 38	113	3.4	4.6
1050 by 2285 by 38	113	3.4	4.6
1200 by 3050 by 38	125	3.7	4.8

- C. **Template Requirements:** Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- D. **Hinge Weight:** Unless otherwise indicated, provide the following:
- Entrance Doors: Heavy-weight hinges.
 - Doors with Closers: Antifriction-bearing hinges.
 - Interior Doors: Standard-weight hinges.
- E. **Hinge Base Metal:** Unless otherwise indicated, provide the following:
- Exterior Hinges: Stainless steel alloy 316, with stainless-steel pin
 - Interior Hinges: Stainless steel alloy 304, with stainless-steel pin.
 - Hinges for Fire-Rated Assemblies: Stainless steel alloy 304, with stainless-steel pin.
- F. **Hinge Options:** Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
- Maximum Security Pin: Fix pin in hinge barrel after it is inserted.



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2. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - a. Out-swinging exterior doors.
3. Corners: 4-mm radius.
- G. **Hinges, General:** Shall be full mortise, template, of concealed ball bearing, 5 knuckles, suitable for high frequency applications and of life time warranty.

2.3 LOCKS AND LATCHES

- A. **Standards:** Comply with the following:
 1. Mortise Locks and Latches: BHMA A156.13.
 2. Interconnected Locks and Latches: BHMA A156.12.
 3. Auxiliary Locks: BHMA A156.5.
 4. Push-Button Combination Locks: BHMA A156.2.
 5. Electromagnetic Locks: BHMA A156.23.
 6. Delayed-Egress Locks: BHMA A156.24.
 7. Exit Locks: BHMA A156.5.
- B. **Mortise Locks:** Stamped steel case with stainless steel parts; BHMA Grade 1; Series 1000. Provide mortise locks for exterior doors, throughout the job, except for toilets. All lock shall be ADA compliant Marine grade mortise locks shall be provided in the exterior and in non air conditioned areas. Provide ten years product warranty for performance and finish.
- C. **Mortise Lock:** Shall be types produced for extra-heavy-duty applications. Lock lever shall be of anti-vandalism design.
- D. Where threaded bars are used to assemble the two pieces of lock spindle, minimum inner diameter of threading bar shall be 6 mm.
- E. **Interconnected Locks:** BHMA Grade 1; Series 5000.
- F. **Auxiliary Locks:** BHMA Grade 1.



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- G. **Push-Button Combination Locks:** BHMA Grade 1 for cylindrical locks and Grade 2 for mortise locks.
- H. **Certified Products:** Provide door hardware listed in the following BHMA directories:
 - 1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."
- I. **Lock Trim:** Comply with the following: All trims to have returns. Trims shall be ADA compliant. Trim shall be stainless steel BHMA-630
 - 1. Lever: Wrought, forged, or cast.
 - 2. Escutcheon (Rose): Wrought, forged, or cast.
 - 3. Dummy Trim: Match lock trim and escutcheons.
 - 4. Lockset Designs: Provide the lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:
- J. **Lock Functions:** Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
 - 1. Mortise Locks: BHMA A156.13.
 - 2. Interconnected Locks: BHMA A156.12.
- K. **Lock Features:** Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
 - 1. Mortise Locks: Minimum 19-mm latchbolt throw.
 - 2. Deadbolts: Minimum 25-mm bolt throw.
 - 3. Pairs of Doors: 16-mm minimum throw of latch.
 - 4. Fire-Rated Doors: Comply with UL requirements for throw of bolts and latches on rated fire openings.
 - 5. Heavy duty anti friction tongue.
 - 6. Non handed auxiliary guard latch.



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7. Adjustable stainless steel armor front.
 8. Seven pin interchangeable core cylinder.
 9. Corrosion protected steel case.
- L. **Rabbeted Doors:** Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- M. **Backset:** 70 mm, unless otherwise indicated.
- N. **Lock Function:** Provide lock functions as described below, but not limited to
1. F-04 Office lock, with faceplate button depressed function.
 2. Classroom function for stores
 3. F-13 Corridor lock.
 4. Provide classroom dead bolts for main doors of toilets and janitors rooms
- Additional lock function will be required as per function of various rooms.
- O. Locks shall have double buttons in face plate. For Office Locks the handle will rotate only when bottom button is depressed or turning key for outside cylinder. For other locks, the bottom button in face plate shall also retract the latch.
- P. These requirements for mortise locks shall remain applicable in all respects for wood doors, steel doors and minimum doors.

2.4 DOOR BOLTS

- A. **Standards:** Comply with the following:
1. Surface Bolts: BHMA A156.16.
 2. Manual Flush Bolts: BHMA A156.16.
- B. **Surface Bolts:** BHMA Grade 1.
1. Flush Bolt Heads: Minimum of 13-mm- diameter rods of brass, bronze, or stainless steel with minimum 300-mm- long rod for doors up to 2100 mm in height. Provide longer rods as necessary for doors exceeding 2100 mm.
- C. **Flush Bolts:** BHMA Grade 1, designed for mortising into door edge.



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- D. **Bolt Throw:** Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
1. Half-Round Surface Bolts: Minimum 22-mm throw.
 2. Interlocking Surface Bolts: Minimum 24-mm throw.
 3. Fire-Rated Surface Bolts: Minimum 25-mm throw; listed and labeled for fire-rated doors.
 4. Dutch-Door Bolts: Minimum 19-mm throw.
 5. Mortise Flush Bolts: Minimum 19-mm throw.

2.5 EXIT DEVICES

- A. **Standard:** BHMA A156.3.
1. BHMA Grade: Grade 1.
- B. **Certified Products:** Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."
- C. **Panic Exit Devices:** Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- D. **Panic Exit Devices:** For non-fire rated doors are to be as specified in Sub-Clause but with facility to hold latchbolts in retracted position so that the doors may be used as push/pull. Dogging is to be accomplished by a hex key cylinder installed on the body of touch bar devices or a hexagonal key in the hinge and lock cases of cross bar devices
- E. **Fire Exit Devices:** Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. **Dummy Push Bar:** Nonfunctioning push bar matching functional push bar.
1. Operation: Rigid.
- G. **Outside Trim:** Lever with cylinder or Pull with cylinder; unless otherwise indicated material and finish to match locksets, unless otherwise indicated.
1. Match design for locksets and latchsets, unless otherwise indicated.



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- H. **Through Bolts:** For exit devices and trim on metal doors and non-fire-rated wood doors.
- I. Fire and panic exit devices shall be of concealed latches. No exposed latches shall be accepted.

2.6 CYLINDERS AND KEYING

- A. **Standards:** Comply with the following:
 - 1. Cylinders: BHMA A156.5.
 - 2. Key Control System: BHMA A156.5.
- B. **Cylinder Grade:** BHMA Grade 1 or Grade 1A.
- C. **Cylinders:** Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Seven.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
- D. **Permanent Cores:** Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key, and usable with other manufacturers' cylinders.
 - 2. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- E. **Construction Keying:** Comply with the following:
 - 1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
 - 2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 4 constructions master keys for Employer/Consultant use.
 - a. Replace construction cores with permanent cores, as directed by Employer.



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- b. Furnish permanent cores to Employer for installation.
- F. **Keying System:** Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:
1. Master Key System: Cylinders are operated by a change key and a master key.
- G. **Keys:** Provide stainless steel keys complying with the following:
1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Employer.
 2. Quantity: In addition to one extra blank key for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
- H. **Key Control System:** BHMA Grade 1 system, including key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers. Contain system in metal cabinet with baked-enamel finish.
1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
 2. Capacity: Able to hold keys for 150 percent of the number of locks.
 3. Cross-Index System: Set up by key control manufacturer, complying with the following:
 - a. Card Index: Furnish four sets of index cards for recording key information. Include three receipt forms for each key-holding hook.

2.7 STRIKES

- A. **Standards:** Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Interconnected Locks and Latches: BHMA A156.12.



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3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 4. Dustproof Strikes: BHMA A156.16.
- B. **Strikes:** Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
 5. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non recessed strike for bolt.
- C. **Dustproof Strikes:** BHMA Grade 1.

2.8 CARD READER

- A. Proximity Reader with Keypad:
1. Technology: Wiengand proximity system compatible with building security system.
 2. Housing: Weather resistant ABS plastic housing. Color as selected by Consultant from manufacturer's full line.
 3. Key Pad: 12 button key pad for entry of Personal Identification Number (PIN) in addition to proximity card.
 4. Display Status: 3 LED status display and controllable beeper to indicate reader operation and status.
 5. Tamper Detection: Mechanical tamper switch to send signal to security room if reader is completely removed from wall in addition to detecting when reader has been separated from its back plate.
 6. Provide all mounting plates, cables, programs and other items required to make card reader work with building security system.



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2.9 OPERATING TRIM

- A. **Standard:** Comply with BHMA A156.6.
- B. Door handles shall have returns in direction of door, straight handles shall not be accepted.
- C. Handles shall be with round (rose) cover plates.
- D. **Materials:** Fabricate from stainless steel, unless otherwise indicated.
- E. **Push-Pull Design:** As indicated on Drawings.

2.10 ACCESSORIES FOR PAIRS OF DOORS

- A. **Standards:** Comply with the following:
 - 1. Coordinators: BHMA A156.3.
- B. **Carry-Open Bars:** Provide carry-open bars for inactive leaves of pairs of doors, unless automatic or self-latching bolts are used.
- C. Do not use security astragals. Use split adjustable astragals or concealed side mounted

2.11 CLOSERS

- A. Closers, General-unless otherwise indicated, provide closers on all fire-rated doors, exterior doors, toilet and locker room doors, sound-retardant doors, corridor doors, doors between heated/cooled and unheated / uncooled areas, elevator equipment room doors, and other door as required. Closer shall be tested for 10 million cycles and will withstand 57 degree ambient temperature and will be provided with all weather hydraulic fluid. Closer will be equipped with the function of variable back check and delayed action. Closer will be provided with ten years warranty and warranty against leaks. Closer will be non banded. Closer will be provided with adjustable with speed and hold open facility. Concealed door closer will be completely and components will minimize tempering and vandalism.
 - 1. **Size of Units:** Unless otherwise indicated, comply with the manufacturer's recommendation for size of door control unit depending on size of door, exposure to weather and drafts, and anticipated frequency of use.
 - 2. **Arms:** Provide parallel arms for all overhead closers, unless otherwise indicated. Provide closer unit one size larger than recommended for use with standard arms.



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3. Closing Cycle: Comply with requirements of authorities having jurisdiction or the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)", whichever are most stringent
 - a. Opening Force: Comply with the following maximum opening-force requirements for locations indicated:
 - 1) Exterior Doors: 67 N.
 - 2) Interior Doors: 22.2N.
 4. Construction: Provide marine-grade construction for closers in non-air conditioned areas and in door swimming pool areas, consisting of nonferrous and stainless steel components.
- B. Aluminum Entrance Doors:** Provide concealed door closer. Standards: Comply with the following:
1. Closers: BHMA A156.4.
 2. Closer Holder Release Devices: BHMA A156.15.
- C. Surface Closers:** BHMA Grade 1.
- D. Concealed Closers:** BHMA Grade 1.
- E. Certified Products:** Provide door closers listed in BHMA's "Directory of Certified Door Closers".
- F. Door Closers on Fire Rated Doors:** Shall be type that closes the door and positively latch the door.
- G. Hold-Open Closers/Detectors:** Coordinate and interface integral smoke detector and closer device with fire alarm system. Fire rated doors with closers of hold open facility shall release automatically in case of fire based on signal from the fire alarm system (electric release door closer). System of release device for double leaf fire rated doors shall be adjustable so as the inactive leaf shall close prior to the active leaf and that active leave shall positively latch to the inactive leaf at final closing position (electric release door closers and door coordinator).
- H. Flush Floor Plates:** Provide finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.
- I. Recessed Floor Plates:** Provide recessed floor plates with insert of floor finish material for floor closers, unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.



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- J. Weather Comply with manufacturer's written recommendation of exposure to weather. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- K. **Grade:** Door closers shall be from types tested for 10 millions cycles of operation and sized for door leafs of minimum weight of 200 kilogram per leaf for both steel doors and external doors.

2.12 PROTECTIVE TRIM UNITS

- A. **Standard:** Comply with BHMA A156.6.
- B. **Materials:** Fabricate protection plates from the following to match requirement indicate:
 - 1. Stainless Steel: beveled top and 2 sides.
- C. **Protection Plates, General:**
 - 1. Fabricate edge trim of stainless steel to fit door thickness in standard lengths or to match height of protection plates.
- D. **Kick Plates:** beveled top and two side edges (B3E). Provide two kick plates for toilet doors. Kick plate will ensure that the door bottom is protected.
 - a. Metal Plates: Stainless steel, 3.00 mm thick
- E. **Armor Plates:** 3 mm thick, 914 mm high by full width of door less clearance for stops on door frame.
- F. **Fasteners:** Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.
- G. Furnish protection plates sized 38 mm less than door width on push side and 13 mm less than door width on pull side, by height specified in Door Hardware Schedule.

2.13 STOPS AND HOLDERS

- A. **Standards:** Comply with the following:
 - 1. Stops and Bumpers: BHMA A156.16.
 - 2. Mechanical Door Holders: BHMA A156.16.
 - 3. Electromagnetic Door Holders: BHMA A156.15.



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4. Combination Overhead Holders and Stops: BHMA A156.8.
5. Door Silencers: BHMA A156.16.
- B. **Stops and Bumpers:** BHMA Grade 1.
- C. **Mechanical Door Holders:** BHMA Grade 1.
- D. **Combination Floor and Wall Stops and Holders:** BHMA Grade 1.
- E. **Combination Overhead Stops and Holders:** BHMA Grade 1.
- F. **Electromagnetic Door Holders for Labeled Fire Door Assemblies:** Coordinate with fire detectors and interface with fire alarm system.
- G. **Floor Stops:** For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
 1. Where floor or wall stops are not appropriate, provide overhead holders.
- H. **Silencers for Wood Door Frames:** BHMA Grade 1; neoprene or rubber, minimum 16 by 19 mm; fabricated for drilled-in application to frame.
- I. **Silencers for Metal Door Frames:** BHMA Grade 1; neoprene or rubber, minimum diameter 13 mm; fabricated for drilled-in application to frame.

2.14 DOOR GASKETING

- A. **Standard:** Comply with BHMA A156.22.
- B. **General:** Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.
 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- C. **Air Leakage:** Not to exceed 0.000774 cu. m/s per m of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.



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- D. **Smoke-Labeled Gasketing:** Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.
- E. **Fire-Labeled Gasketing:** Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252.
- F. **Sound-Rated Gasketing:** Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- G. **Replaceable Seal Strips:** Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- H. **Gasketing Materials:** Comply with ASTM D 2000 and AAMA 701/702.
- I. **Weather-stripping and Seal Types:** Unless otherwise indicated, provide the following, or approved equal:
 - 1. Door Shoes: Extruded aluminum, with vinyl seal and integral rain drip.
 - 2. Rain Drips: Extruded aluminum. Unless noted otherwise, provide rain drips for all exterior doors.
 - 3. Automatic Door Bottoms: Extruded aluminum with neoprene insert for doors to achieve STC of 47 or better, as indicated in the hardware schedule.
 - 4. Meeting Stile Seals (Astragal Seals): Extruded anodized aluminum, with silicon seal.
 - 5. Weather-stripping, Smoke Seals, and Sound Retarding Gaskets: Compression-type self-adhesive silicone gasket applied to door stops, white color.
 - 6. Security Astragals: Cam operated, automatic security astragal.

2.15 THRESHOLDS



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- A. **General:** Unless otherwise indicated, provide standard metal threshold units of type, size, and profile as shown or scheduled. Comply with ANSI/BHMA A156.21.
 1. Material: Extruded aluminum, non-slip finish, except as otherwise specified.
 2. Exterior Hinged Doors: Provide units not less than 100 mm wide, and not more than 12-mm-high, with beveled edges providing a floor level change with a slope of not more than 1:2, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as follows:
 - a. For in-swinging doors provide units with interlocking lip and interior drain channel; include hook on bottom edge of door and drain pan.
 - b. For out-swinging doors provide rabbeted type units with replaceable weather-strip insert in stop. Provide threshold with thermal break when mentioned in the hardware schedule
 - B. **Exterior Thresholds:** ANSI/BHMA A156.21, extruded aluminum. Provide flat saddle type or interlocking type with resilient insert as shown.
 - C. **Threshold for Aluminum Entrance Doors:** Manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than 12-mm-high, with beveled edges providing a floor level change with a slope of not more than 1:2, formed to accommodate change in floor elevation where indicated.
 - D. **Threshold for Doors with Exit Devices:** Extruded aluminum latching type, with replaceable vinyl inserts.
 - E. **Interior Thresholds:** Extruded aluminum flat saddle type with smooth surface.
- 2.16 MISCELLANEOUS DOOR HARDWARE**
- A. **Standard:** Comply with the following:
 1. Auxiliary Hardware: BHMA A156.16.
 2. Exit Alarms: BHMA A156.5.
 - B. **Auxiliary Hardware:** BHMA Grade 1, unless otherwise indicated.
 - C. **Boxed Power Supplies:** Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.



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2.17 FABRICATION

- A. **Manufacturer's Nameplate:** Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Consultant.
 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. **Base Metals:** Produce door hardware units of base metal specified, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. **Fasteners:** Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 1. **Concealed Fasteners:** For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 2. **Steel Machine or Wood Screws:** For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
 3. **Steel Through Bolts:** For the following fire-rated applications, unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.



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4. Spacers: For through bolting of hollow metal doors.
5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.18 BASE METAL

- A. Base Metal for hardware and door furniture shall be as follows:

- 1- Exterior Units: Stainless Steel alloy 316
- 2- Interior Units: Stainless Steel alloy 304

2.19 FINISHES

- A. **Standard:** Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. **Appearance of Finished Work:** Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. **BHMA Designations:** Comply with base material and finish requirements indicated by the following:
1. BHMA 630: Satin stainless steel, over stainless-steel base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Steel Doors and Frames:** Comply with DHI A115 series.



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1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

- B. **Wood Doors:** Comply with DHI A115-W series.

3.3 INSTALLATION

- A. **Mounting Heights:** Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

- C. **Key Control System:** Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

- D. **Thresholds:** Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 ADJUSTING

- A. **Initial Adjustment:** Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 75 mm from the latch, measured to the leading edge of the door.



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- B. **Six-Month Adjustment:** Approximately six months after date of Substantial Completion, Installer shall perform the following:
1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 2. Consult with and instruct Employer's personnel on recommended maintenance procedures.
 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Employer's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

END OF DOCUMENT



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SECTION 33 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Aluminum entrances.
2. Sliding automatic entrances doors.
3. Aluminum windows
4. Structure-Sealant-Glazed curtain walls.
5. Glass visions in doors.

- B. **Related Sections:** The following sections contain requirements that relate to this Section.

Division 5 Section "Metal Fabrications".

1. Division 8 Section "Custom Steel Doors and Frames".
2. Division 8 Section "Aluminum-Framed Entrances and Storefornts".
3. Division 8 Section "Sliding Automatic Entrance Doors".
4. Division 8 Section "Aluminum Windows".
5. Division 8 Section "Mirrored Glass".
6. Division 8 Section "Structure-Sealant-Glazed Curtain Walls".

1.3 DEFINITIONS

- A. **Manufacturer:** Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.



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- B. **Deterioration of Laminated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's directions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.
- C. **Deterioration of Insulating Glass:** Failure of the hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass. Improper practices for maintaining and cleaning glass do not comply with the manufacturer's directions.

1.4 PERFORMANCE REQUIREMENTS

- A. **General:** Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.
- B. **Glass Design:** Glass thicknesses indicated on Drawings shall be considered as the minimum only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
 - 1. Minimum glass thickness, nominally, of lites shall be 6.0 mm.
 - 2. Tinted and heat-absorbing glass thicknesses for each tint indicated shall be the same throughout Project.
 - 3. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, shall be selected so the worst-case probability of failure does not exceed the following:
 - a. Eight lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.



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- b. One lite per 1000 for lites set over 15 degrees off vertical and under action of wind and rain.
- C. **Thermal Movement:** Allow for normal thermal movement resulting from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base Consulting calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 35 deg C ambient; 65 deg C material surfaces.
- D. **Deflection:** Center deflection of loaded glass lites shall not exceed $L/10t$ where L is the short span of the lite in mm and t is the thickness of the monolithic or laminated lite in mm.
- E. **Loads on Glass:**
 - 1. Glass shall be of appropriate thickness to withstand the greater of the following pressures, or combinations thereof, acting normal to the surface without center point deflections in excess of those specified. Load combinations shall be per the specific requirements of the 1997 Uniform Building Code:
 - a. Wind Load: Positive and negative wind load shall be based on the UBC for a basic wind speed of 80 mph (130 km/h), Importance Factor 1.15, and Exposure Category "C".
 - b. Human Impact Loads: Comply with CPSC 16 CFR 1201 Category II in those locations designated as hazardous locations by UBC Section 2406.4.
 - 2. Calculate glass thickness based upon the following minimum safety factors.
 - a. Vertical Glazing:
 - 1) Fully Tempered Glass (Type FT): 1.4.

1.5 SUBMITTALS

- A. **Product Data:** For each glass product and glazing material indicated.
- B. **Samples:** Samples for verification purposes of 300-mm-square samples of each type of glass indicated except for clear monolithic glass products, and 300-mm-long samples of each color required for each type of sealant or gasket exposed to view.



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Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

C. Test Reports:

1. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.
2. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.
3. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

D. Certificates: Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

E. Maintenance Data: For glass and other glazing materials to include in Operating and Maintenance Manual.

F. Consultanting Calculations:

1. Submit Consultanting calculations including glass fabricator/manufacturer's calculations for wind pressure analysis and thermal stress analysis.
2. Consultanting calculations shall be submitted concurrently with the corresponding shop drawings.
3. All calculations shall bear the stamp of a professional Consultant legally authorized to practice in the jurisdiction where Project is located and experienced in providing Consultanting services of the kind indicated.



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1.6 QUALITY ASSURANCE

- A. **Glazing Publications:** Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. AAMA TIR-A7 "Sloped Glazing Guidelines" and "Glass Design for Sloped Glazing".
 2. FGMA "Glazing Manual".
 3. LSGA "Design Guide".
 4. SIGMA TM-3000 "Vertical Glazing Guidelines" and TB-3001 "Sloped Glazing Guidelines".
- B. **Safety Glass:** Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- C. **Insulating Glass Certification Program:** Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of Insulating Glass Certification Council (IGCC).
- D. **Glazier Qualifications:** Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.
- E. **Single-Source Responsibility for Glass:** Obtain glass from one source for each product indicated below:
1. Primary glass of each (ASTM C 1036) type and class indicated.
 2. Heat-treated glass of each (ASTM C 1048) condition indicated.
 3. Laminated glass of each (ASTM C 1172) kind indicated.
 4. Insulating glass of each construction indicated.
- F. **Single-Source Responsibility for Glazing Accessories:** Obtain glazing accessories from one source for each product and installation method indicated.



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- G. **Preconstruction Compatibility and Adhesion Testing:** Submit to sealant manufacturers samples of each glass, gasket, glazing accessory, and glass-framing member that will contact or affect glazing sealants for compatibility and adhesion testing as indicated below:
1. Use test methods standard with sealant manufacturer to determine if priming and other specific preparation techniques are required for rapid, optimum glazing sealants adhesion to glass and glazing channel substrates.
 - a. Perform tests under normal environmental conditions during installation.
 - b. Submit not less than 4 pieces of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, insulating units) for adhesion testing, as well as one sample of each glazing accessory (gaskets, setting, blocks and spacers) for compatibility testing.
 - c. Schedule sufficient time to test and analyze results to prevent delay in the progress of the Work.
 - d. Investigate materials failing compatibility or adhesion tests and obtain sealant manufacturer's written recommendations for corrective measures, including using special primers.
 2. Testing is not required when glazing sealant manufacturer can submit required preparation data that is acceptable to Consultant and is based on previous testing of current sealant products for adhesion to and compatibility with submitted glazing materials.
- H. **Pre-Installation Conference:** Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, and other causes.
1. Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.



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1.8 PROJECT CONDITIONS

- A. **Environmental Conditions:** Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, condensation, or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 4 deg C.

1.9 WARRANTY

General: Warranties specified in this Article shall not deprive the Employer of other rights the Employer may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

- A. **Manufacturer's Warranty on Laminated Glass:** Submit written warranty signed by laminated glass manufacturer agreeing to furnish replacements for laminated glass units that deteriorate as defined in Article 1.2, "Definitions", f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard, but not less than 5 years after date of Substantial Completion.

- B. **Manufacturer's Warranty on Insulating Glass:** Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in Article 1.2, "Definitions", f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard, but not less than 10 years after date of Substantial Completion.



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PART 2 - PRODUCTS

2.1 PRIMARY FLOAT GLASS PRODUCTS

- A. **Float Glass:** ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select).
 - 1. Class 1 (clear), for interior glass unless otherwise indicated.
 - 2. Class 2 (tinted, heat-absorbing, and light-reducing), Arctic-Blue body-tinted.
- B. **Translucent Glass:** Glass that transmits light with varying degrees of diffusion produced by sandblasting of surface of clear float as specified in Sub-Clause A of this Clause so that vision is not clear and light transmittance is lower than clear Glass. Requirements of translucent glass are to be similar to that of ASTM 1036-85, Type 2, Class 1.

2.2 HEAT-TREATED FLOAT GLASS

- A. **Fabrication Process:** By horizontal (roller-hearth) process.
- B. **Clear, Heat-Treated Float Glass:** ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.
 - 1. Kind FT (fully tempered).
 - 2. Fully Tempered: Kind FT (fully tempered, having a minimum surface compression of 110,000 kPa (16,000 psi.).
 - 3. "Roller distortion" and/or "ripples" shall run in the same direction for the entire Project. Glass shall be heat-treated through the use of a horizontal tempering furnace.
- C. **Tinted, Heat-Treated Float Glass:** ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 2 (tinted heat-absorbing and light-reducing), Quality q3 (glazing select), with tint color and performance characteristics for 6.0-mm-thick glass matching those indicated for annealed primary tinted float glass; kind as indicated below:
 - 1. Kind FT (fully tempered) as indicated on Drawings and for the following applications:



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- a. Exterior lites of exterior double insulating glass units.
- b. For low glazing (800mm and below) applications including lites of double insulating glass units. .

2.1 COATED FLOAT GLASS

- A. **General:** Provide coated glass complying with requirements indicated in this Article.
- B. Provide Kind FT (fully tempered) where safety glass is indicated.
- C. **Low-e Coated Float Glass:** Float glass with solar-reflective metallic-oxide coating applied on surface #2 or surface #3 of the double insulating unit. Low-e coating shall be neutral color.

2.3 LAMINATED GLASS

Laminated Glass: Comply with ASTM C 1172, Kind LT (two lites of fully tempered Type 1 glass) and other requirements specified. Refer to primary and heat-treated glass requirements relating to properties of glass products comprising laminated glass products. Unless otherwise indicated, provide the following types of glass:

1. Laminated Glass 8.76 mm Thick Tinted/Clear:
 - a. Outer Lite: Fully tempered, minimum 4.0 mm thick. Provide Arctic-Blue color tinted as selected by Consultant from manufacturer's standard colors to match existing.
 - b. 2x0.38 mm PVB interlayer
 - c. Inner Lite: Clear, fully tempered, minimum 4.0 mm thick.
2. Laminated Glass 13.50 mm Thick Clear/Clear:
 - a. Outer Lite: Fully tempered, minimum 6.0 mm thick.
 - b. 4x0.38 mm PVB interlayer
 - c. Inner Lite: Clear, fully tempered, minimum 6.0 mm thick.
3. Laminated Glass 6.67 mm Thick Clear/Clear:
 - a. Outer Lite: Fully tempered, clear glass minimum 3.0 mm thick.
 - b. 2x0.38 mm PVB interlayer
 - c. Inner Lite: Clear, fully tempered, minimum 3.0 mm thick.



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- B. **Interlayer:** Interlayer material as indicated below, and of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
1. Interlayer Material: Polyvinyl Butyral (PVB) sheets, clear, minimum thickness as indicated before.
- C. **Laminating Process:** Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:
1. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.

2.4 INSULATING GLASS PRODUCTS

- A. **Sealed Insulating Glass Units:** Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated. Provide dual-seal sealing system, spacer material, dessicant, and corner construction as recommended by manufacturer, if not specified here after:
1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
 2. Construction of double insulating glass units Types G1 shall be as follows, unless otherwise indicated as Drawings.
 - a. Outerboard lite: 8.76 mm thick laminated glass of Arctic-Blue tinted\clear construction as specified.
 - b. Air space: 19 mm thick. Provide stainless steel spacers and silica gel granules.
 - c. Innerboard lite: 6.00 mm clear tempered glass. Interior lite shall be fully tempered safety glass for locations designated as hazardous locations in UBC section 2604.4 and for sill glazing (below 800 mm and below from adjoining floor level).
 3. Performance Characteristics of Insulating Units shall be as follows:
 - a. Transmittance, Visible Light: 20 percent.
 - b. U-Value, Summer Daytime: 1.4 W/sq. m x Deg. C., maximum



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- c. Shading Coefficient: 0.21, maximum
 - d. STC: 42 db.
- B. Double Insulating Units Type GL2:
- 1. Panel Make-Up:
 - a. Outer Lite: 6.00 mm thick fully tempered of Arcatic-blue glass.
 - b. Inter Space: 12.00 or 13.00 mm dehydrated air space.
 - c. Inner Lite: 6.00 mm clear float glass. Interior lite shall be fully tempered safety glass for locations designated as hazardous locations in UBC section 2604.4 and for sill glazing (below 900 mm and below from adjoining floor level).
 - d. Low-e Coating: Neutral low-e coating as specified on surface #2 or #3.
 - e. Spacer:
 - Material: Stainless steel.
 - Desiccant: Molecular sieve or silica gel, or blend of both.
 - Corner Construction: Manufacturer's standard corner construction.
 - Seals: Two-layer manufacturer's standard seal system.
 - 2. Thermal Performance:

Shading Coefficient:	0.23 maximum.
a. U-Value (Summer):	1.90 W/m ² .k, maximum
b. Relative Heat Gain:	160 W/m ² , maximum
 - 3. Visible Light Performance

a. Light Transmittance:	21%, minimum.
b. Light Reflection (External):	19%, maximum.
c. Light Reflectance (Internal):	9%, maximum
 - 4. Acoustical Performance:

a. STC:	35
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2.5 FIRE-RATED GLAZING PRODUCTS

- A. **Laminated Glass with Intumescent Interlayers:** Proprietary product in the form of multiple lites of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), annealed float glass laminated with intumescent interlayers; and as follows:
1. Fire-Protection Rating: As indicated for the assembly in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to the Consultant.

2.6 FRAMELESS GLASS (ALL-GLASS) PARTITIONS

- A. **Glass:** 12 mm thick fully tempered safety glass lites.
- B. **Dimensions:** Comply with details indicated on Drawings.
- C. **Edge Treatment:** Polished.
- D. **Assembly Angles:** Stainless steel
- E. **Fixation Systems:** Manufacturer's standard that comply with details indicated on Drawings and general requirements specified in Division 5, Section "Metal Fabrication" for materials and workmanship
- F. **Base Covers:** Stainless steel base covers as specified in Division 5, Section "Formed Metal Fabrications"
- G. **Fasteners and Anchors:** Stainless steel matching finish where exposed to view, zinc-plated steel where concealed
- H. **Miscellaneous Materials:** Furnish complete with all necessary materials for fixing in place.
- I. **Stainless Steel Components:** Alloy 304, satin finish.

2.7 ELASTOMERIC GLAZING SEALANTS

- A. **General:** Provide products of type indicated, complying with the following requirements:
1. **Compatibility:** Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.



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2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 3. Colors: Provide colors of exposed joint sealants as selected by Consultant from manufacturer's full range of standard colors for products of type indicated.
- B. **Elastomeric Glazing Sealant Standard:** Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements for Type, Grade, Class and Uses.

2.8 GLAZING TAPES

- A. **Back-Bedding Mastic Glazing Tape:** Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
1. AAMA 804.1.
 2. AAMA 806.1.
 3. AAMA 807.1.
- B. **Expanded Cellular Glazing Tape:** Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for Product 810.5.

2.9 GLAZING GASKETS

- A. **Dense Compression Gaskets:** Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. EPDM, ASTM C 864.
- B. **Soft Compression Gaskets:** Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
1. EPDM.



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2.10 MISCELLANEOUS GLAZING MATERIALS

- A. **General:** Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. **Cleaners, Primers and Sealers:** Type recommended by sealant or gasket manufacturer.
- C. **Setting Blocks:** Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. **Spacers:** Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. **Edge Blocks:** Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
- F. **Plastic Foam Joint Fillers:** Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.
- G. **Perimeter Insulation for Fire-Resistive Glazing:** Identical to product used in test assembly to obtain fire-resistive rating.

2.11 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standards as required to comply with specified performance requirements.
- B. Glass Edges:
 - 1. Exposed edges shall be ground and polished.
 - 2. Butt glass edges shall be ground and polished.
 - 3. All other edges shall have a high-quality factory-cut edge.



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2.12 SPANDREL PANEL

- A. **Spandrel Panels:** Are to comply with the following requirements and details indicated on Drawings
1. Box encasement: aluminum sheets of mill finish, 2.00 mm thick minimum.
 2. Insulation: Foil-faced mineral fiber insulation as specified in Division 7, Section "Building Insulation".
 3. Glass: To match outer lite of adjoining double insulating glass units as indicated on Drawings and specified with opicifier film on surface #2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 2. Presence and functioning of weep system.
 3. Minimum required face or edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions where indicated on Drawings provide minimum necessary bite on glass, minimum edge and face clearances, and adequate



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sealant thicknesses, with reasonable tolerances. Adjust as required by referenced standards and Project conditions during installation.

- C. Protect glass from edge damage during handling and installation as follows:
 1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
 2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with surface or edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass sizes larger than 1270 united mm (length plus height) as follows:
 1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with specified performance requirements.
 2. Provide 3-mm minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.



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- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- L. Any glass lites installed within 900 mm from adjoining finish floor level (sill glazing) shall be marked as safety in compliance with standard referenced in this Section.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each lite is installed.
- F. Where required, apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Where required, apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.



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- B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- C. Install gaskets so they protrude from face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.7 GLASS PARTITIONS

- A. Fix partitions firm in place indicated on Drawings at lines indicated, perfectly plumb without deviations from horizontal or vertical lines. Provide firm connections between glass lites of partitions and glass fins. All bolts and anchors shall be tightly screwed without overstressing glass. Use concealed EPDM washers and shims as required and comply with manufacturer's instructions.

3.8 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.



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- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass using materials and methods recommended by glass manufacturer.

END OF DOCUMENTS



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PORTLAND CEMENT PLASTER

SECTION 34 – PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Portland cement plaster.
 - 2. Metal Lath suspended ceiling.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Rough Carpentry".
 - 2. Division 9 Section "Ceramic Tiles" for plaster base coat to be applied to receive ceramic wall tiles.

1.1 SUBMITTALS

- A. **Product Data:** For each product specified.
- B. **Samples for Initial Selection:** manufacturer's color charts consisting of actual units or sections of units at least 300 mm square showing the full range of colors, textures, and patterns available for each type of finish indicated.
 - 1. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
 - 2. Include similar Samples of material for joints and accessories involving color selection.
- C. **Shop Drawings:** Submit shop drawings for suspended metal lath ceilings including layout and details of ceilings installation
- D. **Material Certificates:** certificate signed by manufacturer for each kind of plaster aggregate certifying that materials comply with requirements.



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1.1 QUALITY ASSURANCE

- A. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Consultant and the Employer.
- B. **Mockups:** Prior to installing plaster work, construct panels for each type of finish and application required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
 - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Consultant.
 - 2. Erect mockups 1200 by 1200 mm by full thickness in presence of Consultant using materials, including lath, support system, and control joints, indicated for final Work.
 - 3. Notify Consultant 7 days in advance of the dates and times when mockups will be constructed.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Consultant's approval of mockups before start of plaster Work.
 - 6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Portland cement plaster Work.
 - 7. When directed demolish mockups, remove rubbles from site and replace with permanent works.

1.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.
- B. Store materials indoor, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.



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1.1 PROJECT CONDITIONS

- A. **Environmental Requirements, General:** Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.
- B. **Warm-Weather Requirements:** Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.
- C. **Exterior Plaster Work:** Do not apply plaster when ambient temperature is below 4 deg C.
- D. **Interior Plaster Work:** Maintain at least 10 deg C temperature in areas to be plastered for at least 48 hours before, during, and after application.
- E. **Ventilation:** Provide natural or mechanical means of ventilation to properly dry interior spaces after Portland cement plaster has cured.
- F. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 - PRODUCTS

2.1 METAL SUPPORTS FOR SUSPENDED CEILINGS

- A. **General:** Size metal ceiling supports to comply with ASTM C 1063, unless otherwise indicated.
- B. **Postinstalled Anchors in Concrete:** Anchors of type indicated below, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires; and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing according to ASTM E 488 conducted by a qualified independent testing agency.
 - 1. Chemical anchor.
- C. **Wire for Hangers and Ties:** ASTM A 641M, Class 1 zinc coating, soft temper.
- D. **Rod Hangers:** Mild steel, zinc coated.



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- E. **Flat Hangers:** Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. **Channels:** Cold-rolled steel, minimum 1.5-mm- thick base (uncoated) metal and 11.1-mm- wide flanges, and as follows:
 - 1. Carrying Channels: Based on design calculations but not less than 38 mm deep, 0.7 kg/m.
- G. **Finish:** ASTM A 653M, Z180 hot-dip galvanized coating for framing where indicated.

2.1 LATH

- A. **Expanded-Metal Lath:** Comply with ASTM C 847 for material, type, configuration, and other characteristics indicated below.
 - 1. Material: Fabricate expanded-metal lath from sheet metal conforming to the following:
 - a. Galvanized Steel: Structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653M, Z275 minimum coating designation, unless otherwise indicated.
 - b. Form: Coil.
 - c. Special Pieces: For internal corners.
 - 2. Diamond-Mesh Lath for Plaster Background: Comply with the following requirements:
 - a. Configuration: Flat.
 - 1) i. Weight: 1.1 kg/sq. m.
 - 3. Rib Lath for Suspended Ceilings: Comply with the following requirements:
 - a. Configuration: Flat, rib depth of not over 3 mm.
 - 1) Weight: 1.8 kg/sq. m.



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2.1 ACCESSORIES

- A. **General:** Comply with material provisions of ASTM C 1063 and the requirements indicated below; coordinate depth of accessories with thicknesses and number of plaster coats required.
 - 1. **Galvanized Steel Components (for internal plaster):** Fabricated from zinc-coated (galvanized) steel sheet complying with ASTM A 653M, Z90 minimum coating designation.
- B. **Metal Corner Reinforcement:** Expanded, large-mesh, diamond-metal lath fabricated from zinc-alloy or welded-wire mesh fabricated from 1.2-mm- diameter, zinc-coated (galvanized) wire and specially formed to reinforce external corners of

Portland cement plaster on exterior exposures while allowing full plaster encasement.
- C. **Cornerbeads:** Small nose cornerbeads fabricated from the following metal, with expanded flanges of large-mesh diamond-metal lath allowing full plaster encasement.
- D. **Casing Beads:** Square-edged style, with expanded flanges.
- E. **Curved Casing Beads:** Square-edged style, fabricated from aluminum coated with clear plastic, preformed into curve of radius indicated.
- F. **Control Joints:** Prefabricated, of material and type indicated below:
 - 1. **One-Piece Type:** Folded pair of nonperforated screeds in M-shaped configuration, with expanded or perforated flanges.
 - 2. **Two-Piece Type:** Pair of casing beads with back flanges formed to provide slip-joint action, adjustable for joint widths from 3 to 16 mm.
 - a. Provide removable protective tape on plaster face of control joints.
- G. **Foundation Sill (Weep) Screed:** Manufacturer's standard profile designed for use at sill plate line to form plaster stop and prevent plaster from contacting damp earth, fabricated from zinc-coated (galvanized) steel sheet.
- H. **Lath Attachment Devices:** Material and type required by ASTM C 1063 for installations indicated.



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2.1 PLASTER MATERIALS

- A. **Base-Coat Cements:** Type as indicated below:
 - 1. Portland cement, ASTM C 150, Type I.
- B. **Job-Mixed Finish-Coat Cement:** Material and color as indicated below:
 - 1. Portland cement: sand aerated mix
- C. **Cement Color:** Gray.
- D. **Lime:** do not use lime.
- E. **Plasticiser:** ASTM C260.
- F. **Sand Aggregate for Base Coats:** ASTM C 897.
- G. **Aggregate for Finish Coats:** ASTM C 897 system and as indicated below:
 - 1. Manufactured or natural sand, White in color.

2.1 MISCELLANEOUS MATERIALS

- A. **Fiber for Base Coat:** Alkaline-resistant glass or polypropylene fibers, 13 mm long, free of contaminants, manufactured for use in Portland cement plaster.
- B. **Water for Mixing and Finishing Plaster:** Potable.
- C. **Acid-Etching Solution:** Muriatic acid (10 percent solution of commercial hydrochloric acid) mixed 1 part to not less than 6 nor more than 10 parts water.
- D. **Dash-Coat Material:** 2 parts Portland cement to 3 parts fine sand, mixed with water to a mushy-paste consistency.

2.1 PLASTER MIXES AND COMPOSITIONS

- A. **General:** Comply with ASTM C 926 for base- and finish-coat mixes as applicable to plaster bases, materials, and other requirements indicated. Do not use lime in plaster mixes.
- B. **Base-Coat Mixes and Compositions:** Proportion materials for respective base coats in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster



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base indicated. Adjust mix proportions below within limits specified to attain workability.

- C. **Fiber Content:** Add fiber to following mixes after ingredients have mixed at least 2 minutes. Comply with fiber manufacturer's written instructions but do not exceed 16 kg/cu. m of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.
- D. **Three-Coat Work over Metal Lath:** Base-coat proportions as indicated below:
 - 1. Scratch Coat: 1 part Portland cement, 2-1/2 to 4 parts aggregate.
 - 2. Brown Coat: 1 part Portland cement, 3 to 5 parts aggregate.
 - 3. Admixtures and workability aids, as per manufacturer's printed instructions
- E. **Two-Coat Work over Concrete and Concrete Unit Masonry:** Base-coat proportions as indicated below:
 - 1. Base Coat: 1 part Portland cement, 5 parts aggregate, aerating plasticiser as per manufacturer's recommendation.
- F. **Job-Mixed Finish Coats:** Proportion materials for finish coats in parts by volume for cementitious materials and parts by volume per sum of cementitious materials to comply with the following requirements:
 - 1. Proportions using sand aggregates as indicated below:
 - a. 1 part Portland cement, 4 parts aggregate, aerating plasticiser as per manufacturer's recommendation.

2.1 MIXING

- A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION OF CEILING SUSPENSION SYSTEMS

- A. **Preparation and Coordination:** Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure inserts and other structural anchorage provisions have been installed to receive ceiling hangers in a manner that will develop their full strength and at spacings required to support ceiling.



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- B. **Hanger Installation:** Attach hangers to structure above ceiling to comply with ML/SFA 920, "Guide Specifications for Metal Lathing and Furring," and with referenced standards.
- C. Install ceiling suspension system components of sizes and spacings indicated, but not in smaller sizes or greater spacings than those required by referenced lathing and furring installation standards.
 - 1. Wire Hangers: Space 4-mm- diameter wire hangers not over 1200 mm o.c., parallel with and not over 900 mm perpendicular to direction of carrying channels, unless otherwise indicated, and within 150 mm of carrying channel ends.
 - 2. Carrying Channels: Space carrying channels not over 900 mm o.c. with 1200-mm o.c. hanger spacing.
 - 3. Furring Channels to Receive Metal Lath: Space furring channels not over 500 mm o.c. for 1.8-kg/sq. m flat rib lath.

3.1 PREPARATIONS FOR PLASTERING

- A. Clean plaster bases and substrates for direct application of plaster, removing loose material and substances that may impair the Work.
- B. Etch concrete and concrete unit masonry surfaces indicated for direct plaster application. Scrub with acid-etching solution on previously wetted surface and rinse thoroughly with clean water. Repeat application, if necessary, to obtain adequate suction and mechanical bond of plaster (where dash coat, bonding agent, or additive is not used).
- C. **Dissimilar Backgrounds:** where rendering is to be continued without break across joints between dissimilar solid backgrounds which are in the same plane and rigidly bonded or tied together, cover joints with 150mm wide strip of building paper overlaid with 300mm wide galvanized steel lathing fixed with corrosion resistant fasteners at not more than 600mm centers along both edges.
- D. Apply dash coat on concrete and concrete masonry surfaces indicated for direct plaster application. Moist-cure dash coat for at least 24 hours after application and before plastering.
- E. Install temporary grounds and screeds to ensure accurate rodding of plaster to true surfaces; coordinate with scratch-coat work.
- F. Refer to Division 6 Sections for installing permanent wood grounds, if any.



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- G. **Surface Conditioning:** Immediately before plastering, dampen concrete and concrete unit masonry surfaces that are indicated for direct plaster application. Determine and apply amount of moisture and degree of saturation that will result in optimum suction for plastering.

3.1 LATHING

- A. Install metal lath for the following applications where plaster base coats are required. Provide appropriate type, configuration, and weight of metal lath selected from materials indicated that comply with referenced ML/SFA specifications and ASTM lathing installation standards.
1. Dissimilar Backgrounds: where rendering is to be continued without break across joints between dissimilar solid backgrounds which are in the same plane and rigidly bonded or tied together, cover joints with 150 mm wide strip of building paper overlaid with 300 mm wide galvanized steel lathing fixed at not more than 600 mm centers along both edges.

3.1 INSTALLATION OF PLASTERING ACCESSORIES

- A. **General:** Comply with referenced lathing and furring installation standards for provision and location of plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and in alignment during plastering. Install accessories of type indicated at following locations:
1. External Corners: Install corner reinforcement at external corners.
 2. Terminations of Plaster: Install casing beads, unless otherwise indicated.
 3. Control Joints: Install at locations indicated or, if not indicated, at locations complying with the following criteria and approved by Consultant:
 - a. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane.
 - b. Distance between Control Joints: Not to exceed 5.5 m in either direction or a length-to-width ratio of 2-1/2 to 1.
 - c. Wall Areas: Not more than 13 sq. m.
 - d. Horizontal Surfaces: Not more than 9 sq. m in area.
 - e. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.



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3.1 PLASTER APPLICATION

- A. **Plaster Application Standard:** Apply plaster materials, composition, and mixes to comply with ASTM C 926.
- B. Do not use materials that are frozen, caked, lumpy, dirty, or contaminated by foreign materials.
- C. Do not use excessive water in mixing and applying plaster materials.
- D. **Flat Surface Tolerances:** Do not deviate more than plus or minus 3 mm in 3 m from a true plane in finished plaster surfaces, as measured by a 3-m straightedge placed at any location on surface.
- E. Grout hollow-metal frames, bases, and similar work occurring in plastered areas, with base-coat plaster material, and before lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least 150 mm at each jamb anchor.
- F. Sequence plaster application with installation and protection of other work so that neither will be damaged by installation of other.
- G. Plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where interior plaster is not terminated at metal frame by casing beads, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
- H. **Corners:** Make internal corners and angles square; finish external corners flush with corner beads on interior work, square and true with plaster faces on exterior work.
- I. **Finish Coats:** Apply finish coats to comply with the following requirements:
 1. Float Finish: Apply finish coat to a minimum thickness of 3 mm to completely cover base coat, uniformly floated to a true even plane with fine-textured finish matching samples approved by the Consultant.
- J. **Number of Coats and Thickness:** Excluding dash coats and dubbing out coats apply plaster of composition indicated, to comply with the following requirements:
 1. Two Coats: Base and finish coats over the following plaster bases:
 - a. Concrete unit masonry.
 - b. Concrete, cast-in-place or precast when surface condition complies with ASTM C 926 for plaster bonded to solid base.



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2. Three Coats: Scratch, base and finish coats over metal lath backgrounds and installations.
 3. Overall thickness is to be 15.00 mm for internal plaster and 20.00 mm for external plaster.
 4. One plaster base coat (15 mm thick) for walls to be finished with ceramic tiles set with thin bed adhesive.
 5. One coat work (15 mm thick) for plaster on concrete structural slabs uniformly floated to a true even plane
- K. Moist-cure plaster base and finish coats to comply with ASTM C 926, including written instructions for time between coats and curing in "Annex A2 Design Considerations."

3.1 CUTTING AND PATCHING

- A. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

3.1 CLEANING AND PROTECTING

- A. Remove temporary covering and other provisions made to minimize spattering of plaster on other work. Promptly remove plaster from doorframes, windows, and other surfaces not to be plastered. Repair surfaces stained, marred or otherwise damaged during plastering work. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.
- B. Provide final protection and maintain conditions, in a manner acceptable to Consultant, that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

END OF DOCUMENTS



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MARBLE AND GRANITE

SECTION 38 - MARBLE AND GRANITE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes the following:

1. Porcelain Tiles.

- B. Related Sections include the following:

1. Division 3 Section "Cement Based Screeds" for floor screeds to receive ceramic tiles.
2. Division 5 Section "Architectural Joint Systems" for movement joints in ceramic flooring.
3. Division 7 Section "Cold Fluid-Applied Waterproofing" for waterproofing under thickset mortar beds.
4. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
5. Division 9 Section "Portland Cement Plaster" for Portland cement scratch coat over metal lath on wall surfaces.

1.3 DEFINITIONS

- A. **Module Size:** Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. **Facial Dimension:** Actual tile size (minor facial dimension as measured per ASTM C 499).
- C. **Facial Dimension:** Nominal tile size as defined in ANSI A137.1.



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1.4 PERFORMANCE REQUIREMENTS

- A. **Static Coefficient of Friction:** For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
1. Level Surfaces: Minimum 0.6.
- B. **Load-Bearing Performance:** Provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
1. Heavy: Passes cycles 1 through 12. Use where indicated in Finishing Schedules.
 2. Moderate: Passes cycles 1 through 10. Use for other applications indicated on Schedule where heavy duty is not indicated.

1.5 SUBMITTALS

- A. **Product Data:** For each type of tile, mortar, grout, and other products specified.
- B. **Shop Drawings:** For the following:
1. Tile patterns and locations.
 2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
 3. Locate precisely each joint and crack in tile substrates, record measurements on shop drawings, and coordinate them with tile joint locations, as approved by Consultant.
- C. **Tile Samples for Initial Selection:** Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
- D. **Grout Samples for Initial Selection:** Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.
- E. **Samples for Verification:** Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.



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1. Each type and composition of tile and for each color and texture required, at least 400 mm square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Consultant.
 2. Full-size units of each type of trim and accessory for each color required.
 3. Stone thresholds in 150-mm lengths.
- F. **Master Grade Certificates:** For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- G. **Product Certificates:** Signed by manufacturers certifying that the products furnished comply with requirements.
- H. **Installer Experience:** List of five projects (minimum) of a similar nature carried out successfully by the installer with the same product.
- I. **Installer Experience:** List of five projects (minimum) of a similar nature carried out successfully by the installer with the same product Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of Consultants and Employers, and other any information required by Consultant.
- J. **Test Reports:** Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile and tile setting and grouting products with requirements indicated.
- K. **Setting Material Test Reports:** Indicate and interpret test results for compliance of tile-setting and -grouting products with specified requirements.

1.6 QUALITY ASSURANCE

- A. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Consultant and the Employer.
- B. **Installer Qualifications:** Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. **Source Limitations for Tile:** Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.



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- D. **Source Limitations for Setting and Grouting Materials:** Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- E. **Source Limitations for Other Products:** Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
1. Stone thresholds.
 2. Cementitious backer units.
 3. Joint sealants.
 4. Waterproofing.
- F. **Mockups:** Before installing tile, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Consultant.
 2. Notify Consultant 7 days in advance of the dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Consultant's approval of mockups before proceeding with final unit of Work.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Approved mockups in an undisturbed condition as judged solely by the Consultant at the time of Substantial Completion may become part of the completed Work, otherwise demolish mockups, remove rubbles from site and install permanent works.
- G. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.



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- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Employer. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
 2. Retain below with appropriate definitions in referenced part 1 article.
 3. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
 4. Tiles are to be highest grade of production in manufacturer's quality grading system.
- B. **ANSI Standards for Tile Installation Materials:** Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. **Colors, Textures, and Patterns:** Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. Provide Consultant's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.



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- D. **Factory Blending:** For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.
- E. **Mounting:** Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
- F. **Factory-Applied Temporary Protective Coating:** Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. **General Characteristics:** Tiles are to comply with the following general requirements:
 - 1. Floor Tiles:
 - a. Abrasive Hardness: Minimum Index 253 to ASTM C 501 (unglazed tiles), unless otherwise specified.
 - b. Bending Strength: Minimum 35 Kg/cm² to ASTM C 648
 - c. Water Absorption: As specified.
 - d. Chemical Resistance: Unaffected with moderate acids.
 - e. Tile Rating: For heavy duty floor by a rating system acceptable to the Consultant.
 - 2. Wall Tiles:
 - a. Water Absorption: Maximum 6% to ASTM C 373.
- B. **Unglazed Paver Tile:** Provide flat tile complying with the following requirements:
 - 1. Composition: Porcelain mix.
 - 2. Constriction: Color-through.
 - 3. Water Absorption: Less than 0.5% to ASTM C 373.
 - 4. Surface Finish: Matt or Polished as indicated on Drawings.



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5. Facial Dimensions: As indicated on Drawings.
 6. Thickness: minimum 9.0 mm for tiles and 8.50 mm for fittings.
 7. Face: Plain with Square or cushion edges.
- B. Wall Tile:** Provide flat tile complying with the following requirements:
1. Module Size: As indicated on Drawings.
 2. Water Absorption: Less than 6% to ASTM C373.
 3. Thickness: minimum 20 mm.
 4. Face: Plain with modified square edges or cushion edges.
- C. Trim Units:** Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
 2. Shapes: As follows, selected from manufacturer's standard shapes:
 - a. Base for Portland Cement Mortar Installations: Coved.
 - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bull-nose.
 - c. External Corners for Thin-Set Mortar Installations: Surface bull-nose.
 - d. Internal Corners: Field-butt square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.
- D. Tiles Thickness of Tiles:** Specified thickness of tiles exclude thickness of keying patterns on back.
- Background/Base: 15mm thick 1:4 cement/sand render on concrete or concrete block works
- Bedding: Thin cement based adhesive to be approved
- Grouting material: Epoxy grout Nitotile 489 as supplied by Fosroc or equal approved to be used in accordance with manufacturer recommendations. Colour to architects approval.
- Movement joints: All internal corners; Width: 6mm
- Accessories: all exposed edges and corners to have preformed rounded edges



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2.3 PORCELIN WALL TILING

Background/Base: 15mm thick 1:4 cement/sand render on concrete or concrete block works.

Bedding: Thin bed cement based adhesive. Adhesive: to be approved

Grouting material: Epoxy grout Nitotile 489 as supplied by Fosroc or equal approved to be used in accordance with manufacturer recommendations. Colour to architects approval.

Joint width: 3mm. Movement joints: Location: All internal corners; Width: 6mm

Accessories: all exposed edges and corners to have preformed rounded edges In toilets, no tiles behind low level ducts or full height ducts. Complete tiling should be done behind mirrors. In pantry, tiles are to be fixed behind base and wall units but not behind service duct panels. Plaster only where no tiles.

2.02 FLOOR TILING

Background/Base: screed 1 in-situ concrete

Screed: 11.5:3 cement/sand/aggregate semi-dry screed laid to falls and towards floor

drain outlets, overall thickness of flooring to be 75mm

Bedding: Waterproof adhesive on cement 1 sand bed

Adhesive: to be approved

Waterproofing: 2 coats Fosroc Nitoproof 10, or equal, to B.S. Standard. laid to

manufacturer's recommendations, with necessary accessories

Grouting material: Epoxy grout Nitotile 489 as supplied by Fosroc or equal approved to be used in accordance with manufacturer recommendations. Colour to architects approval

Joint width: 2.5mm.

Movement joints: location: At all perimeters including door thresholds; Width: 6mm



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- Accessories:

Skirting: Coved skirting tiles, 100mm high to match ceramic floor tiles, set flush with render, to be fixed on plastered walls, grouted with epoxy grout Nitotile 489 as supplied by Fosroc or equal approved, applied in accordance with manufacturer's recommendations.

2.03 CETAMIC FLOOR TILING TO HALL AREA

Type/Size: Vitritied matt finish floor files 400mmx400mm as manufactured by GRANITS or equivalent. Tiles to be beige colour as per approved sample and to

Carrefour standard requirements. Tile size tolerance to be not greater than + or – 0.25mm in any side.

Background/Base: screed on in-situ concrete.

Screed: Quick curing proprietary wet mix sand/cement screed, such as *Isocrete Heavy Duty K'Screed' laid in panels (maximum area 90m²) and as per manufacturer's recommendations. **Note:** semi-dry screed will not be permitted in these areas.

Adhesive and grout: Adhesive shall be Laticrete 325 or equivalent. Application strictly in accordance with manufacturer's instruction. Grout shall be epoxy Laticrete or equivalent. Colour to Architect approval.

Joint width: 3mm

2.04 GROUTING MATERIALS

- A. **Sand-Portland Cement Grout:** ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. **Chemical-Resistant Epoxy Grout:** ANSI A 118.3, color as indicated.
 1. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 60 deg C and 100 deg C, respectively, as certified by mortar manufacturer for intended use.
- C. **Grout Colors:** Provide colors as selected by the Consultant from manufacturer's full range of standard and custom colors. Finish shall be smooth, unless otherwise specified or directed by the Consultant.



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2.05 ELASTOMERIC SEALANTS

- A. **General:** Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
- B. **Colors:** Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.06 MISCELLANEOUS MATERIALS

- A. **Trowelable Underlayments and Patching Compounds:** Latex-modified, Portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. **Temporary Protective Coating:** Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 49 to 60 deg C per ASTM D 87.
- C. **Tile Cleaner:** A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.07 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.

END OF DOCUMENTS



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PORCELIN TILES

SECTION 38 - PORCELIN TILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes the following:

1. Porcelin Tiles.

- B. Related Sections include the following:

1. Division 3 Section "Cement Based Screeds" for floor screeds to receive ceramic tiles.
2. Division 5 Section "Architectural Joint Systems" for movement joints in ceramic flooring.
3. Division 7 Section "Cold Fluid-Applied Waterproofing" for waterproofing under thickset mortar beds.
4. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
5. Division 9 Section "Portland Cement Plaster" for Portland cement scratch coat over metal lath on wall surfaces.

1.3 DEFINITIONS

- A. **Module Size:** Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. **Facial Dimension:** Actual tile size (minor facial dimension as measured per ASTM C 499).
- C. **Facial Dimension:** Nominal tile size as defined in ANSI A137.1.



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PORCELIN TILES

1.4 PERFORMANCE REQUIREMENTS

- A. **Static Coefficient of Friction:** For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
1. Level Surfaces: Minimum 0.6.
- B. **Load-Bearing Performance:** Provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
1. Heavy: Passes cycles 1 through 12. Use where indicated in Finishing Schedules.
 2. Moderate: Passes cycles 1 through 10. Use for other applications indicated on Schedule where heavy duty is not indicated.

1.5 SUBMITTALS

- A. **Product Data:** For each type of tile, mortar, grout, and other products specified.
- B. **Shop Drawings:** For the following:
1. Tile patterns and locations.
 2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
 3. Locate precisely each joint and crack in tile substrates, record measurements on shop drawings, and coordinate them with tile joint locations, as approved by Consultant.
- C. **Tile Samples for Initial Selection:** Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
- D. **Grout Samples for Initial Selection:** Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.
- E. **Samples for Verification:** Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.



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1. Each type and composition of tile and for each color and texture required, at least 400 mm square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Consultant.
 2. Full-size units of each type of trim and accessory for each color required.
 3. Stone thresholds in 150-mm lengths.
- F. **Master Grade Certificates:** For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- G. **Product Certificates:** Signed by manufacturers certifying that the products furnished comply with requirements.
- H. **Installer Experience:** List of five projects (minimum) of a similar nature carried out successfully by the installer with the same product.
- I. **Installer Experience:** List of five projects (minimum) of a similar nature carried out successfully by the installer with the same product Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of Consultants and Employers, and other any information required by Consultant.
- J. **Test Reports:** Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile and tile setting and grouting products with requirements indicated.
- K. **Setting Material Test Reports:** Indicate and interpret test results for compliance of tile-setting and -grouting products with specified requirements.

1.6 QUALITY ASSURANCE

- A. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Consultant and the Employer.
- B. **Installer Qualifications:** Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- C. **Source Limitations for Tile:** Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.



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- D. **Source Limitations for Setting and Grouting Materials:** Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- E. **Source Limitations for Other Products:** Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
1. Stone thresholds.
 2. Cementitious backer units.
 3. Joint sealants.
 4. Waterproofing.
- F. **Mockups:** Before installing tile, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Consultant.
 2. Notify Consultant 7 days in advance of the dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Consultant's approval of mockups before proceeding with final unit of Work.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Approved mockups in an undisturbed condition as judged solely by the Consultant at the time of Substantial Completion may become part of the completed Work, otherwise demolish mockups, remove rubbles from site and install permanent works.
- G. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination."



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PORCELIN TILES

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Employer. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
- 2. Retain below with appropriate definitions in referenced part 1 article.
- 3. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- 4. Tiles are to be highest grade of production in manufacturer's quality grading system.



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- B. **ANSI Standards for Tile Installation Materials:** Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. **Colors, Textures, and Patterns:** Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 - 1. Provide Consultant's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
- D. **Factory Blending:** For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.
- E. **Mounting:** Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
- F. **Factory-Applied Temporary Protective Coating:** Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. **General Characteristics:** Tiles are to comply with the following general requirements:
 - 1. Floor Tiles:
 - a. Abrasive Hardness: Minimum Index 253 to ASTM C 501 (unglazed tiles), unless otherwise specified.
 - b. Bending Strength: Minimum 35 Kg/cm² to ASTM C 648
 - c. Water Absorption: As specified.
 - d. Chemical Resistance: Unaffected with moderate acids.
 - e. Tile Rating: For heavy duty floor by a rating system acceptable to the Consultant.
 - 2. Wall Tiles:



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- a. Water Absorption: Maximum 6% to ASTM C 373.
- B. Unglazed Paver Tile:** Provide flat tile complying With the following requirements:
1. Composition: Porcelain mix.
 2. Constriction: Color-through.
 3. Water Absorption: Less than 0.5% to ASTM C 373.
 4. Surface Finish: Matt or Polished as indicated on Drawings.
 5. Facial Dimensions: As indicated on Drawings.
 6. Thickness: minimum 9.0 mm for tiles and 8.50 mm for fittings.
 7. Face: Plain with Square or cushion edges.
- B. Wall Tile:** Provide flat tile complying with the following requirements:
1. Module Size: As indicated on Drawings.
 2. Water Absorption: Less than 6% to ASTM C373.
 3. Thickness: minimum 8.0 mm.
 4. Face: Plain with modified square edges or cushion edges.
- C. Trim Units:** Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
 2. Shapes: As follows, selected from manufacturer's standard shapes:
 - a. Base for Portland Cement Mortar Installations: Coved.
 - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bull nose.
 - c. External Corners for Thin-Set Mortar Installations: Surface bull nose.
 - d. Internal Corners: Field-buttet square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.



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PORCELIN TILES

- D. **Thickness of Tiles:** Specified thickness of tiles exclude thickness of keying patterns on back.

Background/Base: 15mm thick 1:4 cement/sand render on concrete or concrete block works

Bedding: Thin cement based adhesive to be approved

Grouting material: Epoxy grout Nitotile 489 as supplied by Fosroc or equal approved to be used in accordance with manufacturer recommendations. Colour to architects approval.

Movement joints: All internal corners; Width: 6mm

Accessories: all exposed edges and corners to have preformed rounded edges

2.3 PORCELIN WALL TILING

Background/Base: 15mm thick 1:4 cement/sand render on concrete or concrete blockworks.

Bedding: Thin bed cement based adhesive. Adhesive: to be approved.

Grouting material: Epoxy grout Nitotile 489 as supplied by Fosroc or equal approved to be used in accordance with manufacturer recommendations. Colour to architects approval.

Joint width: 3mm. Movement joints: Location: All internal corners; Width: 6mm

Accessories: all exposed edges and corners to have preformed rounded edges In toilets, no tiles behind low level ducts or full height ducts. Complete tiling should be done behind mirrors. In pantry, tiles are to be fixed behind base and wall units but not behind service duct panels. Plaster only where no tiles.

2.02 FLOOR TILING

Background/Base: screed 1 in-situ concrete

Screed: 11.5:3 cement/sand/aggregate semi-dry screed laid to falls and towards floor drain outlets, overall thickness of flooring to be 75mm

Bedding: Waterproof adhesive on cement 1 sand bed

Adhesive: to be approved

Waterproofing: 2 coats Fosroc Nitoproof 10, or equal, to B.S. Standard. laid to manufacturer's recommendations, with necessary accessories



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PORCELIN TILES

Grouting material: Epoxy grout Nitotile 489 as supplied by Fosroc or equal approved to be used in accordance with manufacturer recommendations. Colour to architects approval

Joint width: 2.5mm.

Movement joints: location: At all perimeters including door thresholds; Width: 6mm- Accessories:

Skirting: Coved skirting tiles, 100mm high to match ceramic floor tiles, set flush with render, to be fixed on plastered walls, grouted with epoxy grout Nitotile 489 as

supplied by Fosroc or equal approved, applied in accordance with manufacturer's recommendations.

2.03 CERAMIC FLOOR TILING TO HALL AREA

Type/Size: Vitritied matt finish floor files 400mmx400mm as manufactured by GRANITO or equivalent. Tiles to be beige colour as per approved sample and to Carrefour standard requirements. Tile size tolerance to be not greater than + or – 0.25mm in any side.

Background/Base: screed on in-situ concrete.

Screed: Quick curing proprietary wet mix sand/cement screed, such as *Isocrete Heavy Duty KScreeed' laid in panels (maximum area 90m2) and as per manufacturer's recommendations. **Note:** semi-dry screed will not be permitted in these areas.

Adhesive and grout: Adhesive shall be Laticrete 325 or equivalent. Application strictly in accordance with manufacturer's instruction. Grout shall be epoxy Laticrete or equivalent. Colour to Architect approval.

Joint width: 3mm

2.04 GROUTING MATERIALS

- A. **Sand-Portland Cement Grout:** ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. **Chemical-Resistant Epoxy Grout:** ANSI A 118.3, color as indicated.
 1. Provide product capable of resisting continuous and intermittent exposure to temperatures of up to 60 deg C and 100 deg C, respectively, as certified by mortar manufacturer for intended use.



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PORCELIN TILES

- C. **Grout Colors:** Provide colors as selected by the Consultant from manufacturer's full range of standard and custom colors. Finish shall be smooth, unless otherwise specified or directed by the Consultant.

2.05 ELASTOMERIC SEALANTS

- A. **General:** Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
- B. **Colors:** Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.06 MISCELLANEOUS MATERIALS

- A. **Trowelable Underlayments and Patching Compounds:** Latex-modified, Portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. **Temporary Protective Coating:** Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 49 to 60 deg C per ASTM D 87.
- C. **Tile Cleaner:** A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.07 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.



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PORCELIN TILES

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.

END OF DOCUMENTS



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Terrazzo Tile and Cast In Situ Terrazzo

SECTION 39 - TERRAZZO TILE AND CAST IN SITU TERRAZZO

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes the following:

1. Terrazzo Tiles Flooring.
2. Cast in Situ Terrazzo.

- B. Related Sections include the following:

1. Division 3 Section "Cement Based Screeds" for floor screeds to receive ceramic tiles.
2. Division 5 Section "Architectural Joint Systems" for movement joints in ceramic flooring.
3. Division 7 Section "Cold Fluid-Applied Waterproofing" for waterproofing under thickset mortar beds.
4. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
5. Division 9 Section "Portland Cement Plaster" for Portland cement scratch coat over metal lath on wall surfaces.

1.3 DEFINITIONS

- A. **Module Size:** Actual tile size (12" x 12" x 1"thick).
- B. **Facial Dimension:** Actual tile size (minor facial dimension as measured per ASTM C 499).
- C. **Facial Dimension:** Nominal tile size as defined in ANSI A137.1.



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1.4 PERFORMANCE REQUIREMENTS

- A. **Static Coefficient of Friction:** For tile installed on Flooring surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
1. Level Surfaces: Minimum 0.6.
- B. **Load-Bearing Performance:** Provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
1. Heavy: Passes cycles 1 through 12. Use where indicated in Finishing Schedules.
 2. Moderate: Passes cycles 1 through 10. Use for other applications indicated on Schedule where heavy duty is not indicated.

1.5 SUBMITTALS

- A. **Product Data:** For each type of tile, mortar, grout, and other products specified.
- B. **Shop Drawings:** For the following:
1. Tile patterns and locations.
 2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
 3. Locate precisely each joint and crack in tile substrates, record measurements on shop drawings, and coordinate them with tile joint locations, as approved by Consultant.
- C. **Tile Samples for Initial Selection:** Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
- D. **Grout Samples for Initial Selection:** Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.



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- E. **Samples for Verification:** Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
1. Each type and composition of tile and for each color and texture required, at least 12" x 12" mm square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Consultant.
 2. Full-size units of each type of trim and accessory for each color required.
- F. **Master Grade Certificates:** For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- G. **Product Certificates:** Signed by manufacturers certifying that the products furnished comply with requirements.
- H. **Installer Experience:** List of five projects (minimum) of a similar nature carried out successfully by the installer with the same product.
- I. **Installer Experience:** List of five projects (minimum) of a similar nature carried out successfully by the installer with the same product
Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of Consultants and Employers, and other any information required by Consultant.
- J. **Test Reports:** Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile and tile setting and grouting products with requirements indicated.
- K. **Setting Material Test Reports:** Indicate and interpret test results for compliance of tile-setting and -grouting products with specified requirements.

1.6 QUALITY ASSURANCE

- A. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Consultant and the Employer.
- B. **Installer Qualifications:** Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.



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- C. **Source Limitations for Tile:** Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.
- D. **Source Limitations for Setting and Grouting Materials:** Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- E. **Source Limitations for Other Products:** Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
1. Stone thresholds.
 2. Cementitious backer units.
 3. Joint sealants.
 4. Waterproofing.
- F. **Mockups:** Before installing tile, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Consultant.
 2. Notify Consultant 7 days in advance of the dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Consultant's approval of mockups before proceeding with final unit of Work.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Approved mockups in an undisturbed condition as judged solely by the Consultant at the time of Substantial Completion may become part of the completed Work, otherwise demolish mockups, remove rubbles from site and install permanent works.



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- G. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Employer. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
- 2. Retain below with appropriate definitions in referenced part 1 article.
- 3. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- 4. Tiles are to be highest grade of production in manufacturer's quality grading system.



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- B. **ANSI Standards for Tile Installation Materials:** Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. **Colors, Textures, and Patterns:** Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. Provide Consultant's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
- D. **Factory Blending:** For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.
- E. **Mounting:** Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
- F. **Factory-Applied Temporary Protective Coating:** Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. **General Characteristics:** Tiles are to comply with the following general requirements:
1. Floor Tiles:
 - a. Abrasive Hardness: Minimum Index 253 to ASTM C 501, unless otherwise specified.
 - b. Bending Strength: Minimum 35 Kg/cm² to ASTM C 648
 - c. Water Absorption: As specified.
 - d. Chemical Resistance: Unaffected with moderate acids.
 - e. Tile Rating: For heavy duty floor by a rating system acceptable to the Consultant.
 - f. Water Absorption: Maximum 6% to ASTM C 373.



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3.1 TERRAZZO TILE

The ingredients of the terrazzo topping finish of the tiles shall confirm the Specification stipulated for in situ Terrazzo finish herein above. The tiles shall be made by mechanical compression process and shall be of first grade. The size shall be 12" x 12" x 1" thick for floor and ½" thick for skirting. The tile shall be composed of one part of cement and two parts of marble chips. The compositions given above applies to 10 mm thickness of the top surface of the tile remaining portion being composed of normal 1:2 cement and coarse sand mortar. The size and colour composition of the marble chips shall be according to Consultant's instruction. Tiles shall be well shaped perfectly square with straight edges perfectly flat and free from defect which may defect its appearance of serviceability. Tiles with chips or cracks when being installed will not be acceptable. The following samples should be submitted to the Consultant.

Terrazzo tile	2 of each type
Coloring	0.25 kg of each type
Cleaning Compound	1 can of each.

The plain concrete sub-floor surfaces to receive the setting bed for tiles shall be clean and free of dirt, dust, oil or other objectionable matter. Setting beds for terrazzo tile flooring shall be composed of 1 part cement and 2 parts sand by volume with minimum amount of water necessary to produce a workable mass and shall be laid to an average thickness of 25 mm. This shall be covered with neat cement grout of creamy consistency. As large as area of setting bed shall be spread at one time as can be covered with tiles before the mortar has set. Surplus mortar shall be removed. The thickness of setting bed in any space shall not be less than mm. tiles shall be laid out from the center line of each space outward and in straight lines in a symmetrical pattern with a minimum of cut tiles. Joints between tiles shall be as uniform width. Tile shall be cut with a suitable tool and rough edges shall be rubbed smooth. Tile shall be laid to the straight edges.

Floor should be kept wet for 3 days no one should be allowed to walk on tiles during that period.

After seven days of laying the tiles the terrazzo tile floors shall be machine ground to a true even surface using various grades of abrasive stones as required. After the first grinding the floor shall be thoroughly grouted with the same cement and colour composition as used for the manufacture of tiles top surface. The grout shall be of the consistency of thick cream and shall be brushed over the floor to eliminate all blemishes and to thoroughly fill the surface for final grinding. Not less than 72 hours after application, the grouting coat shall be removed by grinding. The final surface should have very smooth finish. Small areas, inaccessible portions and corners which cannot be reached by the grinding machine shall be ground and rubbed by



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hand. The final gloss should be given polishing the surface to the satisfaction of the consultant.

3.2 TERRAZZO SKIRTING TILES

The terrazzo skirting tiles shall be the same as or terrazzo floor tiles except that the skirting tiles shall be 4" x 12" and shall be laid over ½" rough plaster and shall be manufactured and finished in the same manner as the floor tiles.

4.0 FLOOR TILE MEASUREMENT & PAYMENT

Measurement for terrazzo tile shall be made of the net Sq. Ft area on which the terrazzo tile are laid and only approved by the Consultant.

The laid prices tendered for this work shall include the cost of the tiles and all other materials, supplying, mixing and applying, setting bed and slurry, grinding and finishing and of all plant, operation, procedures and requirements necessary of finish this work in accordance with these specification.

- 4.1** Measurement of terrazzo tile skirting shall be made at the net Rft. Length on which the skirting is laid and duty approved by the Consultant.

The Unit Prices tendered for this work shall include the cost of tiles and all other materials, supplying, mixing and applying, setting plaster and slurry curing, grinding and finishing and of all plants, operations, procedures and requirements necessary to finish this work in accordance with these Specifications.

5.0 CONSTRUCTION REQUIREMENTS IN SITU TERRAZZO FLOORING

The floor shall consist of a wearing surface of consistency and net thickness as specified in Bill of Quantities, laid over 1:2:4 concrete base of the specified thickness. The net thickness specified for wearing surface shall be that obtained after grinding and polishing, 1:2:4 concrete shall be mixed and laid in the manner specified for cement concrete floor, using a minimum quantity of water for workability.

The cement concrete shall be leveled with a trowel and straight edge, consolidated and finished with steel trowels to an even but rough surface. The top layer of cement marble chips mixed in the proportion of 1:2 (1 cement and 2 marble Chips) shall be laid over it within 24 hours. The cement and marble chips must be mixed dry in such quantities as are sufficient for a unit of one specified shade. Water shall be added to only such quantities as can be mixed thoroughly and consumed in less than 30 minutes, the quantity of water being the minimum for workability. Mixing must be done on water tight platform and any mix not used within 30 minutes shall be



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discarded and removed from site. A layer of cement and marble chipping mixture should be well trowelled into the surface of the base concrete before filling to the top level of the screeds. The layer should be well compacted and all voids shall be filled in. A layer of neat cement, of the specified colour shall then be well trowelled into the surface leaving a plain smooth surface.

Floors shall be laid in panels of about 4.0'x4'-Q (1.2 x 1.2 meter) or of size as shown on the drawings. Dividing strips of aluminum/brass/glass as specified shall be provided and fixed to exact levels making an allowance for grinding. Aluminum strips shall not be less than 3mm thick and of width equal to the total thickness of cement concrete base and Terrazzo Topping.

Three days after laying the top layer must be evenly and smoothly machine ground with carborandum blocks of coarse, medium and fine grades so as to ensure that all marble chippings are evenly exposed allover the surface. If marble chips are not evenly exposed the Contractor shall pull down the surface and relay it at his own cost. After the first grinding, the floor shall be thoroughly grouted with the same cement and colour composition as specified for the terrazzo mix. The grout shall be of the consistency of thick cream and shall be brushed over the floor to eliminate all impressions and thoroughly fill the surface for final grinding. The surface after grinding shall be left un-disturbed and cured for 2 or 3 weeks, after which it shall be cleaned of dirt and dust by rubbing gently with pumice stone or washing soda in sufficient water. Three days after the surface has been cleaned it shall be rubbed hard with 1:10 solution of oxalic acid using felt. The surface shall then be cleaned and washed with plenty of water. After the surface has dried a final gloss shall be given by polishing the surface. The walls and all surfaces of the finished works of other trades shall be properly protected from damage and spoiling during the process of grinding and washing of the terrazzo. After the finish grinding has been completed and the surface treatment applied, the terrazzo work shall be covered and protected with approved material until completion of the work of all other trades.

6.0 TERRAZZO DADO AND SKIRTING

The marble chips and cement shall conform to specification for floor. Mixing shall be done in the same manner and proportion. The plastered surface over which the dado/skirting is to be applied shall be well roughened and watered; cement mortar of specified ratio shall then be plastered over this well roughened surface to indicated thickness. Before the base course has set the layer of terrazzo mixture shall be well trowelled into the surface of the base to a thickness which after grinding shall result in the finished thickness as per Bill of Quantities. A layer of neat cement of the specified colour shall then be well trowelled into the surface leaving a plain smooth surface. After the period specified for floors above, the Contractor shall start finishing as for floors specified above. Terrazzo skirting shall be provided around all terrazzo



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floors unless shown otherwise. Skirting and dado shall be straight, level and in plumb. Intersections at floors shall be straight and flush.

7.0 TERRAZZO ON STAIRS

The stair risers and treads shall be finished according to exact sizes including the terrazzo topping making allowance for grinding of terrazzo. The nosing shall be flush with the terrazzo toppings, and shall be protected by aluminum angles as specified

or shown on Drawings. The angles shall be firmly secured, by means of counter-sunk brass screws and cast together with the step.

8.0 MEASUREMENT

Work for floor and dado shall be measured in Sq.Ft. /M of wall and floor area, skirting shall be measured in Lin.Ft./H.

8.1 RATE AND PAYMENT

The rate for all items of work under this section shall cover the cost of furnishing all materials, labour, scaffolding framework laying, curing, grinding, polishing, finishing and appliances at site and performing all operations at any height in accordance with drawings, Bill of Quantities and as specified. The rate shall include the cost of furnishing and installing metal fixings, dividing strips for floors, dados, nosing, angles aluminum U-channels and screws for stairs etc., and providing all assistance to other trades for built in items etc.

END OF DOCUMENTS



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PAINTING

SECTION 41 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces.
 - 2. Exposed interior items and surfaces.
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Consultant will select from standard colors and finishes available.
- C. Do not paint pre-finished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - 2. Operating parts include moving parts of operating equipment and the following:
 - 3. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
 - 2. Division 8 Section "Flush Wood Doors" for shop priming wood doors.



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3. Divisions 15 and 16: Painting of mechanical and electrical work is specified in Divisions 15 and 16, respectively.

1.3 DEFINITIONS

A. **General:** the following coating terms apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. **Product Data:** For each paint system specified. Include block fillers and primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

B. **Samples for Initial Selection:** Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1. After color selection, the Consultant will furnish color chips for surfaces to be coated.

C. **Samples for Verification:** Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.



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1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
3. Submit Samples on the following substrates for the Consultant's review of color and texture only:
 - a. Concrete: Provide two 100-mm- square samples for each color and finish.
 - b. Ferrous Metal: Provide two 100-mm- square samples of flat metal and two 200-mm- long samples of solid metal for each color and finish.
- D. **Qualification Data:** For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Consultants and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. **Quality System:** Comply with ISO 9001/9002 Quality System as a minimum. Incorporate all the standard procedures supplied by the Consultant and the Employer.
- B. **Applicator Qualifications:** Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- C. **Source Limitations:** Obtain fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- D. **Benchmark Samples (Mockups):** Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project.
 1. The Consultant will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall Surfaces: Provide samples on at least 9 sq. m of wall surface.
 - b. Small Areas and Items: The Consultant will designate an item or area as required.



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2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, the Consultant will use the room or surface to evaluate coating systems of a similar nature.
 3. Final approval of colors will be from job-applied samples.
- E. Manufacturers Qualifications:** Paint materials shall be the products of paint and coating manufacturers whose qualifications are as follows:
1. Manufacturers shall be reputable of multi-national scale in production and distribution with capabilities to deliver paint materials quantities necessary for the project on due time.
 2. Manufacturers shall have evidence from scientific bodies that demonstrate their participation and share in the development of paint industry generally and production of new painting materials kinds.
 3. Manufacturers shall have their own proprietary brand names that are well known worldwide.
 4. Manufacturers shall have minimum 25 years of successful experience in producing painting materials for use in prestigious projects worldwide of same standard of quality as that intended for the Project.
 5. Manufacturers shall be registered in the associations, councils, boards, federations or other similar bodies of paint manufacturers in countries of origin and practice.
- F. Performance of Paints:** Paints shall be fit for purpose and manufactured specifically for the applications indicated and uses intended, taking into account the type, nature, location, and aesthetic and utility requirements of the Project.
1. Opacity: Paint shall cover or hide the substrate to the Consultant's satisfaction.
 2. Cleanability: Paint shall not absorb dirt and shall be capable of being washed or scrubbed periodically, to the Consultant's satisfaction, without adverse effect on its attributes or appearance.
 3. Scrub resistance wet and dry: paint shall resist abrasion caused by scrubbing in accordance with ASTM D 2486.



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4. Adhesion: Paint shall adhere firmly to the substrate without peeling.
5. Exposure resistance: Paint shall resist yellowing and weathering caused by UV rays and ozone.
- G. **Standards:** Paints shall be manufactured to relevant US standards, or any other international standard approved by Authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 7 deg C. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 1. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 10 and 32 deg C.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 7.2 and 35 deg C.



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- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 3 deg C above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to the Employer.
 - 1. Quantity: Furnish the Employer with an additional 5 percent, but not less than 3.8 L or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT MATERIALS, GENERAL

- A. **General:** Employed paints and painting materials shall be the highest grade and top quality in manufacturer's range of products for the generic kind of paint or paint material.
- B. **General:** Materials for paint works shall comply with requirements of BS 6150, as applicable.
- C. **Material Compatibility:** Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- D. **Material Quality:** Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- E. **Colors:** Provide color selections made by the Consultant or by reference to manufacturer's color designations.

2.2 ANTI-CARBONATION PAINT MATERIALS, GENERAL

- A. Paint for application on internal and external is to be anti-carbonation paint that is easy to clean, applicable on new or existing concrete, Portland cement plaster or



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masonry, water-based and non toxic, allows substrate to breath, Protects substrates form Carbonation, of elastic nature with crack bridging properties.

- B. Anti-carbonation paint is to be self-cleaning by application of just sprayed water, highly durable, copolymer based coating which cures to form a tightly adherent, decorative weatherproof membrane guaranteed for up to 15 years. The formed coating membrane shall tolerate thermal movement in the substrate without splitting or cracking and will retain its elastomeric properties even after prolonged exposure to ultra-violet light. Coating shall have the advantage of being reinforced using glass fiber matting or tapes and shall be capable of bridging cracks or joints between different substrates. The finished surface shall be chemical and pollution-resistant surface that has been specially manufactured to shed dirt, ensuring that it retains a bright, attractive appearance throughout its life. Coating shall be vapor permeable and allows entrapped substrate moisture to escape without causing blistering or delamination and shall produce an effective barrier to carbon dioxide diffusion and provide reinforced concrete substrates with an excellent defense against the harmful effects of carbonation. Color and sheen shall be selected by the Consultant from manufacturer's full range of products.
- C. Anti carbonation paint shall also comply with following properties;
 1. Carbon Dioxide Diffusion Resistance, Taywood Method
 - a. Equivalent Thickness of Air: More than 175 mm.
 - b. Equivalent Thickness of 30N Concrete: More than 500 mm;
 2. Chloride Ion Diffusion Coefficient: No chloride ion diffusion after 60 days; Taywood Method
 3. Static Crack Spanning Capability for 200-micron Dry Film Thickness at 23 °C: Minimum 2.00 mm to ASTM C836.
 4. Tear Resistance: 15 N/mm to ASTM D1004.
 5. Tensile Strength: 5.00 N/mm² to ASTM D412.
 6. Reduction in Water absorption: Not less than 82% to ASTM C642.
 7. Reduction in Chloride Ions Penetration: Not less than 92% to AASHTO M259.
 8. Adhesion: Not less than 1.00 N/mm², BS 1881.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. **Coordination of Work:** Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Consultant about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. **General:** Preparation of surfaces to receive paints is to be according with requirements of BS 6150 and recommendations of paints manufacturer.
- B. **General:** Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- C. **Cleaning:** Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- D. **Surface Preparation:** Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.



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2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of referenced standards.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of referenced standards.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- E. Materials Preparation:** Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.



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2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- F. **Tinting:** Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. **General:** Apply paint according to recommendations of BS 6150 and manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.



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10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting:** Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures:** Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness:** Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work:** Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.



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- F. **Prime Coats:** Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- G. **Pigmented (Opaque) Finishes:** Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- H. **Transparent (Clear) Finishes:** Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.
- I. **Stipple Enamel Finish:** Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- J. **Completed Work:** Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Employer reserves the right to invoke the following test procedure at any time and as often as the Employer deems necessary during the period when paint is being applied:
 - 1. The Employer will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 - 2. The testing agency will perform appropriate tests for the following characteristics as required by the Employer:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.



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- e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
3. The Employer may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

- A. **Cleanup:** At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Consultant.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.



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3.7 EXTERIOR PAINT SCHEDULE

- A. Coordinate the following paint coats with surface preparation steps as specified.
- B. Concrete and Cement Sand Portland Plaster: Provide the following finish system over exterior concrete and Portland Cement Plaster.
 - 1. Light Textured Emulsion Paint
 - a. 100% pure acrylic-based paint specially formulated for external application. The paint is to dry by evaporation of water and will produce a durable, flexible, excellent water and alkali resistant and is to provide long lasting protection for coated surfaces. The paint is to be UV-resistant, of high bond strength to substrates and distinguished color retention, and is to provide anti-carbonation shield for the substrate while allowing moisture of substrate to escape to the outside.
 - b. Finished surface is to be of light texture.
- C. **Ferrous Metal:** Provide the following finish system over exterior ferrous metal.
 - 1. Full-Gloss, Epoxy-Based Enamel: Two finish coat over primer.
 - a. Primer: High-molecular-weight, epoxy-resin primer at spreading rate recommended by manufacturer.
 - b. Finish Coat: High-molecular-weight, epoxy-resin topcoat at spreading rate recommended by the manufacturer.
 - c. Protection Coating: Two Coats of clear polyurethane-based, UV resistant protection coating.

3.8 INTERIOR PAINT SCHEDULE

- A. Coordinate the following paint coats with surface preparation steps as specified.
- B. **Concrete:** Provide the following paint systems over interior concrete and masonry surfaces:
 - 1. Flat Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.025 mm.



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2. First and Second Coats: Flat, acrylic latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.060 mm per coat.
- C. **Plaster:** Provide the following finish systems over new, interior Portland cement plaster surfaces:
1. Flat Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.036 mm.
 - b. Undercoat: same material for finish coats specified hereafter diluted to the manufacturer's recommendations.
 - c. First and Second Finish Coats: Flat, acrylic-latex, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.064 mm per coat.
 2. Semigloss, Alkyd-Enamel Finish: One finish coat over an undercoat and a primer.
 - a. Primer: Alkali-resistant, alkyd- or latex-based, interior primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - b. First and Second Coats: Semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.066 mm.
- D. **Woodwork and Hardboard:** Provide the following paint finish systems over new, interior wood surfaces:
1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.
 - a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.031 mm.
 - b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.066 mm.



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2. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a wood undercoater.
 - a. Undercoat: Alkyd, interior enamel undercoater applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.031 mm.
 - b. First and Second Coats: Full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.061 mm.
- E. Stained Woodwork:** Provide the following stained finishes over new, interior woodwork:
1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sealer coat and an alkyd-based, interior wood stain. Wipe wood filler before applying stain.
 - a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.
 - b. Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.
 - c. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.
 - d. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.
- F. Zinc-Coated Metal:** Provide the following finish systems over zinc-coated metal:
1. Full-Gloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoat and a primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.031 mm.
 - b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.031 mm.



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- c. Finish Coat: Full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.031 mm.

G. Ferrous Metal: Provide the following finish systems over ferrous metal:

- 1. Full-Gloss, Alkyd-Enamel Finish: two finish coat over a primer.
 - a. Primer: Interior ferrous-metal primer at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.031 mm.
 - b. Finish Coat: Full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 0.031 mm percoat.

H. Ferrous Metal: Provide the following finish systems over ferrous metal:

- 1. Full-Gloss, Epoxy-Based Enamel: Two finish coat over primer.
 - a. Primer: High-molecular-weight, epoxy-resin primer at spreading rate recommended by manufacturer.
 - b. Finish Coat: High-molecular-weight, epoxy-resin topcoat at spreading rate recommended by the manufacturer.

END OF DOCUMENT



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TOILET AND BATH ACCESSORIES

SECTION 42 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Drawing and Detail.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Toilet and bath accessories.
 - 2. Warm-air dryers.
- B. Related Sections include the following:
 - 1. Division 8 Section "Mirrored Glass" for mirrors.
 - 2. Division 9 Section "Ceramic Tile" for ceramic toilet and bath accessories.
 - 3. Division 16 Sections for the characteristics of electrical power in the project for hand dryers.

1.3 SUBMITTALS

- A. **Product Data:** Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. **Samples:** For each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. **Setting Drawings:** For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- D. **Product Schedule:** Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- E. **Maintenance Data:** For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.



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1.4 QUALITY ASSURANCE

- A. **Product Options:** Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
 - 1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Consultant, may be provided.
 - 2. Other manufacturers' products with equal characteristics may be considered. See Division 1 Section "Substitutions."
 - 3. Do not modify aesthetic effects, as judged solely by Consultant, except with Consultant's approval. Where modifications are proposed, submit comprehensive explanatory data to Consultant for review.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. BNDeliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. **General Warranty:** Special warranty specified in this Article shall not deprive Employer of other rights Employer may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. **Manufacturer's Mirror Warranty:** Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
 - 4. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Stainless Steel:** ASTM A 666, Type 304, with No. 4 finish (satin), in 0.8-mm minimum nominal thickness, unless otherwise indicated.



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- B. **Brass:** ASTM B 19, leaded and unleaded flat products; ASTM B 16M, rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.
- C. **Sheet Steel:** ASTM A 366/A 366M, cold rolled, commercial quality, 0.9-mm minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. **Galvanized Steel Sheet:** ASTM A 653/A 653M, Z180.
- E. **Chromium Plating:** ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- F. **Baked-Enamel Finish:** Factory-applied, gloss-white, baked-acrylic-enamel coating.
- G. **Mirror Glass:** as per requirements of Division 8, section "Mirrored Glass".
- H. **Galvanized Steel Mounting Devices:** ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. **Fasteners:** Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.2 FABRICATION

- A. **General:** Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. **Surface-Mounted Toilet Accessories:** Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. **Recessed Toilet Accessories:** Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. **Mirror-Unit Hangers:** Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.



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2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- E. **Keys:** Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Employer's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

3.2 ADJUSTING AND CLEANING

- A. Remove temporary labels and protective coatings.
- B. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. **Toilet Tissue Dispenser (Toilet Paper Holder):** Provide toilet tissue dispenser complying with the following:
 1. Type Single-roll dispenser.
 2. Mounting: Surface mounted with concealed anchorage.
 3. Material: Stainless steel
 4. Operation: Noncontrol delivery with mfr's standard spindle.
 5. Capacity: Designed for standard diameter-core tissue rolls up to 140 mm diameter (800 sheets)
- C. **Soap Dish:** Stainless steel size and shape as selected by the Consultant from manufacturer's standard range.



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- D. **Soap Dispenser:** Provide soap dispensers complying with the following:
1. Liquid Soap Dispenser, Vertical-Tank Type: Wall mounted type, minimum 1182.9 ml capacity tank with stainless steel piston, springs, and internal parts designed to dispenses soap in measured quantity by pump action, and stainless-steel cover with unbreakable window-type refill indicator.
 - a. Mounting: Designed for wall mounting.
 - b. Soap Valve: Designed for dispensing soap in liquid form.
- E. **Paper Towel Dispenser:** 800 multi-hold towels capacity, stainless steel, surface mounted.
- F. **Robe Hook**
1. Stainless steel.
 2. Double-prong with rectangular wall bracket and back plate for concealed mounting.
- G. **Grab Bar**
1. Surface mounting, exposed.
 2. Stainless steel.
 3. 38 mm outside diameter and 1.20 mm minimum wall thickness and 38 mm distance from inside of bar and face of wall.
 4. Furnish complete with two end flanges, 3 mm thick minimum and 76 mm diameter, each of three countersunk screw holes for attachment to walls.
 5. Use of flanges with snap covers is acceptable.
- E. **Warm-Air Dryer:** Provide warm-air dryer complying with the following:
1. Touch-Button-Activated Hand Dryer: Surface-mounted, warm-air hand dryer activated by touch button and with manufacturers' standard, white-painted metal cover and 30-second-timed power cut-off switch.

END OF DOCUMENT