SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Comply with Division 1, General Requirements.

B. Products supplied but not installed under the work of this Section:
   1. Bolts and anchors in concrete Section 03 30 00, Cast-in-Place Concrete.
   2. Bolts and anchors in masonry Section 04 43 00, Stone Masonry Units.

1.2 REFERENCES

A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.
   1. CSA O121 Douglas Fir Plywood
   2. CSA O141 Softwood Lumber
   3. CAN/CSA-O80 Series Wood Preservation
   4. NLGA Standard Grading Rules for Canadian Lumber
   5. CSA B111 Wire Nails, Spikes and Staples.
   6. CAN/CSA – G164 Hot Dip Galvanizing of Irregularly Shapes Articles

1.3 QUALITY ASSURANCE

A. Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials in dry locations, leave 150 mm clearance to floor.

B. Protect fire retardant treated materials against moisture.

1.5 SITE CONDITIONS

A. Install rough carpentry in dry areas and where no further installation of moist materials is scheduled.

PART 2 PRODUCTS

2.1 MATERIALS

A. Softwood Lumber: CSA O141 and NLGA - Standard Grading Rules for Canadian Lumber. Except as indicated otherwise lumber to be softwood, S4S, with moisture content not greater than 19 percent at time of installation.

B. Concealed Framing Lumber: No. 2 Ontario White Pine, No. 2 Red Pine or Construction No. 1 Eastern Spruce, Balsam Fir or Jack Pine, COFI Douglas Fir Dense, pressure treated.

C. Grounds, Nailing Strips, Blocking Other Than on Roof, Strapping and Furring: No. 2 Ontario White Pine, No. 2 Red Pine or Construction No. 1 Eastern Spruce, pressure treated.

D. Wood Blocking Exterior to Air (and Vapour) Barrier: Construction grade pine, vacuum/pressure impregnated to CAN/CSA 080.1.

E. Pressure Treated Lumber: CAN/CSA O80.1-M.

F. Pressure Treated Plywood: CAN/CSA O80.9-M.

G. Plywood: CSA 0121: Concealed locations, Douglas Fir plywood, Exterior Bond, pressure treated.

H. Plywood: CSA 0121; for paint finish, Douglas Fir Plywood, GIS.

I. Rough Hardware: Common spiral nails and spiral spikes to CSA B111 except where indicated otherwise. Hot dipped galvanized finished steel hardware CAN/CSA-G164 for exterior work, interior highly humid areas and for pressure-preservative treated lumber. Stainless steel alloy hardware for chemically corrosive areas and as indicated.

J. Sealant: Dymeric 240 by Tremco (Canada) Ltd.

K. Joint Backing: Compatible with sealant as accepted by sealant Manufacturer.

L. Fasteners: Type 316 stainless steel screws, length 100 percent greater than board thickness minimum, diameter 3 mm minimum, 13 mm dia. stainless steel washer 1.0 mm thick min.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with NBC, supplemented by following paragraphs.

B. Make running members full length of units wherever possible.

C. Properly frame materials with tight joints and rigidly hold in place.

D. Construct for expansion and contraction of materials.

E. Accurately cut and join members where required.

F. Erect work plumb, level, square and to required lines. Space uniformly.

G. Select individual pieces without knots and obvious defects that will interfere with placing bolts or proper nailing or making proper connections.

H. Cut out and discard defects which will render a piece unable to serve its intended function. Lumber may be rejected by the Contract Administrator, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

3.2 INSTALLATION - ROUGH FRAMING, SHEATHING AND BUCKS

A. Install rough framing, sheathing and bucks where required.

3.3 INSTALLATION - COPING

A. Install continuous wood and plywood coping on top of masonry walls indicated to receive flashing.

B. Anchor wood coping to masonry with bolts set in masonry cores at 400 mm o.c. maximum.

3.4 INSTALLATION - GROUNDS AND BLOCKING

A. Install wood grounds and strips required for attaching work of other Sections.

B. Install wood blocking as required and detailed.

3.5 INSTALLATION - ROUGH HARDWARE

A. Install rough hardware.

B. Fasten to hollow masonry units with toggle bolts. Fasten to solid masonry or concrete with lead expansion shields and lag screws. Do not use organic fibre or wood plugs.

C. Fasten to structural steel with through bolts or power driven self-drilling screws.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Comply with Division 1, General Requirements.

B. Work covered under this section:
1. Carpentry casework located on the east wall of the Laboratory Room; Secondary Clarifiers 4 & 5.
2. Carpentry casework of the Center Console in the Control Room, Administration Building.
3. Window Stools in the Laboratory Room; Secondary Clarifiers 4 & 5 and in the Control Room, Administration Building.
4. Locker Room Benches in the Lockers Room, Administration Building.

1.2 REFERENCES

A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.
1. Architectural Woodwork Manufacturers Association of Canada – Architectural Woodwork Standards (AWMAC – AWS).
2. CSA O115 Hardwood and Decorative Plywood.
3. CSA O141 Softwood Lumber.
4. ANSI/NEMA LD 3 High Pressure Decorative Laminates (HPDL).
5. ANSI/NPA A208.1 Particleboard.
6. ANSI/NPA A208.2 Medium Density Fiberboard (MDF) for Interior Applications.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Current membership in the Architectural Woodworking Manufacturer’s Association of Canada (AWMAC).

1.4 SUBMITTALS

A. Submit Shop Drawings indicating assemblies and joining details including hardware and fastenings.

B. Indicate materials, thicknesses, finishes and finish hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect and store items to preclude damage, including warpage and exposure to moisture. Ensure that storage areas have sufficient heat and ventilation.

B. Protect exposed surfaces of horizontal plastic laminate and exposed corners with plywood.

1.6 WARRANTY

A. Submit a two-year warranty for the work of this Section against defects in materials and workmanship.

B. Warranty Period: Commencing with date of Substantial Performance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber:
   1. Softwood Lumber: CSA O141; National Lumber Grades Authority standard grading rules for Canadian lumber. Kiln dried.
   2. Hardwood Lumber: CSA O115; grading rules of U.S. National Hardwood Lumber Association. Running matched, quarter sliced.
   3. Maximum Moisture Content:
      a. Interior woodwork: 8 percent.
      b. Exterior woodwork: 12 percent.

B. Solid Wood Blocking and Framing: No. 2 White Pine.

C. Plastic Laminate: ANSI/NEMA LD 3 High Pressure Paper Base Decorative Laminates.
   1. Manufacturers: Arborite by Domtar Laminated Products or Formica by Cyanamid of Canada Ltd.
   2. Grade:
      a. Horizontal Postform Work: Grade HGP 1 mm thick.
      b. Horizontal Flat Work: Grade HGS 1.2 mm thick.
      c. Vertical Postform Work: Grade VGP 0.7 mm thick.
      d. Vertical Flat Work: Grade VGS 0.7 mm thick.
      e. Chemical Resistant Work: Grade HGP 1 mm thick.
      f. Backing Sheet: Grade BK same thickness and Manufacturer as facing sheet sanded one face.
   3. Colours: To later selection from Manufacturer’s standard range of solids, patterns, and woodgrains. [Assume a minimum of two (2) colours of each.]

D. Plywood: CSA OP115, hardwood plywood.

E. Particleboard: ANSI/NPA A208.1.

F. Wood Paneling: Solid hardwood plank, random width, prefinished, Townsend Burley Pecan, by McFadden Hardwoods Ltd. Maximum flame spread of 150 for wall, 25 for ceiling, tested to ULC S102.

G. Hardware:
   1. Finish Hardware for Counter Units: By Manufacturer specified, with fastenings of type and finish compatible with finish of hardware.
   2. Hinges: BLUM Clip Top series, all metal, 120 degrees swing, self-closing, concealed.
   3. Pulls: Knape and Vogt of Canada Ltd., model 822 continuous extruded aluminum strip pull.
   4. Shelf Standards and Shelf Supports: Knape and Vogt of Canada Ltd., KV 255 flush-mounted shelf standards and KV 256 shelf supports. Shelf supports: 5 mm diameter support pins with collar.
   5. Closet Rod: Knape and Vogt of Canada Ltd., wall mounted adjustable rod in nickel finish, of size required.
   6. Chair Rail Spacers: Stainless steel sleeves complete with flanges, of shape detailed.

H. Window Stools and Trim: Plywood with plastic laminate on both sides, edges and ends. Colour: To later selection.

I. Locker Room Benches: Clear Maple.

J. Closet Doors: Bi-fold, mahogany wood slab core louvered, complete with track and hardware.

K. Closet Shelf: Melamine surfaced particleboard, PVC front edge.

2.2 ANCILLARY MATERIALS

A. Glue: Waterproof type, of characteristics and manufacture suitable for each use intended.

B. Woodwork Putty: Single component, acrylic latex polymer, colour to match finish.

C. Fasteners: Manufacturers standard fasteners and miscellaneous hardware required for assembling and anchoring woodwork, including casework.

2.3 FABRICATION – GENERAL

A. Fabricate items of millwork and wood fitments to requirements for Custom Grade Millwork described in Architectural Woodwork Standards of the Architectural Woodwork Manufacturers' Association of Canada.

B. Fabricate running members full length of units wherever possible. Where not possible, scarf joints.

C. Machine dress lumber using slow feed, with cutters sharp and free from edge defects. Finish lumber free from drag, feathers, ridges or other surface imperfections.

D. Fit joints tight. Locate joints at points which will not interfere with, affect strength of or detract from appearance of materials.

E. Construct on-site joints in strength, quality and workmanship comparable to shop fabricated joints.

F. Prepare, fit, assemble and fasten together components complete for placement in final position on Site.

G. Incorporate provision to recognize inherent shrinkage characteristics of materials specified.

H. Obtain governing dimensions before fabricating items.

I. Sand surfaces specified to receive finish smooth and even. Remove surface irregularities, marks and indentations. Sand using machine belt type sanding equipment. Sand by hand, edges, corners, arises and other surfaces impractical to machine sand.

2.4 FABRICATION - WINDOW STOOLS AND TRIM

A. Window Stools and Trim: Plywood with plastic laminate on both sides, edges and ends. Colour: To later selection.

B. Bond plastic laminate to plywood core with resorcinol formaldehyde resin, glue under 550 kPa pressure and 90 degrees C temperature and maintain until adhesive cure.

C. Chamfer exposed edges of plastic laminate uniformly smooth, even and free of chipping.

D. Fabricate window stools and trim in maximum practical lengths. Machine joints square. Use blind spline and locktight fasteners.

2.5 FABRICATION - LOCKER ROOM BENCHES

A. Fabricate benches of clear maple as detailed.

B. Chamfer exposed edges of wood slats as indicated.

C. Use stainless steel screws for concealed fastening of slats to framing members.

D. Use stainless steel bolts and nuts to secure frame together.

2.6 FABRICATION – CLOSET

A. Closet Doors: Bi-fold, mahogany wood slab core louvered, complete with track and hardware.

B. Closet Shelf: 19 mm thick melamine surfaced particleboard, with 19 mm thick melamine surfaced support gables at 900 mm spacing maximum, PVC edges.

2.7 FABRICATION – OPEN SHELVING UNITS

A. Shelving units:
   1. Gables: 19 mm thick with plastic laminate finish to all exposed sides and edges.
   2. Bottoms and tops: 19 mm thick with plastic laminate finish to all exposed sides and edges.
   3. Shelves: 19 mm thick with plastic laminate finish to all exposed sides and edges.
   4. Backs: 12 mm thick with plastic laminate finish, dadoed into sides, bottom and top.

B. Fabricate units to sizes indicated.

C. Provide full height recessed shelf standards 5 mm diameter holes at 32 mm centers for shelf support.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install work of this Section secure and complete. Coordinate with installation of fixtures and fittings.

B. Provide cutouts as required for service fittings and fixtures. Trim exposed edges of openings to match adjacent surfaces.

C. Provide and install materials in longest lengths possible.

D. Erect materials plumb, level, square and to required lines.

E. Accurately cut, fit, frame and rigidly fasten members in neat manner with tight joints.

F. Do not use material which is warped, split, checked, twisted or cupped.

G. Provide for expansion and contraction of materials.

H. Provide blocking or bucks which are wider than 150 mm in two equal pieces.

I. Fasten work to adjacent surfaces in concealed manner, unless otherwise indicated. Provide concealed framing required.

J. Make allowance where fixed objects pass through or project into and around periphery of work of this Section to permit normal movement without restriction.

K. Install work with concealed fasteners maximum 600 mm o.c. and 150 mm from edges and ends. Scribe surfaces of millwork to adjoining surfaces to effect neat, true, and plumb closure.

L. Upon completion of work of this Section, clean surfaces and remove identification marks.

M. Install hardware in accordance with Manufacturer's recommendations. Adjust hardware to operate smoothly.

N. Install wood paneling on wood strapping, centered to suit in pattern indicated.

O. Install closet doors, shelf and rods.

END OF SECTION

SECTION 06 82 00

GLASS-FIBER-REINFORCED PLASTIC

PART 1 GENERAL

1.1 REFERENCES

A. Comply with the latest edition of the following statutes, codes and standards and all amendments thereto.
   1. National Building Code of Canada 2010 with 2011 Manitoba Amendments (NBC).
   2. Occupational Health and Safety Act (OHSA).
   3. ASTM D570 Standard Test Method for Water Absorption of Plastics.
   4. ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning Plastics in a Horizontal Position.
   5. ASTM D638 Standard Test Method for Tensile Properties of Plastics.
   6. ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics.
   7. ASTM D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 Degrees C and 30 Degrees C with a Vitreous Silica Dilatometer.
   8. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
   9. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
   10. ASTM D2344 Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates.
   11. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   12. CAN/CSA S806 Design and Construction of Building Structures with Fibre-Reinforced Polymers.
   13. UL 94 UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.2 DESIGN REQUIREMENTS

A. This section contains components and connectors that require Contractor design.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Submit engineering calculations or data verifying the capacity of members to meet design requirements. Calculations to be sealed and signed by a Professional Structural Engineer licensed in Province of Manitoba.
   2. Product Data: Catalog information and catalog cuts showing materials, shapes, weights, design tasks, and showing load, span, and deflection; include Manufacturer’s Specifications.
   3. Grating: Show dimensions, weight, size, and location of connections to adjacent grating, supports, and other Work.

4. Grating Supports: Show dimensions, weight, size, location, and anchorage to supporting structure.
5. Stairs, Platforms, Stringers, Railing, Ladders, and Support Structures:
   a. Show dimensions, weight, size, and location of connections to adjacent supports and other Work.
   b. Structural calculations for platforms, ladders and cages, railing, and other fabrications shown, including design loads and other structural parameters considered.
6. Cover System:
   a. Show dimensions, weight, size, and location of connections to existing concrete.
   b. Structural calculations for covers and support beams, including design loads and other structural parameters considered.

B. Samples: Each type of grating, railing, and railing connection showing material composition, colour and texture of finish.

C. Information Submittals:
1. Handling and storage requirements.
2. Manufacturer's installation instructions.
3. Factory test reports for physical properties of product.
   a. Test data for railing and supports may supplement load calculations providing data covers the complete system, including anchorage.
   b. Test data for all components showing load and deflection due to load, in enough detail to prove component is strong enough and satisfies national, provincial, local standards, regulations, code requirements, and the Occupational Health and Safety Act, using design loads specified.
   c. Include test data for the following:
      1) Railing and post connections.
      2) Railing wall connections.
      3) Post and base connections.
      4) Railing expansion joint connections.
4. Manufacturer's Certification of Compliance for specified products.
5. Fabricator's qualification experience.
6. Manufacturer's qualification experience.
7. Independent laboratory test report, dated within 2 years of submittal date, of fire retardant testing conducted on exact type of grating proposed (not a resin test report).

1.4 QUALIFICATIONS

A. Manufacturer:
1. Minimum of 5 years' experience in manufacturing of products meeting these Specifications.
2. Membership in good standing of the Society of the Plastics Industry of Canada.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipment:
   1. Insofar as is practical, factory assemble items provided hereunder.
   2. Ship ladders fully shop-fabricated and assembled.
   3. Package and clearly tag parts and assemblies that are of necessity shipped unassembled in a manner that will protect materials from damage, and facilitate identification and final assembly in field.

B. Storage and Handling: In accordance with Manufacturer's recommendations and in such a manner as to prevent damage of any kind, including overexposure to sunlight.

1.6 WARRANTY

A. Submit a two year warranty for work of this Section against defects in materials and workmanship including, but not limited to:
   1. Performance failure of units.
   2. Fading, discolouration or evidence of other defects of exterior surface.

PART 2 PRODUCTS

2.1 GENERAL

A. Like Items of Materials: Where possible, provide end products of one Manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

B. Unless otherwise specified, provide all products manufactured by a pultruded process using vinyl ester resin.

C. Provide products manufactured with ultra-violet (UV) inhibitor additives.

D. Provide exterior surfaces with a synthetic surface veil covering.

E. Furnish molded products as an option where permitted by Specifications.

F. Fire Retardance:
   1. Maximum flame spread less than 25 as measured by ASTM E84.
   2. Include combinations of aluminum trihydrate, halogen, and antimony trioxide, where required to meet fire retardance, in the resin system.
   3. Meet self-extinguishing requirements of ASTM D635.

G. Disperse colour pigment in resin system.

H. Fabricate FRP products exposed to outdoor conditions with an additional 0.025 mm thick UV coating to shield product from UV light.

I. Seal all cut ends, holes, and abrasions of FRP shapes with resin to prevent intrusion of moisture.

J. Design units to applicable parameters established by the NBC and CAN/CSA S806.

K. Design for erection loads, effect of creep and other causes of dimensional change.

L. Design for strength and integrity at service conditions in accordance with engineering practices prevalent in the field of fibreglass reinforced plastics.

M. Provide products free of defects such as voids, porosity, cracks, pits, scratches, dry spots, and any other irregularity.

2.2 GRATING AND STAIR TREADS

A. General:
1. 4.8 kPa minimum, unless otherwise shown.
2. Maximum Deflection: 6 mm, unless otherwise shown.
3. Stair Tread: 4.8 kPa uniform load or concentrated load of 1.3 kN on area of 2600 mm^2 located in center of tread, whichever produces greater stress.

B. Pultruded Type:
1. Main bars joined by cross bars secured in holes drilled in main bars.
2. Cross bars, with 150 mm maximum spacing, shall mechanically lock main bars in position such that they prevent movement.
3. Intersections: Bond using adhesive as corrosive-resistant as pultrusion resin.
4. Main Bar Ends: Minimum bearing support width of 38 mm.
5. Skid-Resistant Surface: No. 200 silica grit adhesively bonded, Manufacturer’s standard.
6. Provide extra stiffness around openings.

C. Hold-Down Clamps: Same material as grating or Type 316 stainless steel.

D. Bolts, Connectors and Supports:
1. Corrosion-resistant FRP or Type 316 stainless steel.
2. Size and strength to meet Code requirements.

E. Fabrications:
1. Field measure areas to receive grating. Verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.
2. Section Length: Sufficient to prevent its falling through clear opening when oriented in span direction when one end is touching either concrete or vertical leg of grating support.

F. Manufacturers:
1. Fibergrate Composite Structures, Inc.
2. IKG/Borden.
3. Strongwell Corp.

2.3 STRUCTURAL PLATFORMS

A. Deflection and Safety Factors:
   1. Deflection Criteria: Not to exceed L/360.
   2. Safety Factors: Minimum ratios of ultimate stress to allowable static service stress:
      a. Flexural Members: 2.5.
      b. Compression Members: 3.0.
      c. Shear: 3.0.
      d. Connections: 4.0.
   3. Minimum design safety factors for dynamic or impact loads shall be twice the values for static service loads.

B. Loads:
   1. 4.8 kPa uniform live load over platform.
   2. Static and dynamic loads for equipment shown.

C. Do not support platform members or components from chemical tanks.

D. Glass fibre reinforced polyester or vinyl ester resin matrix, approximately 50 percent resin-to-glass ratio.

E. Continuous glass strand rovings shall be used internally for longitudinal strength.

F. Continuous strand glass mats shall be used internally for transverse strength.

G. Material Properties:

Minimum Ultimate Coupon Properties (UN)		
Material Properties	Test Method	Units
Pultruded Fibreglass Structural Shapes		
Ultimate tensile stress in longitudinal direction, MPa	ASTM D638	207
Ultimate compressive stress in longitudinal direction, MPa	ASTM D695	207
Ultimate flexural stress in longitudinal direction, MPa	ASTM D790	207
Ultimate short beam shear in longitudinal direction, MPa	ASTM D2344	31
Ultimate tensile stress in transverse direction, MPa	ASTM D638	48
Ultimate compressive stress in transverse direction, MPa	ASTM D695	103
Ultimate flexural stress in transverse direction, MPa	ASTM D790	69

Minimum Ultimate Coupon Properties (UN)		
Material Properties	Test Method	Units
Density kg/mm^3	ASTM D792	0.00166-00194
Water absorption (25-hr immersion)	ASTM D570	0.60 max, % by weight
Barcol hardness	ASTM D2583	45
Coefficient of thermal expansion 10^{-6} mm./mm/º C	ASTM D696	8
Thermal conductivity, w (m°K)	ASTM C177	0.58
Flame-Retardant Properties		
Flammability test	ASTM D635	Self-extinguishing
Surface burning characteristics	ASTM E84	25 maximum
Flammability class	UL 94	VO
Temperature index	UL 94	130°C

H. Manufacturers and Designers:
   1. Strongwell Corp.
   2. Fibergrate Composite Structures, Inc.

2.4 RAILING

A. Structural Criteria:
   1. Design railing system in accordance with the requirements of NBC and CAN/CSA S806, including top rails, posts, mid-rails, brackets, connections, mounts, bases, and anchors.

B. Thermal Movement:
   1. Allow for maximum range of ambient temperature change (difference between high or low and installation temperature).
   2. 30 degrees C, ambient; -30 degrees C, material surfaces.

C. Guards and Handrails
   1. Rails and Posts:
      a. 43 mm nominal square or round tubing posts.
      b. 43 mm nominal round or square rails.
      c. Maximum Post Spacing: 1.5 m.
      d. 2-rail system.

D. Gates:
   1. 43 mm nominal square or round tubing rail framing.
   2. 2-rail system.

E. Kickplates: Corrugated, 125 mm by 12 mm by 3 mm thick or 125 mm by 14 mm thick at all railing locations.

F. Kickplate Connectors and Splices: Continuous with provision for expansion and contraction without distortion or buckling.

G. Connections, Mounts, Bases: Fibreglass or Type 316 stainless steel.

H. Pultruded Parts:

Minimum Mechanical Properties	Test Method	Values
Tensile Stress	ASTM D638	207 MPa
Tensile Modulus	ASTM D638	17.2×10^3 MPa
Compressive Stress	ASTM D695	207 MPa
Compressive Modulus	ASTM D695	17.2×10^3 MPa
Flexural Stress	ASTM D790	207 MPa
Flexural Modulus	ASTM D790	11.0×10^3 MPa
Shear Stress	ASTM D2344	31.0 MPa
Density	ASTM D792	$1.72\text{-}1.94 \times 10^{-3}$g/mm^3
24-Hour Water Absorption	ASTM D570	0.6% max.
Coefficient of Thermal Expansion	ASTM D696	8×10^{-6} mm/mm/degree C
Flexural Stress	Full Section	248 MPa
Flexural Modulus	Full Section	25.5×10^3 MPa

I. Manufacturers:
   1. Strongwell Corp.
   2. Fibergrate Composite Structures, Inc.

2.5 LADDERS

A. Ladder Criteria:
   1. Design in accordance with the requirements of OHSA and CAN/CSA S806 in addition to the requirements listed below.
   2. Side Rails: 45 mm square tubes, 6 mm thick.
   3. Rungs: Minimum 25 mm-diameter thermal cure rod with pigmented epoxy, nonskid grit surface, or 32 mm minimum diameter pultruded, fluted, nonslip surface of vinyl ester resin.

B. Manufacturers:
   1. Strongwell Corp.
   2. Fibergrate Composite Structures, Inc.

2.6 COVER SYSTEM

A. Structural Criteria:
   1. Design cover system in accordance with the requirements of NBC and CAN/CSA S806, including cover pieces, support beams, connections, bases, and anchors.
   2. Design for dead load of cover system components, live loading shown in Contract Drawings, plus concentrated load of 200 kg on a 150 mm by 150 mm area located anywhere on the cover system.
   3. Design for openings and cutouts shown.

B. Configuration:
   1. Cover pieces shall fit tightly together.
   2. Cover pieces shall be removable without removing adjacent pieces.
   3. Provide lifting handles, minimum two per cover piece.
   4. Anchor panels to supporting members with quickly removable interlocking plastic pins that are removable without the use of tools.

C. Thermal Movement:
   1. Allow for maximum range of ambient temperature change (difference between high or low and installation temperature).
   2. 30 degrees C, ambient; -30 degrees C, material surfaces.

D. Surface: Furnish covers with an integral non-skid surface, without the use of paint or coatings.

E. Connections, Bases, Anchors: Fibreglass or Type 316 stainless steel.

F. Pultruded Parts:

Minimum Mechanical Properties	Test Method	Values
Tensile Stress	ASTM D638	207 MPa
Tensile Modulus	ASTM D638	17.2×10^3 MPa
Compressive Stress	ASTM D695	207 MPa
Compressive Modulus	ASTM D695	17.2×10^3 MPa
Flexural Stress	ASTM D790	207 MPa
Flexural Modulus	ASTM D790	11.0×10^3 MPa
Shear Stress	ASTM D2344	31.0 MPa
Density	ASTM D792	$1.72\text{-}1.94 \times 10^{-3}$ g/mm^3
24-Hour Water Absorption	ASTM D570	0.6% max.
Coefficient of Thermal Expansion	ASTM D696	8×10^{-6} mm/mm/degree C
Flexural Stress	Full Section	248 MPa

Minimum Mechanical Properties	Test Method	Values
Flexural Modulus	Full Section	25.5×10^3 MPa

G. Manufacturers:
   1. Strongwell Corp.
   2. Fibergrate Composite Structures, Inc.

PART 3 EXECUTION

3.1 GENERAL

A. Examination:
   1. Examine surfaces to which work is to be anchored, and job conditions.
   2. Report surfaces and conditions which would adversely affect installation.
   3. Do not commence installation until unsatisfactory surfaces and conditions are corrected.

B. Install in accordance with Manufacturer's written instructions.

C. Install plumb or level, rigid and neat, as applicable.

D. Furnish fasteners and anchorages for complete installation.

E. Seal field cut holes, edges, and abrasions with catalyzed resin compatible with original resin.

3.2 GRATING

A. Anchor grating securely to supports to prevent displacement.

B. Install each grating section such that it is easily removable.

C. Clearance (Grating to Vertical Surfaces): 6 mm (plus or minus 3 mm tolerance).

3.3 RAILING

A. Provide and install expansion and contraction connections as shown on approved Shop Drawings.

3.4 STRUCTURAL SHAPES

A. Connect parts with approved connectors meeting Manufacturer's design requirements and with corrosion resistance equal to structural shapes.

B. Provide supports and bracings required to comply with applicable codes and design requirements.

3.5 COVERS

A. Anchor cover securely to supports to prevent displacement.

B. Install each cover section such that it is easily removable.

3.6 LADDERS AND CAGES

A. Epoxy and rivet joints and rungs.

END OF SECTION

SECTION 06 90 00

GENERAL INSTALLATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Comply with Division 1, General Requirements.

B. Products installed but not supplied under the work of this Section:
   1. Steel doors, frames and screens - Section 08 13 10, Rolling Metal Doors.
   2. Hardware for steel doors - Section 08 71 00, Door Hardware.
   3. Cylinders for aluminum doors - Section 08 71 00, Door Hardware.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials: As required to complete work.

B. Rough Hardware: As required hot-dip galvanized steel hardware for exterior work and interior high humidity areas. Stainless steel #316 alloy hardware for chemically corrosive areas.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set frames plumb, square and level, maintaining uniform door widths and heights. Install frames using anchors supplied by Manufacturer.

B. Secure anchorages and connections to adjacent construction.

C. Brace frames solidly in position while being built in. Install temporary horizontal wood spreader at mid height of frame width until adjacent masonry work is completed.

D. Fasten frames to concrete walls, structural steel member, existing walls with screws at recessed fastening points. Fill recess at recessed anchor bolts with metal paste and sand smooth.

E. Make allowance for deflection to ensure structural loads are not transmitted to frames.

F. Hang doors in accordance with Manufacturer's printed instructions.

G. Install doors with following edge clearances: Between door and frame at head: 3 mm; between door and frame at jamb: 2 mm; at door bottom: 9 mm maximum.

H. Install labelled assemblies in fire separations in accordance with NFPA 80.

3.2 INSTALLATION - HARDWARE

A. Install hardware to doors and frames in accordance with Manufacturer's requirements. Install hardware to Standard Hardware Locations Metric Guide by Canadian Steel Door & Frame Manufacturers Association. Adjust hardware to provide smooth operation of doors. Ensure clearances are maintained. Repair damage to adjacent surfaces resulting work of this Section.

B. Install cylinders for locks on aluminum doors.

C. Install cylinders for panic sets on aluminum doors.

D. Lubricate as required to ensure smooth function of hardware as recommended by Manufacturer's printed instructions.

E. Ensure fastening components are tightened. Do not burr or mar edges or surfaces of hardware components. Repair damage caused by installation of hardware.

END OF SECTION