

## **ROUGH CARPENTRY**

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### **1. GENERAL**

#### **1.1 Design Requirements**

- .1 Design construction methods for expansion and contraction of materials. Adopt method of construction to ensure that materials are rigidly and securely attached and will not be loosened by work of other Sections. Fasten wood nailers, blocking, framing and strapping solidly to adjacent materials in true planes.

#### **1.2 Quality Control**

- .1 Lumber Identification: Lumber identification shall conform to requirements of Standard Grading Rules for Canadian Lumber of NLGA or grade stamped by an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.

#### **1.3 Submittals**

- .1 Preservative Treatment Test Reports: Duplicate reports from chemical treatment Manufacturer and certification by independent testing agency comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment Manufacturer's written instructions for handling, storing, installing, and finishing treated material.
- .2 For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project Site.
- .3 Include copies of warranties from chemical treatment manufacturers for each type of treatment.

#### **1.4 Waste Disposal**

- .1 Dispose waste legally off-site, in accordance with governing regulation. Dispose of any end-cuts and left over chemicals in an approved land-fill site. Do not burn or allow other use of end-cuts.

### **2. PRODUCTS**

#### **2.1 Materials**

- .1 Framing Lumber: Unless specified otherwise, Spruce/Pine/Fir (SPF), NLGA 121b Standard, with structural members meeting minimum No. 2 Grade requirements of CAN/CSA-O141.

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- .2 Cants, Curbs, Blocking, Nailers and other Members Less Than 89 mm (4") Wide: Spruce, 122c. "Standard" light framing, except as otherwise specified.
- .3 Softwood Plywood, Douglas Fir, CSA O121-M of Following Grades: Good One Side (G1S) elsewhere.
- .4 Rough Hardware: CSA B111; Nails, screws, bolts, lag screws, anchors, special fastening devices and supports required for erection of carpentry components. Use galvanized components if exposed to exterior atmosphere. Galvanize in accordance with requirements of CAN/CSA-G164-M.
- .5 General purpose adhesive: CSA O112 Series.
- .6 Proprietary fasteners: Toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by Manufacturer.

### 2.2 Wood Preservative-Treated Materials

- .1 Preservative Treatment by Pressure Process: CSA O80 Series, using preservative chemicals acceptable to authorities having jurisdiction, ammoniacal or amine copper quat (ACQ), or copper azole (AC), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated with inorganic boron (SBX).
- .2 Precut wood, where practical, prior to preservative treatment.
- .3 Treat site cut pressure treated lumber cut ends treated with preservatives compatible with pressure treatment chemicals.
- .4 Kiln-dry material after treatment to a maximum moisture content of 19% for lumber and 15% for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
- .5 Mark each treated item with the treatment quality mark of an inspection agency approved by the Canadian Lumber Standards Accreditation Board.
- .6 Application: Treat items indicated on Drawings, and the following:
  - .1 Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, air and vapour barriers, and waterproofing.
  - .2 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

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### **3. EXECUTION**

#### **3.1 Installation - General**

- .1 Install members true to line, levels and elevations.
- .2 Construct continuous members from pieces of longest practical length.
- .3 Install spanning members with crown-edge up.
- .4 Install materials so that grade-marks and other defacing marks are not visible or are removed by sanding.
- .5 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .6 Countersink bolts where necessary to provide clearance for other work.
- .7 Fasten work to hollow units with toggle bolts and to solid masonry or concrete with lead expansion shields and lag screws. Do not use organic fibre or wood plugs.

#### **3.2 Furring And Blocking**

- .1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .2 Install furring to support siding applied vertically and where sheathing is not suitable for direct nailing.

#### **3.3 Nailing Strips, Grounds ,and Rough Bucks**

- .1 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

#### **3.4 Cants, Curbs, Fascia Backing**

- .1 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.

**END OF SECTION**

**FINISH CARPENTRY – MAIN BUILDING**

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**1. GENERAL**

**1.1 Quality Assurance**

- .1 Execute the work of this Section by fully equipped, expert craftsmen, highly skilled in millwork fabrication.
- .2 Quality of work and materials: Unless otherwise specified, comply with the requirements for Premium Grade in accordance with the 2005 AWI/AWMAC Architectural Woodwork Quality Standards Illustrated Eighth Edition Version 2 (AWI/AWMAC QSI).

**1.2 Definitions**

- .1 Exposed Surfaces: Surfaces exposed to view. Surfaces visible when doors and drawers are closed, backs of hinged doors and edges of hinged doors when opened.
- .2 Semi-Exposed Surfaces: Surfaces that become visible when drawers and doors are opened.
- .3 Concealed Surfaces: Surfaces not visible after installation.

**1.3 Delivery, Storage, and Handling**

- .1 Store work in a temperature and humidity controlled area.
- .2 Protect fire-retardant materials against high humidity and moisture.
- .3 Provide protective coverings of suitable material for plastic laminate items; take special precautions at corners.
- .4 Provide dry storage areas. Stack materials with 150 mm (6") clearance off the floor.

**1.4 Submittals**

- .1 Shop Drawings: Show large scale details of construction. Indicate profiles of members, jointing, fastening, strapping, cut-outs for mechanical and electrical services and related items.
- .2 Samples: Duplicate 150 mm x 150 mm (6" x 6") samples of plastic laminate veneers for review, show colours and details of edging, forming and construction.

**2. PRODUCTS**

**2.1 Materials**

- .1 Wood members: Clean, seasoned, straight, square and true on all four sides. Comply with minimum size and tolerances of CSA 0141. Grade-mark all wood materials. Kiln dry wood materials for interior use to a moisture content of 4 to 8%, and 7 to 10% for exterior use.

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- .2 Plywood: Veneer core plywood.
  - .1 Douglas Fir plywood: CSA 0121; Western Softwood Plywood: CSA 0151. Exposed two sides shall be Grade S2S, and exposed one side shall be Grade S1S.
  - .2 Hardwood Plywood: CSA 0115, Type II (Type I for high humidity conditions). Exposed faces of Good Sequence Matched, selected veneers, and unexposed faces of Sound Grade, So, veneers.
  - .3 Birch Faced Hardwood Plywood: CSA 0115, Good Sequence Matched, Select White or Select Red.
- .3 Particleboard: ANSI A208.1, 720 kg/m<sup>3</sup> (45 lb/ft<sup>3</sup>) density, mat formed wood particleboard.
- .4 Concealed Framing: NLGA, S-Dry No. 1 grade Ontario White Pine or Douglas Fir, comply with BCLMA Construction grade.
- .5 Sealer: Water-repellant, low VOC, clear, colourless, penetrating wood sealer, compatible with final finish.
- .6 Hardboard: CGSB 11-GP-3, impregnated, pressed wood with a tempering compound and polymerized by baking.
- .7 Glue For Wood Assemblies: CSA 0112 Series, polyvinyl adhesive.
- .8 Plastic Laminate: NEMA LD-3, high pressure paper base decorative laminates. Unless otherwise specified, use the following:
  - .1 Horizontal Postform Work: Grade HGP, 1 mm (0.040") thick.
  - .2 Horizontal Flat Work: Grade HGS, 1.2 mm (0.048") thick.
  - .3 Vertical Postform Work: Grade VGP, 0.7 mm (0.028") thick.
  - .4 Vertical Flat Work: Grade VGS, 0.7 mm (0.028") thick.
  - .5 Chemical-Resistant: Grade HGP, 1 mm (0.040") thick.
  - .6 Backing Sheet: Grade BK, same thickness as facing sheets, sanded one face and manufactured by the same manufacturer as the facing sheet.
  - .7 Plastic Laminate Colours:
    - .1 Type 1: Antique Bronze LS D493-60 by Wilsonart
    - .2 Type 2: Mission Sage 4848-38 by Wilsonart
    - .3 Type 3: Loden Zephyr 4844-60 by Wilsonart

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- .4 Type 4: Mozzo Zephyr 4846-60 by Wilsonart
- .5 Type 5: Maple Straight Grain by Chemetal
- .6 Type 6: Summer Mist AC40-274-MT by Arborite
- .7 Type 7: Night Mist AC40-276-MT by Arborite
- .9 Melamine Board: Melamine resin impregnated paper, thermally fused to particle board or MDF core.
  - .1 Type 1: Colour to match almond S16 by Roseburg Forest Products.
  - .2 Type 2: Colour to match Hard Rock Maple S55 by Roseburg Forest Products.
- .10 Cabinet Hardware: In accordance with the Drawings.

**2.2 Fabrication - General**

- .1 As far as practical, shop assemble work for delivery to site ready for installation and in size easily handled and to ensure passage through building openings. Leave ample allowance for fitting and scribing on the job.
- .2 Fabricate work square and to the required lines. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs.
- .3 Make each unit rigid and self supporting, suitable for individual removal.
- .4 Provide wood members free from bruises, blemishes, mineral marks, knots, shake and other defects and select for colour, grain and texture. Machine and hand sand surfaces exposed in the finished work to an even, smooth surface free from defects detrimental to appearance.
- .5 Finish exposed edges and curves smooth. Keep contrast in colour and grain in adjoining materials to a minimum.
- .6 Provide running members in the maximum lengths obtainable. Provide thickness of members in maximum dressed size of standard lumber. Where thickness or width indicated is not available in hardwoods, use glue laminations to obtain sizes required.
- .7 Spline or key solid boards 150 mm (6") and wider and glue under pressure. Unless otherwise specified or indicated, book-match veneered faces, using selected and approved veneers. Provide unexposed backs of veneers having the same physical characteristics as the face veneer.
- .8 Design and fabricate work to allow for expansion and contraction of the materials. Unless otherwise specified, work shall be glued, and blind screwed or nailed. Properly frame material with tight, hairline joints and hold rigidly in place. Use glue blocks where necessary.

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- .9 Conceal joints and connections wherever possible. Locate prominent joints where directed. Glue and pin mortise and tenon joints. Intermediate joints between supports will not be permitted. Set and fill surface nails. Prevent opening-up of glue lines in the finished work.
- .10 Comply with glue Manufacturer's recommendations for lumber moisture content, glue shelf life, pot life, working life, mixing, spreading, assembly time, time under pressure and ambient temperature.
- .11 Provide exposed and grain of solid members and edges of exposed plywood with matching solid edging at least 6 mm (1/4") thick.
- .12 Seal finish carpentry wood items before they leave the fabricating shop. For surfaces to receive a natural or stain finish ensure that the sealer is compatible with the final finish. Co-operate with Division 9 Section Painting and obtain written approval of proposed sealer.
- .13 Fit shelf, door, drawer, gable and cabinet edges and other edges with 13 mm (1/2") hardwood edging prior to application of laminated plastic edging or subsequent finishing.
- .14 Set nails and screws, apply wood filler to indentations, sand smooth and prepare to receive finish. Clean, ensure surfaces are free of dust.

**2.3 Fabrication - Cabinets**

- .1 Framing: Solid stock framing assembled with machined dovetailed, mortised tenoned or blind dado joints adequately glued and secured with screws.
- .2 Countertops: Provide cut-outs for sinks, fitments and services as required.
- .3 Gables: Attach gables to framing with tongue and groove. Reinforce connections with supplementary metal angles. Route gables to receive shelf standards and fixed shelving's. Provide plastic laminate finished wood cleats for closet shelving and coat rod installation.
- .4 Backs: Conceal joints behind framing, rout backs into end gables.
- .5 Bottoms: Attach bottoms to front rails with tongue and groove.
- .6 Doors: Flush overlay construction.
- .7 Drawers: Solid stock fronts, backs, sides, dividers, and plywood bottoms. Joints glued.
  - .1 Fronts: 19 mm (3/4") thick
  - .2 Backs: 13 mm (1/2") thick.
  - .3 Dividers: 6 mm (1/4") thick.
  - .4 Sides: 15 mm (e") thick, dovetail joints to fronts, grooved joints to backs.
  - .5 Bottoms: 9 mm (d") thick, grooved into front and sides.

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- .8 Shelving: Apply plastic laminate to visible edges, except that adjustable shelves shall be edged on front and back.
- .9 Base: Solid stock of height equal to base in room.

**2.4 Fabrication - Plastic Laminate Faced Work**

- .1 Factory apply plastic laminate to interiors of all cabinetwork except drawers, but including drawer fronts and shelves, including underside of cabinets.
- .2 Edge band doors, drawers, gables and all visible edges of plywood and particle board components with plastic laminate to match faces, strips same width as plywood or particle board.
- .3 Apply backing sheet to laminated flatwork. Apply uniform coating of sealer on exposed edges. Provide backing sheet of sufficient thickness to compensate stresses caused by the facing sheet.
- .4 Self edge straight-line-edging with flat work material and radius corners with post-forming material; apply with same adhesive as facing sheet. Chamfer edges uniformly at approximately 20 degrees using machine router.
- .5 Locate joints at 2400 to 3000 mm (8' to 10') o.c. Accurately fit members together to provide tight and flush butt joints, in true planes. Provide 6 mm (¼") blind spline and approved type draw bolts; one draw bolt for widths up to 150 mm (6") at maximum 450 mm (18") centres for widths exceeding 150 mm (6"). Colour-match adjoining units.
- .6 Provide cut-outs as required for inserts, fixtures and fittings. Use radiused corners and chamfer edges around cut-outs to avoid chipping laminate.
- .7 Post-form laminate work to details indicated. Provide same core and laminate profiles to provide continuous support and bond for the entire surface.
- .8 Assemble work, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

**2.5 Fabrication - Trim**

- .1 Trim members shall be of sizes and profiles indicated. Trim members shall be slow-fed work, free from chatter and other machine marks.
- .2 Provide trim over 60 mm (2½") wide with backs ploughed or kerfed. Mitre all joints. Carefully machine drum-sand exposed flat surfaces. Minimize sanding on the job.



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**3. EXECUTION**

**3.1 installation**

- .1 Set and secure materials and components in place, rigid, straight, level, plumb and square with hairline joints. Scribe neatly to adjoining surfaces; install blocking and fillers required. Secure units using concealed fasteners.
- .2 Provide matching scribing closer strips between units and walls or similar surfaces.
- .3 Provide heavy duty fixture attachments for wall mounted cabinet work.
- .4 Apply sealant between units and adjacent wall and floor surface, around sills, pipes and escutcheon plates and similar areas to seal and finish installation, in accordance with Section 07900 – Joint Sealants.
- .5 Make allowances around perimeter where fixed objects pass through or project into carpentry work to permit normal movement without restriction.
- .6 Touch up cut edges and surfaces with sealer.
- .7 Apply water resistant building paper or bituminous coating over wood framing members in contact with cementitious construction.
- .8 After installation, adjust operating hardware for proper fit and function.
- .9 Protect finished surfaces by approved means. Do not remove until immediately before Substantial Performance.

**END OF SECTION**

**FIBREGLASS REINFORCED PLASTIC PRODUCTS  
AND FABRICATIONS**

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**1. GENERAL**

**1.1 References**

- .1 The following is a list of standards which may be referenced in this Section:
  - .1 NBC of Canada, 2005.
  - .2 CAN/CGSB-41.22-93 Fibreglass-Reinforced Plastic Corrosion-Resistant Equipment.
  - .3 ASTM:
    - .1 C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus.
    - .2 D570, Standard Test Method for Water Absorption of Plastics.
    - .3 D635, Standard Test Method for Rate of Burning and/or Extent and Time of Burning Plastics in a Horizontal Position.
    - .4 D638, Standard Test Method for Tensile Properties of Plastics.
    - .5 D695, Standard Test Method for Compressive Properties of Rigid Plastics.
    - .6 D696, Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer.
    - .7 D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
    - .8 D792, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
    - .9 D2344, Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates.
    - .10 D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
    - .11 E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

**1.2 Definitions**

- .1 FRP defined as Fibreglass Reinforced Plastic.
- .2 RTP defined as Reinforced Thermosetting Plastic.

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**1.3 Design Requirements**

- .1 Comply with CAN/CGSB-41.22-93. Do not regard shape of FRP units indicated as exact or complete.
- .2 All products shall be resistant to the following chemicals:
  - .1 35% hydrogen peroxide
  - .2 38% sodium bisulphite
- .3 Provide reinforcing ribs as required on underside of units. Design units to sustain loads imposed with a safety factor of 8 and a maximum deflection of 0.6% of span.
- .4 Design units to applicable parameters established by the NBCC including snow loads and wind loads for return period of 1 in 30.
- .5 Design for erection loads, effect of creep and other causes of dimensional change.
- .6 Design for strength and integrity at service conditions in accordance with prevalent engineering practices.

**1.4 Submittals**

- .1 Shop Drawings:
  - .1 Product Data: Catalogue information and catalogue cuts showing materials, dimensions, weights, design tasks, and showing load, span, and deflection; include Manufacturer's specifications, and details of appurtenances.
  - .2 Grating: Show dimensions, weight, size, and location of connections to adjacent grating, supports, and other Work.
  - .3 Grating Supports: Show dimensions, weight, size, location, and anchorage to supporting structure.
  - .4 Stairs, Platforms, Stringers, Handrails, Ladders, and Support Structures:
    - .1 Show dimensions, weight, size, and location of connections to adjacent supports and other Work.
    - .2 Structural calculations for platforms, ladders and cages, handrails, and other fabrications shown.
- .2 Samples: Each type of grating, handrail, and handrail connection.
- .3 Quality Control Submittals:

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- .1 Handling and storage requirements.
- .2 Manufacturer's installation instructions.
- .3 Factory test reports for physical properties of product.
  - .1 Test data for handrails and supports may supplement load calculations providing data covers the complete system, including anchorage.
  - .2 Test data for all components showing load and deflection due to load, in enough detail to prove handrail is strong enough and satisfies national, state, local standards, regulations, and code requirements, using design loads specified.
  - .3 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 two (2) years of submittal date, of fire retardant testing conducted on exact type of grating proposed (not a resin test report).
- .4 Submittals shall be in accordance with Section 01300 – Submittals.

**1.5 Qualifications**

- .1 Designer: Calculations required for Contractor design shall be stamped by a Professional Engineer registered in the Province of Manitoba.
- .2 Fabricator: Minimum of five (5) years experience.
- .3 Manufacturer: Minimum of five (5) years experience in manufacturing of products meeting these specifications on projects of comparable scope.

**1.6 Delivery, Storage, and Handling**

- .1 Preparation for Shipment:

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- .1 Insofar as is practical, factory assemble items provided hereunder.
  - .2 Ladders shall be shipped 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.
- .2 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.

**2. PRODUCTS**

**2.1 General**

- .1 Like Items of Materials: Where possible, provide end products of one Manufacturer in order to achieve standardization for appearance, maintenance, and replacement.
- .2 Unless otherwise specified, all products shall be manufactured by a pultruded process using vinyl ester resin.
- .3 Products shall be manufactured with UV inhibitor additives.
- .4 Exterior surfaces shall have a synthetic surface veil covering.
- .5 Furnish moulded products as an option where permitted by Specifications.
- .6 Color pigment shall be dispersed in resin system.
- .7 All cut ends, holes, and abrasions of FRP shapes shall be sealed with resin to prevent intrusion of moisture.

**2.2 Material Properties**

<b>Minimum Ultimate Coupon Properties (UN)</b>		
<b>Material Properties</b>	<b>Test Method</b>	<b>Units</b>
<b>Pultruded Fiberglas Structural Shapes</b>		
Ultimate tensile stress in longitudinal direction, MPa	ASTM D638	200
Ultimate compressive stress in longitudinal direction, MPa	ASTM D695	200

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<b>Minimum Ultimate Coupon Properties (UN)</b>		
<b>Material Properties</b>	<b>Test Method</b>	<b>Units</b>
Ultimate flexural stress in longitudinal direction, MPa	ASTM D790	200
Ultimate short beam shear in longitudinal direction, MPa	ASTM D2344	30
Ultimate tensile stress in transverse direction, MPa	ASTM D638	50
Ultimate compressive stress in transverse direction, MPa	ASTM D695	100
Ultimate flexural stress in transverse direction, MPa	ASTM D790	70
Density kg/mm <sup>3</sup>	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 <sup>-6</sup> mm/mm/°C	ASTM D696	8.0
<b>Flame-Retardant Properties</b>		
Flammability test	ASTM D635	Self-extinguishing
Surface burning characteristics	ASTM E84	25 maximum
Flammability class	UL 94	VO
Temperature index	UL 94	130°C

**2.3 Grating and Stair Treads**

.1 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 1.5 kN on square area of 100 x 100 located in center of tread as per requirements of NBCC, whichever produces greater stress.

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- .4 Nonskid silica grit adhered to top surface of all bars, providing skid resistance.
- .2 Molded Type:
  - .1 Load bars in both directions with equal stiffness.
  - .2 Square mesh, 40 mm maximum spacing centre to centre.
- .3 Pultruded Type:
  - .1 Main bars joined by cross bars secured in holes drilled in main bars.
  - .2 Cross bars, with 150 mm maximum spacing centre to centre, 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 40 mm.
  - .5 Provide extra stiffness around openings.
- .4 Adjustable Grating Support Pedestals:
  - .1 Adjustable-height pedestals used to support moulded type grating above sloping floors. Pedestals shall be fabricated entirely out of vinyl ester resins and be adjustable up to a height of 1.5 m.
  - .2 Provide lateral bracing for the pedestals to prevent sidesway under pedestrian traffic. Bracing members shall consist of pultruded fibreglass structural shapes attached to the pedestals with fibreglass fasteners.
  - .3 Pedestals and lateral bracing to be designed and provided by the grating Manufacturer.
- .5 Hold-Down Clamps: Same material as grating or Type 316 stainless steel.
- .6 Bolts and Connectors:
  - .1 Corrosion-resistant FRP or Type 316 stainless steel.
  - .2 Size and strength to meet code requirements.
- .7 Fabrications:
  - .1 Field measure areas to receive grating. Verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.

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- .2 Section Length: Sufficient to prevent it from falling through clear opening when oriented in span direction when one end is touching either concrete or vertical leg of grating support.
- .8 Manufacturers:
  - .1 Fibergrate Composite Structures, Inc.
  - .2 IKG/Borden.
  - .3 Strongwell Corp.
  - .4 International Grating, Inc.

**2.4 Structural Platforms**

- .1 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:
    - .1 Flexural Members: 2.5.
    - .2 Compression Members: 3.0.
    - .3 Shear: 3.0.
    - .4 Connections: 4.0.
  - .3 Minimum design safety factors for dynamic or impact loads shall be twice the values for static service loads.
- .2 Loads:
  - .1 4.8 kPa uniform live load over platform, unless noted otherwise on Drawings
  - .2 Static and dynamic loads for equipment shown.
- .3 Glass fibre reinforced polyester or vinyl ester resin matrix, approximately 50% resin-to-glass ratio.
- .4 Continuous glass strand rovings shall be used internally for longitudinal strength.
- .5 Continuous strand glass mats shall be used internally for transverse strength.



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

**2.5 Handrail**

- .1 Design and fabricate handrail system in accordance with the requirements of NBCC for the following loading conditions:
  - .1 Minimum horizontal load of 0.75 kN/m applied inward or outward at the top railing or guard, or a concentrated horizontal load of 1.0 kN applied at any point along the top railing or guard, whichever loading governs.
  - .2 Minimum concentrated load of 0.5 kN applied to any other element within the railing or guard assembly, not acting simultaneously with the minimum horizontal load.
  - .3 Minimum vertical load of 1.5 kN/m applied to the top rail or guard, not acting simultaneously with the minimum horizontal load.
- .2 Design FRP handrail system as indicated and with the following characteristics:
  - .1 All FRP construction.
  - .2 All connections, except expansion connections, continuously welded.
  - .3 Anchor railing system with: Top mounted post base plate anchored to supporting structure.
  - .4 Handrail or circular cross section continuously graspable along its entire length and minimum diameter of 30 mm and maximum diameter of 50 mm.
  - .5 Vertical posts and horizontal railings of identical outside diameter.
  - .6 Formed elbows at changes of direction of handrail.
  - .7 Expansion sleeves at location of building expansion joints and at 8000 mm o.c. maximum spacing. Locate expansion sleeves within 300 mm of post.
  - .8 Railing turned back to wall, floor or post at end of run.
  - .9 Posts located maximum 150 mm each way from corner or point of change of direction. Space both posts equal distance from corner.
  - .10 Pickets and infill grillage as indicated.
  - .11 Welded end caps at railing terminations.

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- .12 Continuous 125 mm high toe-board along open sides of platforms or landings.
- .13 Top rail not less than 1070 mm above the floor or platform on which it is installed.
- .14 Intermediate rail midway between the top rail and floor or platform.

.3 Manufacturers:

- .1 Strongwell Corp.
- .2 Fibergrate Composite Structures, Inc.

**3. EXECUTION**

**3.1 General**

- .1 Examine surfaces to which work is to be anchored and job conditions.
- .2 Report conditions which would adversely affect installation.
- .3 Do not commence installation until unsatisfactory conditions are corrected.
- .4 Install in accordance with manufacturer's written instructions.
- .5 Install plumb or level, rigid and neat, as applicable.
- .6 Furnish fasteners and anchorages for complete installation.
- .7 Seal field cut holes, edges, and abrasions with catalyzed resin compatible with original resin.

**3.2 Grating**

- .1 Anchor grating securely to supports to prevent displacement.
- .2 Install each grating section such that it is easily removable.
- .3 Clearance (Grating to Vertical Surfaces): 6 mm ( $\pm$  3 mm tolerance).
- .4 Install adjustable grating support pedestals and lateral bracing for pedestals in accordance with grating manufacturer's instructions.

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**3.3 Handrail**

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

**3.4 Structural Shapes**

- .1 Connect parts with approved connectors meeting Manufacturer's design requirements and with corrosion resistance equal to structural shapes.
- .2 Provide supports and bracings required to comply with applicable codes and design requirements.

**3.5 Warranty**

- .1 Submit a two (2) 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, and evidence of other defects of exterior surface.

**END OF SECTION**