SECTION  – fiberglass windows

1. General
   1. summary
      1. This Section includes pre-assembled window systems having factory installed glass and glazing of the following type[s]:
         1. Single **[fixed] [and] [casement] [awning] [tilt turn]** units.
         2. Composite, with fixed lites and operable **[casement] [awning] [tilt turn]** lites.
         3. Combination, with **[fixed lites only] [operable lites only]**.
      2. This Section specifies window frames and sashes consisting polyvinyl chloride (PVC) extrusions.
      3. Frames or sashes utilizing wood are not permitted.
      4. Related Requirements:
         1. Section 07 27 13 – Self-Adhered Air Barrier Sheet Membrane.
         2. Section 07 92 00 – Joint Sealants.
         3. Section 08 80 00 – Glazing.
   2. reference standards
      1. Canadian Standards Association (CSA):
         1. CAN/CSA A440 00/A440.1-00, Windows/User Selection Guide to CSA Standard CAN/CSA A440 00, Windows.
         2. CSA A440.4 07 (R2012), Window and Door Installation.
         3. CAN/CSA G164 M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
      2. American Society of Testing and Materials (ASTM):
         1. ASTM A 653/A 653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
         2. ASTM D 3917-12, Standard Specification for Dimensional Tolerance of Thermosetting Glass Reinforced Plastic Pultruded Shapes.
         3. ASTM D 3918-11, Standard Terminology Relating to Reinforced Plastic Pultruded Products.
         4. ASTM D 4216-06, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly(Vinyl Chloride) (CPVC) Building Products Compounds.
         5. ASTM D 4726-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior Profile Extrusions Used for Assembled Windows and Doors.
         6. ASTM D 4385-10, Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products.
   3. definitions
      1. Single Unit Window: A window consisting of one fixed or one operable lite.
      2. Composite Window: A window consisting of a several lites in one main frame. Composite windows may consist of fixed or operable windows, or a combination of both.
      3. Combination Window: A combination of complete window assemblies whose frames are mulled together and may consist of fixed or operable windows, or a combination of both.
   4. SUBMITTALS
      1. Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.
      2. Action Submittals: Provide the following submittals before starting any work of this Section:
         1. Submit manufacturer's product data including construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of window indicated.
         2. Submit shop drawings including plans, elevations, large scale sections and details, hardware, attachments to other work, operational clearances, and the following:
            1. Sections details showing all window perimeter conditions.
            2. Mullion **[and muntin]** details and frame corner connections, including reinforcement and stiffeners.
            3. Joinery and frame anchorage to wall structure details.
            4. Expansion provisions.
            5. Flashing and drainage details, sill flashing terminations, in isometric view, including coordination with wall cladding materials.
            6. Connection to air and vapour retarder membrane.
            7. Weather stripping details showing air sealing within and around perimeter of framing and operable sash.
            8. Glazing details.
            9. Required sizes and tolerances of openings.
         3. Submit product test reports indicating compliance with CSA A440.1 based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of window indicated for the project; test results based on use of downsized test units will not be accepted.
         4. Provide a letter from window manufacturer identifying compliance with ASTM D4216 and ASTM D 4726.
         5. Provide a stress analysis on all tinted heat/absorbing glass and light and heat reflecting glass. Submit prior to ordering glass.
         6. Submit maintenance data for **[operable window sash] [operating hardware] [weather stripping] [and]** finishes.
   5. quality assurance
      1. Installer Qualifications: Minimum five (5) years installing similar assemblies.
      2. Certifications: AAMA certification label indicating assemblies meet the design requirements.
      3. Mock-Up: Provide a mock-up for evaluation of installation techniques and workmanship.
         1. Mock-ups shall incorporate surrounding construction, including wall assembly fasteners, flashing, and other related accessories installed in accordance with manufacturer's approved installation methods.
         2. Do not proceed with remaining work until workmanship is approved by Consultant.
         3. Modify mock-up as required to produce acceptable work.
         4. At Substantial Completion, approved mockups may become part of completed work.
      4. Pre-installation Meeting: Conduct pre-installation meeting on-site two weeks prior to commencement of installation.
   6. design criteria
      1. Materials, fabrication, attachments, accessories, assembly and performance, other than thermal performance, shall meet or exceed applicable requirements of CSA A440, Windows.
      2. Determine thermal performance in conformance with CSA A440.2, Thermal Performance Evaluation of Windows and Sliding Glass Doors, and Appendix A - Overview of the Procedure for Determining the U Value by Computer Simulation.
      3. Design windows to equalize both positive and negative pressure between outside air and:
         1. Cavities surrounding insulating glass units, and
         2. Cavities surrounding operable sash.
      4. Design windows to provide drainage from spaces around operable sash and around insulating glass units to exterior.
      5. Design windows to protect drainage openings from direct entrance of wind driven rain by use of baffles or other protection.
      6. Design frames and sashes for interior glazing methods; exterior glazing methods are not acceptable.
      7. Design main frame for exterior surface of frame to be mounted flush with the exterior sheathing.
      8. Performance Requirements: Provide assemblies able to withstand positive and negative pressures normal to the plane of window in accordance with Building Code climatic requirements based on 1 in 30-year criteria in accordance with CAN/CSA A440/A441.
      9. Design components to accommodate thermally induced movement.
   7. DELIVERY, STORAGE AND HANDLING
      1. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
      2. Deliver and store assembly materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact. Protect from damage.
   8. SITE CONDITIONS
      1. Site Measurements: Verify actual locations of structural supports for fiberglass window systems by site measurements before fabrication and indicate measurements on Shop Drawings.
      2. Established Dimensions: Establish dimensions and proceed with fabricating fiberglass window systems where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual dimensions correspond to established dimensions.
      3. Ambient Conditions: Confirm installation requirements for ambient and surface temperatures of sealants with manufacturer and apply sealants when temperatures are greater than manufacturer's stated minimum from time of application until sealants have cured.
   9. warranty
      1. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
         1. Window Unit: Ten (10) years.
         2. Patio Door Unit: Ten (10) years.
         3. Insulated Glass: Ten (10) years against seal breakage.
2. Products

SPEC NOTE: Do not specify less than A3, B3 and C3 unless client requests a product which has a lower rating.

* 1. manufacturer
     1. Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis of Design Materials, manufacturers offering products that may be incorporated into the Work include but are not limited to, the following:
        1. Atrium SilentGuard Acoustical Windows & Doors; SilentGuard Series.
  2. SINGLE UNIT WINDOWS
     1. Meet or exceed requirements of CSA A440, and the following performance requirements:
        1. Air Tightness Rating, Fixed Windows: Fixed.
        2. Air Tightness Rating, Operable Windows: A3.
        3. Water Tightness Rating: [B3].
        4. Wind Load Resistance Rating: [C3] [C4] [C5].
        5. Forced Entry: F2, pass test for resistance to forced entry.
        6. Glazing: As indicated in Section 08 80 00 - Glazing.

SPEC NOTE: Coordinate and discuss window types and configurations with project manager. Operable sash above fixed glazing is preferable to below, provided hardware is adequately accessible. Higher sash will vent stratified hot air more effectively. Providing both in different windows is the optimum. Operable sash mounted below fixed lite may locate horizontal mullions at heights that obstruct view, particularly for the elderly, the disabled and school students who spend much of their time sitting. Consider these facts and design window configuration to accommodate all building users.

SPEC NOTE: Awnings are the preferred type of operable sash since they provide a barrier to wind driven rain. Casements and tilt‑turns have full window height openings and provide better ventilation of stratified air than awnings. Casements may oscillate in high winds due to typical residential hardware limitations. To minimize this oscillation, concealed arm sash stops are included in this section.

SPEC NOTE: Sliders are not recommended. Their long term performance with regards to maintenance, air and water leakage is not considered acceptable. This specification does not include requirements for sliders.

* 1. [COMBINATION] [AND] [COMPOSITE] WINDOWS
     1. Meet or exceed requirements of CSA A440 for **[combination] [and] [composite]** windows, and the performance requirements for single unit windows.
     2. Where **[composite] [and] [combination]** windows specified have not been tested, individual lights shall meet the performance requirements for the applicable single unit window types specified.
     3. Air and water tightness of joints along frames mulled together, and at mullions where lites within one main frame join, shall meet or exceed performance ratings specified for adjacent single unit windows.
     4. Lateral deflection of mulled frames shall not exceed 1/175 of span when subjected to loading equivalent to wind load resistance of the adjacent single unit windows.
  2. FRAME AND SASH REQUIREMENTS
     1. Frame and sash profiles and glazing detailed on drawings are not intended to restrict product types conforming with these specifications.
     2. Provide FRP frame and sash meeting the following requirements:
        1. Fibreglass Reinforced Plastic FRP: minimum 60% glass content, by weight, resins and inert filler for balance of composition.
        2. FRP Pultrusions, no substitutions:
           1. Inline Fiberglass Ltd., 400 Series.
           2. Omniglass Ltd., Fibertherm 450 Series.
     3. Minimum external wall thickness of pultrusions: 2 mm (5/64") nominal, exceeding requirements of CSA A440, and as follows:
        1. Seal sash perimeter continuously at two locations minimum, with primary seal located between operator and exterior seal.
        2. Secure hardware and attachments using screws into H ports or penetrating minimum of two walls of framing.
        3. Join single units to form combination units with joints at combination unit frame perimeter finished with sealant and steel plate, 75 mm (3") x 75% of depth of framing; fasten plate using a minimum of four (4) screws through plastic into steel reinforcing.
        4. Anchor using metal strap anchors or concealed fasteners through frames; nailing fins or splines are not acceptable.
        5. Brick molding and trim shall be independent of the window framing and secured in place.
        6. Fit corners to provide hairline joint.
        7. Sill and head sections shall be continuous for combination units.
  3. OPERATING HARDWARE
     1. Awning Hinges: Sash balancing friction hinge for use on commercial windows, concealed between sash and frame, complete with friction screw adjustment and enhanced corrosion protection coating.
     2. Casement Hinges: Low friction slide and pivot design casement hinge for use on commercial windows, to provide 135 kg negative air pressure resistance, concealed between sash and frame, with Teflon filled slide shoe on roll formed stainless steel track and flat bottom design specifically for FRP material, adjustment system for sash drag and corrosion protection coating.
     3. Multi Point Locking System: Window locking system providing security and weather seal tightness having locking points to provide 135 kg of force for negative air pressure and forced entry resistance; sequential locking with 16 mm (5/8") of pull in utilizing tie bar driven by a single locking handle to meet handicap accessibility hardware height standards, and lock drive O ring weather seal between lock and window frame; manufactured from high pressure zinc alloy die castings with corrosion protection coating.
     4. Awning Operator: Operators shall provide easy adjustment of window position, crank operated and provide wide range of open positions. Connection to movable sash shall detach for window cleaning and maintenance. Scissors arm design driven by hand crank, hardened steel worm and gearing and high pressure zinc alloy die castings. High strength plastic trim cover matching casement operator, and with corrosion protection coating, ADA compliant.
     5. Casement Operator: Operators shall provide easy adjustment of window position. Connection to movable sash shall detach for window cleaning and maintenance. Operators shall be a combined push arm and drag arm/link design driven by a hand crank, constructed of hardened steel worm and gearing and high pressure zinc alloy die castings and with corrosion protection coating. High strength plastic trim cover matching awning operator, ADA compliant.
     6. Tilt Turn Operator: Concealed hardware parts having only the handle visible. Horizontal and vertical perimeter locking points to provide weathertight performance and security.
  4. INSECT SCREENS
     1. Design windows and hardware to accommodate screens in a tight fitting, removable arrangement, with a minimum of exposed fasteners and latches, and as follows:
        1. Fabricate screens and frames in accordance with CAN/CSA A440 and CAN/CGSB 79.1.
        2. Fabricate insect screens to fully integrate with window frame.
        3. Locate screens on outside of window and provide for each operable exterior sash.
     2. Screen Frames:
        1. Extruded Aluminum or Aluminum Tubular Framing Sections: Aluminum sections having 0.8 mm (1/32") minimum nominal wall thickness, with finish matching aluminum window members.
     3. Screen Fabric:
        1. Screen Class: Class A in accordance with CAN/CGSB 79.1.
        2. Screen Strength: S2 in accordance with CAN/CSA A440 and CAN/CGSB 79.1.
        3. Screen Style: Style 1 in accordance with CAN/CGSB 79.1.
        4. Fabric Mesh Material: Aluminum Wire: Charcoal grey or black finish; in accordance with CAN/CGSB 79.1.
  5. GLASS AND GLAZING MATERIALS
     1. Insulating Glass Units: meet or exceed requirements of CAN/CGSB 12.8, as indicated in Section 08 80 00 - Glazing.
     2. Glazing Gaskets for FRP Sections: Manufacturers standard.
     3. Other Glazing Accessories: As indicated in Section 08 80 00 - Glazing.
  6. ACCESSORIES
     1. Weatherstripping at Operable Sash: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature, and as follows:
        1. Profiled to mechanically key into window frame and operable sash.
        2. Removable without special tools and without dismantling of sash or frame.
        3. Designed to maintain pressure contact against sash through design temperature range.
     2. Steel Clips, Supports and Anchors: minimum 2 mm (5/64") bare sheet thickness, hot dip galvanized to CAN/CSA G164. Provide anchors that permit sufficient adjustment for accurate alignment.
     3. Steel Reinforcement: sheet steel to ASTM A 653M, hot dip galvanized, minimum Z275 coating designation.
     4. Joint Sealants: As specified in Section 07 92 00 "Joint Sealants," as recommended for types of substrates.
     5. Insulating Foam Sealant: one part polyurethane, closed cell foam, skin forming type, expanding maximum 25%.
     6. Foam Backer Rod: extruded closed cell backer rod, oversize 30 to 50%.
     7. Flashing: prefinished sheet aluminum, brake formed as indicated on drawings, 0.62 mm (0.02") thick, or extruded vinyl matching window framing, concealed fastened.
  7. FABRICATION
     1. Fabricate window units square and true with maximum tolerance of ±1.5 mm (1/16") for units with a diagonal measurement of 1830 mm (6') or less and 3 mm (1/8") for units with a diagonal measurement over 1830 mm (6').
     2. Seal fibreglass framing joints with butyl polyisobutylene or silicone sealant.
     3. Steel reinforces vertical and horizontal components of FRP window units as required by engineered structural design.
     4. Continuously and uniformly compress length of gaskets during installation, to compensate for linear shrinkage.
  8. GLAZING
     1. Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets and stop beads before applying splines or gaskets. Use solvents and cleaning agents recommended by manufacturer of sealing materials.
     2. Install glazing gaskets uniformly with accurately formed corners and bevels. Ensure that proper contact is made with glass and rabbet interfaces.
     3. Support both lites of glass thermal units on levelled setting blocks, 4 mm or 6 mm (5/32" or 1/4") minimum, spaced as recommended by glass manufacturer.
     4. Provide at least one setting block at quarter points from each corner; locate setting blocks for casement windows at upper corner away from hinge and lower corner adjacent to hinge to prevent sagging of window unit.
     5. Size glass thermal units to ensure exposed face of spacer is in line with glazing stops.
     6. Use spacers and shims in accordance with glass manufacturer's recommendations.
  9. FRAME AND SASH FINISHES
     1. Fibreglass: manufacturer's standard acrylic paint finish, in colour selected by Consultant from the standard range.

1. Execution
   1. examination
      1. Inspect window prior to installation.
      2. Inspect rough opening for compliance with window manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.
   2. preparation
      1. Prepare windows for installation in accordance with manufacturer's recommendations.
   3. INSTALLATION
      1. Erect and secure window units in prepared openings, plumb and square, free from warp, twist, or superimposed loads.
      2. Mount window with exterior surface of main frame flush with exterior sheathing.
      3. Secure work accurately to structure and in a manner not restricting thermal movement of materials.
      4. Transfer window dead load to wall construction by anchors alone or in combination with plastic shims; wood shims are not acceptable.
      5. Place shims under sill frame at setting block locations, and as recommended by window frame manufacturer.
      6. Conceal anchors and fitments; exposed heads of fasteners are not permitted.
      7. Maintain dimensional tolerances after installation and alignment with adjacent work.
      8. Provide seal around interior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant.
      9. Provide seal at head and jamb of exterior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant. Do not seal sill at exterior.
      10. Install jamb extensions, casings, brick moulds and trim as indicated on drawings.
      11. Install sealant, in accordance with Section 07 92 00 – Joint Sealants, and related materials as indicated on drawings.
      12. Adjust operable sash and hardware to operate smoothly.
      13. Clean interior and exterior surfaces as soon as adjacent contaminating activities are completed, to recommendations of window manufacturer.

END OF SECTION