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1. Section 085313   
   Vinyl Windows

*This draft specification is provided only as an aid in architect’s/engineer’s development of the final specification and is not intended as a substitute for sound architectural/engineering judgment. The architect/engineer shall be responsible to convert this draft specification into a final specification that meets the functional and aesthetic needs of its client, as well as complying with all applicable codes.*

***NOTE TO SPECIFIER- Where boldface, bracketed alternatives are listed within the specification, select one option for each case. Delete any sections, options or verbiage not applicable to the project. Contact your local Alpen High Performance Products representative for specific values and options required for the project.***

* 1. PART 1  GENERAL
     1. Summary
        1. Section Includes: Alpen Tyrol Contour fiberglass reinforced uPVC windows as listed below. All windows are factory assembled and include all required glass and glazing materials; any internal structural reinforcement (stiffeners) that may be required to meet design loads, mulling conditions, non-white vinyl reinforcement and/or proper operation; window hardware, weatherstripping and insect screens.
           1. Size and quantity of each type of vinyl window is shown on drawings
           2. Configuration of windows required: See shop drawings
        2. Related Requirements:

***Note to specifier: Edit the following sections to include only those applicable to the project.***

* + - * 1. Section 072500 - Weather Barriers:  Sealing frames to water-resistive barrier installed on adjacent construction.
        2. Section 079200 - Joint Sealants:  Sealing joints between frames and adjacent construction.
        3. Section 082200 Hinged Vinyl Framed Glass Doors
        4. Section 08260 Sliding Vinyl Framed Glass Doors
        5. Section 088000 - Glazing.
    1. REFERENCE STANDARDS

***Note to specifier: Edit the following standards to include only those applicable to the project.***

* + - 1. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).
      2. AAMA 303 – Voluntary Specification for Rigid PVC Exterior Profiles; 2023
      3. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.
      4. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
      5. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
      6. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
      7. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
      8. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).
      9. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).
      10. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.
      11. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2017 (Reapproved 2023).
      12. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
      13. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Light Transmission at Normal Incidence.
      14. Energy Star – Current Edition
      15. PHIUS - EN 673/ISO 10077; Current Edition.
    1. SUBMITTALS

***Note to specifier: Edit the following submittals to only include those applicable to the project.***

* + - 1. See Section 013000 - Administrative Requirements for submittal procedures.
      2. Product Data:  Submit manufacturer’s product data including installation instructions and **[VALUE]**.
      3. Shop Drawings:  Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements, field requirements, sealant locations and glazing.
      4. Samples:  **[One],** not less than 6 inch (152 mm) length of profile, representing quality of finish to be furnished by manufacturer.
      5. Grade Substantiation:  Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
         1. Evidence of AAMA Certification.
         2. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
      6. Test Reports:  Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance.
      7. Field Quality Control Submittals:  Report of field testing for water penetration and air leakage.
      8. Manufacturer's qualification statement.
      9. Installer's qualification statement.
      10. Specimen warranty.
      11. Evidence of PHIUS Certification
    1. QUALITY ASSURANCE
       1. Manufacturer Qualifications:  Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
       2. Installer Qualifications:  Company specializing in performing this type of installation specified and with at least five years of documented experience.
    2. DELIVERY, STORAGE, AND HANDLING
       1. Protect finished surfaces with wrapping.  Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
       2. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.
       3. Do not store wrapped windows in direct sunlight or exposed weather elements. Do not roll, lay flat or carry windows upside down. Always lift with glass cups with minimum 3 points of support. Follow other manufacturer recommendations.
    3. Project CONDITIONS
       1. Environmental Requirements:
          1. Do not install sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer.
          2. Maintain this minimum temperature during and after installation of sealants.
       2. Field Measurements:
          1. Verify Dimensions of surrounding construction by field measurements so work will be accurately designed, fabricated and fitted to the structure. Contractor and manufacturer shall cooperate to establish and maintain these field dimensions. If the contractor guarantees the dimensions, no field measurements are required.
       3. Project Schedules:
          1. Contractor shall prepare and provide Project Progress Schedule prior to the preconstruction meeting to the engineer and owner for review. The schedule shall show the complete sequence of construction by activity, with dates for beginning and completion of each element of construction. Identify each item by specification section number. Provide sub-schedules to define critical portions of the entire schedule. Coordinate content with schedule of values. Proposed window testing dates shall be indicated in the schedule.
    4. WARRANTY
       1. See Section 017800 - Closeout Submittals for additional warranty requirements.
       2. Manufacturer agrees to repair or replace vinyl windows and storefronts that fail in materials or workmanship within the specified warranty period.
       3. Failures include, but are not limited to, the following:
          1. Failure to meet performance requirements.
          2. Structural failures including excessive deflection, water leakage and air infiltration.
          3. Faulty operation of movable sash and hardware.
          4. Deterioration of materials and finishes beyond normal weathering, per AAMA 303.
          5. Failure of insulated glass including seal failure and interpane dusting or misting.
       4. Warranty Period:
          1. Window: 10 Years
          2. Glazing: 20 Years
  1. PART 2  PRODUCTS

2.01 acceptable MANUFACTURERS

* + - 1. Vinyl Windows:
         1. Alpen High Performance Products​​​​​; uPVC Tyrol Contour Series Windows:​​​​​  www.thinkalpen.com/#ahpp.

2.02 DESCRIPTION

* + - 1. Vinyl Windows:  Factory-fabricated frame and sash members of extruded, hollow, ultra-violet-resistant, fiberglass reinforced unplasticized polyvinyl chloride (uPVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
         1. Configuration:  As indicated on drawings.

Product Type:  Inswing functionality **[DAW - Tilt and turn], [FW - Fixed window], and [Turn-Only Inswing Casement]**

* + - * 1. Exterior Color:  **[White] [Black] Bronze] [From Manufacturers Standard Offering] [\_\_\_\_\_].**
        2. Interior Color: **[White] [To Match Exterior Color] [\_\_\_\_\_]**.
        3. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
        4. Operable Units:  Three weather seals.
        5. Framing Members:  Seamless welded corners and joints; no secondary processing, including use of touch-up paint to conceal miters.
        6. System Internal Drainage:  Drain to exterior side by means of weep drainage network.
        7. Glazing Stops:  Formed of rigid PVC, fitting tightly into frame assembly and applied from the interior.
        8. Mounting Flange:  Integral to frame assembly, providing weather stop at entire perimeter of frame.
        9. Reinforcements (Stiffeners): Fiberglass or composite internal reinforcements inside frame and sash members. Use of steel is not permitted except for in the construction of mullions.
        10. Insect Screens:  Tight fitting for operating sash location.

2.03 PERFORMANCE REQUIREMENTS

* + - 1. Grade:  AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
         1. Minimum Performance Class (PC):  ​CW​

***Note to specifier: Fixed Window performance grade is 50 and Tilt-Turn performance grade is 60.***

* + - * 1. Minimum Performance Grade (PG):  **​[50] [60]**
        2. Comply with all applicable building codes
      1. Other Performance Requirements:
         1. Allow for thermal movement of the window based on site mean temperature +/- 700F, window/element size and coefficient of linear expansion of uPVC. If non-white windows are selected, allow for thermal movement of the window based on the solar heat absorption.

***Note to specifier: Use Section 2 OR Section 3 OR Section 4 depending on project requirements.***

* + - * 1. NFRC 100 Maximum Thermal Performance:

***Note to specifier: AlpenGlass standard IGU configurations are selectable below as well as standard SHGC low-e coating categories: Balanced, SolarControl and HighGain. Select BOTH IGU configuration and low-e category together.***

**[Balanced]**

Fixed: **[TR5: 0.20] [TR6: 0.14] [TR9: 0.12]**

Operable: **[TR5: 0.20] [TR6:0.15] [TR9: 0.13]**

**[SolarControl]**

Fixed: **[TR5: 0.19] [TR6: 0.15] [TR9: 0.12] [TR11: 0.09]**

Operable: **[TR5: 0.20] [TR6: 0.15] [TR9: 0.13] [TR11: 0.11]**

**[HighGain]**

Fixed: **[TR5: 0.20] [TR6: 0.15] [TR9: 0.13]**

Operable: **[TR5: 0.20] [TR6: 0.16] [TR9: 0.13]**

NFRC 200 Maximum SHGC:

**[Balanced]**

Fixed: **[TR5: 0.31] [TR6: 0.29] [TR9: 0.27]**

Operable: **[TR5: 0.27] [TR6: 0.25] [TR9: 0.24]**

**[SolarControl]**

Fixed: **[TR5: 0.20] [TR6: 0.20] [TR9: 0.19] [TR11: 0.17]**

Operable: **[TR5: 0.18] [TR6: 0.17] [TR9: 0.16] [TR11: 0.15]**

**[HighGain]**

Fixed: **[TR5: 0.49] [TR6: 0.46] [TR9: 0.44]**

Operable: **[TR5: 0.42] [TR6: 0.41] [TR9: 0.38]**

* + - * 1. NFRC Thermal Performance: Windows shall meet the following performance data as calculated to NFRC and ISO 15099 Standards and indicated performance requirements.

Comply with all applicable energy codes and ENERGY STAR.

When tested in compliance with NFRC 100, the windows, including glass and vinyl framing, shall have a thermal transmittance (UFactor) of:

**[VALUE]** Btu/hr\*ft2 0F

When tested in compliance with NFRC 200, the windows, including glass and vinyl framing, shall have a Solar Heat Gain Coefficient of: **[VALUE]**

Condensation Resistance Factor:  CRF of **[VALUE]**, minimum, the lower value of the glass and frame window components and determined in accordance with AAMA 1503.

* + - * 1. Passive House Thermal Performance: Windows shall meet the following performance data as calculated to EN 673/ISO 10077 and Passive House Standards and indicated performance requirements.

Window Thermal Transmittance (Uw): Maximum effective overall UValue not more than:

Fixed: **[VALUE]** Btu/hr\*ft2

Operable: **[VALUE]** Btu/hr\*ft2 0F

Glass Thermal Transmittance (Ug): Maximum thermal transmittance of:

**[VALUE]** Btu/hr\*ft2 0F

Glass Solar Heat Gain Coefficient (SHGC): Maximum thermal transmittance when calculated according to EN 410 shall be:

**[VALUE]** Btu/hr\*ft2 0F

***Note to Specifier: Tyrol Contour frame values for operable windows are: 0.170 Btu/hr\*ft2 0F*** ***with 1-5/8” glass***  ***0.140*** ***Btu/hr\*ft2 0F with 1-7/8” glass and foam insert (white only) 0.154 Btu/hr\*ft2 0F with 1-7/8” glass and insert (oversize and dark colors)***

Frame Thermal Performance (Uf): Maximum thermal transmittance of **[VALUE]** Btu/hr\*ft2 0F

Psi-edge (Ψg) performance: **[VALUE]** Btu/hr\*ft2 0F when calculated according to EN ISO 10077-2

* + - 1. Forced Entry Resistance (FER):  Tested to comply with ASTM F588 requirements having at least Grade 10 performance for each required window assembly.
      2. Acoustic Performance:  Minimum outdoor-indoor transmission class (OITC) rating of **[VALUE]**, when tested in accordance with ASTM E90.
      3. Air Infiltration: Maximum 0.02 cfm/ft­­2 when tested in accordance to ASTM E283 for air infiltration at 75 Pa (1.57 cfm/ft­­2)

2.04 COMPONENTS

***Note to specifier: AlpenGlass triple and quad pane products offer a wide range of thermal performance values for project-specific requirements. Please reach out to your local Alpen High Performance Products representative for corresponding IGU performance based on specific unit components.***

* + - 1. Glazing: The Manufacturer of Insulated Glazing Units must be certified by an NFRC Accredited Inspection Agency, NAMI or IGCC.
      2. Insulated glass unit, comprised of thin-glass inner layer **[AlpenGlass triple] [AlpenGlass quad]​​** pane, ​​​clear​​, ​​low-E coated​​,​​ **[Laminated] [Bird-Friendly] [VALUE]**
      3. Individual components shall comply with criteria specified in the following sections. Units shall comply with ASTM E 2190, be hermetically sealed and be pre-pressurized without the need for breather tubes or with a
         1. Components:

Exterior glass to be low-e coated float glass of nominal 1/8” (3mm) thickness or greater as recommended by manufacturer for specified wind conditions​​ and acoustic rating indicated.

Annealed unless required to be tempered per code requirements. Where used, tempered glass shall be qualified per ASTM C 1048, complying with CPSC 16CFR-1201; ANSI Z 97.1

Inner layer(s) to be clear vision glass of 1.1mm or less nominalthickness as required by performance specified herein.

Interior glass to be clear or low-e coated float glass of nominal 1/8” (3mm) thickness or greater as recommended by manufacturer for specified wind conditions​​ and acoustic rating indicated.

Annealed unless required to be tempered per code requirements. Where used, tempered glass shall be qualified per ASTM C 1048, complying with CPSC 16CFR-1201; ANSI Z 97.1

Gas fill: Each cavity shall be filled with an inert gas/air mixture as specified to achieve thermal performance requirements.

Spacer: Shall be an advanced thermo-plastic (TPS) warm-edge spacer.

Secondary sealant: Silicone

* + - * 1. Glass Stops:  Interior applied snap-on PVC glazing bead with color to match interior sash color.
      1. Frame Depth:  3-1/4 inches
      2. Exterior color: Multi-layer laminated foil Renolit FX, with a 20-year warranty for North American applications.
         1. Substitutions must be laminated foils backed by third-party test data for North American use and carry a warranty equal to or exceeding product specified.
         2. Paint-on finishes not permitted.
      3. Divided Lite Grid:  Installed on the surface of the **[exterior pane] [exterior and interior panes]** of insulating glass, **[7/8”]** **[1-1/4”] [2”]** wide, colored to match frame and sash.
         1. Pattern:  As drawn by architect and shown on elevations.
      4. Insect Screens:  Aluminum, roll-formed frame with mitered and reinforced corners; apply screen mesh taut to frame; secure to window with hardware to allow easy removal.
         1. Hardware:  Manufacturer's standard; quantity as required per screen.
         2. Screen Mesh:  Vinyl-coated fiberglass, window manufacturer's 18 x 16 mesh; charcoal colored.
         3. Frame: Manufacturer's standard
      5. Operable Sash Weatherstripping:  Co-extruded polymer; permanently resilient, profiled to maintain weather seal in accordance with AAMA 701/702.
      6. Fasteners:  Stainless steel.
      7. Accessories:  Provide related nailing/taping flange, anchorage and attachment devices as necessary for full assembly and installation.
  1. 2.05 HARDWARE
     + 1. Lever-operated espagnolette and multi-point locking system
       2. Hinge Type: Concealed
       3. Handles: **[White] [Black] [Nickel] [Bronze]**

***Note to specifier: Select EITHER D or E below; OR combination based on required building codes through per window unit labeling process.***

* + - 1. Window Opening Control Devices (WOCD):  Provide operable window sash hardware that limits openings to only allow passage of 4 inch (102 mm) diameter rigid sphere or less, and are easily releasable to fully open without use of keys, tools, or special knowledge while conforming to ASTM F 2090. Units to be labeled on shop drawings.
      2. Limited Opening Hardware (LOH): provide operable window sash hardware that limits openings to only allow passage of 4 inch (102 mm) diameter rigid sphere or less, and are permanently installed while conforming to ASTM F 2090. Units to be labeled on shop drawings.
  1. PART 3  EXECUTION

3.01 EXAMINATION

* + - 1. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive this work.
  1. 3.02 INSTALLATION
     + 1. General Installation Requirements
          1. Install window unit assemblies in accordance with manufacturer’s instructions, industries best practices and applicable building codes.
          2. Follow approved shop drawings for shimming, anchoring and structural support.
          3. Attach window frames and shims to the perimeter opening in a manner that accommodates construction tolerances and corrects for any irregularities.
          4. Align windows plumb and level, free from warp or twist. Maintain specified dimensional tolerances and alignment with adjacent construction.

Installation tolerances shall not exceed +/- 1/8” in width and height and frame must be installed square within 1/16” across diagonals

* + - 1. Condition of Openings
         1. Verify that rough openings are clean, square and plumb prior to installation. Report any conditions that may affect the alignment if installed windows or function of hardware.
         2. Wrap and flash rough openings in accordance with the weather-resistive barrier (WRB) system manufacturer’s guidelines and ASTM E2112.
         3. It is recommended to install a sill pan or sill pan flashing with an adequate back dam to prevent inward water intrusion.
      2. Flashing and Sealing
         1. Follow manufacturer’s instructions, approved shop drawings and architectural drawings. Where discrepancies exist between architectural drawings and window manufacturer’s instructions or WRB system Manufacturer’s instructions, window or WRB system manufacturer’s instructions take precedence.
         2. Apply a continuous perimeter sealant at all four sides of the window frame to tie into the flashed rough opening. Sealant must support pressure-equalized installation and resist the specified design pressure. Spray foam alone is not an acceptable interior air seal.
         3. Back dam including tape or sealant at the sill is recommended to be installed and capable of resisting design pressure without water intrusion.
      3. Functional Testing
         1. It is the responsibility of the installation contractor to do the following:

Operate each installed window through it’s full range of motion to confirm proper tilt, turn and locking functions prior to applying air and water seals.

Verify correct handle positions, sash clearances and consistent gasket compression.

If operation is impeded, inspect the window frame for plumb, level and square and confirm that it is free of bowing, racking or twisting. Re-install the window as necessary before proceeding.

Report any issues or damaged components to the manufacturer immediately and do not proceed with air and water sealing until resolved.

* + - 1. Adjustments
         1. It is the responsibility of the installation contractor to adjust hinges, locking points and sash alignment to ensure smooth operation, full locking engagement and consistent contact pressure.
         2. If proper function cannot be achieved through adjustment, inspect the window frame and sash for plumb, level and square and ensure they are free of distortion. Re-install shims and supports or window frame as necessary before continuing.
      2. Protection
         1. Protect windows from damage during the remainder of construction.
         2. Cover glass and frames completely during masonry or other contaminant-generating work.
         3. If protective film is provided on the exterior surface, remove it within 5 days of installation. Interior films may remain until final cleaning.
      3. Field Corrections
         1. Replace or repair damaged or non-functional components prior to project closeout.
      4. Finish Materials
         1. Follow approved shop drawings for required clearances around operable sashes. Do not install interior or exterior finish materials (including drywall returns, casing, trim cladding or flashing) that obstruct sash movement or hardware operation.
         2. Coordinate finish installation with window operation to ensure full range of tilt and turn functionality that remains unobstructed.
         3. Maintain required service access clearances to all hardware adjustment points as indicated in the manufacturer’s documentation.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb:  +/- 1/8” inch maximum in window height; +/- 1/8” maximum in 10 ft run, non-cumulative.

* 1. 3.04 FIELD QUALITY CONTROL
     + 1. Manufacturer Oversight
          1. Provide services of vinyl window manufacturer's field representative to observe for proper installation of system and submit report.
          2. Where installation is found to be noncompliant, the contractor shall perform corrective actions as directed by the manufacturer. A qualified quality assurance technician designated by the contractor shall inspect subsequent installations to confirm that corrective measures have been properly implemented across the project.
          3. Failure to implement required corrective actions or repeated nonconformance may result in rejection of installation work.
       2. Field Testing
          1. Provide field testing of installed vinyl windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

Perform tests on **[VALUE]** individual windows in designated locations as indicated on drawings.

* + - * 1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference.

Test Pressures:

Field test pressure shall be 2/3 of the laboratory test prescribed by the product’s performance grade.

Mulled assemblies shall be tested to the 2/3 of the least component pressure.

Interpretation of results shall follow AAMA 502-21:

No uncontrolled water shall penetrate beyond a vertical plane aligned with the innermost edge of the window frame.

Water pooling on a sill pan does not constitute a failure if it does not pass beyond the plane of controlled drainage.

If water origin cannot be definitively attributed to the window system or it’s interface, perform a forensic evaluation per AAMA 511.

* + - * 1. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf (75 Pa).

Maximum allowable rate of air leakage is 1.5 times the approved allowable air leakage according to the products’ designated performance class per AAMA/WDMA/CSA 101/I.S.2/A440

* + - 1. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.
         1. Remedial work performed shall be documented as punch list items for the contractor to conduct checks on the remainder of the project to identify any similar conditions.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

* 1. 3.06 CLEANING
     + 1. See Section 017419 - Construction Waste Management and Disposal for additional requirements.
       2. Remove protective material from pre-finished surfaces.
       3. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
       4. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer and appropriate for application indicated.

1. END OF SECTION