

SECTION 08 53 45

VINYL WINDOWS ("Plastic 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.

*These specifications describe **REHAU System 4500 Tilt-turn (Dual-action) window designs**. These versatile designs are made by independent window fabricators in North America using high performance European and North American vinyl window profiles. They allow the designer to create a variety of custom tilt-turn, awning and other hinged window types, plus complementary fixed windows, storefront, and various configurations of hinged glass doors. This specification is specific to Tilt-turn designs while the other System 4500 configurations are specified elsewhere. (See e.g. Section 08 15 20 Doors, 08 53 45.15 Hopper windows and 08 53 50.45 Fixed windows.) Many other styles and performance range designs of vinyl windows, doors and vinyl curtain wall are also available from REHAU fabricators throughout North America.*

PART 1 GENERAL

1.01 SUMMARY

Edit the following paragraph to include only those materials and components specific to the project. Where boldface, bracketed alternatives are listed, select one (1) option for each case.

- A. Section Includes: REHAU System 4500 fully welded vinyl (PVC) **[prime]** **[replacement]** windows as listed below. All windows are factory assembled, and include all required glass and glazing materials; any internal structural metal reinforcement (stiffeners) that may be required (e.g. to meet design loads, mulling conditions, reinforcement of non-white vinyl and/or proper operation); window hardware, weatherstripping and insect screens.
1. Size and Quantity of each type of vinyl window is as shown on drawings
 2. Configurations of windows required: (Note: "tilt-turn" is synonymous with "dual-action")
 - a. **[Prime Tilt-turn window]** **[Replacement Tilt-turn window]**
 - b. **[Custom configuration window(s)]**
 3. Vinyl (PVC) supplementary profile(s) snapped into and fastened to window frame's perimeter.

Edit the following paragraph to include only those sections applicable to the project.

- B. Related Sections:
1. Section 07 92 00 Joint Sealants
 2. Section 08 15 20 Hinged Vinyl-Framed Glass Doors
 3. Section 08 15 70 Sliding Vinyl-Framed Glass Doors
 4. Section 08 44 00 Vinyl Framed Curtain Wall
 5. Section 08 80 00 Glass

1.02 REFERENCES

- A. Publications listed below are part of this specification to the extent they are referenced. When publications are cited in these specifications by use of shortened names or by standard number alone, it must be understood that reference is made to the full publication and edition as listed here.

Edit the following paragraphs to include only those sections applicable to the project. You may choose to limit the listing here to the shortened name and standard number and state that all reference standards, including the full name, edition dates and the issuing organization's address are presented in Section 01 42 19 – Reference Standards

- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440–05, Standard/Specification for windows, doors and unit skylights
 - 2. AAMA 303, Voluntary Specification for Rigid Polyvinyl Chloride (PVC) Exterior Profiles
 - 3. AAMA 502 -02 Voluntary Specification for Field Testing of Windows and Sliding Glass Doors
 - 4. AAMA 800 – 07 Voluntary Specifications and Test Methods for Sealants
- C. American Society of Civil Engineers:
 - 1. ASCE 7 – 05 Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 2005
- D. American Society for Testing and Materials
 - 1. ASTM E 90 -02, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
 - 2. ASTM E 1332 – 90, Standard Classification for Determination of Outdoor-Indoor Transmission Class
- E. German Institute for Standardization (Deutsches Institut für Normung)
 - 1. DIN 18357 German construction contract procedures - Part C: General technical specifications for building works - Mounting of window and door fittings
 - 2. DIN EN 10327, Continuously hot-dip coated strip or sheet of low-carbon steels for cold forming, Technical delivery conditions
- F. Glass Association of North America:
 - 1. GANA Glazing Manual (2004)
- G. National Fenestration Rating Council, Inc.
 - 1. NFRC 100 – 2004, Procedure for Determining Fenestration Product U-Factors
 - 2. NFRC 200 – 2004, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
 - 3. NFRC 500 – 2004, Procedure for Determining Fenestration Product Condensation Resistance Values
 - 4. NFRC 102 – 2004 Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems
- H. REHAU Incorporated
 - 1. System 4500 Technical Information, Profile Print
 - 2. System 4500 Technical Information, Size Limitations
 - 3. System 4500 Technical Information, Glazing Instructions
 - 4. System 4500 Technical Information, Reinforcement Guidelines

1.03 SYSTEM DESCRIPTION

- A. Structural Design Requirements:
 - 1. Design Loads:

Use this section to specify the required strength(s) of windows, keeping in mind that different window designs and different window sizes have different maximum strengths.

In two of the sizes defined by AAMA 101 as minimum test sizes, these are the maximum design loads (i.e. pressures) permissible for the System 4500 windows. Note that the windows successfully passed a structural test pressure 1.5 times the DP given.

Window Design

DP

Window Rating

"Residential Size" Tilt-turn	(44" x 60")	80 psf	(AAMA Grade DA – R80)
"Commercial Size" Tilt-turn	(48" x 72")	90 psf	(AAMA Grade DAW – C90)

*It is recommended that window strength be specified as a required Window Rating (DP) as shown above. Alternatively, jobsite wind conditions can be specified as long as resulting engineering interpretation of equivalent design pressure (i.e. required Window Rating) does not exceed system-specific data above. (If higher strengths than shown above are required, contact REHAU for guidance to select alternate options.). In paragraph "a", specify the first option (DA-R) for windows up to 44" x 60" or the second option (DA-C) for windows up to 4' x 6' in size. Replace the * with a value not to exceed DP values in the table above.*

- a. Windows shall be identical in construction to test windows that comply with all requirements of: **[AAMA 101 Performance Class DA-R_* 44 x 60] [AAMA 101 Performance Class DA-C_* 48 x 72]** [performance as determined by ASCE 7].
2. Comply with all applicable Building Codes.

B. Other Performance Requirements:

Edit the following paragraphs as necessary. Where boldface, bracketed alternatives are listed, select only the option(s) applicable to the project.

1. Allow for thermal movement of the window based on site mean temperature +/- 70 °F, window/element size and coefficient of linear expansion of PVC.
2. If non-white windows are chosen allow for thermal movement of the window based on the solar-heat absorption.
3. Thermal Performance:
 - a. Comply with all applicable energy codes and ENERGY STAR®
 - b. The windows, including glass and vinyl framing, shall have a thermal transmittance (U-value) of **[0.35 Btu/hr/ft²°F or less]** **[specify value]**, when tested in compliance with NFRC 100-2004
 - c. The windows, including glass and vinyl framing, shall have a Solar heat gain coefficient (SHGC) of **[0.40 Btu/hr*ft²*F or less]** when tested in compliance with NFRC 200-2004
 - d. The System 4500 window, when tested in compliance with NFRC 500-2004, shall have a Condensation Resistance Factor (CRF) of **54** or higher.
4. Acoustical Performance (optional):
 - a. Windows shall meet or exceed requirements of **[OITC 28] or [OITC 30]** , when tested according to ASTM E 1332 or **[STC 32] [STC 37] or [STC 39]** , when tested according to ASTM E 90.

1.04 SUBMITTALS

A. Product Data:

1. Manufacturer's printed literature describing specified products shall be submitted in accordance with Section 01 33 00.
2. REHAU Incorporated printed literature describing quality of vinyl extrusions.

B. Shop Drawings:

1. Submit dimensioned shop drawings for system. Show materials, anchorage, field connections, sealants and glazing.
2. Drawings shall show scale elevations and sections. Full size sections shall be shown only when needed for clarity.

C. Samples:

1. Selection Samples:
 - a. Submit color samples displaying manufacturer's standard colors and finishes for initial selection by Architect. Submit actual material samples of colors and finishes available.
 - b. Sample Size: Not less than 6" length of vinyl profile

2. Samples submitted shall be of production type and shall represent quality of finish to be furnished by manufacturer. No work represented by samples shall be fabricated until samples are accepted.
- D. Quality Assurance Submittals:
1. Test Reports:
 - a. Submit certified test reports from an AAMA accredited, independent testing laboratory showing system has been tested and meets or exceeds specified requirements and indicating full compliance with specified performance criteria.

1.05 QUALITY ASSURANCE

- A. Qualifications:
1. This portion of Work shall be provided by a single firm, who has specialized in the fabrication of fully welded vinyl windows and is trained in the application and adjustment of tilt-turn window hardware.
 2. The window fabricator shall be fully trained by a REHAU technical representative in the approved techniques and methods of fabricating **System 4500** vinyl windows. Training or auditing shall have occurred within two years of the commencement of this project.
 3. The window fabricator shall be an authorized REHAU fabricator in good standing.
- B. Materials:
1. Only REHAU Quality vinyl extrusions and REHAU approved components shall be used.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
1. A temporary covering shall protect exposed surfaces after completing fabrication of products.
 2. Deliver materials in manufacturer's original packaging with labels intact.
- B. Storage and Protection:
1. Store windows/elements vertically, inside, in a clean and dry location.
 2. Stacking shall be done in a way to prevent bending.
 3. Cover stacks in a manner to provide air circulation and to reasonably protect materials from damage.
 4. Keep on-site handling to a minimum. Exercise particular care to avoid damage to finishes. Damaged or deteriorated materials shall be removed from the site.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements:
1. Do not proceed with jobsite sealant application when ambient and substrate temperature conditions are not within limits permitted by sealant manufacturer.
 2. Sealants shall not be applied when joint substrates are wet due to rain, frost, condensation or other causes.
- B. Field Measurements:
1. Verify dimensions of surrounding construction by field measurements so work will be accurately fabricated, and fitted to structure. Contractor and manufacturer shall cooperate to establish and maintain these field dimensions. If the contractor guarantees the dimensions, no field measurements are needed.

1.08 SPECIAL WARRANTY

- A. Provide a written warranty signed by both the window fabricator and the installer agreeing to repair or replace defective materials or workmanship, including evidence of early deterioration, weathering or aging of Work, uncontrolled water penetration or air infiltration, glass breakage due to design defects, deterioration of finishes, failure of operating parts to properly function and other deterioration or failure of Work to comply with performance or other requirements.

Warranty shall be for a period of **[one (1) year]** **[specify up to 5 years]** from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Vinyl (PVC) Windows :
1. REHAU Window Designs as provided by a **[REHAU Authorized and Trained Fabricator]** **[Specify a particular REHAU fabricator]**

2.02 MATERIALS

- A. Window System: REHAU **System 4500** Vinyl Windows.
1. Windows on this project shall be furnished and installed in the sizes, configurations and quantities as described in the Project Contract Documents and within the allowed parameters in PART 1, Section 1 of this specification.
 2. All extruded vinyl shall be made from RAU PVC
 3. Minimum Outside Nominal Wall Thickness:
 - a. Primary frame and sash extrusions' exterior walls: 0.106" (2.7 mm)
 - b. Secondary extrusions (e.g. glazing stops and closures): 0.067" (1.8 mm)
 4. Face Dimensions (nominal): As indicated on Architectural Drawings
 5. Window frames shall be **[REHAU "European" frame without nailing fin.] [the REHAU "North American" frame with integral nailing fin] [the REHAU "North American" frame without nailing fin]** (NA frames feature accessory profile grooves on interior and exterior faces. The grooves allow for snap-in attachment of vinyl nailing fin, trim profile(s) and mulled window joint covers.) There shall be multiple chambers in the frame providing structural strength, thermal insulation and separation of drainage passages from any metal reinforcing profiles.
 6. Window sash and frame shall be configured to receive glazing beads (stops) that snap in on the interior side of the glass.
 7. Glazing beads (stops) shall incorporate coextruded black RAU-PREN glazing seals.
- B. Reinforcement:
1. If required (see current REHAU System 4500 technical information), custom shaped steel reinforcements for the internal applications in windows and doors must be used.
 2. Galvanized steel specified according to EN 10327, Grade DX 51D+Z275-N-A-C
 3. Galvanized Steel shall be in size , configuration and location within the window as indicated in the test reports and REHAU System 4500, Reinforcement Instructions
 4. Reinforcement must be used in all main profiles (such as frame, sash or t-mullion), which are non-white
 5. Reinforcement must be used between windows, which are joined with each other and must be sufficiently sized and anchored according to the structural requirements.
- C. Weatherseals:
1. Black polymer (EPDM) replaceable weatherseals:
 - a. Shapes, designs, and thickness as needed to satisfy performance requirements.
 - b. Weatherseals shall be provided in continuous lengths, butted firm to ends of races and to each other when in the same planes.
- D. Glass:
1. Glass shall comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440-05, Section 6.2 and the GANA Glazing Manual.
 2. Insulating glass panels shall have an overall nominal thickness of **[7/8" (22 mm)] [specify other glass panel thickness up to 1 1/4" (32mm)]**.

Insulating glass of any kind and description can be incorporated in REHAU windows. The specifier must provide sufficient information here to describe color, coatings, performance and other attributes important to the project.

3. ***[Specifier: provide complete glass descriptive data here, or refer to another section, e.g. § 08 80 00 Glazing. Caution: Coordinate with section 1.03.B]***

2.03 ACCESSORIES

- A. Fasteners: Stainless Steel: AISI 300 Series
1. Fasteners shall be selected to prevent galvanic reaction with any reinforcement materials fastened.
 2. Above criteria is applicable to screws used to secure internal reinforcement and to fasteners used in window mulling connections, if required.
 3. Avoid exposed fasteners to greatest extent possible.
 4. Where exposed fasteners are unavoidable in finished surfaces, use flathead countersunk Phillips head screws.
 5. Installation anchors must be approved by the responsible engineer/architect for the project
- B. Sealants:
1. Sealants shall comply with requirements of AAMA 800

2.04 FABRICATION

- A. General Requirements:
1. Follow all requirements of the REHAU fabrication guidelines
 2. Miter cut and fusion weld (i.e. thermally weld) all frame and sash corners.
 3. Complete fabrication, assembly, finishing, hardware application, and other work for each individual window unit before shipment to Site. Field assembly to connect two or more mullied windows is permitted.
 4. Provide baffled drainage holes to drain moisture to exterior.
- B. Welding:
1. Welding shall be done in compliance with applicable recommendations and shall be done with materials and equipment as recommended by REHAU.
 2. Welds shall be finished and dressed.
- C. System:
1. Window construction, edge clearance and placement of installation fasteners shall allow for expansion and contraction per the specified system performance requirements.
 2. Provisions shall be made in framing, including sash, for minimum glass edge clearance, nominal edge cover, and nominal pocket width, in compliance with GANA Glazing Manual, for thickness and type glass specified.
 3. Framing shall be provided with reinforcing members as necessary. Provide steel members as needed to reinforce frame, T-mullion and/or sash components as recommended by REHAU to develop needed strength of assembly.
- D. Hardware
- Quality hardware is to be used for vinyl Tilt-turn Windows. Hardware shall meet the requirements according to the German Standard DIN 18357. Material used must be corrosion resistant. Ability for repair and maintenance must be given. The installation must be performed according to the guidelines given by the hardware manufacturer. The fastening of the hardware components has to be safe and secure, preferably into steel reinforcements or at least through 2 PVC walls, meeting the requirements for the actual loads of the sash. Fasteners have to be corrosion resistant.
- E. Insect Screens
1. Insect screens shall conform to AAMA 101, section 7.5
 2. Insect screens are mounted on the outside of the window. They must be removable from the inside.

2.05 SHOP FINISHES

Typical windows are supplied with an integral white color for all vinyl parts; other surface colors or finishes are optional. Delete paragraph "A" if standard white vinyl will be used.

- A. Laminated Coatings:
 - 1. Application of laminated color foils from RENOLIT shall be performed under specification issued by RENOLIT and REHAU.
 - 2. The laminated surface shall be uniform and free from streaks, blisters, sags, or other surface imperfections.
 - 3. Laminated profiles must meet requirements of AAMA 303.
- B. Protection:
 - 1. Provide film to protect exposed finished surfaces during shipment, storage, and installation whenever possible.
 - 2. Film shall not affect factory finish after finished component is installed and film is stripped, no residue, adhesive, or film covering, visual non-uniformity or other deleterious effects or substances shall remain on surfaces.
 - 3. Factory applied protective film must be removed immediately after installation.
 - 4. When cleaning agents/paint etc. are applied to the building the windows must be protected.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Examine window openings and adjacent building structure where windows will be applied for conditions that will prevent proper execution of this portion of Work and endanger permanency.
 - 2. Do not proceed with installation until defects have been corrected.
 - 3. Verify sealant compatibility and adhesion to vinyl in conjunction with sealant manufacturer.

3.02 PREPARATION

- A. Coordination:
 - 1. Coordinate installation with work of other trades.

3.03 INSTALLATION

- A. General Requirements:
 - 1. Comply with manufacturer's instructions and recommendations for installation of work.
 - 2. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Replace materials that are damaged during installation as directed.
 - 3. Set units level, plumb, and true to line, with uniform joints. Support units on shims and secure in place by approved installation anchors/fasteners that properly engage into to supporting structure.
 - 4. Insulation must be used around the perimeter of the window in accordance with shop drawings and the insulation manufacturer's guidelines. Insulation must allow for expansion and contraction of the installed window.
 - 5. Flashing and other materials used around window opening shall be corrosion resistant, non-staining, non-bleeding, and compatible with adjoining materials.
- B. Erection Tolerances:
 - 1. Variations from Plumb: $\pm 1/8$ " maximum in window height.
 - 2. Variations from Level: $\pm 1/8$ " maximum in 10' run, non-cumulative.

3.04 FIELD QUALITY CONTROL

- A. Field Check for Water Leakage:

1. After completion of installation and nominal curing of sealant and glazing compounds, but before installation of interior finishes, perform AAMA 502 test. Architect will determine the quantity and type(s) of window(s) to be tested.
2. In case of water penetration take corrective action and re-test as necessary until the problem is resolved.

3.05 ADJUSTING

- A. Weatherseal contact shall be checked and any required final hardware adjustment made for proper operation and performance of units.

3.06 CLEANING

- A. Clean completed system in compliance with manufacturer's recommendations, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and joint sealants, dirt, and other substances from finished surfaces promptly after erection.
- B. Remove protective material from prefinished surfaces.
- C. Wash down exposed surfaces using a solution of mild detergent in warm water applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.07 PROTECTION

- A. Institute protective measures and other precautions needed to assure Work will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

