Design Guideline 085113
Aluminum Windows

Scope

Aluminum fixed and ventilating windows, including windows which are installed as part of a storefront or curtain wall system.

Related Sections

U-M Design Guideline Section:

3.2 – Energy and Water Conservation
6.1 - 084113 – Aluminum-Framed Entrances and Storefronts
6.1 - 084413 – Glazed Aluminum Curtain Walls
6.1 - 088000 – Glazing
8.2 - Architectural Preferred Manufacturer List

U-M Master Specification Sections: (A digitally accessible version is pending; please email AEC-Digital Accessibility Support if assistance is needed)

084113 – Aluminum-Framed Entrances and Storefronts

Reference Documents:

ASHRAE 90.1-2007, "Energy Standard for Buildings Except Low-Rise Residential Buildings"
AAMA/WDMA/CSA 101/I.S.2/A440-2008: NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights
National Fenestration Rating Council (NFRC) Technical Documents

Design and Installation Requirements

General

Follow the guidelines below when specifying aluminum architectural windows and related items. Unless otherwise indicated, these guidelines are not intended to restrict or replace professional judgment.

Design Requirements

Standards

Comply with AAMA/WDMA/CSA 101.I.S.2/A440-08 specifications.

- Minimum performance class: Specify AW performance class windows for both fixed and ventilating units.
- Minimum performance grade: As required by calculated wind speed for location and exposure category.

Single Source Responsibility

Specify that windows, glazing and sealants be the sole responsibility of a single prime contractor regardless of the location within the specification. In addition, the windows should all be provided by the same manufacturer.

Tests

Require submission of test reports of a qualified independent laboratory indicating compliance with requirements. Review requirements for in-place field testing with the Design Manager.
Specify Owner's field testing for installations of more than 10 units.

Engineering

- Indicate structural loads on drawings.
- Specify delegated design submittals, signed and sealed by an engineer registered in the State of Michigan.

Supplemental Performance Requirement

In addition to the requirements in DG3.2 and AAMA class AW, specify units tested to a minimum condensation resistance factor (CRF) based upon anticipated interior temperature and humidity conditions to ensure that there will be no condensation on the window surface.

Construction

Specify thermal-break construction without exception.

Glazing

Require glass surfaces to be located in the same plane, with a tolerance of 1/8 inch.

Carefully coordinate the selection of glazing to achieve appropriate U-value and Solar Heat Gain Coefficient (SHGC) of the assembly. Specify total assembly U-values, not center-of-glass. Design Guideline 3.2 requires designers to investigate the payback for improved U-values and SHGC.

Refer to Design Guideline 088000 for further requirements.

Finish

Comply with the following:

- For partial renovations and replacement projects, match existing adjacent units to the greatest extent possible.
- For most new and entire building replacement work, specify a 70% polyvinylidene fluoride coating. See PML for acceptable manufacturers.
- Color: In general, specify non-metallic dark bronze. Coordinate other color selections with the Design Manager.
- Specify two-coat application technique; or three-coat for applicable colors/metallics.

- Siliconized polyester and similar coatings are not acceptable.
- When an anodized finish is judged appropriate, specify AAMA 611 Class 1 finish, clear or color anodized, as suited to project.

Requirements for Ventilators

General:

- Specify ventilator units with full weather-stripping.
- Specify insect screens for Housing projects and food preparation areas only.

Office Installations: UM standard practice is to provide a minimum of one ventilating unit per office. Review project requirements with the Design Manager.

Housing Installations: Specify 6" sash limiters on all residential windows or as required by code if less. Coordinate with the Design Manager.

Warranty

Require a 10-year warranty on all components of the window system.

Other Considerations

Pay careful attention to specifying and detailing connections to adjacent construction, moisture control and the potential for incorporating enhanced thermal performance. Regardless of Delegated Design requirements (see below) for the windows, the A/E is responsible for the interface between the windows and the surrounding building (adjacent jamb, head and sill conditions). Perimeter flashing, sealants and insulation, continuity of the air barrier, anchoring and clearances must be thoroughly detailed at head, sill and jamb conditions.

In buildings with higher than typical humidity, perform a thermal analysis of the windows to ensure that condensation will be avoided on both the frame and the glazing. For buildings with typical humidity criteria it should be adequate to specify a minimum Condensation Resistance Factor (CRF) that takes into account the anticipated interior conditions. Refer to Master Specification section 22 0500 for typical mechanical design requirements.

Delegated Design

UM recognizes that it is common practice to specify structural performance criteria for windows and to delegate the actual design needed to meet these criteria to the manufacturer. Indicate the design loads and the displacement on the drawings. The A/E should utilize the Delegated Design language contained in AEC Masterspec Section 085113.

Testing

UM requires the storefront manufacturer to submit documentation of preconstruction testing showing that the designated system meets the performance criteria. If standard systems are being used the manufacturer is allowed to submit standard test reports for that system.

In-place field testing is also usually required for window installations. In special circumstances where the extent of window work is very limited, the requirement for in-place field testing may be waived by the Design Manager (DM). Obtain DM's approval in writing if field testing is to be waived. In most circumstances U-M will contract with a testing service for witnessing and validating testing, as well as for performing enhanced field inspections. The actual testing will normally be performed by the Contractor. In order to achieve testing of representative workmanship, samples for testing will be selected on a random basis by the A/E and the testing company (not the Contractor). At a minimum, field testing should be done twice; once fairly early in the installation process and again at the completion of the process.

Refer to language in AEC Masterspec Section 08 5113 ("Manufacturer Testing" in Part 1 and "Field Quality Control" in Part 3) for appropriate language regarding testing.