Basis of Design

This section applies to the design and installation of glazed curtainwalls, windows, and storefronts, and their coordination with other cladding systems.

Background

Glazed Curtainwalls, storefronts and individual windows are, by design, "barrier walls" with no back-up to protect the building interior. Curtainwall, storefront and window design, fabrication and installation must be done to strict standards to perform as expected.

- Life expectancy of curtainwalls, storefronts and windows is 50 years before major upgrade or replacement. This includes all joints within the curtainwall or window.
- Life expectancy of perimeter joints at the interface with other exterior building systems is 10 years for joint sealants and 50 years for cavity flashing.

Programming

- Determine standard of quality for curtainwalls, storefronts and windows.
- Curtainwalls, storefronts and windows with integral panel systems shall be designed as one system.
- Sub-frames shall be part of the curtainwall package.

Design Criteria

- Bidder design curtainwall systems are acceptable. Bidder designed systems shall conform to this section.
- All systems shall have an AAMA Certification Label and comply with applicable provisions of AAMA (American Architectural Manufacturers Association), ANSI (American National Standards Institute, ASTM (American Society for Testing Materials), AWS (American Wielding Society, OSHA (Occupational Safety and Health Administration) and WISHA (Washington Industrial Safety and Health Administration).
- Storefronts and similar systems shall meet all criteria and specifications of curtainwall system.
- Curtainwall, storefront and window performance criteria: All systems shall meet the following minimum criteria in addition to industry standard practice.
    1) Air infiltration: Test in accordance with ASTM E283, at a pressure of 6.24 psf; air infiltration shall not exceed 0.60 cfm per square foot of wall surface.
    2) Water penetration: Test in accordance with ASTM E331; at a pressure of 8psf, no water shall penetrate to any inside surface.
    3) Wind loading: Per Building Code. Maximum deflection of any member is limited to L/175 of the clear span.
    4) When tested in accordance with AAMA 1503.1, using 1 inch glazing, the condensation resistance factor (CRF) for the system shall not be less than 56, and the thermal transmittance (U-value) shall not exceed .68 BTU / Hr / ft²/ ° F.
    5) Coordinate with requirements for " Safe Access and Fall Protection" in General Requirements

- Curtainwall designs that utilize custom extrusions, i.e., UWMC East Wing Recladding Project, are highly discouraged. If custom extrusions are proposed, the following steps shall be taken:
    1) Design, manufacture and test a mock-up of the proposed system in accordance with project design and performance criteria.
    2) Successful testing of the mockup is a prerequisite for participation in bidding.
    3) Test finished system in place. Test shall be performed in accordance with the Curtainwall Performance Criteria above. Hybrid systems of curtainwall which include other elements such as entry doors, metal panels and operating sash shall be tested as part of the curtainwall.
    4) Requirements for a mock-up of custom designs may be waived if sufficient documentation can be produced to prove the performance of the custom design.
    5) Testing procedures shall be approved by University Campus Engineering.
- On-site representation by the manufacturer is required to advise on coordination with unforeseen conditions, for quality assurance and to assist with intersections at other building systems.
- Access to all windows surfaces, interior and exterior, shall not put maintenance personnel at risk and shall not require personnel to bring equipment such as ladders or lifts unless approved by University plan review. Further design requirements include:
    1) The use of sunshades or visors must be coordinated with the use of a boson chair, typically the most efficient and common method of cleaning windows.
    2) Windows shall be designed to be cleaned by conventional, accepted methods. Coordinate with Custodial Services.
    3) If windows are designed to be cleaned from ground level, provide vehicle access with structural support for the existing University lifts. Coordinate with Custodial Services.
    4) Provide hose bibbs at roof and ground levels at every 100 feet of building perimeter. Connect to building water system.
    5) If a swing stage is required to wash windows, provide weather-proof power receptacles (125V & 15 amps) at every 50 feet of parapet.
    6) Provide outside weather-proof power receptacles (125V & 15 amps) at ground level at every 100 feet of building perimeter.
- Specify Low-E coatings on glazing where applicable to reduce building heat loss.
- Specify a minimum glazing system that consists of sealed, double glazed windows and/or thermally broken frames to reduce building heat loss.
- Specify triple glazed window systems where applicable as a strategy to also provide enhanced acoustical performance if required.

Design Evaluation

The following information is required to evaluate the design:

- Programming Phase: Statement of intent to use curtainwalls, storefronts and/or windows including configuration of system, i.e., custom or stock, materials, and performance standards.
- Schematic Design Phase: Plans and elevations. Outline specification including detailed system and materials description, performance standards, and integration with other cladding systems.
- Design Development Phase: Building elevations showing extent of curtainwalls, storefronts and windows including integral panel systems, all openings and operable sashes. Typical details including head, side, sill, connections to other cladding systems and special conditions. Draft specification.
    1) Bidders wishing to design their own systems must be brought into the process at the beginning of this phase.
- Contract Documents Phase: All information required for installation of the curtain wall, storefront, window and integral panel systems, all details of connection and integration with all other building systems including waterproofing, structure and anchoring. Final specification.

Construction Submittals

The following minimum submittals are required from the Contractor:

- The submittals shall indicate, in addition to industry standard submittals, coordination with adjacent building systems.
- Fabrication details
- Back-up support system
- Fasteners and anchors
- Perimeter flashing conditions
- Samples for appearance and conformance to specifications

Quality Assurance

The following general quality assurance measures apply:

- See requirements for custom curtainwalls above.
- Mock-up is required for large projects, may not be part of the work, may be used to train installers and may be part of adjacent wall mock-up. Work must be approved prior to working on the building. Use same sequencing and testing as proposed for the building. Test mock-up per "Field Testing" below. Test until pass.

- Field Testing: Test finished system in place in accordance with "Field Check of Metal Storefronts, Curtainwalls and Sloped Glazing Systems for Water Leakage", AAMA 501.2-94. Testing shall be on an installed system. Area to be tested shall be more than 1% and less than 10% of the installed system.
- Test shall be performed prior to installation of interior finishes.
- Test at least once for every design condition of the curtainwall, storefront, or window system. Retest until pass.
- On-site representation from manufacturer during construction
    1) To assist with unforeseen conditions
    2) To assist in quality assurance
    3) To assist with intersections with other systems, i.e., metal wall systems

Related Sections

- Facilities Services Design Guide - Exterior Doors
- Facilities Services Design Guide - Metal Walls
- Facilities Services Design Guide - Masonry Walls
- Thermal and Moisture Protection
- Facilities Services Design Guide - Access Control - CAAMS

Products, Materials and Equipment

Materials

- Anchoring elements: Stainless steel or aluminum. Galvanized metal is unacceptable.
- Flashing materials: Compatible with the curtainwall material and matching the life expectancy of the system. Stainless steel, metal with high performance coating or anodized aluminum is acceptable. Flexible flashing at concealed locations is acceptable. Metal with paint, baked-on enamel or exposed galvanizing is not acceptable.
- Shims: Stainless steel or high density plastic
- Hollow metal is not acceptable.
- Consider use of high recycled content aluminum and steel where possible.

Finishes

- High performance fluoropolymer coating: Comply with AAMA 2605-98
- Anodized aluminum: Comply with Class I anodizing conforming to AAMA 611-98
- Powder coating: Comply with AAMA 605.2-90

Installation, Fabrication and Construction

- Tolerances: Comply with American Association Aluminum Standards and Data, latest edition, as applicable to finished, fabricated and assembled materials, except that flatness tolerance for aluminum sheet panels shall be half of standard sheet tolerance.
- Pre-construction conference: Agenda shall include, in addition to typical issues, the following:
    1) Set quality of work
    2) Establish sequence of work
    3) Review requirements
    4) Discuss construction means and methods
    5) Determine who will set supporting steel and flashing.
    6) Intent to enforce the contract
    7) Incentives

END OF DESIGN GUIDE SECTION