Cladding Missile Resistance

The cladding, along with the glazing, are components of the building envelope wind protection system. If the envelope is damaged due to wind-borne missiles, building contents will be damaged as a direct result of wind or rain, that usually accompanies such events. Not only type of cladding material and its condition but also details of the connection, i.e. type, length, spacing, type of substrate, i.e. load-bearing elements of the structure influence the susceptibility of the envelope to damage by wind-borne missiles. In practice, cladding selection is based primarily on price, and no consideration is made of cladding wind-borne missile resistance, supplier experience in wind design nor skill level of builders installing the units.

What do we look for?

Hazards

- Wind zonation maps in structural design codes, local hazard maps (either site-specific or regional, e.g. at County, Community, level) define the wind forces to which structures must be designed. Such maps can thus be used to provide an indication of the local wind hazard level.

- In some countries, e.g. United States, structural design documents (ASCE 7-10) define regions, where wind-borne missiles are to be considered in structural design.

- Construction activities, yard storage or other debris from neighboring 3rd party facilities.

- Architectural features, e.g. extensive glazing, roof sky-lights, which increase the probability of damage due to missile impact.

Controls

- Cladding should be sourced from a supplier with experience in wind design according to code requirements. The material and detailing of the provided cladding must conform to the wind conditions prevalent in the region, as defined in the structural design codes.

- Avoid use of special architectural features, e.g. extensive glazing, roof sky-lights, which increase the probability of wind damage in areas where structural design codes define high wind design forces. If such
features are to be used, ensure proper material selection, e.g. impact resistance of glazing certified by an accredited agency.

- In older buildings cladding material deteriorate if not maintained properly. Aging of cladding material due to exposure to ultraviolet (UV) radiation, weathering, seasonal thermal cycles, etc. necessitates replacement after a period of time defined by the supplier.

- Selection of cladding material type should be based on wind design requirements. Where no wind design codes exist or no specific requirements are made in the structural design codes, consideration must be given to topography, neighboring 3rd party facilities (yard storage, construction activities, etc.), architectural features, e.g. changes in building elevation. In regions with seasonal high-wind issues or where high winds are a common occurrence, use of reinforced or precast concrete panels and masonry or concrete block walls are recommended.

- Cladding inspections are to be included in the building maintenance program. Cracking, warping, discoloration and other evidence of surficial damage is to be reported for further investigation by a specialist. Maintenance and replacement requirements are to be provided by the cladding panel supplier.

- “Good“ controls in non-tropical storm regions include buildings with metal panel wall cladding.

- “Good“ controls for tropical storm regions are metal panel wall cladding for important buildings.

- The following criteria apply for a “very good“ rating of controls in tropical storm regions:
  - Wall cladding of reinforced or precast concrete construction, or concrete masonry units.
  - Buildings located in a wind-borne debris region with large missile impact resistant cladding within 9m (30ft) of grade, or small missile impact resistant cladding from 9m (30ft) above grade to 18m (60ft) above grade. Where aggregate-surfaced roofs are within 460m (1'500ft), small missile impact resistant cladding is also provided to a height of 9m (30ft) above the elevation of the highest exposing aggregate surfaced roof.

Risk improvement ideas

- Regular inspections should be conducted to identify issues such as missing connections, cracks in panels, discoloration due to aging, etc.

- Off-site inspections should be regularly conducted to identify potential sources of wind-borne missiles from neighboring facilities, e.g. construction sites.

- Cladding material should be sourced from and installed by contractors with proven experience in code requirements. Price only should not be the determining factor.

- As for glazing, in wind-borne debris regions, wall cladding assemblies should be impact resistant to large and small missiles.

- Cladding and components should be rated, i.e. tested and qualified, in accordance with internationally-recognized standards, testing methods, or guidelines.

- ASTM E 1996 defines missile load levels (five categories). Building importance and basic wind speed determine testing requirements in terms of missile types. ASTM E 1886 defines the test method to be used to demonstrate compliance with the E 1996 load criteria.
Footnote: For United States locations, the typical ASCE 7-10 code requirement is to utilize the Category II wind speed maps for the definition of wind borne debris locations; however, Zurich best practices recommends using Category III wind speed maps for delineation of wind borne debris regions.

Resources

External Resources


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