

Wind Loading on Lightweight Structures

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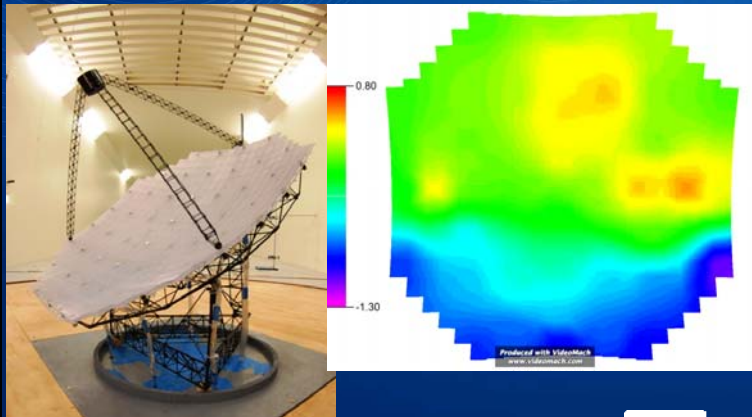
Wind loading

Function of:

- external shape of the structure
- surface roughness
- porosity of surface
- edge treatment
- surrounding structures
- incident turbulence
- wind climate



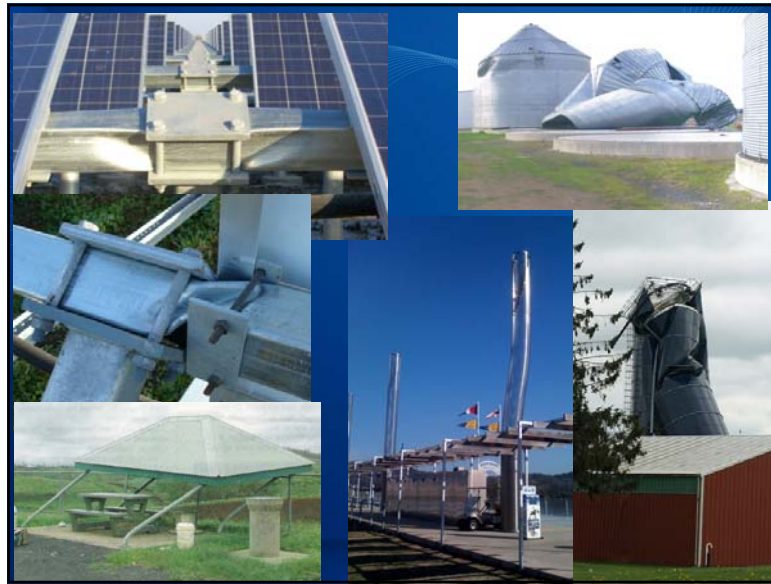
Fluctuating pressure



AS/NZS 170.2: Wind actions





- Rigid smooth, generally rectilinear structures
 - loading generally conservative when applied to smooth curved surfaces
- Generally based on testing of large structures
 - for smaller structures small scale turbulence becomes important creating asymmetric loading
 - continuous membranes have a good ability to redistribute high local pressures
- Loads are for design of primary wind resisting structural system, not asymmetric loading




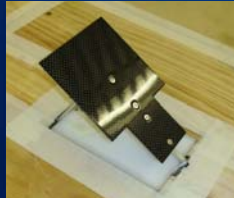



Wind tunnel testing

- Rigid model can be used if the deformed shape does not significantly affect the pressure distribution.








- Pressure model – measures pressure simultaneously at discrete points
- Base balance model – measures forces and moments for complete structure




Output from pressure tests

- Time-series of simultaneous pressures over the surface for a range of wind directions
 - local surface pressures, or integrated for nett pressures and/or structural loading
 - dynamic response
 - fatigue

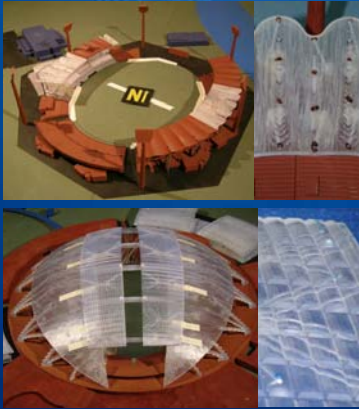

Generic arch roof

- Range of arch profiles, supports, and end openings
- Influence coefficient technique for end reactions and bending in structure
- Design standards are non-conservative

Stadia roofs

- Local and structural loads
- Critical load cases developed with fabric and structural consultant
- Peak responses and pressure distributions extracted to facilitate an efficient design

Thank you for your time. Questions...



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