



HIGH RISE BUILDINGS IN HURRICANE AREAS

By Michael Soligo, Vice President

In Technote #1, the advantages of wind tunnel studies for high rise buildings in hurricane areas were discussed. In this article, a case study is being presented of two residential developments in Miami. The study compares wind tunnel loads to the ASCE 7-93 analytical code requirements.

Wind loading patterns on buildings are very complex and variable. However, to remain practical, building codes must simplify the treatment of wind loads, and they often produce conservative results. This conservatism can translate into extremely high loads in hurricane areas.

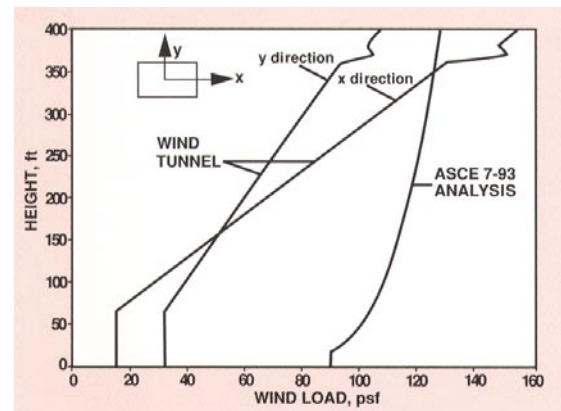
Project-specific wind tunnel studies can be used where the benefits to the design outweigh the extra cost of the study. Wind tunnel testing is recognized by the ASCE 7-93 Standard and other major building codes as an appropriate method for determining wind loads.

The table below summarizes the comparison of wind tunnel results with those of the analytical procedure of the ASCE 7-93 Standard for two typical high rise residential buildings. The ASCE 7-93 method produces very high wind suction on corners, well in excess of 200 psf. The wind tunnel results are considerably lower than the analytical results, the highest suction being 170 psf. Lower loads are obtained from the wind tunnel tests mainly because better account is taken of the building shape and details such as balconies and parapets. As well, the results often identify high loads in specific areas that are not picked up by the code method, thereby ensuring greater safety in design.

	Range of Results	
	ASCE 7-93 Method	Wind Tunnel Method
Building 1	108 – 260	80 – 170
Building 2	100 – 242	80 – 125

Negative Pressures, psf

The figure below compares the wind tunnel loads on the main structural system of Building 1 with the loads from the ASCE 7-93 method. As shown, the wind tunnel loads are less than the code loads for the majority of the building. The wind tunnel method has also improved design safety by identifying higher loading for the structure. The code method would have produced insufficient loads in this area.



Structural Wind Loads

For many of today's unique tower designs, the torsional loading can be critical. While ASCE 7-93 does not account for torsional effects, wind tunnel testing ensures that this type of loading is properly considered. In addition, the greater understanding of the torsional loading provided by the wind tunnel testing allows optimization of the building design (e.g., placement of shear walls).

The **benefits of wind tunnel studies** can be summarized as follows:

- Increased accuracy
- Building and site specific
- Reduced construction cost by minimizing conservatism (cost savings of \$500,000 or more have resulted)
- Increased safety
- Increased knowledge of torsional effects

Rowan Williams Davies & Irwin Inc.

Consulting engineers specializing in assessing and solving design problems related to:

- Wind Engineering
- Sun / Shade / Glare
- Acoustics, Noise & Vibration
- Snow Impacts
- Pedestrian Comfort
- Industrial process optimization
- Air Quality
- Emergency Planning
- Hazard & Risk

650 Woodlawn Road West, Guelph, Ontario, Canada N1K 1B8

Tel: (519) 823-1311 Fax: (519) 823-1316 Email: info@rwdi.com Website: http://www.rwdi.com