ENGINEERING COMPANY OF CENTRAL AMERICA
ESTRUCTURISTAS CONSULTORES
Consulting – Engineering – Supervision
Industrial Plants – Buildings – Infrastructure

NEWSLETTER

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WIND DESIGN IN CENTRAL AMERICA

Central America is located within one of the most active tropical cyclone prone areas. For large areas of the Isthmus, hurricane winds with gust speeds of up to 200 km/h have to be accounted for. The effects of such tropical cyclones are devastating. In this region, alone Hurricane Mitch caused over 19'000 casualties and multi billion dollar damages in 1998 (see colored track in fig. 1).

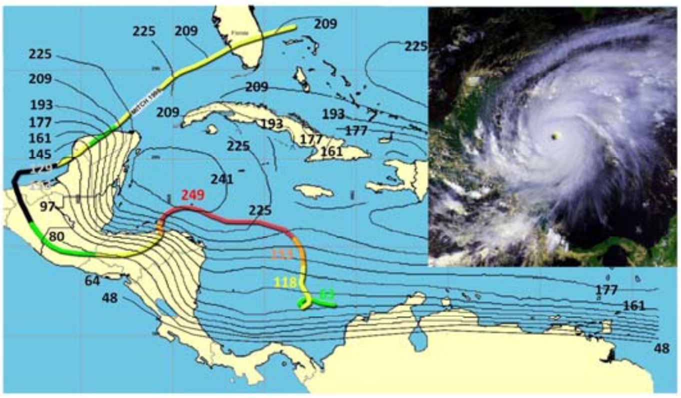

Fig. 1. Black lines & numbers: Contours of peak gusts wind speeds in Km/h, at the height of 10 meters in flat open terrain, predicted for a 100 year return period. Insert: Sarellite view of hurricane Mitch, approaching Honduras in 1998. The track of this storm is shown by the coloured line, where maximum sustained wind speeds are given for the coloured track sections. Insert: Satellite view of hurricane Mitch at the verge of hitting the coasts of Honduras and Belize.

The calculation of wind pressures is performed differently in each country of Central America. As shown in table 1, either basic wind speeds or basic wind pressures are used. These parameters are defined according to the geographical location of a specific structure type and/or its height. As a special case, Honduras regulations require local wind studies.

	Basic Wind Speed (in Km/h)		Basic Wind Pressures (in Kg/m^2)	
COUNTRY	MIN.	MAX.	MIN.	MAX.
Guatemala	112	210	62 V_{min}=112 Km/h	200 Vmax=210 Km/h
El Salvador	75		30	
Honduras	100	200	48 Vmin=100 Km/h	193 Vmax=200 Km/h
Nicaragua	n/a	n/a	70	
Costa Rica	n/a	n/a	70	
Panama	115	140	60	

Table 1: Design wind speeds and wind pressures for Central America. In general, minimum and maximum design wind speeds refer to protected areas (urban and mountains) and open coastal regions respectively. For the case of Guatemala and Honduras, min. and max. wind pressures are calculated from the corresponding min. and max. wind speeds of the country. For the case of Costa Rica and Nicaragua, basic wind pressures are readily defined, whereas for the case of Panama, wind pressures are calculated according to ASCE-7-98.

Design wind pressures on a 150m high building were calculated in each country of C.A. The height of 150m represents the limit set by Panama wind design codes: Buildings in Panama exceeding this height are requiered to be modelled specifically (wind tunnel experiments).

The results in figures 2 and 3 clearly indicate that wind design pressures are highest for Guatemala Belize and Honduras. This finding matches well with the location of major parts of these countries in hurricane affected areas, as shown in fig. 1. Nicaragua and Costa Rica show similar wind load results for the specified structure, whereas El Salvador exhibits the lowest calculated wind loads of the region.

For the case of Nicaragua, resulting wind loads provide rather low values as compared to its alo hurricane-prone. neighbours.

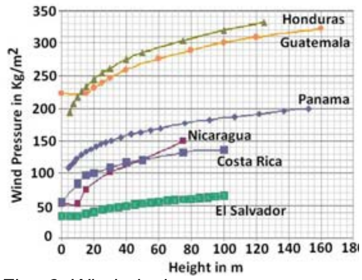

Fig. 2 Wind design pressures as a function of height, calculated for same building , according to local wind design codes of each country, assuming worst case conditions regarding exposure and location.

Fig. 3: Calculated wind pressures for same building at 10 m height at worst case conditions. (Value for Belize: extrapolated)

PROJECT HIGHLIGHT

EC has recently completed the structural and civil design of a Heavy Maintenance Aircraft Hangar, including offices and maintenance facilities. The two-bay facility is located at the International Airport of El Salvador and houses Airbus A320, Boeing B737, and Boeing B757 aircrafts.

The hangar has been designed to resist wind speeds of 75 Km/h and UBC zone 4 earthquakes. Its structure is formed by light-weight steel frames with 44m spans (s. fig. 4-top), and is partially supported by cables (see fig. 4-center).

Fig. 4 Top: Hangar roof structure, formed by light-weight steel frames, and semitransparent roof cover providing abundant natural light. (span: 44 m). Center: Hangar front view. Below: Vertical sliding doors are being opened.

The hangar floor is formed by a concrete slab with a design force of 35 metric tons (design loads of the plane tow tractors). Foundation solution: isolated footings. Hangar operation started in August 2008 (fig. 4-bottom).

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