WIND CODE EVALUATION

TRINIDAD AND TOBAGO

Evaluation Conducted by Winston H.E. Suite

NAME OF DOCUMENT: [Small Residential Buildings] Trinidad and Tobago Small Buildings Code, Board of Engineering of Trinidad and Tobago **www.boett.org**

YEAR: 2001 updated second draft version (July)

GENERAL REMARKS:

"In the preparation of this code, extensive use has been made of the Parts of the Caribbean Uniform Building Code (CUBiC) which deals with wind". It was noted that at this time CUBiC is being considered for revision and the management committee for the revision project has elected to make use of the International Code Council Inc. of the USA in the provision of the base documentation for this review. In like manner for this code use has been made of the ICC year 2000 International Residential Code Final Draft 1998" [Foreword].

The exercise was managed by the Board of Engineering of Trinidad and Tobago sponsored by the Joint Consultative Council of the Construction Industry (T&T) and the Interim National Physical Planning Commission (T&T) with support of the Trinidad and Tobago Bureau of Standards (TTBS).

Note: Bracketed numbers refer to Code specific Chapters or Articles. [ ]
Parenthesis numbers refer to item of this document. ( )

CONTENTS

SPECIFIC ITEMS:

1. SCOPE

1.1 Explicit Concepts and Limitations

This Code shall apply to the construction, alteration, movement, enlargement, repairs, equipment, use, occupancy, location, maintenance, removal and demolition of buildings for single or multiple family residential or general purpose use of not more than two stories in height and with a floor area of three hundred square metres or less" [1.201].

[1.2.2] "The Code is intended to provide minimum requirements to safeguard life, limb, health and public welfare".

1.2 Performance Objectives

To provide minimum requirements to safeguard life, limb, health and public welfare. It calls for minimum requirements for building materials in common use and takes into consideration the need for protection against wind and earthquake.

The code stresses that "before any construction work commences, it shall be determined whether planning permission and other approvals would be required from the competent (relevant) authorities". It stresses that "a preliminary inspection of the site shall be undertaken ..."

[3.1] Preliminary Investigations

[3.1.8.1.1.2] The areas most vulnerable to hurricane forces are the roofs, windows, walls and appendages.

[3.1.8.1.1.3] The objective is to produce a building that will not collapse during a hurricane. The building must be standing and its occupants shall be safe.

[1.2.4] The builder/designer is advised to seek assistance from registered professionals in the design and construction of wind and earthquake resistant structures for buildings outside the scope of this code and/or for special application or other than normal environmental conditions.

[1.3] Application to Build

Applicants shall comply with the requirements of the Planning and Development of Land Act and with the requirements of the code.

2. WIND HAZARD

2.1 Basic Wind Speed

Wind Design [3.2.2.2]

[Table 1 – Design Pressure for Winds]

Design Pressure	Trinidad (Central)	Trinidad (Coastal)	Tobago
Basic wind speed km/hr	72	92	101
Wall (horizontal load) kN/m^2	0.70	0.90	1.00
Roof (uplift) kN/m^2	1.00	1.30	1.45

2.1.1 Height Above Ground
10 metres

2.1.2 Ground Condition
An equivalent elevation over open water

2.1.3 Averaging Period
10 minutes

2.1.4 Return Period
One in 50 years [see Fig. A2-2, Trinidad and Tobago Winds]

2.1.5 Quality of Data
(not discussed)

2.2 Topography

[3.1.8.2.1.1] Buildings sited in exposed areas (e.g. on the brow of a hill or near coastal areas) are most vulnerable, while those sheltered by natural topography are less vulnerable. Buildings sited in gullies or river beds are very vulnerable as they are subject to severe damage by floods caused by heavy rains, which often accompany a hurricane.

[3.1.8.2.1.2] Steep slopes and edge of cliffs should be avoided, as well as other conditions such as steep sided valleys where exceptionally high wind speeds are found.

2.2.1 Escarpments
[not treated]

2.2.2 Ridges
[not treated]

2.2.3 Axisymmetric Hills
(not discussed)

2.2.4 Valleys
(not discussed)

2.3 Height above Ground

(not discussed)

2.4 Ground Roughness

(not discussed)

3. WIND DESIGN ACTION

3.1 Important Factors

The following issues are considered important and discussed in some detail.

- Application to Build [1.3]
- The building inspector (Chief Building Officer) approval and permit to commence or proceed [1.4]

3.2 Scale Effects

[not specifically discussed]

3.3 Pressure (Internal and External)

[not specifically discussed]

3.4 Dynamic and Aero-elastic Effects (Gust Effects)

[not specifically discussed]

3.5 Directionality Effects

[not specifically discussed]

4. METHODS OF ANALYSIS

4.1 Simplified Procedure [3.1.8]

Timber buildings – because of the relatively light nature extra precaution shall be taken to prevent uplift. The entire structure must be fastened to the foundation.

The most effective roofs are hip-roofs then gable, both being better than shed roofs or monoslope roof because of uplift.

Sloping site must be designed as shown in [Fig A2-1b].

Table 1 – Design Pressure for Wind

The provisions in the code are largely prescriptive and are supported by drawings which serve as guidelines for bolting/strapping down of roof elements. The Code is accompanied by a series of typical structural drawings which are presented as part of the prescriptive guide to developers and builders. This may be considered a significant asset of the Code as extensive drawings of detailing are provided.

Timber Buildings

[3.1.8.2.2] The spaces between the supporting columns may be filled in to reduce the uplift forces [see Fig A1.6]. Drawings referred to above demonstrate desired construction practices.

Steel Buildings

[3.1.8.2.3] Ensure that there are adequate numbers and sizes of foundation holding down bolts.

Adequate lateral support provided by cross bracing or horizontal ties. [See drawings given with the Code.]

Roofs [3.1.9]

Roofs with pitch between 0 and 20^{o} (or a slope between 0% and 36%) are more vulnerable to uplift forces. It is recommended that roofs be constructed with a pitch between 20^{o} and 40^{o} (or a slope between 36% and 84%).

Attention should be given to the location of fixings used for roof cladding. It is necessary to provide additional fixing at the roof edges and ridges, since high-localised pressures are produced in these locations.

Roof overhangs also experience high local pressures and, where possible, these should be kept to a minimum or adequately strengthened. [See drawings given with the Code].

Windows and Doors [3.1.10]

Special attention must be paid to the installation of doors and windows, since the loss of a door or window during a hurricane will greatly alter the internal pressure of the building, thus adversely affecting its safety. For this reason, glazed windows and doors may be fitted with shutters.

4.2 Analytic Procedures

[not addressed]

The Code as it expressly stated focuses on Small Buildings and is therefore more prescriptive than analytical in its treatment.

4.3 Experimental Procedures

[not addressed]

5. INDUCED EFFECTS

5.1 Impact of Flying Objects

This is not specifically addressed except to recommend the use of shutters to protect glazing [3.1.10].

5.2 Wind Driven Rain

This is not specifically treated but should be addressed. May be considered for more detailed treatment.

6. SAFETY VERIFICATION

6.1 Structure

Not specifically addressed.

One may be inclined to assume that the reason why a more detailed treatment of wind impact on small residential buildings was not carried out, was partly because Trinidad is considered by many to be outside the trace of the annual tropical storms and hurricanes, as opposed to the other Caribbean islands.

6.2 Cladding and Non-Structural Elements

Not specifically addressed.

7. SMALL RESIDENTIAL BUILDINGS

The Code is intended as a 'small buildings building code' i.e. applicable to small residential buildings.

This code has been developed specifically to deal with small buildings and was intended to fill the gap in this respect for the CUBiC. It is therefore recommended that it should be incorporated into the new CUBiC.

RECOMMENDATIONS FOR CODE IMPROVEMENT

The code can be considered fairly up-to-date. However, there is a need to address several issues indicated in this review, which the code has not addressed.

Note also that the Base Code (CUBiC) is under consideration for review.