



ENGINEERING INNOVATION

FCC COLLOCATION WORKSHOP

May 1, 2012



STRUCTURAL CONSIDERATIONS

Neil J. Kuplic, PE
Vice President

- » Registered Professional Engineer in 31 States
- » Experienced in Design, Construction and Forensic Investigations
- » Was a Licensed Unlimited General Contractor
- » 28 Years of Experience
- » FDH Performs Approximately 400 Tower Analyses per Month

STRUCTURAL CONSIDERATIONS

Telecommunication Tower Analysis and Design

- » Specifically Referred to in State Building Codes
- » Specific Code for the Design and Review of Telecommunication Towers
 - » Structural Standard for Antenna Supporting Structures and Antennas
 - » TIA Standard (TIA-222-G)
 - » Site Specific data to analyze Towers contained in TIA Standard

STRUCTURAL CONSIDERATIONS

1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapter 6 of ASCE 7 or provisions of the alternate all-heights method in Section 1609.6. The type of opening protection required, the basic wind speed and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of the AF&PA WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas.

with Section 6.5 of ASCE 7, unless specific testing is performed that demonstrates it is the aerodynamic coefficient of the building, rather than shielding from other structures, that is responsible for the lower values. The 80-percent limit shall be permitted to be adjusted by the ratio of the frame load at critical wind directions as determined from wind tunnel testing without specific adjacent buildings, but including appropriate upwind roughness, to that determined in Section 6.5 of ASCE 7.

1609.1.1.2.2 Lower limits on components and cladding. The design pressures for components and cladding on walls or roofs shall be selected as the greater of the wind tunnel test results or 80 percent of the pressure obtained for Zone 4 for walls and Zone 1 for roofs as determined in Section 6.5 of ASCE 7, unless specific testing is performed that demonstrates it is the aerodynamic coefficient of the building, rather than shielding from nearby structures, that is responsible for the lower values. Alternatively, limited tests at a few wind directions without specific adjacent buildings, but in the presence of an appropriate upwind roughness, shall be permitted to be used to demonstrate that the lower pressures are due to the shape of the building and not to shielding.

TIA Code



State Code



2012 NORTH CAROLINA BUILDING CODE

313



STRUCTURAL CONSIDERATIONS



ANSI/TIA-222-G-2005
Approved: August 2, 2005

TIA STANDARD

**Structural Standard for Antenna
Supporting Structures and Antennas**

EFFECTIVE JANUARY 1, 2006

TIA-222-G
(Revision of TIA/EIA-222-F)

August 2005

TELECOMMUNICATIONS INDUSTRY ASSOCIATION



Representing the telecommunications industry in
association with the Electronic Industries Alliance



STRUCTURAL CONSIDERATIONS

Design Wind Speeds

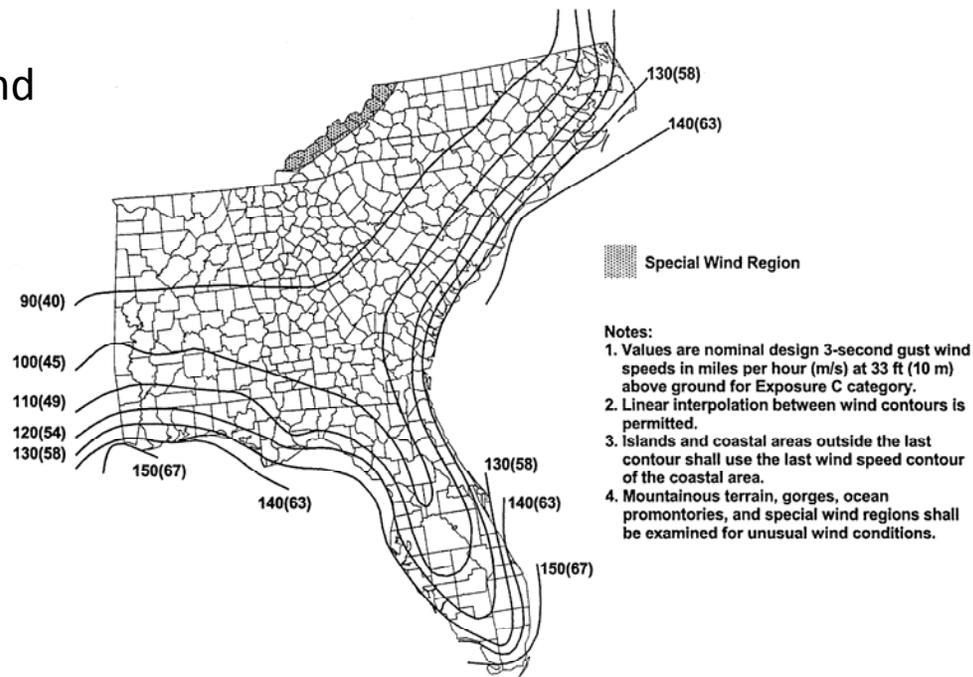


FIGURE A1-1d BASIC WIND SPEED WITHOUT ICE, V mph [m/s]

ANSI/TIA-222-G



STRUCTURAL CONSIDERATIONS

Antenna Wind Loads

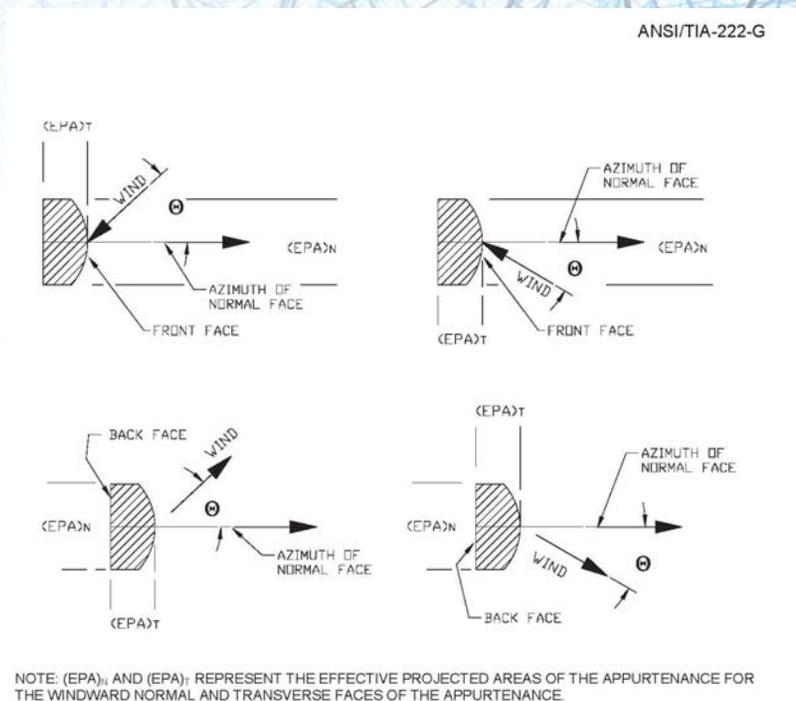


Figure 2-4: Wind Force on Appurtenances

STRUCTURAL CONSIDERATIONS

Microwave Wind Loads

ANSI/TIA-222-G

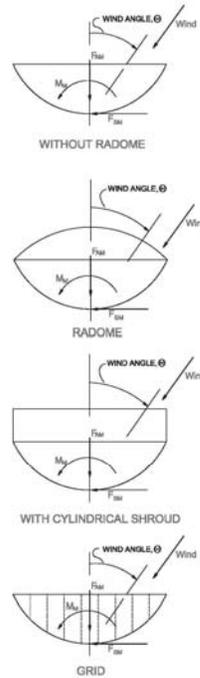


Figure C-1: Wind Forces on Typical Microwave Antennas

STRUCTURAL CONSIDERATIONS

Tower Bracing

ANSI/TIA-222-G

Table 4-2: Minimum Required Resistance at Panel Points

| | | |
|---|--|--|
| | | |
| | | |
| | | |
| <p>Notes:</p> <ol style="list-style-type: none"> For leg slopes greater than 15 degrees from vertical, P_r shall be divided by the cosine of the leg slope. | | |

STRUCTURAL CONSIDERATIONS

Collocation Process

- » Receive Collocation Application from Client Requesting a Structural Analysis of the Tower
- » Review Application – Existing Antennas on Tower versus Proposed Antennas
- » Verify Pertinent Structural Information on Tower is Available
- » Model Tower in 3D Software per TIA code
- » Review Results of 3D Analysis
- » Provide Report to Client

STRUCTURAL CONSIDERATIONS

Tower Structural Analysis Report



FDH Engineering, Inc., 6521 Meriden Drive, Raleigh, NC 27616, Ph. 919.755.1012, Fax 919.755.1031

Structural Analysis for

300' Guyed Tower

Site Name:
Site ID:

Site Name:

FDH Project Number

Analysis Results

| Tower Components | 63.8% | Sufficient |
|------------------|-------|------------|
| Foundation | 57.2% | Sufficient |

Prepared By:

Gregory C. Clutter
Project Engineer

Reviewed By:

Neil J. Kuplic, PE
Vice President
MS PE License No. 12422

FDH Engineering, Inc.
6521 Meriden Drive
Raleigh, NC 27616
(919) 755-1012
info@fdh-inc.com



April 25, 2012

Prepared pursuant to TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures



