
GRAHAM ARCHITECTURAL PRODUCTS

# TEST METHODS AND SPECIFICATIONS

There are two basic test methods utilized in hurricane testing; HVHZ TAS 201, 202, and 203 (Florida Building Code) and ASTM E 1886. These documents describe the technique used to propel the airborne missile and impact the fenestration system. These test methods also include details for subjecting the test specimens to the required repetitive cyclical loads (see Table 3 below).

The referenced ASTM test method also has a corresponding specification, ASTM E 1996, that indicates what missile size and weight shall be used depending upon application and wind speed (see table 1 and 2), location of impact, pass/fail criteria, and substitution limitations. For example, 30 feet from grade and below is typically the zone for impact by a wood 2 x 4 (large missile), whereas above 30 feet from grade is the zone for impact by 2 gram steel ball bearings (small missile).

Table 1 - Missile Type & Velocity

| Missile Level | MIssile Description | Impact Speed | |
|---|---|---|---|
| | | ft/sec | mph |
| A | Steel ball, Weight: 2g ± 5% | 130 | 89 |
| B | 2x4 lumber, Weight: 2.0 lb. ± 0.25 lb. Length: 1 ft - 9 in. ± 4 in. | 50 | 34 |
| C | 2x4 lumber, Weight: 4.5 lb. ± 0.25 lb. Length: 4 ft - 4 in. ± 4 in. | 40 | 27 |
| D | 2x4 lumber, Weight: 9.0 lb. ± 0.25 lb. Length: 8 ft. ± 4 in. | 50 | 34 |
| E | 2x4 lumber, Weight: 9.0 lb. ± 0.25 lb. | 80 | 55 |

## WIND-BORNE DEBRIS REGION

Designated areas where the basic wind speed is 140 MPH or greater.

130 MPH and within 1 mile of the coast.

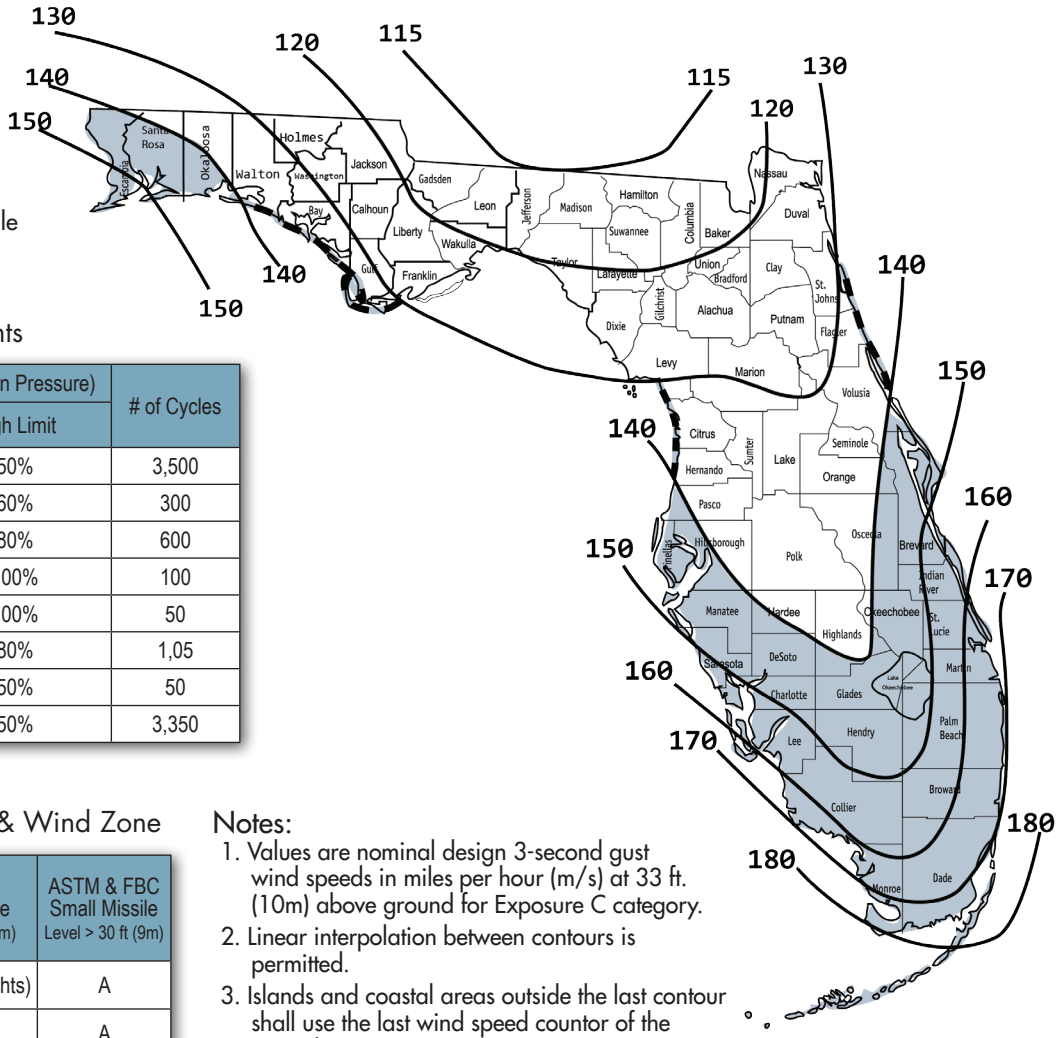


Table 2 - Cycle Test Load Requirements

| Seq | Applied Load Direction | Load Range (% of Rated Design Pressure) | | # of Cycles |
|---|---|---|---|---|
| | | Low Limit | High Limit | |
| 1 | Positive | 20% | 50% | 3,500 |
| 2 | Positive | 0% | 60% | 300 |
| 3 | Positive | 50% | 80% | 600 |
| 4 | Positive | 30% | 100% | 100 |
| 5 | Negative | 30% | 100% | 50 |
| 6 | Negative | 50% | 80% | 1,05 |
| 7 | Negative | 0% | 50% | 50 |
| 8 | Negative | 20% | 50% | 3,350 |

Table 3 - Missile Req'd by Elevation & Wind Zone

| Wind Zone | Wind Speed mph (km/hr) | HVHZ Missile Level ≤30 ft (9m) | ASTM Basic Missile Level > 30 ft (9m) | ASTM & FBC Small Missile Level > 30 ft (9m) |
|---|---|---|---|---|
| 1 | 110 (177) | D | C (B for Skylights) | A |
| 2 | 120 (193) | D | C | A |
| 3 | 130 (209) | D | D | A |
| 4 | >140 (225) | D | D | A |

Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft. (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed countor of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speed correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 years).

Figure 1609A Wind-Borne Debris Region, Category II and III
Building and Structures except health care facilities

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