

TESTING APPLICATION STANDARD (TAS) 201-94

IMPACT TEST PROCEDURES

1. **Scope**
 - 1.1 This protocol covers procedures for conducting the impact test of materials as required by Section 1626 of the *Florida Building Code, Building*.
2. **Referenced Documents**
 - 2.1 The *Florida Building Code, Building*.
3. **Terminology**
 - 3.1 Definitions - For definitions of terms used in this protocol, refer to Sections 1625, 1626 and/or Chapter 2 of the *Florida Building Code, Building*.
 - 3.2 Description of Terms Specific to This Protocol.
 - 3.2.1 Specimen - The entire assembled unit submitted for test, including but not limited to anchorage devices and structure to which product is to be mounted.
 - 3.2.2 Test Chamber - An airtight enclosure of sufficient depth to allow unobstructed deflection of the specimen during pressure cycling, including ports for air supply and removal, and equipped with instruments to measure test pressure differentials.
 - 3.2.3 Maximum Deflection - The maximum displacement of the specimen measured to the nearest $\frac{1}{8}$ of an inch attained from the original position while the maximum test load is being applied.
 - 3.2.4 Permanent Deformation - The permanent displacement of the specimen measured to the nearest $\frac{1}{8}$ of an inch from the original position to final position that remains after maximum test load has been removed.
 - 3.2.5 Test Load - As determined by Sections 1606, 1625, and 1626 of the *Florida Building Code, Building*.
 - 3.2.6 Specimen Failure - A change in condition of the specimen indicative of deterioration under repeated load or incipient failure, such as cracking, fastener loosening, local yielding, or loss of adhesive bond.
4. **Significance and Use**
 - 4.1 The test procedures outlined in this protocol provide a means of determining whether a particular product used as wall cladding, exterior windows, glazing, exterior doors, skylights, glass block, shutters and any other similar device used as external protection to maintain the envelope of the building, provides sufficient resistance to windborne debris, as stated in Section 1626 of the *Florida Building Code, Building*.
5. **Test Specimen**
 - 5.1 *Test specimen* - All parts of the test specimen shall be full size, using the same materials, details, methods of construction and methods of attachment as proposed for actual use. The specimen shall consist of the entire assembled unit attached to a given type of structural framing of the building, and shall contain all devices used to resist wind forces and windborne debris. When testing glazed products, the material used to make such glazed product windborne debris resistant (i.e., fillers, film and similar), shall be an integral part, factory applied, of such glazed product.

In the case of windows, doors, and sliding glass doors, a pressure treated nominal 2 x 4 wood buck #3 Southern Pine shall be used for attachment of the specimen to the test frame/stand/chamber. Such wood buck will become part of the approval.

In the case of storm panels, they must be tested in worst case scenarios where attachments are directly to CBS block. Figure 1, on the following page, shows the basic three (3) configurations that shall be required; one per each of the three (3) required specimens. Each storm panel specimen shall consist of minimum three (3) panels.

5.1.1 Locking mechanisms shall be permanently mounted on the specimen. Such locking mechanism shall require no tools to be latched in the locked position. Devices such as pins shall be permanently secured to the specimen through the use of chains or wires which must be of corrosion resistant material. This section does not apply to specimens referenced in Section 2413 of the *Florida Building Code, Building*.

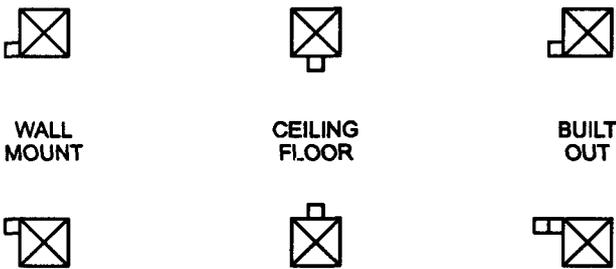


FIGURE 1
THREE (3) BASIC STORM PANEL ATTACHMENTS
FOR TESTING

5.1.2 Products that are not categorized as means of egress/escape and are provided with more than one single action locking mechanism, shall be provided with permanently posted instructions on latching for high wind pressures.

5.1.3 Specimen and fasteners, when used, shall not become disengaged during test procedure.

5.2 Manufacturers of any specimen with width of more than 20 ft and/or a height of more than 8 ft, must submit for approval a proposed comparative test criteria to the Authority Having Jurisdiction prior to testing.

6. Apparatus

6.1 The description of the apparatus is general in nature. Any equipment, properly certified, calibrated, and approved by the Authority Having Jurisdiction capable of performing this test within the allowable tolerance is permitted.

6.2 Major Components

6.2.1 *Cyclic Wind* - Pressure Loading As described in protocol TAS 203-94. (Number of cycles and amount of pressure are indicated in Section 1625.4, Table 1625 and Table 1626 of the *Florida Building Code, Building*. Design wind pressure is to be determined by using Section 1619 of the *Florida Building Code, Building*.)

6.2.1.1 *Test Chamber* - The test chamber, to which the specimen is mounted, shall be provided with pressure taps to measure the pressure difference across the test specimen and shall be so located that the reading is unaffected by the velocity of air supplied to or from the chamber. The specimen mounting frame must not deflect under test load in such manner that the performance of the specimen will be affected.

6.2.1.2 *Air System* - A controllable blower, a compressed-air supply, an exhaust system, or reversible controllable blower designed to provide the required maximum air pressure difference across the specimen. The system shall provide an essentially constant air-pressure difference for the required test period.

6.3 *Missile Impact*

6.3.1 *Timing System* - The timing system, which is comprised of two, through-beam photoelectric sensors spaced at a known distance apart and used to start and stop an electronic clock, shall be capable to measure speeds accurate to $\pm 2\%$. The speed of the missile shall be measured anywhere between the point where 90% of the missile is outside of the cannon, to the point where the missile is 1 ft. away from the test specimen. The missile speed shall not be measured while the missile is acceler-

ating. The through-beam photoelectric sensors shall be of the same model.

The electronic clock shall be activated when the reference point of the missile passes through the timing system. The electronic clock shall have an operating frequency of no less than 10 kHz with a response time not to exceed 0.15 milliseconds. The speed of the missile shall be determined by dividing the distance between the two through-beam photoelectric sensors by the total time interval counted by the electronic clock.

6.3.1.1 *Calibration of Timing Equipment* - The timing system shall be calibrated and certified by an independent qualified agency approved by the Building Code Compliance Officer, at six-month intervals using one of the following methods:

1. Photographically, using a stroboscope,
2. Photographically, using a high speed camera with a frame rate exceeding 500 frames per second,
3. Photographically, using a high speed video camera with a frame rate exceeding 500 frames per second, or
4. Any other certified timing system calibration device used by an independent certified agency approved by this office.

The calibration report shall include: the date of the calibration, the name of the agency conducting the calibration, the distance between the through-beam photoelectric sensors (if used), the speed of the missile as measured by the timing system, the speed of the missile as determined from the calibration system, and the percentage difference in speeds. The system shall be determined to be accurate if the speed of the

missile measured by the timing system and the speed measured by the calibration system agree within 2%.

6.3.2.1 *LARGE MISSILE* - The large missile shall be a solid S4S nominal 2x4 #2 surface dry Southern Pine. The weight of the missile shall be as specified in Section 1626.2.3 of the *Florida Building Code, Building* and shall have a length of not less than 7 feet and not more than 9 feet. The missile shall be marked/ticked in dark ink at one inch intervals on center, and cogruently numbered every three inches. A sabot shall be attached to the trailing edge of the missile to facilitate launching. The weight of the sabot shall not exceed 1/2 lb. The combined weight of the timber and sabot, which constitutes the missile, shall be between 9 lb and 9.5 lb. The missile shall be propelled through a cannon as described in Section 6.3.3 of this protocol.

6.3.2.2 When testing any specimen with more than one component, in addition to complying with the impacts required by Section 1626.2 of the *Florida Building Code, Building* the framing member connecting these components shall be impacted at one half the span of such member with the large missile at a speed indicated in Section 1626.2.4 of the *Florida Building Code, Building*.

6.3.2.3 Any specimen that passes the large missile impact test need not be tested for the small missile impact test if the specimen has no opening that a 3/16 inch sphere can pass through.

- 6.3.3 **LARGE MISSILE CANNON** - The large missile cannon shall use compressed air to propel the large missile. The cannon shall be capable of producing impact at the speed specified in Section 1626.2.4 of the *Florida Building Code, Building*. The missile cannon shall consist of four major components: a compressed air supply, a pressure release valve, a pressure gauge, a barrel and support frame, and a timing system for determining the missile speed. The barrel of the missile cannon shall consist of a 4-inch inside diameter pipe and shall be at least as long as the missile. The barrel of the large missile cannon shall be mounted on a support frame in a manner to facilitate aiming the missile so that it impacts the specimen at the desired location. The distance from the end of the cannon to the specimen shall be 9 feet plus the length of the missile.
- 6.3.4 **SMALL MISSILE** - The missiles shall be propelled through cannon as described in Section 6.3.5 of this protocol. The small missile shall be launched in such a manner that each specimen shall be impacted over an area not to exceed two square feet per impact as described in Section 1626.3.5 of the *Florida Building Code, Building*.
- 6.3.5 **SMALL MISSILE CANNON** - A compressed air cannon shall be used that is capable of propelling missiles of the size and speed defined in 1626.3.3 and 1626.3.4 of the *Florida Building Code, Building*. The cannon assembly shall be comprised of a compressed air supply and gauge, a remote firing device and valve, a barrel, and a timing system. The small missile cannon shall be mounted to prevent movement of the cannon so that it can propel missiles to impact the test specimen at points defined in 1626.3.5 of the *Florida Building Code, Building*. The timing system shall be positioned to measure missile speed within 5 feet of the impact point on the test specimen.

7. Hazards

- 7.1 Testing facilities must take all necessary precautions to protect the observers during the entire test procedure. All observers shall always be at a safe distance away from specimen and apparatus. Safety regulations must be followed in order to avoid any injuries to any and all observers.

8. Testing Facilities For a more detailed description see TAS 301-94.)

- 8.1 Any testing facility wishing to perform this test must first obtain the approval of the Authority Having Jurisdiction. Such approval shall only be given to those facilities which show that they are properly equipped to perform the complete test, including the cyclic loading and the small and large missile impact test. Testing facilities shall request, in writing, approval of their facilities. Such request shall contain the ability of the facility to perform all aspects of the test, all equipment used in the performance of the test, name of independent agency calibrating their equipment, location of facilities, personnel involved in the testing, a quality control program, a safety program and any other pertinent information which will clearly indicate that such facility is in the business of performing independent testing. The Authority Having Jurisdiction will visit the site and reserve the right to order any changes necessary to accept the facility for testing.
- 8.2 Approval of facilities to perform the test described in this protocol, does not constitute an approval of such facilities to perform other tests not specifically mentioned in this protocol.
- 8.3 Fee for testing facilities shall be determined per protocol TAS 301-94.

9. Format of Test

The manufacturer shall notify the Authority Having Jurisdiction seven (7) working days prior to the performing of the test. The Authority Having Jurisdiction reserves the right to observe the test. The Authority Having Jurisdiction must be notified of the place and time the test will take place. The test must be recorded on video (VHS) and submitted along with test report.

10. Test Reports

The following minimum information shall be included in the submitted report:

- 10.1 Date of the test and the report, and report number.
- 10.2 Name, location, and certification number of facilities performing the test.
- 10.3 Name and address of requester of the test.
- 10.4 Identification of the specimen (manufacturer, source of supply, dimension, model types, material, procedure of selection and any other pertinent information).
- 10.5 Detailed drawings of the specimen showing dimensioned section profiles, type of framing specimen was attached to, panel arrangement, installation and spacing of anchorage, locking arrangement, sealants, hardware, product markings and their location, and any other pertinent construction details. Any deviation from the drawings or any modifications made to the specimen to obtain the reported values shall be noted on the drawings and in the report.
- 10.6 Maximum deflection recorded and mechanism used to make such determination.
- 10.7 Permanent deformation (provide cross section diagram to show where it occurred).
- 10.8 Name, address, signature and seal of Florida professional engineer, witnessing the test and preparing the report. Engineer shall be part of the laboratory's permanent staff or under laboratory's contract. (See TAS 301-94.)
- 10.9 The results for all three specimens shall be reported, each specimen being properly identified, particularly with respect to distinguishing features or differing adjustments. A separate drawing for each specimen will not be required if all differences between them are noted on the drawings provided.
- 10.10 Location of impacts on each test specimen.
- 10.11 The large and small missile velocities.
- 10.12 The weight of the missiles.
- 10.13 Maximum positive and negative pressures

used in the cyclic wind pressure loading.

- 10.14 A description of the condition of the test specimens after testing, including details of any damage and any other pertinent observations.
- 10.15 When the tests are made to check conformity of the specimen to a particular specification, an identification or description of that specification.
- 10.16 A statement that the tests were conducted in accordance with this test method.
- 10.17 A statement of whether or not, upon completion of all testing, the specimens meet the requirements of Section 1626 of the *Florida Building Code, Building*.
- 10.18 A statement as to whether or not tape or film, or both were used to seal against air leakage, and whether in the judgment of the test engineer, the tape or film influenced the results of the test.
- 10.19 Signatures of persons responsible for supervision of the tests and a list of official observers.
- 10.20 All data not required herein, but useful to a better understanding of the test results, conclusions or recommendations, should be appended to the report.

11. Recording Deflections

Maximum Deflection

Permanent Deformation

12. Additional Testing

- 12.1 Following successful completion of this test, all specimen must then be successfully tested as per TAS 203-94.
- 12.2 Any product when installed that is subjected to weathering, where such weathering can affect the integrity of the product, the manufacturer shall contact the Authority Having Jurisdiction for additional testing requirements such as but not limited to moisture, U.V., accelerated aging, and other similar tests.

12.3 The Authority Having Jurisdiction reserves the right to require any additional testing necessary to assure full compliance with the intent of the *Florida Building Code, Building*.

12.4 Some products, such as, but not limited to exterior doors, exterior windows, skylights, and wall cladding shall be required to be successfully tested under TAS 202-94 prior to conducting tests under this protocol.

13. Product Marking

13.1 Any and all approved products shall be permanently labeled with the manufacturer's name, city, state, and the following statement: "Product Control Approved."

13.2 Permanently labeled shall be a metallic label fixed permanently to the frame of the specimen by rivets or permanent adhesive. See Section 13.2.1 of this protocol for storm panels.

13.2.1 Permanent label on storm panels could be printed directly on each panel at intervals not to exceed 24 inches with non removable paint or ink.

13.3 Any instructions for operations shall be permanently mounted on the specimen in an area not subject to be painted or concealed. Storm panels may be excluded from this section.