



Product Evaluation Report

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PTC Report No.: 2210

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PTC Project No.: 413-0303

Product Mfg.: Hurricane Storm Panel Mfg. Inc.
1720 Main St. NE. Unit 1
Palm Bay, FL 32905

Product Name: HVHZ Impact Storm Panel

Product Category: Shutters

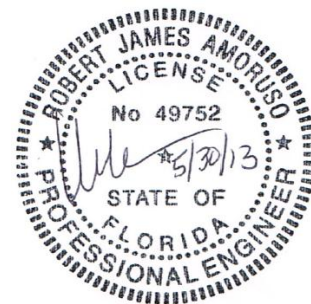
Product Sub-Category: Storm Panels

Compliance Method: Product Approval Rule 9N-3.005(1)(d) – Product Evaluation Report by a Licensed Professional Engineer

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CERTIFICATE OF INDEPENDENCE

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Scope

Evaluate Hurricane Storm Panel Mfg. Inc.'s HVHZ Impact Storm Panel for conformance to the 2010 Florida Building Code – Building and Residential Volumes including the High Velocity Hurricane Zone (HVHZ).

Description of Product – Installation Requirements

See Reference 1.a for a description of the product, its installation and other pertinent data related to its approved use.

Limitations and Conditions of Use

This product evaluation report contains or makes reference to specifications, technical details and installation details and/or methods that pertain to the proper use and/or installation of the product specified herein. Specific limitations and conditions of its use including but not limited to the following are contained in Reference 1 and are the subject of Product Approval in accordance with the State of Florida Product Approval Rule 9N-3.

- Design Pressure Rating (psf)
- Installation substrate requirements.
- Installation anchor requirements.
- Installation restrictions.
- Product description.
- Product components.

Applications/Installations outside the Limitations and Conditions of Use of this Product's Approval

Rule 9N-3.005(1)(e) states "Rational engineering analysis cannot be used in lieu of a standard test required by the Code for approval of products within the scope of the standard, except that project specific approval by the local authorities having jurisdiction in accordance with alternate methods and materials authorized in the Code." Any modification to this product as evaluated in this report and approved by the Florida Building Commission is outside the scope of this evaluation and will be the responsibility of others. As allowed in Rule 9N-3.005(1)(e), a project specific approval by the local authorities having jurisdiction may be used given an appropriate rational analysis is conducted and deemed acceptable to the local authorities having jurisdiction.

Quality Assurance

This product is manufactured under a quality assurance program audited by an approved Certification and Quality Assurance Entity **National Accreditation & Management Institute (NAMI)** as required in Rule 9N-3.005(3). See FBC Organization No. CER1773 and QUA1789 for approval under Rule 9N-3.

Performance and Testing Standards

Reference 2 conducted testing to the following standard(s). See Reference 3.b for Code Conformance Evaluation to the 2010 FBC for these testing standards.

- 1) ASTM E330-97, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- 2) ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- 3) ASTM E1886 - 02, Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
- 4) ASTM E1886 - 97, Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
- 5) ASTM E1996 - 02, Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes
- 6) TAS201-94, Impact Test Procedures.
- 7) TAS202-94, Criteria for Testing Impact & Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.
- 8) TAS203-94, Criteria for Testing Products Subjected to Cyclic Wind Pressure Loading.

Code Conformance Structural Performance, Impact & Cyclic Loading

DESIGN PRESSURE LIMITATIONS

- Design Pressure is based on the following requirements:
 - 2010 Florida Residential Code, Sections R301.2.1.2 and R615.1.
 - Tested at 1.5 x Design Pressure
 - 2010 Florida Building Code, Section 1609.1.2.3
 - Tested at 1.5 x Design Pressure
- Testing documented in Reference 2 test reports was based on
 - Static Wind Loading testing to 1.5 x Design Pressure.
 - Post-Impact Cyclic Wind Loading testing to the Design Pressure.
 - The Design Pressure limitations shown on the Installation Anchorage Details (Reference 1.a) are based on the Design Pressure results.
- Conclusion
 - Design Pressures shown in Reference 1.a are in compliance with the 2010 Florida Building and Residential Codes.

DEFLECTION LIMITATIONS

- Deflection of Shutters shall not exceed L/30 based on the following requirements.
 - 2010 Florida Residential Code, Section R4403.2.1.
 - 2010 Florida Building Code, Section 1615.3
- Deflection results from Reference 2 testing indicate that recorded deflections due to static loading based on ASTM E330/TAS 202 testing and dynamic loading based on ASTM E1996/TAS 203 testing is less than L/30 as evaluated in Ref. 3.a.
- See following section for Fenestration-to-Shutter separation requirements.

FENESTRATION-TO-SHUTTER SEPERATION REQUIREMENTS

NON-HVHZ INSTALLATION:

- The 2010 FBC and 2010 FRC do not have specific requirements for non-HVHZ areas. ASTM E1996 separation requirements would be mandated if applicable as discussed below.
- This product approval is based on ASTM E1996-02.
- ASTM E1996-02 does not require separation of non-porous shutter protective coverings. The requirement exists for porous protective coverings only.
- ASTM E1996-05 revised separation requirements for porous shutter systems (Section 8.3) to Essential Facilities for all Wind Zones and all impact protective systems (intrinsically including non-porous systems) in Wind Zone 4.
- ASTM E1996-09 clarifies Porous and Non-Porous separation requirements as: (a) Section 8.3.1 Porous systems shall include separation criteria for all wind zones and (b) Section 8.3.2 non-porous systems for essential facilities in all wind zones. However, non-porous systems do not require separation for non-essential facilities per Section 8.3.2 of ASTM E1996-09; a clarification/change from previous versions of ASTM E1996.
- For purposes of this product approval evaluation, only ASTM E1996-02 requirements are mandatory for non-HVHZ installations. Therefore, no separation is required.
- To allow for user-applied separation requirements in non-HVHZ installations, additional guidance based on ASTM E1996-09 is included.

HVHZ INSTALLATIONS

- For HVHZ installations, minimum separation shall be based on the requirements of 2010 FBC, Section 2413.2 and 2010 FRC, Section R4410.4.2 as follows.
 - The storm shutters shall be designed and constructed to insure a minimum of 1 inch (25 mm) separation at maximum deflection with components and frames of components they are to protect.
- Reference 3.a evaluated dynamic loading deflection due to ASTM E1996/TAS 203 testing as follows.

- Deflections as defined in ASTM E1996/TAS 203 where summarized at the tested panel lengths.
- Deflections at other lengths were arrived at by interpolation.
- Deflections where increased in accordance with ASTM E1996 and Sections 2413.2 and R4410.4.2 and the worst case tabulated. Those results are used in the Separation Table below and in Reference 1.a Installation Drawing.

CONCLUSION

Using the parameters above, the following notes and separation table are included in Reference 1.a.

SEPARATION REQUIREMENTS - WIND ZONES 1, 2, 3 AND 4 NOT INCLUDING THE HIGH VELOCITY HURRICANE ZONE (HVHZ)

1. REQUIRED (MANDATORY) SEPARATION REQUIREMENTS:
 - 1.1. PER ASTM E1996-02 UNDER WHICH THIS PRODUCT WAS TESTED AND APPROVED IN THIS PRODUCT APPROVAL DOCUMENT AND IN ACCORDANCE WITH THE 2010 FLORIDA BUILDING CODE, ONLY POROUS SHUTTER ASSEMBLIES REQUIRE SEPARATION OF THE SHUTTER ASSEMBLY FROM THE FENESTRATION UNIT.
 - 1.2. THIS PRODUCT IS A NON-POROUS SHUTTER ASSEMBLY. THEREFORE SEPARATION IS NOT REQUIRED BY ASTM E1996-02 AS ADOPTED BY THE 2010 FLORIDA BUILDING CODE.
 - 1.3. THE MANUFACTURER RECOMMENDS THE USER MAINTAIN A NON-MANDATORY MINIMUM 1 INCH SEPARATION.
 - 1.4. SEE ITEM 2 BELOW FOR NON-MANDATORY SEPARATION REQUIREMENTS THAT MAY BE EMPLOYED FOR WIND ZONES 1, 2, 3 AND 4 NOT INCLUDING THE HIGH VELOCITY HURRICANE ZONE (HVHZ).
2. NON-MANDATORY SEPARATION REQUIREMENTS DERIVED FROM ASTM E1996-09:
 - 2.1. THIS PRODUCT IS NOT TESTED OR APPROVED FOR ASTM E1996-09, THEREFORE THE FOLLOWING IS FOR GUIDANCE ONLY AND IS NON-MANDATORY TO THIS APPROVAL.
 - 2.1.1. THIS PRODUCT WAS TESTED FOR WIND ZONES 1 THROUGH 4, MISSILE LEVEL D.
 - 2.1.2. FOR NON ESSENTIAL FACILITIES (I.E. BASIC PROTECTION), SEPARATION OF THE SHUTTER ASSEMBLY FROM THE FENESTRATION UNIT IS NOT REQUIRED.
 - 2.1.2.1. THE MANUFACTURER RECOMMENDS THE USER MAINTAIN A NON-MANDATORY MINIMUM 1 INCH SEPARATION.
 - 2.1.3. FOR ESSENTIAL FACILITIES, SEPARATION OF THE SHUTTER ASSEMBLY FROM THE FENESTRATION UNIT IS REQUIRED FOR THE FOLLOWING.
 - 2.1.3.1. FOR ASSEMBLY HEIGHTS \leq 30 FT. IN WIND ZONES 1 AND 2, THE *SEPARATION TABLE* BELOW CAN BE USED.
 - 2.1.3.2. FOR ASSEMBLY HEIGHTS \leq 30 FT. IN WIND ZONES 3 AND 4, THIS PRODUCT DOES NOT MEET ASTM E1996-09 REQUIREMENTS.
 - 2.1.3.3. FOR ASSEMBLY HEIGHTS $>$ 30 FT. IN WIND ZONES 1 THROUGH 4, THE *SEPARATION TABLE* BELOW CAN BE USED.
 - 2.2. SEE *SEPARATION TABLE* BELOW FOR NON-MANDATORY SEPARATION REQUIREMENTS THAT MAY BE EMPLOYED.

SEPARATION REQUIREMENTS - HIGH VELOCITY HURRICANE ZONE (HVHZ)

1. PER THE 2010 FLORIDA BUILDING CODE, SECTION 2413.2 AND THE 2010 FLORIDA RESIDENTIAL CODE, SECTION R4410.4.2, THE STORM SHUTTER SHALL BE DESIGNED AND CONSTRUCTED TO INSURE A MINIMUM OF 1 INCH (25 MM) SEPARATION AT MAXIMUM DEFLECTION.
2. THE SEPARATION TABLE BELOW SHALL BE USED TO ASCERTAIN MINIMUM SEPARATION IS MAINTAINED MEETING THESE REQUIREMENTS.

0.050" Aluminum	
Max. Panel Length (L) (in)	Minimum Separation Distance (in)
144	5.703
138	5.625
132	5.547
126	5.469
120	5.391
114	5.328
108	5.266
106	5.245
102	5.203
96	5.141
90	5.078
84	5.016
78	4.963
72	4.913
56	4.779
43	4.671

24 Ga. Galvanized Steel	
Max. Panel Length (L) (in)	Minimum Separation Distance (in)
144	5.625
138	5.594
132	5.563
126	5.531
120	5.500
114	5.469
108	5.438
106	5.427
102	5.406
96	5.375
90	5.344
84	5.313
78	5.281
72	5.250
56	5.167
43	5.099

Code Conformance - Labeling

Labeling as shown on the Installation Drawing (Reference 1.a) in compliance with the requirements of the 2010 Florida Building Code Sections 1715.8.1, 1715.8.2 and 1715.8.3 and 2010 Florida Residential Code, Sections R615.2.1, R615.2.2 and R615.2.3.

Code Conformance - Installation

Installation shall be as shown on the Installation Drawing (Reference 1.a) in compliance with the requirements of the 2010 Florida Building Code Section 1715.8.4 and 2010 Florida Residential Code, Sections R615.2.4.

Where required as shown in *Code Conformance - Structural Performance, Impact & Cyclic Loading* section above, fenestration-to-shutter minimum separation shall be maintained.

References and Supporting Documents

1) Drawings

- a. HSPM0001, Rev. 0, dated 5/30/13, *Hurricane Storm Panel Manufacturing, HVHZ Impact Storm Panel, Installation Anchorage Details.*

2) Tests

- a. ATLNC 0428.01-04, KD Manufacturing Storm Panels, 0.050" Aluminum Corrugated. Dated 5/28/04, Signed and Sealed by David Johnson, P.E., NC License No. 005655.
- b. ATLNC 0428.03-04, KD Manufacturing Storm Panels, 24 GA Steel Corrugated. Dated 5/28/04, Signed and Sealed by David Johnson, P.E., NC License No. 005655.
- c. ATLNC 0224.01-09, KD Manufacturing Storm Panels, 24 GA Steel Corrugated. Dated 2/25/09, Signed and Sealed by David Johnson, P.E., NC License No. 00061915.
- d. ATLNC 0224.02-09, KD Manufacturing Storm Panels, 0.050" Aluminum Corrugated. Dated 2/25/09, Signed and Sealed by David Johnson, P.E., NC License No. 00061915.

3) Reports

- a. PTC Report No. 1297, Rev. 2, *Hurricane Storm Panel Manufacturing, HVHZ Impact Storm Panel, Anchor Calculations*, Dated 5/30/13, signed and sealed by Robert J. Amoruso, P.E.
- b. PTC Report No. 2210-EER, Rev. 0, *Hurricane Storm Panel Manufacturing, HVHZ Impact Storm Panel, Equivalency Evaluation to the 2010 FBC*, Dated 5/30/13, signed and sealed by Robert J. Amoruso, P.E.

4) 2010 Florida Building Code & 2010 Florida Residential Code

- a. Testing and Labeling Requirements
 - i. Testing Requirements, Static Loading at 1.5 x Design Pressure
 - 1. Section 1609.1.2.3
 - 2. Section R301.2.1.2
 - 3. Section R615.1
 - ii. Impact Testing Requirements
 - 1. Section 1609.1.2
 - 2. Section R301.2.1.2
- b. Labeling Requirements
 - i. Section 1715.8.1, 1715.8.2 and 1715.8.3
 - ii. Section R615.2.1, R615.2.2 and R615.2.3
- c. Installation Requirements
 - i. Section 1615.3
 - ii. Section 1715.8.4
 - iii. Section 2413.2
 - iv. Section R615.4
 - v. Section R4403.2.1
 - vi. Section R4410.4.2