Product Evaluation Report

Date:	July 16, 2020
PTC Report No.:	2210
Report Revision No.:	2
PTC Project No.:	419-1103
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/ Sub-Category:	Shutters / Storm Panels
Code:	Current Edition FBC including 7th Edition (2020) FBC
Compliance Method:	Product Approval Rule 61G20-3.005(1)(d) – Product Evaluation Report by a Licensed Professional Engineer
Prepared By:	Robert J. Amoruso, P.E. Florida P.E. License Number 49752 PTC Product Design Group, LLC FBPE Certification of Authorization No. 25935

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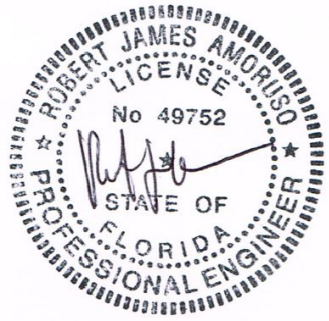

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Scope

Evaluate Hurricane Storm Panel Mfg. Inc.'s HVHZ Impact Storm Panel for conformance to the Current Edition of the 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 61G20-3.

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

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 **61G20**-3.005(3). See FBC Organization No. CER1773 and QUA1789 for approval under Rule 61G20-3.

Performance and Testing Standards

Reference 2 conducted testing to the following standard(s). See Reference 3.b for Code Conformance Evaluation to the Current Edition of the 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:
  - Current Edition of the Florida Residential Code, Chapter 3 and 6
    - Tested at 1.5 x Design Pressure
  - Current Edition of the Florida Building Code, Chapter 16
    - 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 Current Edition of the Florida Building and Residential Codes.

DEFLECTION LIMITATIONS

- Deflection of Shutters shall not exceed L/30 based on the following requirements.
  - Current Edition of the Florida Building Code, Chapter 16.
- 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 are 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 Current Edition of the FBC and the Current Edition of the FRC do not have specific requirements for non-HVHZ.
- ASTM E1996 separation requirements can 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 E1996-12a is included below.
- From ASTM E1996-12a:
    - 8.3.2 Non-porous impact protective systems in essential facilities in all wind zones that are tested independently of the fenestration assembly shall be accepted for installations in which they are offset from the fenestration assemblies by the greater of the following:
    - 8.3.2.1 The maximum dynamic deflection, as measured in 5.5 + 2 mm (0.1 in.); or
    - 8.3.2.2 The sum of the maximum positive deflection and the residual deflection, as measured in 5.5 + 2 mm (0.1 in.).
    - 8.4 Where the specifying authority has specified optional additional pass/fail criteria in accordance with 7.2, non-porous impact protective systems that are tested independently of the fenestration assembly shall be accepted for installations only in which they are offset from the fenestration assemblies as specified in 8.3.2.

HVHZ INSTALLATIONS

- For HVHZ installations, minimum separation shall be based on the requirements of the Current Edition of the FBC, Chapter 24 and the Current Edition of the FRC, Chapter 44 (references Chapter 24 of FBC) 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 Chapter 24 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 CURRENT EDITION 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 CURRENT EDITION 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 E1996-12a:
   2.1. THIS PRODUCT IS NOT TESTED OR APPROVED FOR ASTM E1996-12a; 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 ≤ 30 FT. IN WIND ZONES 3 AND 4, THIS PRODUCT DOES NOT MEET ASTM E1996-12a 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 CURRENT EDITION FLORIDA BUILDING CODE, CHAPTER 16 & 24, 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	5.563
138	5.500
132	5.438
126	5.375
120	5.313
114	5.263
108	5.213
106	5.196
102	5.163
96	5.113
90	5.063
84	5.013
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	5.500
138	5.475
132	5.450
126	5.425
120	5.400
114	5.375
108	5.350
106	5.342
102	5.325
96	5.300
90	5.275
84	5.250
78	5.225
72	5.200
56	5.133
43	5.079

Code Conformance - Labeling

A permanent label in accordance with Chapter 17 of the current edition of the FBC and Chapter 6 of the current edition of the FRC shall be placed on the impact resistant coverings and shall face the exterior or outside.

Code Conformance - Installation

Installation shall be as shown on the Installation Drawing (Reference 1.a) in compliance with the requirements of the Current Edition of the Florida Building Code Chapter 17 and the Current Edition of the Florida Residential Code, Chapter 6.

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. C, dated 7/16/20, signed and sealed by Robert J. Amoruso, P.E., *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.
    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.
    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.
    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.

3) Reports
    a. PTC Report No. 1297, Rev. 3, *Hurricane Storm Panel Manufacturing, HVHZ Impact Storm Panel, Anchor Calculations*, dated 7/16/20, signed and sealed by Robert J. Amoruso, P.E.
    b. PTC Report No. 2210-EER, Rev. 2, *Hurricane Storm Panel Manufacturing, HVHZ Impact Storm Panel*, *Equivalency Evaluation to the Current Edition of the FBC*, dated 7/16/20, signed and sealed by Robert J. Amoruso, P.E.

4) Current Edition of the Florida Building Code & Current Edition of the Florida Residential Code.