National Wind Institute
Debris Impact Facility- Texas Tech University
P.O. Box 43155
Lubbock, Texas 79409-1023

Report No. _20140523A
Specimen No. ____1____
Test Date: _05-23-14

1.0 MANUFACTURER'S IDENTIFICATION

1.1 NAME OF APPLICANT: **ForceShield Tornado Doors**
206 S. Springfield St.
Berryville, Arkansas 72616

1.2 CONTACT PERSON: **Mr. Marty Strough**

1.3 TEST LAB CERTIFICATION: Federal Emergency Management Agency (FEMA) and the ICC-500 Shelter Standard; ISO 17025 certified tests available.

2.0 TEST UNIT IDENTIFICATION

2.0 PRODUCT TYPE: **Tested May 23, 2014**
Series 1- FEMA 320. 3'-0" x 6'-8" steel tornado door.

2.1 MODEL NUMBER: **N/A**
2.2 CONFIGURATION: See Article 3.0 Test Unit Description
2.3 SAMPLE SIZE: See Article 3.0 Test Unit Description
2.4 DOOR ASSEMBLY: See Article 3.0 Test Unit Description,
2.5 DRAWINGS: See Appendix B Drawings

3.0 TEST UNIT DESCRIPTION

3.0 TEST FRAME UNIT CONSTRUCTION: N/A
3.1 ASSEMBLY CONSTRUCTION:

3.1.1 **Series 1** FEMA 320, Door size 2'-8" x 6'-8" and 3'-0" x 6'-8". Outer shell and jams are 10 gage A-36 steel. Inner shell is 16 gage A-36 steel. Inner tube brace is 1 ½" x 1 ½" x 16 gage steel tube A-500 grade B. Hinge length 5". Barrel is 1" diameter mild steel bar bored for a 5/8" diameter pin. Locking pins are 1" diameter solid mild steel bar. Door frame is fabricated from 10 gage, A-36 steel jambs and head. Frame is seam welded together to form a single unit. Door is secured on frame by four ball bearing hinges. Hinges are welded to door and frame. Frame is secured to shelter jambs with 18 -# 14 screws (8 in each jamb and 2 in head). Locking mechanism consists of six 1" diameter locking pins attached to a 1 ¼" x 1 ¼" 14 gage steel tube. All pins ate activated at the same time by a single operation.

5.0 CONCLUSIONS

Within the bounds of reasonable engineering and technical certainty, and subject to change if additional information becomes available, the following is my professional opinion:

Pressure and impact tests were conducted by the NWI Debris Impact Facility on an in-swing door assembly produced by ForceShield Tornado Doors. The test door included the following:

1) **Series 1**– FEMA 320/ICC-500, 3-ft. x 6-ft. 8-in.

These tests were consistent with the guidelines of FEMA 320/361 and ICC-500 (2008) Standard for "The Design and Construction of Storm Shelters" and the ICC-500 requirement that the pressure test load should include a safety factor of 1.2. This pressure relates to a 250 mph ground speed tornado and the door installed in Zones 4&5 per ASCE 7-05 for a corner zone with the negative pressures being greater than the positive pressures. The goal pressure is 2.10 psi which must be held for 10 seconds in accordance to ASTM E330. The **Series 1** door was further tested with three debris impacts per the Test Protocol 4, Tornado.

The **Series 1** door assembly is qualified to meet both the FEMA 320 and the ICC-500 standards of door pressures and impacts for doors in storm shelters. Smaller doors of the same construction and locking hardware is further approved.

Any alterations made to the shelter design or construction must be approved or retested by WISE at Texas Tech University.

All testing was in strict accordance to FEMA 320/361 (2008), ICC-500 (2008), and ASTM E330.

Engineer of Record
Larry J. Tanner, P.E.