



7115 N. Bryant Ave. ♦ Oklahoma City, OK. ♦ 73121
Phone: (405) 475-9991 ♦ Fax: (405) 475-9992

April 10, 2009

Mr. Jerry Wirtz
FlatSafe Tornado Shelters, L.L.C.
P.O. Box 467
Ponca City, OK 74602

Dear Mr. Wirtz:

Sequoyah Engineering, Inc. has completed the review of your FlatSafe Tornado Shelter System. Drawings were prepared and the unit's structural integrity was evaluated by Mr. Otis Courtwright, P.E., a structural engineer. The attachment reflects the door transverse span bracing on 20-inch centers required to certify the top door for an 8,600-pound vehicle load. His evaluation presumes the unit will be installed in the following manner:

1. Excavation will be into compacted soil with concrete properly placed (vibrated) beneath the unit and up the sides. Shelter size and the table below will determine the minimum amount of concrete used for proper installation, with prescribed concrete requirement to ensure the shelter will not float:

Shelter Size	Composite (36" Wide)	Medium (36" Wide)	Large (42" Wide)	X-Large (48" Wide)
Concrete Requirement	2.25 yd ³	1.5 yds ³	2.0 yds ³	2.25 yds ³

2. Angle iron reinforcement will be placed on the shelters exterior such that when concrete filling the void around the unit is poured, the angle iron reinforcement will be enclosed in concrete.
3. Installation is performed at residential properties or single story commercial facilities.

Please note that installation of these units near structural walls other than standard footings shall be individually evaluated prior to installation.

The information contained within this analysis is provided in good faith, and reasonable effort was made to ensure that it is accurate. However, this analysis relies upon information, reports, data, observations, installation, and analysis not generated or verified by the undersigned engineer.

Accordingly, this information is provided "as is" without warranty of any kind. The undersigned engineer excludes all warranties, either expressed or implied. In no event shall the undersigned engineer, nor engineering firm, be liable for any damages arising, directly or indirectly, from the use of the information contained herein including damages arising from inaccuracies, omissions or errors.

Any person relying on any of the information contained within this analysis or making any use of the information contained herein, shall do so at their own risk. The undersigned hereby disclaims any liability and shall not be held liable for any damages including, without limitation, direct, indirect or consequential damages.

By: Sequoyah Engineering, Inc.
CA #2393

Jon Blickenstaff, P.E., OK11887

INNOVATIVE SOLUTIONS FOR TOUGH PROBLEMS

O. J. C. CO.
 CONSULTING ENGINEERS
 PHONE: (918) 747-0891

SUBJECT: Storm Shelter

PROJ.NO. 24261 CLIENT: Sequoyah Eng.
 BY: OCC
 DATE: 11/08/06 SHEET NO. 1

Width	Depth	Length	Uplift	Conc.	Steel	TOTAL	FS	OK
Size 4.00	5.00	7.00	8,736.00 lbs	9,112.50	1,343	10,456	1.20	

Concrete around Sides
 Hor. Pressure
 w = 36.000 pcf

2.25 Cy
 At Base H = 450.00 Lbs M = 2,205.00 Lb-Ft
 At 20" H = 180.88 Lbs M = 886.31 Lb-Ft

LOAD ON TOP

HUMMER 2 =
 SUV 'S
 CARS

TOTAL WEIGHT = 8,600.00 LBS WL = 2,150.0 LBS
 TOTAL WEIGHT = 6,000.00 LBS WL = 1,500.0 LBS
 TOTAL WEIGHT = 4,000.00 LBS WL = 1,000.0 LBS

WHEEL LOAD

USE MAXIMUM WHEEL LOAD = 2,150 LBS OR UNIFORM LOAD = 100.00 PSF = 0.69 PSI
 TIRE AREA = 6" x 8" = 48.00 SqIn P = 45 psi

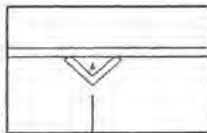
TOP OF SLIDING DOOR

t = 0.250 In
 b = 9.00 " WIDE STRIP L = 37.00 In

TOP PLATE ONLY Sx = b t² / 6 = 0.0938 In³ Fs = 24,000 psi E = 2.9.E+07 PSI
 ALLOWABLE LOAD = P = (Sx * Fs * 4) / L = 243 LBS NG
 W = (Sx * Fs * 8) / L² = 13 PSF NG

M = PL/4 = 19,887.5 In-Lb Sz = M/Fs = Req'd Sx = 0.83 In³
 M = WL² / 8 = 17,112.5 In-Lb Sx = M/Fs = Req'd Sx = 0.71 In³

TOP PLATE + ANGLES

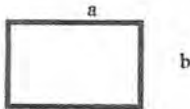
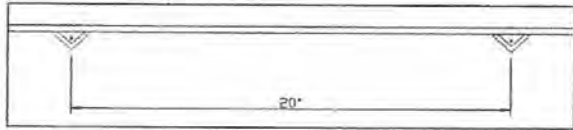


	NO.	SIZE	Ax	d	Ax*d	Ax*d ²	Io
PL	1	9.000 0.250	2.250	0.125	0.281	0.035	0.003
ANGLE	1.0	L's 1x1x0.25 =	0.438	0.562	0.246	0.138	0.037
TOTAL=			2.688		0.528	0.174	0.040
			d top =	0.196		-0.104	
			d bot =	0.851	TOTAL=	Ixx =	0.110
S = I/c =							
TOP Sx =			0.561		BOT Sx =	0.129	

ALLOWABLE LOAD = P = (Sx * Fs * 4) / L = 1,455 LBS NG TOP BOT 336 LBS NG
 W = (Sx * Fs * 8) / L² = 79 LBS NG 18 LBS NG
 DEFLECTION = PL³ / 48 EI = 0.71 In L/Dx = 52

CHECK DOOR AS SUPPORTED ON FOUR SIDES

CHECK TOP PLATE SUPPORTED ON FOUR SIDE



$a = 37.00$ $a/b = 1.85$
 $b = 20.00$ $\beta = 0.5792$
 $t = 0.25$ $\alpha = 0.1040$
 $\delta = 0.5000$

From: Formulas for Stress & Strain by Roark & Young
 pg.386

FOR UNIFORM LOAD OF = 0.69 PSI

$\text{Max } F_s = \beta * q * b^2 / t^2 = 2,574.00 \text{ PSI OK}$
 $\text{Max } Y_x = \alpha * q * b^4 / (E * t^3) = -0.03 \text{ IN OK}$
 $\text{Max } R = \delta * q * b = 6.94 \text{ LBS OK}$
 $L/Y_x = 1,451 \text{ OK}$

FOR UNIFORM LOAD OVER SMALL CIRCLE OF r_o' $W = 2,150.0 \text{ LBS}$ OR $W = 1,500.0 \text{ 1,000.0}$

$r_o = 12.00 \text{ In}$ $r_o' = (1.6r_o^2 + t^2)^{0.5} - 0.675t = 15.01 \text{ In}$
 If $r_o < 0.5 t$ & $r_o' = r_o$ if $r_o > 0.5 t$ $v = 0.30$ $\beta = 0.9348$
 $\alpha = 0.1779$

$\text{Max } F_s = 3W / 2 * \text{PI} * t^2 * [(1+v) * L_n(2b / \text{PI} * r_o) + \beta] = 16,618 \text{ PSI OK}$
 $\text{Max } Y_x = \alpha * W * b^4 / (E * t^3) = -0.34 \text{ In}$
 $L/Y_x = 110$

OK 11,594 7,729
 OK -0.24 -0.16
 OK 157 236
 OK OK

**TOP OF SLIDING DOOR IS GOOD FOR A VEHICLE OF 8,600 LBS
 OR A UNIFORM LOAD OF 100 PSF**
 Deflection is GOOD for a uniform Load of 100 psf.
 Deflections for a Wheel Load in the center might be excessive and cause
 some permanent damage for the heavier vehicles (over 4,000 Lbs).

Handwritten signature
 11/13/06

MCDONALD-MEHTA ENGINEERS
Specializing in Wind Engineering
Lubbock, Texas

James R. McDonald, Ph.D., P.E. (Retired)

Kishor C. Mehta, Ph.D., P.E.

December 8, 2006

Dr. Ernst Kiesling
NSSA
P.O. Box 41023
Lubbock, TX 79409

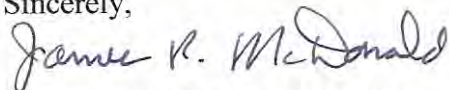
RE: Third-Party Evaluation of FlatSafe Tornado Shelters
Four Models

Dear Dr. Kiesling:

I have performed third-party evaluations of the four underground steel FlatSafe Tornado Shelter models produced by FlatSafe Tornado Shelters, Oklahoma City, OK. To the best of my knowledge, these shelter models are in compliance with the provisions of the NSSA Design Standard and FEMA 320. A copy of my evaluation report is enclosed.

If you have questions or need additional information, I will be pleased to discuss them with you or your representative.

Sincerely,



James R. McDonald, Ph.D., P.E.
Principal/Partner

Enclosure

Wind Science & Engineering Research Center

Box 41023
Lubbock, TX 79409-1023
Telephone (806) 742-3476
FAX (806) 742-3446
<http://www.wind.ttu.edu>

December 5, 2003

Mr. Cliff Vaughn
Jenco Construction
P.O. Box 60554
Oklahoma City, OK 73146

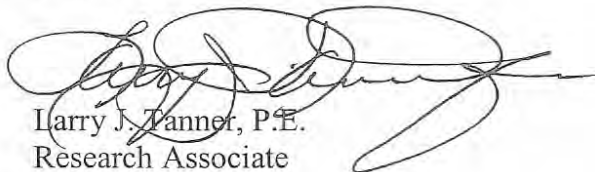
Re: Shelter Door Testing

Dear Mr. Vaughn:

On November 24, 2003, tests were conducted on your company's below ground shelter door assembly in the Debris Impact Facility at Texas Tech University. The steel below ground shelter door manufactured by A to Z Machining for Jenco Construction is capable of resisting the 15-lb. 2x4 missile traveling at 67 mph, as required by FEMA 320, "Taking Shelter from the Storm," for a missile dropped by a 250 mph ground speed tornado. Deflections on the cover and door assembly were less than 3-in. and all locks remained engaged and locked at the conclusion of the tests. This test approval is contingent upon the use of solid steel wheels instead of the roller bearing wheels.

Congratulations on your successful tests. The Wind Engineering Research Center at Texas Tech University applauds your company's efforts in providing a safe product for the consumer and looks forward to providing further testing services for your company.

Sincerely,



Larry J. Tanner, P.E.
Research Associate