

MISH ENGINEERING CONCEPTS, P.L.C.

September 23, 2009

MEC File No. 2570.02b

CLIENT: WATERSHED ARCHITECTS  
1520 West Main Street, Suite 102  
Richmond, VA 23220

RE: General Wind Load Structural Analysis – ReadyShelter 3 Bedroom Dwelling

CRITERIA: Wind Load: 140 MPH, Exposure C

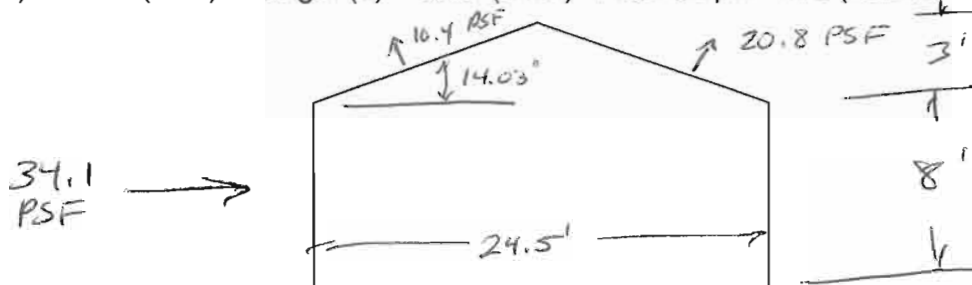
PLANS: Project 2436-3 ReadyShelter FEMA 1BR Unit, Revised 14 August 2008

APPLICABLE CODE: 2006 IBC & ASCE 7

WINDSPEED: 140MPH (3 Second Gust), EXPOSURE C

$$P=(0.00256)K_E K_D V^2= 0.00256(1.21)(.85)(1)(140)^2 = 51.6 \text{ Pounds per Square-Foot (psf)}$$

Width (W) = 24.5' (20.5)' Length (L) = 36.5' (24.5)' Roof Slope: 4:12 (25% or 14.03°)

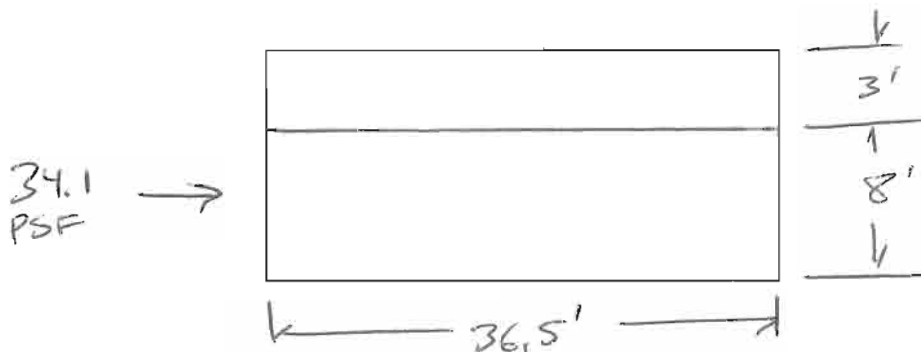


TRANSVERSE LOADING:

$$\text{Total Horizontal Shear} = (34.1\text{psf})(8')(36.5') + (7.74\text{psf}^*)(3')(36.5') = 10,805 \text{ lbs}$$

$$\text{Shear Load Applied to Each End Wall} = 10,805 \text{ lbs}/2 = \underline{5,402 \text{ lbs}}$$

\*- Denotes Average Pressure



LONGITUDINAL LOADING:

$$\text{Total Longitudinal Shear} = (34.1\text{psf})((8'+11')/2)(24.5') = 7,937 \text{ lbs}$$

$$\text{Shear Load Applied to Each Side Wall} = 7,937/2 = \underline{3,968 \text{ lbs}}$$

CHECK 2" WALL PANELS: (Per Provided Dura Building Systems Test Results)

Maximum Transverse Load to Panel: 35.1 psf allowable – Spans Horz to Wall Studs, 8' Tall Panel & Stud. (Note: 2-way Panels also span vertically to floor and Ceiling – no info provided).

Therefore: 35.1psf allowable > 34.1 psf applied wind pressure – OK

Lateral Load to studs = 34.1psf (4') = 136.4 lbs/ft

Studs Span 8' vertically so  $V_{max}$  (@ flr & roof connections) 136.4 lbs/ft (8')/2 = 545.6 lbs (Check)

Stud Moment: 545.6 lbs (4')/2 = 1091.2 ft-lbs. < 1497 ft-lbs stud capacity – OK (Verify)

Therefore  $M_{capacity} = 8'(35.1psf) = 281$  ft-lbs/ft

CHECK DIAGONAL STRAPS: (Worst Case – Front Elevation End Wall)

End Wall Shear Applied = 5,402 lbs

Shear Capacity of Each 4'-wide Panel = 1718 lbs ultimate, with 2:1 SF = 859 lbs.

End Wall Total Shear Capacity w/o Straps = (5 min intact panels)(859 lbs/panel) = 4295 lbs

Therefore 5,402 lbs – 4,295 lbs = 1107 lbs (Horz) remaining for one Diagonal Strap (In Tension)

@ ~45° Angle, Strap Tension ~  $((1107^2)(2))^{-2} = 1566$  lbs < 2256 lbs Strap Cap. - OK (VERIFY)

CHECK FOUNDATION PIERS:

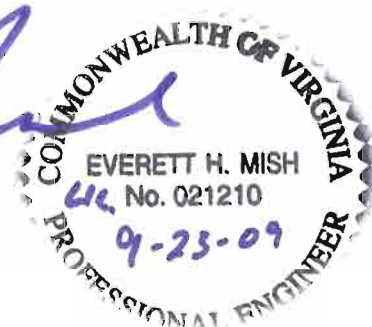
Maximum Uplift / Pier (Average) = 21.2psf x 36'x24' / 12 Piers = 1526 lbs/pier.

Rough Est. of Dead Loads = (36'x24'x10 lbs/ft)+(600 lbs/2'x2'x1'ftg & pier(12 piers)) = 15,840 lbs

Therefore: 15,840 lbs/12 piers = 1340 lbs/per < 1526 lbs uplift/pier. Not Acceptable – Will require additional anchorages tied to perimeter and center girder. (Figures do not include soil adhesion and backfill weight).

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cc: file