Pacific Energy Consulting

Hearts and Homes for Maui

Hawai‘i‘s New Innovative Housing Pilot Program

**Proprietary Information*

Our Mission

At Pacific Energy Consulting, OUR MISSION is to lead the way in sustainable, off-grid living by utilizing modern technology to create eco-friendly, affordable, and resilient homes in Hawai‘i. We believe in making a positive impact on individuals, communities, and the planet.

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Multiple Complex Problems

Maui fire victims need:

- Immediate, transitional, emergency housing.
- **Affordable building solutions**.
- Adequate insurance coverage or **financing** to rebuild.
- **Land** for displaced renters.

Our modular and off-grid solution can scale quickly to solve these problems.

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The Current West Maui Housing Crisis

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Over
2,200
properties
destroyed

Over
6,791
People Living in
Hotel Rooms

Over
$6.2 Billion
in Damages

Over
3,000 homes
needed

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THE SOLUTION

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What makes a Hearts Homes unique?

Affordability:

Time Efficiency:

Safety:

Self-Sustainability:

Expandability:

The process:

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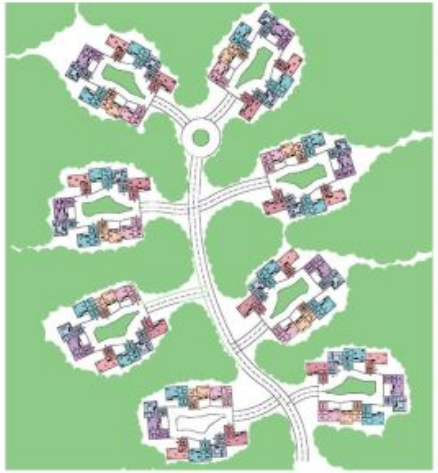

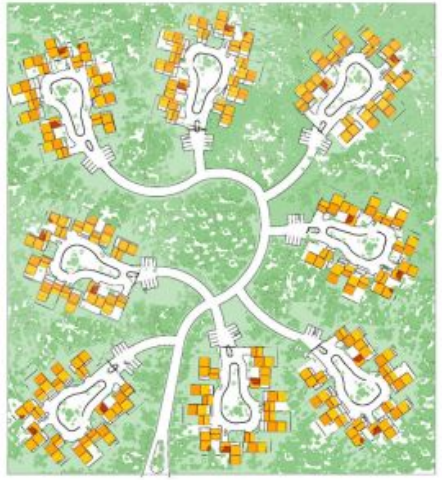

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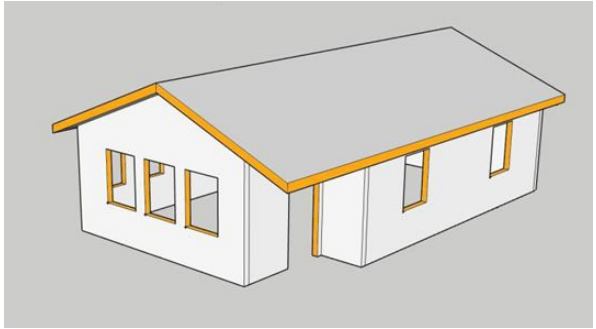
The Brittani 2



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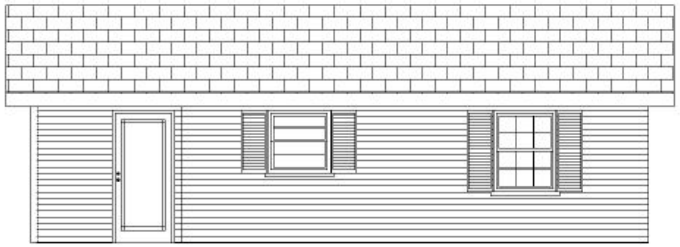
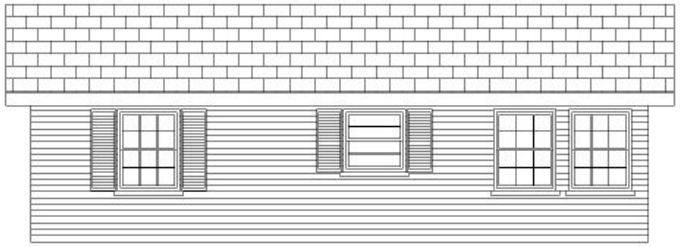


North Elevation

West Elevation



South Elevation

East Elevation

Brittani 2 Bedroom (Elevation)

FINISH DATE:	9/14/2022
REVISION:	
SCALE:	NTS

THERMASTEEL ADVANCED PANEL SYSTEM

SHEET

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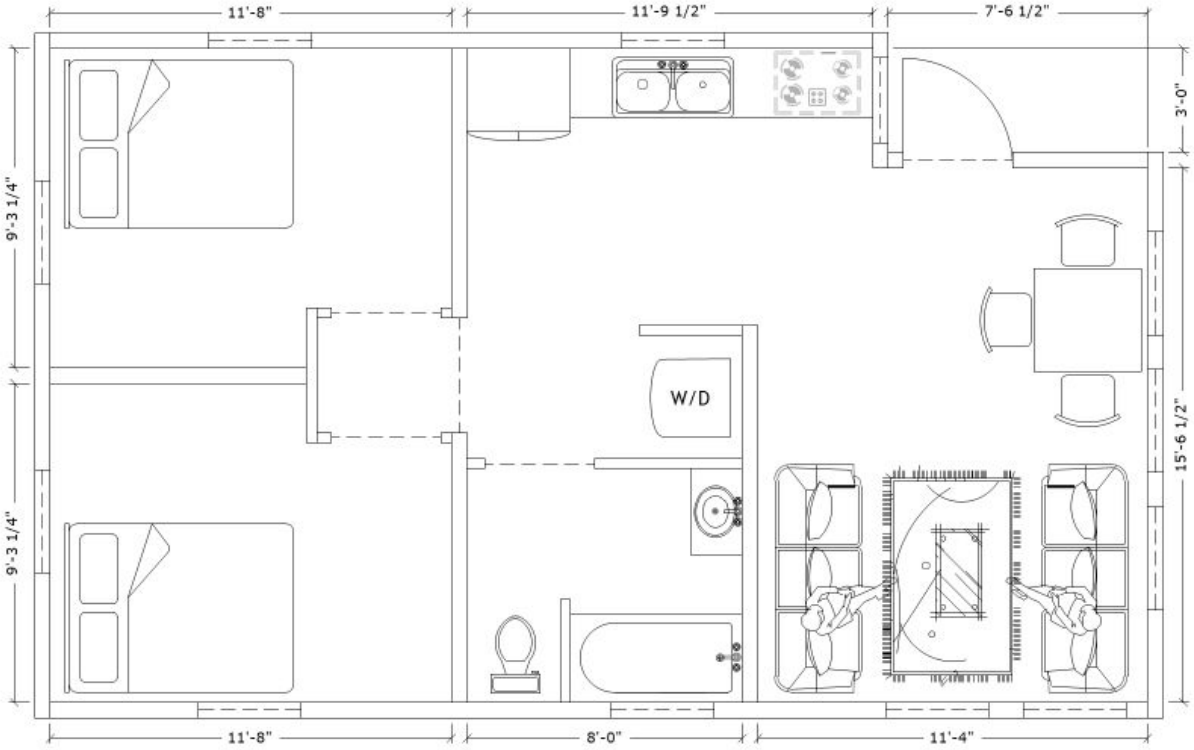

560 Sq Ft

Brittani 2 Bedroom (Floor Plan)

FINISH DATE: 9/14/2022
REVISION:
SCALE: NTS

THERMASTEEL ADVANCED PANEL SYSTEM

SHEET

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Turn-key utility. Stylish living.

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Design Concept: Turn Key Units and Interiors
Better living, long-term maintenance, cost-reduction

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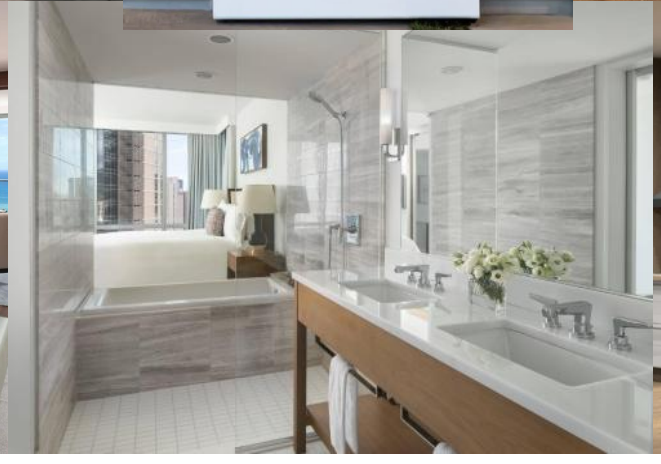
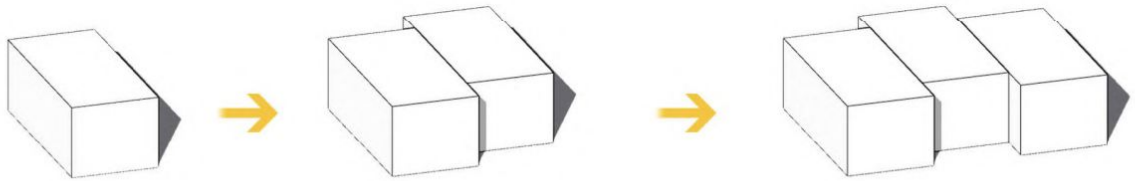


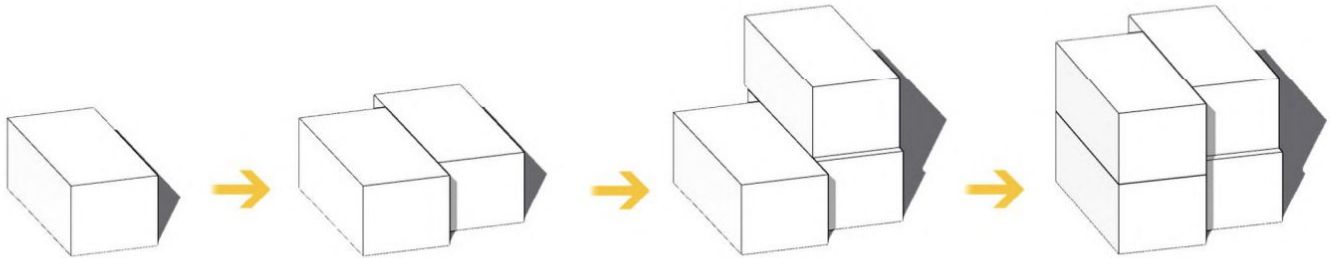
The ingenious expandable modular home

EXPANDABLE HOUSE A



BASE A | BASE + 1 | BASE + 2

EXPANDABLE HOUSE B



BASE B | BASE + 1 | BASE + 2 | BASE + 3

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The Hearts and Homes Living Design Portfolio

Design	Size (approx)	Bed/Bath	Price	Delivery	Furnished
KAHI				100 days	Yes
LUA				100 days	Yes
KOLU				100 days	Yes
KA'A				60 days	No
PU'UHONUA				60 days	Partial

Pricing may be subject to change based on actual order

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How to order your new Hearts Home

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Project Team - Hawaiian-Owned and Operated

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Clean Energy

Doug Carter
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DCS Design

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Paige Kapiolani Barber
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Hawaiian Housing Advocacy

Irish Barber
Director, Labor Relations and Operations

Peggy Liu
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Clinton Global Initiative
World Economic Forum

George Tsai, Ph.D
Business Ethics
Title App Technology
University of Hawaii

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Key Partners

TESLA

POWERWALL

TESLA HOME BATTERY

THERMASTEEL

ADVANCED PANEL SYSTEM

dcs DESIGN

DAVIS CARTER SCOTT™

UNIVERSITY OF HAWAI'I

MĀLAMALAMA

UA MAU KE EA O KA 'ĀINA I KA PONO

1907

™

crowdbotics

Nānākuli Housing Corporation

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FAQs

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TONGUE & GROOVE (T-G) PANELS

CSI Division: 07 00 00-THERMAL AND MOISTURE PROTECTION

CSI Sections: 07 40 00—RoofingPanels
07 42 00—Wall Panels

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 2018, 2015, and 2012 International Building Code® (IBC)
- 2018, 2015, and 2012 International Residential Code® (IRC)
- 2020 Florida Building Code, Building – Supplement attached
- 2020 Florida Building Code, Residential – Supplement attached

1.2 Evaluated in Accordance with:

- 2016/S1-18, 2012, and 2007 with Supplement 2 (2010) North American Specification for the Design of Cold-Formed Steel Structural Members (AISI)
- ASCE 7-2016 and 7-2010 Minimum Design Loads for Buildings and Other Structures

1.3 Properties assessed:

- Structural

2.0 PRODUCT USE

The Tongue and Groove (T-G) panels are insulated structural composites that are used to construct walls, floors, and roofs in Type V construction. When used in Types I through IV construction, documentation shall be submitted to the Building Official in accordance with Chapter 6 and Sections 718 and 2603 of the IBC as required for the specific project. Use in Types I through IV construction is outside the scope of this report. Walls may be either load-bearing or non-load bearing. This panelized system is available for both residential and commercial applications. The panels comply with IBC Section K107 as prefabricated construction. The panels are permitted where an engineering design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 PRODUCT DESCRIPTION

3.1 Product Information: T-G panels are manufactured with expanded polystyrene foam plastic insulation and light gauge galvanized steel to create an insulated lightweight structural composite panel. Evaluation the foam plastic is outside the scope of this report. The light gauge steel members (stiffeners) support loads and are flush with each face of the panel. The light gauge steel load-bearing stiffeners are separated and bonded to the Expanded Polystyrene (EPS) insulation that provides a thermal break between faces. Panels are manufactured by applying a thermosetting adhesive coating to the steel and then subjecting the framing members to low-pressure molding.

3.1.1 Framing: The framing members (stiffeners) are light-gauge galvanized steel embedded in both faces of the panel. Stiffeners are spaced at 16 inches (406 mm) or 24 inches (610 mm) on center. The light gauge material is roll-formed from Nos. 24, 20, 18, or 16 gauge steel sheets bent to shape for use in the panel, as shown in Figure 1 of this report.

3.1.2 Tracks: Panel ends are supplied with Nos. 18, 20, or 24 gauge galvanized or galvalume coated steel tracks.

3.1.3 Upper Header: In wall panels, the upper header is metal. The header width shall match the EPS core thickness.

3.1.4 Panel: The standard manufactured panel is 48 inches (1219 mm) wide. Standard panel lengths are 8 feet (2438 mm), 9 feet (2743 mm), 10 feet (3048 mm), or 12 feet (3658 mm). In addition, custom widths and lengths may be formed. Standard panel thicknesses are 3½ inches (89 mm), 5½ inches (140 mm), and 7½ inches (190 mm), as illustrated in Figure 1 of this report. The T-G fastening system provides for an opening for a wire chase between panels.

3.1.5 Connector/Shear Plate: Connector/shear plates are light gauge steel with a minimum thickness of No. 20 gauge, as shown in Table 2 of this report. The plate area shall be no smaller than 3-inch-by-5- inch (76 mm-by-127 mm).

3.1.6 Self-tapping Screws: The screws shall be No.8 by ½-inch-long (12.7 mm), self-tapping, and produced from steel complying with AISI 1018 or equivalent. Steel hardness shall meet the Rockwell C44 minimum hardness value.

3.2 Material Information

3.2.1 Expanded Polystyrene (EPS): EPS panels shall be manufactured in accordance with ASTM C578. The flame-spread index and smoke density index shall be less than 25 and 450, respectively, at a minimum density of 1.3 pounds per cubic foot (20.8 kg/m^3). Evaluation of the EPS is outside

the scope of this report. EPS panel density varies with thickness, as summarized in Table 1 of this report.

TABLE 1—EPS Densities

Thickness		Density			
		Minimum		Nominal	
Inches	(mm)	Pcf [a]	(g/l) [b]	Pcf [a]	(g/l) [b]
3.5	89	1.25	20	1.50	24.0
5.5	140	0.9	14	1.0	16
7.5	190	0.9	14	1.0	16

[a]pounds per cubic foot [b]grams per liter

3.2.2 Panel Steel: All steel members shall be manufactured in accordance with ASTM A653 SS, Grade 37, and coated with ASTM A924 G60 galvanizing/galvalume. In this evaluation report, steel thickness refers to the minimum uncoated base-metal thickness. The design thickness is based on AISI uncoated values, as noted in Table 2 of this report.

TABLE 2—Light Gauge Metal Coil Thickness (inches)

Uncoated			Coated (Galvanized)		
Gauge	Minimum	Nominal	AISI Design	Abs min	Nominal
24	0.0209	0.0239	0.022	0.0236	0.0276
22	0.0269	0.0299	0.0283	0.0296	0.0336
20	0.0329	0.0359	0.0346	0.0356	0.0396
18	0.0428	0.0478	0.0451	0.0466	0.0516
16	0.0538	0.0598	0.0566	0.0575	0.0635

3.2.3 Thermosetting Adhesive: A Thermosetting neoprene/phenol adhesive is applied to steel stiffeners and tracks prior to molding the panel.

4.0 DESIGN AND INSTALLATION

4.1 Design

4.1.1 Design Loads: Design loads shall be determined in accordance with the applicable code and manufacturer's design manual. The design may be based on Allowable Stress Design (ASD) or Load Resistance Factor Design (LRFD). Both the allowable design load and the load causing failure are provided in load Tables 3 through 9 of this report. These two types of loadings are consistent with the IBC and are provided to give the designer a choice.

4.1.1.1 Wall Bearing Loads: Axial compressive Loads may act on a wall panel as a point load (lbs), or distributed load (lbs/ft). Table 3 of this report shows allowable (ASD) or capacity (LRFD) of a point load acting on two stiffeners or studs (one on each face) of a panel. If a point load is between stiffeners, the top plate shall be sized for the location of the load on the plate.

4.1.1.2 Transverse Loads: Panels may be used to support floor or roof loads. Tables 4 through 9 of this report provide uniformly distributed transverse allowable (ASD) and failure (LRFD) loads. Single span deflections for service live loads are also given.

4.1.1.3 Shear Racking Loads: Panels resist seismic and wind through shear. ASTM E72 shear racking tests were conducted on both single panel and double panel (96-inch) widths. Shear racking resistance values in Tables 10 to 14 of this report are based on no gravity loads. These tables account for wall failure (yielding, local buckling, or lateral buckling) of the studs at the leading edge (a strength criterion) and an IBC code racking limit (a service limit). Axial compressive strength (LRFD) or allowable load (ASD) at leading edge studs are provided in Table 16 of this report. The tables provide both LRFD and ASD provisions for checking the strength of the panel. The racking limit between floors is h/50 (0.02h) where h is the height between floors. These tables also provide an allowable racking shear and shear stiffness so the IBC code racking deformation limits may be met. Code-based gravity and (seismic or wind) load combinations shall be checked for the leading stud. This reaction shall meet Equations EQ-1 and EQ-2 in which the subscript "a" is allowable and "n" is nominal.

$$\text{ASD:}\quad R_c \le R_a \qquad \text{(EQ-1)}$$

$$\text{LRFD:}\quad \left(R_u = R_c\right) \le \phi R_n \qquad \text{(EQ-2)}$$

4.1.1.4 Load Interaction: If loading conditions result in a simultaneously applied axial and transverse load, the Equations EQ-3 or EQ-4 shall be used:

$$\text{ASD:}\quad \left(\frac{p}{p_a}\right)+\left(\frac{w}{w_a}\right) \le 1 \qquad \text{(EQ-3)}$$

$$\text{LRFD:}\quad \left(\frac{p_u}{\varphi p_n}\right)+\left(\frac{w_u}{\varphi w_n}\right) \le 1 \qquad \text{(EQ-4)}$$

The axial compressive loads may be either distributed or a point load; p is an axial load and w is a transverse load. The subscript "a" is allowable, "n" is nominal, and "u" is factored.

4.1.1.5 In-Plane Loads: Panels may be used to resist in-plane shear in all seismic design categories. Panels may be light-frame load-bearing or light-frame non-load bearing elements. The design coefficients and factors for seismic force resisting systems shall be as shown in Table 15 of this report.

4.1.2 Limitations of the Load Tables: Tabulated loads listed in the load tables may be used for shorter spans or shorter heights. Extrapolation of panel lengths is outside the scope of this report. The EPS minimum density for 3.5-inch-thick (88.9 mm) structural panels is 1.5 pcf (24 kg/m^3).

4.1.3 Scope: Other supporting elements typically used to brace against design loads such as siding, wood structural sheathing (OSB or Plywood), and gypsum board are outside the scope of this report.

4.2 Installation: Panels shall be installed in accordance with the items listed in this report, the manufacturer's installation instructions, and IBC Section 2603. Where conflicts occur, the more restrictive shall govern.

4.2.1 Panel to Panel Connection: T-G Panels shall be connected to each other by shear plate connectors. Each panel has a steel channel that runs full length along the edges of the outside and inside facings. The facings butt to the edge of the next panel. A minimum of four equally spaced connector/shear steel plates (maximum spacing of 2 feet-6 inches (762 mm)) shall be attached with three self-tapping screws to each framing member. The connector/shear plate shall be applied on both faces of the panels.

4.2.2 Corners: Corners are joined in accordance with the details shown in Figure 2 of this report.

4.2.3 Exterior and Interior Wall Panels: Each exterior and interior wall panel shall be attached to the top and bottom tracks with self-tapping screws. Three self-tapping screws shall be provided at inside and outside faces where track and stud (stiffener) intersect. If required, a second top track or wood top plate may be installed.

4.2.4 Roof and Floor Panels: Each roof and floor panel shall have an in-plane boundary element field-installed across the width of the top and bottom of the panel similar to the top and bottom tracks of exterior and interior wall panels.

4.2.5 Cladding Attachment

4.2.5.1 Exterior Walls: Exterior wall panels shall be protected with a water-resistive barrier in accordance with IBC Chapter 14. Exterior wall panels shall be protected with a code complying exterior wall covering. The exterior wall coverings shall be installed in accordance with applicable codes and the manufacturer's recommendations. Thermal barriers are required in accordance with Section 5.4 of this report.

4.2.5.2 Interior Walls: The interior wall panels shall be covered with an approved interior wall covering. Installation methods shall be approved by the building official and in accordance with the IBC or IRC. Thermal barriers are required in accordance with Section 5.4 of this report.

4.2.5.3 Roof: The roof covering, flashing, and underlayment, shall be installed in accordance with IBC Chapter 15 and approved by the building official. Thermal barriers are required in accordance with Section 5.6 of this report. Minimum roof slope shall be in accordance with IBC Chapter 15 or IRC Chapter 9. The roof shall provide for proper drainage.

4.2.5.4 Floor: Floor panels shall be covered with an approved floor covering. Installation methods shall be in accordance with the current IBC. Thermal barriers are required in accordance with Section 5.4 of this report.

5.0 LIMITATIONS

The Tongue & Groove (T-G) Panels described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 T-G "Manufactured Panel Building Systems" shall be identified and installed in accordance with this report, the manufacturer's instructions, the IBC or IRC, AISI S100, and ASCE 7. Where conflicts occur, the more restrictive shall govern.

5.2 When required, structural calculations shall be performed and submitted to the building official by the permit applicant for approval to size panels to carry the applied loads. Calculations shall also be performed to resist in-plane shear, panel connections, top and bottom plate connections, upper header size, lintel types and sizes for openings, anchors between walls and floor, and supporting structure. The plans, specifications, structural calculations, and other construction documents shall be prepared by a registered design professional when required by the statutes of the jurisdiction where the panels are used.

5.3 T-G Panels are recognized for use in Type V construction. When used in Types I through IV construction, documentation shall be submitted to the Building Official in accordance with Chapter 6 and Sections 718 and 2603 of the IBC as required for the specific project. Use in Types I through IV construction is outside the scope of this report.

5.4 Except as provided for in IBC 2018, 2015, 2012 Section 2603.4.1 and 2012 IBC Section 2603.10, 2009 IBC Section 2603.9 and IRC Sections R316.5 and R316.6, T-G Panels shall be separated from the interior of a building by a thermal barrier of minimum ½-inch (12.7 mm) thick gypsum wallboard or other approved material in accordance with IBC 2603.4. Thermal barrier exceptions in 2018, 2015, 2012 IBC Sections 2603.4.1.1 through 2603.4.1.14, 2009 IBC Sections 2603.4.1 through 2603.13, and IRC Sections R316.5 and R316.6, do not apply to foam plastic insulation used as an interior wall or ceiling finish in plenums.

5.5 Roof covering, flashing, and underlayment shall be in accordance with IBC Chapter 15 or IRC Chapter 9 and approved by the building official. The use with hot-asphalt or hot-coal roof coverings are outside the scope of this report.

5.6 T-G panels are manufactured with an expanded polystyrene core (EPS). The EPS core has a permeability rating sufficient to not require a vapor barrier.

5.7 In areas where the probability of termite infestation is very heavy in accordance with 2018, 2015, and 2009 IBC Figure 2603.8, 2012 IBC Figure 2603.9, and IRC Figure R301.2(6), installation is limited in accordance with 2018, 2015, 2009 IBC Section 2603.8, or 2012 IBC Section 2603.9.

5.8 Field-cutting of the panel and panel alteration are outside the scope of this report.

5.9 T-G Panels are fabricated at ThermaSteel Inc. facilities in Radford, Virginia, under a quality control program that complies with the minimum requirements for IAPMO UES Listee's Quality Assurance System.

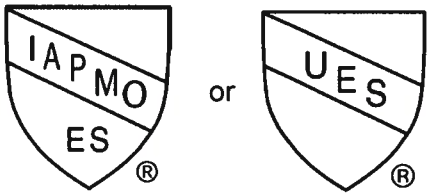
5.10 Foam plastic insulation used in the panels shall be listed in a product evaluation report showing compliance with requirements of IBC Chapter 26 from an approved and accredited certification agency or other nationally recognized certification program accepted by IAPMO Uniform Evaluation Services.

6.0 SUBSTANTIATING DATA

Test reports are from laboratories in compliance with ISO/IEC 17025. Test data was in accordance with the Standard Test Methods of Conducting Strength Tests of Panels for Building Construction, ASTM E72.

7.0 IDENTIFICATION

The T-G Panels are identified by a label that notes the manufacturer's name, product name, and the Uniform Evaluation Report number (ER-128). Either IAPMO UES Mark of Conformity may also be used as shown below:

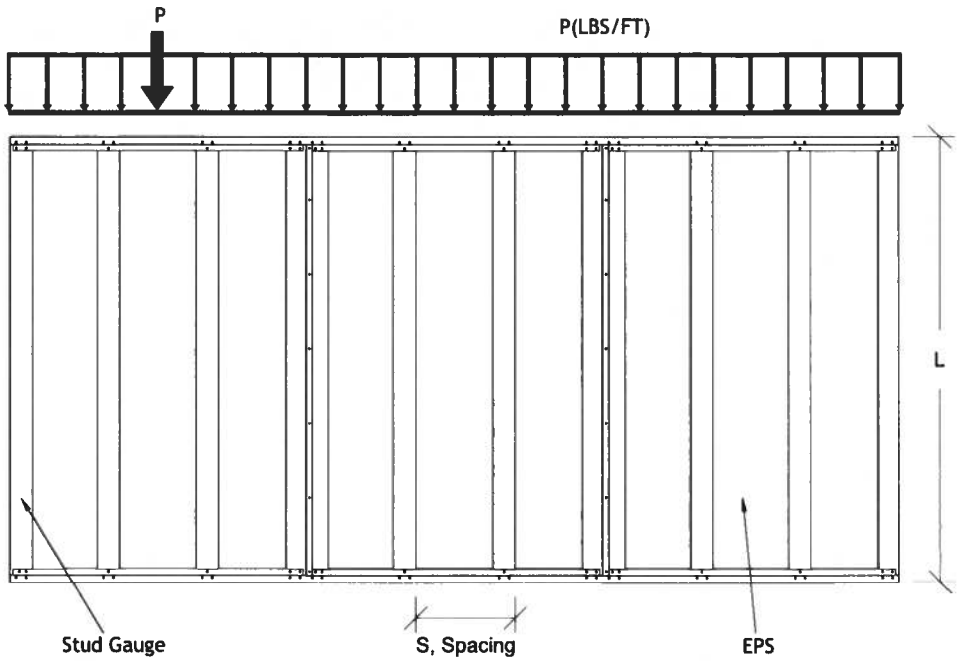


IAPMO UES ER-128

8.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research completed out by IAPMO Uniform Evaluation Service on ThermaSteel Inc. Tongue & Groove (T-G) Panels to assess conformance to the codes shown in Section 1.0 of this report and serves as documentation of the product certification. Products are manufactured at locations noted in Section 5.9 of this report under a quality control program with periodic inspection under the supervision of IAPMO UES.

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org



Elevation View: Wall Panel with a Point Load and/or Distributed Load

TABLE 3 - Concentrated Axial Design Load per 2 Stiffeners[1] (one on each face)

Length (ft)	Gauge	Strength, LRFD (ϕP_n)			Allowable, ASD (P_a)		
		3.5" (lbs)	5.5" (lbs)	7.5" (lbs)	3.5" (lbs)	5.5" (lbs)	7.5" (lbs)
8	24	2432	---	---	1,535	---	---
9	24	2432	---	---	1,535	---	---
10	24	2432	---	---	1,535	---	---
12	24	2432	---	---	1,535	---	---
8	20	4,612	5,004	6,210	2,882	3,127	3,881
9	20	4,612	5,004	6,210	2,882	3,127	3,881
10	20	4,612	5,004	6,210	2,882	3,127	3,881
12	20	4,612	5,004	6,210	2,882	3,127	3,881
8	18	9,682	9,977	11,233	6,051	6,236	7,020
9	18	9,209	9,977	11,143	5,756	6,236	6,965
10	18	8,708	9,977	11,019	5,442	6,236	6,887
12	18	7,649	9,938	10,735	4,781	6,211	6,709
8	16	13,568	13,583	14,059	8,480	8,489	8,787
9	16	12,907	13,324	13,918	8,067	8,327	8,699
10	16	12,207	13,040	13,761	7,629	8,150	8,601
12	16	10,727	12,406	13,406	6,704	7,754	8,379

[1]3.5-inch panels are made with 350S075-mils type studs at each face. 5.5-inch and 7.5-inch panes are made with 362S162-mils type studs at each face.

TABLE 4 - 3.5" Thick Panel; Stiffeners at 16" o.c.

Gauge	L (ft)	Axial Distributed Loads (plf)[a]		1.5 pcf (EPS): Transverse Loads (psf)[b]				
		Strength	Service	Strength	Service loads			
		LRFD (φp_n)	ASD (p_a)	LRFD (φw_n)	ASD (w_a)	L/180	L/240	L/360
24	8	2,432	1,520	56	35	47	35	24
24	9	2,432	1,520	45	28	45	34	23
24	10	2,432	1,520	36	23	34	25	17
24	12	2,432	1,520	25	16	20	15	10
20	8	4,612	2,882	56	35	89	67	44
20	9	4,612	2,882	50	31	66	49	33
20	10	4,612	2,882	45	28	50	37	25
20	12	4,612	2,882	36	22	30	23	15
18	8	9,729	6,081	56	35	107	80	54
18	9	9,729	6,081	50	31	80	49	33
18	10	9,729	6,081	45	28	61	46	30
18	12	8,630	5,394	37	23	37	28	19
16	8	13,568	8,480	56	35	125	93	62
16	9	12,907	8,067	50	31	94	70	47
16	10	12,207	7,629	45	28	72	54	36
16	12	10,727	6,704	37	23	45	34	22

TABLE 5 - 3.5" Thick Panel; Stiffeners at 24" o.c.

Gauge	L (ft)	Axial Distributed Loads (plf)[a]		1.5 pcf (EPS): Transverse Loads (psf)[b]				
		Strength	Service	Strength	Service loads			
		LRFD (φp_n)	ASD (p_a)	LRFD (φw_n)	ASD (w_a)	L/180	L/240	L/360
24	8	1,841	1,151	43	27	44	33	22
24	9	1,841	1,151	34	21	31	24	16
24	10	1,841	1,151	27	17	23	17	12
24	12	1,841	1,151	19	12	14	10	7
20	8	3,459	2,162	56	35	64	48	32
20	9	3,459	2,162	48	30	47	35	23
20	10	3,459	2,162	39	24	35	26	17
20	12	3,459	2,162	27	17	21	16	10
18	8	7,297	4,560	56	35	79	59	39
18	9	7,297	4,560	50	31	58	35	23
18	10	7,297	4,560	45	28	43	33	22
18	12	6,472	4,045	35	22	26	20	13
16	8	10,176	6,360	56	35	93	70	46
16	9	9,680	6,050	50	31	69	51	34
16	10	9,155	5,722	45	28	52	39	26
16	12	8,045	5,028	37	23	32	24	16

Loadings comply with 2007 with S2 (2010), 2012 and 2016 AISI S100; IBC 2009, 2012, 2015 and 2018; and IRC 2009, 2012, 2015 and 2018.

LRFD: Capacity factor, ϕ=0.8 (axial & flexure); ϕ=0.5 (shear); ASD: Factor of safety = 2.0

(a) Values account for yielding, local buckling, and lateral buckling.

(b) Values account for yielding, local buckling, and lateral torsional buckling.

TABLE 6 - 5.5" Thick Panel; Stiffeners at 16" o.c.

Gauge	L (ft)	Axial Distributed Loads (plf)[a]		1 pcf (EPS): Transverse Loads (psf)[b]				
		Strength	Service	Strength	Service loads			
		LRFD (φp_n)	ASD (p_a)	LRFD (φw_n)	ASD (w_a)	L/180	L/240	L/360
20	8	5,000	3,125	88	55	94	70	47
20	9	5,000	3,125	78	49	77	58	39
20	10	5,000	3,125	70	44	64	48	32
20	12	5,000	3,125	59	37	45	34	22
18	8	9,977	6,236	88	55	101	76	51
18	9	9,977	6,236	78	49	84	58	39
18	10	9,977	6,236	70	44	71	53	35
18	12	9,938	6,211	59	37	51	38	25
16	8	13,583	8,489	88	55	107	80	53
16	9	13,324	8,327	78	49	90	67	45
16	10	13,040	8,150	70	44	76	57	38
16	12	12,406	7,754	59	37	56	42	28

TABLE 7 - 5.5" Thick Panel; Stiffeners at 24" o.c.

Gauge	L (ft)	Axial Distributed Loads (plf)[a]		1 pcf (EPS): Transverse Loads (psf)[b]				
		Strength	Service	Strength	Service loads			
		LRFD (φp_n)	ASD (p_a)	LRFD (φw_n)	ASD (w_a)	L/180	L/240	L/360
20	8	3,750	2,344	88	55	81	61	41
20	9	3,750	2,344	78	49	65	49	33
20	10	3,750	2,344	70	44	53	40	26
20	12	3,750	2,344	59	37	36	27	18
18	8	7,483	4,677	88	55	90	67	45
18	9	7,483	4,677	78	49	73	49	33
18	10	7,483	4,677	70	44	60	45	30
18	12	7,453	4,658	59	37	42	31	21
16	8	10,187	6,367	88	55	96	72	48
16	9	9,993	6,246	78	49	79	59	40
16	10	9,780	6,113	70	44	66	49	33
16	12	9,305	5,816	59	37	47	35	23

Loadings comply with 2001, 2007 with S2 (2010), 2012, and 2016 AISI S100; IBC 2009, 2012, 2015, and 2018; and IRC 2009, 2012, 2015, and 2018.

LRFD: Capacity factor, ϕ=0.8 (axial & flexure); ϕ=0.5 (shear); ASD: Factor of safety = 2.0

(a) Values account for yielding, local buckling, and lateral buckling.

(b) Values account for yielding, local buckling, and lateral torsional buckling.

TABLE 8 - 7.5" Thick Panel; Stiffeners at 16" o.c.

Gauge	L (ft)	Axial Distributed Loads (plf)[a]		1 pcf (EPS): Transverse Loads (psf)[b]				
		Strength	Service	Strength	Service Loads			
		LRFD (φp_n)	ASD (p_a)	LRFD (φw_n)	ASD (w_a)	L/180	L/240	L/360
20	8	6,205	3,878	120	75	70	52	35
20	9	6,205	3,878	107	67	60	45	30
20	10	6,205	3,878	96	60	52	39	26
20	12	6,205	3,878	80	50	40	30	20
18	8	11,233	7,020	120	75	72	54	36
18	9	11,143	6,965	107	67	62	45	30
18	10	11,019	6,887	96	60	55	41	27
18	12	10,735	6,709	80	50	43	32	21
16	8	14,059	8,787	120	75	73	55	37
16	9	13,917	8,698	107	67	64	48	32
16	10	13,761	8,601	96	60	56	42	28
16	12	13,405	8,378	80	50	44	33	22

TABLE 9 - 7.5" Thick Panel; Stiffeners at 24" o.c.

Gauge	L (ft)	Axial Distributed Loads (plf)[a]		1 pcf (EPS): Transverse Loads (psf)[b]				
		Strength	Service	Strength	Stress	Service Deflection		
		LRFD (φp_n)	ASD (p_a)	LRFD (φw_n)	ASD (w_a)	L/180	L/240	L/360
20	8	4,654	2,909	120	75	66	49	33
20	9	4,654	2,909	107	67	56	42	28
20	10	4,654	2,909	96	60	48	36	24
20	12	4,654	2,909	80	50	36	27	18
18	8	8,424	5,265	120	75	69	51	34
18	9	8,358	5,223	107	67	59	42	28
18	10	8,264	5,165	96	60	51	38	25
18	12	8,051	5,032	80	50	39	29	19
16	8	10,544	6,590	120	75	71	53	35
16	9	10,438	6,524	107	67	61	46	30
16	10	10,321	6,450	96	60	53	40	27
16	12	10,054	6,284	80	50	41	31	21

Loadings comply with 2007 with S2 (2010), 2012, and 2016 AISI S100; IBC 2009, 2012, 2015 and 2018; and IRC 2009, 2012, 2015 and 2018.

LRFD: Capacity factor, ϕ=0.8 (axial & flexure); ϕ=0.5 (shear); ASD: Factor of safety = 2.0

(a) Values account for yielding, local buckling, and lateral buckling.

(b) Values account for yielding, local buckling, and lateral torsional buckling.

TABLE 10 - 3.5" (1.5 pcf) Thick Panel (Shear Racking with No Gravity Loads)

Stiffners Gage	EPS Density (pcf)	h (ft)	Stud Spacing @ 16" o.c.				Stud Spacing @ 24" o.c.			
			Limiting Shear Force		Displ: $\Delta r \leq 0.02h$		Limiting Shear Force		Displ: $\Delta r \leq 0.02h$	
			LRFD:(φv_n) (plf)	ASD:(v_a) (plf)	Force v_d (plf)	Stiffness k(plf/in)	LRFD:(φv_n) (plf)	ASD:(v_a) (plf)	Force v_d (plf)	Stiffness k(plf/in)
24	1.5	8	327	204	327	170.5	314	196	327	170.5
24	1.5	9	301	188	325	150.7	280	175	325	150.7
24	1.5	10	259	162	324	134.9	252	158	323	134.9
24	1.5	12	215	134	323	112.3	212	132	320	112.3
20	1.5	8	593	370	329	171.2	585	365	328	171.2
20	1.5	9	527	329	327	151.4	521	325	327	151.4
20	1.5	10	478	299	326	135.8	470	294	325	135.8
20	1.5	12	402	251	324	112.3	393	246	323	112.3
18	1.5	8	1,239	774	329	171.5	1,225	765	329	171.5
18	1.5	9	1,092	682	328	151.8	1,037	648	327	151.8
18	1.5	10	897	561	327	136.2	1,184	740	326	136.2
18	1.5	12	662	413	325	112.8	650	406	324	112.8
16	1.5	8	1,731	1,082	330	171.8	1,671	1,044	339	171.8
16	1.5	9	1,466	916	328	152.1	1,451	907	328	152.1
16	1.5	10	1,252	783	328	136.5	1,237	773	327	136.5
16	1.5	12	923	577	326	113.1	909	568	325	113.1

TABLE 11 - 5.5" (1.5pcf) Thick Panel (Shear Racking with No Gravity Loads)

Stiffners Gage	EPS Density (pcf)	h (ft)	Stud Spacing @ 16" o.c.				Stud Spacing @ 24" o.c.			
			Limiting Shear Force		Displ: $\Delta r \leq 0.02h$		Limiting Shear Force		Displ: $\Delta r \leq 0.02h$	
			LRFD:(φv_n) (plf)	ASD:(v_a) (plf)	Force v_d (plf)	Stiffness k(plf/in)	LRFD:(φv_n) (plf)	ASD:(v_a) (plf)	Force v_d (plf)	Stiffness k(plf/in)
20	1.5	8	650	406	515	268.4	639	399	514	267.9
20	1.5	9	579	362	511	236.7	569	356	511	236.6
20	1.5	10	526	329	509	212.2	514	321	508	211.9
20	1.5	12	444	277	256	175.0	431	270	248	174.7
18	1.5	8	1,288	805	517	269.2	1,270	794	516	268.6
18	1.5	9	1,191	744	513	237.6	1,150	719	512	237.2
18	1.5	10	1,040	650	512	213.2	1,020	638	511	212.8
18	1.5	12	872	545	507	176.1	851	532	506	175.8
16	1.5	8	1,746	1,091	518	269.6	1,687	1,054	529	275.7
16	1.5	9	1,527	954	515	238.5	1,505	941	514	238.1
16	1.5	10	1,350	844	513	213.8	1,329	831	512	213.4
16	1.5	12	1081	675	509	176.9	1,059	662	508	176.6

TABLE 12 - 5.5" (1 pcf) Thick Panel (Shear Racking with No Gravity Loads)

Stiffners Gage	EPS Density (pcf)	h (ft)	Stud Spacing @ 16" o.c.				Stud Spacing @ 24" o.c.			
			Limiting Shear Force		Displ: Δr ≤ 0.02h		Limiting Shear Force		Displ: Δr ≤ 0.02h	
			LRFD:(ϕv_n)	ASD:(v_a)	Force	Stiffness	LRFD:(ϕv_n)	ASD:(v_a)	Force	Stiffness
			(plf)	(plf)	v_d (plf)	k(plf/in)	(plf)	(plf)	v_d (plf)	k(plf/in)
20	1	8	636	397	127	66.0	629	393	126	65.9
20	1	9	594	371	142	65.9	560	350	126	58.4
20	1	10	511	319	126	52.5	505	315	126	52.4
20	1	12	428	267	125	43.6	422	264	125	43.5
18	1	8	1,264	790	127	66.0	1,254	784	127	65.9
18	1	9	1,174	734	126	58.5	1,116	697	126	58.4
18	1	10	1,015	634	126	52.6	1,005	628	126	52.5
18	1	12	845	528	124	43.1	836	522	126	43.6
16	1	8	1,718	1,074	127	66.1	1,652	1,032	132	68.5
16	1	9	1,499	937	126	58.5	1,488	930	126	58.5
16	1	10	1,323	827	126	52.6	1,312	820	126	52.5
16	1	12	1052	658	126	43.7	1,042	651	126	43.6

TABLE 13 - 7.5" (1.5 pcf) Thick Panel (Shear Racking with No Gravity Loads)

Stiffners Gage	EPS Density (pcf)	h (ft)	Stud Spacing @ 16" o.c.				Stud Spacing @ 24" o.c.			
			Limiting Shear Force		Displ: Δr ≤ 0.02h		Limiting Shear Force		Displ: Δr ≤ 0.02h	
			LRFD:(ϕv_n)	ASD:(v_a)	Force	Stiffness	LRFD:(ϕv_n)	ASD:(v_a)	Force	Stiffness
			(plf)	(plf)	v_d (plf)	k(plf/in)	(plf)	(plf)	v_d (plf)	k(plf/in)
20	1.5	8	815	509	700	364.8	643	402	514	364.8
20	1.5	9	728	455	694	321.3	586	367	511	321.3
20	1.5	10	661	413	691	287.8	533	333	508	287.8
20	1.5	12	560	350	682	236.7	451	282	248	236.7
18	1.5	8	1,463	914	703	366.2	1,277	798	702	366.2
18	1.5	9	1,339	837	698	323.0	1,138	711	698	323.0
18	1.5	10	1,160	725	695	289.6	1,027	642	693	289.6
18	1.5	12	954	596	687	238.5	858	536	686	238.5
16	1.5	8	1,819	1,137	705	367.3	1,699	1,062	719	367.3
16	1.5	9	1,609	1,005	701	324.7	1,514	946	700	324.7
16	1.5	10	1,438	899	698	290.7	1,371	857	697	290.7
16	1.5	12	1,181	738	691	239.9	1,066	666	690	239.9

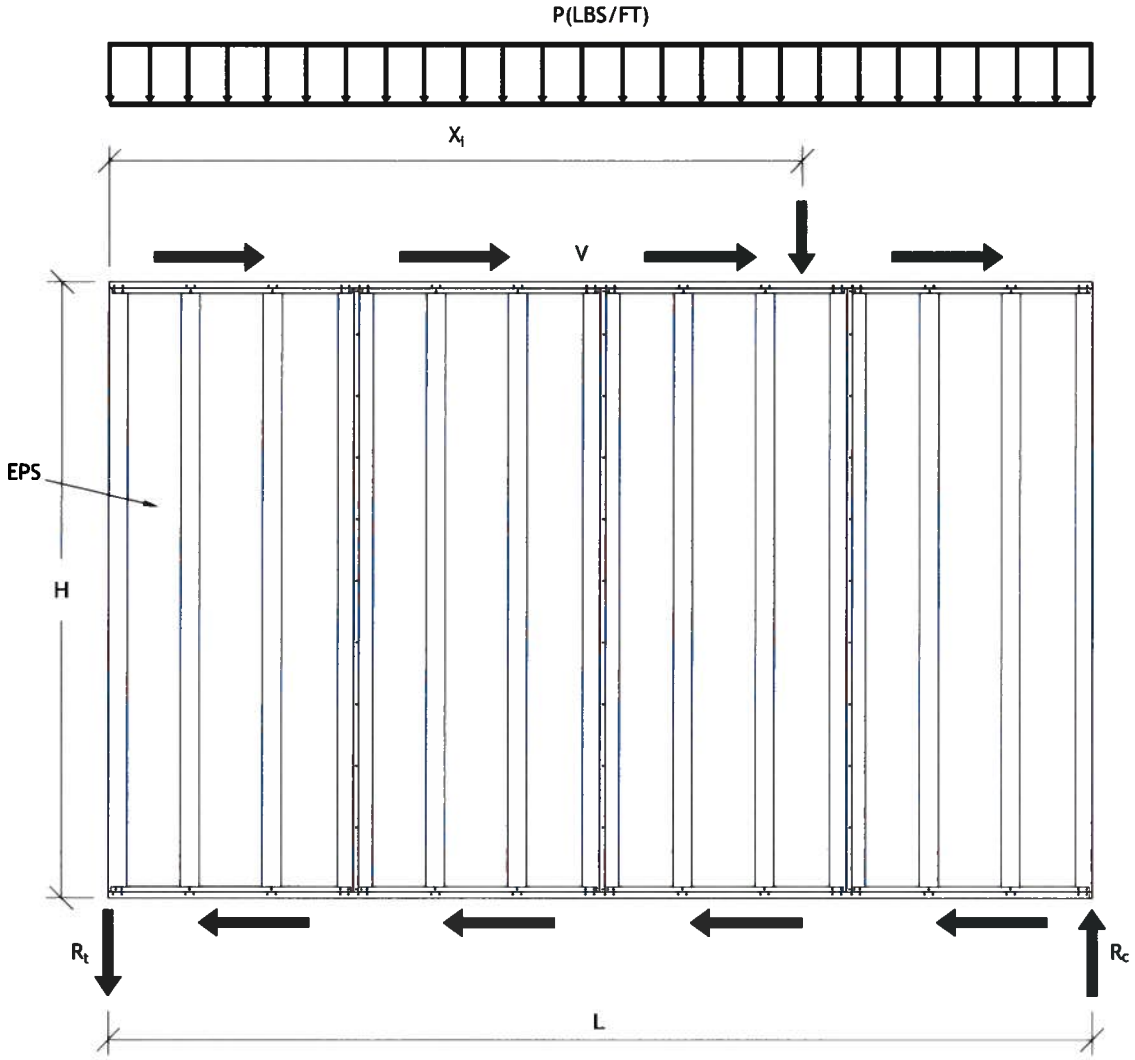
TABLE 14 - 7.5" (1 pcf) Thick Panel (Shear Racking with No Gravity Loads)

Stiffners Gage	EPS Density (pcf)	h (ft)	Stud Spacing @ 16" o.c.				Stud Spacing @ 24" o.c.			
			Limiting Shear Force		Displ: Δr ≤ 0.02h		Limiting Shear Force		Displ: Δr ≤ 0.02h	
			LRFD:(ϕv_n)	ASD:(v_a)	Force	Stiffness	LRFD:(ϕv_n)	ASD:(v_a)	Force	Stiffness
			(plf)	(plf)	v_d (plf)	k(plf/in)	(plf)	(plf)	v_d (plf)	k(plf/in)
20	1	8	791	495	173	89.9	783	489	172	89.7
20	1	9	701	438	172	79.6	697	435	172	79.5
20	1	10	636	398	172	71.5	628	393	171	71.4
20	1	12	534	334	171	59.3	525	328	171	59.2
18	1	8	1,427	892	173	90.0	1,414	884	172	90.0
18	1	9	1,313	821	172	79.7	1,248	780	172	79.7
18	1	10	1,124	703	172	71.6	1,112	695	172	71.6
18	1	12	954	596	171	59.4	905	566	171	59.4
16	1	8	1,781	1,113	173	90.1	1,715	1,072	179	90.1
16	1	9	1,570	981	172	79.8	1,557	973	172	79.8
16	1	10	1,400	875	172	71.7	1,386	866	172	71.7
16	1	12	1,141	713	171	59.5	1,128	705	171	59.5

TABLE 15 - Design Coefficients and Factors for Seismic Force Resisting Systems

System Type	R	Ω_0	C_d	Height Limitations (ft) by SDC*				
				B	C	D	E	F
Light-frame walls sheathed with wood structural panels rated for shear resistance or steel sheets	6.5	3	4	NL	NL	65	65	65
Light-frame wall systems using flat strap bracing	4	2	3.5	NL	NL	65	65	65
Plain panels braced only by EPS	3	2	3	45	45	45	NP	NP

* NL denotes No Limit.
* NP denotes Not Permitted.



Metal studs @ 16" oc.

$$R_c = \left[\frac{pL}{2} + \sum_i \left\{\frac{x_i}{L}\right\} P_i\right]_{gravity} + \left[\frac{vh}{L}\right]_{racking}$$

TABLE 16 - Limiting Stud Force (Rc); see above							
Gage	Ht h (ft)	3.5 "		5.5 "		7.5 "	
		LRFD $ØR_n$ (kips)	ASD R_a (kips)	LRFD ØRn (kips)	ASD Ra (kips)	LRFD ØRn (kips)	ASD Ra (kips)
20	8	5.67	3.60	6.25	3.91	7.76	4.85
20	9	5.67	3.60	6.25	3.91	7.76	4.85
20	10	5.67	3.60	6.25	3.91	7.76	4.85
20	12	5.67	3.60	6.25	3.91	7.76	4.85
18	8	12.10	7.56	12.47	7.79	14.04	8.78
18	9	11.51	7.19	12.47	7.79	13.93	8.71
18	10	10.88	6.80	12.47	7.79	13.77	8.61
18	12	9.56	5.98	12.42	7.76	13.42	8.39
16	8	16.96	10.60	16.98	10.61	17.57	10.98
16	9	16.13	10.08	16.65	10.41	17.40	10.88
16	10	15.26	9.54	16.3	10.19	17.20	10.75
16	12	13.41	8.38	15.51	9.69	16.76	10.48

FIGURE 1 - Typical T-G Structural Insulated Composite Panels

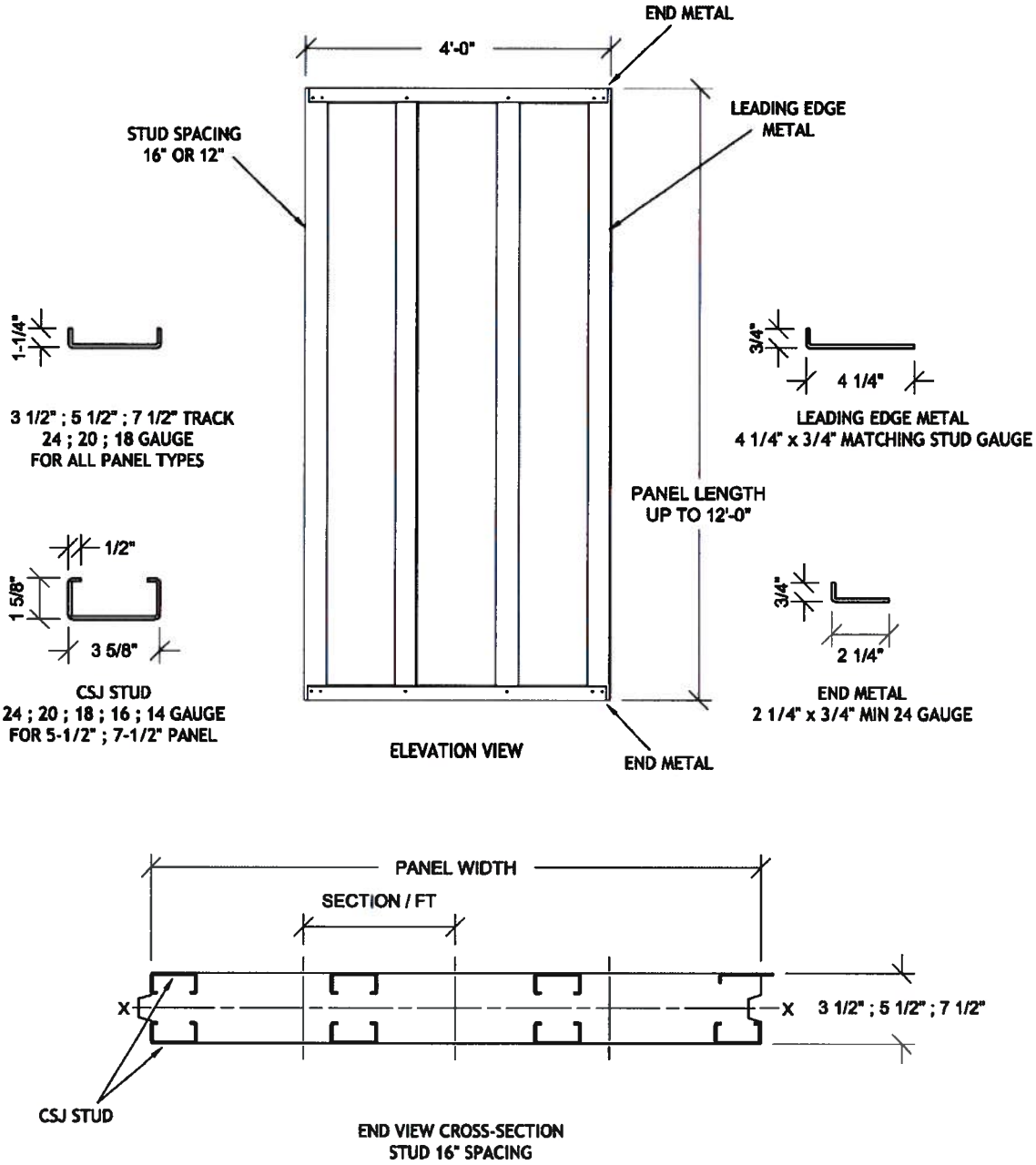
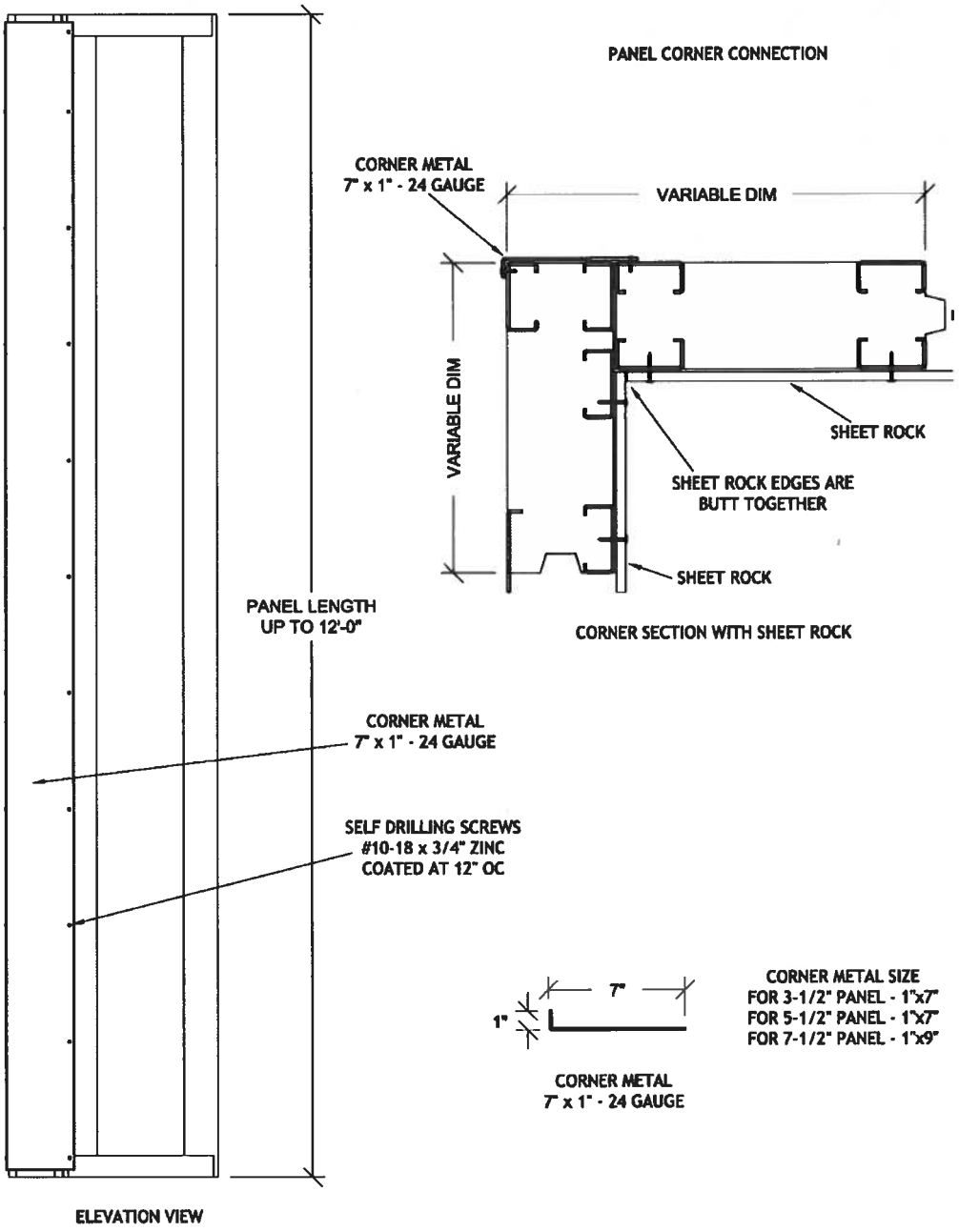


FIGURE 2 - T-G Wall Corner Detail and Gypsum Installation



FLORIDA SUPPLEMENT

THERMASTEEL INC.
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TONGUE & GROOVE (T-G) PANELS

CSI Division: 07 00 00-THERMAL AND MOISTURE PROTECTION

CSI Sections: 07 40 00—Roofing
07 42 00—Wall Panels

1.0 RECOGNITION

The ThermaSteel, Inc. Tongue and Groove (T-G) panels, as recognized in IAPMO UES ER-128, have been evaluated for compliance with the following code:

- 2020 Florida Building Code®—Building
- 2020 Florida Building Code®—Residential

2.0 LIMITATIONS

Tongue and Groove (T-G) panels recognized in IAPMO UES ER-128 are subject to the following limitations:

2.1 Design requirements shall be determined in accordance with the Florida Building Code®—Building.

2.2 Use and installation of Tongue and Groove (T-G) panels shall be in accordance with the 2018 International Building Code® or 2018 International Residential Code® provisions, as applicable, of IAPMO UES ER-128, unless otherwise noted in this supplement.

2.3 Evaluation for compliance with the High Velocity Hurricane Zone provisions of the Florida Building Code®—Building and the Florida Building Code®—Residential of Tongue and Groove (T-G) panels is outside the scope of this supplement.

2.4 Verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission (or the building official when the report holder does not possess an approval by the Commission), to provide oversight and determine that the products are being manufactured as described in this evaluation report to establish continual product performance shall be provided for products falling under Section (5)(d) of Florida Rule 61G20-3.009.

2.5 This supplement expires concurrently with ER-128.

THERMASTEEL™
ADVANCED PANEL SYSTEMS

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MATERIAL SAFETY DATA SHEET

PRODUCTION IDENTIFICATION

Manufacturer's Name: ThermaSteel Inc.

CAS Number: 9003-53-6
MSDS Code: 52586

Address: 609 West Rock Road
Radford, VA 24141

Telephone: 1-540-633-5000

Trade Name: ThermaSteel Inc. Panel *

Synonyms: None

II INGREDIENTS

COMPONENT NAME / CAS NUMBER	COMPONENT EXPOSURE LIMITS	UNITS
POLYSTYRENE / 9003-53-6	OSHA PEL ACGIH TLV	N/A
PENTANE / 109-66-0	OSHA PEL	2950 MG/M3
PENTANE / 109-66-0	ACGIH TLV	1800 MG/M3

STRUCTURAL STEEL / ASTM A-653 SS, Grade and coated with ASTM A924 G60 galvanizing/galvalume.

NOTE: Under Section 5 of the OSHA Hazardous Communication Standard (29CFR1910.1200) the ThermaSteel Inc. Panel is defined as an article which is formed to a specific shape or design during manufacture and is exempt.

BY: SAFETY OFFICER
THERMASTEEL Inc.

EFFECTIVE DATE: MAY 1986

DISCLAIMER OF WARRANTY:

III HEALTH EFFECT INFORMATION

EYE CONTACT	NOT EXPECTED TO PRESENT AN EYE CONTACT HAZARD UNDER ANTICIPATED CONDITIONS OF NORMAL USE
SKIN CONTACT	NOT EXPECTED TO PRESENT A SKIN CONTACT HAZARD UNDER ANTICIPATED CONDITIONS OF NORMAL USE
INHALATION	NOT EXPECTED TO PRESENT AN INHALATION CONTACT HAZARD UNDER ANTICIPATED CONDITIONS OF NORMAL USE
INGESTION	NOT EXPECTED TO PRESENT AN INGESTION CONTACT HAZARD ANTICIPATED CONDITIONS OF NORMAL USE
HEALTH DATA	NO ADDITIONAL MEDICAL INFORMATION FOUND

IV EMERGENCY & FIRST AID PROCEDURES

EYE CONTACT	RESIDUAL PENTANE CAUSE IRRITATION IF EYE CONTACT MADE WITH THIS MATERIAL. IMMEDIATELY RINSE WITH CLEAN WATER FOR 20-30 MINUTES. RETRACT EYELIDS OFTEN. OBTAIN EMERGENCY MEDICAL ATTENTION IF PAIN, BLINKING, TEARS OR REDNESS PERSIST.
SKIN CONTACT	NOT EXPECTED TO PRESENT A SKIN HAZARD UNDER ANTICIPATED CONDITIONS OF NORMAL USE
INHALATION	NOT EXPECTED TO PRESENT AN INHALATION HAZARD UNDER ANTICIPATED CONDITIONS OF NORMAL USE
INGESTION	NOT EXPECTED TO PRESENT AN INGESTIONS HAZARD UNDER ANTICIPATED CONDITIONS OF NORMAL USE

V PERSONAL HEALTH PROTECTION INFORMATION

EYE PROTECTION	NO EYE PROTECTION NECESSARY UNDER ANTICIPATED CONDITIONS OF NORMAL USE
SKIN PROTECTION	NO SKIN PROTECTION NECESSARY UNDER ANTICIPATED CONDITIONS OF NORMAL USE
RESPIRATORY PROTECTION	IF EXPOSURE EXCEEDS THE PEL/TLV, USE NIOSH/MSHA APPROVED RESPIRATORY PROTECTION EQUIPMENT
VENTILATION	BOTH LOCAL EXHAUST AND GOOD GENERAL ROOM VENTILATION MUST BE PROVIDED
OTHER	

VI FIRE PROTECTION INFORMATION

FLASH POINT NOT DETRMINED **TEST METHOD**

AUTOIGNITION TEMPERATURE 500° c **TEST METHOD**

FLAMMABLE LIMITS IN AIR% BY VOL. LOWER 1.5 UPPER 8.0

Based on Pentane

EXTINGUISHING MEDIA	DRY CHEMICAL	WATERSPRAY
	CO^2	FOAM
	WATER FOG	

SPECIAL FIRE FIGHTING PROCEDURES	DO NOT ENTER AREA WITHOUT PROTECTION. INCOMPLETE COMBUSTION MACHINE PRODUCE CARBON MONOXIDE AND CARBON DIOXIDE. PRODUCES DENSE BLACK SMOKE WHEN BURNING. OBSCURING VISION. FIREFIGHT FROM SAFE DISTANCE/PROTECTD AREA.
UNUSUAL FIRE AND EXPLOSIVE CONDITIONS	VERY FLAMMABLE. A RESIDUAL FLAMMABLE VAPOR MAY BE RELEASED DURING STORAGE, WHICH IS HEAVIER THAN AIR. WHEN MATERIAL IS HANDLED STATIC CHARGE MAY BE GENERATED WHICH CANNOT BE COMPLETELY DISSIPATED DUE TO INSULATING PROPERTY, CAUSING SPARK/IGNITION/EXPLOSION

VII REACTIVITY DATA

STABILITY (THERMAL LIGHT, ETC)	STABLE
CONDITIONS TO AVOID	HEAT, OPEN FLAME OXIDIZING CONDITIONS
HAZARDOUS POLYMERIZATION	NOT EXPECTED TO OCCUR
CONDITIONS TO AVOID	
INCOMPATIBILITY MATERIALS TO AVOID	STRONG OXIDIZING AGENT
HAZARDOUS DECOMPOSITION PRODUCTS	INCOMPLETE COMBUSTION MAY PRODUCE CARBON MONOXIDE A CARBON DIOXIDE

VIII ENVIRONMENTAL PRECAUTIONS

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	POLYSTYRENE IN NOT A RCRA REGULATED MATERIAL
WASTE DISPOSAL METHOD	LANDFILL SOLIDS AT PERMITTED SITES. COMPLY WITH FEDERAL/STATE/LOCAL SOLID WASTE REGULATIONS. SOLIDS MAY ALSO BE BURNED. RECOMMEND CRUSHING OR OTHER MEANS TO PREVENT UNAUTHORIZED REUSE.

IX MISCELLANEOUS

HANDLING AND STORAGE REQUIREMENTS	STORE IN WELL VENTILATED AREAS. KEEP CLEAR OF ALL IGNITTION SOURCES AS YOU WOULD FOR ANY OTHER COMBUSTIBLE MATERIAL
ADDITONAL INFORMATION	SOME OF THE INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FORM SOURCES OTHER THAN DIRECT TEST DATA ON THE PRODUCT ITSELF

THERMASTEEL™
ADVANCED PANEL SYSTEMS

X PHYSICAL PROPERTIES

BOILING POINT	N/A
MELTING POINT	UNDEFINED
APPEARANCE	WHITE OR COLORED
ODOR	ODORLESS
VAPOR PRESSURE	
PERCENT VOLATILE	N/L
VAPOR DENSITY (AIR-1)	N/A
SOLUBILITY	SOLUBLE IN HYDROCARBONS
EVAPORATION RATE (EE-1)	N/A
SPECIFIC GRAVITY	.94
MOLECULAR WEIGHT	VARIES

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Housing - Federal Housing Commissioner	STRUCTURAL ENGINEERING BULLETIN NO. 1072 Rev. 6 (Supersedes issue dated June 12, 2007)
TO: DIRECTORS, SINGLE FAMILY HOCs DIRECTORS, MULTIFAMILY HUBs	ISSUE DATE December 7, 2017
	REVIEW DATE December 7, 2020

SUBJECT: **1. Item Description** THERMASTRUCTURE®/WALLFRAME™ BUILDING SYSTEMS Steel Channel, Foam Core, Wall and Roof Panels

2. Name and address of Manufacturer

THERMASTEEL, Inc.
609 West Rock Road
Radford, VA 24141

This Structural Engineering Bulletin (SEB) should be filed with other SEBs and related Bulletins on materials or products as required by prescribed procedures.

1. General:

This Bulletin sets forth specific requirements under the Technical Suitability of Products Program for determining the eligibility of housing to be constructed under HUD mortgage insurance, or other HUD housing programs.

2. Scope:

This Bulletin applies only to the structural features of this method of construction. Final determination of eligibility is made by the appropriate HUD Field Office. Other factors considered by the Field Office will be valuation, location, architectural planning and appeal, mechanical equipment, thermal characteristics, and market acceptance. Consideration is also necessary to determine whether a specific property will qualify under the specific HUD program, when constructed according to the method outlined in this Bulletin, and where the structure is to be located.

In geographical areas subject to hurricanes, earthquakes, or other severe conditions affecting dwelling structures, the HUD Field Office shall require additional safeguards in proposed designs, when necessary.

3. Minimum Property Standards (MPS):

Compliance with HUD MPS will be determined by the HUD Field Office on the same basis as submissions involving conventional construction, except for the special features described in this Bulletin.

4. Inspection:

Field compliance inspections covering conventional items of construction and any special features covered in this Bulletin shall be made in accordance with prescribed procedures.

The appropriate HUD Field Office shall furnish a copy of a HUD field inspection report to Headquarters, Office of Manufactured Housing Programs, when there is:

a. Evidence of noncompliance with portions of the system of construction described in this Bulletin.

b. Faulty shop fabrication, including significant surface defects.

c. Damage to shop fabricated items or materials due to improper transportation, storage, handling, or assembly.

d. Unsatisfactory field workmanship or performance of the product or system.

e. Any significant degradation or deterioration of the product or evidence of lack of durability or performance.

Periodic plant inspections will be made by HUD Field Office or State Agency personnel in accordance with their prescribed procedures. Factory inspection reports shall be submitted to HUD Headquarters, upon request.

5. Certification:

The manufacturer named in this Bulletin shall furnish the builder with a written certification stating that the product has been manufactured in compliance with the HUD Minimum Property Standards (MPS), except as modified by this Bulletin. The builder shall endorse the certification with a statement that the product has been erected in compliance with HUD MPS, except as modified by this Bulletin, and that the manufacturer's certification does not relieve the builder, in any way, of the responsibility under the terms of the Builder's Warranty required by the National Housing Act, or under any provisions applicable to any other housing program. This certification shall be furnished to the HUD Field Office upon completion of the property.

OUTLINE DESCRIPTION, CATEGORY II CONSTRUCTION:

GENERAL:

Shop fabricated foam core with steel channel, load bearing wall and roof panels for one- and two-story dwellings are furnished in this method of construction.

Panels are transported to the building site where they are assembled with conventional construction, and may include various types of interior and exterior finish materials. All materials and methods of installation shall be in accordance with HUD Minimum Property Standards (MPS), Use of Materials Bulletin (UM), and Materials Releases (MR), except as may be specifically noted herein. Plumbing, heating and electrical systems are field installed.

This Bulletin is based on a structural review of RADVA Corporation's THERMASTRUCTURE® One-Story Three Bedroom with/Loft Model and Two-Story "Family Housing Construction", but may be considered applicable to all structurally similar units of this company. Foundation design and nonstructural items (such as architectural, plumbing, heating and electrical features) are not covered by this Bulletin.

SPECIFICATIONS:

Form HUD-92005, "Description of Materials" specifying only the structurally related items (Nos. 1 to 12, 14, 26 and 27), as originally submitted for technical suitability determination, describes the materials that shall be used in construction of housing units under this system of construction. Form HUD-92005, furnished with each application for use under HUD housing programs, shall include as a minimum the same structural materials.

DRAWINGS:

The following drawings by RADVA for the one story with loft model and drawings by Ed. Zublin A.G. for the two-story family housing construction shall be considered an integral part of this Bulletin:

Drawing No.	Date	Description
One-Story 3 BR w/Loft Model (RADVA Drawings)		
A-1	12/12/83	Floor Plan
A-2	12/12/83	Elevations
A-3	12/12/83	Sections, Details
A-4	12/12/83	Wall and Roof Panels Elevations and Schedules
A-5	04/18/88	Panel Details
Two-Story Family Housing Construction (Zublin Drawings)		
A-2	09/08/87 Rev.	Floor Plans 3BR JNCO
A-6	09/08/87 Rev.	Elevations 3BR JNCO
A-10	09/10/87 Rev.	Sections
A-17	09/08/87 Rev.	Typ. Party Wall Sections
A-18	09/08/87 Rev.	Typ. Wall Roof Sections
A-23	09/10/87 Rev.	General Details
S-2	09/08/87 Rev.	Framing Plans, Structural Details
S-6	09/08/87 Rev.	Ext. Wall Panels, Wall Bracing
S-7	09/07/87 Rev.	Wall Panel Types
S-8	09/08/87 Rev.	Structural Details

The Builder shall submit construction drawings to the HUD Homeownership Center with each application under HUD housing programs, which shall include the same or similar structural features as shown on the drawings listed above. Copies of these listed drawings shall also be furnished to the HUD Homeownership Center by the Builder upon request.

SPECIAL CONSTRUCTION FEATURES:

Wall and Roof Panels: Panels consist of a polystyrene foam (1.0 pcf density for 5½" panels, 1.5 pcf for 3½" panels) with embedded vertical steel channels on the interior and exterior faces of the core, combined in a low-pressure molding process into a load bearing panel. Horizontal steel shiplap strips on both sides, at the top and bottom of the panels are shop fastened onto the vertical channels. Sizes and details of the roof, standard wall panels, corner, door and window panels, headers, and interior partition panels are as shown on the reference drawings.

Steel strips shall be 24 ga., 37,000 psi minimum yield, Grade 37 in accordance with ASTM A 653-98. Protective coating shall be G-90 (galvanized) conforming to ASTM A 924-96. The steel strips are formed into channels or angles and are embedded or fastened to the panel during the manufacturing process. Sizes and locations of channels are shown on reference drawings. Horizontal strips may be added for securing accessories, fixture, etc.

The expanded polystyrene foam core is ARCO Polymers, Inc., M-77 or equal.

Wall panels are connected in the field by fastening together overlapping steel strips with No. 8 x 5/8" self-tapping metal screws @ 12" o.c. The panels are connected to a 2 x 4 wood sill plate and cap plates with 18 gage galvanized steel plates located at each vertical steel channel on each side of the panel.

Roof panels are connected to support beams by 6" galvanized steel spikes or screws, and galvanized clip angles. Spikes or screws go through the plywood roof sheathing and the metal channels of the roof panel, or the plywood sheathing is attached separately to the channels with screws.

DESIGN AND CONSTRUCTION REQUIREMENTS:

Design Loads: The construction for the One-Story 3BR, w/Loft Model described in this Bulletin is based on ASCE 7-88 maximum design loads of: 30 psf for snow, SeismicZone II and a Basic Wind Speed of 80 mph and Exposure C. The following allowable superimposed Load Table shall be used as a basis for structural designs submitted to the local HUD Office for the Two-Story Family Housing Construction and for housing units located in geographical areas where the above design loads are exceeded. Allowable loads include a safety factor of 2.5, except deflection loads are the lesser of the applied load at the allowable deflection or the maximum load divided by the 2.5 safety factor.

Allowable Superimposed Load Table

Roof Panels* :

Uniform Load	Span	Deflection / Span Ration (Short-term load test)
3 ½ " Roof Panels w/ [@ 16"o.c.:		
95 psf**	4'	L / 360**
95 psf**	4'	L / 240**
3 ½ " Roof Panels w/ [@ 24"o.c.:		
63 psf**	4'	L / 360
71 psf**	4'	L / 240**
5 ½ " Roof Panels w/ [@ 16"o.c.:		
53 psf**	6'	L / 360
63 psf**	6'	L / 240**
5 ½ " Roof Panels w/ [@ 24"o.c.:		
55 psf**	6'	L / 360**
55 psf**	6'	L / 240**

*Panels are 4' wide x 8' long for 4' spans, and 12' long for 6' spans (see wall panel table for L/240 at 8' span).

**Limited by failure load divided by 2.5 safety factor.

WALL PANELS* :

Panels*	Vert. Comp. Uniform (Axial) Load (plf)	Horiz. (Lateral) Uniform Load (psf) L/240	Racking Shear Load (plf)			Mid-Point Concent. Load (lbs)
				Deflection		
			**Max.	1/8"	L/480 (0.02")	
3 ½" w/ [@ 16" o.c	1,300 plf	27.9 psf	354	162	216	2,646 lbs.
3 ½" w/ [@ 24" o.c	1,033 plf	20.5 psf	248	107	144	2,646 lbs.
5 ½" w/ [@ 16" o.c	1,868 plf	42.3 psf	311		201	2,646 lbs.
5 ½" w/ [@ 24" o.c	1,067 plf	21.8 psf	243	63	100	2,942 lbs.
3 ½" Window, w/[Wood Surround	1,130 plf					2,667 lbs.
3 ½" Window, w/[Surround	800 plf					
3 ½" Door	1,130 plf					1,866 lbs.
3 ½" Corner	1,300 plf		320			5,200 lbs.
10 1/4" Party Wall	3,567 plf	44.3 psf	403	312	403**	6,400 lbs.

*Panels are 4' wide x 8' high. For other sizes refer to manufacturer's test data or compute by engineering formulas.

**Limited by failure load divided by 2.5 safety factor.

FIRE PROTECTION:

The polystyrene foam core shall have a flame spread rating of not more than 75, and a smoke development rating of not more than 450 when tested in accordance with ASTM E-84. All interior surfaces are covered with ½" thick gypsum wallboard or equivalent material with a 15-minute finish (fire) rating.

NOTE: Caution shall be exercised in the use of foam plastics. If foam plastics are allowed to remain exposed or unprotected, they may, under some circumstances produce rapid flame spread, quick flashover, intense heat, dense smoke, toxic and flammable gases and may present a serious fire hazard. The manufacturer of the foam plastic or the Society of the Plastic Industry, Inc., shall be consulted for instructions to minimize the risk in the use of these products in manufacture and in construction.

Roof Construction: Trussed rafters shall be designed and constructed in accordance with ANSI/TPI 1-1995 Standard (American National Standards Institute and Truss Plate Institute), "National Design Standard for Metal Plate Connected Wood Truss Construction."

MANUFACTURING PLANT:

Structural components covered under this Bulletin will be produced in the following plant:

THERMASTEEL, Inc.
609 West Rock Road
Radford, VA 24141
(540) 633-5000

The appropriate HUD Field Office or Homeownership Center in whose jurisdiction the manufacturing plant is located, or HUD designated representative will inspect this (these) plant(s) in accordance with prescribed procedures.

QUALITY CONTROL:

The appropriate HUD Field Office or Homeownership Center in whose jurisdiction the manufacturing plant is located, or the State Agency (in Category III States) shall review and approve plant fabrication procedures and quality control program, to ensure compliance with approved plans and specifications. In addition, the manufacturing process and the quality control program shall be periodically reviewed by a third-party inspection agency. The quality control program shall include field erection or supervision by THERMASTEEL, Inc.

RECORD OF PROPERTIES:

The manufacturer shall provide a list of the first ten properties in which the component or system described in this Bulletin is used. The list shall include the complete address, or description of location, and approximate date of installation or erection. Failure of the manufacturer to provide HUD with the above information may result in cancellation of this Bulletin.

NOTICE OF CHANGES:

The manufacturer shall inform HUD in advance of changes in production facilities, transportation, field erection procedures, design, or of materials used in this product. Further, the manufacturer must inform HUD of any revision to corporate structure, change of address or change in name or affiliation of the prime manufacturer. Failure of the manufacturer to notify HUD of any of the above changes may result in cancellation of this Bulletin.

EVALUATION:

This SEB shall be valid for a period of three years from the date of initial issuance or most recent renewal or revision, whichever is later. The holder of this SEB shall apply for a renewal or revision 90 days prior to the Review Date printed on this SEB. Submittals for renewal or revision shall be sent to:

U. S. Department of Housing and Urban Development
Office of Manufactured Housing Program
451 7th Street, SW, Room 9170
Washington, DC 20410-8000

Appropriate User Fee(s) for the TSP program can be submitted through the Pay.gov website at https://pay.gov/public/form/start/73881741

The holder of this SEB may apply for revision at any time prior to the Review Date. Minor revision may be in the form of a supplement to the SEB.

If the Department determines that a proposed renewal or supplement constitutes a revision, the appropriate User Fee for a revision will need to be submitted in accordance with Code of Federal Regulations 24 CFR 200.934, "User Fee System for the Technical Suitability of Products Program", and current User Fee Schedule.

CANCELLATION:

Failure to apply for a renewal or revision shall constitute a basis for cancellation of the SEB. HUD will notify the manufacturer that the SEB may be canceled when:

1. conditions under which the document was issued have changed so as to affect production of, or to compromise the integrity of the accepted material, product, or system,

2. the manufacturer has changed its organizational form without notifying HUD, or

3. the manufacturer has not complied with responsibilities it assumed as a condition of HUD's acceptance.

However, before cancellation, HUD will give the manufacturer a written notice of the specific reasons for cancellation, and the opportunity to present views on why the SEB should not be canceled. No refund of fees will be made on a canceled document.

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This Structural Engineering Bulletin is issued solely for the captioned firm, and is not transferable to any person or successor entity.

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HLU Committee

From: shaun kama <shaun.kama@pecgroupusa.com>
Sent: Thursday, November 9, 2023 10:18 AM
To: HLU Committee
Subject: Hearts and Homes (Healing hearts and building homes)
Attachments: Hearts and Homes Presentation Photos.pdf; evaluation-report-for-iapmo-2023.pdf; department-hud-bulletin.pdf; thermasteel-msds.pdf

Aloha,
Please let me know if this is suffice.

Shaun Kama-Member
Pacific Energy Consulting LLC
74 Kihapai st
Kailua HI 96734
808.979.4901
shaun.kama@pecgroupusa.com
www.pecgroupusa.com

Nehemiah 2:3-5

3 but I said to the king, “May the king live forever! Why should my face not look sad when the city where my ancestors are buried lies in ruins, and its gates have been destroyed by fire?”4 The king said to me, “What is it you want?”Then I prayed to the God of heaven, 5 and I answered the king, “If it pleases the king and if your servant has found favor in his sight, let him send me to the city in Judah where my ancestors are buried so that I can rebuild it.”