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EVALUATION SUBJECT:
TONGUE & GROOVE (T-G)

REPORT: USER
ThermaSteel Inc.
609 West Rock Road, Radford, Virginia 24141

CSI Division: 07-THERMAL AND MOISTURE PROTECTION
CSI Section: 07410—Roof panels and Wall Panels

SCOPE OF EVALUATION
1.1 Compliance to the following codes & regulations:
2018, 2015, 2012, 2009, & 2006 International Building Code® (IBC)
2018, 2015, 2012, 2009 & 2006 International Residential Code® (IRC)
2015 National Building Code of Canada (NBC)

1.2 Evaluated in Accordance with:
2017, 2015, 2012, 2007 & 2001 North American Specification for the Design of Cold-Formed Steel Structural Members (AISI)
CSA Group, S136-16, North American Specification for the Design of Cold-Formed Steel Structural Members
ASCE 7-2016, ASCE 7-2010 & 7-2005 Minimum Design Loads for Buildings and Other Structures

1.3 Properties assessed:
Structural

2.0 PRODUCT USE
Tongue and Groove (T-G) light gage steel insulated composite panels, that are used to construct foundation walls, basement walls, retaining walls above grade exterior and interior walls, floors, roofs and ceilings for Type II-V construction (commercial and residential). Walls may be either load bearing or non-load bearing. This panelized system has been tested and engineered and is available for both residential and commercial applications in Canada, Mexico and the United States. The panels comply with IBC Section K107 as prefabricated construction. Panels also comply with Section R301.1.3 of the current International Residential Building Code, IRC), the International Building Code (IBC) and the Canadian National Building Code (NBC).

3.0 PRODUCT DESCRIPTION
3.1 Product information: (T-G) panels are manufactured with expanded polystyrene foam plastic insulation and light gauge galvanized / Galvalume (G60 or G90) steel to create an insulated lightweight structural composite panel. (T-G) panels are a manufactured assembly that has a flame spread index of not more than 75 and a smoke-developed index of not more than 450 in accordance with ASTM E84. In accordance with Section 2603.3 of the IBC.

3.1.1 Framing: The panel may be used as a wall or a beam / floor / roof, depending on the direction of the loads. Studs are on the long side of the panel (CSJ). The panel is made of two separate steel frames - one on the exterior and one one the interior of the panel. The steel frames are molded together with EPS. The EPS provides a thermal break between the steel members, see Figures 1, 2, 3. The steel framing members are spaced at 12 inches (305 mm) or 16 inches (406 mm) on center. The light gauge material is roll formed from Nos. 24, 20, 18, 16, or 14 gauge steel sheets bent to shape for use in the panel. Panels are manufactured by applying a thermosetting adhesive coating to steel members and then subjecting framing members to low-pressure molding.

3.1.2 End Metal: Every panel top and bottom comes with Nos. 14, 16, 18, 20 or 24 gauge galvanized or galvalume coated steel L tracks that are ¾" x 2 ¼" and up to 2 ¼" x 10", see Figures 2.

3.1.3 Standard Panels: The standard manufactured panels are up to 48 inches (1219 mm) wide and up to 12-ft (3,658 mm) long The standard panel thicknesses are 3½ inches (89 mm), 5½ inches (140 mm) and 7½ inches (190 mm), see Figure 2. The (T-G) with the leading edge provides a fastening system between panels. Panels have openings for horizontal wire chases.

3.1.4 Customized Panels: Custom widths and lengths are availablein 1/8 inch increments. Standard panels are available in widths up to 4 ft, and lengths up to 12 ft. Panel thickeness comes in; 3.5; 5.5 and 7.5 with 1 or 1.5 nominal density. Longer lengths can be achieved by connecting multiple panels.

3.1.5 Connector/Shear Plate: Shear plates and connectors may be used to connect other structural elements to the panel. Standard plate area shall be no smaller than 3 inches by 5 inches (76 mm by 127 mm) and no less than 20 gauge.

3.1.6 Self-tapping Screws: Screws shall be No.10 self-tapping and produced from steel complying with AISI 1018 or equivalent.

3.2 Material information

3.2.1 Expanded Polystyrene (EPS): EPS panels shall be manufactured in accordance with ASTM C578. The flame-spread index shall be 25 or less and smoke developed index shall be 450 or less for all densities In accordance with Section 2603.5.4 of the IBC. EPS density varies according the design requirements see Table 1. Design values are provided in Table 2.

Table 1. EPS Panel density design values

Thickness		Density			
		Minimum		Maximum	
Inches	(mm)	Pcf [a]	(g/l) [b]	Pcf [a]	(g/l) [b]
3.5	89	1.25	20	1.55	24.8
5.5	140	0.9	14	1.5	24
7.5	190	0.9	14	1.5	24

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

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Table 2. EPS density Mechanical properties Design Values				
EPS Prop	Type I		Type II	
Density (pcf)	1	Avg.	1.5	Avg.
E (psi)	180-220	200	320-360	340
G (psi)	280-320	300	460-500	480

3.2.2 Panel Steel: All steel members shall be manufactured in accordance with ASTM A653 SS, Grade 33, and coated with ASTM A924 G60 galvanizing / galvalume (or G90 if required). Designs can be made available for higher strength steels such as ASTM A653 SS Grade 50/1. In this evaluation report steel thickness refers to minimum uncoated base-metal thickness. The design thickness is based on AISI uncoated values, as noted in Table 3 of this report.

Table 3. 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
14	0.0677	0.0747	0.0713	0.0705	0.0785

3.2.3 Thermosetting Adhesive: A Thermosetting neoprene / phenol adhesive is applied to steel memebers 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. Design may be based on Allowable Stress Design (ASD), Limit State Design (LSD), or Load Resistance Factor Design (LRFD). The design resistance factors for seismic are provided in Table 4. Both allowable design load and load causing failure are provided in Tables 5 through 13 of this report. These two types of loadings are consistent with IBC and the CBC requirements, and these options are provided to give the designer the tools to meet the appropriate building code.

4.1.1.1 Axial Compression: Compressive axial load Tables are based on the ASTM E72 standard in which load is applied at 1/3 the panel thickness (t) when measured from the face of the panel. This is an eccentricity (e= t/6); that is load is measured from the panel centerline. If the panel is subjected to an axial compressive load with zero eccentricity, the allowable or the ultimate compressive axial load capacity will be 25% higher than the value given in the Table.

4.1.1.2 Wall Bearing Loads: compressive axial loads may act on a wall panel as a point load (lbs), or as a distributed load (lbs/ft). Table 5 of this report shows allowable (ASD) or capacity (LSD or LRFD) of a point load acting on two studs (one on each face) of a panel, see Figure 4. If a point load is between stud members, the top plate shall be sized to resist bending for the location of the load on the plate.

4.1.1.3 Transverse Loads: Panels may be used to support floor or roof loads, see Tables 6 through 8 of this report. The loads in the Tables provide for uniform distributed transverse allowable (ASD) and failure (LSD, LRFD) loads. Single span transverse load capacities or deflection control service live loads are given for stud spacings of 16" and 12" on center and EPS densities of 1 pcf and 1.5 pcf. Thermasteel provides F Panels which are stay-in-place insulated forms for concrete a floor slab-joist system. This option is provided in Section 6.3 of this report.

4.1.1.4 Shear Racking Loads: All Thermasteel panels resist shear. Shear-racking resistance for both 1 pcf and 1.5 pcf panels is provided by Tables 9a through 9d. Shear Frame Wall panels, with horizontal bracing, at 1.5 pcf EPS density is provided in Tables 10a through 10b, see Figures 5 and 6. Additional shear values can be obtained using cross-bracing or sheathing in accordance with ASTM E72.

Shear design Tables for the panels are for shear only (not combined) loading. Failure (yielding, local buckling or lateral buckling) of the studs at the leading edge (a strength criterion) and racking (a service) limit are design considerations that are accounted for. For example, the ends of a shear panel will experience up lift (Rt) on one end and compression (Rc) on the other end and shall be provided for in combination with gravity loads in the design process. Therefore, axial compressive strength (LSD, LRFD) or allowable load (ASD) at leading edge studs are listed in Tables 11a and 11b. The Tables provide both LSD, LRFD and ASD provisions for checking the strength of the panel. Shear design Tables do not include gravity loads. Additional capacity provided by sheathing is not included. The leading-edge stud should be checked in accordance with Code for gravity and seismic (or wind) load combinations, see Figure 2 and 7 and Tables 11a and 11b. (Rt and Rc). Depending on the design code, this reaction shall meet either Equations EQ-1, EQ-2 or EQ-3 in which the subscript "a" is allowable and "n" is nominal. These equations are valid for both Rc (compression stud) or Rt (tension stud).

ASD: $R_c \leq R_a$ (EQ-1)
LRFD: $(R_u = R_c) \leq \emptyset R_n$ (EQ-2)
LSD: $(R_u = R_c) \leq \emptyset R_n$ (EQ-3)
These equations do not include the added value provided by sheathing.

4.1.1.5 Load Interaction: If loading conditions result in a simultaneously applied axial, shear and transverse load, depending on the code, Equations EQ-4, EQ-5 or EQ-6 shall be used:

ASD: $$\left(\frac{p}{p_a}\right)+\left(\frac{w}{w_a}\right)\leq 1 \quad \text{(EQ-4)}$$

LRFD: $$\left(\frac{p_u}{\varphi p_n}\right)+\left(\frac{w_u}{\varphi w_n}\right)\leq 1 \quad \text{(EQ-5)}$$

LSD: $$\left(\frac{p_u}{\varphi p_n}\right)+\left(\frac{w_u}{\varphi w_n}\right)\leq 1 \quad \text{(EQ-6)}$$

Panel shear resistance is accommodated by calculating maximum added axial forces in the studs. Axial stud forces imposed by overturning due to shear is added to the gravity loads in the stud. 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 ϕ is a capacity reduction factor, and "u" is factored.

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4.1.1.6 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 detailed to resist shear, see Table 4 coefficients and the design Tables for sizing.

4.1.1.7 Horizontal Bracing Calculation Method:
Shear resistance was calculated using a finite element method for evaluating resistance for the structurally insulated composite wall panel.

4.1.1.8 Seismic Design:
Shear wall panels with bracing, acting as moment frames may be used in zones B; C; D; E; F without height restrictions. In such cases the bottom Track is acting as hold down. In theses cases the guage and depth of the track needs to be determined by the engineer. Standard panels may be used per restrictions shown in Table 4.

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. If panel lengths are less than those provided, interpolation may be used.

4.2 Installation: All panels (T-G) shall be installed in accordance the applicable IRC, IBC and NBC codes and the installation manual of the manufacturer.

4.2.1 Panel to Panel Connection: The T-G panels shall be connected by the leading edge at the exterior face of the panel (a shear connection). Each leading edge will be connected to the adjacent panel using #10 screws at 12" o.c. for the height of the panel.

4.2.2 Corners: Corners are joined in accordance with the details shown in Figure 3 of this report.

4.2.3 Exterior and Interior Wall Panels: Each exterior and interior wall panel shall be attached to top and bottom tracks with self-tapping screws. Every stud (exterior and interior) shall be connected to the top and bottom track with two #10 self-tapping screws per stud (inside and out, and top and bottom).

4.2.4 Roof and Floor Panels: Roof and floor panels may be used as a diaphragm.If the loads exceed in-plane capacity an additional structural element may be added (this is out of scope of this report). Connected panels provide a monorhinic behavior.

4.2.5 Cladding Attachment

4.2.5.1 Exterior Walls (Coverings): 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. If thermal barriers on the exterior face are required, they shall be applied in accordance with the applicable code. Thermal barriers on the interior face are required, see section 5.1 of this report.

4.2.5.2 Interior Walls (Coverings): The interior wall panels shall be covered with an approved interior wall covering in accordance with IBC or IRC and NBC. Thermal barriers are required in accordance with Section 5.1 of this report.

4.2.5.3 Roof (Coverings): Thermal barriers are required in accordance with Section 5.1 and Tables 14,15 of this report. . Minimum roof slope shall be in accordance with IBC Chapter 15 or IRC Chapter 9 and/or NBC. The roof shall provide for proper drainage, see Tables 14 and 15.

4.2.5.4 Floor (Covering): Floor panels shall be covered with a code accepted floor covering. Installation methods shall be in accordance with current IBC, IRC, NBC. See section 5.1 and Tables 14,15 of this report. Fire separation shall be in accordance with the applicable code.

5.0 GENERAL NOTES

5.1 Thermal Barrier Interior Separation: Except as provided for in IBC Section 2603.4.1 and 2012 IBC Section 2603.10, 2009 and 2006 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 2012 IBC Sections 2603.4.1.1 through 2603.4.1.14, 2009 or 2006 IBC Sections 2603.4.1 through 2603.13 and IRC Sections R316.5 and R316.6, and the appropriate sections of the NBC do not apply to foam plastic insulation used as an interior wall or ceiling finish in plenums.

5.2 Caulking: Every panel requires caulking inside and outside at the bottom track. Every vertical seam between two panels requires caulking on the interior face. All seams located below grade require caulking and additional water proofing, see Table 15. Caulking must be EPS compatible per manufacturer's specifications.

5.3 Vapor Barrier: The 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, see Tables 14 and 15 for the covering.

5.4 Tracks: The bottom track shall be a minimum of 18 gauge. The bottom track shall be attached to the floor system on top of sill-foam or equivalent. Bolts size and spacing shall be chosen by the engineer and applicable code.

5.5 Termites: In areas where the probability of termite infestation is very heavy in accordance with 2015 IBC Figure 2603.9, 2009 and 2006 IBC Figure 2603.8, and IRC Figure R301.2(6) installation is limited in accordance with 2015 IBC section 2603.9, 2009 and 2006 IBC Section 2603.8 and any appropriate sections of the IRC and NBC.

5.6 Field Cuts: Field-cutting of the panel, and panel alterations shall be pre-approved by the manufacture.

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

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6.0 SPECIALITY PANELS & Other DESIGNS

6.1 Fire Rated Panels

6.1.1 Consider an insulated structural composite wall system that has a fire rating that is in compliance with ASTM E119 fire test results. Fire ratings for cold form steel walls were studied by Zhili Quan and J. L. Hulsey at University of Alaska Fairbanks, Alaska (1). ASTM E119 experimental fire test results were numerically simulated, and the simulation results were favorable with experimental findings (1).

Based on findings, an extensive study of the temperature response for 7.5 inch 1.5 pcf density wall panels with embedded cold form studs at 16 inches on centers was examined as a function of 1 to 3 layers of 5/8 inch Type X gypsum. Consider that the layers were applied to both the ambient side and the furnace side.

Simulations were conducted for a 7.5 inch 1.5 pcf density panel with 20 gauge and 16 gauge embedded cold form steel studs spaced at 16 inches on center. Simulations were conducted for 20 gauge track bracing at mid-height and parallel to the wall panel. Two different bracings, one at 36 inches apart and the other at mid-height or 72 inches. Based on the research findings, the EPS began to get soft at 100C and it liquefies at 240C. The fire rating for the TS insulated structural composite wall panel is presented in Tables 12 and 13.

6.2 Below grade Panels: Consider that wall panels may be used for foundation walls or basement walls. When applying panels for below grade walls use only 7.5 inch, 1.5 density panels. Based on the combination of axial compressive and transverse load, a wall panel may be sized by the engineer as a foundation wall. For basement walls, use C600 studs spaced at 16 inch or 12 inch o.c. Walls shall be waterproofed as shown in Figure 10 and stiffened on the exterior side with concrete parchment.

The design accounts for a non-frost susceptible (NFS) backfill, water proofing and rodent inhibiting barrier (such as parch cement for foundation walls and ¼ inch galvanized lath) on the outside surface and 5/8 inch gypsum on the inside face of the panel. Backfill shall not be placed until the wall is secured at the footing and top of wall by the floor framing. Heavy equipment shall not be used to compact backfill next to the wall. Compaction of the backfill using a plate compactor is accepTable in no more than 6 inch lifts. The installer shall be careful not to get heavy equipment next to the wall. At the interior side of the basement wall, the top of the concrete floor slab shall be no less than 4 inches above the bottom of the wall, see Figure 10 and 12. The backfill shall be NFS material such as clean sand or a clean sandy gravel. Drain tile and all other required provisions will be used next to the exterior side of the footing to relieve any water pressure around the wall (out of the scope of this report and per desing of the engineer). A state-of-art finite element analysis was conducted on a 10 foot tall C600 wall panel subjected to an at rest soil pressure. The wall system meeting the design details provided in Figures 10, 11, and 12 will meet lateral displacement of h/240. The basement wall design is limited to a 10 foot high basement wall with soil no higher than 12 inches below the top of the wall (Fig 12 – (A)). The design is based on Rankine's soil pressure theory in which the "at rest" soil pressure coefficient is k=0.5. Soil density is assumed to be 120 pcf. The basement wall is shown in Figures 10 and 11.

Figure 12 shows the calculation model the acting soil pressure that is adjacent to the exterior face of the wall. The basement wall is to be sized and evaluated using the Allowable Stress Design method (ASD). Table 16 provides the engineer with the allowable axial wall compressive load on a stud line and the allowable moment on that same stud line. Panels may be 4 foot tall to 10 foot tall. Any gravity load acting on the basement wall must meet the following load combination, see Equation EQ-7. This equation is providing for ASD load combinations. It should be noted that the loads (P and M) are the acting axial force, P and the acting moment, M. The subscript, "a" is used to describe the ASD allowable axial load and allowable bending moment.

$$\left(\frac{P}{Pa}\right) + \left(\frac{M}{Ma}\right) < 1 \qquad \text{(EQ-7)}$$

6.3 Panels forms for Concrete Floor Joists: Load Tables were developed to accommodate insulated concrete floor applications. The system provided is available for simply supported concrete floor slabs for spans less than 20 ft to 50 ft. The methodology and load Tables will be available in a Thermasteel Engineering Design Manual (it is not part of this document).

7.0 SUBSTANTIATING DATA

7.1 Test Reports: Test results 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.

7.2 Panel Selection: Load Tables in this report were developed based on calculations to resist yielding, local buckling, and lateral buckling in accordance with the United States research publications 2001-2015 North American Specification for the Design of Cold-Formed Steel Structural Members (AISI), 2006, 2009, 2012 and 2015, and or the appropriate criteria for Canada CSA Group, S136-16, North American Specification for the Design of Cold-Formed Steel Structural Members, International Building Code (IBC), 2006, 2009, 2012, 2015, and 2018 International Residential Code, 2015 and 2018 or the National Building Code of Canada; ASCE 7-05, ASCE 7-10, and ASCE 7-16 and verified with ASTM E72 test data.

8.0 IDENTIFICATION

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Table 4. Design Coefficients and Factors for Seismic Force Resisting Systems								
				Height Limitations (ft) by SDC*				
System Type	R	Ω_0	C_d	B	C	D	E	F
Light-frame walls sheathed with wood structural panels rated	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								

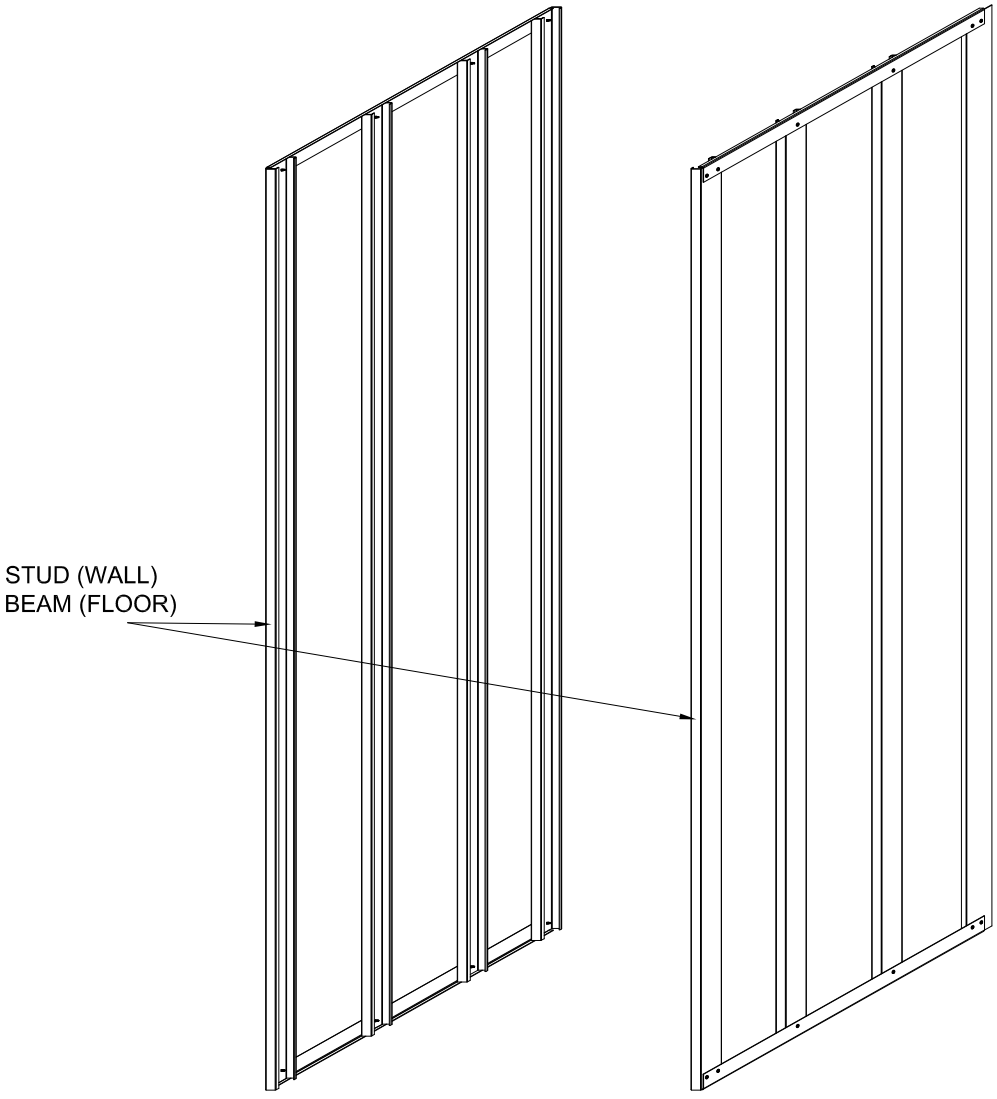

FIGURE 1: STEEL FRAMES THERMALLY BROKEN

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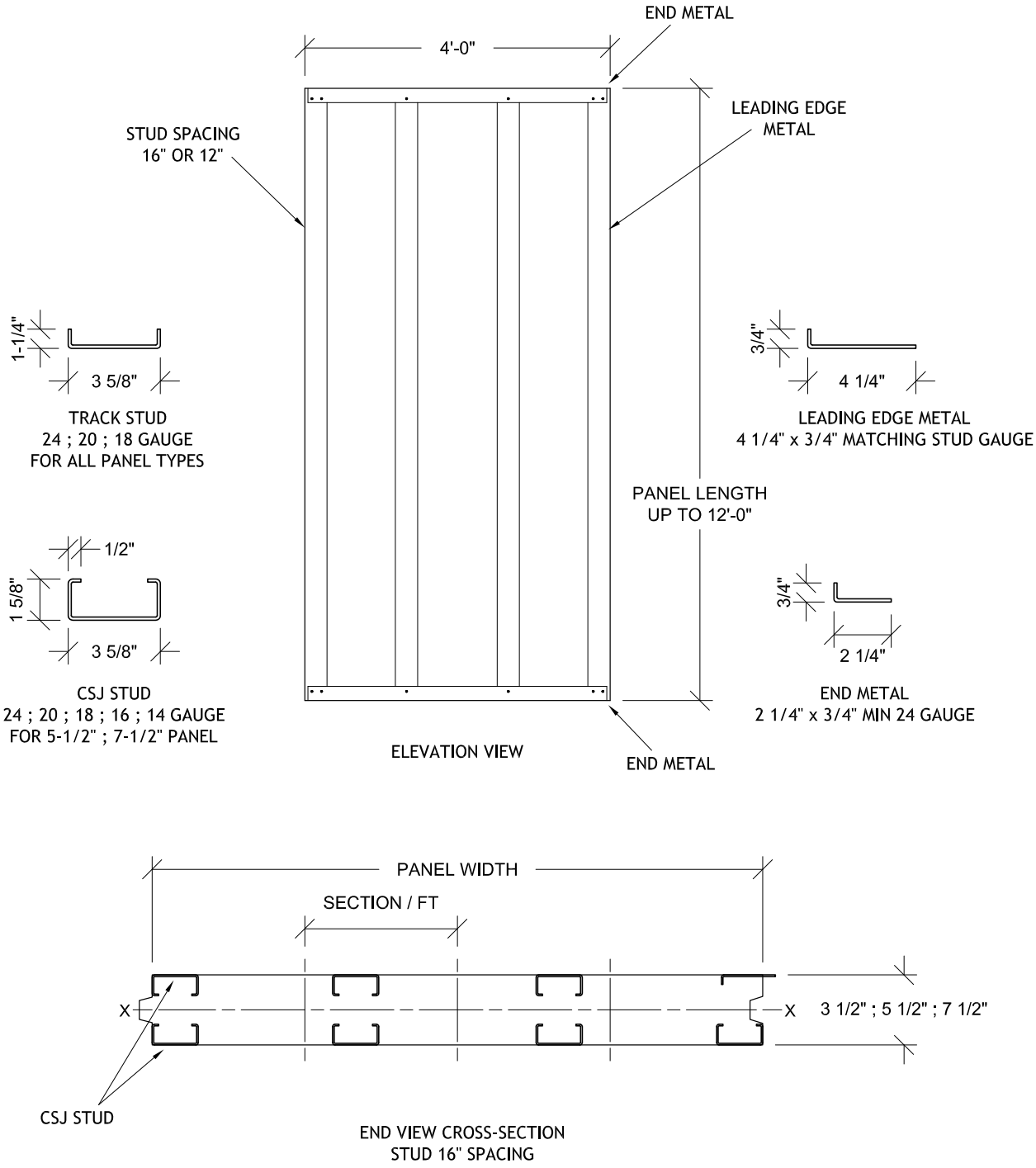

FIGURE 2: THERMASTEEL PANELS

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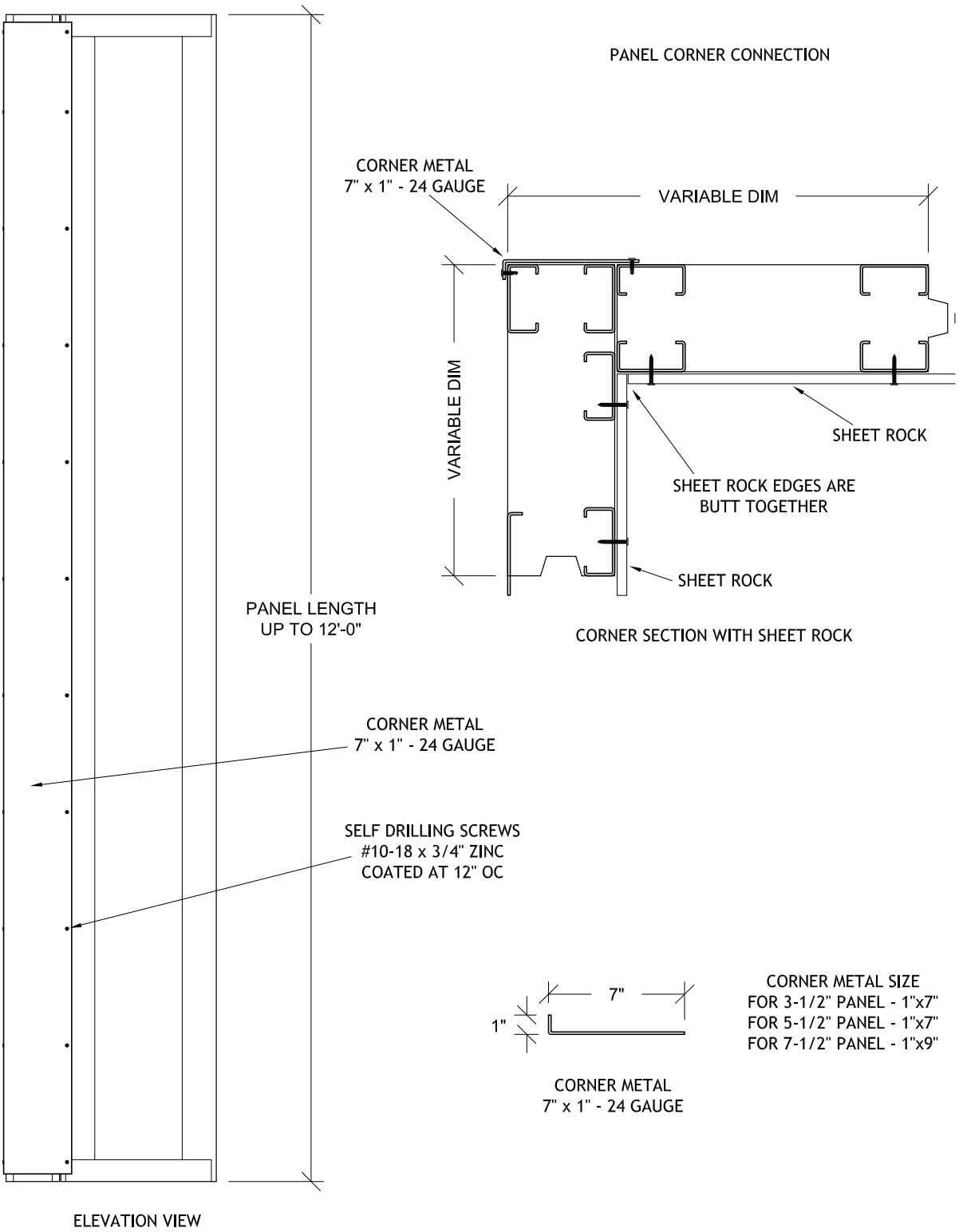

FIGURE 3: WALL CORNER DETAILS

THERMASTEEL™
ADVANCED PANEL SYSTEM

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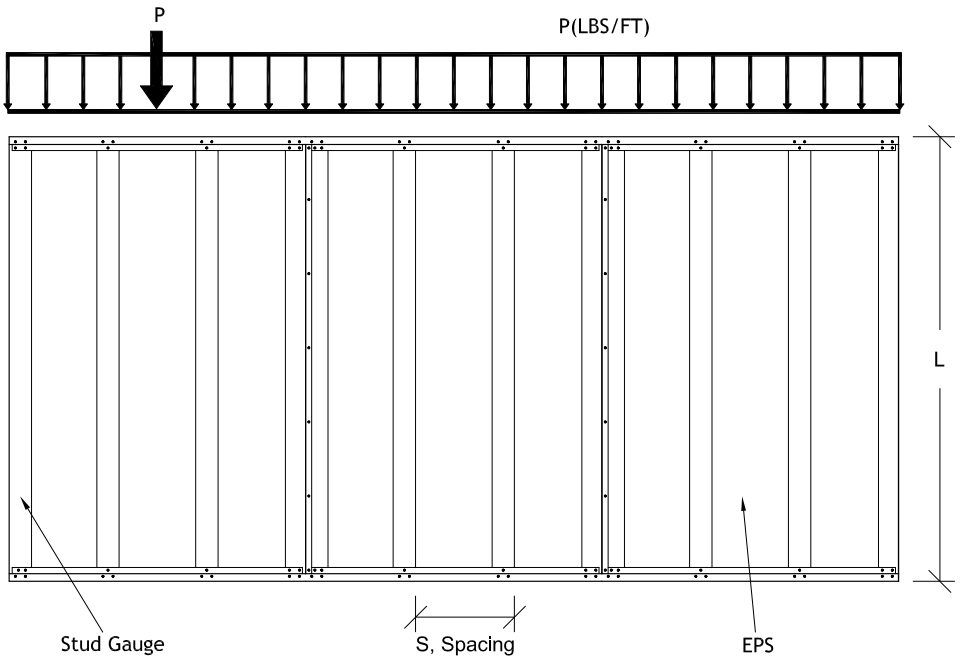

FIGURE 4: AXIAL DISTRIBUTED LOAD AND/OR POINT LOAD ACTING ON A STUD PACK*

*Added strength by horizontal brace and lateral support by EPS is not considered

Table 5. Axial Compressive Design Load acting on 2- Studs* (1 & 1.5 pcf density EPS)

		Strength: LRFD, LSD (ϕPn)				Allowable, ASD (Pa)		
		*3.5"	5.5"	7.5"		*3.5"	5.5"	7.5"
Length (ft)	Gauge	(lbs)	(lbs)	(lbs)		(lbs)	(lbs)	(lbs)
8	24	**2,432**	------	------		**1,520**	------	------
9	24	**2,432**	------	------		**1,520**	------	------
10	24	**2,432**	------	------		**1,520**	------	------
12	24	**2,432**	------	------		**1,520**	------	------
8	20	**4,612**	6,282	8,362		**2,882**	4,702	6,259
9	20	**4,612**	6,282	8,362		**2,882**	4,702	6,259
10	20	**4,612**	6,282	8,362		**2,882**	4,702	6,259
12	20	**4,612**	6,282	8,362		**2,882**	4,702	6,259
8	18	**9,729**	10,074	11,916		**6,081**	7,540	8,919
9	18	**9,729**	10,074	11,916		**6,081**	7,540	8,919
10	18	**9,729**	10,074	11,916		**6,081**	7,540	8,919
12	18	**8,630**	9,600	11,916		**5,394**	7,185	8,919
8	16	**13,568**	15,622	16,027		**8,480**	11,693	11,996
9	16	**12,907**	15,622	15,851		**8,067**	11,693	11,864
10	16	**12,207**	15,622	15,656		**7,629**	11,693	11,719
12	16	**10,727**	15,622	15,215		**6,704**	11,693	11,389
8	14	------	19,038	19,894		------	14,250	14,890
9	14	------	18,610	19,675		------	13,930	14,727
10	14	------	18,143	19,434		------	13,580	14,546
12	14	------	17,107	18,886		------	12,804	14,136

ASTM E72: Concentrated compressive load is applied at e=t/6

*3.5- inch panels are made with 350T075-mils type studs at each face

5.5; 7.5 – inch panels are made with 362s162- mils type studs at each face

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Table 6a. 3.5-inch-thick panel 350T075 mils track type studs at 16-inch O.C. 1.5 density EPS									
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS 1.5 pcf density				
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads		
Gauge	L (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360
24	**8**	2,432	1,520		57	36	**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		67	42	**89**	**67**	**44**
20	**9**	4,612	2,882		59	37	**66**	**49**	**33**
20	**10**	4,612	2,882		52	32	**50**	**37**	**25**
20	**12**	4,612	2,882		36	22	**30**	**23**	**15**
18	**8**	9,729	6,081		67	42	**107**	**80**	**54**
18	**9**	9,729	6,081		59	37	**80**	**49**	**33**
18	**10**	9,729	6,081		53	33	**61**	**46**	**30**
18	**12**	8,630	5,394		44	28	**37**	**28**	**19**
16	**8**	13,568	8,480		67	42	**125**	**93**	**62**
16	**9**	12,907	8,067		59	37	**94**	**70**	**47**
16	**10**	12,207	7,629		53	33	**72**	**54**	**36**
16	**12**	10,727	6,704		44	28	**45**	**34**	**22**
All strength values account for local buckling, yielding and lateral buckling									
ASTM E72 Axial distributed compressive loads are applied at e=t/6									
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0									

Table 6b. 3.5-inch-thick panel 350T075 mils track type studs at 12-inch O.C. 1.5 density EPS									
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS 1.5 pcf density				
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)		
Gauge	L (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360
24	**8**	3,243	2,027		76	47	**63**	**47**	**31**
24	**9**	3,243	2,027		60	38	**60**	**45**	**30**
24	**10**	3,243	2,027		49	30	**45**	**34**	**22**
24	**12**	3,243	2,027		34	21	**27**	**20**	**13**
20	**8**	6,149	3,843		89	55	**118**	**89**	**59**
20	**9**	6,149	3,843		79	49	**87**	**66**	**44**
20	**10**	6,149	3,843		69	43	**66**	**50**	**33**
20	**12**	6,149	3,843		48	30	**40**	**30**	**20**
18	**8**	12,972	8,107		89	55	**143**	**107**	**71**
18	**9**	12,972	8,107		79	49	**106**	**66**	**44**
18	**10**	12,972	8,107		71	44	**81**	**61**	**41**
18	**12**	11,507	7,192		59	37	**50**	**37**	**25**
16	**8**	18,091	11,307		89	55	**166**	**125**	**83**
16	**9**	17,210	10,756		79	49	**125**	**94**	**62**
16	**10**	16,275	10,172		71	44	**96**	**72**	**48**
16	**12**	14,302	8,939		59	37	**60**	**45**	**30**
All strength values account for local buckling, yielding and lateral buckling									
ASTM E72 Axial distributed compressive loads are applied at e=t/6									
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0									

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Table 7a. 5.5-inch-thick panel with 362S162-mils type studs at 16" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS: 1.0 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**6,282**	**3,926**		154	96	58	44	29	22	
20	9	**6,282**	**3,926**		122	76	48	36	24	18	
20	10	**6,282**	**3,926**		98	62	46	34	23	17	
20	12	**6,282**	**3,926**		68	43	37	28	19	14	
18	8	**10,074**	**6,296**		267	167	63	47	31	24	
18	9	**10,074**	**6,296**		211	132	51	38	26	19	
18	10	**10,074**	**6,296**		171	107	49	37	25	18	
18	12	**9,600**	**6,000**		118	74	39	29	20	15	
16	8	**15,622**	**9,764**		331	207	67	51	34	25	
16	9	**15,622**	**9,764**		261	163	57	43	28	21	
16	10	**15,622**	**9,764**		212	132	54	40	27	20	
16	12	**15,622**	**9,764**		147	92	43	32	22	16	
14	8	**19,038**	**11,899**		448	280	74	55	37	28	
14	9	**18,610**	**11,631**		354	221	64	48	32	24	
14	10	**18,143**	**11,339**		287	179	59	44	30	22	
14	12	**17,107**	**10,692**		199	125	47	35	24	18	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

Table 7b. 5.5-inch-thick panel with 362S162-mils Type studs at 12" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS: 1.0 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**8,376**	**5,235**		205	128	78	58	39	29	
20	9	**8,376**	**5,235**		162	101	63	48	32	24	
20	10	**8,376**	**5,235**		131	82	61	46	31	23	
20	12	**8,376**	**5,235**		91	57	50	37	25	19	
18	8	**13,431**	**8,395**		355	222	84	63	42	31	
18	9	**13,431**	**8,395**		281	176	68	51	34	26	
18	10	**13,431**	**8,395**		227	142	66	49	33	25	
18	12	**12,799**	**8,000**		158	99	52	39	26	20	
16	8	**20,829**	**13,018**		441	276	90	67	45	34	
16	9	**20,829**	**13,018**		349	218	76	57	38	28	
16	10	**20,829**	**13,018**		282	176	71	54	36	27	
16	12	**20,829**	**13,018**		196	123	58	43	29	22	
14	8	**25,384**	**15,865**		598	374	98	74	49	37	
14	9	**24,813**	**15,508**		472	295	85	64	43	32	
14	10	**24,191**	**15,119**		383	239	79	59	39	30	
14	12	**22,809**	**14,255**		266	166	63	47	32	24	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

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Table 7c. 5.5-inch-thick panel with 362S162-mils Type studs at 16" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS: 1.5 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**6,282**	**3,926**		155	97	88	66	44	33	
20	9	**6,282**	**3,926**		123	77	63	47	32	24	
20	10	**6,282**	**3,926**		99	62	51	38	25	19	
20	12	**6,282**	**3,926**		69	43	34	26	17	13	
18	8	**10,074**	**6,296**		267	167	94	70	47	35	
18	9	**10,074**	**6,296**		211	132	67	51	34	25	
18	10	**10,074**	**6,296**		171	107	58	43	29	22	
18	12	**9,600**	**6,000**		118	74	37	28	19	14	
16	8	**15,622**	**9,764**		331	207	104	78	52	39	
16	9	**15,622**	**9,764**		261	163	73	55	36	27	
16	10	**15,622**	**9,764**		212	132	62	47	31	23	
16	12	**15,622**	**9,764**		147	92	42	31	21	16	
14	8	**19,038**	**11,899**		448	280	105	79	53	39	
14	9	**18,610**	**11,631**		354	221	80	60	40	30	
14	10	**18,143**	**11,339**		287	179	67	50	34	25	
14	12	**17,107**	**10,692**		199	125	45	34	23	17	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

Table 7d. 5.5-inch-thick panel with 362S162-mils Type studs at 12" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS: 1.5 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**8,376**	**5,235**		207	130	117	88	59	44	
20	9	**8,376**	**5,235**		164	102	84	63	42	32	
20	10	**8,376**	**5,235**		133	83	68	51	34	25	
20	12	**8,376**	**5,235**		92	58	46	34	23	17	
18	8	**13,431**	**8,395**		355	222	125	94	62	47	
18	9	**13,431**	**8,395**		281	176	90	67	45	34	
18	10	**13,431**	**8,395**		227	142	77	58	38	29	
18	12	**12,799**	**8,000**		158	99	50	37	25	19	
16	8	**20,829**	**13,018**		441	276	138	104	69	52	
16	9	**20,829**	**13,018**		349	218	97	73	49	36	
16	10	**20,829**	**13,018**		282	176	83	62	42	31	
16	12	**20,829**	**13,018**		196	123	56	42	28	21	
14	8	**25,384**	**15,865**		598	374	140	105	70	53	
14	9	**24,813**	**15,508**		472	295	107	80	54	40	
14	10	**24,191**	**15,119**		383	239	89	67	45	34	
14	12	**22,809**	**14,255**		266	166	60	45	30	23	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

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Table 8a. 7.5-inch-thick panel with 362S162-mils type studs at 16" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS: 1.0 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**8,180**	**5,113**		329	206	87	65	44	33	
20	9	**8,180**	**5,113**		260	163	64	48	32	24	
20	10	**8,180**	**5,113**		211	132	56	42	28	21	
20	12	**8,180**	**5,113**		146	91	34	25	17	13	
18	8	**15,240**	**9,525**		417	260	92	69	46	34	
18	9	**15,240**	**9,525**		329	206	68	51	34	26	
18	10	**15,240**	**9,525**		267	167	59	44	30	22	
18	12	**14,837**	**9,273**		185	116	41	31	20	15	
16	8	**18,585**	**11,615**		517	323	98	74	49	37	
16	9	**18,585**	**11,615**		409	255	72	54	36	27	
16	10	**18,585**	**11,615**		331	207	63	47	31	24	
16	12	**18,585**	**11,615**		230	144	43	32	21	16	
14	8	**33,156**	**20,722**		817	510	146	110	73	55	
14	9	**32,792**	**20,495**		645	403	78	58	39	29	
14	10	**32,389**	**20,243**		523	327	68	51	34	25	
14	12	**31,476**	**19,673**		363	227	46	34	23	17	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

Table 8b. 7.5-inch-thick panel with 362S162-mils type studs at 12" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS: 1.0 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**10,907**	**6,817**		439	274	116	87	58	44	
20	9	**10,907**	**6,817**		347	217	86	64	43	32	
20	10	**10,907**	**6,817**		281	176	75	56	37	28	
20	12	**10,907**	**6,817**		195	122	45	34	22	17	
18	8	**20,320**	**12,700**		555	347	123	92	61	46	
18	9	**20,320**	**12,700**		439	274	91	68	46	34	
18	10	**20,320**	**12,700**		355	222	79	59	39	30	
18	12	**19,782**	**12,364**		247	154	54	41	27	20	
16	8	**24,779**	**15,487**		690	431	131	98	66	49	
16	9	**24,779**	**15,487**		545	341	96	72	48	36	
16	10	**24,779**	**15,487**		441	276	84	63	42	31	
16	12	**24,779**	**15,487**		307	192	57	43	29	21	
14	8	**44,208**	**27,630**		1089	680	195	146	98	73	
14	9	**43,722**	**27,326**		860	538	104	78	52	39	
14	10	**43,186**	**26,991**		697	436	90	68	45	34	
14	12	**41,968**	**26,230**		484	302	61	46	31	23	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

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Table 8c. 7.5-inch-thick panel with 362S162-mils type studs at 16" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse Loads (psf); EPS: 1.5 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**8,362**	**6,259**		338	211	125	93	62	47	
20	9	**8,362**	**6,259**		267	167	103	77	51	39	
20	10	**8,362**	**6,259**		216	135	101	76	51	38	
20	12	**8,362**	**6,259**		150	94	81	61	41	30	
18	8	**11,916**	**8,919**		432	270	130	98	65	49	
18	9	**11,916**	**8,919**		341	213	108	81	54	40	
18	10	**11,916**	**8,919**		276	173	104	78	52	39	
18	12	**11,916**	**8,919**		192	120	85	64	43	32	
16	8	**16,027**	**11,996**		536	335	141	106	70	53	
16	9	**15,851**	**11,864**		424	265	137	102	68	51	
16	10	**15,656**	**11,719**		343	214	109	82	55	41	
16	12	**15,215**	**11,389**		238	149	90	67	45	34	
14	8	**33,156**	**20,722**		817	510	146	110	73	55	
14	9	**32,792**	**20,495**		645	403	156	117	78	59	
14	10	**32,389**	**20,243**		523	327	148	111	74	55	
14	12	**31,476**	**19,673**		363	227	116	87	58	43	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

Table 8d. 7.5-inch-thick panel with 362S162-mils type studs at 12" o.c.; no gypsum or siding.											
		Axial Distributed Compression (plf)			Transverse loading (psf); EPS: 1.5 pcf density						
		LRFD, LSD	ASD		LRFD, LSD	ASD	Service loads (psf)				
Gauge	Ht (ft)	(φ pn)	(pa)		(φ wn)	(wa)	L/180	L/240	L/360	L/480	
20	8	**11,149**	**8,345**		450	281	166	125	83	62	
20	9	**11,149**	**8,345**		356	222	137	103	69	51	
20	10	**11,149**	**8,345**		288	180	135	101	67	51	
20	12	**11,149**	**8,345**		200	125	108	81	54	41	
18	8	**15,888**	**11,892**		576	360	173	130	87	65	
18	9	**15,888**	**11,892**		455	284	143	108	72	54	
18	10	**15,888**	**11,892**		368	230	138	104	69	52	
18	12	**15,888**	**11,892**		256	160	114	85	57	43	
16	8	**21,369**	**15,995**		715	447	188	141	94	70	
16	9	**21,135**	**15,819**		565	353	182	137	91	68	
16	10	**20,875**	**15,625**		457	286	145	109	73	55	
16	12	**20,287**	**15,185**		318	199	120	90	60	45	
14	8	**44,208**	**27,630**		1089	680	195	146	98	73	
14	9	**43,722**	**27,326**		860	538	208	156	104	78	
14	10	**43,186**	**26,991**		697	436	197	148	99	74	
14	12	**41,968**	**26,230**		484	302	155	116	77	58	
All strength values account for local buckling, yielding and lateral buckling											
ASTM E72 Axial distributed compressive loads are applied at e=t/6											
LRFD, LSD Capacity reduction factor, $\boldsymbol{\phi = 0.8}$ axial & flexure; ASD safety factor = 2.0											

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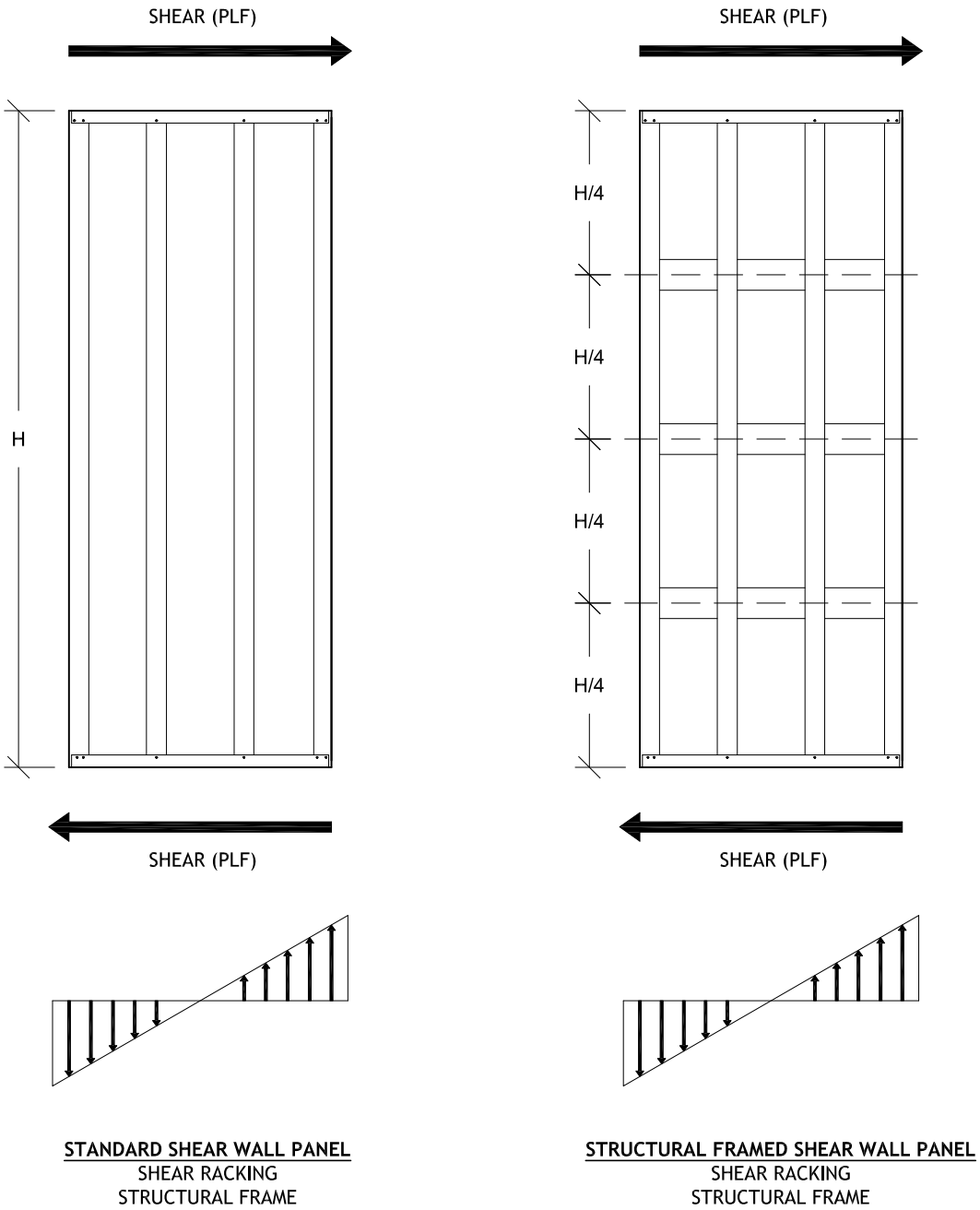

FIGURE 5: SHEAR PANELS (STANDARD AND STRUCTURAL FRAMED)

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Table 9a. 5.5-inch-thick Shear Wall Standard Panel (No Gravity Loads); no gypsum or sheathing										
			stud spacing @ 16" o.c.				stud spacing @ 12" o.c.			
	EPS		Limiting shear force		Displ: $\Delta r \leq 0.02h$		Limiting shear force		Displ: $\Delta r \leq 0.02h$	
	Density	h	(φv_n)*	ASD:(v_a)	Force	Stiffness	(φv_n)	ASD:(v_a)	Force	Stiffness
Gauge	(pcf)	(ft)	(plf)	(plf)	**v_d (plf)**	k(plf/in)	(plf)	(plf)	**v_d (plf)**	k(plf/in)
20	1	8	1,514	946	**901**	3,136	1,937	1,211	**1,010**	3,513
20	1	9	1,483	927	**911**	2,818	1,661	1,038	**1,022**	3,160
20	1	10	1,246	779	**819**	2,280	1,401	876	**904**	2,516
20	1	12	1,090	681	**830**	1,925	1,243	777	**904**	2,096
18	1	8	2,804	1,752	**945**	3,288	3,163	1,977	**1,074**	3,737
18	1	9	2,768	1,730	**968**	2,995	3,135	1,959	**1,105**	3,417
18	1	10	2,158	1,349	**862**	2,399	2,523	1,577	**967**	2,691
18	1	12	2,060	1,288	**870**	2,017	2,254	1,409	**953**	2,211
16	1	8	3,529	2,206	**976**	3,396	4,036	2,523	**1,119**	3,895
16	1	9	3,529	2,206	**1,011**	3,128	3,979	2,487	**1,168**	3,613
16	1	10	2,800	1,750	**894**	2,490	3,201	2,001	**1,014**	2,822
16	1	12	2,546	1,591	**899**	2,085	2,886	1,804	**1,001**	2,322
Note: (φv_n)* Strength values. LSD, LRFD										

Table 9b. 5.5 inch-thick Shear Standard Wall Panel (No Gravity Loads); no gypsum or sheathing										
			stud spacing @ 16" o.c.				stud spacing @ 12" o.c.			
	EPS		Limiting shear force		Displ: $\Delta r \leq 0.02h$		Limiting shear force		Displ: $\Delta r \leq 0.02h$	
	Density	h	(φv_n)*	ASD:(v_a)	Force	Stiffness	(φv_n)	ASD:(v_a)	Force	Stiffness
Gauge	(pcf)	(ft)	(plf)	(plf)	**v_d (plf)**	k(plf/in)	(plf)	(plf)	**v_d (plf)**	k(plf/in)
20	1.5	8	1,555	972	**1,074**	3,736	1,741	1,088	**1,187**	4,130
20	1.5	9	1,511	944	**1,088**	3,366	1,668	1,042	**1,205**	3,726
20	1.5	10	1,284	803	**982**	2,734	1,337	835	**1,074**	2,988
20	1.5	12	1,124	703	**1,000**	2,320	1,220	763	**1,080**	2,504
18	1.5	8	2,788	1,743	**1,119**	3,893	3,170	1,981	**1,252**	4,357
18	1.5	9	2,782	1,739	**1,148**	3,551	3,024	1,890	**1,291**	3,993
18	1.5	10	2,270	1,419	**1,030**	2,866	2,323	1,452	**1,141**	3,175
18	1.5	12	2,069	1,293	**1,044**	2,422	2,213	1,383	**1,140**	2,644
16	1.5	8	3,442	2,151	**1,150**	4,001	3,908	2,442	**1,298**	4,516
16	1.5	9	3,451	2,157	**1,193**	3,690	3,829	2,393	**1,356**	4,194
16	1.5	10	2,853	1,783	**1,064**	2,962	2,936	1,835	**1,190**	3,312
16	1.5	12	2,563	1,602	**1,076**	2,495	2,771	1,732	**1,184**	2,746
Note: (φv_n)* Strength values.. LSD, LRFD										

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Table 9c. 7.5-inch-thick Shear Wall Standard Panel (No Gravity Loads); no gypsum or sheathing										
			stud spacing @ 16" o.c.				stud spacing @ 12" o.c.			
	EPS		Limiting shear force		Displ: $\Delta r \leq 0.02h$		Limiting shear force		Displ: $\Delta r \leq 0.02h$	
Stiffeners	Density	h	$(\varphi v_n)^*$	ASD:(v_a)	Force	Stiffness	(φv_n)	ASD:(v_a)	Force	Stiffness
Gauge	(pcf)	(ft)	(plf)	(plf)	**v_d (plf)**	k(plf/in)	(plf)	(plf)	**v_d (plf)**	k(plf/in)
20	1	8	1,146	716	**404**	1,406	1,162	726	**410**	1,426
20	1	9	1,076	673	**400**	1,236	1,103	689	**405**	1,254
20	1	10	996	623	**373**	1,039	1,034	646	**379**	1,054
20	1	12	910	569	**390**	904	943	589	**395**	917
18	1	8	1,512	945	**405**	1,410	1,557	973	**411**	1,430
18	1	9	1,433	895	**401**	1,240	1,469	918	**407**	1,258
18	1	10	1,320	825	**374**	1,042	1,363	852	**380**	1,058
18	1	12	1,216	760	**392**	909	1,257	786	**397**	921
16	1	8	1,846	1,154	**406**	1,412	1,870	1,169	**412**	1,432
16	1	9	1,731	1,082	**402**	1,242	1,786	1,116	**407**	1,260
16	1	10	1,599	1,000	**376**	1,045	1,659	1,037	**381**	1,061
16	1	12	1,483	927	**393**	911	1,533	958	**398**	923
Note: $(\varphi v_n)^*$ Strength values.. LSD, LRFD										

Table 9d. 7.5-inch-thick Shear Standard Wall Panel (No Gravity Loads); no gypsum or sheathing										
			stud spacing @ 16" o.c.				stud spacing @ 12" o.c.			
	EPS		Limiting shear force		Displ: $\Delta r \leq 0.02h$		Limiting shear force		Displ: $\Delta r \leq 0.02h$	
Stiffeners	Density	h	$(\varphi v_n)^*$	ASD:(v_a)	Force	Stiffness	(φv_n)	ASD:(v_a)	Force	Stiffness
Gauge	(pcf)	(ft)	(plf)	(plf)	**v_d (plf)**	k(plf/in)	(plf)	(plf)	**v_d (plf)**	k(plf/in)
20	1.5	8	1,446	904	**551**	2,205	1,497	936	**558**	2,234
20	1.5	9	1,381	863	**487**	1,947	1,173	733	**313**	1,254
20	1.5	10	1,240	775	**410**	1,639	1,292	807	**415**	1,661
20	1.5	12	1,140	713	**357**	1,428	1,187	742	**362**	1,446
18	1.5	8	1,958	1,224	**553**	2,213	2,028	1,267	**560**	2,241
18	1.5	9	1,881	1,175	**489**	1,955	1,595	997	**315**	1,258
18	1.5	10	1,682	1,051	**412**	1,647	1,795	1,122	**417**	1,670
18	1.5	12	1,556	972	**359**	1,437	1,618	1,011	**364**	1,455
16	1.5	8	2,416	1,510	**554**	2,217	2,496	1,560	**561**	2,245
16	1.5	9	2,328	1,455	**490**	1,959	1,969	1,230	**315**	1,260
16	1.5	10	2,084	1,302	**413**	1,652	2,155	1,347	**418**	1,674
16	1.5	12	1,932	1,208	**361**	1,443	2,005	1,253	**365**	1,459
Note: $(\varphi v_n)^*$ Strength values.. LSD, LRFD										

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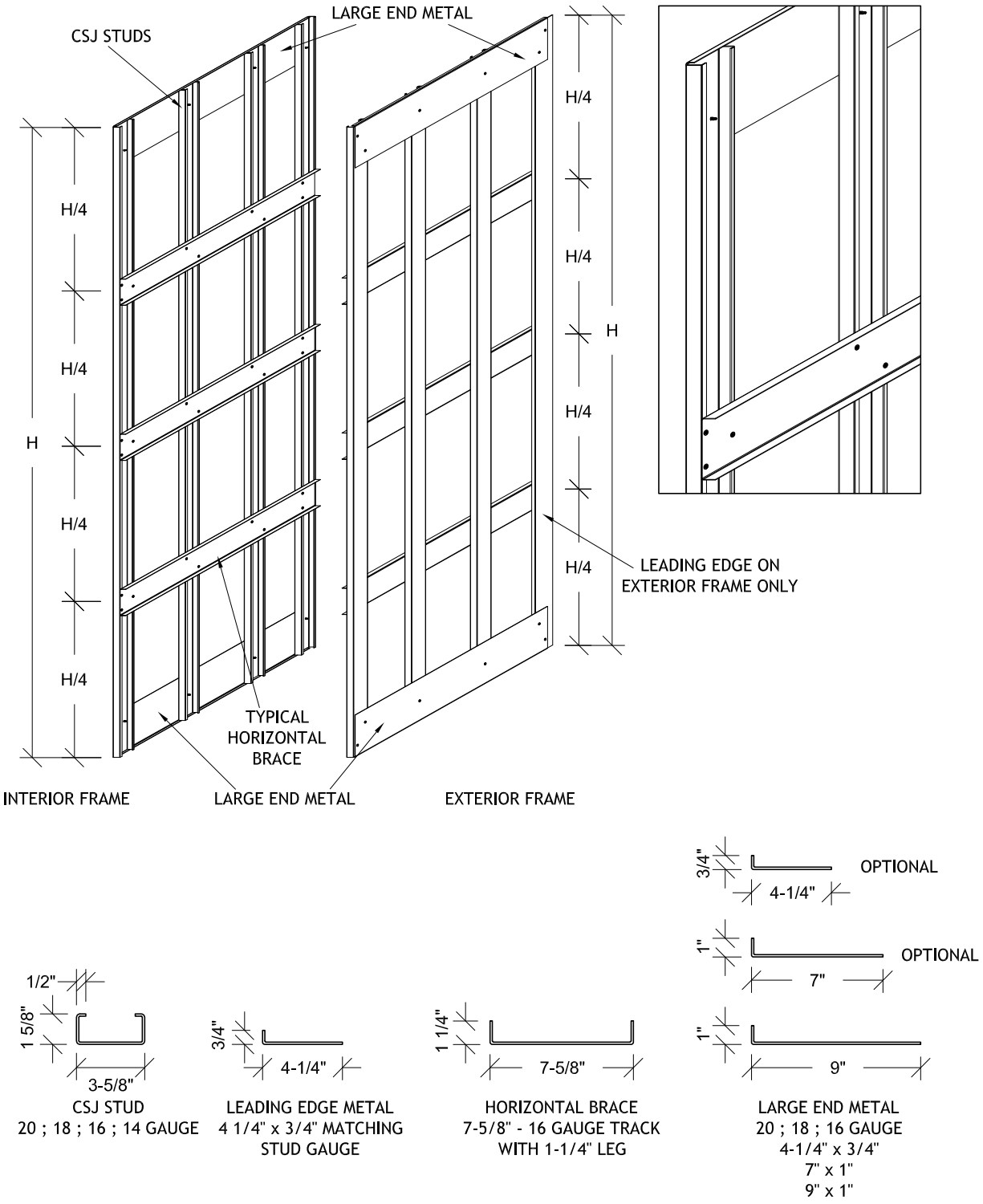

FIGURE 6: SHEAR WALL PANEL - TABLES 10A 10B

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Table 10a. 5.5-inch wall panel; Special Shear Wall (3-horizontals)										
			stud spacing @ 16" o.c.				stud spacing @ 12" o.c.			
	EPS		Limiting shear force		Displ: $\Delta r \leq 0.02h$		Limiting shear force		Displ: $\Delta r \leq 0.02h$	
	Density	h	$(\varphi v_n)^*$	**ASD:(v_a)**	Force	Stiffness	(φv_n)	**ASD:(v_a)**	Force	Stiffness
Gauge	(pcf)	(ft)	(plf)	**(plf)**	v_d (plf)	k(plf/in)	(plf)	**(plf)**	v_d (plf)	k(plf/in)
20	1.5	8	1,693	**1,058**	4,668	4,060	1,816	**1,135**	5,496	4,780
20	1.5	9	1,524	**953**	3,882	3,001	1,641	**1,025**	3,558	2,751
20	1.5	10	1,360	**850**	3,515	2,446	1,487	**929**	3,845	2,675
20	1.5	12	1,170	**731**	3,096	1,795	1,255	**784**	3,317	1,923
18	1.5	8	2,254	**1,596**	5,726	4,980	3,162	**1,976**	6,807	5,921
18	1.5	9	2,385	**1,491**	4,745	3,668	2,849	**1,781**	5,570	4,307
18	1.5	10	2,298	**1,436**	4,203	2,925	2,560	**1,600**	4,969	3,458
18	1.5	12	2,051	**1,282**	3,666	2,126	2,183	**1,364**	4,009	2,325
16	1.5	8	2,568	**1,605**	6,510	5,663	3,924	**2,453**	7,747	6,739
16	1.5	9	2,415	**1,510**	5,385	4,163	2,898	**1,811**	5,614	4,340
16	1.5	10	2,245	**1,403**	4,717	3,282	2,707	**1,692**	5,331	3,709
16	1.5	12	2,191	**1,370**	4,090	2,372	2,539	**1,587**	4,525	2,624
Note: $(\varphi v_n)^*$ Strength values.. LSD, LRFD										

Table 10b. 7.5-inch wall panel; Special Shear Wall (3-horizontals)										
			stud spacing @ 16" o.c.				stud spacing @ 12" o.c.			
	EPS		Limiting shear force		Displ: $\Delta r \leq 0.02h$		Limiting shear force		Displ: $\Delta r \leq 0.02h$	
	Density	h	$(\varphi v_n)^*$	**ASD:(v_a)**	Force	Stiffness	(φv_n)	**ASD:(v_a)**	Force	Stiffness
Gauge	(pcf)	(ft)	(plf)	**(plf)**	v_d (plf)	k(plf/in)	(plf)	**(plf)**	v_d (plf)	k(plf/in)
20	1.5	8	1,693	**1,058**	4,668	4,060	1,834	**1,146**	5,633	4,900
20	1.5	9	1,524	**953**	3,882	3,001	1632	**1,020**	4,663	3,605
20	1.5	10	1,360	**850**	3,515	2,446	1,474	**921**	4,112	2,861
20	1.5	12	1,170	**731**	3,096	1,795	1,268	**793**	3,586	2,079
18	1.5	8	2,554	**1,596**	5,726	4,980	3,183	**1,990**	6,938	6,035
18	1.5	9	2,385	**1,491**	4,745	3,668	2,840	**1,775**	5,728	4,429
18	1.5	10	2,298	**1,436**	4,203	2,925	2,571	**1,607**	4,959	3,451
18	1.5	12	2,051	**1,282**	3,666	2,126	2,210	**1,381**	4,285	2,484
16	1.5	8	2,568	**1,605**	6,510	5,663	3,871	**2,420**	7,907	6,878
16	1.5	9	2,415	**1,510**	5,385	4,163	3,456	**2,160**	6,516	5,038
16	1.5	10	2,245	**1,403**	4,717	3,282	2,129	**1,956**	5,588	3,888
16	1.5	12	2,191	**1,370**	4,090	2,372	2,684	**1,678**	4,805	2,786
Note: $(\varphi v_n)^*$ Strength values.. LSD, LRFD										

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Table 11a. Limiting stud force (Rc) in Compression							
		3.5- inch		5.5- inch		7.5- inch	
	Ht	LRFD, LSD	ASD	LRFD, LSD	ASD	LRFD, LSD	ASD
		$ØR_n$	R_a	ØRn	Ra	ØRn	Ra
Gauge	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)
20	8	4.1	2.5	6.3	4.7	8.4	6.3
20	9	4.1	2.5	6.3	4.7	8.4	6.3
20	10	4.1	2.5	6.3	4.7	8.4	6.3
20	12	4.1	2.5	6.3	4.7	8.4	6.3
18	8	7.0	4.4	10.1	7.5	11.9	8.9
18	9	7.0	4.4	10.1	7.5	11.9	8.9
18	10	7.0	4.4	10.1	7.5	11.9	8.9
18	12	6.7	4.2	9.6	7.2	11.9	8.9
16	8	10.7	6.7	15.6	11.7	16.0	12.0
16	9	10.1	6.3	15.6	11.7	15.9	11.9
16	10	9.5	6.0	15.6	11.7	15.7	11.7
16	12	8.3	5.2	15.6	11.7	15.2	11.4

Table 11b. Limiting stud force (Rt) in Tension							
		3.5- inch		5.5-inch		7.5- inch	
	Ht	LRFD, LSD	ASD	LRFD, LSD	ASD	LRFD, LSD	ASD
		$ØR_n$	R_a	ØRn	Ra	ØRn	Ra
Gauge	(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)
20	8	13.4	8.1	13.4	8.1	13.4	8.1
20	9	13.4	8.1	13.4	8.1	13.4	8.1
20	10	13.4	8.1	13.4	8.1	13.4	8.1
20	12	13.4	8.1	13.4	8.1	13.4	8.1
18	8	17.6	10.6	17.6	10.6	17.6	10.6
18	9	17.6	10.6	17.6	10.6	17.6	10.6
18	10	17.6	10.6	17.6	10.6	17.6	10.6
18	12	17.6	10.6	17.6	10.6	17.6	10.6
16	8	22.0	13.2	22.0	13.2	22.0	13.2
16	9	22.0	13.2	22.0	13.2	22.0	13.2
16	10	22.0	13.2	22.0	13.2	22.0	13.2
16	12	22.0	13.2	22.0	13.2	22.0	13.2

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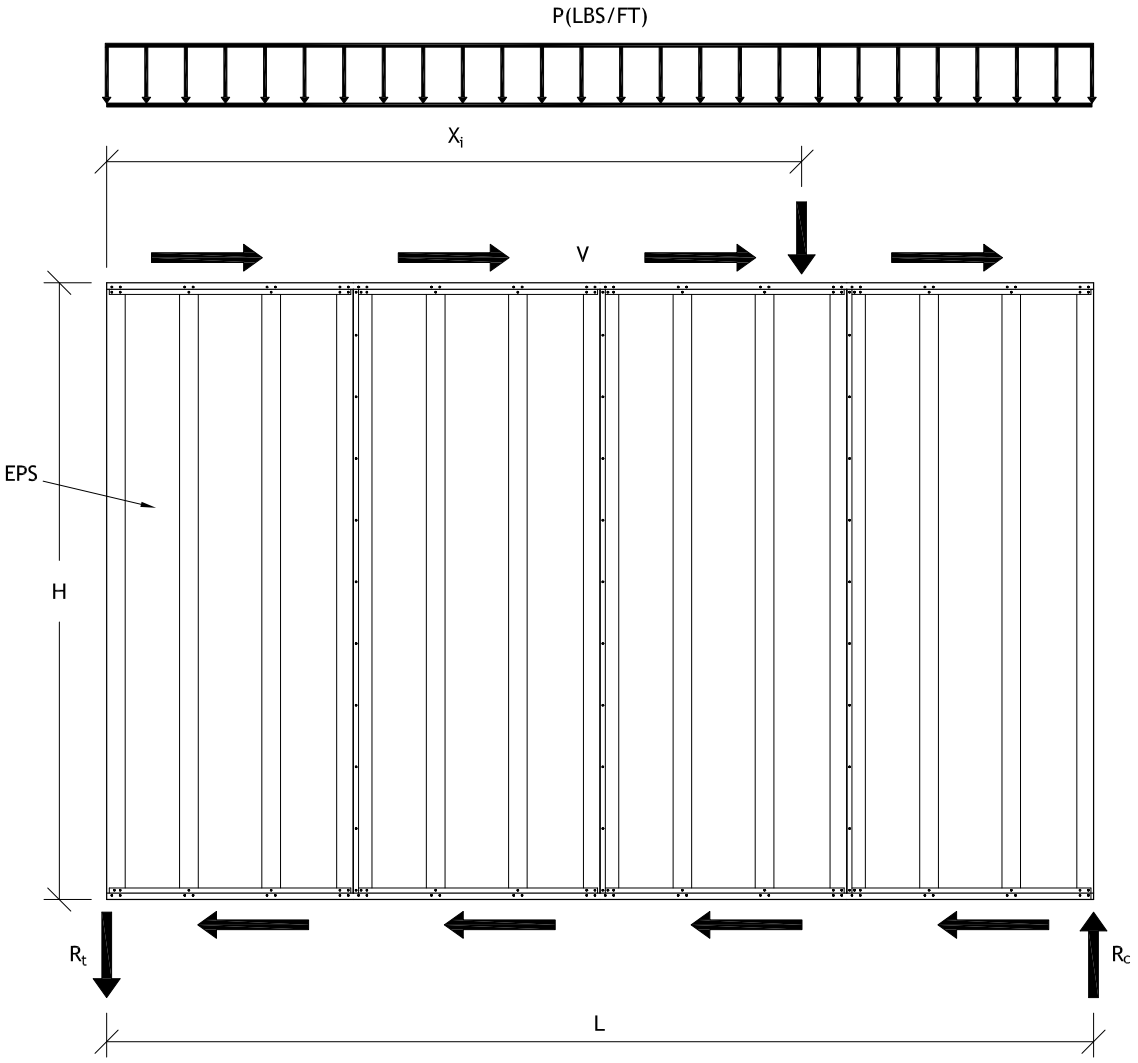

$$Rc = \left[\frac{pL}{2} + \sum_i \left\{\frac{x_i}{L}\right\} p_i\right]_{gravity} + \left[\frac{Vh}{L}\right]_{racking}$$

FIGURE 7: GRAVITY AND SHEAR LOAD INTERACTION

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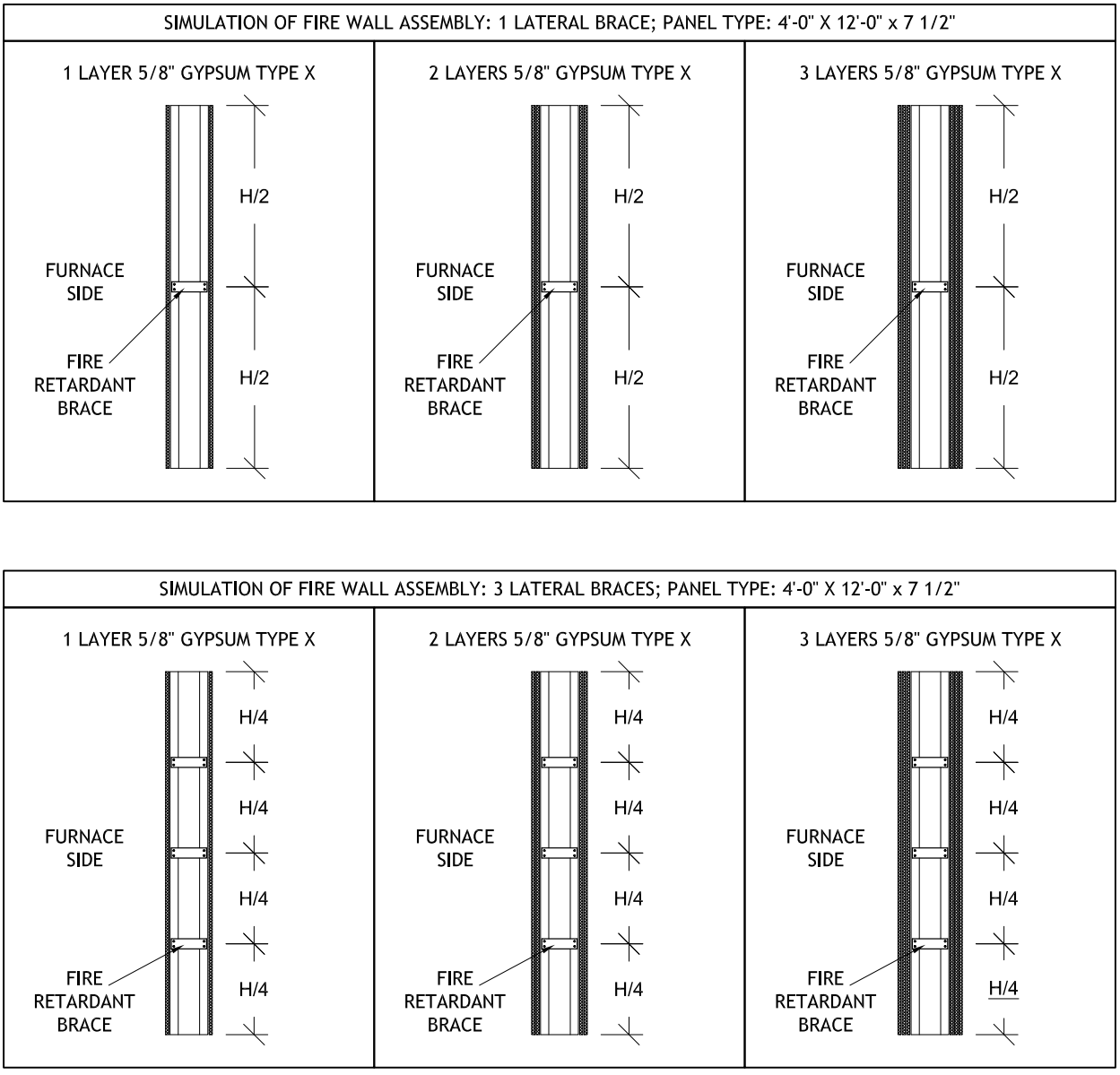

FIGURES 8, 9: CROSS SECTION OF LOAD BEARING FIRE TEST WALL

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Table 12. Fire Rated LRFD, LSD & ASD Load Bearing Capacities: 7.5-inch x 12-ft, EPS, 362S62-33 @ 16" oc						
			Bracing Parallel to wall @ mid height (72 inches)			
			Bracing Transverse to wall		Bracing Transverse to wall	
		Stud(s)	36 inch		72 inch	
5/8" Type X	Fire Rating	Max Temperature	LRFD, LSD	ASD	LRFD, LSD	ASD
# of Gyp. Layers	(minutes)	(F)	ϕPn (kips)	Pa (kips)	ϕPn (kips)	Pa (kips)
		68	10.32	6.45	9.58	5.99
3	60	154	10.32	6.45	9.55	5.97
3	120	553	9.32	5.83	8.19	5.12
3	180	604	8.88	5.55	7.80	4.87
2	60	563	9.24	5.78	8.12	5.08
2	120	662	8.25	5.16	7.27	4.54
2	180	841	5.59	3.49	4.99	3.12
1	60	745	7.16	4.47	6.34	3.96
1	120	919	4.12	2.57	3.64	2.28
1	180	936	3.78	2.36	3.32	2.07

Table 13. Fire Rated LRFD, LSD & ASD Load Bearing Capacities: 7.5-inch x 12-ft, EPS, 362S62-54 @ 16" oc						
			Bracing Parallel to wall @ mid height (72 inches)			
			Bracing Transverse to wall		Bracing Transverse to wall	
		Stud(s)	36 inch		72 inch	
5/8" Type X	Fire Rating	Max Temperature	LRFD, LSD	ASD	LRFD, LSD	ASD
# of Gyp. Layers	(minutes)	(F)	ϕPn (kips)	Pa (kips)	ϕPn (kips)	Pa (kips)
		68	19.77	12.36	17.44	10.90
3	60	154	19.74	12.34	17.41	10.88
3	120	553	18.00	11.25	15.42	9.64
3	180	604	17.11	10.70	14.69	9.18
2	60	563	17.84	11.15	15.29	9.55
2	120	662	15.87	9.92	13.70	8.56
2	180	841	10.67	6.67	9.38	5.86
1	60	745	13.71	8.57	11.94	7.47
1	120	919	7.92	4.95	6.88	4.30
1	180	936	7.30	4.56	6.29	3.93

Table 14. Roof applications		
Shingles roof	Metal deck roof	Other roof type
Sheathing and under layment per manufacturer	Tape or caulk* Sims the exterior face of	Consult specialist
Use shingle nails per manufacturer	Use screws with seals per manufacturer	Per case
* EPS compliant caulk		
Furring out shingles with strips will cause condensation – Not permitted		

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Table 15. Weather barrier and Waterproofing applications				
Type	**Above Grade**		**Below Grade**	
Condition	Vapor Pressure	Water Pressure	Vapor Pressure	Water Pressure
Exterior walls	No Vapor barrier required	Full Waterproofing	Full Waterproofing	Full Waterproofing
Interior walls	No Vapor barrier required	Full Waterproofing	No Vapor barrier required	Full Waterproofing
Floor	No Vapor barrier required	Full Waterproofing	Full Waterproofing	Full Waterproofing
Roof	Underlayment and roofing material	Full Waterproofing		
Foundation	Full Waterproofing	Full Waterproofing	Full Waterproofing	Full Waterproofing
Vapor pressure refers to atmospheric pressure or when panels are covered with rain screen (brick, siding, EIFS, etc.)				
Water proofing systems are out of the scope of this bulletin and per designer's specifications				

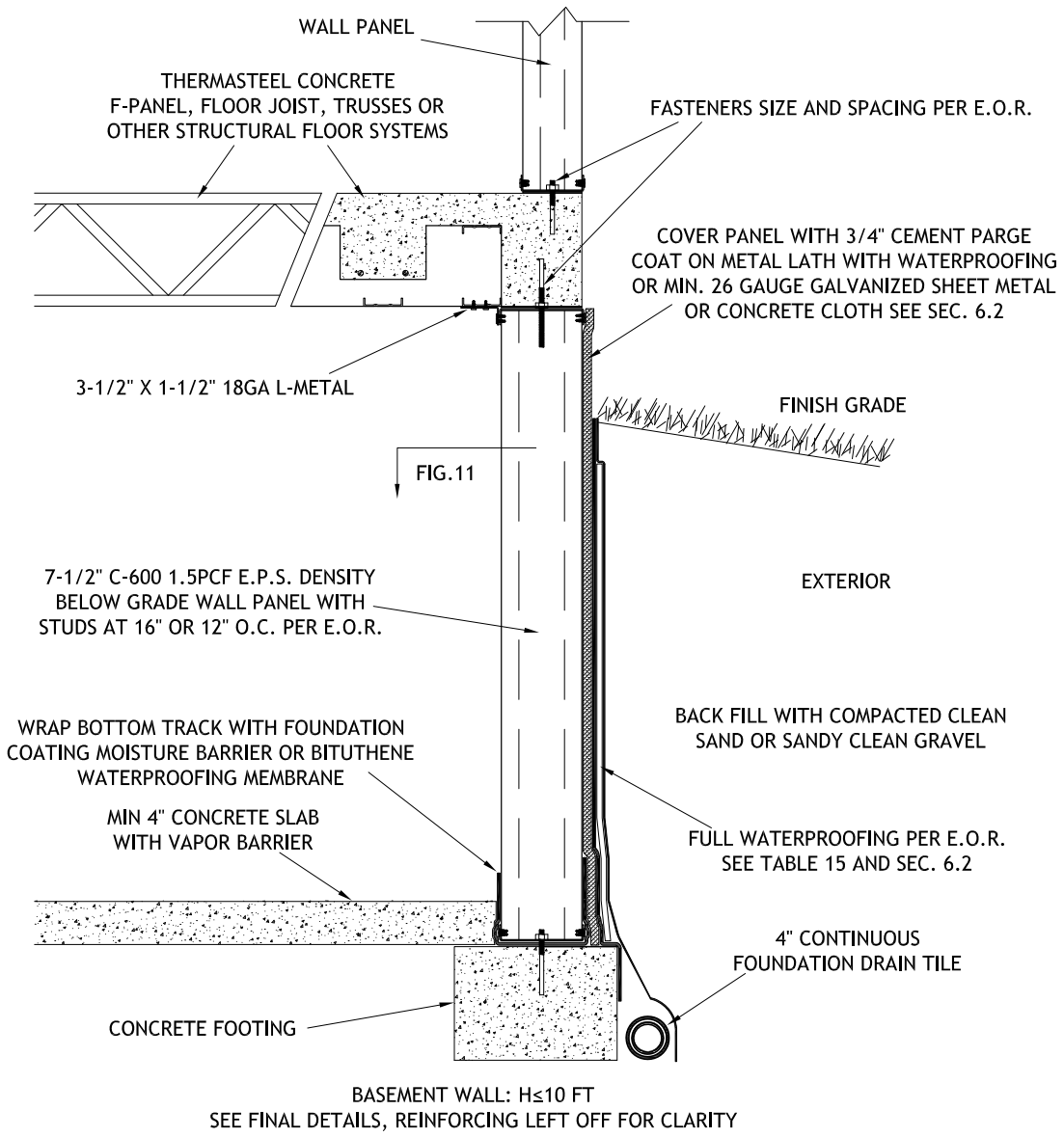

FIGURE 10: TYPICAL BELOW GRADE WALL

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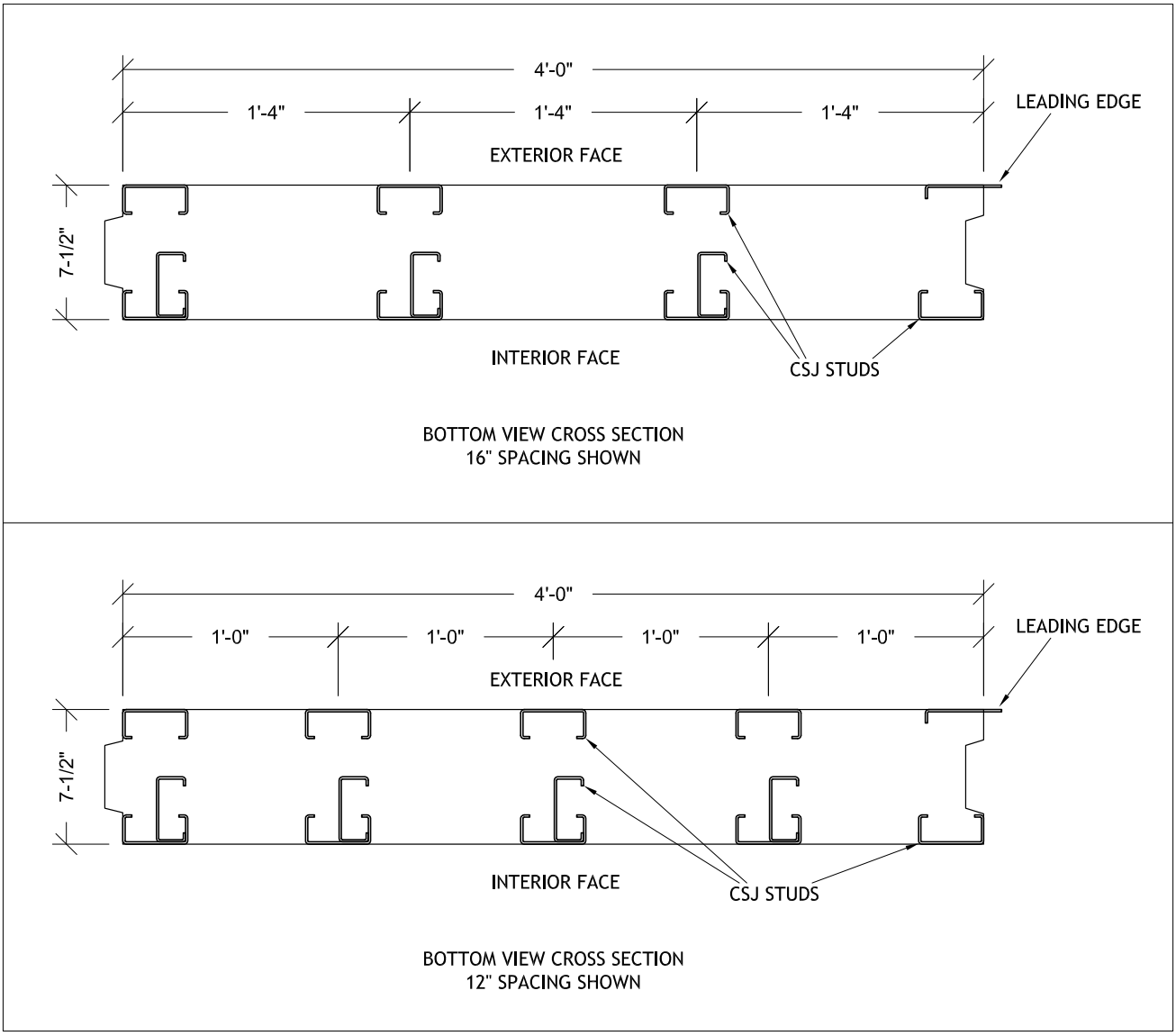

FIGURE 11: BELOW GRADE WALL SECTION WITH C600 STUDS EVERY 16 OR 12 INCH ON CENTER

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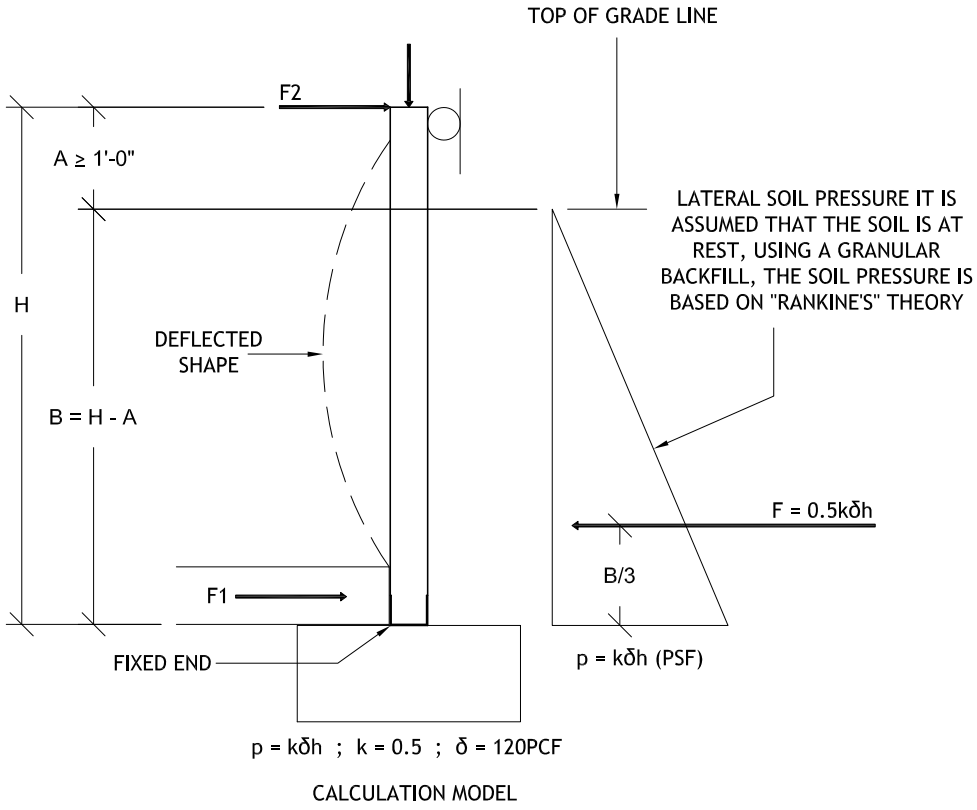

FIGURE 12: BELOW GRADE WALL WITH RANKINE'S SOIL PRESSURE THEORY

Table 16. Below grade wall allowable loads						
Below grade wall section C600 studs 1.5 pcf every 16 or 12 inch on center						
			stud spacing @ 16" o.c.		stud spacing @ 12" o.c.	
Panel height	Max backfill	Soil pressure at the bottom	Transverse load p (plf)	ASD Acting moment	Transverse load p (plf)	ASD Acting moment
H (ft)	h (ft)	p= kδh (psf)	p(max) at the bottom	M (ft-k)/16"	p(max) at the bottom	M (ft-k)/12"
4	3	180	240	0.19	180	0.14
5	4	240	320	0.32	240	0.24
6	5	300	400	0.8	300	0.6
7	6	360	480	1.35	360	1.01
8	7	420	560	2.1	420	1.58
9	8	480	640	3.08	480	2.31
10	9	540	720	4.34*	540	3.26
Max allowable axial compressive load is 10.78 kips per stud line						
*Max allowable axial bending moment per stud line is 3.88 (ft-k) kips per stud line						
For increased seismic and shear performance it is recommended to key in the panel 1.5" into the footing						
Maximum moments imposed by backfill occur at the bottom of the wall (h-ft)						
Load interaction shall be satsified in which P (kips) & M (ft-k) $\left(\frac{p}{10.78}+\frac{M}{3.88}\right)\leq 1$						