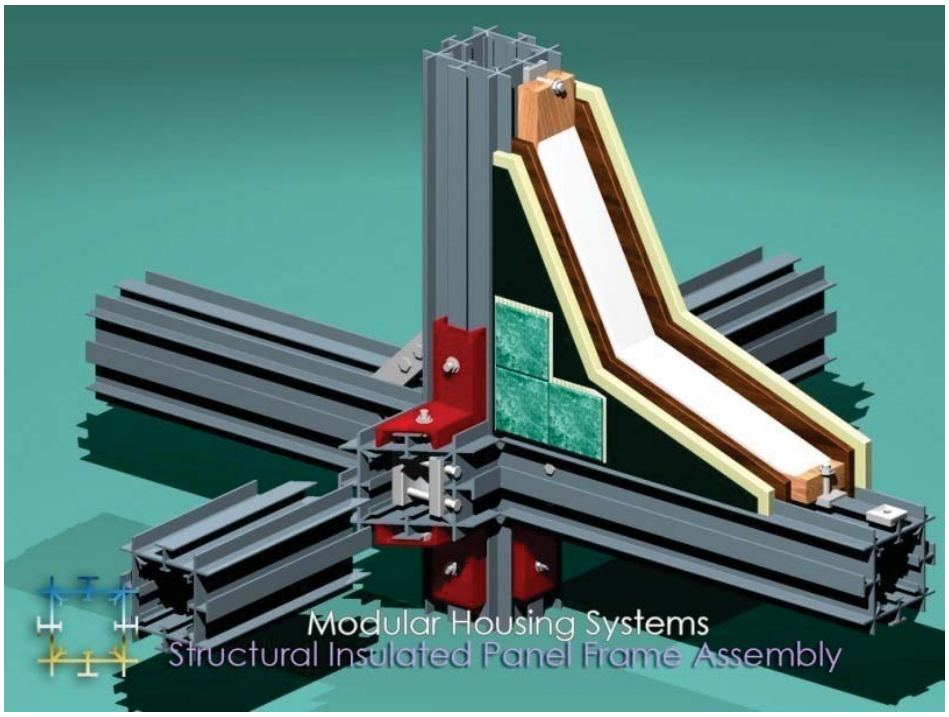
	Modular Housing Systems™ MHS-Building Systems	Page: 1 of 24

Revised June 2020



Design Load Tables for

MHS-Prefab Aluminum Framing, Panel Frame Assembly for Wall, Roof and Floor Panels

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MHS Building Systems
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General Approval LARR **25703**
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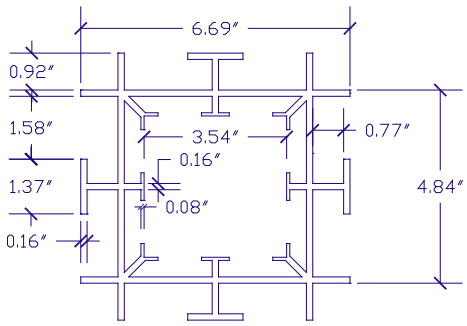
Updated for

LARR & IAPMO

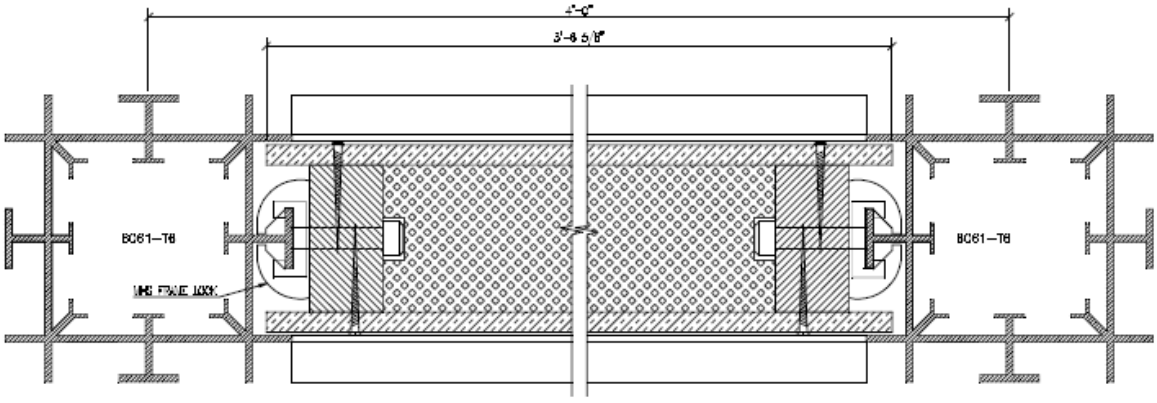
Table 1: MHS Section 170-4w Capacity*

MHS 170-4W Aluminum Beam

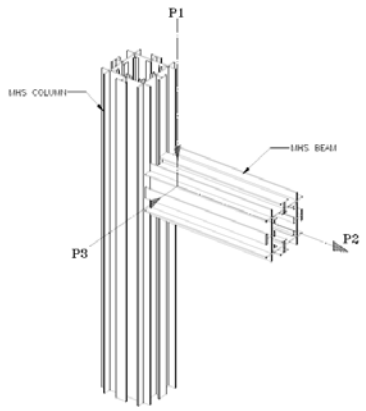
Engineering Specifications



SECTION PROPERTIES	
Cross Section Area	6.39 in^2
Nominal Weight	
Moment of Inertia	Ix=27.87 in^4
	Iy=27.87 in^4
Section Modules	Sxt=8.38 in^3
	Sxb=8.38 in^3
	Sy=8.38 in^3
Radius of Gyration	rx=2.09 in
	ry=2.09 in



Shear Capacity of MHS Connections

MHS FRAME CONNECTION	LOAD DIRECTION	ALLOWABLE STRENGTH (Kips)	STRENGTH AT 1/8" DEFLECTION (Kips)	
Intersecting MHS framing members must be connected using one P1, P2, P3 MHS clamp and two L-connections and C-connections	P1	**4.9**	**5.94**	
	P2	**5.17**	**4.52**	
	P3	5.14	**4.00**	
				Safety factors have been applied.

Transverse Load, Capacity of MHS /Sip framed panels

Deflection (inch)	Transverse capacity from load-deflection curve (Kip)	Equivalent distributed load (Lb/ft^2)
L/180=0.27	6.22	173
L/240=0.2	4.38	122
L/360=0.13	2.65	74

ALLOWABLE LOADS OF MHS STRUCTURAL INSULATED PANEL FRAME ASSEMBLY

MHS STRUCTURAL INSULATED PANEL FRAME ASSEMBLY	TRANSVERSE LOAD (WALL, ROOF, FLOOR).			RACKING SHEAR LOAD	
	L/180	L/240	L/360	Design Strength (lb./ft.)	Deflection at Design Strength(Inches)
One 4 foot- wide-by-8-foot-high-or-long SIP connected on four edges to MHS framing member	173 Lb/ft^2	122 Lb/ft^2	74 Lb/ft^2		

Maximum Three 4-foot-wide-by-9-foot-high SIPs connected to each other with 2-by-4 lumber splines. The perimeter of the three SIPs is connected to the MHS framing member The vertical MHS framing members are secured to the MHS foundation fixture with a bolts	36*	35*	24*	$P_{ASD\_Wind} = 619$ $P_{ASD\_Seismic} = 445$	$\Delta_{ASD\_Wind} = 0.53$ $\Delta_{ASD\_Seismic} = 0.35$
For SI: 1 inch =254 mm. 1 foot = 3048 mm, 1 psf= 6 894 kPa 1 kip=445 kN					
Safety factors have been applied.					
*These values are not tested by MHS. So, the Ser-2233 values can be used until testing them by MHS.					

Loading Chart for Design of MHS 170-4W Beams

Span (ft)	Dead+Live (lb)	Live (lb)	Span (ft)	Dead+Live (lb)	Live (lb)
3	3692	3692	10	626	417
4	2769	2769	11	470	313
5	2215	2215	12	362	241
6	1846	1846	13	285	190
7	1582	1216	14	228	152
8	1222	814	15	185	124
9	858	572	16	153	102

Notes:

1. The safety factor of connections shear capacity is considered equal to 2.1.
2. The deflection limit under the Dead+Live combination is limited to L/240, according to IBC2018.
3. The deflection limit under the Live loads is limited to L/360, according to IBC2018.
4. The benefits of using double floors are not considered in these tables and can be calculated using more stringent analysis.
5. Using double sections, the capacity of beams can be increased considerably (about two times of single section).

Table 2: MHS Section 170-4w capacity

Members Length (ft)	Allowable Axial Forces				Allowable Moment Stresses & Forces		Allowable Shear Stresses & Forces	
	Compression		Tension					
	Fa (Ksi)	Pa (Kip)	Ft (Ksi)	Pt (Kip)	Fb (Ksi)	Mb (Kip-ft)	Fv (Ksi)	Pv (Kip)
3	17.92	114.4	15.47	98.8	21.09	14.5	12.24	28.95
6	15.76	100.6						
9	13.61	86.9						
12	10.75	68.6						
15	6.88	43.9						
18	4.78	30.5						
21	3.51	22.4						

MHS 170-4w allowable loads

Table 3: MHS 170-4w allowable loads (pound per square feet)*

MHS Internal Beam Design Parameters							
Distance Between Beams (ft)	Beam Length (ft)	Allowable Uniform Distributed Loads on Floors and Roofs (psf)		Distance Between Beams (ft)	Beam Length (ft)	Allowable Uniform Distributed Loads on Floors and Roofs (psf)	
		Live	Dead+Live			Live	Dead+Live
6	4	1086	1211	4	4	1629	1816
	6	322	483		6	483	724
	8	136	204		8	204	305
	10	70	104		10	104	156
	12	40	60		12	60	91
	14	25	38		14	38	57
	16	17	25		16	25	38
5	4	1303	1453	3	4	2172	2422
	6	386	579		6	644	965
	8	163	244		8	272	407
	10	83	125		10	139	209
	12	48	72		12	80	121
	14	30	46		14	51	76
	16	20	31		16	34	51

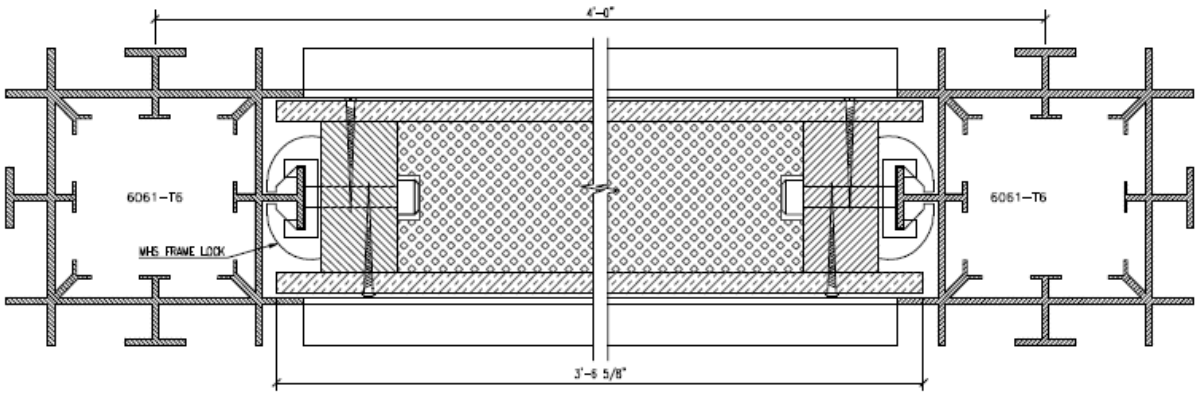
- Using MHS-Double sections and other similar shapes, is permitted for special cases such as heavy loadings and long spans to increase the integrity of the building and its modularity.
- For combination of beams together in various directions, the accurate calculations are needed.

MHS Internal Beam Design Parameters

Table 3: MHS Internal Beam Design Parameters*

Distance Between Beams (ft)	Beam Length (ft)	Deflection Limits (in.) IBC2018 (Table1604.3)		Stress Limits	Moment Capacity
		Live (L/360)	Dead+Live (L/240)	Fb (Ksi)	(Kip-ft)
6	4	0.13	0.20	21.09	14.5
	6	0.20	0.30		
	8	0.27	0.40		
	10	0.33	0.50		
	12	0.40	0.60		
	14	0.47	0.70		
	16	0.53	0.80		
4	4	0.13	0.20	21.09	14.5
	6	0.20	0.30		
	8	0.27	0.40		
	10	0.33	0.50		
	12	0.40	0.60		
	14	0.47	0.70		
	16	0.53	0.80		
3	4	0.13	0.20	21.09	14.5
	6	0.20	0.30		
	8	0.27	0.40		
	10	0.33	0.50		
	12	0.40	0.60		
	14	0.47	0.70		
	16	0.53	0.80		

Design of Shear Walls to Transfer the Wind Loads



Calculation

$p = qh[(GC_p) - (GC_{pi})]$ Design wind pressure (psf)

ASCE Reference Eqn. {30.3-1}

Where:

$qh = 0.00256K_ZK_{Zt}K_dV^2$ = Velocity pressure (psf) — Eqn. {26.10-1}

$K_Z = 2.01(z/zg)^{2/a}$ = Velocity pressure exposure coef. — Table 26.10-2

Z = Height above ground (maximum of *h and* Zmin) — Table 26.10-2

Z_{min} =30 ft for Exposure B or 15 ft for Exposures C and D — Table 26.10-1 and Table 26.11-1

Zg = Terrain exposure constant — Table 26.11-1

a = Terrain exposure constant — Table 26.11-1

Kzt = Topographic factor — Sec. 26.8, Fig. 26.8-1 where *Kzt* = 1.0

Kd = Wind directionality factor for MWFRS — Table 26.6-1 where *Kd* = 0.85

V = Basic wind speed (based on risk category) — Table 15-1 and Figure 26.5-1A, B, C or D and Figure 26.5-2A, B, C or D

And where:

(GCp) = External pressure coefficients for walls — Figure 30.3-1

Where effective wind area A = Max. (l x trib. width) or ($l^2/3$):

A ≤ 10	10 < A < 500	A>500
-1.4	0.353(log A) - 1.753	-0.8
-1.1	0.176578(log A) - 1.27658	-0.8
1.0	-0.176578(log A) + 1.17658	0.7

Table 26.13-1 where Enclosure Classification = Enclosed Buildings

(GCpi) = Internal pressure coefficients for walls

* Three second wind gust speed based om MRI=700 year(Risk Category II).
* Tornado winds are not considered (to be addressed in ASCE 7-22).
* Ground Elevation Adjustment Factor Ke is assumed equal to 1.0.
* Minimum Velocity pressure qh (zone 4) = 16 psf.

Table 4: Design of Shear Walls to Transfer the Wind Loads*

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
85	<15	B	16.00	445	8.6	10.8	12.9	15.1	17.3	19.4	21.6	23.7	25.9
		C	16.00		8.6	10.8	12.9	17.4	17.3	19.4	21.6	23.7	25.9
		D	16.20		8.7	10.9	13.1	21.2	17.5	19.7	21.8	24.0	26.2
	20	B	16.00	445	11.5	14.4	17.3	17.1	23.0	25.9	28.8	31.6	34.5
		C	16.00		11.5	14.4	17.3	24.7	23.0	25.9	28.8	31.6	34.5
		D	17.03		12.2	15.3	18.4	29.7	24.5	27.6	30.6	33.7	36.7
	25	B	16.00	445	14.4	18.0	21.6	22.8	28.8	32.4	36.0	39.6	43.1
		C	16.00		14.4	18.0	21.6	32.4	28.8	32.4	36.0	39.6	43.1
		D	17.70		15.9	19.9	23.9	38.5	31.8	35.8	39.8	43.8	47.7
	30	B	16.00	445	17.3	21.6	25.9	28.8	34.5	38.8	43.1	47.5	51.8
		C	16.00		17.3	21.6	25.9	40.3	34.5	38.8	43.1	47.5	51.8
		D	18.27		19.7	24.6	29.6	47.7	39.4	44.3	49.3	54.2	59.1
	35	B	16.00	445	20.1	25.2	30.2	35.0	40.3	45.3	50.3	55.4	60.4
		C	16.00		20.1	25.2	30.2	48.5	40.3	45.3	50.3	55.4	60.4
		D	18.77		23.6	29.5	35.4	57.1	47.2	53.1	59.1	65.0	70.9
	40	B	16.00	445	23.0	28.8	34.5	41.7	46.0	51.8	57.5	63.3	69.0
		C	16.41		23.6	29.5	35.4	57.2	47.2	53.1	59.0	64.9	70.8
		D	19.21		27.6	34.5	41.4	66.9	55.3	62.2	69.1	76.0	82.9

Design of Shear Walls to Transfer the Wind Loads - **Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
90	<15	B	16.00	445	8.6	10.8	12.9	15.1	17.3	19.4	21.6	23.7	25.9
		C	16.00		8.6	10.8	12.9	17.4	17.3	19.4	21.6	23.7	25.9
		D	18.16		9.8	12.2	14.7	21.2	19.6	22.0	24.5	26.9	29.4
	20	B	16.00	445	11.5	14.4	17.3	17.1	23.0	25.9	28.8	31.6	34.5
		C	16.00		11.5	14.4	17.3	24.7	23.0	25.9	28.8	31.6	34.5
		D	19.09		13.7	17.2	20.6	29.7	27.5	30.9	34.3	37.8	41.2
	25	B	16.00	445	14.4	18.0	21.6	22.8	28.8	32.4	36.0	39.6	43.1
		C	16.66		15.0	18.7	22.5	32.4	30.0	33.7	37.4	41.2	44.9
		D	19.85		17.8	22.3	26.8	38.5	35.7	40.1	44.6	49.1	53.5
	30	B	16.00	445	17.3	21.6	25.9	28.8	34.5	38.8	43.1	47.5	51.8
		C	17.31		18.7	23.3	28.0	40.3	37.3	42.0	46.7	51.3	56.0
		D	20.48		22.1	27.6	33.1	47.7	44.2	49.7	55.2	60.7	66.3
	35	B	16.00	445	20.1	25.2	30.2	35.0	40.3	45.3	50.3	55.4	60.4
		C	17.88		22.5	28.1	33.8	48.5	45.0	50.6	56.3	61.9	67.5
		D	21.04		26.5	33.1	39.7	57.1	53.0	59.6	66.2	72.8	79.4
	40	B	16.00	445	23.0	28.8	34.5	41.7	46.0	51.8	57.5	63.3	69.0
		C	18.39		26.4	33.1	39.7	57.2	52.9	59.5	66.1	72.7	79.3
		D	21.54		31.0	38.7	46.5	66.9	62.0	69.7	77.4	85.2	92.9

Design of Shear Walls to Transfer the Wind Loads - **Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
95	<15	B	16.00	445	8.6	10.8	12.9	15.1	17.3	19.4	21.6	23.7	25.9
		C	16.67		9.0	11.2	13.5	17.4	18.0	20.2	22.5	24.7	27.0
		D	20.23		10.9	13.6	16.4	21.2	21.8	24.6	27.3	30.0	32.7
	20	B	16.00	445	11.5	14.4	17.3	17.1	23.0	25.9	28.8	31.6	34.5
		C	17.72		12.7	15.9	19.1	24.7	25.5	28.7	31.8	35.0	38.2
		D	21.27		15.3	19.1	22.9	29.7	30.6	34.4	38.2	42.1	45.9
	25	B	16.00	445	14.4	18.0	21.6	22.8	28.8	32.4	36.0	39.6	43.1
		C	18.56		16.7	20.9	25.0	32.4	33.4	37.5	41.7	45.9	50.1
		D	22.11		19.9	24.8	29.8	38.5	39.8	44.7	49.7	54.7	59.6
	30	B	16.00	445	17.3	21.6	25.9	28.8	34.5	38.8	43.1	47.5	51.8
		C	19.29		20.8	26.0	31.2	40.3	41.6	46.8	52.0	57.2	62.4
		D	22.82		24.6	30.8	36.9	47.7	49.2	55.4	61.5	67.7	73.9
	35	B	16.00	445	20.1	25.2	30.2	35.0	40.3	45.3	50.3	55.4	60.4
		C	19.93		25.1	31.3	37.6	48.5	50.2	56.4	62.7	69.0	75.2
		D	23.45		29.5	36.9	44.3	57.1	59.0	66.4	73.8	81.1	88.5
	40	B	16.00	445	23.0	28.8	34.5	41.7	46.0	51.8	57.5	63.3	69.0
		C	20.50		29.5	36.8	44.2	57.2	59.0	66.3	73.7	81.1	88.4
		D	24.00		34.5	43.1	51.8	66.9	69.0	77.7	86.3	94.9	103.5

Design of Shear Walls to Transfer the Wind Loads - **Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
100	<15	B	16.00	445	8.6	10.8	12.9	15.1	17.3	19.4	21.6	23.7	25.9
		C	18.47		10.0	12.5	14.9	17.4	19.9	22.4	24.9	27.4	29.9
		D	22.42		12.1	15.1	18.1	21.2	24.2	27.2	30.2	33.3	36.3
	20	B	16.00	445	11.5	14.4	17.3	17.1	23.0	25.9	28.8	31.6	34.5
		C	19.63		14.1	17.6	21.2	24.7	28.2	31.8	35.3	38.8	42.3
		D	23.57		16.9	21.2	25.4	29.7	33.9	38.1	42.4	46.6	50.8
	25	B	16.00	445	14.4	18.0	21.6	22.8	28.8	32.4	36.0	39.6	43.1
		C	20.57		18.5	23.1	27.7	32.4	37.0	41.6	46.2	50.8	55.5
		D	24.50		22.0	27.5	33.0	38.5	44.0	49.6	55.1	60.6	66.1
	30	B	16.00	445	17.3	21.6	25.9	28.8	34.5	38.8	43.1	47.5	51.8
		C	21.37		23.1	28.8	34.6	40.3	46.1	51.9	57.6	63.4	69.2
		D	25.29		27.3	34.1	40.9	47.7	54.6	61.4	68.2	75.0	81.8
	35	B	15.93	445	20.0	25.1	30.1	35.0	40.1	45.1	50.1	55.1	60.1
		C	22.08		27.8	34.7	41.7	48.5	55.6	62.5	69.5	76.4	83.4
		D	25.98		32.7	40.9	49.0	57.1	65.4	73.6	81.7	89.9	98.1
	40	B	16.55	445	23.8	29.8	35.7	41.7	47.6	53.6	59.5	65.5	71.4
		C	22.71		32.7	40.8	49.0	57.2	65.3	73.5	81.7	89.8	98.0
		D	26.59		38.2	47.8	57.4	66.9	76.5	86.0	95.6	105.2	114.7

Design of Shear Walls to Transfer the Wind Loads – **Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
105	<15	B	16.00	445	8.6	10.8	12.9	15.1	17.3	19.4	21.6	23.7	25.9
		C	20.37		11.0	13.7	16.5	17.4	22.0	24.7	27.5	30.2	33.0
		D	24.72		13.3	16.7	20.0	21.2	26.7	30.0	33.3	36.7	40.0
	20	B	16.00	445	11.5	14.4	17.3	17.1	23.0	25.9	28.8	31.6	34.5
		C	21.64		15.6	19.5	23.3	24.7	31.1	35.0	38.9	42.8	46.7
		D	25.98		18.7	23.4	28.0	29.7	37.4	42.0	46.7	51.4	56.0
	25	B	16.00	445	14.4	18.0	21.6	22.8	28.8	32.4	36.0	39.6	43.1
		C	22.68		20.4	25.5	30.6	32.4	40.8	45.9	51.0	56.1	61.2
		D	27.01		24.3	30.3	36.4	38.5	48.6	54.6	60.7	66.8	72.8
	30	B	16.81	445	18.1	22.7	27.2	28.8	36.3	40.8	45.3	49.9	54.4
		C	23.56		25.4	31.8	38.1	40.3	50.8	57.2	63.5	69.9	76.2
		D	27.88		30.1	37.6	45.1	47.7	60.1	67.7	75.2	82.7	90.2
	35	B	17.56	445	22.1	27.6	33.1	35.0	44.2	49.7	55.2	60.8	66.3
		C	24.34		30.6	38.3	45.9	48.5	61.3	68.9	76.6	84.2	91.9
		D	28.64		36.0	45.1	54.1	57.1	72.1	81.1	90.1	99.1	108.1
	40	B	18.25	445	26.2	32.8	39.4	41.7	52.5	59.1	65.6	72.2	78.7
		C	25.04		36.0	45.0	54.0	57.2	72.0	81.0	90.0	99.0	108.0
		D	29.31		42.2	52.7	63.2	66.9	84.3	94.8	105.4	115.9	126.5

Design of Shear Walls to Transfer the Wind Loads **– Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
110	<15	B	16.00	445	8.6	10.8	12.9	15.1	17.3	19.4	21.6	23.7	25.9
		C	22.35		12.1	15.1	18.1	17.4	24.1	27.1	30.1	33.1	36.2
		D	27.13		14.6	18.3	21.9	21.2	29.3	32.9	36.6	40.2	43.9
	20	B	16.43	445	11.8	14.8	17.7	17.1	23.6	26.6	29.5	32.5	35.4
		C	23.75		17.1	21.3	25.6	24.7	34.2	38.4	42.7	47.0	51.2
		D	28.52		20.5	25.6	30.8	29.7	41.0	46.1	51.3	56.4	61.5
	25	B	17.51	445	15.7	19.7	23.6	22.8	31.5	35.4	39.3	43.3	47.2
		C	24.89		22.4	28.0	33.6	32.4	44.7	50.3	55.9	61.5	67.1
		D	29.65		26.7	33.3	40.0	38.5	53.3	60.0	66.6	73.3	80.0
	30	B	18.45	445	19.9	24.9	29.9	28.8	39.8	44.8	49.8	54.7	59.7
		C	25.86		27.9	34.9	41.8	40.3	55.8	62.8	69.7	76.7	83.7
		D	30.60		33.0	41.3	49.5	47.7	66.0	74.3	82.5	90.8	99.0
	35	B	19.28	445	24.3	30.3	36.4	35.0	48.5	54.6	60.7	66.7	72.8
		C	26.72		33.6	42.0	50.4	48.5	67.3	75.7	84.1	92.5	100.9
		D	31.43		39.6	49.4	59.3	57.1	79.1	89.0	98.9	108.8	118.7
	40	B	20.03	445	28.8	36.0	43.2	41.7	57.6	64.8	72.0	79.2	86.4
		C	27.48		39.5	49.4	59.3	57.2	79.0	88.9	98.8	108.7	118.6
		D	32.17		46.3	57.8	69.4	66.9	92.5	104.1	115.7	127.2	138.8

Design of Shear Walls to Transfer the Wind Loads **– Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
120	<15	B	18.01	445	9.7	12.1	14.6	17.0	19.4	21.9	24.3	26.7	29.1
		C	26.60		14.3	17.9	21.5	25.1	28.7	32.3	35.9	39.5	43.0
		D	32.28		17.4	21.8	26.1	30.5	34.8	39.2	43.5	47.9	52.2
	20	B	19.55	445	14.1	17.6	21.1	24.6	28.1	31.6	35.1	38.7	42.2
		C	28.26		20.3	25.4	30.5	35.6	40.6	45.7	50.8	55.9	61.0
		D	33.94		24.4	30.5	36.6	42.7	48.8	54.9	61.0	67.1	73.2
	25	B	20.84	445	18.7	23.4	28.1	32.8	37.5	42.1	46.8	51.5	56.2
		C	29.62		26.6	33.3	39.9	46.6	53.2	59.9	66.6	73.2	79.9
		D	35.28		31.7	39.6	47.6	55.5	63.4	71.4	79.3	87.2	95.1
	30	B	21.95	445	23.7	29.6	35.5	41.4	47.4	53.3	59.2	65.1	71.0
		C	30.78		33.2	41.5	49.8	58.1	66.4	74.7	83.0	91.3	99.6
		D	36.42		39.3	49.1	58.9	68.7	78.6	88.4	98.2	108.0	117.8
	35	B	22.94	445	28.8	36.0	43.2	50.4	57.6	64.8	72.0	79.2	86.4
		C	31.79		39.9	49.9	59.9	69.9	79.8	89.8	99.8	109.8	119.8
		D	37.41		47.0	58.7	70.5	82.2	93.9	105.7	117.4	129.2	140.9
	40	B	23.83	445	34.3	42.8	51.4	60.0	68.6	77.1	85.7	94.3	102.8
		C	32.70		47.0	58.8	70.5	82.3	94.1	105.8	117.6	129.3	141.1
		D	38.29		55.1	68.8	82.6	96.4	110.1	123.9	137.7	151.4	165.2

Design of Shear Walls to Transfer the Wind Loads – Continued

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
125	<15	B	19.54	445	10.5	13.2	15.8	18.4	21.1	23.7	26.3	29.0	31.6
		C	28.86		15.6	19.5	23.3	27.2	31.1	35.0	38.9	42.8	46.7

		D	35.03		18.9	23.6	28.3	33.1	37.8	42.5	47.2	52.0	56.7
	20	B	21.21	445	15.3	19.1	22.9	26.7	30.5	34.3	38.1	42.0	45.8
		C	30.66		22.1	27.6	33.1	38.6	44.1	49.6	55.1	60.6	66.2
		D	36.82		26.5	33.1	39.7	46.3	53.0	59.6	66.2	72.8	79.4
	25	B	22.61	445	20.3	25.4	30.5	35.6	40.6	45.7	50.8	55.9	61.0
		C	32.14		28.9	36.1	43.3	50.6	57.8	65.0	72.2	79.4	86.7
		D	38.28		34.4	43.0	51.6	60.2	68.8	77.4	86.0	94.6	103.2
	30	B	23.82	445	25.7	32.1	38.5	45.0	51.4	57.8	64.2	70.7	77.1
		C	33.40		36.0	45.0	54.0	63.0	72.0	81.1	90.1	99.1	108.1
		D	39.52		42.6	53.3	63.9	74.6	85.2	95.9	106.6	117.2	127.9

Design of Shear Walls to Transfer the Wind Loads **- Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
130	<15	B	21.13	445	11.4	14.2	17.1	19.9	22.8	25.6	28.5	31.3	34.2
		C	31.22		16.8	21.0	25.3	29.5	33.7	37.9	42.1	46.3	50.5
		D	37.89		20.4	25.5	30.6	35.8	40.9	46.0	51.1	56.2	61.3
	20	B	22.95	445	16.5	20.6	24.8	28.9	33.0	37.1	41.3	45.4	49.5
		C	33.17		23.8	29.8	35.8	41.7	47.7	53.7	59.6	65.6	71.5
		D	39.83		28.6	35.8	43.0	50.1	57.3	64.4	71.6	78.8	85.9
	25	B	24.46	445	22.0	27.5	33.0	38.5	44.0	49.5	55.0	60.5	65.9
		C	34.76		31.2	39.1	46.9	54.7	62.5	70.3	78.1	85.9	93.7
		D	41.41		37.2	46.5	55.8	65.1	74.4	83.7	93.0	102.4	111.7
	30	B	25.76	445	27.8	34.7	41.7	48.6	55.6	62.5	69.5	76.4	83.4
		C	36.12		39.0	48.7	58.4	68.2	77.9	87.7	97.4	107.1	116.9
		D	42.74		46.1	57.6	69.2	80.7	92.2	103.7	115.3	126.8	138.3

Design of Shear Walls to Transfer the Wind Loads **- Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity	Building Width perpendicular to Wind Direction (ft)

				of Walls	16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf	(lb/ft)	Required Wall Length Parallel to Wind Direction (ft)								
140	<15	B	24.51	445	13.2	16.5	19.8	23.1	26.4	29.7	33.0	36.4	39.7
		C	36.20		19.5	24.4	29.3	34.2	39.1	43.9	48.8	53.7	58.6
		D	43.94		23.7	29.6	35.5	41.5	47.4	53.3	59.2	65.2	71.1
	20	B	26.61	445	19.1	23.9	28.7	33.5	38.3	43.1	47.8	52.6	57.4
		C	38.47		27.7	34.6	41.5	48.4	55.3	62.2	69.2	76.1	83.0
		D	46.19		33.2	41.5	49.8	58.1	66.4	74.7	83.0	91.3	99.7
	25	B	28.36	445	25.5	31.9	38.2	44.6	51.0	57.4	63.7	70.1	76.5
		C	40.32		36.2	45.3	54.4	63.4	72.5	81.5	90.6	99.7	108.7
		D	48.02		43.2	54.0	64.7	75.5	86.3	97.1	107.9	118.7	129.5
	30	B	29.88	445	32.2	40.3	48.3	56.4	64.5	72.5	80.6	88.6	96.7
		C	41.89		45.2	56.5	67.8	79.1	90.4	101.7	113.0	124.3	135.6
		D	49.57		53.5	66.8	80.2	93.6	106.9	120.3	133.7	147.0	160.4

Design of Shear Walls to Transfer the Wind Loads - **Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf	(lb/ft)	Required Wall Length Parallel to Wind Direction (ft)								
145	<15	B	26.29	445	14.2	17.7	21.3	24.8	28.4	31.9	35.5	39.0	42.5
		C	38.84		20.9	26.2	31.4	36.7	41.9	47.1	52.4	57.6	62.8
		D	47.13		25.4	31.8	38.1	44.5	50.8	57.2	63.6	69.9	76.3
	20	B	28.55	445	20.5	25.7	30.8	35.9	41.1	46.2	51.3	56.5	61.6
		C	41.26		29.7	37.1	44.5	51.9	59.3	66.8	74.2	81.6	89.0
		D	49.55		35.6	44.5	53.4	62.4	71.3	80.2	89.1	98.0	106.9
	25	B	30.43	445	27.3	34.2	41.0	47.9	54.7	61.5	68.4	75.2	82.0
		C	43.25		38.9	48.6	58.3	68.0	77.7	87.5	97.2	106.9	116.6
		D	51.51		46.3	57.9	69.5	81.0	92.6	104.2	115.8	127.3	138.9
	30	B	32.05	445	34.6	43.2	51.9	60.5	69.1	77.8	86.4	95.1	103.7
		C	44.94		48.5	60.6	72.7	84.8	96.9	109.1	121.2	133.3	145.4
		D	53.17		57.4	71.7	86.0	100.4	114.7	129.0	143.4	157.7	172.1

Design of Shear Walls to Transfer the Wind Loads **- Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
150	<15	B	28.14	445	15.2	19.0	22.8	26.6	30.4	34.1	37.9	41.7	45.5
		C	41.56		22.4	28.0	33.6	39.2	44.8	50.4	56.0	61.6	67.2
		D	50.44		27.2	34.0	40.8	47.6	54.4	61.2	68.0	74.8	81.6
	20	B	30.55	445	22.0	27.5	33.0	38.4	43.9	49.4	54.9	60.4	65.9
		C	44.16		31.8	39.7	47.6	55.6	63.5	71.4	79.4	87.3	95.3
		D	53.03		38.1	47.7	57.2	66.7	76.3	85.8	95.3	104.9	114.4
	25	B	32.56	445	29.3	36.6	43.9	51.2	58.5	65.9	73.2	80.5	87.8
		C	46.28		41.6	52.0	62.4	72.8	83.2	93.6	104.0	114.4	124.8
		D	55.13		49.6	61.9	74.3	86.7	99.1	111.5	123.9	136.3	148.7
	30	B	34.30	445	37.0	46.2	55.5	64.7	74.0	83.2	92.5	101.7	111.0
		C	48.09		51.9	64.8	77.8	90.8	103.7	116.7	129.7	142.7	155.6
		D	56.90		61.4	76.7	92.1	107.4	122.8	138.1	153.4	168.8	184.1

Design of Shear Walls to Transfer the Wind Loads **– Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
160	<15	B	32.02	445	17.3	21.6	25.9	30.2	34.5	38.8	43.2	47.5	51.8
		C	47.29		25.5	31.9	38.3	44.6	51.0	57.4	63.8	70.1	76.5
		D	57.39		31.0	38.7	46.4	54.2	61.9	69.6	77.4	85.1	92.9
	20	B	34.76	445	25.0	31.2	37.5	43.7	50.0	56.2	62.5	68.7	75.0
		C	50.24		36.1	45.2	54.2	63.2	72.3	81.3	90.3	99.4	108.4
		D	60.33		43.4	54.2	65.1	75.9	86.8	97.6	108.5	119.3	130.2
	25	B	37.05	445	33.3	41.6	49.9	58.3	66.6	74.9	83.2	91.6	99.9
		C	52.66		47.3	59.2	71.0	82.8	94.7	106.5	118.3	130.2	142.0
		D	62.72		56.4	70.5	84.6	98.7	112.8	126.9	140.9	155.0	169.1

Design of Shear Walls to Transfer the Wind Loads **- Continued**

Basic Wind Speed	Building Height	Exposure Category	qh	Shear Capacity of Walls (lb/ft)	Building Width perpendicular to Wind Direction (ft)								
					16	20	24	28	32	36	40	44	48
(Mph)	(ft)		psf		Required Wall Length Parallel to Wind Direction (ft)								
170	<15	B	36.14	445	19.5	24.4	29.2	34.1	39.0	43.9	48.7	53.6	58.5
		C	53.38		28.8	36.0	43.2	50.4	57.6	64.8	72.0	79.2	86.4
		D	64.79		34.9	43.7	52.4	61.1	69.9	78.6	87.4	96.1	104.8
	20	B	39.24	445	28.2	35.3	42.3	49.4	56.4	63.5	70.5	77.6	84.6
		C	56.72		40.8	51.0	61.2	71.4	81.6	91.8	102.0	112.2	122.4
		D	68.11		49.0	61.2	73.5	85.7	98.0	110.2	122.4	134.7	146.9
	25	B	41.82	445	37.6	47.0	56.4	65.8	75.2	84.6	94.0	103.4	112.8
		C	59.44		53.4	66.8	80.1	93.5	106.9	120.2	133.6	146.9	160.3
		D	70.81		63.6	79.6	95.5	111.4	127.3	143.2	159.1	175.0	190.9

MHS Earthquake Calculations

Table 5: MHS Earthquake Calculations according to 2018 IBC

Site Class: A	Shear Walls Capacity (lb/ft)	Required Length of Shear Walls in each direction (ft)							
Ss (Short Period)		Building width with square plan assumption (ft)							
		16	16	24	24	32	32	40	40
		Number of Stories							
		1	2	1	2	1	2	1	2
<0.25	445	0.26	0.52	0.44	0.88	0.78	1.57	1.22	2.45
0.5	445	0.52	1.03	0.88	1.76	1.57	3.13	2.45	4.89
0.75	445	0.77	1.55	1.32	2.64	2.35	4.70	3.67	7.34
1	445	1.03	2.07	1.76	3.52	3.13	6.26	4.89	9.78
>1.25	445	1.29	2.58	2.20	4.40	3.91	7.83	6.11	12.23

Continued (Site Class B)

Site Class: B	Shear Walls Capacity (lb/ft)	Required Length of Shear Walls in each direction (ft)							
Ss (Short Period)		Building width with square plan assumption (ft)							
		16	16	24	24	32	32	40	40
		Number of Stories							
		1	2	1	2	1	2	1	2
<0.25	445	0.32	0.65	0.55	1.10	0.98	1.96	1.53	3.06
0.5	445	0.65	1.29	1.10	2.20	1.96	3.91	3.06	6.11
0.75	445	0.97	1.94	1.65	3.30	2.94	5.87	4.59	9.17
1	445	1.29	2.58	2.20	4.40	3.91	7.83	6.11	12.23
>1.25	445	1.61	3.23	2.75	5.50	4.89	9.78	7.64	15.29

Continued (Site Class C)

Site Class: C	Shear Walls Capacity (lb/ft)	Required Length of Shear Walls in each direction (ft)							
Ss (Short Period)		Building width with square plan assumption (ft)							
		16	16	24	24	32	32	40	40
		Number of Stories							
		1	2	1	2	1	2	1	2
<0.25	445	0.39	0.77	0.66	1.32	1.17	2.35	1.83	3.67
0.5	445	0.77	1.55	1.32	2.64	2.35	4.70	3.67	7.34
0.75	445	1.07	2.13	1.82	3.63	3.23	6.46	5.04	10.09
1	445	1.29	2.58	2.20	4.40	3.91	7.83	6.11	12.23
>1.25	445	1.61	3.23	2.75	5.50	4.89	9.78	7.64	15.29

Continued (Site Class D)

Site Class: D	Shear Walls Capacity (lb/ft)	Required Length of Shear Walls in each direction (ft)							
Ss (Short Period)		Building width with square plan assumption (ft)							
		16	16	24	24	32	32	40	40
		Number of Stories							
		1	2	1	2	1	2	1	2
<0.25	445	0.52	1.03	0.88	1.76	1.57	3.13	2.45	4.89
0.5	445	0.90	1.81	1.54	3.08	2.74	5.48	4.28	8.56
0.75	445	1.16	2.32	1.98	3.96	3.52	7.04	5.50	11.01
1	445	1.42	2.84	2.42	4.84	4.30	8.61	6.73	13.45
>1.25	445	1.61	3.23	2.75	5.50	4.89	9.78	7.64	15.29

Continued (Site Class E)

Site Class: E	Shear Walls Capacity (lb/ft)	Required Length of Shear Walls in each direction (ft)							
Ss (Short Period)		Building width with square plan assumption (ft)							
		16	16	24	24	32	32	40	40
		Number of Stories							
		1	2	1	2	1	2	1	2
<0.25	445	0.81	1.61	1.38	2.75	2.45	4.89	3.82	7.64
0.5	445	1.10	2.20	1.87	3.74	3.33	6.65	5.20	10.40
0.75	445	1.16	2.32	1.98	3.96	3.52	7.04	5.50	11.01
1	445	1.32	2.50	1.98	3.96	3.52	7.04	5.50	11.01
>1.25	445	1.45	2.91	2.48	4.95	4.40	8.81	6.88	13.76

* The earthquake forces must be transferred using MHS Wood Shear Panels (Based on Cyclic Experimental Results).
* Seismic Importance Factor is assumed equal to 1.0
* Seismic Design Category is assumed to be "D".
* Redundancy Factor is assumed equal to 1.0.
* Non-Irregularity is considered.
* Min shear wall length is 4 feet.
* The effects of vertical component of Earthquake should be considered separately with 3d modeling and analyses.
* The total Drift of the Building must be controlled using appropriate load combinations.
* The Behavior Factor of this system is considered equal to 7 for LRFD and 7*1.4=9.8 for ASD.
*These tables are given just for initial view of required walls for MHS Buildings. It is evident that because of complexity of earthquake load determination and its distribution in the structure and also the drift control in the building, it is highly recommended to do more accurate analyses for each building.
* By the Case, the partition effect should be considered separately.

MHS-Structural Insulated Panel Frame Assembly for Wall, floor and roof Panels

MHS prefab-Structural Insulated Panel Frame Assemblies *recognized under this Technical Report and will be limited to the following items:*

a. Structural capacity of wall, floor and roof assemblies consisting of an aluminum frame with infill SIPs. The structural capacity of the SIPs with EPS Foam as the core materials used as infill panels in the MHS aluminum frame will be limited to resist out-of-plane (walls, roofs, and floors) and in-plane loads (MHS-shear walls only). The axial loads on the walls will be resisted by the MHS aluminum framing members acting as posts and beams.

b. Complete plans and design calculations bearing the signature of a licensed civil or structural engineer registered in the State of California shall be submitted to Structural Plan Check Section for review and approval.

c. Panel (EPS) can be used as interior and exterior infill.

d. Connections of the panel to building frame shall be installed in accordance with the US SYSTEMS details and assembly instructions.

e. MHS structural aluminum connection shall be installed in accordance with the details and Locations of connectors must be detailed on approved plans by Plan Check.

f. The framing and panels shall be installed per the manufacturer's erection instructions. A copy of these instructions shall be available on the construction site.

MHS LARR (25703) DETAILS:
MHS Structural Insulated Panel Frame Assembly consists of prefabricated MHS Modular aluminum frame extrusions in conjunction with structural insulated panels (SIP) with EPS foam plastic core material.
All structural insulated panel (SIP) with EPS foam cores to be used with the MHS aluminum frames shall have a valid LARR, ICC or IAPMO listing number.
The aluminum frame is made of MHS aluminum extrusion 170-4W with a base material of 6061-T6 per ASTM B-221. The structural insulated panels consist of oriented strand board (OSB) laminated with structural adhesives. The adhesive shall be a Type II, Class 2, laminating adhesive complying with the ICC-ES Acceptance Criteria for Sandwich Panel Adhesives (AC05).
The EPS foam core shall have a flame spread index not exceeding 25 and a smoke density index not exceeding 450.

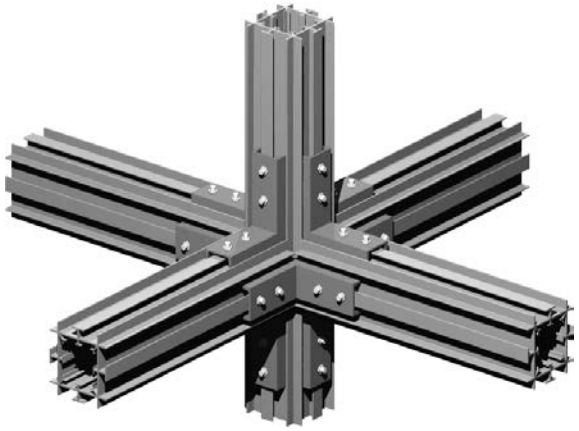
Approval conditions:
1. Complete plans and calculations bearing the signature of a licensed civil or structural engineer, registered in the State of California and shall be submitted to the Structural Plan Check Section for review and approval.
2. The panel and frame assembly shall be installed in buildings of Type V construction only.
3. For exterior and applications, panels shall be separated from the building interior with ½" gypsum board or a thermal barrier complying with Section 2603.4 of the 2020 Los Angeles Building Code.
4. Exterior walls must be protected by a water-resistive barrier complying with Section 1404.2 of the 2020 Los Angeles Building Code and by wall coverings that provide the necessary structural resistance to wind and seismic forces in spanning between wall framing members.
5. The fire-resistive rating of the panels as building elements has not been reviewed and is outside the scope of this general approval.
6. The allowable loads are noted in attached tables. The allowable panel capacities shall not be increased for wind and seismic loads.
7. The fabrication of the panels shall be in a shop of a fabricator licensed by the City of Los Angeles Department of Building and Safety in accordance with the manufacturing standards submitted to the Department.
8. Connections of the panel to the building substrate shall be per the attached connection details. The location of the panel connections must be shown and detailed on construction plans reviewed and approved by the Department.

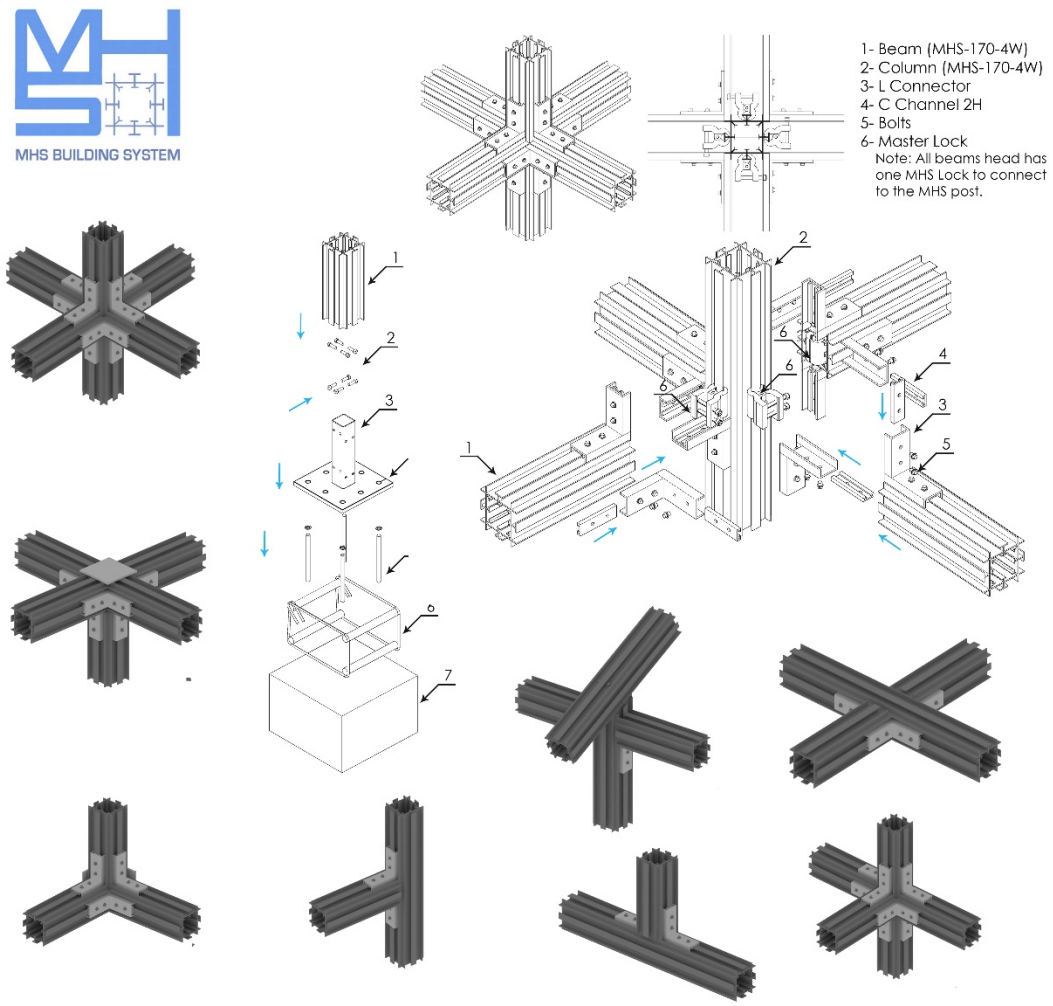
9. The panels shall be installed per the manufacturer published installation instructions. A copy of these instructions shall be available at the construction site.
10. The MHS framing member and connectors shall be labeled with the manufacturer name (MHS Building Systems Co.) and the Los Angeles Research Report number (LARR-25703)

DISCUSSION
The report is in compliance with 2020 Los Angeles Building Code.
The approval is based on tests on file with the Building Research Section.
This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this approval have been met in the project in which it is to be used.
Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

References:
1. 2006-2018 International Building Code® (IBC), International Code Council.
2. Aluminum Design Manual", The Aluminum Association Inc. 2020
3. 1997 Uniform Building Code™ (UBC).
4. ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
5. 2017-2020 Los Angeles Building Codes (Aluminum Design Manual Pt1-Specifications for aluminum structures)
6. 2016, 2019 California Residential Codes
7. Acceptance Criteria for OSB-Sandwich Panels AC04, AC05- used as insert panels and shear wall only on MHS- Structural Aluminum Framing Assembly,

Los Angeles Code Approval: MHS LARR # 25703,
IAPMO report
Laboratory: Smith Emery Lab, Los Angeles
John Latiolaite P.E, Andrew Tan P.E
Pingsheng Zhu, Testing Engineer
MHS Structural Engineer:
Engineer of Record:
Ta-Wei Lu, P.E.
P.E. #C64216
Philip Z Yin, SE
S.E. #S4633
System's Inventor Tim Siahatgar AE.
Note: Philip Yin is retained by MHS Structural Systems as Engineer of Record from May 2020 to May 2023 to review and edit this document and is not responsible for previous testing reports and analysis of MHS Structural Systems done prior to May 2020.





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