Project: Webster University
Interdisciplinary Science Building

Substitution Request Number: 25

From: Vogel Sheet Metal

To: Cannon Design

Date: 6/29/16

Re: Cladding Support Substition

Contract For:

Specification Title: Cladding Support Systems

Description: Fiberglass Clip System

Section: 074800

Page: 2

Article/Paragraph: 2.2 Cladding Support Systems

Proposed Substitution: Smartci Greengirt Clip

Trade Name: Greengirt

Model No.: Greengirt Clip

Manufacturer: Advanced Architectural Products

Address: 959 Industrial Dr.
Allegan, MI 49010

Phone: 269-355-1818

Manufacturer Web Page: smartcisystems.com

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

Savings to Owner for accepting substitution: Cascadia Clips made in Canada and lead times have been an issue due to hold up in customs. Greengirt made in USA. ($)

Proposed substitution changes Contract Time: ☐ No ☒ Yes [Add] [Deduct] days.

The Undersigned Bidding General Contractor/Construction Manager Certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified products.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

- The following supporting data is attached to this request and verifies the above statements:
  - ☐ Drawings
  - ☒ Product Data
  - ☐ Samples
  - ☒ Tests
  - ☒ Reports
  - ☐ Other (explain) _____

Submitted by: Rick Sowa

Signed by: Rick Sowa

Contractor: Vogel Sheet Metal

Address: 1642 Manufacturers Dr.
Fenton, MO 63026

Phone: 314-581-5975 Email: ricks@vogelheating.com

Review and Action

- ☐ Substitution approved – Make submittals in accordance with the Specifications.
- ☒ Substitution approved as noted – Make submittals in accordance with the Specifications.
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution received too late – Use specified materials.

Comments: Product is acceptable as substitution to specified product with following stipulations:
1. Screw fasteners shall be min. #14, stainless steel as specified.
2. Depths shall conform to drawings indicated as 3.5 in. & 5 in.
3. Seismic factor of 1.5 as specified shall be maintained.

Signed by: Kathy Williams Date: July 21, 2016

Comparison of GreenGirt v. Cascadia Clip for UMSL COBA

16” OC vertical GreenGirt at 3.5” in depth. (Wider spacing is EASILY) accommodated with the light weight cladding.

GreenGirt will have 5 fasteners every 8 feet, and will lock together to provide continuous, level girts.

GG will be installed simultaneously with the mineral with only 2 installers. This means a single revolution around the envelope.

GG retains the mineral wool without the use of Stick Pins or Washered Fasteners.

The cascadia clip requires that the hat channel be pre-drilled and attached on the ground if possible.

If a single fastener is stripped, there is no way to move the clip up or side to side to try and screw it to the stud, meaning you have no recourse but to have a screw with no pullout strength (unless of course you drill a new hole in the clip to reach the substrate)

Once you get the clips in place and the hat channel on, you must go around and install stick pins.

Once the stick pins are in place, you must go around the envelope and install the insulation while using a mineral wool knife to notch out the insulation so that the boards can touch and count as continuous insulation.

Summary:

GG is a single pass solution.

The cascadia clip is a triple pass solution.

Other Considerations:

According to Simpson Gumpertz Heger’s most recent study of CI systems, the GreenGirt is 97% thermally efficient, versus the Cascadia clip, which is only 71% efficient. If you go by the manufacturer’s data, GG is 95% thermally efficient, and the cascadia clip would be around 83% efficient.

GG has ZERO thermal Bridging.

The cascadia clip has two large fasteners cantilevering through the insulation every 2.66 SF.

GG has ZERO interstitial condensation because there are NO cold spots.

The cascadia clip has a major dew point at each fastener penetration (particularly in very cold weather).

GG is not pre-drilled, giving a much tighter fastener path, not allowing for air flow through the air barrier.

The cascadia clip is pre-drilled with holes larger than the threads of the screw, so once the air barrier is punctured, there is potentially a direct path for air/water/vapor to flow through the membrane.

Both are thoroughly tested. Both are good systems. Both are better than most other solutions. I am partial to the GreenGirt because it is faster, stronger, and easier to install.

COMMERCIAL TESTING COMPANY
1215 South Hamilton Street • Dalton, Georgia 30720
Telephone (706) 278–3935 • Facsimile (706) 278–3936

Standard Method of Test for
Surface Burning Characteristics of Building Materials

ASTM E84–14

061714–1

Report Number 14–08155

Test Number 4561–1875–0814R
June 24, 2014

Advanced Architectural Products, LLC
Allegan, Michigan

Commercial Testing Company

Deviane Jackson

(Authorized Signature)

TESTED TO BE SURE®
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INTRODUCTION

This report is a presentation of results of a surface flammability test on a material submitted by Advanced Architectural Products, LLC, Allegan, Michigan.

The test was conducted in accordance with the ASTM International fire-test-response standard E84–14, *Surface Burning Characteristics of Building Materials*, sometimes referred to as the Steiner tunnel test. ASTM E84 is an American National Standard (ANSI) and has been approved for use by agencies of the Department of Defense. The ASTM E84 test method is the technical equivalent of UL No. 723. The test is applicable to exposed interior surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated face down toward the ignition source. Thus, specimens shall either be self-supporting by its own structural quality, held in place by added supports along the test surface, or secured from the back side.

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire conditions.

PURPOSE

The purpose of the test is to provide only the comparative measurements of surface flame spread and smoke development of materials with that of select grade red oak and fiber–reinforced cement board, Grade II, under specific fire exposure conditions. The test exposes a nominal 24-foot long by 20-inch wide test specimen to a controlled air flow and flaming fire adjusted to spread the flame along the entire length of a red oak specimen in 5½ minutes. During the 10-minute test duration, flamespread over the specimen surface and density of the resulting smoke are measured and recorded. Test results are calculated relative to red oak, which has an arbitrary rating of 100, and fiber–reinforced cement board, Grade II, which has a rating of 0.

The test results are expressed as Flame Spread Index and Smoke Developed Index. The Flame Spread Index is defined in ASTM E 176 as "a number or classification indicating a comparative measure derived from observations made during the progress of the boundary of a zone of flame under defined test conditions." The Smoke Developed Index, a term specific to ASTM E84, is defined as "a number or classification indicating a comparative measure derived from smoke obscuration data collected during the test for surface burning characteristics." There is not necessarily a relationship between the two measurements.

The method does not provide for measurement of heat transmission through the surface tested, the effect of aggravated flame spread behavior of an assembly resulting from the proximity of combustible walls and ceilings, or classifying a material as noncombustible solely by means of a Flame Spread Index.

The zero reference and other parameters critical to furnace operation are verified on the day of the test by conducting a 10–minute test using 1/4–inch fiber–reinforced cement board, Grade II. Periodic tests using NOFMA certified 23/32–inch select grade red oak flooring provide data for the 100 reference.

TEST SAMPLE

The test sample, selected by the client, was identified as **061714–1,** a fiber reinforced resinous slat having a nominal thickness of 0.125-inch. The material was conditioned to equilibrium in an atmosphere with the temperature maintained at 71 ± 2°F and the relative humidity at 50 ± 5 percent. For testing, three planks each measuring 8-feet in length by 8-inches wide were place side by side making up a sample 24-inches wide. For testing, the three plank assemblies were placed end-to-end over a 2-inch hexagonal mesh wire supported by ¼-inch diameter steel rods spanning the ledges of the tunnel furnace at 24-inch intervals. This method of auxiliary sample support is described in Appendix X1 of the E 84 standard, Guide to Mounting Methods, Sections X1.1.2.2 (a) and X1.1.2.3.

TEST RESULTS

The test results, calculated on the basis of observed flame propagation and the integrated area under the

recorded smoke density curve, are presented below. The Flame Spread Index obtained in E84 is rounded to the nearest number divisible by five. Smoke Developed Indices are rounded to the nearest number divisible by five unless the Index is greater than 200. In that case, the Smoke Developed Index is rounded to the nearest 50 points. The flame spread and smoke development data are presented graphically at the end of this report.

Test Specimen	Flame Spread Index	Smoke Developed Index
Fiber-Reinforced Cement Board, Grade II	0	0
Red Oak Flooring	100	100
061714–1	**25**	**200**

OBSERVATIONS

Specimen ignition over the burners occurred at 1.58 minutes. Surface flame spread was observed to a maximum distance of 7.34 feet beyond the zero point at 7.28 minutes. The maximum temperature recorded during the test was 547°F. For information purposes, the actual (unrounded) Flame Spread and Smoke Developed Indices were 25.4 and 220.1 respectively.

CLASSIFICATION

The Flame Spread Index and Smoke Developed Index values obtained by ASTM E84 tests are frequently used by code officials and regulatory agencies in the acceptance of interior finish materials for various applications. The most widely accepted classification system is described in the National Fire Protection Association publication NFPA 101 *Life Safety Code*, where:

Class A	0 – 25 Flame Spread Index	0 – 450 Smoke Developed Index
Class B	26 – 75 Flame Spread Index	0 – 450 Smoke Developed Index
Class C	76 – 200 Flame Spread Index	0 – 450 Smoke Developed Index

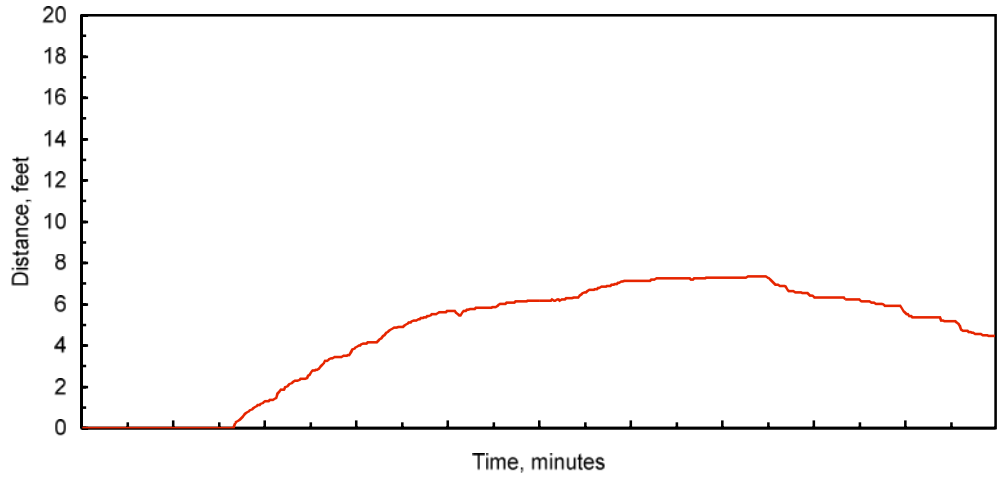
Class A, B, and C correspond to Type I, II, and III respectively in other codes. They do not preclude a material being otherwise classified by the authority of jurisdiction.

ASTM E 84 TEST DATA

Client: Advanced Architectural Products, LLC
Test Number: 4561-1875-0814R
Material Tested: 061714-1
Date: June 24, 2014

Test Results:

Time to Ignition	=	01.58 minutes
Maximum Flamespread Distance	=	07.34 feet
Time to Maximum Spread	=	07.28 minutes
Flame Spread Index	=	25
Smoke Developed Index	=	200



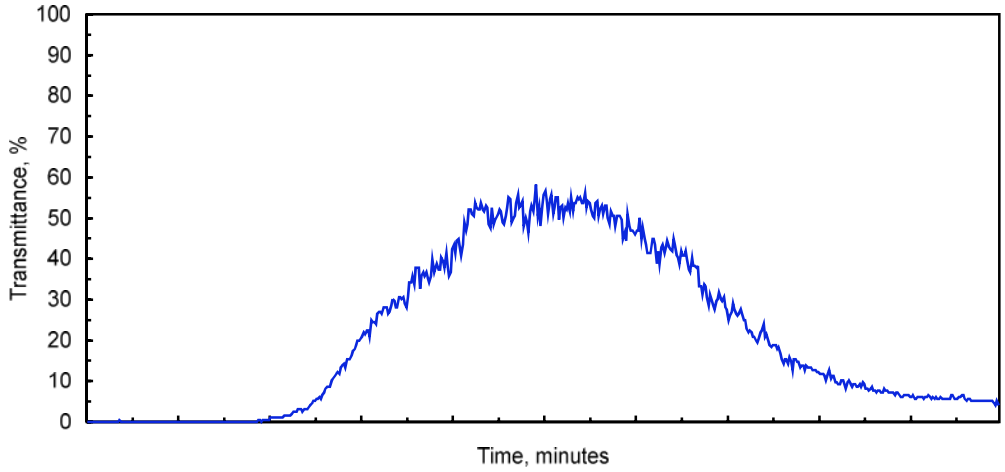


Table 1: Gen1 GreenGirt Engineering Section Properties:

SECTION PROPERTIES-GEN1-200														
Area (In^2)	Moments of Inertia (In^4)			Radii of Gyration (In)		Centroid location Bounding box (In.)					profile flange & web thickness & depth (In.)			
A	I_x	I_y	I_{xy}	r_x	r_y	X(-)	X(+)	Y(-)	Y(+)		T_{flange}	T_{web}	D_{flange}	D_{web}
1.1787	1.4645	0.6231	0.5808	1.1147	0.7271	-1.5425	1.7375	-1.2734	1.4766		0.15	0.15	2	2.75
SECTION PROPERTIES-GEN1-300														
Area (In^2)	Moments of Inertia (In^4)			Radii of Gyration (In)		Centroid location Bounding box (In.)					profile flange & web thickness & depth (In.)			
A	I_x	I_y	I_{xy}	r_x	r_y	X(-)	X(+)	Y(-)	Y(+)		T_{flange}	T_{web}	D_{flange}	D_{web}
1.3287	3.0079	0.6281	0.8062	1.5046	0.6875	-1.5213	1.7587	-1.7458	2.0042		0.15	0.15	2	3.75

Table 2: Gen2 GreenGirt Engineering Section Properties:

SECTION PROPERTIES-GEN2-200														
Area (In^2)	*Moments of Inertia (In^4)*			*Radii of Gyration (In)*		*Centroid location Bounding box (In.)*					*profile flange & web thickness & depth (In.)*			
A	I_x	I_y	I_{xy}	r_x	r_y	X(-)	X(+)	Y(-)	Y(+)		T_{flange}	T_{web}	D_{flange}	D_{web}
0.79311	0.48173	0.35836	0.312	0.77935	0.67219	-1.43934	1.42566	-0.95857	1.04143		0.14	0.105	1.485	2
SECTION PROPERTIES-GEN2-250														
Area (In^2)	Moments of Inertia (In^4)			Radii of Gyration(In)		Centroid location Bounding box (In.)					profile flange & web thickness & depth (In.)			
A	I_x	I_y	I_{xy}	r_x	r_y	X(-)	X(+)	Y(-)	Y(+)		T_{flange}	T_{web}	D_{flange}	D_{web}
0.84561	0.80735	0.35841	0.39857	0.97712	0.65104	-1.43891	1.42609	-1.20088	1.29912		0.14	0.105	1.485	2.5
SECTION PROPERTIES-GEN2-300														
Area (In^2)	Moments of Inertia (In^4)			Radii of Gyration(In)		Centroid location Bounding box (In.)					profile flange & web thickness & depth (In.)			
A	I_x	I_y	I_{xy}	r_x	r_y	X(-)	X(+)	Y(-)	Y(+)		T_{flange}	T_{web}	D_{flange}	D_{web}
0.89811	1.22901	0.35846	0.48514	1.1698	0.63176	-1.43853	1.42647	-1.44409	1.55591		0.14	0.105	1.485	3
SECTION PROPERTIES-GEN2-350														
Area (In^2)	Moments of Inertia (In^4)			Radii of Gyration(In)		Centroid location Bounding box (In.)					profile flange & web thickness & depth (In.)			
A	I_x	I_y	I_{xy}	r_x	r_y	X(-)	X(+)	Y(-)	Y(+)		T_{flange}	T_{web}	D_{flange}	D_{web}
0.95061	1.75331	0.35851	0.57171	1.35809	0.61411	-1.43853	1.42647	-1.69409	1.80591		0.14	0.105	1.485	3.5
SECTION PROPERTIES-GEN2-400														
Area (In^2)	Moments of Inertia (In^4)			Radii of Gyration(In)		Centroid location Bounding box (In.)					profile flange & web thickness & depth (In.)			
A	I_x	I_y	I_{xy}	r_x	r_y	X(-)	X(+)	Y(-)	Y(+)		T_{flange}	T_{web}	D_{flange}	D_{web}
1.00311	2.38673	0.35856	0.65827	1.54251	0.59787	-1.4379	1.4271	-1.93263	2.06737		0.14	0.105	1.485	4

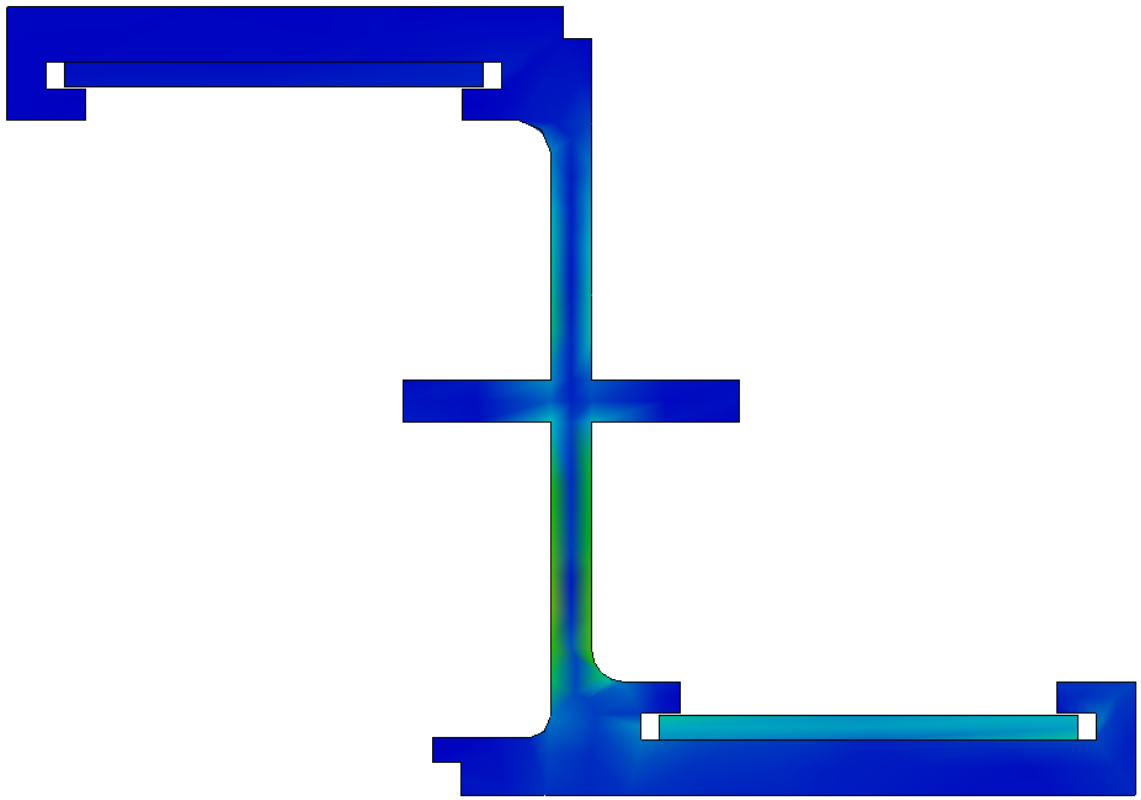
Notes:

1) Yield Stress: 30,000 psi

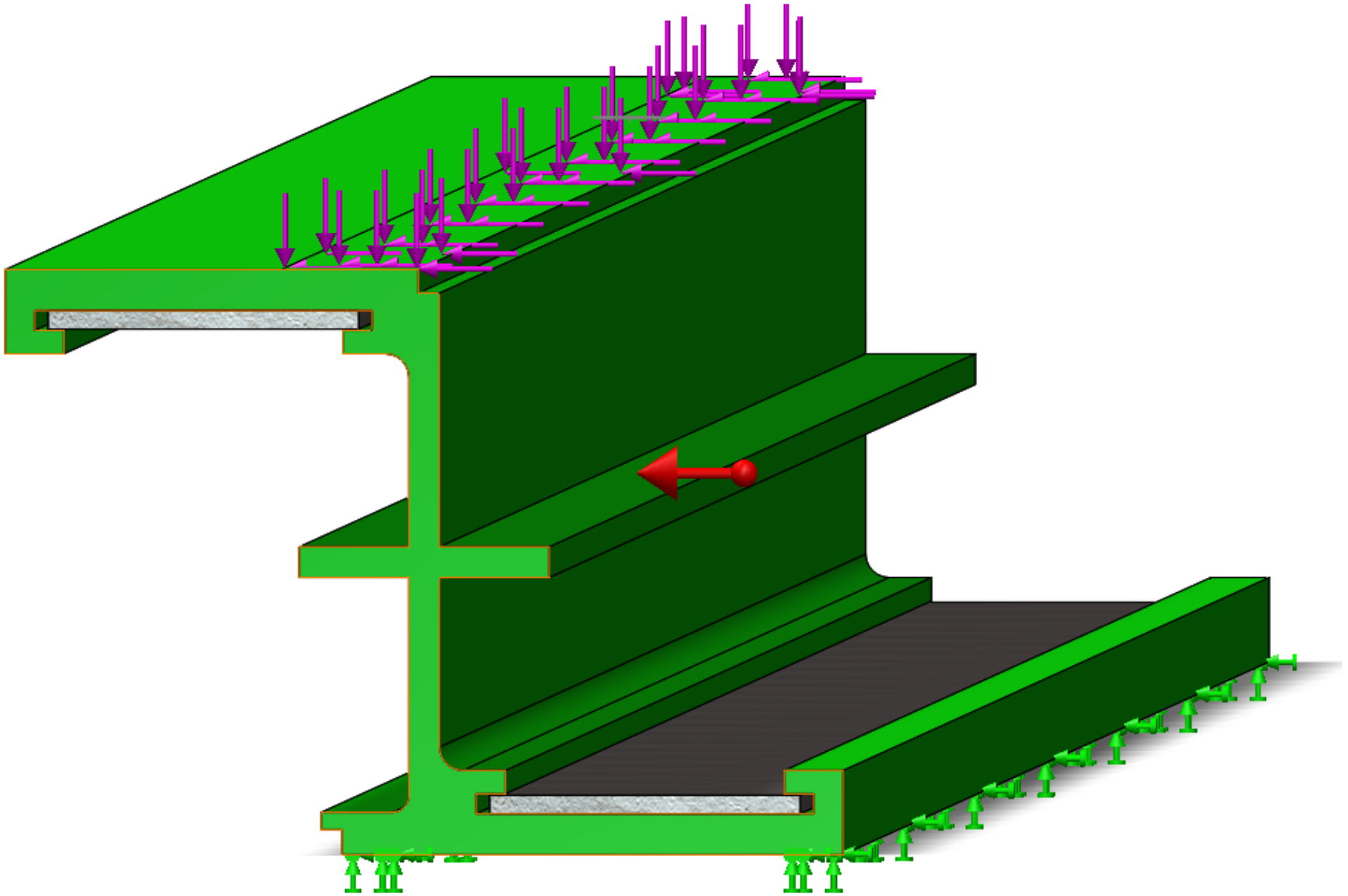
2) Modulus of elasticity: 2,500,000 psi

3) for specific section modulus use the appropriate moment of inertia and the distance from the centroid to the point of interest (maximum distances are tabulated)

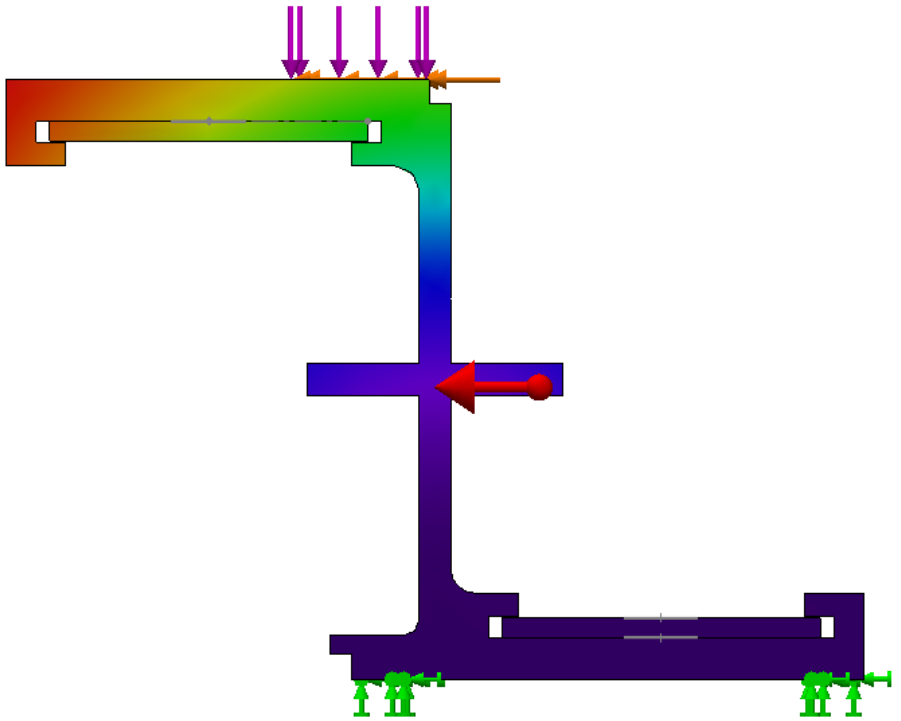
4) Please contact AAP for your specific project requirements with respect to allowable lateral loading and allowable cladding weights.

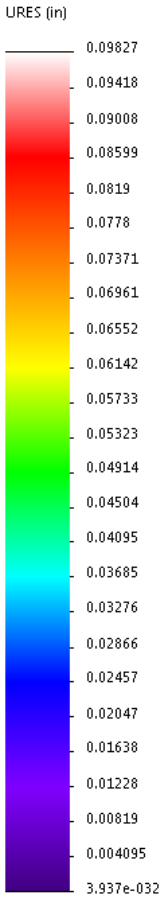


Model name: GEN2-200--8FEET-DFsz-MULTI span 16 FA
Study name: 24in_spacing_15psf-clad-75psf wind(-Default-)
Plot type: Static nodal stress Stress1
Global value: 3.92199 to 8981.31 psi



Model name: GEN2-200--8FEET-DFsz-MULTI span 16 FA
Study name: 24in_spacing_15psf-clad-75psf wind(-Default-)
Plot type: Static displacement Displacement1
Global value: 0 to 0.0982741 in

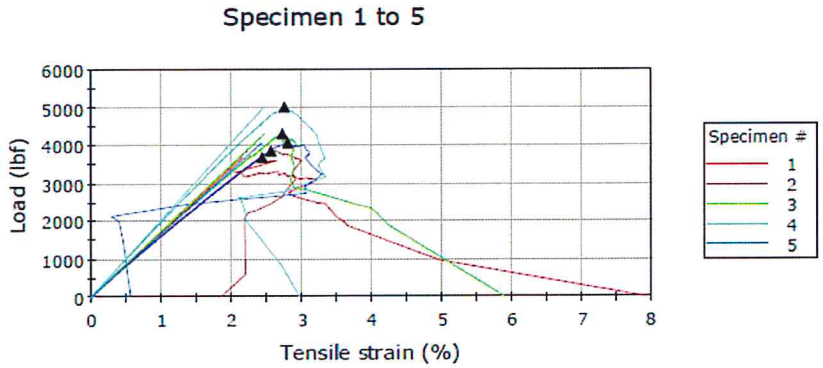




TENSILE - ASTM D638
ASTM D-638 (MAT-2202)

AF number	80437 T2 243215
SAMPLE ID	061714-1 LONGITUDINAL
XHEAD RATE	0.2 in/min
Temperature	72F
Humidity	53%
Rate 1	0.20000 in/min
Operator Name	km

Graph 1

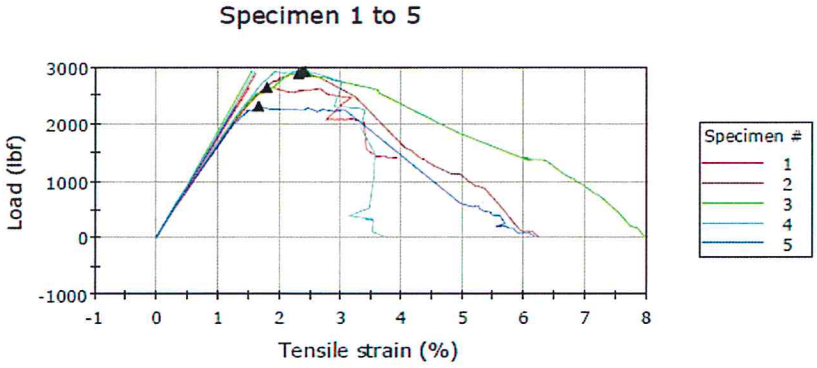


	Max Tensile Strength (psi)	Young's Modulus (ksi)	Elongation at Max Load (%)	Load at Max (lbf)	Width (in)	Thickness (in)
1	57,166	2,632.8	2.44	3,688	0.508	0.127
2	60,454	2,706.7	2.57	3,854	0.506	0.126
3	68,087	2,747.1	2.73	4,307	0.506	0.125
4	78,812	3,187.3	2.75	5,005	0.508	0.125
5	64,148	2,632.2	2.81	4,057	0.506	0.125
Mean	65,733	2,781.2	2.66	4,182	0.507	0.126
Standard Deviation	8,372	232.3	0.15	515	0.001	0.001

TENSILE - ASTM D638
ASTM D-638 (MAT-2202)

AF number	80437 T3 243217
SAMPLE ID	061614-2 TRANSVERSE
XHEAD RATE	0.2 in/min
Temperature	72F
Humidity	53%
Rate 1	0.20000 in/min
Operator Name	km

Graph 1

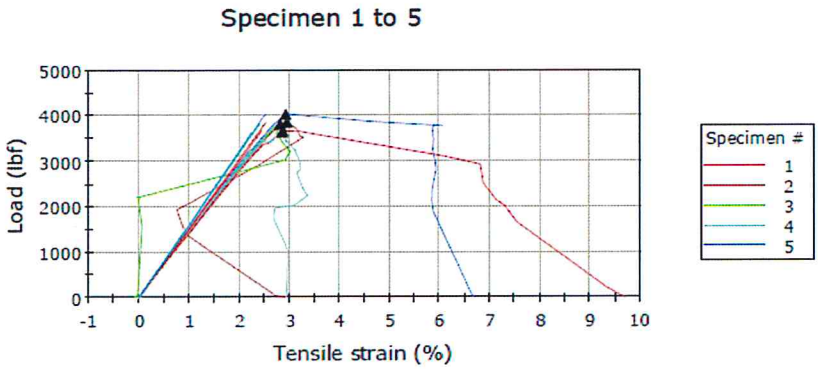


	Max Tensile Strength (psi)	Young's Modulus (ksi)	Elongation at Max Load (%)	Load at Max (lbf)	Width (in)	Thickness (in)
1	41,725	2,741.0	1.80	2,650	0.504	0.126
2	45,281	2,781.8	2.31	2,893	0.507	0.126
3	45,642	2,939.1	2.37	2,933	0.510	0.126
4	45,833	2,854.0	2.42	2,934	0.508	0.126
5	36,697	2,829.4	1.66	2,321	0.506	0.125
Mean	43,036	2,829.0	2.11	2,746	0.507	0.126
Standard Deviation	3,923	75.4	0.35	265	0.002	0.000

TENSILE - ASTM D638
ASTM D-638 (MAT-2202)

AF number	80437 T4 243219
SAMPLE ID	061614-2 LONGITUDINAL
XHEAD RATE	0.2 in/min
Temperature	72F
Humidity	53%
Rate 1	0.20000 in/min
Operator Name	km

Graph 1



	Max Tensile Strength (psi)	Young's Modulus (ksi)	Elongation at Max Load (%)	Load at Max (lbf)	Width (in)	Thickness (in)
1	57,506	2,344.9	2.87	3,674	0.507	0.126
2	59,925	2,367.2	2.94	3,866	0.508	0.127
3	60,205	2,511.8	2.82	3,823	0.508	0.125
4	57,508	2,567.0	2.86	3,645	0.507	0.125
5	63,573	2,524.5	2.93	4,037	0.508	0.125
Mean	59,744	2,463.1	2.88	3,809	0.508	0.126
Standard Deviation	2,496	100.1	0.05	159	0.001	0.001

ENGINEERING DATA FOR SCREWS

ULTIMATE AVERAGE PULLOUT VALUES IN METAL (POUNDS)

FASTENER		STEEL GAUGE											
SIZE	POINT	26	24	22	20	18	16	14	12	3/16"	1/4"	5/16"	1/2"
#6	T2	120	183	248	296	471	679	847					
#8	T2	119	193	265	298	491	703	959					
#10	T17	166	262	365	480	585							
	T1	148	241	311	357	565	826	1111	1796				
	T2	131	214	272	368	547	784	1033					
	T3	124	208	266	299	499	708	965	1474				
#12	T17	181	290	420	495	670							
	T1	159	261	338	390	649	908	1259	1947				
	T2	156	243	283	375	605	848	1181	1856	3520			
	T3	142	211	287	341	551	757	1063	1631	2998			
	T4					495	697	986	1532	3485	4013		
	T5					487	699	913	1527	3701	3999		
#14	T1	208	329	428	562	800	1151						
	T3	141	231	293	346	613	880	1145	1858	4550			
Fenderheads	T5										5322	5812	6257

ULTIMATE AVERAGE PULLOUT VALUES IN WOOD (POUNDS)

OUR CODE	FASTENER		PLYWOOD 1/2"	PLYWOOD 3/4"	2x4 PINE 1"	2x4 PINE 1 1/4"	2x4 PINE 1 1/2"
CS AS	8-15	T-17	228	258	398		
MW	9-14		271	578	680	750	880
MW	10-16	Hi-Lo	398	722	845	907	1124
CS AC	10-12	T-17	300	617	682	962	
CS AS	10-12	T-17	307	592	677	949	
CS AC	12-11	T-17	275	576	705	894	1187
CS AS	12-11	T-17	282	593	672	862	1169
AC	14-10	T-17	278	631	810	1103	1287

NOTE: Pullout values in wood will vary drastically more than pullout values in steel because of the vast inconsistencies of wood. These pullout values should be used as only a guideline. A job site pull test is required if you need to know the exact pull-out values for your specific project. Users must determine and apply appropriate safety factors.

ULTIMATE SHEAR VALUES (POUNDS)

FASTENER		STEEL GAUGE									
DIA.	POINT	26-26	24-24	22-22	20-20	18-18	16-16	14-14	12-12	1/8-1/8	1/4-1/4
6	T2	278	466	526	758	845					
8	T2	294	496	560	740	1060					
10	T1	398	584	659	884	1373					
	T2	312	478	589	830	1206					
	T3				728	1263	1540	1552			
12	T1	432	703	753	1018	1452					
	T2	365	600	623	898	1370	1756	2136	2202		
	T3				769	1358	1620	1970	1986		
	T4								2048	2030	
	T5								2650	2700	2762
14	T1	511	849	885	1244	1764					
	T3				930	1442	2100	2584	2650		

The ultimate shear AND pullout values must be reduced by at least a 4 to 1 safety factor to determine the safe actual allowable working load.

FASTENER VALUES

FASTENER	TENSILE (LBS. MIN.)	SHEAR (AVG. LBS. ULT.)	TORQUE (MIN. IN-LBS.)
6-20	1284	750	25
8-18	1544	1000	42
10-16	1936	1400	61
12-14	2778	2000	92
12-24 T4	3020	2100	100
12-24 T5	3188	2200	150
14-14	4060	2600	150
14-20 T5 Fenderheads	4225	3822	150

NOMINAL SCREW SIZES

Thread Diameter	Decimal Equivalent
#6	.140
#7	.150
#8	.160
#9	.180
#10	.190
#11	.200
#12	.210
#13	.230
1/4	.240
#14	.250

SHEET STEEL GAUGES

	Common Sheet Steel Gauges	Decimal Equivalent
LIGHT	29	.014
	26	.018
	24	.024
	22	.030
	20	.036
MEDIUM	18	.048
	16	.060
	14	.075
	12	.105
	10	.134

ADVANCED ARCHITECTURAL PRODUCTS

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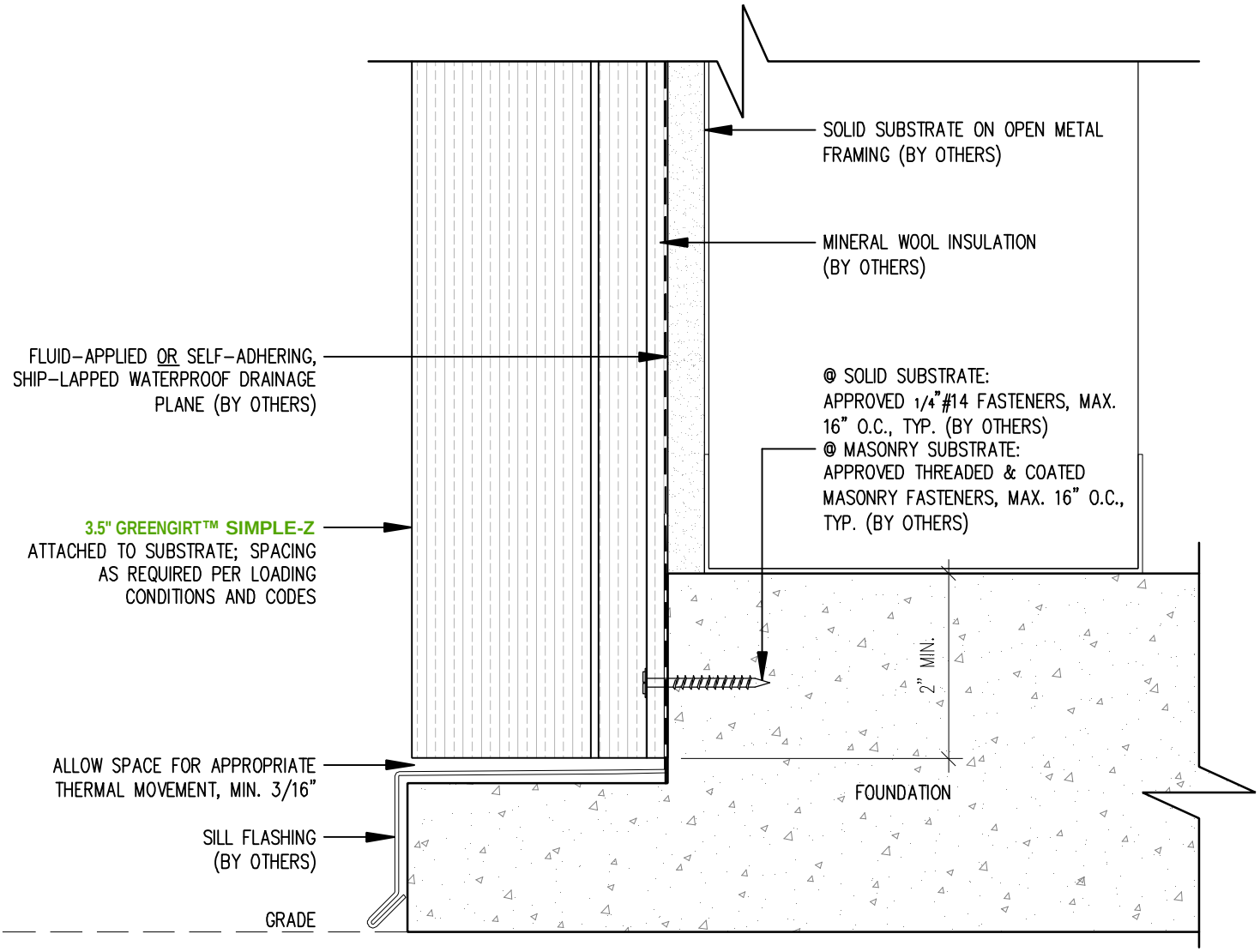

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SUBSTRATE: SOLID/MASONRY	MINERAL WOOL DETAILS
CLADDING: BY OTHERS	DATE: 06-17-2015
SIMPLE-Z SIZE: 3.5", 16" O.C.	SIMPLE-Z ORIENTATION: VERTICAL

FOUNDATION DETAIL

NOT TO SCALE

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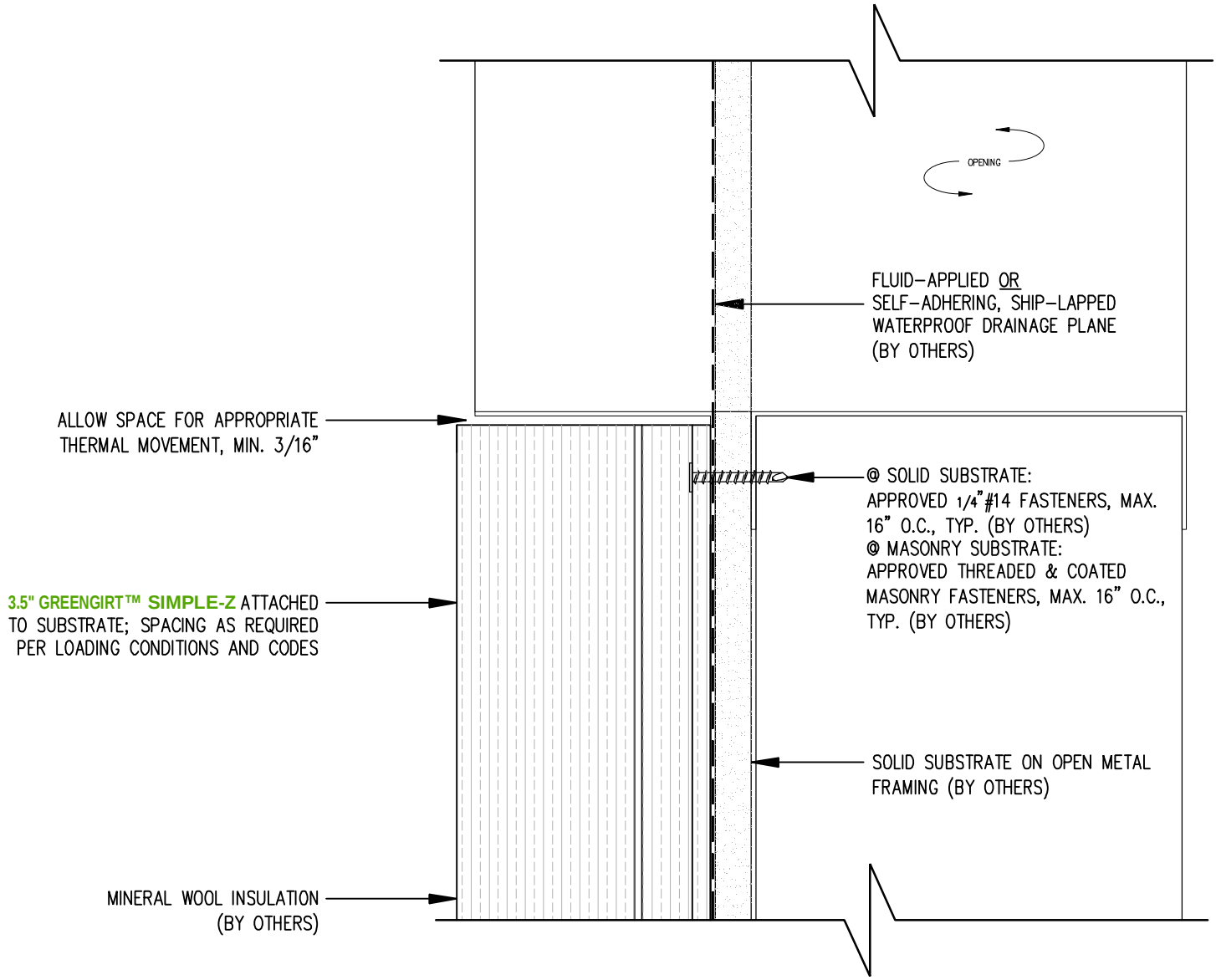

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OPENING SILL DETAIL

NOT TO SCALE

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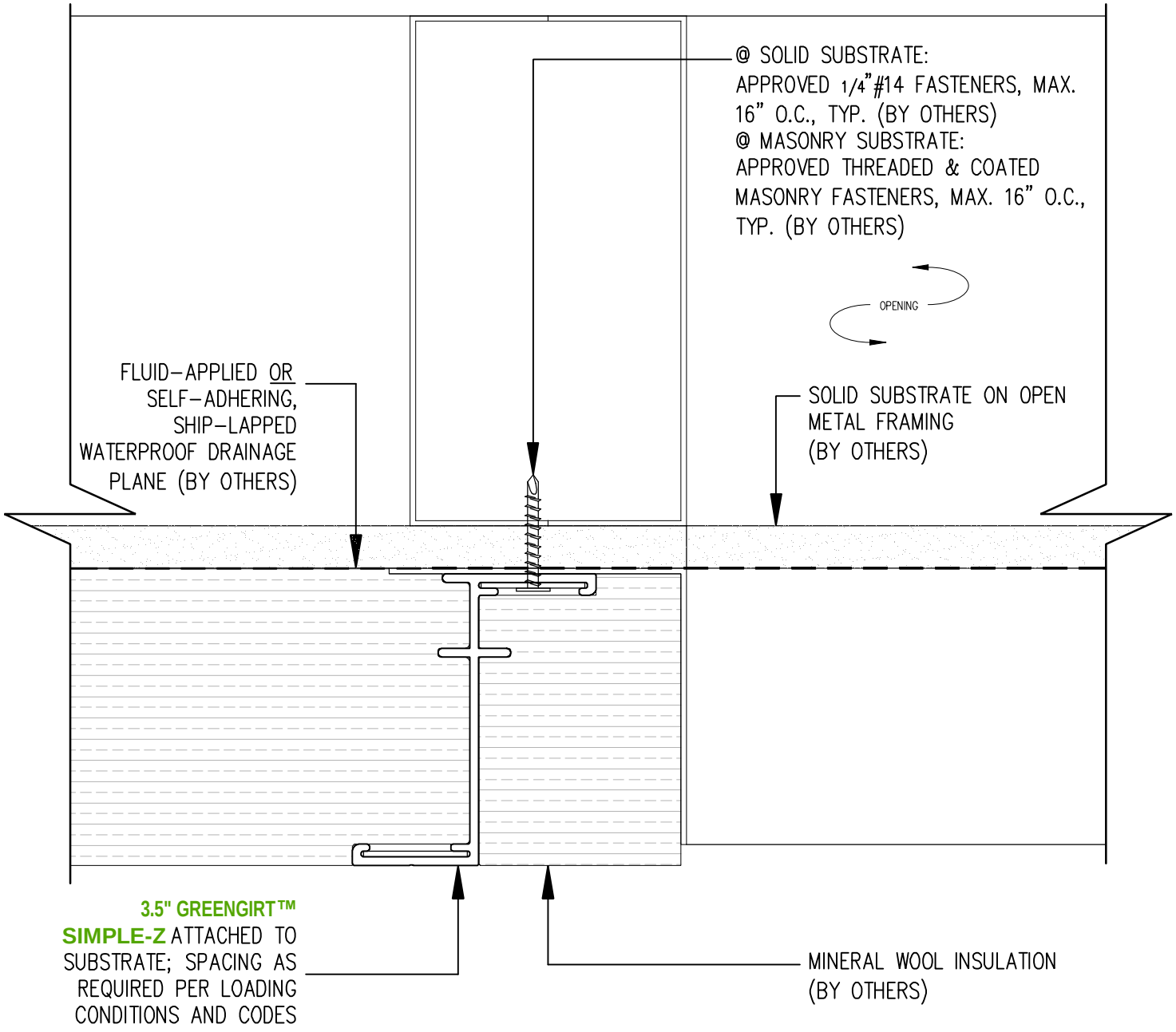

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OPENING JAMB DETAIL

NOT TO SCALE

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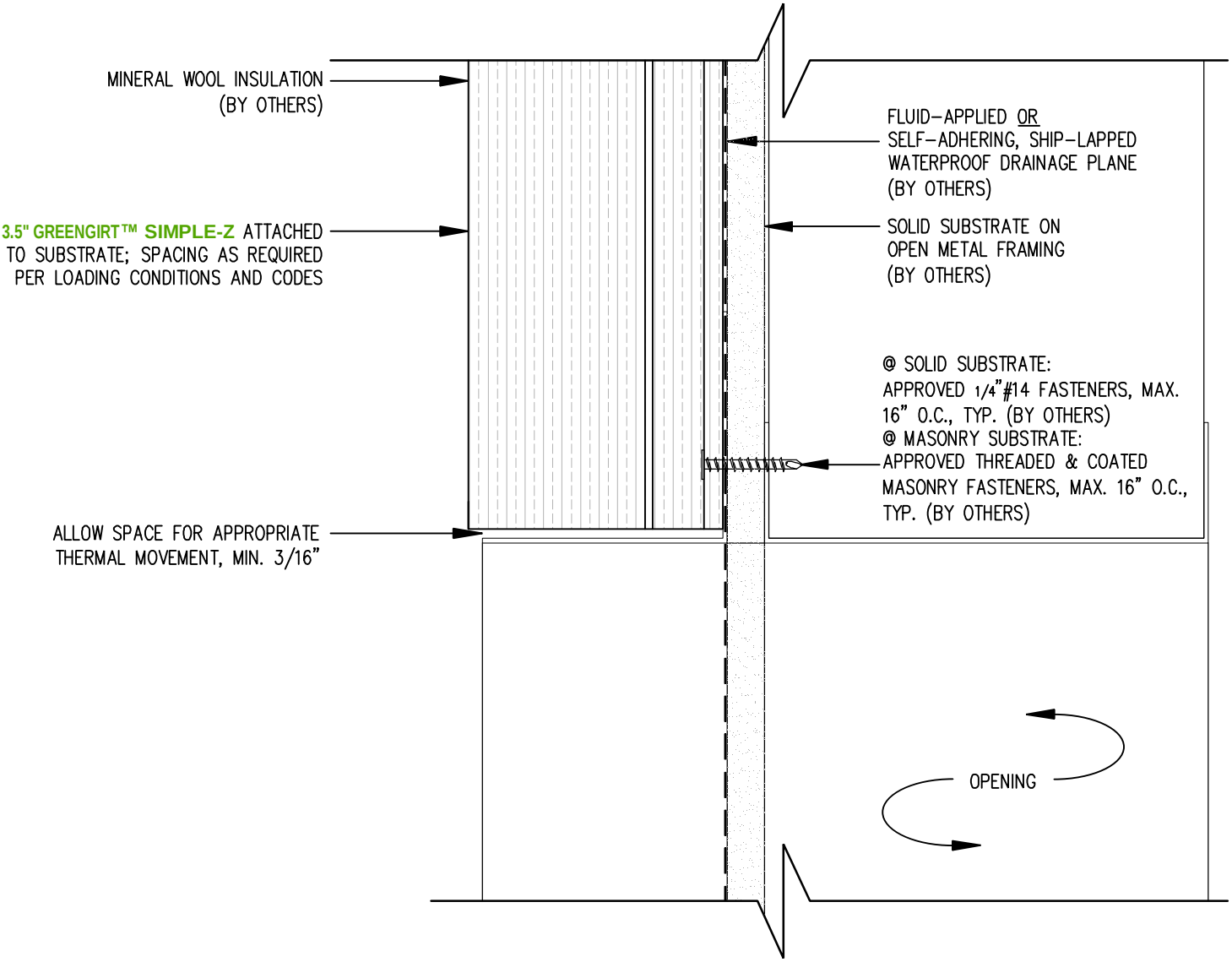

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OPENING HEADER DETAIL

NOT TO SCALE

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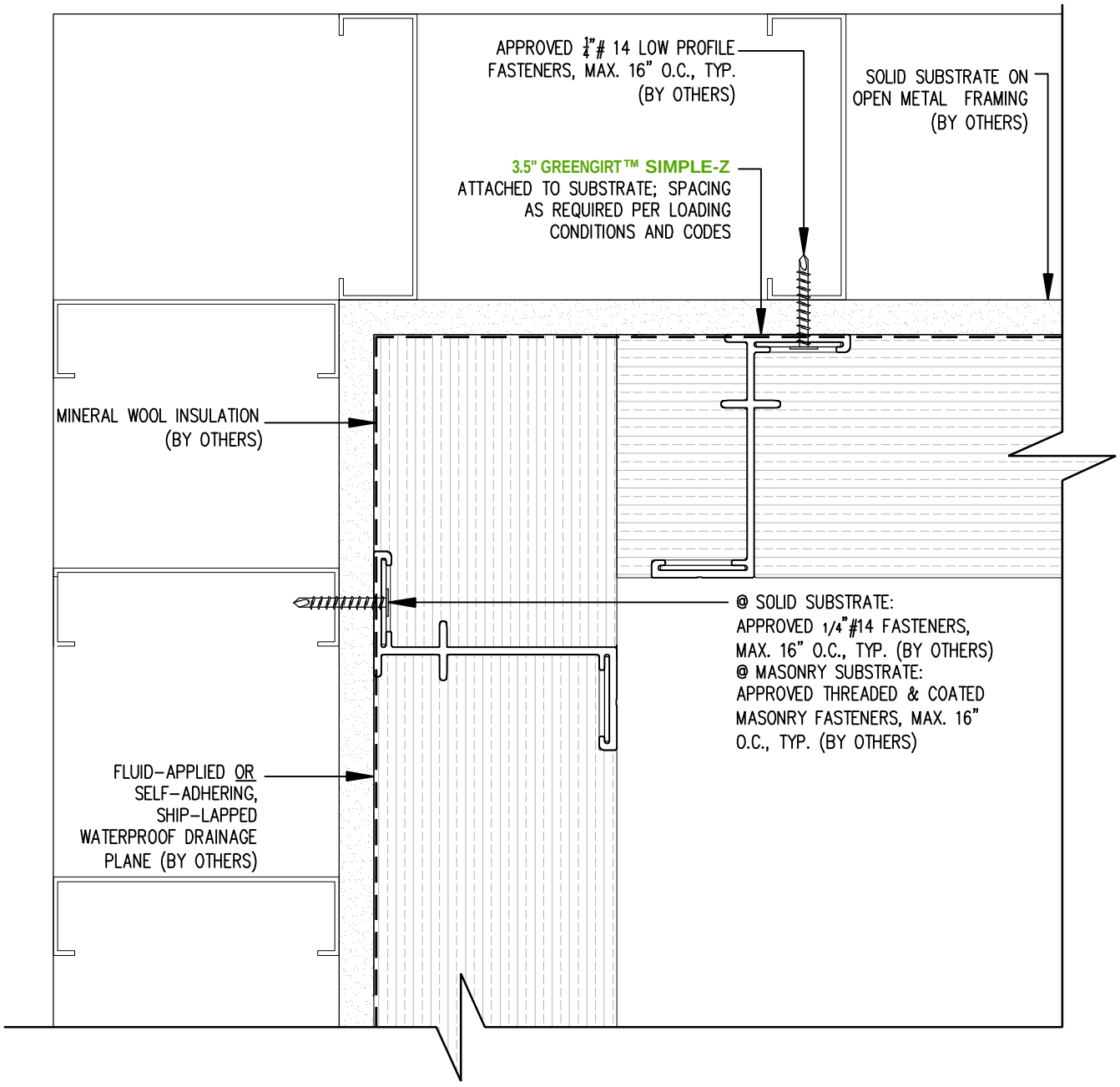

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INSIDE CORNER DETAIL

NOT TO SCALE

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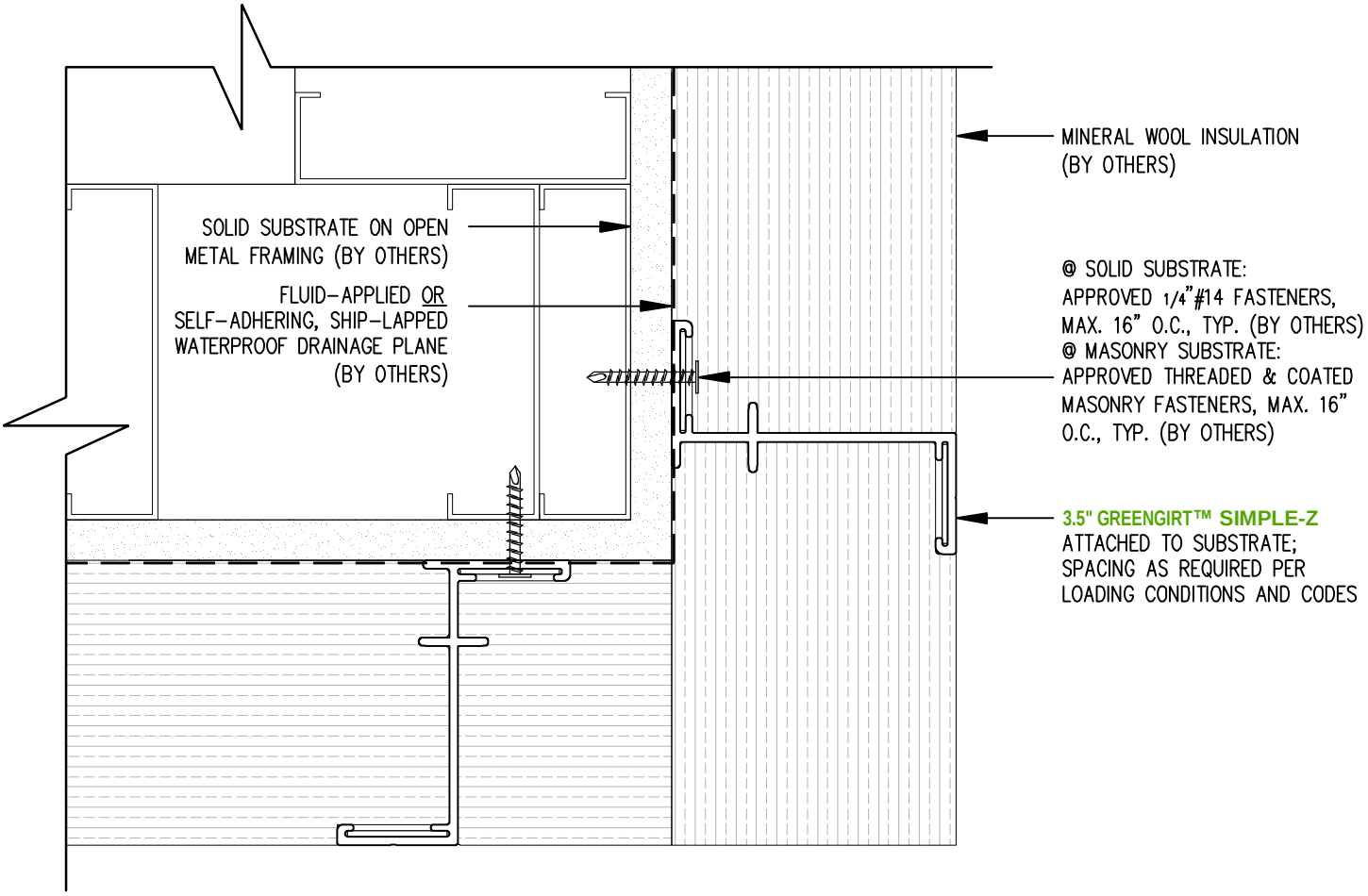

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OUTSIDE CORNER DETAIL

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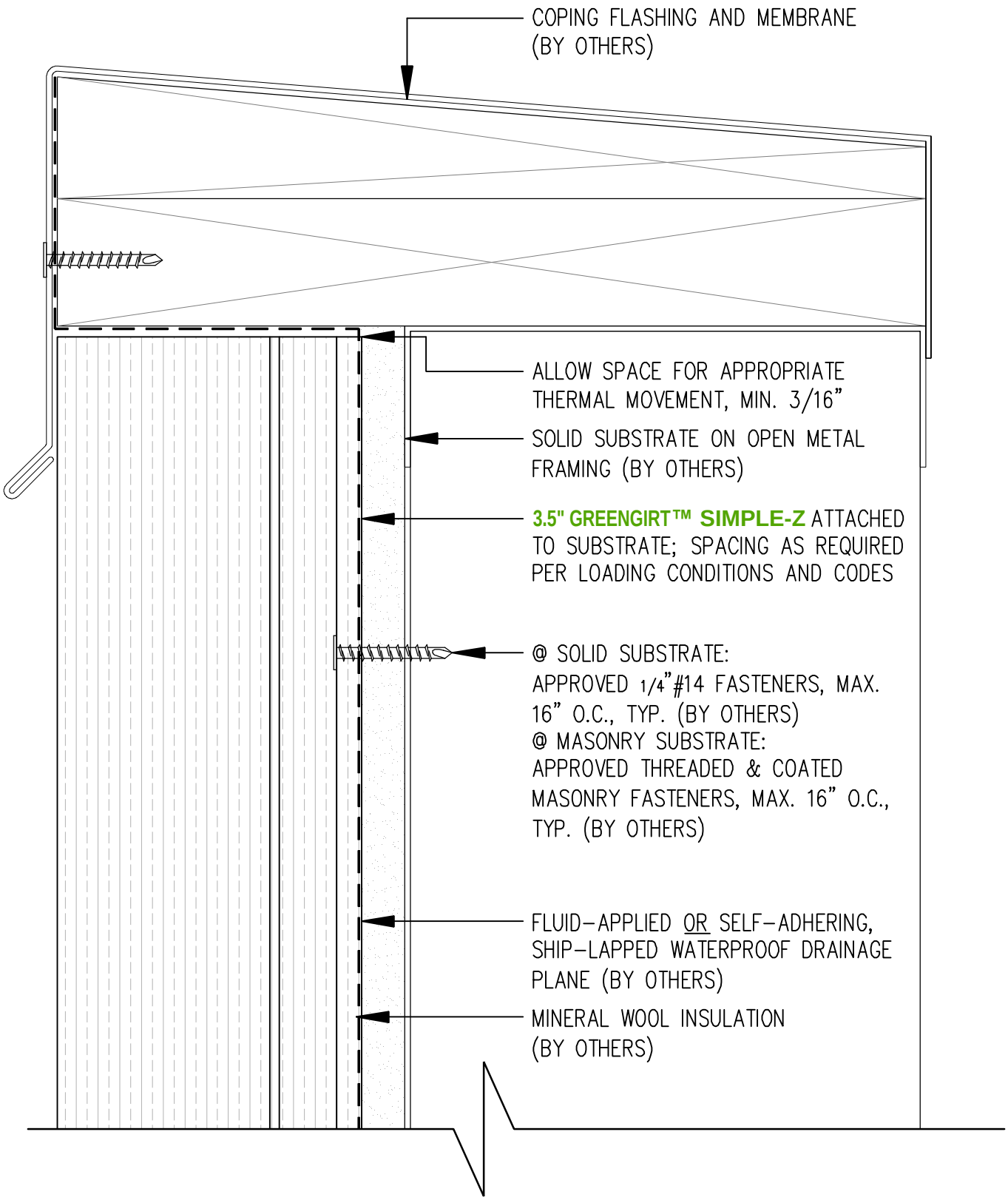

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PARAPET DETAIL

NOT TO SCALE