

PROJECT RIO-2087B-07
ENGINEERING REPORT FOR ATTACHING JAMES HARDIE® BRAND FIBER CEMENT
LAP SIDING TO ASTM C90 MASONRY UNIT WALL WITH ET & F FASTENERS

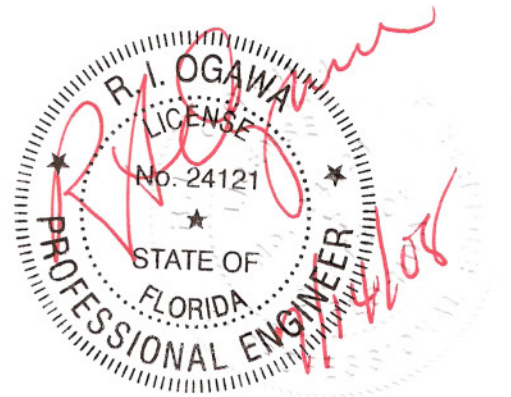
ET & F FASTENING SYSTEMS, INC.
29019 SOLON ROAD
SOLON, OHIO 44139

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This analysis is to determine allowable design loads for use of ET&F pin fasteners to fasten James Hardie Hardiplank fiber cement lap siding to concrete masonry walls complying with ASTM C90.

Reference: NER-405
 Lab. No. 29279-UDI by Applied Research Laboratories (ASTM D1761)
 ICI -1020-88 - 9.5 Hardiplank (ASTM E330)
 ICI-1034-88 - 9.5 Hardiplank (ASTM E-330)
 2007 Florida Building Code
 2006 International Building Code
 2006 International Residential Code

Pull out values reported by Applied Research indicate average value of 725 lbs with embedment of 1" and shot with a special tool. Using a FS of 8, the withdrawal is 90 lbs. Therefore, withdrawal is not a concern from concrete masonry products meeting C90. In both the tests conducted under the following report, pull through governed the results.

	Negative	Positive	fastener	Condition
from ICI-1020-88	199 psf	208 psf	6d	Exposed
from ICI-1020-88	147 psf	208 psf	11 ga roofing	Concealed

The ET &F fastener has a head diameter of 0.30 inch and a shank diameter of 0.144-inch.
 The 6d common nail has a head diameter of 0.265-inch and a shank diameter of 0.113-inch.
 The 11 ga roofing nail has a head diameter of 0.375-inch and a shank diameter of 0.12 -inch

For faced nailed application, the ET&F fastener can be substituted directly for the 6d common nail when attaching to concrete masonry walls. This is because the head diameter of the ET&F pin is equal or greater than the 6d nail tested.

For concealed conditions, the head diameter is not the same, therefore in order to use the ET&F fastener as a substitute for the 11 ga roofing nail, the spacing must be adjusted to accommodate the smaller head diameter.

According to the referenced report, the failure of the concealed fastener system was by the fastener head pulling through the Hardiplank. Therefore, we need to analyze the bearing stress on the nail head and compute the a new allowable load.

The bearing area of the fastener is the area of the head minus the shank diameter. For the 11 ga roofing nail, the net area is 0.099087 sq in. With the failure load of 149 psf, the load on each fastener is 147 psf x 9.5 x 16/144 = 155 lb per fastener.

The bearing area of the ET&F fastener is 0.055264 sq in.
 The bearing capacity of the ET&F fastener is 0.055264/.099087 x 155 lb = 87 lbs.

Applying a factor of safety of 2.5, the allowable load is 35 lbs Use FS = 2.5
 Applying a factor of safety of 2, the allowable load is 43.5 lbs

Using value for FS =2.5, the allowable pressure for various Hardiplank are:

6.25" wide	7.25" wide	8.25" wide	9.5" wide
84	70	60	51

psf

Pressure determined by dividing the allowable pin value of 35 lbs by the area of 1 foot length times the width of exposed plank width

Pressure = 35 lb x 144/(12" x (plank width - 1.25)

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Table 1 - Pressures to be Resisted at Various Wind Speeds - Exposure B

Height			Wind Spd	85	90	100	110	120	130	140	150	170
(feet)	Factor	Factor	Fastest Mile	70	75	80	90	100	110	120	130	150
	Exp B	Exp. C	Exp D	17.4	19.5	24.1	29.5	34.7	40.7	47.2	54.2	69.6
0-15	1	1.21	1.47	17.4	19.5	24.1	29.5	34.7	40.7	47.2	54.2	69.6
20	1	1.29	1.55	17.4	19.5	24.1	29.5	34.7	40.7	47.2	54.2	69.6
30	1	1.40	1.66	17.4	19.5	24.1	29.5	34.7	40.7	47.2	54.2	69.6
40	1.09	1.49	1.74	19.0	21.3	26.3	32.1	37.8	44.4	51.4	59.1	75.9
50	1.16	1.56	1.81	20.2	22.6	28.0	34.2	40.3	47.2	54.8	62.9	80.7
60	1.22	1.62	1.87	21.2	23.8	29.4	36.0	42.3	49.7	57.6	66.1	84.9
100	0.99			34	39	48	58	69	81	93	107	138

Table 2 - Pressures to be Resisted at Various Wind Speeds - Exposure C

Height			Wind Spd	85	90	100	110	120	130	140	150	170
(feet)	Factor	Factor	Fastest Mile	70	75	80	90	100	110	120	130	150
	Exp B	Exp. C	Exp D	17.4	19.5	24.1	29.5	34.7	40.7	47.2	54.2	69.6
0-15		1.21	1.47	21.1	23.6	29.2	35.7	42.0	49.2	57.1	65.6	84.2
20		1.29	1.55	22.4	25.2	31.1	38.1	44.8	52.5	60.9	69.9	89.8
30		1.40	1.66	24.4	27.3	33.7	41.3	48.6	57.0	66.1	75.9	97.4
40		1.49	1.74	25.9	29.1	35.9	44.0	51.7	60.6	70.3	80.8	103.7
50		1.56	1.81	27.1	30.4	37.6	46.0	54.1	63.5	73.6	84.6	108.6
60		1.62	1.87	28.2	31.6	39.0	47.8	56.2	65.9	76.5	87.8	112.8
100		1.26		44	49	61	74	87	103	119	137	175

Table 3 - Pressures to be Resisted at Various Wind Speeds - Exposure D

Height			Wind Spd	85	90	100	110	120	130	140	150	170
(feet)	Factor	Factor	Fastest Mile	70	75	80	90	100	110	120	130	150
	Exp B	Exp. C	Exp D	17.4	19.5	24.1	29.5	34.7	40.7	47.2	54.2	69.6
0-15		1.21	1.47	25.6	28.7	35.4	43.4	51.0	59.8	69.4	79.7	102.3
20		1.29	1.55	27.0	30.2	37.4	45.7	53.8	63.1	73.2	84.0	107.9
30		1.40	1.66	28.9	32.4	40.0	49.0	57.6	67.6	78.4	90.0	115.5
40		1.49	1.74	30.3	33.9	41.9	51.3	60.4	70.8	82.1	94.3	121.1
50		1.56	1.81	31.5	35.3	43.6	53.4	62.8	73.7	85.4	98.1	126.0
60		1.62	1.87	32.5	36.5	45.1	55.2	64.9	76.1	88.3	101.4	130.2
100		1.43		50	56	69	84	99	116	135	155	199

These tables were developed based on ASCE 7-05 and consistent with 2007 Florida Building Code

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for H > 60 feet, the pressure developed by $q(GCp) \pm q(Gcpi) \times Kz$

$GCp = 1.8$
 $GCpi = 0.18$
 $q(GCp \pm Gcpi) = 2.0$

HT	Kz		
	EXP B	EXP C	EXP D
0-15	0.7	0.85	1.03
20	0.7	0.9	1.08
30	0.7	0.98	1.16
40	0.76	1.04	1.22
50	0.81	1.09	1.27
60	0.85	1.13	1.33
100	0.99	1.26	1.43

$Q = .00256KzKdV^2I$

I = IMPORTANCE FACTOR = 1
Kd = DIRECTIONAL FACTOR = 0.85
Kz = EXP. COEFFICIENT

$P = qs[CGp - CGpi]$

$qx = 0.00256V^2KzKzI KdI$

$CGp = 1.4$
 $CGpi = -.18$ ENCLOSED

$KD = 0.85$
 $[GCP - GCPI] = 1.58$ enclosed

$B = P \times 144 / (D \times W)$

P = ET & F Fastener Capacity = 35lbs. based on FS = 2.5
D = Hardiplank exposed width
W = Pressure at various wind speed from Table above for Exp B C and D.
B = ET & F fastener spacing

Table 4 - Spacing of ET&F fastener for wind speed of 130 mph (3-sec gust) (inches)

HT	6-1/4" Hardiplank installed on Block Wall (84)			7-1/4" Hardiplank installed on Block Wall (70)			8-1/4" Hardiplank installed on Block Wall (60)			9-1/4" Hardiplank installed on Block Wall (51)		
	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D
0-15	25	20	17	21	17	14	18	15	12	15	13	11
20	25	19	16	21	16	13	18	14	11	15	12	10
30	25	18	15	21	15	12	18	13	11	15	11	9
40	23	17	14	19	14	12	16	12	10	14	10	9
50	21	16	14	18	13	11	15	11	10	13	10	9
60	20	15	13	17	13	11	15	11	9	13	10	8
100	13	10	9	10	8	7	9	7	6	8	6	5

Notes:

1. Fastener is ET&F Fastening System, Inc. [part number, ASM 144-125, head diameter = 0.30", shank diam = 0.144".]
2. Maximum wind speed, 3-sec gust, is 130 mph.
3. Interpolation to address building height and other Hardiplank width is permissible.
4. Numbers in parenthesis (84, 70, 64, and 51) are allowable pressures on Hardiplank.

Table 5 - Spacing of ET&F fastener for wind speed of 140 mph (3-sec gust) (inches)

HT	6-1/4" Hardiplank installed on Block Wall (84)			7-1/4" Hardiplank installed on Block Wall (70)			8-1/4" Hardiplank installed on Block Wall (60)			9-1/4" Hardiplank installed on Block Wall (51)		
	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D
0-15	21	18	15	18	15	12	15	15	12	18	15	12
20	18	14	11	18	14	11	14	14	11	18	14	11
30	18	13	11	18	13	11	13	13	11	18	13	11
40	16	12	10	16	12	10	12	12	10	16	12	10
50	15	11	10	15	11	10	11	11	10	15	11	10
60	15	11	10	15	11	10	11	11	10	15	11	10
100	9	7	6	9	7	6	7	7	6	9	7	6

Notes:

1. Fastener is ET&F Fastening System, Inc. [in, part number, ASM 144-125, head diameter = 0.30", shank diam = 0.144".]
2. Maximum wind speed, 3-sec gust, is 140 mph.
3. Interpolation to address building height and other Hardiplank width is permissible.
4. Numbers in parenthesis (84, 70, 64, and 51) are allowable pressures on Hardiplank.

Table 6 - Spacing of ET&F fastener for wind speed of 150 mph (3-sec gust) (inches)

HT	6-1/4" Hardiplank installed on Block Wall (84)			7-1/4" Hardiplank installed on Block Wall (70)			8-1/4" Hardiplank installed on Block Wall (60)			9-1/4" Hardiplank installed on Block Wall (51)		
	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D	EXP B	EXP C	EXP D
0-15	19	15	13	15	13	11	13	11	9	12	10	8
20	19	14	12	15	12	10	13	10	9	12	9	8
30	19	13	11	15	11	9	13	9	8	12	8	7
40	17	12	11	14	10	9	12	9	8	11	8	7
50	16	12	10	13	10	9	11	9	7	10	7	6
60	15	11	10	13	10	8	11	8	7	10	7	6
100	9	7	7	8	6	5	7	5	5	9	7	6

Notes:

1. Fastener is ET&F Fastening System, Inc. [in, part number, ASM 144-125, head diameter = 0.30", shank diam = 0.144".]
2. Maximum wind speed, 3-sec gust, is 150 mph.
3. Interpolation to address building height and other Hardiplank width is permissible.
4. Numbers in parenthesis (84, 70, 64, and 51) are allowable pressures on Hardiplank.

