BROADWAY ENGINEERING, P.A.

1335 W. Cass Street
Tampa, FL 33606
(813) 251-9244
Fax: 251-9330
www.broadway-eng.com

CIVIL
MECHANICAL
STRUCTURAL
BUILDING DESIGN

SERIES NS213, MS380, AND WS500 BUTT HUNG DOORS IN FL200 STOREFRONT SYSTEM

CORAL INDUSTRIES

3010 Rice Mine Rd ❖ Tuscaloosa, AL ❖ 35406 ❖ (800) 772-7737

ELIZABETH A. BROADWAY
LICENSE
No. 38558
STATE OF FLORIDA
PROFESSIONAL ENGINEER

SHTS 1-19
7/20/12

Elizabeth A. Broadway
Professional Engineer
Florida Registration No. 38558

BROADWAY ENGINEERING, P.A.
1335 W. CASS ST.
TAMPA, FL 33606
(813)251-9244
(813)251-9330 FAX
CERT. OF AUTHORIZATION NO. 4599

PRODUCT APPROVAL SUBMITTAL

REFER TO DESIGN DRAWINGS FL200_3, SHEETS 1 TO 14, DATED 7/18/12

A. SERIES NS213 DOOR IN FL200 FRAMING

1. DESIGN WIND LOAD AS PER TESTING

P = +60 / -60 PSF

2. FRAMING SYSTEM

FL200 UNREINFORCED JAMBS

3. GLASS

TYPE T: 1/4" TEMPERED GLASS

MANUFACTURER: VARIES

MAXIMUM D.L.O. - 46" x 92" (29.4 ft^2)

4. TESTED ASSEMBLY

73-3/4" x 85-3/4"

5. ANALYSIS FOR UNREINFORCED JAMB

CHECK STRESS AND DEFLECTION

F_b FOR ALUMINUM = 25 ksi / 1.65 = 15.15 ksi
F_b FOR STEEL = 36 ksi x 0.67 = 24 ksi
I_x = 2.700 in^4
S_x = 1.233 in^3

$M := 0.393$ k-ft (FROM PG. 8)

$F_b := 15.15$ ksi

$$S_{req} := \frac{M \cdot 12}{F_b}$$

$S_{req} = 0.311$ in^3 < S_x = 1.233 in^3 OK

Δ = L / 2778 < L / 175 OK (FROM PG. 8)

6. CHECK REACTION AT MULLION ENDS

R_{end} = 292 lb (FROM PG. 9)

7. CHECK SHEAR CAPACITY FOR ANCHORS

$V_{allow} := 384$ lb > R_{end} = 292 lb OK (FOR 1/4" ϕ TAPCONS, FROM PG. 16)

$V_a := 1100$ lb > R_{end} = 292 lb OK (FOR 3/8"ϕ BOLT, FROM PG. 17)

$V_{ult} := 1395$ lb (FOR 1/4-14 SCREWS, FROM PG. 18)

$V_a := \frac{V_{ult}}{3}$ (WITH S.F. OF 3)

$V_a = 465$ lb > R_{end} = 292 lb OK

$V_a := 190$ lb (FOR #14 WOOD SCREW, FROM PG. 19)

$V_{tot} := V_a \cdot 2$ (FOR (2) SCREWS)

$V_{tot} = 380$ lb > R_{end} = 292 lb OK

8. CHECK REACTION AT INTERMEDIATE ANCHOR IN JAMB

R_{end} = 968 lb (FROM PG. 7)

9. CHECK SHEAR CAPACITY FOR ANCHORS

$V_{allow} := 384$ lb (FOR 1/4" ϕ TAPCONS, FROM PG. 16)

$V_{tot} := V_{allow} \cdot 3$ (FOR (3) TAPCONS)

$V_{tot} = 1152$ lb > R_{end} = 968 lb OK

$V_a := 1100$ lb > R_{end} = 968 lb OK (FOR 3/8"ϕ BOLT, FROM PG. 17)

$V_{ult} := 1395$ lb (FOR 1/4-14 SCREWS, FROM PG. 18)

$V_a := \frac{V_{ult}}{3}$ (WITH S.F. OF 3)

$V_a = 465$ lb

$V_{tot} := V_a \cdot 3$ (FOR (3) SCREWS)

$V_{tot} = 1395$ lb > R_{end} = 968 lb OK

$V_a := 190$ lb (FOR #14 WOOD SCREW, FROM PG. 19)

$V_{tot} := V_a \cdot 5$ (FOR (5) SCREWS)

$V_{tot} = 950$ lb < R_{end} = 968 lb OK

B. SERIES NS213 DOOR IN FL200 FRAMING WITH TRANSOM

1. DESIGN WIND LOAD AS PER TESTING

P = +60 / -60 PSF

2. FRAMING SYSTEM

FL200 UNREINFORCED JAMBS

3. GLASS

TYPE T: 1/4" TEMPERED GLASS

MANUFACTURER: VARIES

MAXIMUM D.L.O. - 46" x 92" (29.4 ft^2)

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4. TESTED ASSEMBLY

73-3/4" x 85-3/4"

5. ANALYSIS FOR UNREINFORCED JAMB

CHECK STRESS AND DEFLECTION

F_b FOR ALUMINUM = 25 ksi / 1.65 = 15.15 ksi
F_b FOR STEEL = 36 ksi x 0.67 = 24 ksi
$I_x = 2.700 \text{ in}^4$
$S_x = 1.233 \text{ in}^3$

$M := 0.221$ k-ft (FROM PG. 11)

$F_b := 15.15$ ksi

$$S_{req} := \frac{M \cdot 12}{F_b}$$

$S_{req} = 0.175 \text{ in}^3 < S_x = 1.233 \text{ in}^3$ OK

$\Delta = L / 2395 < L / 175$ OK (FROM PG. 11)

6. CHECK REACTION AT MULLION ENDS

$R_{end} = 302$ lb (FROM PG. 10)

7. CHECK SHEAR CAPACITY FOR ANCHORS

$V_{allow} := 384$ lb $> R_{end} = 302$ lb OK (FOR 1/4" ϕ TAPCONS, FROM PG. 16)

$V_a := 1100$ lb $> R_{end} = 302$ lb OK (FOR 3/8"ϕ BOLT, FROM PG. 17)

$V_{ult} := 1395$ lb (FOR 1/4-14 SCREWS, FROM PG. 18)

$$V_a := \frac{V_{ult}}{3}$$ (WITH S.F. OF 3)

$V_a = 465$ lb $> R_{end} = 302$ lb OK

$V_a := 190$ lb (FOR #14 WOOD SCREW, FROM PG. 19)

$V_{tot} := V_a \cdot 2$ (FOR (2) SCREWS)

$V_{tot} = 380$ lb $> R_{end} = 302$ lb OK

8. CHECK REACTION AT INTERMEDIATE ANCHOR IN JAMB

$R_{end} = 904$ lb (FROM PG. 10)

9. CHECK SHEAR CAPACITY FOR ANCHORS

$V_{allow} := 384$ lb (FOR 1/4" ϕ TAPCONS, FROM PG. 16)

$V_{tot} := V_{allow} \cdot 3$ (FOR (3) TAPCONS)

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$V_{tot} = 1152$ lb > R_{end} = 904 lb OK

$V_a := 1100$ lb > R_{end} = 904 lb OK (FOR 3/8"φ BOLT, FROM PG. 17)

$V_{ult} := 1395$ lb (FOR 1/4-14 SCREWS, FROM PG. 18)

$V_a := \frac{V_{ult}}{3}$ (WITH S.F. OF 3)

$V_a = 465$ lb

$V_{tot} := V_a \cdot 2$ (FOR (2) SCREWS)

$V_{tot} = 930$ lb > R_{end} = 904 lb OK

$V_a := 190$ lb (FOR #14 WOOD SCREW, FROM PG. 19)

$V_{tot} := V_a \cdot 5$ (FOR (5) SCREWS)

$V_{tot} = 950$ lb < R_{end} = 904 lb OK

10. ANALYSIS FOR TRANSOM HEAD

CHECK STRESS AND DEFLECTION

F_b FOR ALUMINUM = 25 ksi / 1.65 = 15.15 ksi
F_b FOR STEEL = 36 ksi x 0.67 = 24 ksi
$I_x = 2.888\ in^4$
$S_x = 1.274\ in^3$

$M := 0.18$ k-ft (FROM PG. 12)

$F_b := 15.15$ ksi

$S_{req} := \frac{M \cdot 12}{F_b}$

$S_{req} = 0.143$ $in^3 < S_x = 1.274\ in^3$ OK

$\Delta = 0.038$ in < L / 175 OK (FROM PG. 12)

11. ANALYSIS FOR NARROW DOOR STILE

CHECK STRESS AND DEFLECTION

F_b FOR ALUMINUM = 25 ksi / 1.65 = 15.15 ksi
F_b FOR STEEL = 36 ksi x 0.67 = 24 ksi
$I_x = 0.408\ in^4$
$S_x = 0.494\ in^3$

$M := 0.084$ k-ft (FROM PG. 15)

$F_b := 15.15$ ksi

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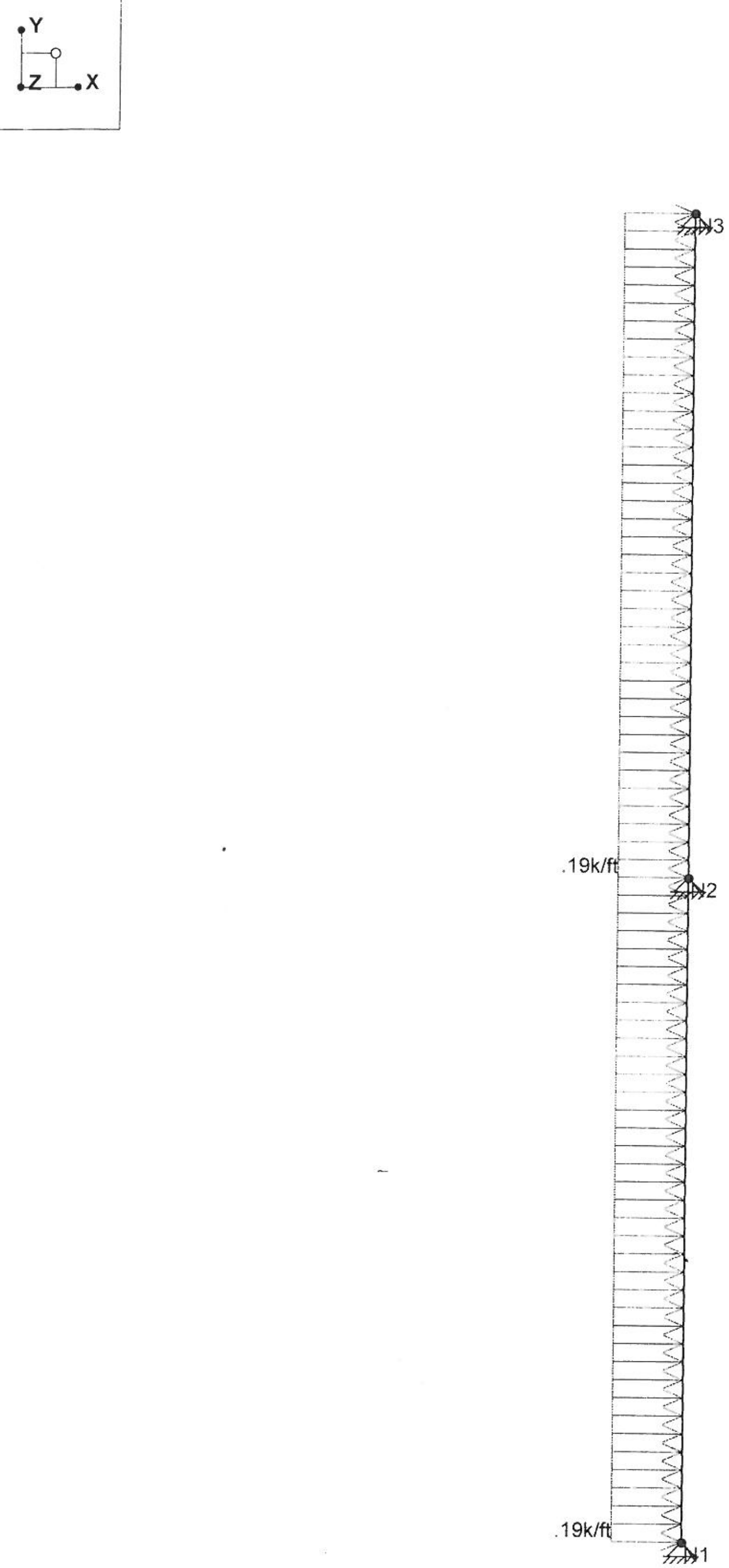
$$S_{req} := \frac{M \cdot 12}{F_b}$$

$S_{req} = 0.067$ $in^3 < S_x = 0.494\ in^3$ <u>OK</u>

$\Delta = L / 2568 < L / 175$ <u>OK</u> (FROM PG. 15)



Loads: BLC 1, WIND LOAD
Results for LC 1, WIND LOAD

Broadway Engineering, P.A.	CORAL ARCH. PROD. - ELEV. E1	
Elizabeth A Broadway		July 10, 2012 at 9:44 AM
BE-4033		4033-1.r2d

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]
1	gen_Alum	10100	4077	.3	1.29	.173

General Section Sets

	Label	Shape	Type	Material	A [in2]	I (90,270) [in4]	I (0,180) [in4]
1	FL209/104 JAMB		Column	gen_Alum	1.141	.275	2.7

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Design List	Type	Material	Design Rules
1	M1	N1	N2		FL209/104 JAMB	None	Column	gen_Alum	Default
2	M2	N2	N3		FL209/104 JAMB	None	Column	gen_Alum	Default

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	4.083	0
3	N3	0	8.167	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	
2	N2	Reaction	Reaction	
3	N3	Reaction	Reaction	

Member Distributed Loads (BLC 1 : WIND LOAD)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.19	.19	0	0
2	M2	X	.19	.19	0	0

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	WIND LOAD	WL					2

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	WIND LOAD	Yes			1	1														

Joint Reactions (By Combination)

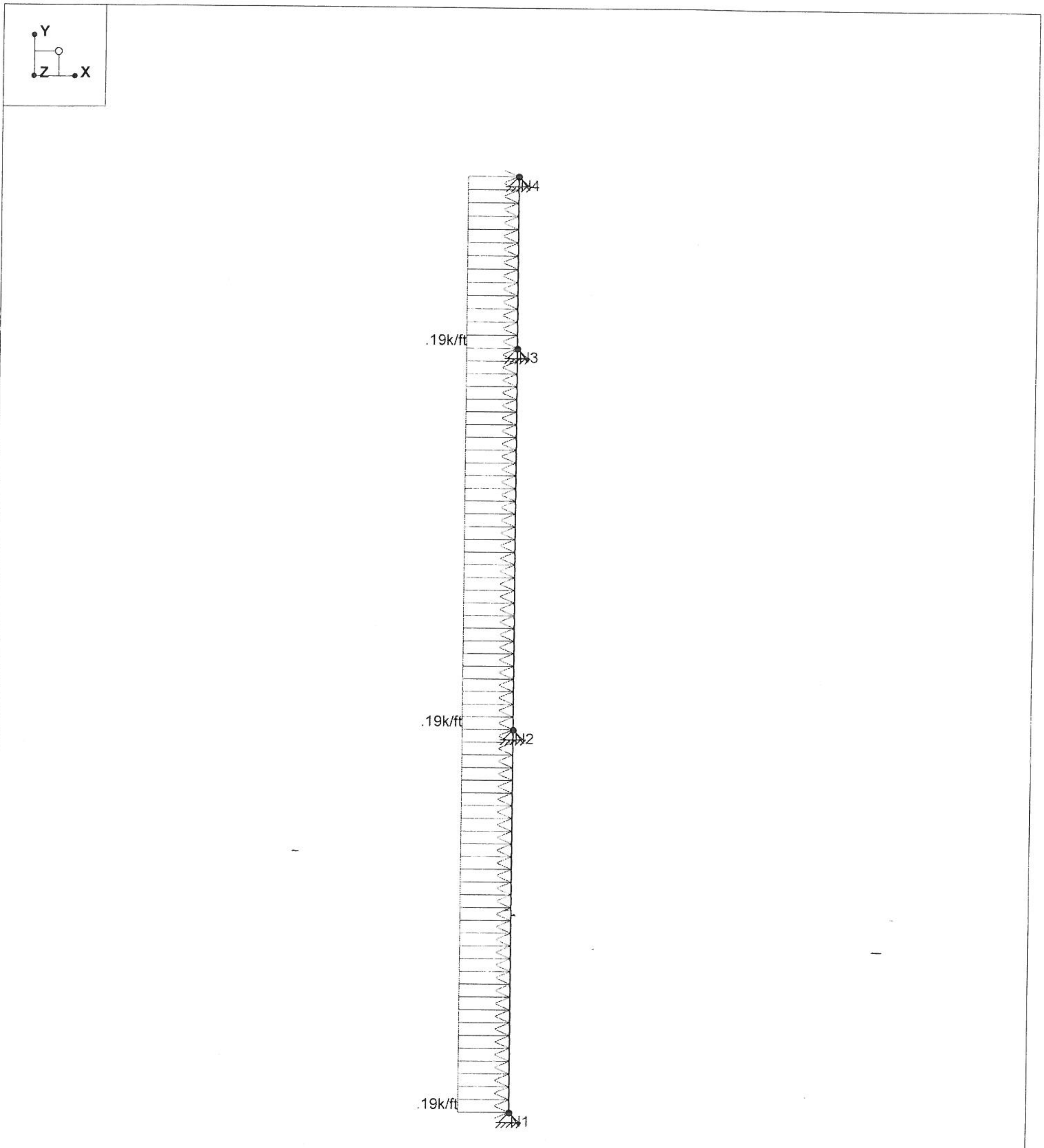
	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	N1	-.292	0	0
2	1	N2	-.968	0	0
3	1	N3	-.292	0	0
4	1	Totals:	-1.552	0	
5	1	COG (ft):	NC	NC	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	.292	0
2			2	0	.098	-.199
3			3	0	-.096	-.199
4			4	0	-.29	-.002
5			5	0	-.484	.393
6	1	M2	1	0	.484	.393
7			2	0	.29	-.002
8			3	0	.096	-.2
9			4	0	-.098	-.199
10			5	0	-.292	0

Member Section Deflections

	LC	Member Label	Sec	x [in]	y [in]	(n) L/y Ratio
1	1	M1	1	0	0	NC
2			2	0	-.015	3306.285
3			3	0	-.018	2782.134
4			4	0	-.008	5882.042
5			5	0	0	NC
6	1	M2	1	0	0	NC
7			2	0	-.008	5869.885
8			3	0	-.018	2778.086
9			4	0	-.015	3302.087
10			5	0	0	NC



Loads: BLC 1, WIND LOAD
Results for LC 1, WIND LOAD

Broadway Engineering, P.A.	CORAL ARCH. PROD. - ELEV. E2	
Elizabeth A Broadway		July 10, 2012 at 9:50 AM
BE-4033		4033-2.r2d

Company : **Broadway Engineering, P.A.**		July 10, 2012
Designer : **Elizabeth A Broadway**		9:49 AM
Job Number : **BE-4033**	**CORAL ARCH. PROD. - ELEV. E2**	Checked By:_____

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]
1	gen_Alum	10100	4077	.3	1.29	.173

General Section Sets

	Label	Shape	Type	Material	A [in2]	I (90,270) [in4]	I (0,180) [in4]
1	FL209/104 JAMB		Column	gen_Alum	1.141	.275	2.7

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Design List	Type	Material	Design Rules
1	M1	N1	N2		FL209/104 JAMB	None	Column	gen_Alum	Default
2	M2	N2	N3		FL209/104 JAMB	None	Column	gen_Alum	Default
3	M3	N3	N4		FL209/104 JAMB	None	Column	gen_Alum	Default

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	4.083	0
3	N3	0	8.167	0
4	N4	0	10	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	
2	N2	Reaction	Reaction	
3	N3	Reaction	Reaction	
4	N4	Reaction	Reaction	

Member Distributed Loads (BLC 1 : WIND LOAD)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.19	.19	0	0
2	M2	X	.19	.19	0	0
3	M3	X	.19	.19	0	0

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	WIND LOAD	WL					3

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	WIND LOAD	Yes			1	1														

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	N1	-.302	0	0
2	1	N2	-.904	0	0

Joint Reactions (By Combination) (Continued)

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
3	1	N3	-.616	0	0
4	1	N4	-.078	0	0
5	1	Totals:	-1.9	0	
6	1	COG (ft):	NC	NC	

Member Section Forces

	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	.302	0
2			2	0	.108	-.209
3			3	0	-.086	-.221
4			4	0	-.28	-.034
5			5	0	-.474	.35
6	1	M2	1	0	.431	.35
7			2	0	.237	.009
8			3	0	.043	-.133
9			4	0	-.151	-.077
10			5	0	-.345	.176
11	1	M3	1	0	.27	.176
12			2	0	.183	.072
13			3	0	.096	.008
14			4	0	.009	-.016
15			5	0	-.078	0

Member Section Deflections

	LC	Member Label	Sec	x [in]	y [in]	(n) L/y Ratio
1	1	M1	1	0	0	NC
2			2	0	-.017	2952.002
3			3	0	-.02	2395.125
4			4	0	-.011	4528.421
5			5	0	0	NC
6	1	M2	1	0	0	NC
7			2	0	-.004	NC
8			3	0	-.009	5539.219
9			4	0	-.006	7615.274
10			5	0	0	NC
11	1	M3	1	0	0	NC
12			2	0	0	NC
13			3	0	0	NC
14			4	0	0	NC
15			5	0	0	NC

Title : CORAL ARCHITECTURAL PRODUCTS Job # BE-4033
Dsgnr: EAB Date: 10:01AM, 10 JUL 12
Description : NS212, MS380, WS500 DOORS

Scope :

Single Span Beam Analysis

Description ELEV. E2 - FL207 DOOR HEADER

General Information

Center Span	6.00 ft	Moment of Inertia	2.888 in4
Left Cantilever	ft	Elastic Modulus	10,100 ksi
Right Cantilever	ft	Beam End Fixity	Pin-Pin

Trapezoidal Loads

Magnitude @ Left	k/ft	0.060 k/ft	k/ft	k/ft
Magnitude @ Right	0.060 k/ft	k/ft	k/ft	k/ft
Dist. To Left Side	ft	3.000 ft	ft	ft
Dist. To Right Side	3.000 ft	6.000 ft	ft	ft

Query Values

Center Location	0.000 ft	**Left Cant**	0.000 ft	**Right Cant**	0.000 ft
Moment	0.00 k-ft		0.00 k-ft		0.00 k-ft
Shear	0.09 k		0.00 k		0.00 k
Deflection	0.00000 in		0.00000 in		0.00000 in

Summary

Moments...

Max + @ Center	0.18 k-ft	at	3.01 ft
Max - @ Center	0.00 k-ft	at	0.00 ft
@ Left Cant	0.00 k-ft		
@ Right Cant	0.00 k-ft		
Maximum =	**0.18** k-ft		

Shears...

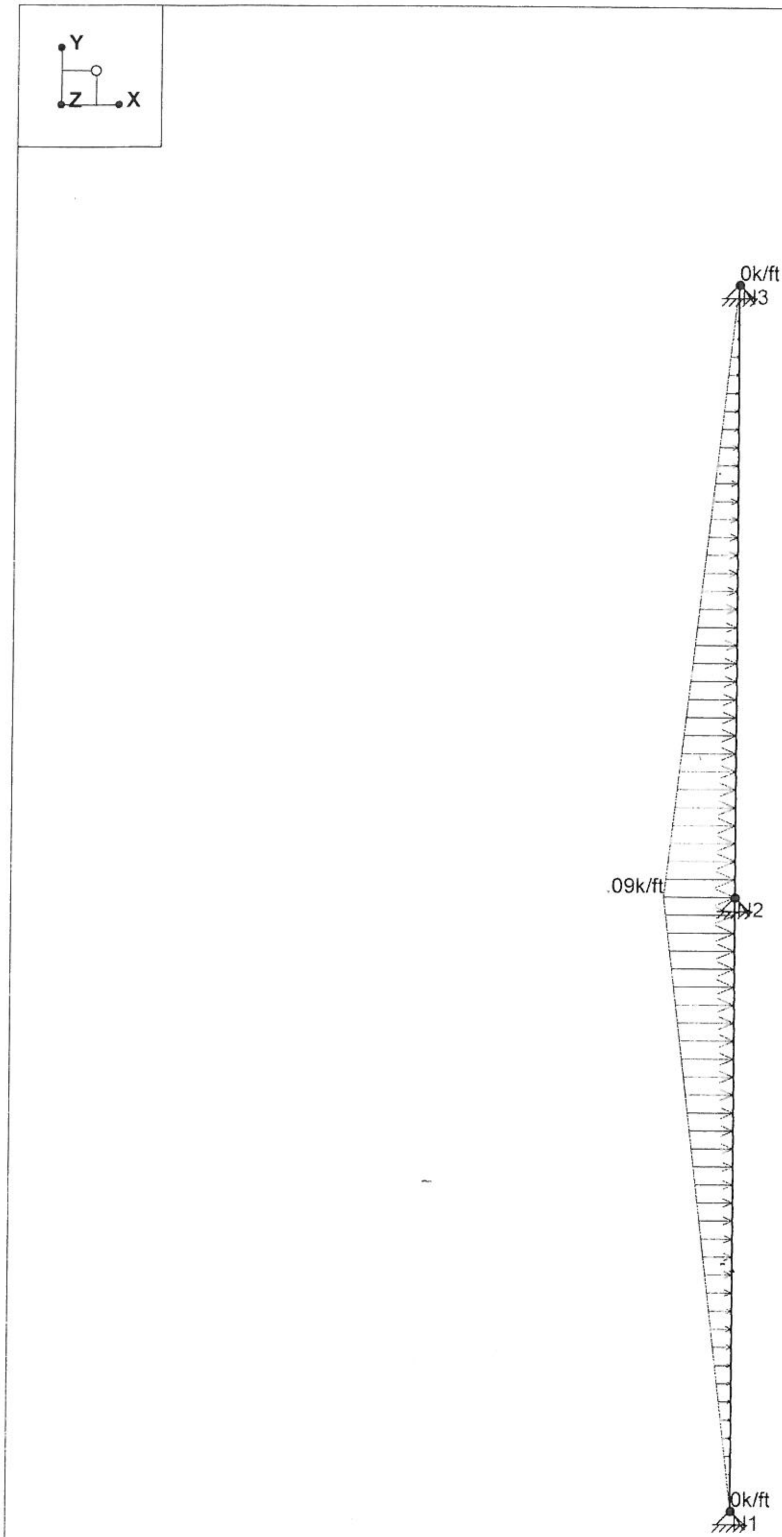
@ Left	0.09 k
@ Right	0.09 k
Maximum	0.09 k

Reactions...

@ Left	0.09 k
@ Right	0.09 k

Deflections...

@ Center	-0.038 in	at	3.01 ft
@ Left Cant.	0.000 in	at	0.00 ft
@ Right Cant	0.000 in	at	0.00 ft



Loads: BLC 1, WIND LOAD
Results for LC 1, WIND LOAD

Broadway Engineering, P.A.	CORAL ARCH. PROD. - NARROW STILE	
Elizabeth A Broadway		July 10, 2012 at 11:19 AM
BE-4033		4033-3.r2d

14

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]
1	gen_Alum	10100	4077	.3	1.29	.173

General Section Sets

	Label	Shape	Type	Material	A [in2]	I (90,270) [in4]	I (0,180) [in4]
1	D103 STILE		Column	gen_Alum	1.104	.501	.408

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Design List	Type	Material	Design Rules
1	M1	N1	N2		D103 STILE	None	Column	gen_Alum	Default
2	M2	N2	N3		D103 STILE	None	Column	gen_Alum	Default

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N1	0	0	0
2	N2	0	3.75	0
3	N3	0	7.5	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Rotation[k-ft/rad]
1	N1	Reaction	Reaction	
2	N2	Reaction	Reaction	
3	N3	Reaction	Reaction	

Member Distributed Loads (BLC 1 : WIND LOAD)

	Member Label	Direction	Start Magnitude[k/ft,d...	End Magnitude[k/ft,d...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	0	.09	0	3.75
2	M2	X	.09	0	0	3.75

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	WIND LOAD	WL					2

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	WIND LOAD	Yes			1	1														

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	MZ [k-ft]
1	1	N1	-.034	0	0
2	1	N2	-.27	0	0
3	1	N3	-.034	0	0
4	1	Totals:	-.337	0	
5	1	COG (ft):	NC	NC	

Member Section Forces

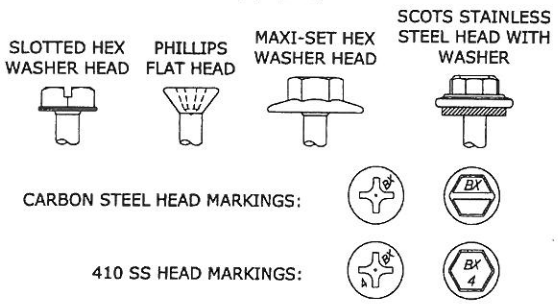
	LC	Member Label	Sec	Axial[k]	Shear[k]	Moment[k-ft]
1	1	M1	1	0	.034	0
2			2	0	.023	-.028
3			3	0	-.008	-.037
4			4	0	-.061	-.006
5			5	0	-.135	.084
6	1	M2	1	0	.135	.084
7			2	0	.061	-.006
8			3	0	.008	-.037
9			4	0	-.023	-.028
10			5	0	-.034	0

Member Section Deflections (By Combination)

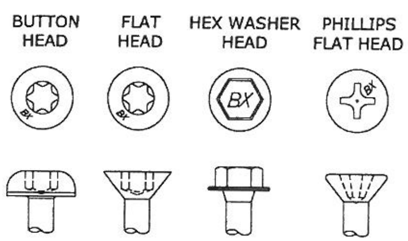
	LC	Member Label	Sec	x [in]	y [in]	(n) L/y Ratio
1	1	M1	1	0	0	NC
2			2	0	-.014	3288.171
3			3	0	-.018	2567.957
4			4	0	-.009	5024.63
5			5	0	0	NC
6	1	M2	1	0	0	NC
7			2	0	-.009	5024.63
8			3	0	-.018	2567.957
9			4	0	-.014	3288.171
10			5	0	0	NC

GENERAL NOTES:

1. THIS PRODUCT HAS BEEN DESIGNED & TESTED IN ACCORDANCE WITH THE 2007 FLORIDA BUILDING CODE(HIGH VELOCITY HURRICANE ZONE) AND THE FOLLOWING STANDARDS: ASTM E488, ASTM G85, & TAS 114.
2. ANCHORS ARE MANUFACTURED FROM HEAT-TREATED STEEL WITH AN ALTERNATING HIGH-LOW THREAD FORM AND SHALL HAVE CORROSION-RESISTANT COATINGS AS DESCRIBED BELOW:
   - ULTRASHIELD OR WHITE ULTRASHIELD OR
   - BLUE OR SILVER CLIMASEAL OR
   - CLIMASHIELD
3. ANCHOR INSTALLATION SHALL BE MADE IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS AND THIS NOTICE OF ACCEPTANCE.
4. CONCRETE SHALL CONFORM TO ACI 301 SPECIFICATIONS, WITH STRENGTH PROPERTIES AS SPECIFIED HEREIN. HOLLOW AND GROUT-FILLED CONCRETE BLOCK SHALL CONFORM TO ASTM C-90.
5. REFERENCE THE FOLLOWING TEST REPORTS:
   - HURRICANE ENGINEERING & TESTING, INC.
     #HETI-00-4160 (10/25/2000)
     #HETI-00-4092 (02/25/2000)
     #HETI-00-4153 (10/25/2000)
     #HETI-00-4072 (02/25/2000)
     #HETI-01-5029 (05/07/2001)
     #HETI-01-5027 (05/07/2001)
     #HETI-01-C109 (01/16/2001)
   - PRI ASPHALT TECHNOLOGIES, INC.
     #PRI 01078 (08/27/2001)
     #PRI 01079 (08/27/2001)
   - APPLIED RESEARCH LABORATORIES
     #ARL 30291 (01/22/2002)
     #ARL 30292 (01/29/2002)
     #ARL 30299 (01/30/2002)
     #ARL 30294 (01/30/2002)
   - CENTER FOR APPLIED ENGINEERING, INC.
     #MTS 25-7654-PS (06/03/1996)
   - CELOTEX CORPORATION TESTING SERVICES
     #MTS 520614-PS (06/14/2000)

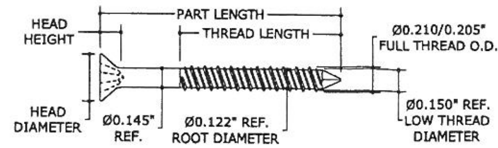


1/1 3/16" OR 1/4" HEAD STYLES
N.T.S.



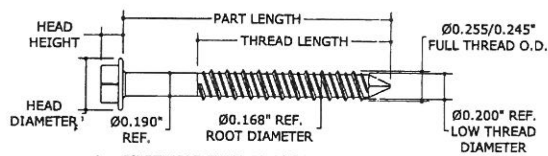
2/1 5/16" XL HEAD STYLES
N.T.S.

ITW Buildex TAPCON®
CONCRETE & MASONRY ANCHOR



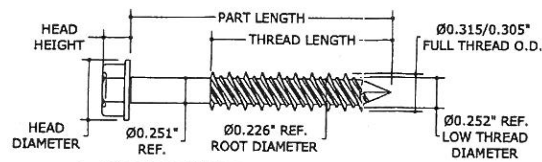
1. PILOT HOLE SHALL BE 1/4" LONGER THAN EMBEDMENT WITH 0.171" DIAMETER.
2. ALLOWABLE LOADS ARE BASED ON AVERAGE ULTIMATE TEST LOAD DIVIDED BY 4.
3. CENTER TO CENTER DISTANCE OF 2-1/4" IS NECESSARY FOR 100% CAPACITY AND 1-1/8" FOR 50% CAPACITY.
4. REFERENCE SHEET 2 FOR ADDITIONAL ANCHOR DIMENSIONS.

3/1 3/16" TAPCON
1'-0" = 1'-0" SIDE VIEW



1. PILOT HOLE SHALL BE 1/4" LONGER THAN EMBEDMENT WITH 0.200" DIAMETER.
2. ALLOWABLE LOADS ARE BASED ON AVERAGE ULTIMATE TEST LOAD DIVIDED BY 4.
3. CENTER TO CENTER DISTANCE OF 3" IS NECESSARY FOR 100% CAPACITY AND 1-1/2" FOR 50% CAPACITY.
4. REFERENCE SHEET 2 FOR ADDITIONAL ANCHOR DIMENSIONS.

4/1 1/4" TAPCON
1'-0" = 1'-0" SIDE VIEW



1. PILOT HOLE SHALL BE 1/4" LONGER THAN EMBEDMENT WITH 0.263" DIAMETER.
2. ALLOWABLE LOADS ARE BASED ON AVERAGE ULTIMATE TEST LOAD DIVIDED BY 4.
3. CENTER TO CENTER DISTANCE OF 3-3/4" IS NECESSARY FOR 100% CAPACITY AND 1-7/8" FOR 50% CAPACITY.
4. REFERENCE SHEET 2 FOR ADDITIONAL ANCHOR DIMENSIONS.

5/1 5/16" TAPCON
1'-0" = 1'-0" SIDE VIEW

3/16" CARBON STEEL TAPCONS

	EMBEDMENT	EDGE DISTANCE	TENSION (LB)	SHEAR (LB)
HOLLOW BLOCK	1-1/4"	1-1/8"	94	112
		2-5/8"	99	197
CONCRETE (3192 PSI MIN)	1"	1-1/8"	128	147
		2-5/8"	128	157
	1-3/4"	1-1/8"	354	160
		2-5/8"	354	229

1/4" TAPCONS

	EMBEDMENT	EDGE DISTANCE	CARBON STEEL TENSION (LB)	CARBON STEEL SHEAR (LB)	STAINLESS STEEL TENSION (LB)	STAINLESS STEEL SHEAR (LB)
HOLLOW BLOCK	1-1/4"	1"	117	94	148	107
		2-1/2"	195	264	180	279
CONCRETE (3192 PSI MIN)	1"	1"	209	115	166	148
		2-1/2"	212	297	166	275
	1-3/4"	1"	510	115	466	189
		2-1/2"	575	384	547	472

5/16" CARBON STEEL TAPCON XL

	EMBEDMENT	EDGE DISTANCE	TENSION (LB)	SHEAR (LB)
HOLLOW BLOCK	1-3/4" †	4"	261 LB	570 LB
CONCRETE (2899 PSI MIN)	1-1/4"	1-9/16"	262	333
		2-3/16"	301	431
		3-1/8"	301	543
	1-3/4"	1-9/16"	505	382
		2-3/16"	563	626
		3-1/8"	583	627
	2-1/4"	1-9/16"	713	489
		2-3/16"	780	812
		3-1/8"	788	852
GROUT FILLED BLOCK	1-3/4"	4"	487	706
	2-1/4"		942	785
THRU 2x WOOD BUCK (G=0.36 MIN) TO 3KSI MIN CONCRETE	1-3/4" ††	1-3/4"	—	312

† EMBEDMENT IS THROUGH 1-1/4" FACE SHELL OF HOLLOW BLOCK

†† EMBEDMENT DEPTH IS INTO 3KSI CONCRETE, WITH THE WOOD BUCK LOCATED BETWEEN CONCRETE AND SIDE MEMBER

PRODUCT RENEWED as complying with the Florida Building Code
Acceptance No 07-1126.10
Expiration Date 02/20/2013
By [signature]
Miami Dade Product Control Division

FRANK L. BENNARDO, P.E.
PE0046549
03/10/2008

ENGINEERING EXPRESS®
160 SW 12th AVENUE, #106
DEERFIELD BEACH, FL 33442
PH: (954) 354-0660 FAX: (954) 354-0443
WWW.ENGEXP.COM
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ITW Buildex
BUILDEX DIVISION OF ILLINOIS TOOL WORKS, INC.
1349 WEST BRYN MAWR AVENUE
ITASCA, IL 60143

TAPCON MASONRY FASTENERS
MIAMI-DADE NOTICE OF ACCEPTANCE

REMARKS	DRWN	CHKD	DATE
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BOLTED CONNECTIONS

TABLE V-4.5(A) Allowable Loads, in Kips for A307 Bolts (Shear = 10ksi)

Bolt Dia. (in.)	Area (in.²)	Single Shear (kips)	Double Shear (kips)	BEARING VALUE (kips)											
				F_p (ksi)	THICKNESS (in.)										
					0.024	0.030	0.036	0.048	0.060	0.075	0.105	0.135	0.164	0.194	0.224
¼	0.0491	0.49	0.98	1.50 x 50	0.45	0.56	0.68	0.90	1.12	1.41	1.97	2.53	3.08	3.64	4.20
				1.35 x 50	0.40	0.51	0.61	0.81	1.01	1.26	1.77	2.28	2.77	3.27	3.78
				1.00 x 50	0.30	0.38	0.45	0.60	0.75	0.94	1.31	1.69	2.05	2.42	2.80
⅜	0.1104	1.10	2.21	1.50 x 50	0.68	0.84	1.01	1.35	1.69	2.11	2.95	3.80	4.61	5.46	6.30
				1.35 x 50	0.61	0.76	0.91	1.22	1.52	1.90	2.66	3.42	4.15	4.91	5.67
				1.00 x 50	0.45	0.56	0.68	0.90	1.12	1.41	1.97	2.53	3.08	3.64	4.20
½	0.1963	1.96	3.93	1.50 x 50	0.90	1.12	1.35	1.80	2.25	2.81	3.94	5.06	6.15	7.28	8.40
				1.35 x 50	0.81	1.01	1.22	1.62	2.02	2.53	3.54	4.55	5.54	6.55	7.56
				1.00 x 50	0.60	0.75	0.90	1.20	1.50	1.88	2.62	3.38	4.10	4.85	5.60
⅝	0.3068	3.07	6.14	1.50 x 50	1.12	1.41	1.69	2.25	2.81	3.52	4.92	6.33	7.69	9.09	10.50
				1.35 x 50	1.01	1.26	1.52	2.02	2.53	3.16	4.43	5.70	6.92	8.18	9.45
				1.00 x 50	0.75	0.94	1.12	1.50	1.88	2.34	3.28	4.22	5.12	6.06	7.00
¾	0.4418	4.42	8.84	1.50 x 50	1.35	1.69	2.02	2.70	3.38	4.22	5.91	7.59	9.22	10.91	12.60
				1.35 x 50	1.22	1.52	1.82	2.43	3.04	3.80	5.32	6.83	8.30	9.82	11.34
				1.00 x 50	0.90	1.12	1.35	1.80	2.25	2.81	3.94	5.06	6.15	7.28	8.40
⅞	0.6013	6.01	12.03	1.50 x 50	1.58	1.97	2.36	3.15	3.94	4.92	6.89	8.86	10.76	12.73	14.70
				1.35 x 50	1.42	1.77	2.13	2.84	3.54	4.43	6.20	7.97	9.69	11.46	13.23
				1.00 x 50	1.05	1.31	1.58	2.10	2.62	3.28	4.59	5.91	7.18	8.49	9.80
1	0.7854	7.85	15.71	1.50 x 50	1.80	2.25	2.70	3.60	4.50	5.62	7.88	10.12	12.30	14.55	16.80
				1.35 x 50	1.62	2.02	2.43	3.24	4.05	5.06	7.09	9.11	11.07	13.10	15.12
				1.00 x 50	1.20	1.50	1.80	2.40	3.00	3.75	5.25	6.75	8.20	9.70	11.20

TABLE V-4.5(B) Allowable Loads in Kips for A325 Bolts • Threading Excluded from Shear Plane

Bolt Dia. (in.)	Area (in.²)	Single Shear (kips)	Double Shear (kips)	F_p (ksi)	0.024	0.030	0.036	0.048	0.060	0.075	0.105	0.135	0.164	0.194	0.224
¼	0.0491	1.47	2.94	1.50 x 50	0.45	0.56	0.68	0.90	1.12	1.41	1.97	2.53	3.08	3.64	4.20
				1.35 x 50	0.40	0.51	0.61	0.81	1.01	1.26	1.77	2.28	2.77	3.27	3.78
				1.00 x 50	0.30	0.38	0.45	0.60	0.75	0.94	1.31	1.69	2.05	2.42	2.80
⅜	0.1104	3.31	6.62	1.50 x 50	0.68	0.84	1.01	1.35	1.69	2.11	2.95	3.80	4.61	5.46	6.30
				1.35 x 50	0.61	0.76	0.91	1.22	1.52	1.90	2.66	3.42	4.15	4.91	5.67
				1.00 x 50	0.45	0.56	0.68	0.90	1.12	1.41	1.97	2.53	3.08	3.64	4.20
½	0.1963	5.89	11.78	1.50 x 50	0.90	1.12	1.35	1.80	2.25	2.81	3.94	5.06	6.15	7.28	8.40
				1.35 x 50	0.81	1.01	1.22	1.62	2.02	2.53	3.54	4.55	5.54	6.55	7.56
				1.00 x 50	0.60	0.75	0.90	1.20	1.50	1.88	2.62	3.38	4.10	4.85	5.60
⅝	0.3068	9.20	18.41	1.50 x 50	1.12	1.41	1.69	2.25	2.81	3.52	4.92	6.33	7.69	9.09	10.50
				1.35 x 50	1.01	1.26	1.52	2.02	2.53	3.16	4.43	5.70	6.92	8.18	9.45
				1.00 x 50	0.75	0.94	1.12	1.50	1.88	2.34	3.28	4.22	5.12	6.06	7.00
¾	0.4418	13.25	26.51	1.50 x 50	1.35	1.69	2.02	2.70	3.38	4.22	5.91	7.59	9.22	10.91	12.60
				1.35 x 50	1.22	1.52	1.82	2.43	3.04	3.80	5.32	6.83	8.30	9.82	11.34
				1.00 x 50	0.90	1.12	1.35	1.80	2.25	2.81	3.94	5.06	6.15	7.28	8.40
⅞	0.6013	18.04	36.08	1.50 x 50	1.58	1.97	2.36	3.15	3.94	4.92	6.89	8.86	10.76	12.73	14.70
				1.35 x 50	1.42	1.77	2.13	2.84	3.54	4.43	6.20	7.97	9.69	11.46	13.23
				1.00 x 50	1.05	1.31	1.58	2.10	2.62	3.28	4.59	5.91	7.18	8.49	9.80
1	0.7854	23.56	47.12	1.50 x 50	1.80	2.25	2.70	3.60	4.50	5.62	7.88	10.12	12.30	14.55	16.80
				1.35 x 50	1.62	2.02	2.43	3.24	4.05	5.06	7.09	9.11	11.07	13.10	15.12
				1.00 x 50	1.20	1.50	1.80	2.40	3.00	3.75	5.25	6.75	8.20	9.70	11.20

TABLE V-4.5(C) Allowable Loads in Kips for A325 Bolts • Threading Not Excluded from Shear Plane

Bolt Dia. (in.)	Area (in.²)	Single Shear (kips)	Double Shear (kips)	F_p (ksi)	0.024	0.030	0.036	0.048	0.060	0.075	0.105	0.135	0.164	0.194	0.224
¼	0.0491	1.03	2.06	1.50 x 50	0.45	0.56	0.68	0.90	1.12	1.41	1.97	2.53	3.08	3.64	4.20
				1.35 x 50	0.40	0.51	0.61	0.81	1.01	1.26	1.77	2.28	2.77	3.27	3.78
				1.00 x 50	0.30	0.38	0.45	0.60	0.75	0.94	1.31	1.69	2.05	2.42	2.80
⅜	0.1104	2.32	4.64	1.50 x 50	0.68	0.84	1.01	1.35	1.69	2.11	2.95	3.80	4.61	5.46	6.30
				1.35 x 50	0.61	0.76	0.91	1.22	1.52	1.90	2.66	3.42	4.15	4.91	5.67
				1.00 x 50	0.45	0.56	0.68	0.90	1.12	1.41	1.97	2.53	3.08	3.64	4.20
½	0.1963	4.12	8.24	1.50 x 50	0.90	1.12	1.35	1.80	2.25	2.81	3.94	5.06	6.15	7.28	8.40
				1.35 x 50	0.81	1.01	1.22	1.62	2.02	2.53	3.54	4.55	5.54	6.55	7.56
				1.00 x 50	0.60	0.75	0.90	1.20	1.50	1.88	2.62	3.38	4.10	4.85	5.60
⅝	0.3068	6.44	12.88	1.50 x 50	1.12	1.41	1.69	2.25	2.81	3.52	4.92	6.33	7.69	9.09	10.50
				1.35 x 50	1.01	1.26	1.52	2.02	2.53	3.16	4.43	5.70	6.92	8.18	9.45
				1.00 x 50	0.75	0.94	1.12	1.50	1.88	2.34	3.28	4.22	5.12	6.06	7.00
¾	0.4418	9.28	18.56	1.50 x 50	1.35	1.69	2.02	2.70	3.38	4.22	5.91	7.59	9.22	10.91	12.60
				1.35 x 50	1.22	1.52	1.82	2.43	3.04	3.80	5.32	6.83	8.30	9.82	11.34
				1.00 x 50	0.90	1.12	1.35	1.80	2.25	2.81	3.94	5.06	6.15	7.28	8.40
⅞	0.6013	12.63	25.25	1.50 x 50	1.58	1.97	2.36	3.15	3.94	4.92	6.89	8.86	10.76	12.73	14.70
				1.35 x 50	1.42	1.77	2.13	2.84	3.54	4.43	6.20	7.97	9.69	11.46	13.23
				1.00 x 50	1.05	1.31	1.58	2.10	2.62	3.28	4.59	5.91	7.18	8.49	9.80
1	0.7854	16.49	32.99	1.50 x 50	1.80	2.25	2.70	3.60	4.50	5.62	7.88	10.12	12.30	14.55	16.80
				1.35 x 50	1.62	2.02	2.43	3.24	4.05	5.06	7.09	9.11	11.07	13.10	15.12
				1.00 x 50	1.20	1.50	1.80	2.40	3.00	3.75	5.25	6.75	8.20	9.70	11.20

Dril-Flex® Structural Fasteners

COMPARISON TO STAINLESS STEEL FASTENERS

300 series stainless steel fasteners will not rust, and, because of their low hardness, they also provide high resistance to hydrogen embrittlement failures. However, because stainless steel is galvanically incompatible with certain building materials – including steel and aluminum – it can cause other problems (see chart) when combined with these materials. Stainless steel fasteners trigger a sacrificial action in the aluminum or steel panel, which can lead to degradation of the panel and loosening of the fastener.

The dual-hardening process allows Dril-Flex fasteners to provide high strength and resistance to hydrogen embrittlement failures. Their unique Stalgard® finish provides corrosion resistance several times greater than other commonly-used finishes. Fasteners coated with Stalgard finish typically show no red rust or other base metal corrosion on significant surfaces even after 800 hours of 5% neutral salt spray exposure (ASTM B117).

If the environment is corrosive enough to significantly affect the Stalgard® finish, the potential for significant degradation of the aluminum/stainless steel assembly would also exist.

Galvanic Series

Anodic End	
Metal/Alloy	*EMF (v)*
Magnesium	-1.60
Zinc	-1.10
Alum (5000, 6000, 7000)	-.75
Iron, Low Alloy Steels	-.70
Alum (2000)	-.60
Lead	-.55
18% Chromium Steel	-.35
Naval Brass	-.30
Brass, Bronze	-.25
Austenitic Stainless (300 Series)	-.20
Nickel	-.15
Silver	0
Gold	+15
Cathodic End	

In the presence of moisture, materials higher on the list will be sacrificial to materials lower on the list. The greater the EMF differential, the greater the sacrificial action of the anode to the cathode in a galvanic cell.

EMBRITTLEMENT TESTING

Embrittlement testing of Dril-Flex fasteners was performed in accordance to ASTM F1624-06, "Standard Test Method for Measurement of Hydrogen Embrittlement in Steel by the Incremental Loading Method". Fastener lots were tested to determine their Threshold Stress Limits for both Internal Hydrogen Embrittlement and Environmental Hydrogen Embrittlement. Threshold Stress Limit is the stress level below which no time-dependent cracking will occur. Above this level, subcritical cracking that leads to time-delayed fracture or embrittlement may occur if the fastener is exposed to a hydrogen environment.

Embrittlement Test Results

- Dril-Flex fasteners have a hardness range of HRC 28 – 34, which is roughly equivalent to a SAE Grade 5 fastener (HRC 25 – 34).
- Dril-Flex fasteners showed resistance to the effect of hydrogen-assisted cracking when loaded to 75% of their tensile strength. This is within accepted industry guidelines for in-service loading conditions.
- Dril-Flex fasteners showed no degradation or failures in tensile strength below their Ultimate Tensile Strength.

SHEAR AND PULL-OUT VALUES

Pull-out Tests – Steel

Pull-out values shown are in lbs.

Screw Size	Point Type	Drill Cap	Steel 18	16	14	12	1/8	3/16	1/4	5/16
10-16	3	.150	396	501	634	1595	1693			
12-14	3	.187	396	527	710	1678	2061	2898		
1/4-14	3	.187	398	530	686	1950	2264	3919		
1/4-20	4	.312		516	649	1912	2296	2928	3561	4488
5/16-24	4	.312				2148	2573	4226	5424	6622

Shear Tests – Steel

Shear values shown are in lbs.

Screw Size	Point Type	Drill Cap	Steel 18-18 gage	18-14 gage	16-16 gage	14-14 gage	1/8"-3/16"	3/16"-1/4"	1/4"-12 gage
10-16	3	.150	1362	1733	1462				
12-14	3	.187	1315	2118	1655	1816			
1/4-14	3	.187	1395	2313	1681	2417	2600		
1/4-20	4	.312	1350	2086	1582	2450	2814	2810	2706
5/16-24	4	.312					5486	5283	4761

Pull-out Tests – Aluminum

Pull-out values shown are in lbs.

Screw Size	Point Type	Drill Cap	Aluminum 6063-T5 1/8"	1/4"	3/8"
10-16	3	.150			
12-14	3	.187	939	2286	
1/4-14	3	.187	1003	2424	
1/4-20	4	.312	897	2075	3683
5/16-24	4	.312	1043	2566	

Shear Tests – Aluminum

Shear values shown are in lbs.

Screw Size	Point Type	Drill Cap	Aluminum 6063-T5 1/8" - 1/8"	1/8" - 1/4"
10-16	3	.150	1466	
12-14	3	.187	1797	2483
1/4-14	3	.187	1996	2883
1/4-20	4	.312	2006	2926
5/16-24	4	.312	1849	2926

NOTE: All test setups and dimensions were as limited and outlined in AISI Test Method for Mechanically Fastened Cold-Formed Steel Connections (CF92-1) document. Performance values listed are ultimate values obtained under laboratory conditions. Appropriate safety factors should be applied for design purposes.

TABLE 6.31

Wood Screws—Lateral Load Design Values[a, b]

Gage of Screw		6	7	8	9	10	12	14	16	18	20	24
	D	0.138	0.151	0.164	0.177	0.190	0.216	0.242	0.268	0.294	0.320	0.372
	$7D$	0.966	1.057	1.148	1.239	1.330	1.512	1.694	1.876	2.058	2.240	2.604
	$4D$	0.552	0.604	0.656	0.708	0.760	0.864	0.968	1.072	1.176	1.280	1.488
Species Group[c]	I	91	109	129	150	173	224	281	345	415	492	664
	II	75	90	106	124	143	185	232	284	342	406	548
	III	62	74	87	101	117	151	190	233	280	332	448
	IV	48	58	68	79	91	118	148	181	218	258	349

[a] Source: *National Design Specification for Wood Construction* (3).

[b] Design values for lateral loads (shear), P, (lb) for screws embedded to approximately 7 times the shank diameter, D, into the member holding the point. For less penetration, reduce loads in proportion. Penetration should not be less than 4 times the shank diameter.

[c] See Tables 6.1 and 6.2 for species groups for sawn lumber and glued laminated timber, respectively.