Edward C. Robison, PE, SE

30 MARCH 2016

Architectural Metal Works
ATTN: Sean Wentworth
1483 67th ST
Emeryville, CA 94608

SUBJ: BALCONY GUARD POSTS FASCIA MOUNTED TO WOOD DECK

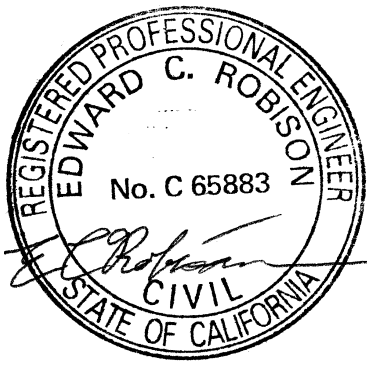
The attached details show two alternatives for attaching guardrail posts to a wood deck rim joist. The details will work with joists that are a minimum 2x8.

The third detail is for attaching to a 4x10 or larger beam with 5/16" x 5-1/8" GRK PHEinox fasteners.

Design load is 200# concentrated load on the top rail 42" above the finish floor height.

These installation details comply with the 2010, 2013 and 2016 California Building Codes and California Residential Codes.

Edward Robison, P.E.



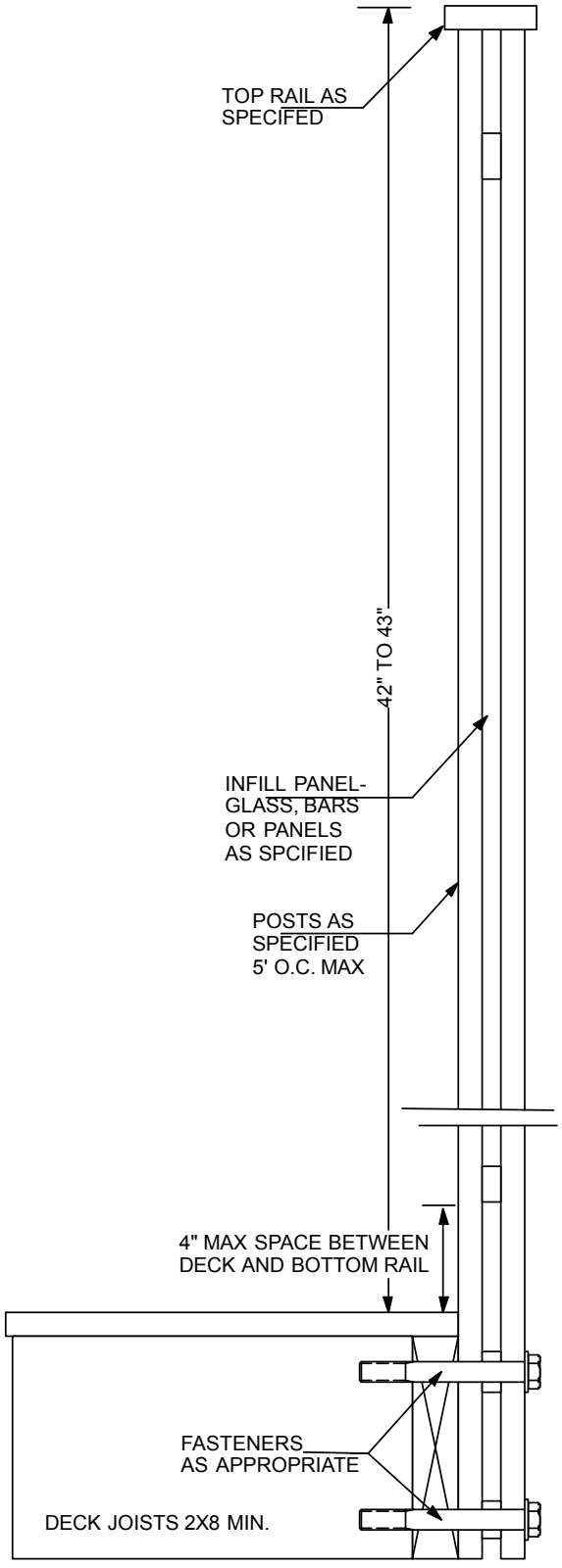
Signed 03/30/2016

10012 Creviston DR NW
Gig Harbor, WA 98329

253-858-0855
fax 253-858-0856
email: elrobison@narrows.com

Load on post = 200# at top rail
Dead load = 5psf*5'*3'+3.6*5'+ 3.6*4.167 = 108#

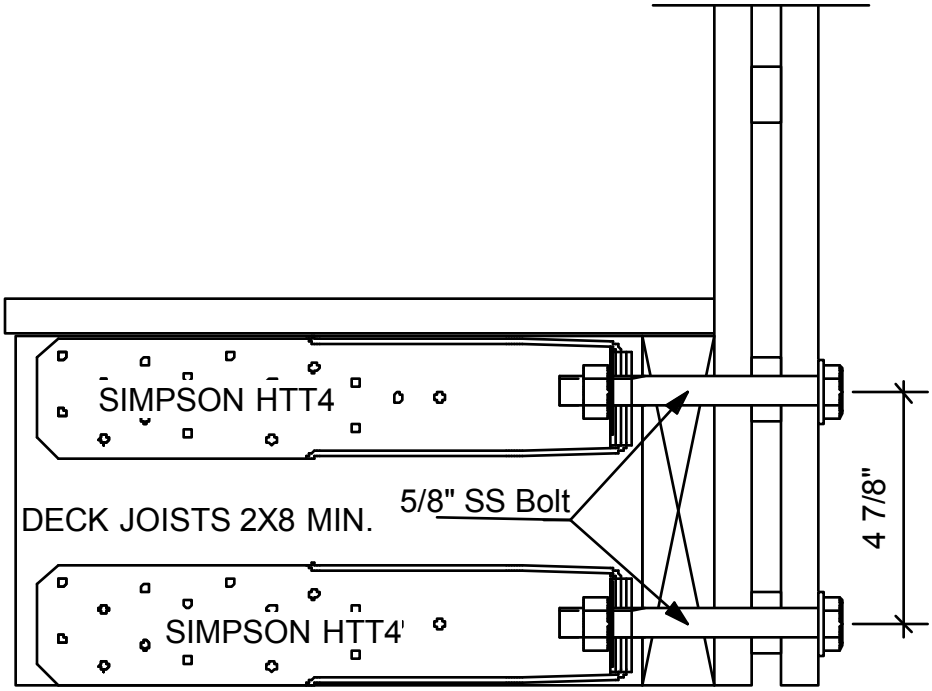
Load on bolts - bolts at 5" on center located at 1-⅛" from top and bottom
From ∑M about the bottom:
∑M = 0 = 200*49.75 + 108*1.375 -T*5"
solving for T:
T = 10,098.5/5 = 2,020#



Edward C. Robison, PE, SE
10012 Creviston DR NW
Gig Harbor, WA 98329
253-858-0855
fax 253-858-0856
email: elrobison@narrows.com

Bolts need to be tied directly to joists so that rim joist doesn't pull off.

Try Simpson HTT4
Tension strength = 3,105# ≥ 2,020



This detail requires installation along side joist.
This will require either adding extra joist at post or moving post to be along side joist.

For installation on joists deeper than 2x8 (7-1/4") set tension tie at top of joist and at 4-7/8" center to center for lower tension tie.

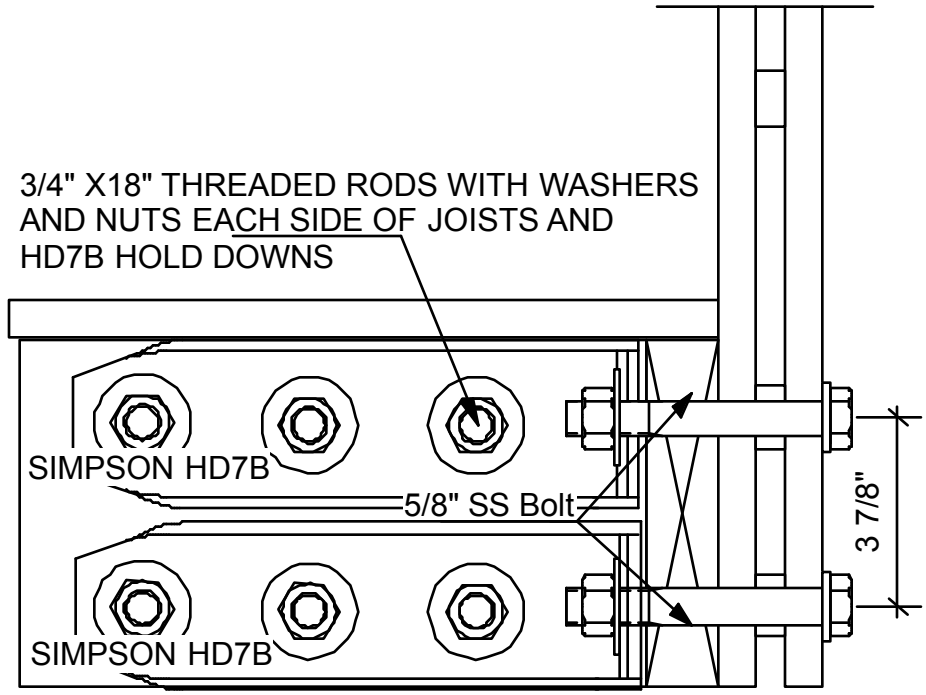
Edward C. Robison, PE, SE
10012 Creviston DR NW
Gig Harbor, WA 98329
253-858-0855
fax 253-858-0856
email: elrobison@narrows.com

OPTION B
Posts located between studs with hold downs mounted on threaded rods.
V = 2,020#
Shear strength of threaded rod on joist - NDS Table 11B for G ≥ 0.43
½" rod; Z = 520#; M_a = 422"#
⅝" rod; Z = 650#; M_a = 824"#
¾" rod; Z = 780#; M_a = 1,424"#
⅞" rod; Z = 910#; M_a = 2,261"#
1" rod; Z = 1,040#; M_a = 3,375"#

Moment on rod from connection at middle of bay
M= 2,020#*14.5"/8 = 3,661"#

Try HD7B uses three 3/4" bolts
V_a = 3*2*780 = 4,680# ≥ 2,020#
M_a = 3*1,424 = 4,272"# ≥ 3,661"#

Bolts must be moved closer together so that revised bolt tension force:
T = 10,098.5/4.5" = 2,244# ≤ 4,680
M= 2,244#*14.5"/8 = 4,067"# ≤ 4,272"#



Hold downs may be located at any location between joists on threaded rods.

For installation on joists deeper than 2x8 (7-1/4") set tension tie at top of joist and at 3-7/8" center to center for lower tension tie.

Edward C. Robison, PE, SE
10012 Creviston DR NW
Gig Harbor, WA 98329
253-858-0855
fax 253-858-0856
email: elrobison@narrows.com

OPTION C
Lag screws into 4x10 beam
Lags at 7" on center
$\sum M = 0 = 200*51.5 + 108*1.375 - T*8$"
solving for T:
T = 10,449/8 = 1,306#

Try using (2) pairs of 5/16" x 5-1/8" GRK PHEinox screws
with 3" thread depth into main member:
Withdrawal strength based on ESR-2442:

TABLE 2—RSS™ REFERENCE WITHDRAWAL (*W*) AND PULL-THROUGH (*P*) DESIGN VALUES[1,2,4]

FASTENER DESIGNATION		THREAD LENGTH (inches)	*W* (lbf/ in.)[2] For Specific Gravities of: 0.42	*W* (lbf/ in.)[2] For Specific Gravities of: 0.55	P (lbf)[3] For Specific Gravities of: 0.42	P (lbf)[3] For Specific Gravities of: 0.55
PHEinox	1/4 x 2 1/2"	1 1/2	134	187	162	306
	1/4 x 3 1/8"	2				
	5/16 x 2 1/2"	1 5/8	136	202	199	254
	5/16 x 3 1/8"	2 1/8				
	5/16 x 4"	2 1/2				
	5/16 x 5 1/8"	3 3/8				
	5/16 x 6"	3 7/8				

W' = W*C_D*e = 199#/in*1.6*3" = 955# each
For 2 screws:
W' = 2*955 = 1,910#
WET USE:
W' = 0.7*1,910 = 1,337# ≥ 1,306# Wet use okay without change.

Shear strength:

TABLE 3—RSS™ REFERENCE LATERAL DESIGN VALUES (*Z*) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS[1,3]
[For Sawn Lumber or SCL with Both Members of Identical Specific Gravity]

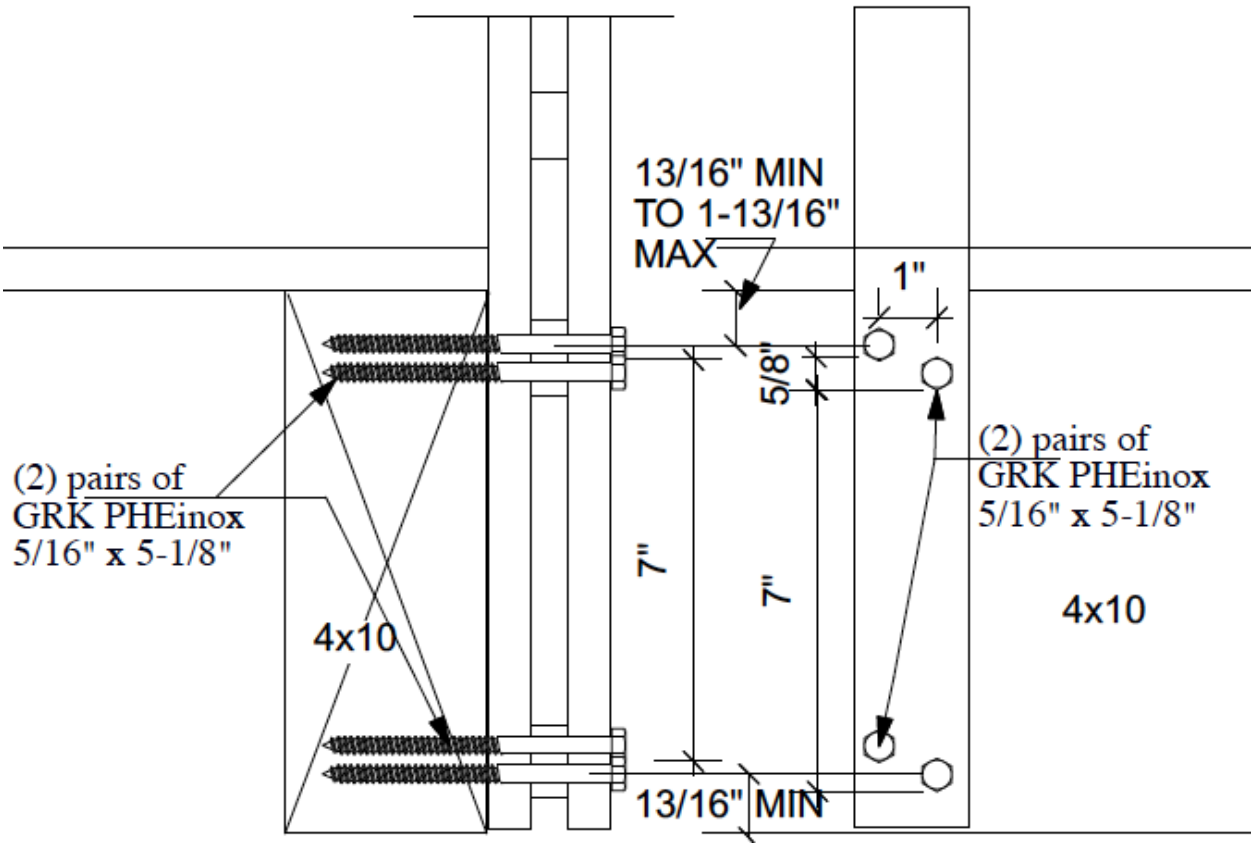
FASTENER DESIGNATION		SIDE MEMBER THICKNESS, t^s (inches)	FASTENER PENETRATION INTO MAIN MEMBER[2], *p* (inches)	REFERENCE LATERAL DESIGN VALUE, *Z* (lbf)[2,4] FOR SPECIFIC GRAVITIES OF: 0.42 Parallel to Grain, $Z_\parallel$	0.42 Perpendicular to Grain, $Z_\perp$	0.55 Parallel to Grain, $Z_\parallel$	0.55 Perpendicular to Grain, $Z_\perp$
PHEinox	1/4 x 2 1/2"	3/4	1 5/8	162	134	215	185
	1/4 x 3 1/8"	3/4	2 3/8				
	5/16 x 2 1/2"	3/4	1 5/8	151	149	181	175
	5/16 x 3 1/8"	3/4	2 3/8				
	5/16 x 4"	1 1/2	2 3/8	249	229	337	272
	5/16 x 5 1/8"	1 1/2	3 5/8				
	5/16 x 6"	2	3 7/8	302	340	449	358

Z' = Z*C_D = 272#*1.6 = 435# each
V = 108/4 = 27#

Edward C. Robison, PE, SE
10012 Creviston DR NW
Gig Harbor, WA 98329
253-858-0855
fax 253-858-0856
email: elrobison@narrows.com

Install upper screws at 13/16” minimum and 1-13/16” maximum from top of joist to center line of top screw.

Minimum edge distance at bottom is 13/16” centerline of screw to bottom edge.
For installation on beams deeper than 4x10 (9-1/4”) keep same top distance.



Edward C. Robison, PE, SE
10012 Creviston DR NW
Gig Harbor, WA 98329
253-858-0855
fax 253-858-0856
email: elrobison@narrows.com