RCA-C Rigid Connector Angle for Concrete

Our lineup of rigid connector angles (RCA) has a new addition with the RCA-C. The RCA-C is an ideal solution for attaching stud framing to concrete supports. This connector provides the most anchor options for attaching to concrete in comparison to other similar connectors on the market. The connector's design includes holes for a ½"-diameter anchor, or two ¼"-diameter concrete screws, accompanied by a wide array of fastening options — thus saving the installer the time and cost of drilling connector holes at the jobsite. In addition, the RCA connectors have been rigorously tested and load rated, giving you the confidence of quality and performance for your job.

Features:

- 2" x 2" legs provide plenty of room to make attachments to structure and stud framing.
- Multiple screw pattern options to stud framing for different load ratings.
- Can be used as either a heavy-duty shear and tension connector or light-duty moment connection.
- Prepunched holes for screws to stud framing and attachment to concrete. Prepunched holes on anchor leg provide options for (1) ½"-diameter anchor, (2) ¼"-diameter anchors, or (2) ¼"-diameter concrete screws.
- Attachment to concrete or masonry can be achieved with ½"-diameter Titen HD®, ½"-diameter Strong-Bolt® 2, ¼"-diameter Titen HD, or ¼"-diameter Titen Turbo™.

Material: RCA-C — 97 mil (12 ga.), 50 ksi

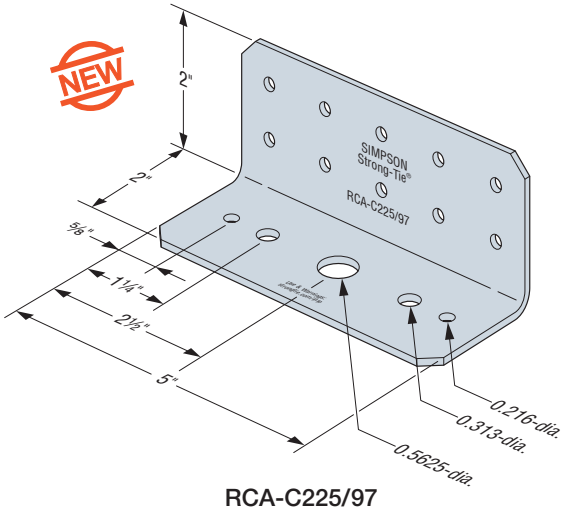
Finish: Galvanized (G90)

Installation:

- Use all specified anchors/fasteners.

Codes: Tested per ICC-ES AC261 and calculations per AISI RP18-4, AISI S100 or generally accepted industry standards. Visit **strongtie.com** for the latest load values and testing information.

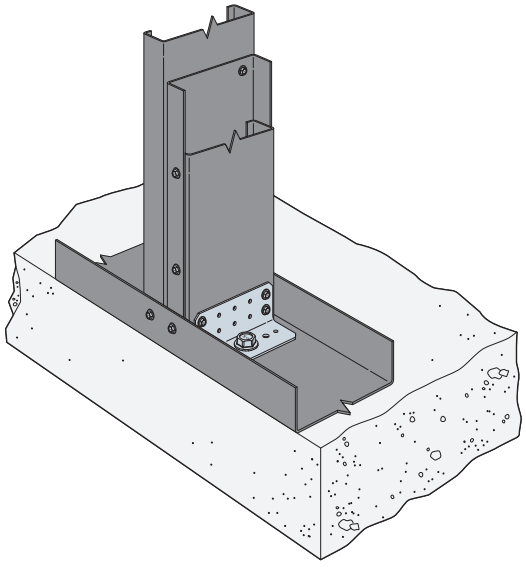
Ordering Information: RCA-C225/97-R55
(55 connectors per bucket)



RCA-C225/97

Simpson Strong-Tie® Anchors for RCA-C Attachment to Concrete or Masonry

Anchor Type	Anchor Diameter
Titen HD Heavy-Duty Screw Anchor	½" or ¼"
Strong-Bolt 2 Wedge Anchor	½"
Titen Turbo Concrete and Masonry Screw Anchor	¼"



RCA-C Installation at Post

RCA-C Rigid Connector Angle for Concrete

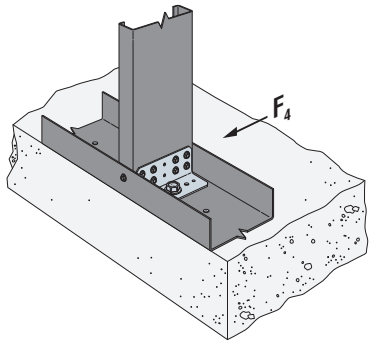


Figure A
F_4 Loading
(one anchor shown)

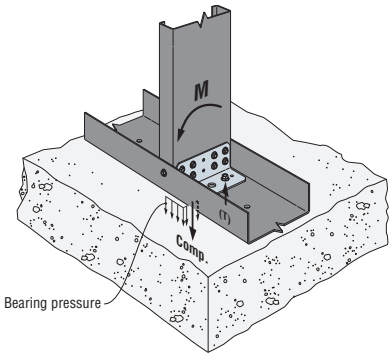


Figure B
Anchor Tension, T, Created from Moment
(two anchors shown)

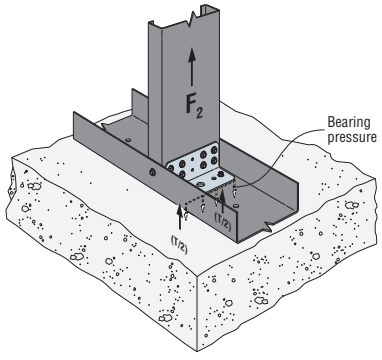


Figure C
Anchor Tension, T, Created from F_2
(two anchors shown)

Table 1: RCA-C Allowable Connector Loads (lb.)

Model No.	Anchor Type	Fastener Pattern	No. of #10 Fasteners to Stud	Framing Member Thickness mil (ga.)	Connector Rotational Stiffness β (in.-kip/rad.)	Allowable Load			Anchor Tension, T	
						Moment M (in.-lb.)	Tension F_2 (lb.)	Shear F_4 (lb.)	At Allowable Moment, M (lb.)	At Allowable Tension Load, F_2 (lb.)
									f'_c = 4,000 psi	f'_c = 4,000 psi
RCA-C225/97	(1) ½"-diameter Titen HD® or (1) ½"-diameter Strong-Bolt® 2	4A	4	33 (20)	130	845	660	425	345	705
				43 (18)	160	1,500	1,020	550	615	1,105
				54 (16)	165	1,900	1,050	1,050	785	1,140
		8A	8	33 (20)	155	1,830	1,050	845	755	1,140
				43 (18)	160	3,215	1,050	1,105	1,355	1,140
				54 (16)	175	4,075	1,050	2,100	1,745	1,140
		10A	10	33 (20)	155	3,430	1,050	845	1,455	1,140
				43 (18)	160	4,905	1,050	1,105	2,140	1,140
				54 (16)	175	7,640	1,050	2,100	3,540	1,140
	(2) ¼"-diameter Titen HD	4B	4	33 (20)	155	1,100	660	480	295	705
				43 (18)	200	1,770	1,020	625	480	1,105
				54 (16)	220	2,005	1,050	1,185	545	1,140
		8B	8	33 (20)	170	2,375	1,050	960	645	1,140
				43 (18)	220	3,795	1,050	1,250	1,040	1,140
				54 (16)	240	4,300	1,050	2,375	1,180	1,140
		10B	10	33 (20)	170	4,450	1,050	960	1,225	1,140
				43 (18)	220	5,790	1,050	1,250	1,610	1,140
				54 (16)	240	8,060	1,050	2,375	2,285	1,140
	(2) ¼"-diameter Titen Turbo™	4C	4	33 (20)	190	1,100	660	480	250	705
				43 (18)	250	1,770	1,020	625	405	1,105
				54 (16)	310	2,005	1,050	1,185	460	1,140
		8C	8	33 (20)	200	2,375	1,050	960	545	1,140
				43 (18)	260	3,795	1,050	1,250	880	1,140
				54 (16)	320	4,300	1,050	2,375	995	1,140
		10C	10	33 (20)	200	4,450	1,050	960	1,035	1,140
				43 (18)	260	5,790	1,050	1,250	1,355	1,140
				54 (16)	320	8,060	1,050	2,375	1,910	1,140

1. For additional important information, see General Information and Notes on p. 26.
2. The designer is responsible for anchorage design. Reference Table 2 on p. 114 for anchorage solutions.
3. See illustrations for fastener pattern placement.
4. Tabulated values are based on framing members with track and stud of the same thickness and (1) #10 screw into each stud flange unless otherwise noted.
5. Tabulated moment values correspond to maximum connector strength without consideration of serviceability. The designer must check out-of-plane deflections using tabulated rotational stiffness.
6. Tabulated connector rotational stiffness may be used for any wall heights. The designer must consider member deflection due to bending in the stud member.
7. Per IBC 2021, 2018, 2015, 2012 Table 1604.3 footnote f, wind load is permitted to be taken as 0.42 times "component and cladding loads" for deflection checks. For IBC 2009 and earlier, the factor is 0.7 instead of 0.42. Tabulated values have not been adjusted.
8. Allowable loads are based on cold-formed steel members with a minimum F_y of 33 ksi and F_u of 45 ksi for 43 mil (18 ga.) and thinner and a minimum F_y of 50 ksi and F_u of 65 ksi for 54 mil (16 ga.) and thicker.
9. Connectors subjected to tension, shear and moment loads: $F_2/F_{2all} + F_4/F_{4all} + M/M_{all} \leq 1.0$. F_4 interaction with Moment not required to be checked for walls 2'-0" or taller. Where: F_2, F_4 and M are the applied ASD tension, shear and moment, respectively. F_{2all}, F_{4all}, M_{all} are the allowable tension, shear and moment from Table 1, respectively.
10. Anchor tension, T, is the force in the anchor, or both anchors for two-anchor solutions, at maximum allowable, M, or maximum allowable tension, F_2. See Table 2 on p. 114 for pre-engineered anchorage solutions that incorporate anchor T into the solution.
11. Anchor tension is calculated using AISC Steel Design Guide 1. The Anchor Bolt Design illustration (Figure B) shows the anchor tension, T, based on an applied moment, M. An illustration for the anchor tension, T, based on a vertical tension load, F_2, shown in Figure C.
12. Anchor tension, T, may be interpolated. Examples:
    - M_{req} = 3,312 in.-lb. (given), fastener pattern 10C, 54 mil studs. Anchor tension, T, at allowable moment = (3,312/8,060) x 1,910 = 785 lb.
    - T_{req} = 525 lb. (given), fastener pattern 4A, 33 mil studs. Anchor tension, T, at allowable tension load, F_2 = (525/660) x 755 = 601 lb.
13. Tabulated anchor tension, T, is based on f'_c = 4,000 psi. For f'_c = 3,000 psi, use an increase factor of 1.05.

RCA-C Rigid Connector Angle for Concrete

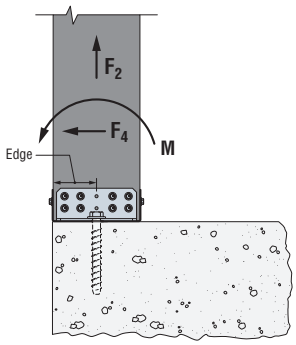


Figure A
One Anchor

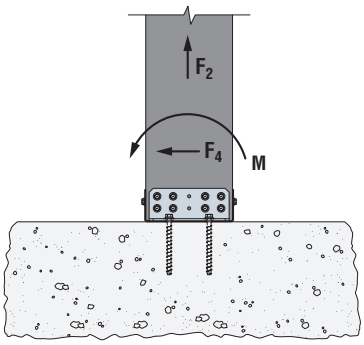


Figure B
Two Anchors

Table 2: RCA-C Allowable Anchorage Loads (lb.)

Model No.	Type of Concrete	Anchor Type	Nominal Embedment Depth, h_{nom} (in.)	Min. Concrete Thickness, $h_{min.}$ (in.)	Min. Anchor Edge Distance (in.)	Uncracked 4,000 psi Concrete			Cracked 4,000 psi Concrete					
						Wind and Seismic in SDC A and B			Wind and Seismic in SDC A and B			Seismic in SDC C and D		
						Allowable			Allowable			Allowable		
						Moment M (in.-lb.)	Tension F_2 (lb.)	Shear F_4 (lb.)	Moment M (in.-lb.)	Tension F_2 (lb.)	Shear F_4 (lb.)	Moment M (in.-lb.)	Tension F_2 (lb.)	Shear F_4 (lb.)
RCA-C225/97	SLWC	(1) ½"-diameter Titen HD®	3¼	5	3	3,015	1,165	885	2,190	845	635	785	305	295
					12	3,425	1,320	1,560	2,465	950	1,105	885	340	515
		(1) ½"-diameter Strong-Bolt® 2	2¾	6	4	2,185	845	975	2,315	895	965	830	320	450
					12	2,890	1,115	1,465	2,315	895	1,035	830	320	485
		(2) ¼"-diameter Titen HD	1⅝	3¼	1½	1,265	565	445	1,205	540	315	425	190	150
					6	2,410	1,025	1,070	1,375	595	680	485	210	315
		(2) ¼"-diameter Titen Turbo™	1¾	3¼	1¾	1,360	590	495	—	—	—	—	—	—
					3	1,955	835	520	—	—	—	—	—	—
	NWC	(1) ½"-diameter Titen HD	3¼	5	3	4,330	1,670	1,305	3,165	1,225	930	1,150	445	435
					12	4,895	1,890	2,295	3,555	1,375	1,625	1,295	500	760
		(1) ½"-diameter Strong-Bolt 2	2¾	6	4	3,160	1,220	1,435	3,345	1,290	1,420	1,215	470	665
					12	4,150	1,605	2,150	3,345	1,290	1,525	1,215	470	710
		(2) ¼"-diameter Titen HD	1⅝	3¼	1½	1,855	825	655	1,765	785	465	625	280	220
					6	3,515	1,475	1,455	2,010	860	995	710	310	465
		(2) ¼"-diameter Titen Turbo	1¾	3¼	1¾	1,990	855	520	—	—	—	—	—	—
					3	2,860	1,205	520	—	—	—	—	—	—

1. Anchor allowable loads have been determined using ACI 314-14 Chapter 17 anchorage calculations with the minimum concrete compressive strength, f'_c, and slab thickness listed. Sand-Lightweight Concrete is abbreviated as SLWC, Normal Weight Concrete is abbreviated as NWC.
2. Load values are for anchor based on ACI 318-14, condition B, load factors from ACI 318 Section 5.3, no supplemental edge reinforcement, $\Psi_{c,v} = 1.0$ for cracked concrete and periodic special inspection. Reference ICC-ES or IAPMO-UES evaluation reports for further information.
3. Allowable Stress Design (ASD) values were determined by multiplying calculated strength design values by a conversion factor, Alpha (α), of 0.7 for seismic loads and 0.6 for wind loads. ASD values for other load combinations may be determined using alternate conversion factors.
4. End distances are assumed as N/A perpendicular to load.
5. Tabulated allowable ASD loads for Wind and Seismic in SDC A and B are based on using wind conversion factors and may be increased by 1.17 for seismic SDC A and B only.
6. Allowable loads have been divided by an Omega (Ω) seismic factor of 2.5 for brittle failure as required by ACI 318-14 Chapter 17.
7. Tabulated capacities are based on maximum allowable anchorage loads only. The capacity of the connection system shall be the minimum of the tabulated value and the RCA-C allowable load value listed on Table 1 on p. 113.
8. Tabulated loads in Table 2 are based on f'_c = 4,000 psi. For f'_c = 3,000 psi, use an adjustment factor of 0.86.
9. For anchor subjected to tension, shear and moment loads:

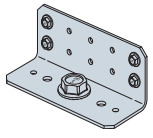
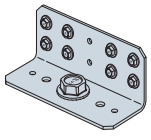
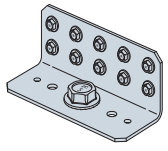
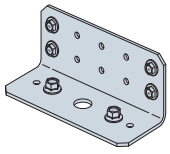
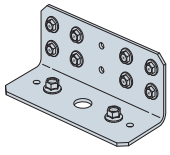
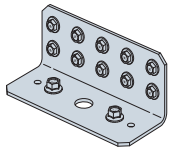
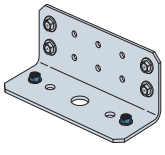
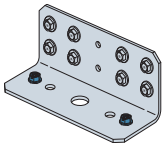
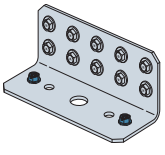
When $(F_4/F_{4all}) \le 0.2$ — $F_2/F_{2all} + M/M_{all} \le 1.0$

When $(F_2/F_{2all} + M/M_{all}) \le 0.2$ — $F_4/F_{4all} \le 1.0$

When $(F_4/F_{4all}) > 0.2$ and $(F_2/F_{2all} + M/M_{all}) > 0.2$ — $(F_2/F_{2all} + M/M_{all}) + (F_4/F_{4all}) \le 1.2$

Where: F_2, F_4 and M are the applied ASD tension, shear and moment, respectively.
F_{2all}, F_{4all}, M_{all} are the allowable tension, shear and moment from Table 2, respectively.

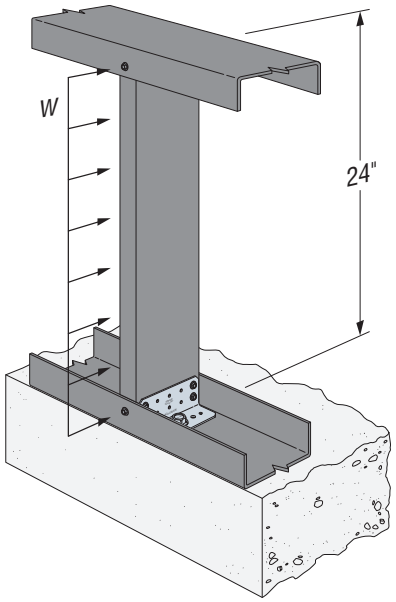
RCA-C Fastener Patterns

(1) ½"-Diameter Titen HD/Strong-Bolt 2		
Pattern 4A	Pattern 8A	Pattern 10A
		
(2) ¼"-Diameter Titen HD		
Pattern 4B	Pattern 8B	Pattern 10B
		
(2) ¼"-Diameter Titen Turbo		
Pattern 4C	Pattern 8C	Pattern 10C
		

RCA-C Rigid Connector Angle for Concrete

Example #1: Exterior Parapet Stud

- 2021 IBC (ASCE 7-16) and AISI S100-16
- 600S162-43 (33 ksi) stud @ 16" o.c. supported at base
- Parapet height, L = 24"
- Wind design pressure = 55.24 psf (LRFD)
- Deflection Limit, Δ_{allow} = L/240 (Ref. IBC Table 1604.3)
- 4,000 psi NWC uncracked, SDC A&B, 3" edge



1. Determine ASD Wind Pressure:

p = (0.6) (55.24 psf) = 33.14 psf

w = (33.14 psf) (16 in.) (1 ft./12 in.) = 44.19 plf

2. Connector Moment Check:

$$M_{req} = \frac{wL^2}{2} = \frac{(44.19\,plf)(24\,in.)^2}{2\left(12\frac{in.}{ft.}\right)} = 1{,}061\ in.\text{-}lb.$$

From Table 1 for 600S162-43 (33ksi), 6" deep 43 mil stud:
Select RCA-C225/97 (Fastener Pattern 4A) with ½" ϕ anchor and (4) #10 screws, attaching to each stud @ 16" o.c.
Allowable Moment 1,380 in.-lb. > 1,061 in.-lb. **OK**

3. Check Deflection at Required Moment:

$$\Delta_{req} = \Delta_{stud} + \Delta_{connection} = \frac{(0.7)wL^4}{8\,EI_{xe}} + \left(\frac{(0.7)(M_{req})}{\beta}\right)L =$$

$$\Delta_{req} = \left(\frac{(0.7 \times 44.19\,plf)(1\,ft./12)(24\,in.)^4}{8\,(29{,}500{,}000\,psi)(2.32\,in.^4)}\right) + \left(\frac{(0.7)(1{,}061\,in.\text{-}lb.)}{165{,}000\,\frac{in.\text{-}lb.}{rad.}}\right) 24\,in. = 0.002\,in. + 0.108\,in. = 0.110\,in.$$

$$\Delta_{allow} = \frac{2L}{240} = \frac{2(24\,in.)}{240} = 0.200\,in. > 0.110\,in.$$ **OK**

4. Select Anchorage:

Normal weight concrete with f'c = 4,000 psi
Table 2 — Uncracked concrete in SDC A&B
(1) ½"-diameter Titen HD® with 3¼" embedment and 3" edge

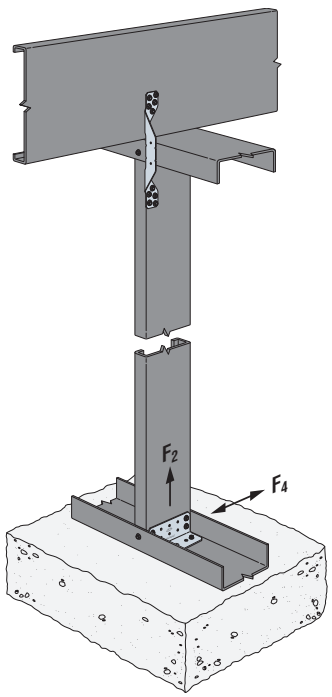
$F_{4req} = \frac{(44.19\,plf)(24\,in.)}{\left(12\frac{in.}{ft.}\right)} = 88.4\,lb.$ $\quad F_{4all} = 1{,}305\,lb.$ $\quad F_{4req}/F_{4all} = 0.07 < 1$ **OK**

$M_{req} = 1{,}061\,in.\text{-}lb.$ $\quad M_{all} = 4{,}330\,in.\text{-}lb.$ $\quad M_{req}/M_{all} = 0.25 < 1$ **OK**

Notes:
1. 2021 IBC load combinations for ASD include a factor of 0.6 for wind loads.
2. Per IBC table 1604.3 footnote f, 0.42 factor can be used to calculate deflections for component and cladding wind loads for LRFD loads; ASD load conversion is 0.7.

Example #2: Load-Bearing Wall with Tension and Shear on Base Connector

- 2021 IBC (ASCE 7-16) and AISI S100-16
- 600S162-33 (33 ksi) stud @ 16" o.c. load bearing condition
- Base connection 4,000 psi NWC uncracked, SDC A&B, 3" edge (nearest fastener)
- Reactions F_2 = 425 lb., F_4 = 147 lb. (ASD Loads)



Select RCA-C225/97 (Fastener Pattern 4C) with (4) #10 screws and (2) ¼"-diameter, 1¾" embedded Titen Turbo™.

1. Determine Connector Allowables and Interactions (Reference Table 1 for Allowables):

F_{2req} = 425 lb.	F_{2all} = 660 lb.	F_{2req}/F_{2all} = 0.64 < 1 **OK**
F_{4req} = 147 lb.	F_{4all} = 480 lb.	F_{4req}/F_{4all} = 0.31 < 1 **OK**
		Interaction = 0.95 < 1 **OK**

2. Determine Anchorage Allowables and Interactions (Reference Table 2 for Allowables):

F_{2req} = 425 lb.	F_{2all} = 1,205 lb.	F_{2req}/F_{2all} = 0.35 < 1 **OK**
F_{4req} = 147 lb.	F_{4all} = 520 lb.	F_{4req}/F_{4all} = 0.28 < 1 **OK**
		Interaction = 0.63 < 1.2 **OK**