

**PA**

# Strap-Tie Holddown

The PA strap-tie holddown is a wood-to-concrete connector that connects studs to the foundation to satisfy engineering and code requirements.

**Material:** 12 gauge

**Finish:** Galvanized or ZMAX® coating

**Installation:**

- Use all specified fasteners; see General Notes
- For additional length, an MST strap can be attached using ½" bolts through existing holes
- Visit [strongtie.com](http://strongtie.com) for additional information

**Codes:** See p. 11 for Code Reference Key Chart

These products are available with additional corrosion protection. For more information, see p. 14.

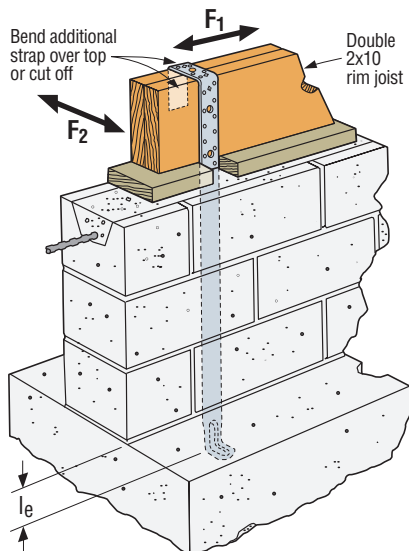
**SD** Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 348–352 for more information.

Wind and SDC A&B – Allowable Tension Loads							
Model No.	Strap Length, L (in.)	l <sub>e</sub> (in.)	Uncracked Concrete		Cracked Concrete		Code Ref.
			Required Nails (in.)	Tension	Required Nails (in.)	Tension	
PA51	51	4	(10) 0.148 x 3	2,025	(10) 0.148 x 3	2,025	IBC, FL
PA68	70	4	(10) 0.148 x 3	2,025	(10) 0.148 x 3	2,025	IBC, FL

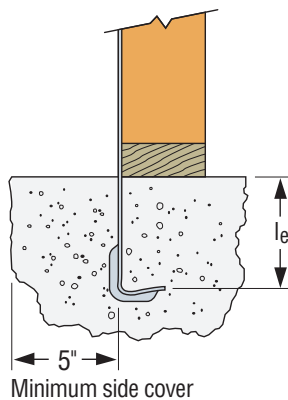
  

SDC C–F – Allowable Tension Loads							
Model No.	Strap Length, L (in.)	l <sub>e</sub> (in.)	Uncracked Concrete		Cracked Concrete		Code Ref.
			Required Nails (in.)	Tension	Required Nails (in.)	Tension	
PA51	51	4	(10) 0.148 x 3	2,025	(10) 0.148 x 3	1,840	IBC, FL
PA68	70	4	(10) 0.148 x 3	2,025	(10) 0.148 x 3	1,840	IBC, FL

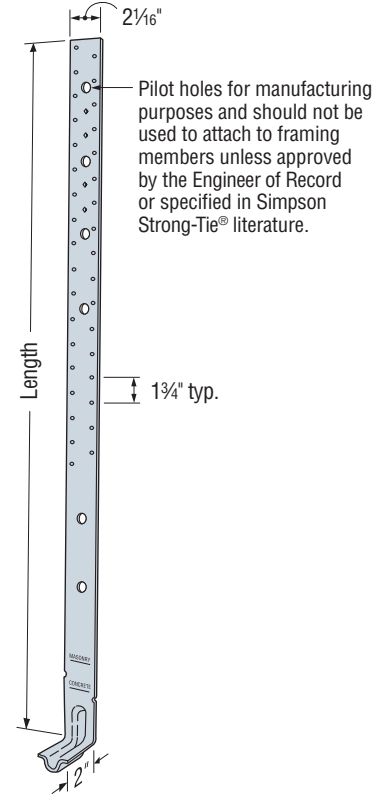
1. Allowable loads have been increased for wind or earthquake loading with no further increase allowed. Reduce where other loads govern.
2. Concrete shall have a minimum compressive strength of  $f'_c = 2,500$  psi.
3. Masonry applications require grout-filled CMU with minimum compressive strength of  $f'_m = 1,500$  psi.
4. Deflection at highest allowable load is as follows: PA51 and PA68 = 0.10".
5. PA allowable lateral loads are  $F_1 = 795$  lb. and  $F_2 = 280$  lb.
6. #9 x 1½" Strong-Drive® SD Connector screws (SD9) may be substituted for table fasteners with no load reduction.
7. **Fasteners:** Nail dimensions are listed diameter by length. See pp. 21–22 for fastener information.



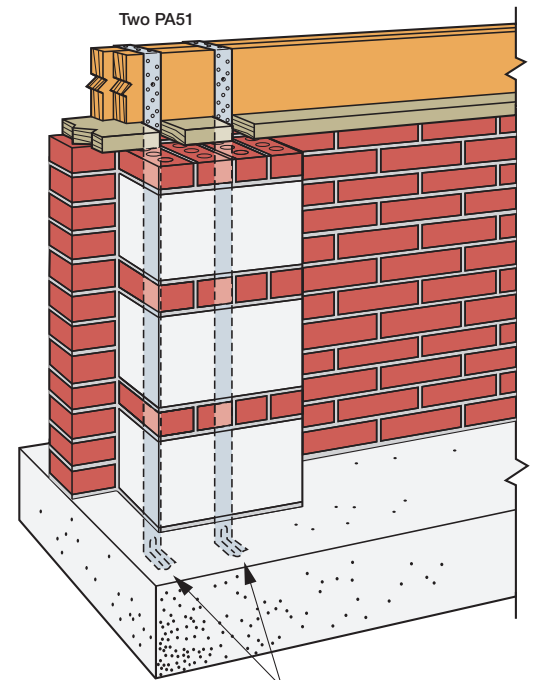
**Typical PA51 Installation**  
(PA68 similar)



**Typical PA Connecting Stud to Foundation**



**PA51**  
(PA68 similar)



**Minimum Two Straps per Pier**  
**Minimum 4" Embedment into Footing**

Per ICC 600-2020, Section 505.2.2.2., the assembly shown above is limited to 140 mph, SDC A and B, and one- and two-story buildings.

# PA/HPA/PAI/MPAI

## Purlin Anchors

Purlin anchors offer solutions for wood-to-concrete and concrete-block connections which satisfy code requirements. The HPA offers the highest capacity in concrete. The PA's dual-embedment line allows installation in concrete or concrete block.

**Material:** PA/PAI — 12 gauge; HPA — 10 gauge; MPAI — 14 gauge

**Finish:** Galvanized; PAs available HDG or ZMAX® coating

**Installation:**

- Use all specified fasteners; some models have extra fastener holes. See General Notes.
- Purlin anchor must hook around rebar.
- Allowable loads are for a horizontal installation into the side of a concrete or masonry wall.
- For vertical installation in the top of GFCMU, refer to engineering letter L-C-PAGFCMUUP on [strongtie.com](http://strongtie.com).
- Strap may be bent one full cycle. (Bent vertical 90° then bent horizontal.)

**Edge Distance** — Minimum concrete edge distance is 5". Minimum concrete block left-to-right edge distance is 20".

**Concrete Block Wall** — The minimum wall specifications are:

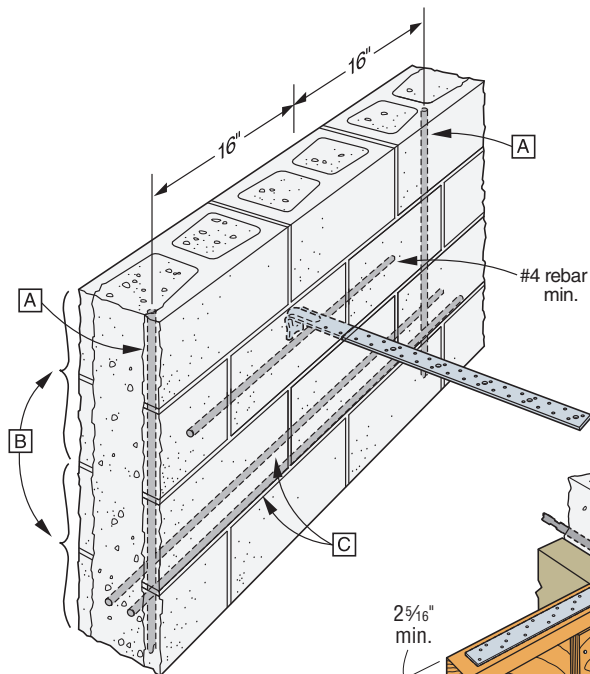
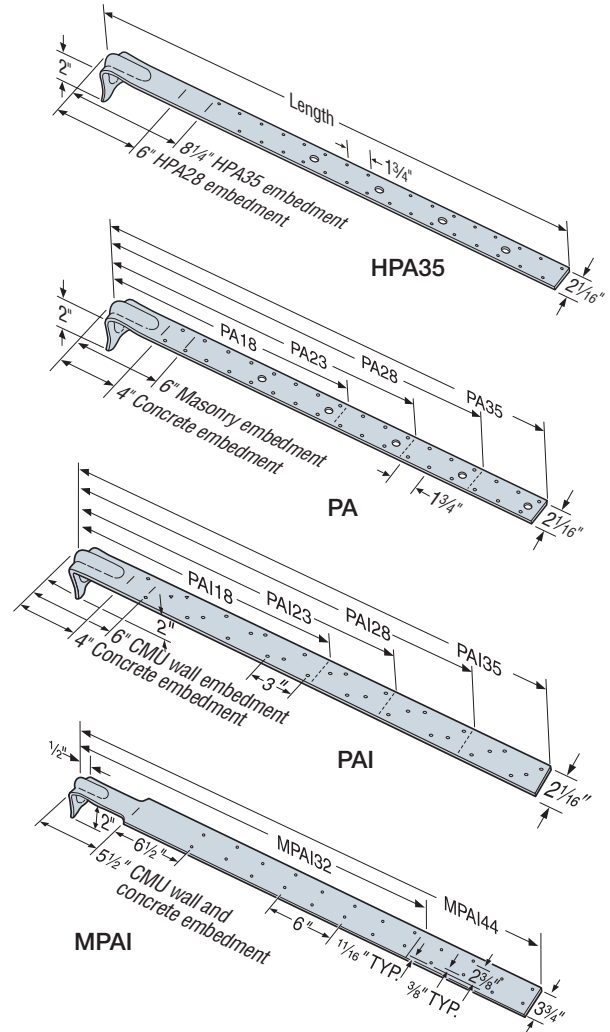
- A** One #4 vertical rebar, 32" long, 16" each side of anchor
- B** Two courses of grout-filled block above and below the anchor (no cold joints allowed)
- C** A horizontal bond beam with two #4 rebars, 40" long, a maximum of two courses above or below the anchor
- D** Minimum masonry compressive strength,  $f'_m = 1,500$  psi

**Options:** See LTT and HTT tension ties for alternate retrofit solutions

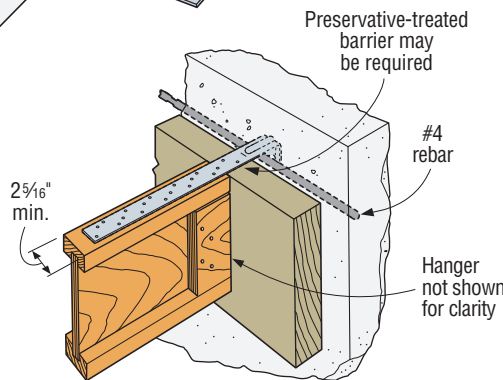
**Codes:** See p. 11 for Code Reference Key Chart

**ASCE7 12.11.2.2.5 States:**

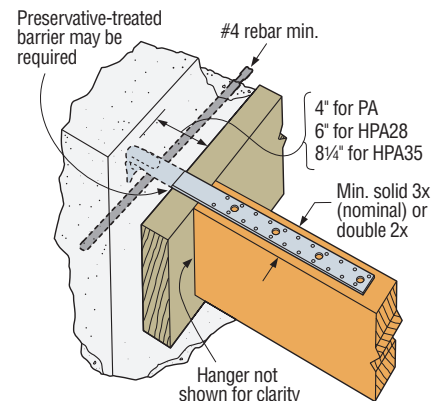
... Diaphragm to structural wall anchorage using embedded straps shall have the straps attached to or hooked around the reinforcing steel, or otherwise terminated to effectively transfer forces to the reinforcing steel.



**PA/PAI/MPAI Purlin to Grout-Filled Concrete-Block Wall**  
(refer to installation notes above)



**PAI Purlin to Concrete Wall**  
(MPAI similar)



**PA/HPA Purlin to Concrete Wall**  
PAI/MPAI for I-joist applications

# PA/HPA/PAI/MPAI

## Purlin Anchors (cont.)

These products are available with additional corrosion protection. For more information, see p. 14.

Holdowns and Tension Ties

Wind and SDC A&B – Allowable Tension Loads (160)													
Max Ledger Size	Model No.	Strap Length, L (in.)	Embed Length, l <sub>e</sub> (in.)		Uncracked Concrete		Cracked Concrete		GFCMU Wall		Max. Allowable Strap Tension	Deflection at Allowable Load (in.)	Code Ref.
			Concrete	GFCMU	Required Nails (in.)	Tension	Required Nails (in.)	Tension	Required Nails (in.)	Tension			
4x Ledger	PA18	18½	4	6	(12) 0.148 x 3	2,430	(12) 0.148 x 3	2,260	(12) 0.148 x 3	1,890	NA	0.087	IBC, FL
	PAI18	18	4	6	(10) 0.148 x 1½	2,025	(10) 0.148 x 1½	2,025	(9) 0.148 x 1½	1,055	NA	0.1	
	PA23	23¾	4	6	(16) 0.148 x 3	3,220	(12) 0.148 x 3	2,260	(16) 0.148 x 3	2,815	NA	0.118	
	PAI23	23	4	6	(15) 0.148 x 1½	3,035	(12) 0.148 x 1½	2,260	(14) 0.148 x 1½	1,805	NA	0.158	
	PA28	29	4	6	(16) 0.148 x 3	3,230	(12) 0.148 x 3	2,260	(16) 0.148 x 3	2,815	NA	0.085	
	PAI28	29	4	6	(16) 0.148 x 1½	3,230	(12) 0.148 x 1½	2,260	(16) 0.148 x 1½	2,705	NA	0.167	
	PA35	35	4	6	(16) 0.148 x 3	3,230	(12) 0.148 x 3	2,260	(16) 0.148 x 3	2,815	NA	0.085	
	PAI35	35	4	6	(16) 0.148 x 1½	3,230	(12) 0.148 x 1½	2,260	(18) 0.148 x 1½	2,815	NA	0.13	
	MPAI32	33½	5½		(16) 0.148 x 1½	2,885	(16) 0.148 x 1½	2,885	(16) 0.148 x 1½	2,355	NA	0.167	
	MPAI44	45½	5½		(16) 0.148 x 1½	2,885	(16) 0.148 x 1½	2,885	(24) 0.148 x 1½	2,865	NA	0.167	
	HPA28	32½	6	6	(22) 0.148 x 3	5,145	(20) 0.148 x 3	4,675	—	—	NA	0.133	
	HPA35	38½	8¼	8¼	(22) 0.148 x 3	5,145	(22) 0.148 x 3	5,145	—	—	NA	0.132	
SDC C-F – Allowable Tension Loads (160)													
Max Ledger Size	Model No.	Strap Length, L (in.)	Embed Length, l <sub>e</sub> (in.)		Uncracked Concrete		Cracked Concrete		GFCMU Wall		Max. Allowable Strap Tension	Deflection at Allowable Load (in.)	Code Ref.
			Concrete	GFCMU	Required Nails (in.)	Tension	Required Nails (in.)	Tension	Required Nails (in.)	Tension			
4x Ledger	PA18	18½	4	6	(12) 0.148 x 3	2,430	(10) 0.148 x 3	1,980	(12) 0.148 x 3	1,890	3,220	0.087	IBC, FL
	PAI18	18	4	6	(10) 0.148 x 1½	2,025	(10) 0.148 x 1½	1,980	(9) 0.148 x 1½	1,055	4,180	0.1	
	PA23	23¾	4	6	(14) 0.148 x 3	2,830	(10) 0.148 x 3	1,980	(16) 0.148 x 3	2,815	3,220	0.118	
	PAI23	23	4	6	(14) 0.148 x 1½	2,830	(10) 0.148 x 1½	1,980	(14) 0.148 x 1½	1,805	4,180	0.158	
	PA28	29	4	6	(14) 0.148 x 3	2,830	(10) 0.148 x 3	1,980	(16) 0.148 x 3	2,815	3,935	0.085	
	PAI28	29	4	6	(14) 0.148 x 1½	2,830	(10) 0.148 x 1½	1,980	(16) 0.148 x 1½	2,705	5,070	0.167	
	PA35	35	4	6	(14) 0.148 x 3	2,830	(10) 0.148 x 3	1,980	(16) 0.148 x 3	2,815	3,935	0.085	
	PAI35	35	4	6	(14) 0.148 x 1½	2,830	(10) 0.148 x 1½	1,980	(18) 0.148 x 1½	2,815	5,070	0.13	
	MPAI32	33½	5½		(16) 0.148 x 1½	2,885	(16) 0.148 x 1½	2,885	(16) 0.148 x 1½	2,355	3,205	0.167	
	MPAI44	45½	5½		(16) 0.148 x 1½	2,885	(16) 0.148 x 1½	2,885	(24) 0.148 x 1½	2,865	3,205	0.167	
	HPA28	32½	6	6	(22) 0.148 x 3	5,145	(18) 0.148 x 3	4,090	—	—	5,145	0.133	
	HPA35	38½	8¼	8¼	(22) 0.148 x 3	5,145	(22) 0.148 x 3	5,145	—	—	5,145	0.132	

1. Allowable loads have been increased for wind or earthquake loading with no further increase allowed. Reduce where other loads govern.
2. Deflection listed is at the highest allowable load.
3. Multiply **Seismic and Wind ASD load values** by 1.43 or 1.67, respectively, to obtain LRFD capacities.
4. Nail quantities are based on Douglas fir (DF) or equivalent specific gravity of 0.50 or better. For use in spruce-pine-fir (SPF) or hem-fir (HF), nails quantities shall be increased by 1.15 to achieve loads listed.
5. For wall anchorage systems in SDC C-F, the maximum strap allowable load shall not be less than 1.4 times the ASD anchor design load.
6. Minimum center-to-center spacing is 3x the required embedment — i.e., standard installation is based on a minimum 5" end distance.
7. Structural composite lumber beams have sides that show either the wide face or the lumber strands/veneers. Values in the tables reflect installation into the wide face.
8. Concrete shall have a minimum compressive strength of f<sub>c</sub> = 3,000 psi.
9. Grout-filled CMU (GFCMU) shall have a minimum compressive strength of f<sub>m</sub> = 1,500 psi.
10. PA models installed vertically in the top of a grouted masonry wall with 6" embedment and (12) 0.148" x 3" nails achieve an allowable uplift load of 1,890 lb.
11. For PA models, 0.148" x 1½" nails may be substituted for 0.148" x 3" nails at 100% of listed load and with a 15% increase in deflection. For installation over sheathing, use 3"-long nails minimum.
12. For PAI/MPAI models, 0.148" x 1½" nails shall be used directly onto framing member. For installation over sheathing, use 2½"-long nails minimum.
13. **Fasteners:** Nail dimensions are listed diameter by length. See pp. 21–22 for fastener information.

# PA/HPA Purlin Anchors

PA/HPA purlin anchors offer solutions for CFS to concrete and concrete block connections which satisfy code requirements. The HPA offers the highest capacity in concrete. The PAs dual embedment line allows installation in concrete or concrete block.

**Material:** PA — 12 gauge; HPA — 10 gauge

**Finish:** Galvanized. PAs available in HDG or ZMAX® coating.

**Installation:**

- Use all specified fasteners; some models have extra fastener holes. See General Notes.
- Purlin anchor must hook around rebar.
- Allowable loads are for a horizontal installation into the side of a concrete or masonry wall.
- Strap may be bent one full cycle. (Bent vertical 90° then bent horizontal.)

**Edge Distance** — Minimum concrete edge distance is 5". Minimum concrete block left-to-right edge distance is 20".

**Concrete Block Wall** — The minimum wall specifications are:

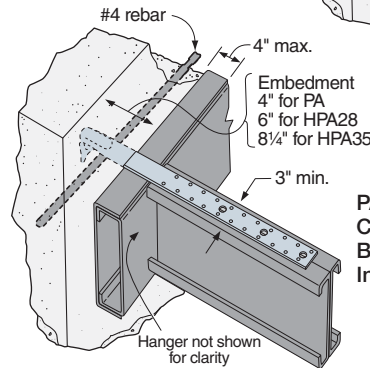
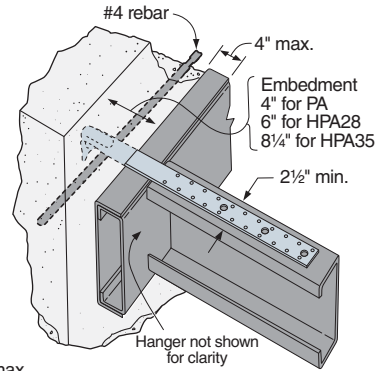
- A One #4 vertical rebar, 32" long, 16" each side of anchor.
- B Two courses of grout filled block above and below the anchor (no cold joints allowed).
- C A horizontal bond beam with two #4 rebars, 40" long, a maximum of two courses above or below the anchor.
- D Minimum masonry compressive strength,  $f'_m = 1,500$  psi.

**Options:** See S/LTT and HTT Tension Ties for alternate retrofit solutions

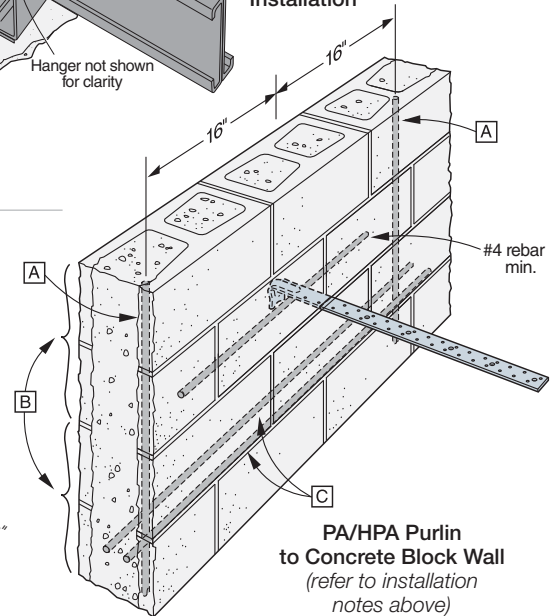
**Codes:** See p. 11 for Code Reference Key Chart

**ASCE 12.11.2.2.5 states:**

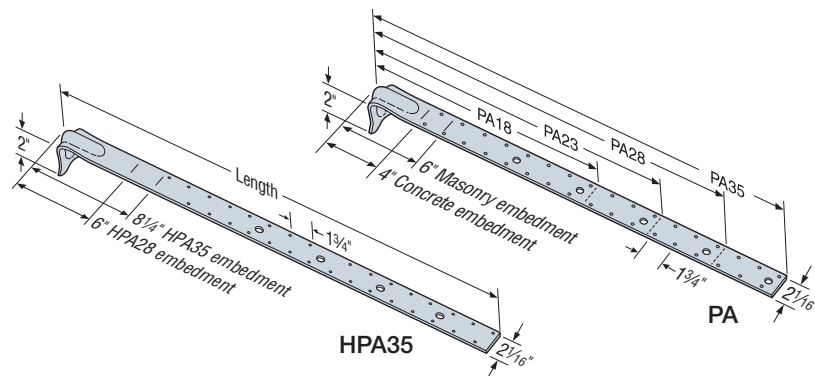
... Diaphragm to structural wall anchorage using embedded straps shall have the straps attached to, or hooked around the reinforcing steel or otherwise terminated to effectively transfer forces to the reinforcing steel.



**PA/HPA Purlin to Concrete Wall Back-to-Back Joist Installation**



**PA/HPA Purlin to Concrete Block Wall**  
(refer to installation notes above)



Wind and SDC A&B — Allowable Load (lb.)										Code Ref.
Model No.	Strap Length L (in.)	l <sub>e</sub> <sup>o</sup> (in.)	Fasteners <sup>8</sup>			Non Cracked Tension Load	Cracked Tension Load	Max. Allowable Strap Tensile Capacity	Masonry Installation Tension Load	
			Rafter/Stud /Joist Thickness							
			33 mil (20 ga.)	43 mil (18 ga.)	54 mil (16 ga.)					
PA18	18 1/2	4	(16) #10	(16) #10	(8) #10	2,430	2,260	NA	1,895	
PA23	23 3/4	4	(22) #10	(16) #10	(8) #10	3,220	2,260	NA	2,815	
PA28	29	4	(22) #10	(16) #10	(8) #10	3,230	2,260	NA	2,815	
PA35	35	4	(22) #10	(16) #10	(8) #10	3,230	2,260	NA	2,815	
HPA28	32 1/2	6	(28) #10	(20) #10	(10) #10	5,145	4,675	NA	—	
HPA35	38 1/2	8 1/4	(32) #10	(22) #10	(12) #10	5,145	5,145	NA	—	
SDC C-F — Allowable Load (lb.)										IBC
PA18	18 1/2	4	(16) #10	(16) #10	(8) #10	2,340	1,980	3,220	1,895	
PA23	23 3/4	4	(22) #10	(16) #10	(8) #10	2,830	1,980	3,220	2,815	
PA28	29	4	(22) #10	(16) #10	(8) #10	2,830	1,980	3,935	2,815	
PA35	35	4	(22) #10	(16) #10	(8) #10	2,830	1,980	3,935	2,815	
HPA28	32 1/2	6	(28) #10	(20) #10	(10) #10	5,145	4,090	5,145	—	
HPA35	38 1/2	8 1/4	(32) #10	(22) #10	(12) #10	5,145	5,145	5,145	—	

These products are available with additional corrosion protection. Additional products on this page may also be available with this option. Check with Simpson Strong-Tie for details.

1. Loads may not be increased for short-term loading.
2. For concrete installs, the minimum compressive strength,  $f'_c = 3,000$  psi.
3. Multiply Seismic and Wind ASD load values by 1.4 or 1.67, respectively, to obtain LRFD capacities.
4. In accordance with 2012, 2015 and 2018 IBC Section 1613.1, detached one- and two-family dwellings in Seismic Design Category (SDC) C may use "Wind and SDC A&B" allowable loads.
5. Minimum center-to-center spacing is 3 times the required embedment ( $S_{min} = 3 \times l_e$ ) for PA/HPAs acting in tension simultaneously, where  $l_e$  = embedment depth. Standard installation is based on minimum 5" end distance.
6. Install fasteners symmetrically and with a minimum of 4 of the required fasteners between the embedment line and the first tooling hole. In some cases, not all of the fastener holes will need to be filled.
7. Per ASCE7-10, 12.11.2.2.2, for diaphragms in structures assigned to SDC C-F, maximum allowable strap tensile capacity shall be no less than 1.4 times the design load. Not applicable (NA) for Wind and SDC A&B designs.
8. For PA straps, concrete embedment shown; embedment in masonry shall be 6".
9. See *Fastening Systems* catalog (C-F-2019) on [strongtie.com](http://strongtie.com) for more information on Simpson Strong-Tie fasteners.