

CODE LISTED

ICC-ES ESR-2272

CATEGORY 1

**CRACKED &
UNCRACKED CONCRETE**



Snake+Anchor

Strength Design Anchoring System

Powers is a proud member of:



Powers
FASTENERS

Snake+™

Internally Threaded Screw Anchor

PRODUCT DESCRIPTION

The Snake+ anchor is an internally threaded, self-tapping screw anchor designed for performance in cracked and uncracked concrete. Suitable base materials include normal-weight concrete, structural sand-lightweight concrete and concrete over metal deck. The Snake+ screw anchor is installed into a drilled hole with a power tool and a Snake+ setting tool. After installation a steel insert element is threaded into the anchor body.

GENERAL APPLICATIONS AND USES

- Suspending conduit
- Cable trays and strut
- Pipe supports
- Fire sprinklers
- Interior applications/low level corrosion environment
- Tension zone applications
- Seismic wind loading applications
- Suspended lighting

FEATURES AND BENEFITS

- Designed for use in holes drilled with standard ANSI carbide drill bits
- Anchor design allows for shallow embedment and mechanically interlocks with base material
- Internally threaded anchor for easy adjustment and removability of threaded rod or bolt
- Fast anchor installation with a powered impact wrench
- Hammer not used for installation

THREAD VERSION

Unified coarse thread (UNC)

ANCHOR MATERIALS

Zinc plated carbon steel body

ANCHOR SIZE RANGE (TYP.)

3/8" diameter

SUITABLE BASE MATERIALS

Normal-weight concrete
Structural sand-lightweight concrete
Concrete over steel deck

APPROVALS AND LISTINGS

- International Code Council, Evaluation Service (ICC-ES), ESR-2272
- Tested in accordance with ACI 355.2 and ICC-ES AC193 for use in concrete under the design provisions of ACI 318 (Strength Design method using Appendix D)
- Evaluated and qualified by an accredited independent testing laboratory for use in cracked and uncracked concrete including seismic and wind loading (Category 1 anchor)
- Evaluated and qualified by an accredited independent testing laboratory for reliability against brittle failure, e.g. hydrogen embrittlement
- FM Global (FM Approvals) for use in concrete - File No. 3024502

GUIDE SPECIFICATIONS

CSI Divisions: 03151-Concrete Anchoring and 05090-Metal Fastenings. Internally threaded anchors shall be Snake+ screw anchors as supplied by Powers Fasteners, Inc., Brewster, NY. Anchors shall be installed in accordance with published instructions and the Authority Having Jurisdiction.

MATERIAL SPECIFICATIONS

Anchor Component	Specification
Anchor body	Case hardened carbon steel
Plating	Zinc plating according to ASTM B633, SC1, Type III (Fe/Zn 5)

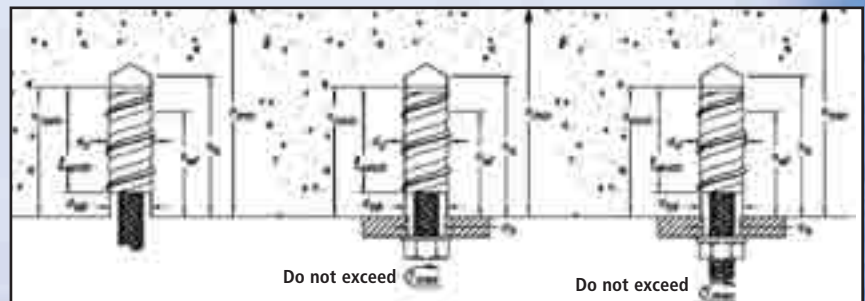
INSTALLATION SPECIFICATIONS

Installation Table for Snake+ Screw Anchor

Anchor Property / Setting Information	Notation	Units	Nominal Anchor Size
			3/8"
Nominal outside anchor diameter	d_o	in. (mm)	1/2 (12.7)
Internal thread diameter (UNC)	d	in. (mm)	0.375 (9.5)
Minimum drill bit diameter	d_{bit}	in.	1/2 ANSI
Minimum nominal embedment depth	h_{nom}	in. (mm)	1-5/8 (41)
Effective embedment	h_{ef}	in. (mm)	1.10 (28)
Minimum hole depth ¹	h_o	in. (mm)	2 (51)
Minimum concrete member thickness ¹	h_{min}	in. (mm)	4 (102)
Overall anchor length	$anch$	in. (mm)	1-1/4 (32)
Minimum edge distance ¹	$c_{a,min} (c_{min})$	in. (mm)	3 (76)
Minimum spacing distance ¹	s_{min}	in. (mm)	3 (76)
Critical edge distance ¹	c_{ac}	in. (mm)	3 (76)
Maximum impact wrench power (torque)	T_{screw}	ft.-lb. (N-m)	345 (468)
Minimum diameter of hole clearance in fixture for steel insert element (following anchor installation)	d_h	in. (mm)	7/16 (11)
Maximum tightening torque of steel insert element (threaded rod or bolt)	T_{max}	ft.-lb. (N-m)	8 (11)

1. For installations through the soffit of steel deck into concrete, see the installation detail. Anchors in the lower flute may be installed with a maximum 1-inch offset in either direction from center of the flute. In addition, anchors shall have an axial spacing along the flute equal to the greater of $3h_{ef}$ or 1.5 times the flute width.

Dimensional Sketch for Snake+ Screw Anchor Installed with Steel Insert Element





INSTALLATION SPECIFICATIONS

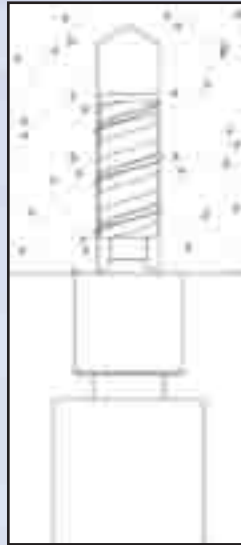
Installation Instructions for Snake+ Screw Anchor



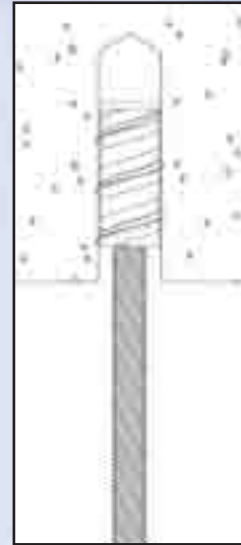
Using the proper drill bit size, drill a hole into the base material to the required depth. The tolerances of the carbide drill bit used should meet the requirements of ANSI Standard B212.15.



Select a powered impact wrench that does not exceed the maximum torque, T_{screw} , for the selected anchor diameter. Attach the Snake+ setting tool supplied by Powers Fasteners to the impact wrench. Mount the anchor onto the setting tool.

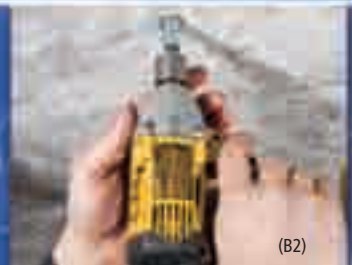
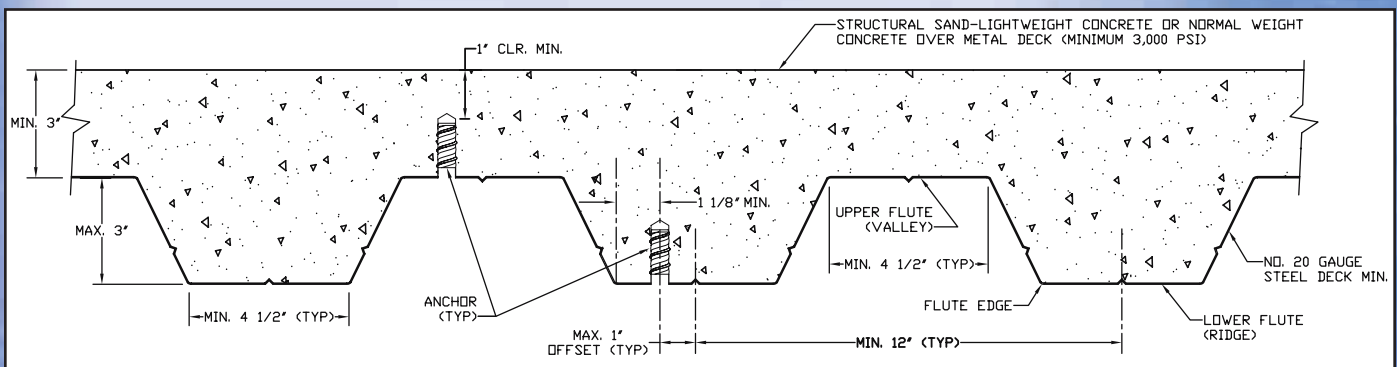


Drive the anchor into the hole until the shoulder of the Snake+ setting tool comes into contact with the surface of the base material. Do not spin the setting tool off the anchor to disengage.



Insert threaded rod or a bolt into the Snake+, taking care not to exceed the maximum specified tightening torque of the steel insert element, T_{max} . Minimum thread engagement should be at least one diameter of the steel insert element.

Installation Detail for Snake+ Screw Anchor Installed Through Soffit Steel Deck into Concrete¹



PERFORMANCE DATA

Tension Design Information (For use with load combinations taken from ACI 318 Section 9.2)^{1,2}

Design Characteristic	Notation	Units	Nominal Anchor Size	
			3/8"	
Anchor category	1, 2 or 3	-	1	
Nominal embedment depth	h_{nom}	in.	1-5/8	
STEEL STRENGTH IN TENSION⁴				
Minimum specified yield strength of steel insert element (threaded rod or bolt)	f_y	ksi (N/mm ²)	SAE J429, Grade 2 or ASTM A 307, Grade C	36.0 (248)
		ksi (N/mm ²)	ASTM A 193, Grade B7	105.0 (724)
Minimum specified ultimate strength of steel insert element (threaded rod or bolt)	f_{ut}	ksi (N/mm ²)	SAE J429, Grade 2 or ASTM A 307, Grade C	58.0 (400)
		ksi (N/mm ²)	ASTM A 193, Grade B7	125.0 (862)
Effective tensile stress area of steel insert element (threaded rod or bolt)	A_{se}	in ² (mm ²)	0.0775 (50)	
Steel strength in tension	N_{sa}	lb (kN)	SAE J429, Grade 2 or ASTM A 307, Grade C	4,495 (20.0)
		lb (kN)	ASTM A 193, Grade B7	9,685 (43.1)
Reduction factor for steel strength ³	ϕ	-	0.65	
CONCRETE BREAKOUT STRENGTH IN TENSION⁸				
Effective embedment	h_{ef}	in. (mm)	1.10 (28)	
Effectiveness factor for uncracked concrete	k_{uncr}	-	24	
Effectiveness factor for cracked concrete	k_{cr}	-	17	
Modification factor for cracked and uncracked concrete ⁵	$\psi_{c,N}$	-	1.0 See note 5	
Critical edge distance	c_{ac}	in. (mm)	3 (76)	
Reduction factor for concrete breakout strength ³	ϕ	-	Condition B = 0.65	
PULLOUT STRENGTH IN TENSION (NON-SEISMIC APPLICATIONS)⁸				
Characteristic pullout strength, uncracked concrete (2,500 psi) ⁶	$N_{p,uncr}$	lb (kN)	See note 7	
Characteristic pullout strength, cracked concrete (2,500 psi) ⁶	$N_{p,cr}$	lb (kN)	See note 7	
Reduction factor for pullout strength ³	ϕ	-	Condition B = 0.65	
PULLOUT STRENGTH IN TENSION FOR SEISMIC APPLICATIONS⁸				
Characteristic pullout strength, seismic ^{6,9}	N_{eq}	lb (kN)	See note 7	
Reduction factor for pullout strength ³	ϕ	-	Condition B = 0.65	
PULLOUT STRENGTH IN TENSION FOR STRUCTURAL SAND-LIGHTWEIGHT AND NORMAL-WEIGHT CONCRETE OVER STEEL DECK				
Characteristic pullout strength, uncracked concrete over steel deck ¹⁰	$N_{p,deck,uncr}$	lb (kN)	1,515 (6.7)	
Characteristic pullout strength, cracked concrete over steel deck ¹⁰	$N_{p,deck,cr}$	lb (kN)	1,075 (4.8)	
Reduction factor for pullout strength ³	ϕ	-	Condition B = 0.65	

1. The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations the additional requirements of ACI 318 D.3.3 shall apply.
 2. Installation must comply with published instructions and details and information in this report.
 3. All values of ϕ were determined from the load combinations of ACI 318 Section 9.2 and IBC Section 1605.2 and Condition B in accordance with ACI 318 Section D.4.4. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5.
 4. It is assumed that the threaded rod or bolt used with the Snake+ screw anchor will be a ductile steel element as defined by ACI 318 Section D.1.
 5. For all design cases use $\psi_{c,N} = 1.0$. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be selected.
 6. For concrete compressive strength greater than 3,000 psi, $N_{p,cr} = (\text{Pullout strength value from table}) \times (\text{specified concrete compressive strength}/3000)^{0.5}$.
 7. Pullout strength does not control design of indicated anchors and does not need to be calculated.
 8. Anchors are permitted to be used in structural sand-lightweight concrete provided that N_b , N_{eq} and N_{pn} are multiplied by a factor of 0.60.
 9. Values for $N_{p,deck}$ are for structural sand-lightweight concrete ($f'_c \text{ min} = 3,000 \text{ psi}$) and additional lightweight concrete reduction factors need not be applied. In addition, evaluation for the concrete breakout capacity in accordance with ACI 318 Section D.5.2 is not required for anchors installed in the flute (soffit).
 10. For 2003 IBC code basis replace f_{uta} with f_{ut} ; N_{sa} with N_s ; $\psi_{c,N}$ with ψ_s ; and N_{eq} with $N_{p,seis}$.



PERFORMANCE DATA

Shear Design Information (For use with load combinations taken from ACI 318 Section 9.2)^{1,2}

Design Characteristic	Notation	Units	Nominal Anchor Size	
			3/8"	
Anchor category	1, 2 or 3	-	1	
Nominal embedment depth	h_{nom}	in.	1-5/8	
STEEL STRENGTH IN SHEAR⁴				
Minimum specified yield strength of steel insert element (threaded rod or bolt)	f_y	ksi (N/mm ²)	SAE J429, Grade 2 or ASTM A 307, Grade C	36.0 (248)
		ksi (N/mm ²)	ASTM A 193, Grade B7	105.0 (724)
Minimum specified ultimate strength of steel insert element (threaded rod or bolt)	f_{ut}	ksi (N/mm ²)	SAE J429, Grade 2 or ASTM A 307, Grade C	58.0 (400)
		ksi (N/mm ²)	ASTM A 193, Grade B7	125.0 (862)
Steel strength in shear	V_{sa}	lb (kN)	SAE J429, Grade 2 or ASTM A 307, Grade C	770 (3.4)
		lb (kN)	ASTM A 193, Grade B7	1,655 (7.4)
Reduction factor for steel strength ³	ϕ	-	0.65	
CONCRETE BREAKOUT STRENGTH IN SHEAR⁵				
Load bearing length of anchor (h_{ef} or $8d_o$, whichever is less)	e	in. (mm)	1.10 (28)	
Reduction factor for concrete breakout strength ³	ϕ	-	Condition B = 0.70	
CONCRETE PRYOUT STRENGTH IN SHEAR⁵				
Coefficient for prout strength (1.0 for $h_{ef} < 2.5$ in., 2.0 for $h_{ef} \geq 2.5$ in.)	k_{cp}	-	1.0	
Effective embedment	h_{ef}	in. (mm)	1.10 (28)	
Reduction factor for prout strength ³	ϕ	-	Condition B = 0.70	
STEEL STRENGTH IN SHEAR FOR SEISMIC APPLICATIONS⁵				
Steel strength in shear, seismic ⁶	V_{eq}^8	lb (kN)	SAE J429, Grade 2 or ASTM A 307, Grade C	770 (3.4)
		lb (kN)	ASTM A 193, Grade B7	1,655 (7.4)
Reduction factor for steel strength in shear for seismic ³	ϕ	-	0.65	
STEEL STRENGTH IN SHEAR FOR STRUCTURAL SAND-LIGHTWEIGHT AND NORMAL-WEIGHT CONCRETE OVER STEEL DECK⁸				
Steel strength in shear, concrete over steel deck ⁷	$V_{sa,deck}$	lb (kN)	SAE J429, Grade 2 or ASTM A 307, Grade C	770 (3.4)
		lb (kN)	ASTM A 193, Grade B7	1,655 (7.4)
Reduction factor for steel strength in shear for steel deck ³	ϕ	-	0.65	

- The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; For anchors resisting seismic load combinations the additional requirements of ACI 318 D.3.3 shall apply.
- Installation must comply with published instructions and details and information in this report.
- All values of ϕ were determined from the load combinations of ACI 318 Section 9.2, Condition B in accordance with ACI 318 Section D.4.4 and IBC Section 1605.2. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5.
- It is assumed that the threaded rod or bolt used with the Snake+ anchor will be a ductile steel element as defined by ACI 318 Section D.1.
- Anchors are permitted to be used in structural sand-lightweight concrete provided that N_p and N_{pn} are multiplied by a factor of 0.60.
- Values for $V_{sa,deck}$ are for structural sand-lightweight concrete ($f'_c, min = 3,000$ psi) and additional lightweight concrete reduction factors need not be applied. In addition, evaluation for the concrete breakout capacity in accordance with ACI 318 Section D.6.2 and the prout capacity in accordance with ACI 318 D.6.3 are not required for anchors installed in the flute (soffit).
- Shear loads for anchors installed through steel deck into concrete may be applied in any direction.
- For 2003 IBC code basis replace f_{uta} with f_{ut} ; V_{sa} with V_s ; and e with e and V_{eq} with $V_{sa,seis}$.



Factored Resistance Strength (ϕN_n and ϕV_n) Calculated in Accordance with ACI 318-05 Appendix D:

- Tabular values are provided for illustration and applicable for single anchors installed in normal-weight concrete with minimum slab thickness, $h_a = h_{min}$, and with the following conditions:
 - c_{a1} is greater than or equal to the critical edge distance, c_{ac} (table values based on $c_{a1} = c_{ac}$).
 - c_{a2} is greater than or equal to 1.5 times c_{a1} .
- Calculations were performed according to ACI 318-05 Appendix D. The load level corresponding to the controlling failure mode is listed (e.g. For *tension*: steel, concrete breakout and pullout; For *shear*: steel, concrete breakout and pryout). Furthermore, the capacities for concrete breakout strength in tension and pryout strength in shear are calculated using the effective embedment values, h_{ef} , for the selected anchors as noted in the design information tables. Please also reference the installation specifications for more information.
- Strength reduction factors (ϕ) were based on ACI 318 Section 9.2 for load combinations. Condition B is assumed.
- Tabular values are permitted for static loads only, seismic loading is not permitted with these tables.
- For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318 Appendix D.
- Interpolation is not permitted to be used with the tabular values. For intermediate base material compressive strengths please see ACI 318 Appendix D. For other design conditions including seismic considerations please see ACI 318 Appendix D.



Tension and Shear Factored Resistance Strength for Snake+ for Cracked Concrete

Nominal Anchor Size (in.)	Nominal Embed. h_{nom} (in.)	Steel Insert Element (Threaded Rod or Bolt)	Minimum Compressive Concrete Strength, f'_c (psi)									
			2,500		3,000		4,000		6,000		8,000	
			ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)
3/8	1-5/8	SAE J429 Grade 2	635	500	700	500	805	500	985	500	1,140	500
	1-5/8	ASTMA 193 Grade B7	635	685	700	750	805	870	985	970	1,140	1,065

Tension and Shear Factored Resistance Strength For snake+ for Uncracked Concrete

Nominal Anchor Size (in.)	Nominal Embed. h_{nom} (in.)	Steel Insert Element (Threaded Rod or Bolt)	Minimum Compressive Concrete Strength, f'_c (psi)									
			2,500		3,000		4,000		6,000		8,000	
			ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)
3/8	1-5/8	SAE J429 Grade 2	900	500	985	500	1,140	500	1,395	500	1,610	500
	1-5/8	ASTMA 193 Grade B7	900	970	985	1,060	1,140	1,080	1,395	1,080	1,610	1,080

Anchor Pullout/Pryout Strength Controls
 Concrete Breakout Strength Controls
 Steel Strength Controls

ORDERING INFORMATION

Carbon Steel Snake+ Screw Anchor

Cat. No.	Anchor Size	Nominal Embedment	Internal Thread Depth	Std. Box	Std. Ctn.
6401SD	3/8"	1-5/8"	11/16"	50	500

Setting Tool for Snake+ Screw Anchor

Cat. No.	Driver	Anchor Size	Std. Box
6407SD	1/2" Square	3/8"	1



POWERS FASTENERS **BRANCH INFORMATION****USA LOCATIONS**

CITY	ADDRESS	CONTACT	PHONE	FAX
Alabama	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Jeff Hatchett	205-520-6044	678-966-9242
Atlanta	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Robert Brito	678-966-0000	678-966-9242
Boston	2 Powers Lane, Brewster, NY 10509	Jack Armour	800-524-3244	914-576-6483
Charlotte	349 L West Tremont Avenue, Charlotte, NC 28203	Bob Aurisy	704-375-5012	704-376-5517
Chicago	2472 Wisconsin Avenue, Downers Grove, IL 60515	Dan Gilligan	630-960-3156	630-960-3912
Dallas	10625 King Williams Drive, Dallas, TX 75220	Kyle Thuenemann	972-506-9258	972-506-9290
Denver	2475 West Second Street #35, Denver, CO 80223	Aaron Minnis	303-922-9202	303-922-9228
Detroit	21600 Wyoming Avenue, Oak Park, MI 48237	Glen Gaskill	248-543-8600	248-543-8601
Florida	9208 Palm River Road, Bldg. 3, Suite 305, Tampa, FL 33619	Mark Mamula	813-626-4500	813-626-4545
Houston	13833 North Promenade, Suite 100, Stafford, TX 77477	Chris Salisbury	281-491-0351	281-491-0367
Indianapolis	15290 Stony Creek Way, Noblesville, IN 46060	Bill Trainor	317-773-1668	317-773-1690
Kansas City / St Louis	716 East 16th Avenue, North Kansas City, MO 64116	Don James, Jr.	816-472-5038	816-472-5040
Los Angeles	2761 Dow Avenue, Tustin, CA 92780	Jack Stewart	714-731-2500	714-731-2566
Maryland	3137-B Pennsy Drive, Landover, MD 20785	Chris Van Syckle	301-773-1722	301-341-5119
Milwaukee	12020 W. Feerick Street, Milwaukee, WI 53222	Donn Raduenz	414-466-2400	414-466-3993
Minneapolis	351 Wilson Street, NE Minneapolis, MN 55413	Josh Nelson	612-644-3047	612-331-3549
Nashville/Memphis	221 Blanton Avenue, Nashville, TN 37210	Ira Liss	615-248-2667	615-248-2676
New Orleans	102 Sampson Street, Houston, TX 77003	Cal Zenor	713-228-1524	713-228-1528
New York	2 Powers Lane, Brewster, NY 10509	John Partridge	914-235-6300	914-576-6483
Philadelphia	2 Powers Lane, Brewster, NY 10509	Greg Stephenson	800-524-3244	914-576-6483
Phoenix	3602 E. Southern Ave, Suite 5 Phoenix, AZ 85040	Craig Hering	602-431-8024	602-431-8027
Pittsburgh	1360 Island Avenue, McKees Rocks, PA 15136	Bill Dugan	412-771-3010	412-771-9858
Portland	129 South Kenyon, Seattle, WA 98108	Jim Swink	360-608-6845	206-762-5817
Rochester	40 Harrison Street, Rochester, NY 14605	Mike Kolstad	585-288-2080	585-288-8732
Salt Lake City	2212 SW Temple #20, Salt Lake City, UT 84115	Don Manning	801-466-9428	801-466-3083
San Francisco	28970 Hopkins Street, Suite B+C, Hayward, CA 94545	Dan Mullan	510-293-1500	510-293-1505
Seattle	129 South Kenyon, Seattle, WA 98108	Darin Arnold	206-762-5812	206-762-5817

INTERNATIONAL LOCATIONS

COUNTRY/REGION	ADDRESS	CONTACT	PHONE	FAX
Australia	Factory 3, 205 Abbots Road, Dandenong, South Victoria 3175	Phil Rose	+61 3 8787 5888	+61 3 8787 5899
Canada	6950 Edwards Blvd. Mississauga, Ontario L5T 2W2	Mark Russell	905-673-7295	905-673-6490
China	Metropolitan Business Centre, East Nandan Road, Lane 300, No. 9, Room 604 Xuhui District, Shanghai, China 200030	Jake Olsen	+86-21-3363-2880	+86-21-3363-2881
China	Trif International, 4E, Building 11, The City of Design, Tianmian Village, Futian, Shenzhen 518000	Tom Nie	86-755-82795378	86-755-82795379
Europe	Westrak 208, 1771 SV Wieringerwerf, Netherlands	Paul Geuvers	+31 888 769 377	+31 227 594 759
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Thailand	80/89 MOO4 Petchakasem Road, Bangkae Bangkok 10160	Chalee Surakavanichakorn	+661 826 5821	

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COUNTRY/REGION	ADDRESS	CONTACT	PHONE	FAX
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Colombia	Electrogeno, S.A., Carrera 52 #71c-38, Bogota, Colombia		(57) 1 6600 9436	
Costa Rica	Electro Mechanics Supply, La Uruca Contiguo Banco Ntnl., De Costa Rica Condominio, Horizontal Bodega #9, San Jose, Costa Rica		(506) 2233-2595	
Dominican Republic	Calle Estancia Nueva #17 E Esquina Cul-De-Sac 9, San Geronimo, Santo Domingo	Rodfor Team	809-224-5615	809-472-8640
Ecuador	Acero Comercial Ecuatoriano S.A., Av. La Prensa N45-14 y Telégrafo 1 – Quito Av. Juan Tanca Marengo Km. 1.7 – Guayaquil	infoio@acero comercial.com infofy@acero comercial.com	(593-2) 2454 333 (593-4) 2683 060	(593-2) 2454 455 (593-4) 2683 059
Guatemala	Tecnofijaciones, 6 Avenue 8-56 Zona 9, Zona 9, Guatemala	Oscar Lucas Penagos	502-233-4-3478	
Panama	Centro-Industrial, Vía Cincuentenario, No. 7910, Ciudad Panama, Panama		(507) 302-8022	
Peru	Powers Peruana SAC, Av. Santa Catalina, 555 La Victoria, Lima 13, Peru (www.powersperuana.com)	Martin Vasquez	(011) 511 265 8500	(011) 511 330 0909
Venezuela	Calle Sucre/Qta. Maudora, #1721 Entre Cec Acosta Y San Ignacio Chacao, Caracas	Distributor	58 212 264 1313	58 212 263 0219
Trinidad - Tobago	Ft. Farfan, 3-5 Ibis Avenue, Ibis Acres, San Juan	Derek Cumming	(868) 674-7896	

Note: The information and data contained within this documentation was current as of December 2010. The information is for marketing purposes only and is subject to change and updates as needed. Powers Fasteners, Inc. reserves the right to change designs and specifications without notice or liability for such changes. Please contact Powers Fasteners for the most current and up to date available information or refer to our website at www.powers.com

Powers Fasteners 2 Powers Lane, Brewster, NY 10509 P: (914) 235-6300 F: (914) 576-6483

Powers Fasteners Canada Ltd. 6950 Edwards Boulevard Mississauga Ontario L5T-2W2 Canada

P: (905) 673-7295 or 1-800-387-3480 F: (905) 673-6490

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