IMPAC® FIX Fast Anchoring and adhesive

DESCRIPTION:

FIX Fast Anchoring and adhesive system has been specially formulated as a high-performance, two component adhesive anchor system for threaded rods and reinforcing bars in uncracked concrete to suit transportation applications.

BASE MATERIAL

Uncracked concrete

FEATURES

- Fixing close to free edges
- Versatile range of embedment depths
- Anchoring without expansion forces
- Component volume ratio of 1:1
- Extended working time
- High load capacities

Testing

EP1 DoT has been tested according to ASTM C 881 Type I, II, III, IV, Class C, Grade 3

Shelf Life

Cartridges should be stored in their original packaging, the correct way up, in cool conditions (+50°F to +77°F) out of direct sunlight. When stored correctly, the product shelf life will be 24 months from the date of manufacture.

Health & Safety

For health and safety information, please refer to the relevant Safety Data Sheet.

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Working & Loading Times

Cartridge Temperature	T Work (minutes)	Base Material Temperature	T Load (hours)
+50°F to +59°F	20	+40°F to +49°F	24
		+50°F to +59°F	12
+59°F to +72°F	15	+59°F to +72°F	8
+72°F to +77°F	11	+72°F to +77°F	7
+77°F to +86°F	8	+77°F to +86°F	6
+86°F to +95°F	6	+86°F to +95°F	5
+95°F to +104°F	4	+95°F to +104°F	4
+104°F	3	+104°F	3

T Work is the typical time to gel at the highest temperature in the range
T Load is the typical time to reach full capacity

Guide Cartridge Coverage Data

Anchor Size:		(in.)	5/16	3/8	1/2	5/8	3/4	1	1 1/4
Drill Hole Diameter:		(in.)	3/8	1/2	9/16	3/4	7/8	1 1/8	1 3/8
Embedment Depth:		(in.)	2 3/8	2 3/8	2 3/4	3 1/8	3 3/4	4	5
Estimated Number of Fixings*	Cartridge Volume	250ml	68	38	26	12	7	4	2
		600ml	176	99	67	33	20	11	6
		1500ml	455	256	175	86	53	30	16

**Number of fixings assumes 30ml wastage in initial extrusion and holes filled to 3/4 full*

Anchor Size:		(in.)	5/16	3/8	1/2	5/8	3/4	1	1 1/4
Drill Hole Diameter:		(in.)	3/8	1/2	9/16	3/4	7/8	1 1/8	1 3/8
Embedment Depth:		(in.)	3 1/8	3 3/4	5	6 1/4	7 1/2	10	12 1/2
Estimated Number of Fixings*	Cartridge Volume	250ml	51	24	14	6	3	1	0
		600ml	134	62	37	16	10	4	2
		1500ml	346	162	96	43	26	12	6

**Number of fixings assumes 30ml wastage in initial extrusion and holes filled to 3/4 full*

Physical Properties

Property	Result	Method
Consistency	Pass	ASTM C 881
Gel Time	30 minutes	ASTM C 881
Bond Strength (2 day cure)	2000 psi	ASTM C 882
Bond Strength (14 day cure)	2500 psi	ASTM C 882
Compressive Strength (7 day)	>10,000 psi	ASTM D 695
Compressive Modulus (7 days)	400000 psi	ASTM D 695
Flexural Strength (7 days) Flexural Strength (14 days)	4,350 psi 6,960 psi	ASTM D 790 @ +20°C / +72°F
Water Absorption	0.08%	ASTM D 570
Heat Deflection Temperature	122°F	ASTM D 468
Linear Coefficient of Shrinkage	0.0003 in/in	ASTM D 2566
Shore D (15hrs)	85	ASTM D2240
VOC	5g/L	ASTM D2369

Installation Specification

Property	Symbol	Unit							
Threaded Rod Diameter	d_a	in	3/8	1/2	5/8	3/4	7/8	1	1-1/4
Drill Bit Diameter	d_o	in	1/2	9/16	3/4	7/8	1	1-1/8	1-3/8
Cleaning Brush Size	d_b	-	S14H/F	S16H/F	S22H/F	S24H/F	S27H/F	S31H/F	S38H/F
Rebar Size	d_a	in	#3	#4	#5	#6	#7	#8	#10
Drill Bit Diameter	d_o	in	9/16	5/8	3/4	7/8	1	1-1/8	1-3/8
Cleaning Brush Size	d_b	-	S16H/F	S18H/F	S22H/F	S27H/F	S31H/F	S35H/F	S43H/F
Minimum Embedment Depth	$h_{ef,min}$	in	3	4	5	6	7	8	10
Maximum Embedment Depth	$h_{ef,max}$	in	4 1/2	6	7 1/2	9	10 1/2	12	15
Minimum Concrete Thickness	h_{min}	in	$2.0\ h_{ef}$						
Critical Anchor Spacing	S_{cr}	in	$2.0\ c_{ac}$						
Critical Edge Distance	c_{ac}	in	$c_{ac} = h_{ef} * (\frac{\tau_{uncr}}{1160})^{0.4} * [3.1 - 0.7\frac{h}{h_{ef}}]$						
Maximum Tightening Torque	T_{inst}	ft.lb	15	30	60	100	125	150	200

need not be taken as larger than 2.4; and

is the characteristic bond strength and need not be taken as larger than: $\tau_{uncr} = \frac{k_{uncr}\sqrt{(h_{ef} * f'_c)}}{\pi * d_a}$

Allowable Steel Strength for Threaded Rods

Anchor Diameter (in.)		Carbon Steel ASTM F 1554 Grade 36 (A307 Gr.C)		Carbon Steel ASTM A 193 B7		Stainless Steel ASTM F 593 CW		Stainless Steel ASTM F 593 SH	
		Allowable Tension, N_{all}	Allowable Shear, V_{all}	Allowable Tension, N_{all}	Allowable Shear, V_{all}	Allowable Tension, N_{all}	Allowable Shear, V_{all}	Allowable Tension, N_{all}	Allowable Shear, V_{all}
3/8”	lb	2,110	1,080	4,550	2,345	3,630	1,870	4,190	2,160
	kN	9.4	4.8	20.2	10.4	16.1	8.3	18.6	9.6
1/2”	lb	3,750	1,930	8,100	4,170	6,470	3,330	7,450	3,840
	kN	16.7	8.6	36.0	18.5	28.8	14.8	33.1	17.1
5/8”	lb	5,870	3,030	12,655	6,520	10,130	5,220	11,640	6,000
	kN	26.1	13.5	56.3	29.0	45.1	23.2	51.8	26.7
3/4”	lb	8,460	4,360	18,220	9,390	12,400	6,390	15,300	7,880
	kN	37.6	19.4	81.0	41.8	55.2	28.4	68.1	35.1
7/8”	lb	11,500	5,930	24,800	12,780	16,860	8,680	20,830	10,730
	kN	51.2	26.4	110.3	56.8	75.0	38.6	92.7	47.7
1”	lb	15,020	7,740	32,400	16,690	22,020	11,340	27,210	14,020
	kN	66.8	34.4	144.1	74.2	97.9	50.4	121.0	62.4
1 - 1/4”	lb	23,480	12,100	50,610	26,070	34,420	17,730	38,470	19,820
	kN	104.4	53.8	225.1	116.0	153.1	78.9	171.1	88.2

Allowable Tension, Nall = 0.33 x f_u x nominal cross sectional area

Allowable Shear, Vall = 0.17 x f_u x nominal cross section area

Allowable Load Data in Shear and Tension - Threaded Rods

Anchor Diameter (in.)	Embedment Depth (in.)	Allowable Concrete Capacity / Bond Strength					
		Tension (lb)			Shear (lb)		
		f'_c = 2,500psi	f'_c = 4,000psi	f'_c = 8,000psi	f'_c = 2,500psi	f'_c = 4,000psi	f'_c = 8,000psi
3/8”	3	1373	1439	1542	1830	1918	2056
	3 3/4	1716	1798	1928	2288	2398	2570
	4 1/2	2059	2158	2313	2746	2878	3084
1/2”	4	2470	2589	2775	3294	3453	3700
	5	3088	3237	3469	4118	4316	4626
	6	3706	3884	4163	4941	5179	5551
5/8”	5	4194	4396	4711	5592	5861	6282
	6 1/4	5243	5495	5889	6990	7327	7853
	7 1/2	6291	6594	7067	8389	8792	9423
3/4”	6	6619	6938	7436	8826	9251	9915
	7 1/2	8274	8672	9295	11032	11563	12393
	9	9929	10407	11154	13239	13876	14872
7/8”	7	9067	9504	10186	12090	12673	13581
	8 3/4	11334	11880	12733	15113	15840	16977
	10 1/2	13601	14256	15279	18135	19008	20372
1”	8	12007	12584	13488	16009	16779	17984
	10	15008	15731	16860	20011	20974	22480
	12	18010	18877	20232	24014	25169	26976
1 - 1/4”	10	17995	18861	20215	23993	25148	26953
	12 1/2	22494	23576	25268	29992	31435	33691
	15	26993	28292	30322	35990	37722	40430

Temperature Reduction Factors							
In-service Temperature (°F)	40	68	110	130	150	168	176
Reduction Factor* (-)	1.00	1.00	0.90	0.70	0.50	0.40	0.30

1. The above values represent mean ultimate values and allowable working loads. The allowable working loads have been reduced using a safety factor of 4.0 for tension and 3.0 for shear, however, in some cases, such as life safety, safety factors of 10.0 or higher may be necessary.

2. Allowable loads must be checked against steel capacity. The lowest value controls.

3. Tabulated data is applicable to single anchors in normal weight concrete unaffected by edge or spacing reduction factors. Values are valid for anchors installed into dry concrete in holes drilled with a hammer drill and ANSI carbide drill bit.

4. Linear interpolation is allowed. Data must not be extrapolated.

Allowable Steel Strength for Rebar

Rebar Size		Carbon Steel CAN/CSA-G30.18 Gr.400	
		Allowable Tension, N_{all}	Allowable Shear, V_{all}
10M	lb	4,016	2,069
	kN	17.9	9.2
15M	lb	8,052	4,148
	kN	35.8	18.5
20M	lb	11,960	6,161
	kN	53.2	27.4
25M	lb	19,975	10,290
	kN	88.9	45.8
30M	lb	28,121	14,486
	kN	125.1	64.4
35M	lb	40,089	20,652
	kN	178.3	91.9

Tension = 0.33 x f_u x nominal cross sectional area
Shear = 0.17 x f_u x nominal cross section area

Allowable Steel Strength for Rebar

Rebar Size		Carbon Steel ASTM A 615 Grade 60	
		Allowable Tension, N_{all}	Allowable Shear, V_{all}
#3	lb	3,280	1,690
	kN	14.6	7.5
#4	lb	5,831	3,004
	kN	25.9	13.4
#5	lb	9,111	4,693
	kN	40.5	20.9
#6	lb	13,121	6,759
	kN	58.4	30.1
#7	lb	17,859	9,200
	kN	79.4	40.9
#8	lb	23,326	12,016
	kN	103.8	53.4
#10	lb	37,623	19,381
	kN	167.4	86.2

1. *Above values for reinforcing steel assume the design method is the same as a post-installed adhesive anchor,under the principles of anchor design (failure modes will be concrete breakout, pryout, steel failure, or adhesive bond)and not under the principles of reinforcing steel design (failure modes are typically splitting failure, inadequatebar development etc..).*

Allowable Load Data in Shear and Tension - Reinforcing Bars

Anchor Diameter	Embedment Depth (in.)	Allowable Concrete Capacity / Bond Strength					
		Tension (lb)			Shear (lb)		
		f'_c = 2,500psi	f'_c = 4,000psi	f'_c = 8,000psi	f'_c = 2,500psi	f'_c = 4,000psi	f'_c = 8,000psi
#3	3	1349	1414	1515	1798	1885	2020
	3 3/4	1686	1767	1894	2248	2356	2526
	4 1/2	2032	2121	2273	2698	2828	3031
#4	4	2470	2589	2775	3294	3453	3700
	5	3088	3237	3469	4118	4316	4626
	6	3706	3884	4163	4941	5179	5551
#5	5	4194	4396	4711	5592	5861	6282
	6 1/4	5243	5495	5889	6990	7327	7853
	7 1/2	6291	6594	7067	8389	8792	9423
#6	6	6025	6315	6769	8034	8421	9025
	7 1/2	7532	7894	8461	10043	10526	11282
	9	9038	9473	10153	12051	12631	13538
#7	7	9067	9504	10186	12090	12672	13581
	8 3/4	11334	11880	12733	15113	15840	16977
	10 1/2	13601	14256	15279	18135	19008	20371
#8	8	11843	12413	13304	15791	16551	17739
	10	14804	15517	16630	19739	20689	22174
	12	17765	18620	19957	23687	24827	26609
#10	10	13862	14529	15572	18483	19372	20762
	12 1/2	17327	18161	19465	23103	24215	25953
	15	20793	21794	23358	27724	29058	31144

Temperature Reduction Factors							
In-service Temperature (°F)	40	68	110	130	150	168	176
Reduction Factor* (-)	1.00	1.00	0.90	0.70	0.50	0.40	0.30

1. The above values represent mean ultimate values and allowable working loads. The allowable working loads have been reduced using a safety factor of 4.0 for tension and 3.0 for shear, however, in some cases, such as life safety, safety factors of 10.0 or higher may be necessary.
2. Allowable loads must be checked against steel capacity. The lowest value controls.
3. Tabulated data is applicable to single anchors in normal weight concrete unaffected by edge or spacing reduction factors. Values are valid for anchors installed into dry concrete in holes drilled with a hammer drill and ANSI carbide drill bit.
4. Linear interpolation is allowed. Data must not be extrapolated.

Installation Accessories - Threaded Bar

Anchor Size	Drilled Hole Size	Brush Size	Nozzle Type	Extension Tube Required?	Resin Stopper Required?	Notes
3/8″	1/2″	S14H/F	Q	Y1 > 3.5″ h_{ef}	N	
1/2″	9/16″	S16H/F	Q	Y1 > 3.5″ h_{ef}	N	
5/8″	3/4″	S22H/F	Q/QH	Y2 > 10″ h_{ef}	RS18 > 10″ h_{ef}	QH nozzle required at h_{ef} >8″
3/4″	7/8″	S24H/F	QH	Y2 > 10″ h_{ef}	RS18 > 10″ h_{ef}	
7/8″	1″	S27H/F	QH	Y2 > 10″ h_{ef}	RS22 > 10″ h_{ef}	
1″	1 1/8″	S31H/F	QH	Y2 > 10″ h_{ef}	RS22 > 10″ h_{ef}	
1 1/4″	1 3/8″	S38H/F	QH	Y2 > 10″ h_{ef}	RS30 > 10″ h_{ef}	

Note: The hand pump is limited to a maximum anchor size of 5/8" (M16) threaded rod or #5 (Ø16mm) rebar and a maximum embedment depth of 10" (254mm).

Installation Accessories - Reinforcing Bar

Anchor Size	Drilled Hole Size	Brush Size	Nozzle Type	Extension Tube Required?	Resin Stopper Required?	Notes
#3	9/16″	S16H/F	Q	Y1 > 3.5″ h_{ef}	N	
#4	5/8″	S18H/F	Q/QH	Y1 > 3.5″ h_{ef}	N	QH nozzle required at h_{ef} >3.5″
#5	3/4″	S22H/F	Q/QH	Y2 > 10″ h_{ef}	RS18 > 10″ h_{ef}	QH nozzle required at h_{ef} >8″
#6	7/8″	S27H/F	QH	Y2 > 10″ h_{ef}	RS18 > 10″ h_{ef}	
#7	1″	S31H/F	QH	Y2 > 10″ h_{ef}	RS22 > 10″ h_{ef}	
#8	1 1/8″	S35H/F	QH	Y2 > 10″ h_{ef}	RS22 > 10″ h_{ef}	
#10	1 3/8″	S43H/F	QH	Y2 > 10″ h_{ef}	RS30 > 10″ h_{ef}	

Note: The hand pump is limited to a maximum anchor size of 5/8" (M16) threaded rod or #5 (Ø16mm) rebar and a maximum embedment depth of 10" (254mm).

Key:

Extension Tubes:

Y1	Required: 3/8″ diameter fitted to Q
Y2	Required: 9/16″ diameter fitted to QH
N	Not Required

Resin Stoppers:

N	Not Required
RS18	Use 18mm dia resin stopper
RS22	Use 22mm dia resin stopper
RS30	Use 30mm dia resin stopper

Installation Method (Solid Substrates)

1. Drill hole to required depth using a hammer drill with the drill bit that is appropriate to match the hole diameter as stated.

2. Insert the air lance to the bottom of the hole anddepress the trigger for 2 seconds. The compressed air used should be at a minimum pressure of 6bar / 90psi and should be free from oil and / or water. Repeat the operation. If using the hand pump, give two blowing operations.

3. Select the correct size brush. Ensure that the brush is in good condition and check that the diameter of the brush is correct for the size of the drilled hole. Insert the brush to the bottom of the hole and pull out using a back and forth twisting motion. Repeat the operation.

4. Repeat 2

5. Repeat 3

6. Repeat 2

7. Select the appropriate static mixer nozzle for the installation and screw onto the mouth of the cartridge. Insert the cartridge into a good quality extrusion gun after checking that the extrusion gun is in good working order.

8. Extrude the first part of the cartridge to waste until an even colour has been achieved without streaking in the resin.

9. If necessary, attach extension tubing and resin stopper.

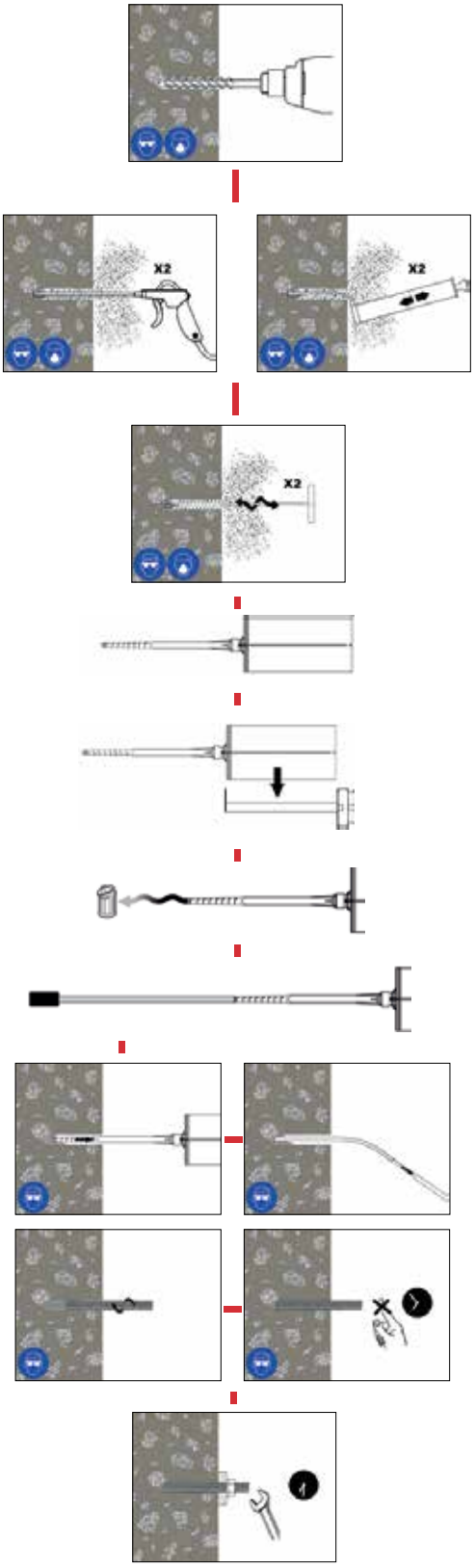
10. Insert the mixer nozzle to the bottom of the hole. Begin to extrude the resin and slowly withdraw the mixer nozzle from the hole ensuring that there are no air voids as the mixer nozzle is withdrawn. Fill the hole to approximately ½ to ¾ full and remove the mixer nozzle and cartridge completely.

11. Take the steel element of the anchor. This should be free from oil or other release agents. Insert the steel element to the bottom of the hole using a back and forth twisting motion. Any excess resin should be expelled from the hole evenly around the steel element.

12. Clean any excess resin from around the mouth of the hole.

13. Leave the anchor to cure. Do not disturb the anchor until the appropriate working time has elapsed depending on the substrate conditions and ambient temperature.

14. Attach the fixture as required.



Overhead Substrate Installation Method

1. Using the SDS Hammer Drill with a carbide tipped drill bit of the appropriate size, drill the hole to suit the anchor.

2. a) Select the correct Air Lance, insert to the bottom of the hole and depress the trigger for 2 seconds. The compressed air must be clean – free from water and oil – and at a minimum pressure of 90psi (6bar). Perform the blowing operation twice.
b) If a Manual Pump is to be used, complete the blowing operation as above using the full stroke of the pump and blow the hole clean twice.

3. Select the correct size Hole Cleaning Brush. Ensure that the brush is in good condition and the correct diameter. Insert the brush to the bottom of the hole and withdraw with a twisting motion. There should be positive interaction between the steel bristles of the brush and the sides of the drilled hole. Perform the brushing operation twice.

4. Repeat 2 (a) or (b)

5. Repeat 3

6. Repeat 2 (a) or (b)

7. Select the appropriate static mixer nozzle and attach to the cartridge. Check the Dispensing Tool is in good working order. Place the cartridge into the dispensing tool.
Note: The QH nozzle is in two sections. One section contains the mixing elements and the other section is an extension piece. Connect the extension piece to the mixing section by pushing the two sections firmly together until a positive engagement is felt.

8. Extrude some resin to waste until an even-colored mixture is extruded, The cartridge is now ready for use.

9. As specified in the Installation Accessories Table, attach an extension tube with resin stopper (if required) to the end of the mixing nozzle with a push fit. (The extension tubes may be pushed into the resin stoppers and are held in place with a coarse internal thread).

10. Insert the mixing nozzle to the bottom of the hole. Extrude the resin and slowly withdraw the nozzle from the hole. Ensure no air voids are created as the nozzle is withdrawn. Inject resin until the hole is approximately ¾ full and remove the nozzle from the hole.