Technical Data Sheet
TDS-296-01086

IAA™HS

High Strength Injection Acrylic Adhesive

Building & Transportation | Oil, Gas & Industrial | Offshore & Onshore | Water & Wastewater

PRODUCT DESCRIPTION

Formulated for high-strength anchorage of threaded rod and rebar into cracked and uncracked concrete and masonry under a wide range of conditions, CTech-LLC® IAA™HS acrylic-based chemical anchor dispenses easily in cold or warm environments and in below-freezing temperatures with no need to warm the cartridge.

ADVANTAGES

- 10:1 two-component, acrylic-based anchoring adhesive.
- Passed the demanding ICC-ES AC308 adverse-condition tests pertaining to reduced and elevated temperatures and long-term sustained loads.
- Code listed under the IBC/IRC for cracked and uncracked concrete per IAPMO UES ER-263 and City of L.A. RR25960
- Code listed under the IBC/IRC for masonry per IAPMO UES ER-281 and City of L.A. RR25966
- Suitable for use under static and seismic loading conditions in cracked and uncracked concrete as well as masonry
- Easy hole-cleaning procedure — no power-brushing required
- Suitable for use in dry or water-saturated concrete
- Cures in substrate temperatures as low as 14°F (–10°C) in 24 hours or less

TYPICAL USES

- Threaded rod anchoring and rebar doweling into concrete, masonry.
- Suitable for horizontal, vertical and overhead applications.

CODES

IAPMO UES ER-263 (concrete); IAPMO UES ER-281 (masonry).

TEST CRITERIA

Anchors installed with IAA™HS adhesive have been tested in accordance with ICC-ES.
Acceptance Criteria for Post-Installed Adhesive Anchors in Masonry Elements (AC58) and Adhesive Anchors in Concrete Elements (AC308).

TECHNICAL DATA

Property	Test Method	Result*
Consistency	ASTM C881	Passed, Non-sag
Heat deflection	ASTM D648	253°F (123°C)
Bond strength (moist cure, 60°F)	ASTM C882	3,227 psi (2 d) 3,560 psi (14 d)
Water absorption	ASTM D570	0.10% (24 hr)
Compressive yield strength (cured 60°F)	ASTM D695	10,930 psi (7 d)
Compressive modulus (cured 60°F)	ASTM D695	718,250 psi
Gel time	ASTM C881	5 min
Shrinkage coefficient	ASTM D2566	0.002 in./in.

*Material and curing conditions: 73 ± 2°F, unless otherwise noted.

CURE SCHEDULE

Base Material Temperature		Gel Time	Cure Time
°F	°C	minutes	hrs
14	-10	30	24
32	0	15	8
50	10	7	3
68	20	4	1
86	30	11⁄2	30 min.
100	38	1	20 min.

For water saturated concrete, the cure time must be doubled.

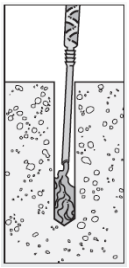
INSTALLATION PROCEDURE

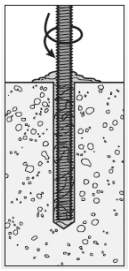
HOLE PREPARATION

- Drill: Drill hole to specified diameter and depth.
- Blow: Remove dust from hole with oil-free compressed air for a minimum of

four seconds. Compressed air nozzle must reach the bottom of the hole.

- Brush: Clean with a nylon brush for a minimum of four cycles. Brush should provide resistance to insertion. If no resistance is felt, the brush is worn and must be replaced.
- Blow: Remove dust from hole with oil-free compressed air for a minimum of four seconds. Compressed air nozzle must reach the bottom of the hole.


Fill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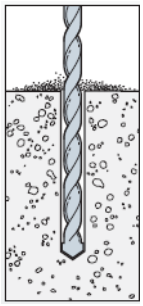
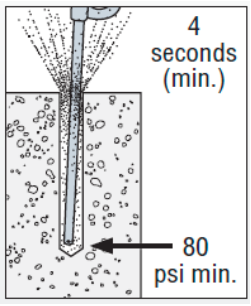
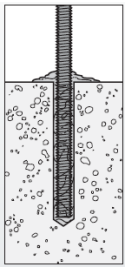
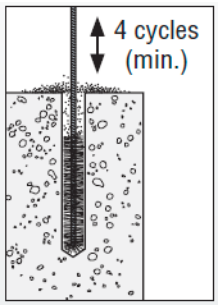

Drill

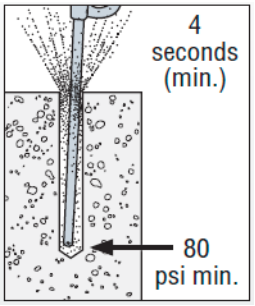


Blow


Do not disturb



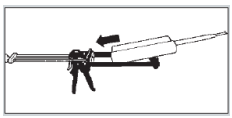
Brush



Blow

Cartridge Preparation

- Insert: Insert cartridge into dispensing tool.
- Dispense: Dispense adhesive to the side until properly mixed (uniform color).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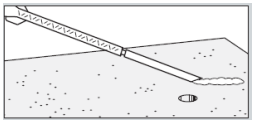
Dispense

FILLING THE HOLE

- *FOR SOLID BASE MATERIALS*

Fill: Fill hole completely full, starting from bottom of hole to prevent water pockets. Withdraw nozzle as hole fills up.
Insert: Insert clean, oil-free anchor, turning slowly until the anchor contacts the bottom of the hole.
Do not disturb: Do not disturb anchor until fully cured.

IAA™HS Design Information

IAA™HS Installation Information and Additional Data for Threaded Rod and Rebar in Normal-Weight Concrete[1]

Characteristic		Symbol	Units	Nominal Anchor Diameter d_a (in.) / Rebar Size						
				3/8 / #3	1/2 / #4	5/8 / #5	3/4 / #6	7/8 / #7	1 / #8	11/4 / #10
Installation Information										
Drill Bit Diameter for Threaded Rod		d_{hole}	in.	7/16	9/16	11/16	13/16	1	1 1/8	1 3/8
Drill Bit Diameter for Rebar		d_{hole}	in.	1/2	5/8	3/4	7/8	1	1 1/8	1 3/8
Maximum Tightening Torque		T_{inst}	ft.-lb.	10	20	30	45	60	80	125
Permitted Embedment Depth Range[2]	Minimum	h_{ef}	in.	2 3/8	2 3/4	3 1/8	3 1/2	3 3/4	4	5
	Maximum	h_{ef}	in.	7 1/2	10	12 1/2	15	17 1/2	20	25
Minimum Concrete Thickness		h_{min}	in.	$h_{ef} + 5d_{hole}$						
Critical Edge Distance[2]		c_{ac}	in.	See foonote 2						
Minimum Edge Distance		c_{min}	in.	1 3/4						2 3/4
Minimum Anchor Spacing		s_{min}	in.	3						6

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 and ACI 318-11.
2. $c_{ac} = h_{ef} (\tau_{k,uncr} / 1{,}160)^{0.4} \times [3.1 - 0.7(h/h_{ef})]$, where:
$[h/h_{ef}] \leq 2.4$
$\tau_{k,uncr}$ = the characteristic bond strength in uncracked concrete, given in the tables that follow $\leq k_{uncr} ((h_{ef} \times f'_c)^{0.5}/(\pi \times d_a))$
h = the member thickness (inches)
h_{ef} = the embedment depth (inches)

IAA™HS Tension Strength Design Data for Threaded Rod in Normal-Weight Concrete[1]

Characteristic			Symbol	Units	Nominal Anchor Diameter d_a (in.)						
					3/8	1/2	5/8	3/4	7/8	1	1 1/4
Steel Strength in Tension											
Threaded Rod	Minimum Tensile Stress Area		A_{se}	in.^{2}	0.078	0.142	0.226	0.334	0.462	0.606	0.969
	Tension Resistance of Steel — ASTM F1554, Grade 36		N_{sa}	lb.	4,525	8,235	13,110	19,370	26,795	35,150	56,200
	Tension Resistance of Steel — ASTM A193, Grade B7				9,750	17,750	28,250	41,750	57,750	75,750	121,125
	Tension Resistance of Steel — Type 410 Stainless (ASTM A193, Grade B6)				8,580	15,620	24,860	36,740	50,820	66,660	106,590
	Tension Resistance of Steel — Type 304 and 316 Stainless (ASTM A193, Grade B8 and B8M)				4,445	8,095	12,880	19,040	26,335	34,540	55,235
	Strength Reduction Factor — Steel Failure		ϕ	—	0.75[6]						
Concrete Breakout Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)											
Effectiveness Factor — Uncracked Concrete			k_{uncr}	—	24						
Effectiveness Factor — Cracked Concrete			k_{cr}	—	17						
Strength Reduction Factor — Breakout Failure			ϕ	—	0.65[8]						
Bond Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)											
Uncracked Concrete [2,3,4]	Characteristic Bond Strength		$\phi_{k,uncr}$	psi	1,390	1,590	1,715	1,770	1,750	1,655	1,250
	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	2	2 3/4	3 1/8	3 1/2	3 3/4	4	5
		Maximum			7 1/2	10	12 1/2	15	17 1/2	20	25
Cracked Concrete [2,3,4]	Characteristic Bond Strength[9,10,11]		$\phi_{k,cr}$	psi	1,085	1,035	980	950	815	800	700
	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	3	3	3 1/8	3 1/2	3 3/4	4	5
		Maximum			7 1/2	10	12 1/2	15	17 1/2	20	25
Bond Strength in Tension — Bond Strength Reduction Factors for Continuous Special Inspection											
Strength Reduction Factor — Dry Concrete			ϕ_{dry}	—	0.65[7]					0.55[7]	
Strength Reduction Factor — Water-Saturated Concrete			ϕ_{sat}	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			ϕ_{sat}	—	0.54[5]		0.77[5]			0.96[5]	
Bond Strength in Tension — Bond Strength Reduction Factors for Periodic Special Inspection											
Strength Reduction Factor — Dry Concrete			ϕ_{dry}	—	0.55[7]					0.45[7]	
Strength Reduction Factor — Water-Saturated Concrete			ϕ_{sat}	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			ϕ_{sat}	—	0.46[5]		0.65[5]			0.81[5]	

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 and ACI 318-11.
2. Temperature Range: Maximum short-term temperature of 180°F. Maximum long-term temperature of 110°F.
3. Short-term concrete temperatures are those that occur over short intervals (diurnal cycling).
4. Long-term concrete temperatures are constant temperatures over a significant time period.
5. In water-saturated concrete, multiply $\phi_{k,uncr}$ and $\phi_{k,cr}$ by K_{sat}.
6. The value of ϕ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
7. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
8. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
9. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values for 1/2", 5/8", 3/4" and 1" anchors must be multiplied by $\phi_{N,seis}$ = 0.85.
10. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values for 1 1/4" anchors must be multiplied by αN,seis = 0.75.
11. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values for 7/8" anchors must be multiplied by αN,seis = 0.59.

IAA™HS Tension Strength Design Data for Rebar in Normal-Weight Concrete[1]

Characteristic			Symbol	Units	Rebar Size						
					#3	#4	#5	#6	#7	#8	#10
Steel Strength in Tension											
Rebar	Minimum Tensile Stress Area		A_{se}	in.^{2}	0.11	0.2	0.31	0.44	0.6	0.79	1.27
	Tension Resistance of Steel — Rebar (ASTM A615 Grade 60)		N_{sa}	lb.	9,900	18,000	27,900	39,600	54,000	71,100	114,300
	Tension Resistance of Steel — Rebar (ASTM A706 Grade 60)				8,800	16,000	24,800	35,200	48,000	63,200	101,600
	Strength Reduction Factor — Steel Failure		□	—	0.75[6]						
Concrete Breakout Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)											
Effectiveness Factor — Uncracked Concrete			k_{uncr}	—	24						
Effectiveness Factor — Cracked Concrete			k_{cr}		17						
Strength Reduction Factor — Breakout Failure			□	—	0.65[8]						
Bond Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)											
Uncracked Concrete [2,3,4]	Characteristic Bond Strength		□$_{k,uncr}$	psi	1,010	990	970	955	935	915	875
	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	2 3/8	2 3/4	3 1/8	3 1/2	3 3/4	4	5
		Maximum			7 1/2	10	12 1/2	15	17 1/2	20	25
Cracked Concrete [2,3,4]	Characteristic Bond Strength		□$_{k,cr}$	psi	340	770	780	790	795	795	820
	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	3	3	3 1/8	3 1/2	3 3/4	4	5
		Maximum			7 1/2	10	12 1/2	15	17 1/2	20	25
Bond Strength in Tension — Bond Strength Reduction Factors for Continuous Special Inspection											
Strength Reduction Factor — Dry Concrete			□$_{dry}$	—	0.65[7]					0.55[7]	
Strength Reduction Factor — Water-Saturated Concrete			□$_{sat}$	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			□$_{sat}$	—	0.54[5]		0.77[5]			0.96[5]	
Bond Strength in Tension — Bond Strength Reduction Factors for Periodic Special Inspection											
Strength Reduction Factor — Dry Concrete			□$_{dry}$	—	0.55[7]					0.45[7]	
Strength Reduction Factor — Water-Saturated Concrete			□$_{sat}$	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			□$_{sat}$	—	0.46[5]		0.65[5]			0.81[5]	

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 and ACI 318-11.
2. Temperature Range: Maximum short-term temperature of 180°F. Maximum long-term temperature of 110°F.
3. Short-term concrete temperatures are those that occur over short intervals (diurnal cycling).
4. Long-term concrete temperatures are constant temperatures over a significant time period.
5. In water-saturated concrete, multiply □$_{k,uncr}$ and □$_{k,cr}$ by $K_{sat.}$
6. The value of □ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of □.
7. The value of □ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of □.
8. The value of □ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of □. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of □.

IAA™HS Shear Strength Design Data for Threaded Rod in Normal-Weight Concrete[1]

Characteristic		Symbol	Units	Nominal Anchor Diameter (in.)						
				3/8	1/2	5/8	3/4	7/8	1	11/4
Steel Strength in Shear										
Threaded Rod	Minimum Shear Stress Area	A_{se}	in.^{2}	0.078	0.142	0.226	0.334	0.462	0.606	0.969
	Shear Resistance of Steel — ASTM F1554, Grade 36	V_{sa}	lb.	2,260	4,940	7,865	11,625	16,080	21,090	33,720
	Shear Resistance of Steel — ASTM A193, Grade B7			4,875	10,650	16,950	25,050	34,650	45,450	72,675
	Shear Resistance of Steel — Type 410 Stainless (ASTM A193, Grade B6)			4,290	9,370	14,910	22,040	30,490	40,000	63,955
	Shear Resistance of Steel — Type 304 and 316				4,855	7,730	11,425	15,800	20,725	33,140
	Reduction for Seismic Shear — ASTM F1554, Grade 36	$\alpha_{v,sisi}$[5]	—	0.85						
	Reduction for Seismic Shear — ASTM A193, Grade B7			0.85						
	Reduction for Seismic Shear — Type 410 Stainless (ASTM A193, Grade B6)			0.85	0.75					0.85
	Reduction for Seismic Shear — Type 304 and 316 Stainless (ASTM A193, Grade B8 and B8M)			0.85	0.75					0.85
	Strength Reduction Factor — Steel Failure	ϕ	—	0.65[2]						
Concrete Breakout Strength in Shear										
Diameter of Anchor		d_a	in.	0.375	0.5	0.625	0.75	0.875	1	1.25
Load-Bearing Length of Anchor in Shear		e_e	in.	h_{ef}						
Strength Reduction Factor — Breakout Failure		ϕ	—	0.70[3]						
Concrete Pryout Strength in Shear										
Coefficient for Pryout Strength		k_{cp}	—	1.0 for h_{ef} < 2.50"; 2.0 for h_{ef} ≥ 2.50"						
Strength Reduction Factor — Pryout Failure		ϕ	—	0.70[4]						

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 and ACI 318-11.
2. The value of ϕ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
3. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
4. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
5. The values of V_{sa} are applicable for both cracked concrete and uncracked concrete. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, V_{sa} must be multiplied by $\alpha_{V,seis}$ for the corresponding anchor steel type.

IAA™HS Shear Strength Design Data for Rebar in Normal-Weight Concrete[1]

Characteristic		Symbol	Units	Rebar Size						
				#3	#4	#5	#6	#7	#8	#10
Steel Strength in Shear										
Rebar	Minimum Shear Stress Area	A_{se}	in.^{2}	0.11	0.2	0.31	0.44	0.6	0.79	1.27
	Shear Resistance of Steel — Rebar (ASTM A615 Grade 60)	V_{sa}	lb.	4,950	10,800	16,740	23,760	32,400	42,660	68,580
	Shear Resistance of Steel — Rebar (ASTM A706 Grade 60)			4,400	9,600	14,880	21,120	28,800	37,920	60,960
	Reduction for Seismic Shear — Rebar (ASTM A615 Grade 60)		—	0.56			0.80			
	Reduction for Seismic Shear — Rebar (ASTM A706 Grade 60)			0.56			0.80			
	Strength Reduction Factor — Steel Failure	□		0.65[2]						
Concrete Breakout Strength in Shear										
Diameter of Anchor		d_a	in.	0.375	0.5	0.625	0.75	0.875	1	1.25
Load-Bearing Length of Anchor in Shear		ℓ_e	in.	h_{ef}						
Strength Reduction Factor — Breakout Failure		□	—	0.70[3]						
Concrete Pryout Strength in Shear										
Coefficient for Pryout Strength		k_{cp}	—	1.0 for $h_{ef} < 2.50"$; 2.0 for $h_{ef} \geq 2.50"$						
Strength Reduction Factor — Pryout Failure		□	—	0.70[4]						

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 and ACI 318-11.
2. The value of □ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of □.
3. The value of □ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of □. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of □.
4. The value of □ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of □.
5. The values of V_{sa} are applicable for both cracked concrete and uncracked concrete. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, V_{sa} must be multiplied by □ for the corresponding anchor steel type.

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