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Pure220+™ Adhesive Anchoring System and Installations with Coil Threaded Rods

ACI 318, Chapter 17 (-19 and -14) and ACI 318-11 Appendix D (and by reference to the 2021, 2018, 2015 IBC and 2012 IBC, respectively) requires that adhesive anchors for concrete be tested and qualified with standard steel threaded rods and/or reinforcing bars for each anchor diameter in concrete. This is to determine how the anchor size and steel element type can influence the bond strength of installed adhesive anchors.

Up until now, DEWALT published bond strengths for Pure220+ adhesive anchors that are based on standard threaded rods and reinforcing bars. Fortunately, DEWALT has conducted supplemental laboratory testing in accordance with recognized standards on Pure220+ adhesive anchors installed with coil threaded rods in concrete. The table below shows the results of testing the adhesive anchor system with typical standard threaded rods and with coil threaded rods. The corresponding reduction factor derived from this comparative testing is provided below. This reduction factor must be applied to the bond strength when calculating the bond strength capacity for the given adhesive anchor used with coil threaded rods and relevant conditions.

Adhesive Anchor System	Steel Element	Drilling Method	Hole Cleaning Method	Bond Strength Reduction Factor
DEWALT Pure220+	Threaded Rods (UNC)	Hammer drilling	Per published instructions	N/A (baseline values)
	Coil Threaded Rods			0.95 (5% reduction)

N/A = Not applicable.

- Results shown are based on tension tests conducted in accordance with ACI 355.4/ASTM E488 in dry uncracked normal weight concrete.
- Holes were drilled with a hammer drill and standard carbide drill bit and cleaned following published instructions for the [Pure220+ adhesive anchor system](#). Hollow drill bits (DustX+ System) may be used, as applicable.
- Standard carbide drill bits and hollow drill bits must meet the requirements of ANSI B212.15; ANSI compliance for hole drilling is required by [ICC-ES ESR-5144](#).
- See published literature for the specific adhesive anchor system for additional design and installation information which is available at [anchors.DEWALT.com](#).
- The reduction factor for coil threaded rods is supplemental to all other relevant design considerations for the specific application, as applicable.

Pure220+ adhesive anchors will achieve published design strengths for relevant loading conditions when the product is properly installed into holes drilled in concrete. The adhesive anchors must be installed in accordance with all other published installation instructions specific to the application and conditions of the connection.

Coil Threaded Rod Material Properties

Steel Description (General)	Steel Specification (ASTM)	Nominal Anchor Size (in.)	Minimum Yield Strength, f_y (psi)	Minimum Ultimate Strength, f_u (psi)
Carbon coil thread rod	A108	3/8 through 1	92,000	120,000
	Grade 1045	1-1/4	81,000	105,000

Tabulated material properties are provided for reference; other coil threaded steel hardware elements may also be considered.

Steel Tension and Shear Design Information for Coil Threaded Rods^{1,2}

Design Information		Symbol	Units	Nominal Coil Thread Rod Diameter ¹ (inch)						
				3/8	1/2	5/8	3/4	7/8	1	1-1/4
Coil Threaded rod nominal outside diameter		d_a	inch (mm)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)	0.875 (22.2)	1.000 (25.4)	1.250 (31.8)
Coil Threaded rod effective cross-sectional area		A_{se}	inch ² (mm ²)	0.0775 (50)	0.1419 (92)	0.2260 (146)	0.3345 (216)	0.4617 (298)	0.6057 (391)	0.9691 (625)
ASTM A108 Grade 1045	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lbf (kN)	9,300 (41.4)	17,025 (75.7)	27,120 (120.6)	40,140 (178.5)	55,905 (248.7)	72,685 (323.3)	101,755 (452.6)
		V_{sa}	lbf (kN)	5,580 (24.8)	10,215 (45.4)	16,270 (72.4)	24,085 (107.1)	33,540 (149.2)	43,610 (194.0)	61,050 (271.6)
	Strength reduction factor for tension ²	ϕ	-	0.75						
	Strength reduction factor for shear ²	ϕ	-	0.65						

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N. For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf.

- Values provided for steel element material types are based on minimum specified strengths and calculated in accordance with ACI 318-19 Eq. 17.6.1.2 and Eq. 17.7.1.2(b) or ACI 318-14 Eq. 17.4.1.2 and Eq. 17.5.1.2b or ACI 318-11 Eq. (D-2) and Eq. (D-29), as applicable, except where noted. Nuts and washers must be appropriate for the rod. Nuts must have specified proof load stresses equal to or greater than the minimum tensile strength of the specified threaded rod.
- The tabulated value of ϕ applies when the load combinations of section 1605.2 of the IBC, ACI 318 (-19 or -14) 5.3 or ACI 318-11 9.2, as applicable, are used in accordance with ACI 318-19 section 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.4. values correspond to ductile steel elements.