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AC200+™ Adhesive Anchoring System and Installations with Large Diameter Threaded Rods and Rebars

DEWALT has conducted supplemental testing on the AC200+ adhesive for use with large diameter threaded rods and rebars in post-installed anchoring installations. The AC200+ has had published performance data for threaded rods up to 1-1/4-inch in diameter and rebars up to size No. 10. To supplement this, DEWALT has performed additional testing using threaded rod with sizes up to 2-inch diameter at nominal embedments of 12 times the rod diameter and using No. 11 rebar at an embedment depth of 9 times the nominal bar diameter. The information presented below is based on results and assessment of data at the specific embedments listed in this bulletin and offered for your consideration and use.

Ultimate and Allowable Load Capacities for AC200+ Installed into Normal Weight Concrete with Threaded Rod (based on bond strength/concrete capacity)[1,2,3,4,5,6,7,8,9,10,11,12,13]

Threaded Rod Diameter d (in.)	Minimum Embedment Depth h_{nom} (in.)	Minimum Concrete Compressive Strength (psi)					
		f'c = 3,000 psi		f'c = 4,000 psi		f'c = 6,000 psi	
		Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)
1-3/8	16-1/2	82,395	20,600	84,800	21,200	88,310	22,080
1-1/2	18	92,645	23,160	95,350	23,840	99,295	24,825
1-3/4	21	100,110	25,030	103,035	25,760	107,300	26,825
2	24	108,000	27,000	111,150	27,790	115,750	28,940
Rebar Size No.	Minimum Embedment Depth h_{nom} (in.)	Minimum Concrete Compressive Strength (psi)					
		f'c = 3,000 psi		f'c = 4,000 psi		f'c = 6,000 psi	
		Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)
#11	12-3/8	105,595	26,400	108,680	27,170	113,175	28,295

1. Results shown are based on tension tests conducted in accordance with ACI 355.4/ASTM E488 in dry uncracked normal weight concrete. Concrete compressive strength must be at the specified minimum at the time of installation.
2. Ultimate load capacities are provided for reference and must be reduced by a minimum safety factor of 4.0 or greater to determine the allowable working load.
3. Allowable loads are based on an applied safety factor of 4.0. Linear interpolation may be used to determine allowable loads for intermediate concrete compressive strengths.
4. Allowable load values are applicable for long term in-service temperatures up to 122°F and short term in-service temperatures up to 176°F. Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
5. Installations into saturated (wet) concrete require a reduction in capacity for tabulated values of 30 percent.
6. Allowable bond strength/concrete capacity must be checked against allowable steel strength of the selected anchor element to determine the controlling allowable load.
7. The tabulated load values are applicable to single anchors installed at critical edge and spacing distances and where the member thickness is greater than or equal to $1.25h_{nom}$.
8. The critical spacing distance is $1.5h_{nom}$ where the full load values in the table may be used. The anchor spacing for listed threaded rods may be reduced to 5d provided the allowable tension load values are multiplied by a reduction factor of 0.55. The anchor spacing for listed rebars may be reduced to 5d provided the allowable tension load values are multiplied by a reduction factor of 0.70. Linear interpolation may be used between critical and minimum distances.
9. Load capacities for threaded rods are based on tension testing conducted at minimum edge distance; therefore, critical edge distance is equal to the minimum edge distance of 5d where the full load values in the table may be used. For rebars, the critical edge distance is $1.5h_{nom}$ where the full load values in the table can be used; the rebar edge distance may be reduced to 5d provided the allowable tension load values are multiplied by 0.70.
10. Holes were drilled with a hammer drill and standard carbide drill bit and cleaned following published instructions for the AC200+ adhesive anchor system. Hollow drill bits (DustX+ System) may be used, as applicable.
11. Standard carbide drill bits and hollow drill bits must meet the requirements of ANSI B212.15.
12. See published literature for the specific adhesive anchor system for additional design and installation information which is available at anchors.DEWALT.com.
13. The tabulated load values have not been tested or evaluated for installations overhead and are outside the scope of this technical bulletin.

AC200+ adhesive anchors will achieve tabulated design strengths 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.

Allowable Load Capacities for Threaded Rod (Based on Steel Strength) [1,2,3,4,5]

Nominal Rod Diameter (in.)	Steel Elements - Common Threaded Rods											
	A36 or F1554, Grade 36 F_u = 58 ksi		F1554, Grade 55 F_u = 75 ksi		A193, Gr. B7, A354, Gr. BC or F1554, Gr. 105 F_u = 125 ksi		A193, Gr. B8, Class 1 F_u = 75 ksi		F593, Cond. CW2 F_u = 85 ksi		A193, Gr. B8, Class 2 F_u = 100 ksi	
	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.
1.375	28,420	14,640	36,750	18,930	61,250	31,555	36,750	18,930	41,650	21,455	49,000	25,245
1.5	33,825	17,425	43,735	22,530	72,895	37,550	43,735	22,530	49,570	25,535	58,315	30,040
1.75	46,035	23,715	59,530	30,665	99,220	51,110	59,530	30,665	-	-	-	-
2	60,130	30,975	77,755	40,055	129,590	66,760	77,755	40,055	-	-	-	-

1. Continuously threaded carbon steel or stainless steel rod (all-thread) having thread characteristics complying with ANSI B1.1 UNC Coarse Thread Series.
2. The listed ultimate tensile strengths of the tabulated steel elements are minimum values according to information in the referenced ASTM standards.
3. AISC defined steel strength (ASD) for threaded rod: calculated using allowable tension and shear equal to 0.33 x F_u x A_{nom} and 0.17 x F_u x A_{nom}, respectively.
4. Allowable load capacities are calculated for the steel element type. Consideration of applying additional safety factors may be necessary depending on the application, such as life safety or overhead.
5. Allowable steel strength in tension must be checked against allowable bond strength/concrete capacity in tension to determine the controlling allowable load.

Allowable Load Capacities for Reinforcing Bar (Based on Steel Strength) [1,2,3,4]

Nominal Rebar Size (No.)	Steel Elements - Common Rebars							
	A615, Grade 60 F_u = 90 ksi		A706, Grade 60 F_u = 80 ksi		A615 Grade 75 F_u = 100 ksi		A706 Grade 80 F_u = 100 ksi	
	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.	Tension lbs.	Shear lbs.
#11	46,375	23,980	41,220	21,235	51,530	26,545	51,530	26,545

1. The listed ultimate tensile strengths of the tabulated steel elements are minimum values according to information in the referenced ASTM standards.
2. Calculated using allowable tension and shear equal to 0.33 x F_u x A_{nom} and 0.17 x F_u x A_{nom}, respectively.
3. Allowable load capacities are calculated for the steel element type. Consideration of applying additional safety factors may be necessary depending on the application, such as life safety or overhead.
4. Allowable steel strength in tension must be checked against allowable bond strength/concrete capacity in tension to determine the controlling allowable load.

AC200+ Supplemental Installation Specifications and Equipment for Large Diameter Threaded Rods and Rebars[1,7]

Anchor property / Setting information	Units	Nominal Threaded Rod Diameter (in.)				Nominal Rebar Size
		1-3/8	1-1/2	1-3/4	2	#11
Nominal drill bit diameter (ANSI)	in.	1-1/2	1-3/4	2	2-3/16	1-3/4
Maximum torque[2]	ft-lbs.	240	260	300	340	-
Nominal wire brush size[3,4]	in.	1-1/2	1-3/4	2	2-3/16	1-3/4
Nominal piston plug size[5,6]	in.	1-1/2	1-3/4	2	2-3/16	1-3/4

1. Continuously threaded carbon steel or stainless steel rod (all-thread) having thread characteristics complying with ANSI B1.1 UNC Coarse Thread Series.
2. Torque may not be applied to the anchors until the full cure time of the adhesive has been achieved.
3. An SDS-plus adaptor (08283-PWR) is available to attach the steel wire brush to an SDS drill tool.
4. Standard wire brushes are approximately 11-3/4 inches in usable length. A 12-inch long brush extension (08282-PWR) must be used with a steel wire brush for holes drilled deeper than the brush length, as applicable. Brush extensions can be attached together and stacked to enable longer extension lengths.
5. Installations require the use of piston plugs for the selected anchor size where the embedment depth is greater than 10 inches.
6. Extension tubes (08281-PWR or 08297-PWR) or flexible extension hose (PFC1640600) or equivalent approved by DEWALT must be used together with piston plugs to connect them to the mixing nozzle.
7. An air compressor nozzle (08292-PWR) which includes an 18-inch extension is available.

Supplemental Ordering Information

Wire Brushes			Piston Plugs		
Cat. No.	Description	Pack Qty.	Cat. No.	Description	Pack Qty.
08291-PWR	Standard wire brush for 1-1/2" ANSI hole	1	PFC1691570	1-1/2” premium piston plug	1
08299-PWR	Standard wire brush for 1-3/4" ANSI hole	1	PFC1691580	1-3/4” premium piston plug	1
08271-PWR	Standard wire brush for 2" ANSI hole	1	PFC1691590	2” premium piston plug	1
08272-PWR	Standard wire brush for 2-3/16" ANSI hole	1	PFC1691600	2-3/16” premium piston plug	1

For the more information about the AC200+ Adhesive Anchoring System including cartridges, mixing nozzles, dispensing tools, hollow drill bits (DustX+) and other installation accessories, see the published technical pages for the product at anchors.DEWALT.com.