

**ANCHORS & FASTENERS**

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PURE220+™ Adhesive Anchoring System and Installations into Oversized Drilled Holes

ACI 318 (-19 and -14, Chapter 17) and by reference to the 2021, 2018 or 2015 IBC respectively, requires that adhesive anchors for concrete be tested and qualified with drill hole specifications for each anchor diameter. This is because the size of the drilled hole in concrete can influence the bond strength of installed adhesive anchors.

However, there are cases where an allowance for oversizing the drill hole is desirable (e.g. repairing existing anchorage in the same location, anchor placement tolerances, ability for final adjustment of the anchoring points, unintentional mistakes). The ACI qualification standard for adhesive anchors also includes provisions for oversized drill hole specifications provided testing is conducted to determine effects of increasing the annular gap between the threaded rod or reinforcing bar and the drilled hole.

Previously, DEWALT published bond strengths for PURE220+ adhesive anchors that are based on typical standard drill hole specifications that are nominally 1/16-inch to 3/8-inch larger than the threaded rod or reinforcing bar, depending on the anchor diameter (the table below is provided for baseline reference):

Typical Standard Drill Holes	Nominal common threaded rod / reinforcing bar sizes																							
	3/8"	#3	10M	1/2"	#4	5/8"	#5	15M	3/4"	#6	7/8"	#7	20M	1"	#8	25M	#9	1 1/4"	#10	30M	1 1/2"	#11	35M	
Nominal ANSI drill bit size (in.)	7/16	1/2	9/16	9/16	5/8	11/16	3/4	3/4	7/8	7/8	1	1	1	1 1/8	1 1/8	1 1/4	1 3/8	1 3/8	1 1/2	1 1/2	1 3/4	1 3/4	1 3/4	

Fortunately, additional drill hole specifications are now available for end users as DEWALT has conducted supplemental laboratory testing on PURE220+ adhesive anchors installed in holes approximately 150% larger than the nominal size of the threaded rod or reinforcing bar.

The table below provides the results of testing the adhesive anchor system in oversized holes compared with typical standard drilled holes with hammer-drilling and published hole cleaning instructions. The corresponding supplemental reduction factor derived from oversized drill hole testing is provided below. These reduction factors must be applied when calculating the bond strength capacity for the given adhesive anchor and relevant conditions.

Oversized Drill Holes (maximum sizes)	Nominal common threaded rod / reinforcing bar sizes																							
	3/8"	#3	10M	1/2"	#4	5/8"	#5	15M	3/4"	#6	7/8"	#7	20M	1"	#8	25M	#9	1 1/4"	#10	30M	1 1/2"	#11	35M	
Nominal ANSI drill bit size (in.)	9/16	9/16	11/16	3/4	3/4	7/8	7/8	7/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	2	2	2	
Bond strength reduction factor, α_{hole}	0.85	1.0	1.0	0.85	1.0	0.85	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.85	0.85	0.85	1.0	0.85	0.85	1.0	0.85	0.85	

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 (DEWALT DustX+ System) may be considered, 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 bond strength reduction factor, α_{hole} , for oversized drill holes, as applicable, is a supplement to all other relevant design considerations and requirements for the specific application.

PURE220+ adhesive anchors will achieve published design strengths for short-term loading conditions (e.g. seismic and wind loading) when the product is properly installed into oversized holes drilled in dry concrete. The adhesive anchors must be installed in accordance with all other published installation instructions specific to the application and conditions of the connection.