ICC-ES Evaluation Report

ESR-5279

Issued June 2024

Subject to renewal June 2025

DIVISION: 03 00 00—CONCRETE **Section: 03 16 00—Concrete Anchors** **DIVISION: 05 00 00—METALS** **Section: 05 05 19—Post-installed Concrete Anchors**	**REPORT HOLDER:** **PROSPECT ANCHOR AND TOOL LLC** Prospect Anchor and Tool	**EVALUATION SUBJECT:** **PAT UNDERCUT ANCHORS**	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024, 2021, 2018 and 2015 *International Building Code*® (IBC)
- 2024, 2021, 2018 and 2015 *International Residential Code*® (IRC)

Property evaluated:

- Structural

2.0 USES

The PAT Undercut Anchor is used as anchorage to concrete to resist static, wind, and seismic (Seismic Design Categories A through F) tension and shear loads in cracked and uncracked normal-weight concrete and lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

The PAT anchors comply with Section 1901.3 of the 2024, 2021, 2018 and 2015 IBC. The anchors are an alternative to cast-in-place anchors described in Section 1901.3 of the 2024, 2021, 2018 and 2015 IBC. The anchors may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 General:

The PAT Undercut Anchors are displacement controlled undercut anchors comprised of internally threaded expansion cone, an anchor rod (threaded rod), expansion sleeve, hex nut and washer as shown in Figure 1. The anchors are installed into pre-drilled holes in concrete that have been undercut at the bottom with an undercut tool provided by the manufacturer, and after setting the expanded anchor sleeve creates a mechanical interlock with the surrounding concrete base material.

PAT Undercut Anchors are available in ⅜-inch (9.5 mm) and ½-inch (12.7 mm) diameters in stainless steel under this report. Table 1 shows dimensions of the undercut anchors.

3.2 Anchor Materials:

The anchor internally threaded expansion cone, anchor rod, expansion sleeve, hex nut and washer used are ASTM A193, Grade B8M Class 1 stainless steel (316 SS).

3.3 Concrete:

Normal weight and lightweight concrete must conform to Sections 1903 and 1905 of the IBC, as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Strength Design:

4.1.1 General: Design strength of anchors complying with the 2024 and 2021 IBC, as well as Section R301.1.3 of the 2024 and 2021 IRC must be determined in accordance with ACI 318-19 Chapter 17 and this report.

Design strength of anchors complying with the 2018 and 2015 IBC, as well as Section R301.1.3 of the 2018 and 2015 IRC must be determined in accordance with ACI 318-14 Chapter 17 and this report.

Design parameters are described in Table 3 and Table 4 of this report and are based on the 2024 and 2021 IBC (ACI 318-19), and 2018 and 2015 IBC (ACI 318-14) unless noted otherwise in Sections 4.1.1 through 4.1.12.

The strength design of anchors must comply with ACI 318-19 17.5.1.2 or ACI 318-14 17.3.1, except as required in ACI 318-19 17.10 or ACI 318-14 17.2.3, as applicable. Strength reduction factors, ϕ, as given in ACI 318-19 17.5.3 or ACI 318-14 17.3.3, as applicable, and noted in Table 3 and Table 4 of this report, must be used for load combinations calculated in accordance with Section 1605.1 of the 2024 and 2021 IBC or Section 1605.2 of the 2018 and 2015IBC and Section 5.3 of ACI 318 (-19 and-14), as applicable.

The value of f'_c used in the calculations must be limited to a maximum of 8,000 psi (55.2 MPa), in accordance with ACI 318-19 17.3.1 or ACI 318-14 17.2.7, as applicable.

4.1.2 Requirements for Static Steel Strength in Tension, N_{sa}: The nominal static steel strength in tension must be calculated in accordance with ACI 318-19 17.6.1.2 or ACI 318-14 17.4.1.2, as applicable. The values for N_{sa} are given in Table 3 of this report. Strength reduction factors, ϕ, corresponding to ductile steel elements must be used.

4.1.3 Requirements for Static Concrete Breakout Strength in Tension, N_{cb} and N_{cbg}: The nominal concrete breakout strength of a single anchor or group of anchors in tension, N_{cb} and N_{cbg}, respectively, must be calculated in accordance with ACI 318-19 17.6.2 or ACI 318-14 17.4.2, as applicable, with modifications as described in this section. The basic concrete breakout strength of a single anchor in tension, N_b, must be calculated in accordance with ACI 318-19 17.6.2.2 or ACI 318-14 17.4.2.2, as applicable, using the values of h_{ef} and k_{cr} as given in Table 3 of this report. The nominal concrete breakout strength in tension, in regions where analysis indicates no cracking in accordance with ACI 318-19 17.6.2.5 or ACI 318-14 17.4.2.6, as applicable, must be calculated with the value of $\psi_{c,N} = 1.0$ and using the value of k_{uncr} as given in Table 3 of this report.

4.1.4 Requirements for Static Pullout Strength in Tension, N_p: In cracked and uncracked concrete, pullout strength does not control and therefore need not be evaluated.

4.1.5 Requirements for Static Steel Strength in Shear, V_{sa}: The nominal steel strength in shear, V_{sa}, in accordance with ACI 318-19 17.7.1.2 or ACI 318-14 17.5.1.2, as applicable, is given in Table 4 of this report and must be used in lieu of the value derived by calculation from ACI 318-19 Eq 17.7.1.2b or ACI 318-14 Eq 17.5.1.2b, as applicable. Strength reduction factors, ϕ, corresponding to ductile steel elements must be used for the anchors, as described in Table 4.

4.1.6 Requirements for Static Concrete Breakout Strength in Shear, V_{cb} or V_{cbg}: The nominal concrete breakout strength in shear of a single anchor or group of anchors, V_{cb} or V_{cbg}, respectively, must be calculated in accordance with ACI 318-19 17.7.2 or ACI 318-14 17.5.2, as applicable, with modifications as provided in this section. The basic concrete breakout strength of a single anchor in shear, V_b, must be calculated in accordance with ACI 318-19 17.7.2.2 or ACI 318-14 17.5.2.2, as applicable, using values of l_e and d_o given in Table 4 of this report.

4.1.7 Requirements for Static Concrete Pryout Strength in Shear, V_{cp} or V_{cpg}: The nominal static concrete pryout strength of a single anchor or group of anchors in shear, V_{cp} or V_{cpg}, respectively, must be calculated in accordance with ACI 318-19 17.7.3 or ACI 318-14 17.5.3, as applicable, modified by using the value of k_{cp} provided in Table 4 of this report and the value of N_{cb} or N_{cbg} as calculated in accordance with Section 4.1.3 of this report.

4.1.8 Requirements for Seismic Design:

4.1.8.1 General: For load combinations including seismic, the design must be performed in accordance with ACI 318-19 17.10 or ACI 318-14 17.2.3, as applicable. Modifications to ACI 318-19 17.10 or ACI 318-14 17.2.3 must be applied under Section 1905.7 of the 2024 IBC or Section 1905.1.8 of the 2021, 2018 and 2015 IBC, as applicable.

The anchors comply with ACI 318 (-19 and-14) 2.3, as ductile steel elements and must be designed in accordance with ACI 318-19 17.10.5, 17.10.6 or 17.10.7; or ACI 318-14 17.2.3.4, 17.2.3.5, 17.2.3.6 or 17.2.3.7, as applicable.

4.1.8.2 Seismic Tension: The nominal steel strength and the nominal concrete breakout strength for anchors in tension must be calculated in accordance with ACI 318-19 17.6.1 and 17.6.2 or ACI 318-14 17.4.1 and 17.4.2, respectively, as applicable, as described in Sections 4.1.2 and 4.1.3 of this report. In cracked and uncracked concrete, pullout strength in tension for seismic loads $N_{p,eq}$ does not control and therefore need not be evaluated.

4.1.8.3 Seismic Shear: The nominal concrete breakout strength and pryout strength for anchors in shear must be calculated according to ACI 318-19 17.7.2 and 17.7.3 or ACI 318-14 17.5.2 and 17.5.3, respectively, as applicable, as described in Sections 4.1.6 and 4.1.7 of this report. In accordance with ACI 318-19 17.7.1.2 or ACI 318-14 17.5.1.2, as applicable, the appropriate value for nominal steel strength for seismic loads, $V_{sa,eq}$ described in Table 4 must be used in lieu of V_{sa}.

4.1.9 Requirements for Interaction of Tensile and Shear Forces: For anchors or groups of anchors that are subject to the effects of combined tensile and shear forces, the design must be performed in accordance with ACI 318-19 17.8 or ACI 318-14 17.6, as applicable.

4.1.10 Requirements for Critical Edge Distance: In applications where $c < c_{ac}$ and supplemental reinforcement to control splitting of the concrete is not present, the concrete breakout strength in tension for uncracked concrete, calculated according to ACI 318-19 17.6.2 or ACI 318-14 17.4.2, as applicable, must be further multiplied by factor $\psi_{cp,N}$ as given by the following equation:

$$\psi_{cp,N} = \frac{c}{c_{ac}} \qquad \text{(Eq-1)}$$

where the factor $\psi_{cp,N}$ need not be taken as less than $1.5h_{ef} / c_{ac}$. For all other cases, $\psi_{cp,N} = 1.0$. In lieu of ACI 318-19 17.9.5 or ACI 318-14 17.7.6, as applicable, values for the critical edge distance c_{ac} must be taken from Table 2 of this report.

4.1.11 Requirements for Minimum Member Thickness, Minimum Anchor Spacing and Minimum Edge Distance: In lieu of ACI 318-19 17.9.2 or ACI 318-14 17.7.1 and 17.7.3, respectively, as applicable, values of s_{min} and c_{min} as given in Table 2 of this report must be used. In lieu of ACI 318-19 17.9.4 or ACI 318-14 17.7.5, as applicable, minimum member thickness h_{min} as given in Table 2 of this report must be used.

4.1.12 Lightweight Concrete: For the use of anchors in lightweight concrete, the modification factor λ_a equal to 0.8λ is applied to all values of $\sqrt{f'_c}$ affecting N_n and V_n.

For ACI 318-19 (2024 and 2021 IBC) and ACI 318-14 (2018 and 2015 IBC), λ must be determined in accordance with the corresponding version of ACI 318.

4.2 Allowable Stress Design (ASD):

4.2.1 General: Design values for use with allowable stress design load combinations calculated in accordance with Section 1605.1 of the 2024 and 2021 IBC or Section 1605.3 of the 2018 and 2015 IBC must be established as follows:

$$T_{allowable,ASD} = \frac{\phi N_n}{\alpha} \qquad \text{(Eq-2)}$$

$$V_{allowable,ASD} = \frac{\phi V_n}{\alpha} \qquad \text{(Eq-3)}$$

where,

$T_{allowable,ASD}$ = Allowable tension load (lbf or kN)

$V_{allowable,ASD}$ = Allowable shear load (lbf or kN)

ϕN_n = Lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318 (-19 or -14) Chapter 17 as applicable and 2024 IBC Section 1905.7 or 2021, 2018 and 2015 IBC Section 1905.1.8, and Section 4.1 of this report, as applicable.

ϕV_n = Lowest design strength of an anchor or anchor group in shear as determined in accordance with ACI 318(-19 or -14) Chapter 17 as applicable and 2024 IBC Section 1905.7 or 2021, 2018 and 2015 IBC Section 1905.1.8, and Section 4.1 of this report, as applicable.

α = Conversion factor calculated as a weighted average of the load factors for the controlling load combination. In addition, α must include all appropriate factors to account for nonductile failure modes and required over-strength.

The requirements for member thickness, edge distance and spacing, described in this report, must apply.

4.2.2 Requirements for Interaction of Tensile and Shear Forces: The interaction must be calculated and consistent with ACI 318-19 1 17.8 or ACI 318-14 17.6, as applicable, as follows:

For shear loads $V_{applied} \leq 0.2V_{allowable,ASD}$, the full allowable load in tension $T_{allowable,ASD}$ may be taken.

For tension loads $T_{applied} \leq 0.2T_{allowable,ASD}$, the full allowable load in shear $V_{allowable,ASD}$ may be taken.

For all other cases:

$$\frac{T_{applied}}{T_{allowable,ASD}} + \frac{V_{applied}}{V_{allowable,ASD}} \leq 1.2 \qquad \text{(Eq-4)}$$

4.3 Installation:

PAT Undercut Anchors must be installed per the manufacturer's published installation instructions (see Figure 2 of this report) and this report. In case of conflict, this report governs. Anchor locations must comply with this report and the plans and specifications approved by the code official. Anchors must be installed in holes drilled into concrete using carbide-tipped, hammer-drill bits complying with ANSI B212.15-1994. The hole must be cleaned using a wire brush, and compressed air or vacuum system. The nominal drill bit diameter and minimum drilled hole depth are given in Table 2.The undercut drill bit must then be inserted into the hole and drilled until the pin and slot located on the side of the tool have reached their full travel. The hole must be cleaned again with a wire brush, and compressed air or vacuum system. The anchor is positioned within the drilled and cleaned hole and set using a setting sleeve. The setting sleeve is driven into the undercut by a compressive force imparted by a hammer or hammer drill. Continue to pound until the setting sleeve is flush with the concrete surface or has traveled approximately 0.5 inches. Attach fixture to anchor, allowing fixture to fully seat against concrete surface. Secure fixture by placing washer and nut on the treaded stud. Hand tighten nut before torquing. Torque the anchor to the values specified in Table 2 for the given anchor dimension.

4.4 Special Inspection:

Periodic special inspection is required, in accordance with Section 1705.1.1 and Table 1705.3 of the 2024, 2021, 2018 or 2015 IBC, as applicable. The special inspector must make periodic inspections during anchor installation to verify anchor type, anchor dimensions, concrete type, concrete compressive strength, hole dimensions, anchor spacing, edge distances, concrete thickness, anchor embedment, installation torque, maximum impact wrench torque rating and adherence to the manufacturer's published installation instructions. The special inspector must be present as often as required in accordance with the "statement of special inspection". Under the IBC, additional requirements as set forth in Sections 1705, 1706 and 1707 must be observed, where applicable.

5.0 CONDITIONS OF USE:

The PAT Undercut Anchors described in this report comply with, or are a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Anchor sizes, dimensions and minimum embedment depths are as set forth in the tables of this report.

5.2 The anchors must be installed in accordance with the manufacturer's published installation instructions and this report, in cracked and uncracked normal weight and lightweight concrete having a specified compressive strength of f'_c = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa). In case of conflict between this report and the manufacturer's instructions, this report governs.

5.3 The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.1 MPa).

5.4 The concrete must have attained its minimum design strength prior to installation of the anchors.

5.5 Strength design values are established in accordance with Section 4.1 of this report.

5.6 Allowable stress design values are established in accordance with Section 4.2 of this report.

5.7 Anchor spacing and edge distance as well as minimum member thickness must comply with Table 2 of this report.

5.8 Prior to installation, calculations and details demonstrating compliance with this report must be submitted to the code official. The calculations and details must be prepared, signed and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.9 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of anchors subjected to fatigue or shock load is unavailable at this time, the use of these anchors under such conditions is beyond the scope of this report.

5.10 Anchors may be installed in regions of concrete where cracking has occurred or where analysis indicates cracking may occur ($f_t > f_r$), subject to the conditions of this report.

5.11 Anchors may be used to resist short-term loading due to wind or seismic forces in locations designated as Seismic Design Categories A through F under the IBC, subject to the conditions of this report.

5.12 Where not otherwise prohibited in the code, PAT Undercut anchors are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

- The anchors are used to resist wind or seismic forces only.
- Anchors that support a fire-resistance-rated envelope or a fire-resistance-rated membrane are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- Anchors are used to support nonstructural elements.

5.13 Use of anchors made of stainless steel as specified in this report is permitted for exterior exposure or damp environments.

5.14 Use of anchors made of stainless steel as specified in this report is permitted for contact with preservative treated and fire-retardant-treated wood.

5.15 Special inspection must be provided in accordance with Section 4.4 of this report.

5.16 Anchors are manufactured under an approved quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193), dated October 2017 (Editorially revised April 2024), which incorporates requirements in ACI 355.2-19 / ACI 355.2-07, for use in cracked and uncracked concrete.

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5279) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

7.2 In addition, the anchors are identified by packaging labeled with the evaluation report holder's name (PROSPECT ANCHOR AND TOOL) and address, anchor name, and anchor size (diameter x length, in inches).

7.3 The report holder's contact information is the following:

PROSPECT ANCHOR AND TOOL LLC
1123 PERRY HIGHWAY
PORTERSVILLE, PENNSYLVANIA 16051
UNITED STATES
(724) 602-1907

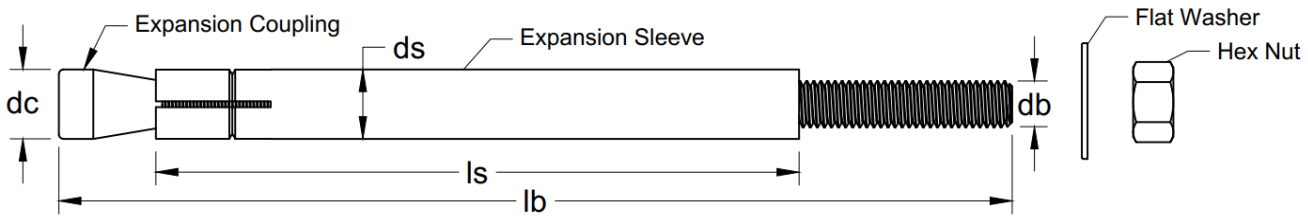


FIGURE 1— PAT UNDERCUT ANCHOR ASSEMBLY

TABLE 1—PAT UNDERCUT ANCHOR DIMENSIONAL CHARACTERISTICS[1]

Anchor Designation	Rod ASTM Designation	Units	Rod Diameter, d_b (inch)	Anchor Length, l_b (inch)	Sleeve Length, l_s (inch)	Sleeve Diameter, d_s (inch)	Expansion Coupling Dia., d_c (inch)
375-4-316	A193 B8M	in.	3/8	6 1/2	4 1/4	5/8	5/8
		(mm)	(9.5)	(165.1)	(108.0)	(15.9)	(15.9)
500-6-316	A193 B8M	in.	1/2	9 1/2	6	3/4	3/4
		(mm)	(12.7)	(241.3)	(152.4)	(19.1)	(19.1)

For **SI:** 1 inch = 25.4 mm.

[1]All components are ASTM A193 B8M, 316 Stainless Steel

TABLE 2—PAT UNDERCUT ANCHOR DESIGN AND INSTALLATION INFORMATION[1,2]

Setting and Design Information	Symbol	Units	Nominal anchor diameter	
			3/8	**1/2**
Nominal Anchor Diameter	d_{rod}	in.	3/8	1/2
		(mm)	(9.5)	(12.7)
Anchor Nominal Outer Diameter	d_a	in.	5/8	3/4
		(mm)	(15.9)	(19.1)
Nominal Drill Bit Diameter	d_{bit}	in.	5/8	3/4
		(mm)	(15.9)	(19.1)
Undercutting Tool Size	$d_{undercut}$	in.	0.815 - 0.895	0.920 – 0.960
		(mm)	(20.7 – 22.7)	(23.4 – 24.4)
Nominal embedment depth	h_{nom}	in.	4 3/4	6 1/2
		(mm)	(120.7)	(165.1)
Effective embedment depth	h_{ef}	in.	4 1/4	6
		(mm)	(108.0)	(152.4)
Min. hole depth	h_o	in.	4 3/4	6 1/2
		(mm)	(120.7)	(165.1)
Min member thickness	h_{min}	in.	6 1/2	9
		(mm)	(165.1)	(228.6)
Critical edge distance	c_{ac}	in.	10 5/8	15
		(mm)	(269.9)	(381.0)
Min. edge distance	c_{min}	in.	3 3/4	**4 1/2**
		(mm)	(95.4)	(114.3)
Min. anchor spacing	s_{min}	in.	3 3/4	**4 1/2**
		(mm)	(95.4)	(114.3)
Installation torque	T_{inst}	ft-lb	20	45
		(Nm)	(27)	(61)

For **SI:** 1 inch = 25.4 mm, 1lbf = 4.45 N, 1 psi = 0.006895 MPa. For **pound-in** units: 1 mm = 0.03937 inches.

[1]The data in this table is intended to be used with the design provisions of ACI 318 (-19 or -14) Chapter 17, as applicable; for anchors resisting seismic load combinations the additional requirements of ACI 318-19 17.10 or ACI 318-14 17.2.3, as applicable, shall apply.

[2] Installation must comply with manufacturer's printed installation instructions and details.

TABLE 3—TENSION DESIGN INFORMATION FOR PAT UNDERCUT ANCHORS[1,2]

DESIGN INFORMATION	Symbol	Units	Nominal anchor diameter	
			$^3/_8$	$^1/_2$
Anchor Nominal Outer Diameter	d_a	in. (mm)	$^5/_8$ (15.9)	$^3/_4$ (19.1)
Anchor category	1, 2 or 3	-	1	2
Nominal embedment depth	h_{nom}	in. (mm)	4 $^3/_4$ (120.7)	6 $^1/_2$ (165.1)
Effective embedment depth	h_{ef}	in. (mm)	4 $^1/_4$ (108.0)	6 (152.4)
STEEL STRENGTH IN TENSION (ACI 318-19 17.6.1 or ACI 318-14 17.4.1)				
Effective tensile stress area (anchor rod)	$A_{se,N}$	in^2	0.078 (50)	0.142 (91)
Minimum specified ultimate strength	f_{uta}	psi (N/mm^2)	75,000 (517.1)	75,000 (517.1)
Minimum specified yield strength	f_{ya}	psi (N/mm^2)	30,000 (206.8)	30,000 (206.8)
Steel strength in tension[4]	N_{sa}	lb (kN)	5,850 (26.0)	10,650 (47.4)
Reduction factor, steel strength in tension[3,4]	ϕ		0.75	
CONCRETE BREAKOUT STRENGTH IN TENSION (ACI 318-19 17.6.2 or ACI 318-14 17.4.2)				
Critical edge distance	c_{ac}	in.	10 $^5/_8$ (269.9)	15 (381.0)
Effectiveness factor k_{uncr} uncracked concrete[2]	k_{uncr}	-	24	
Effectiveness factor k_{cr} cracked concrete[2]	k_{cr}	-	17	
Modification factor for cracked and uncracked concrete[5]	$\psi_{c,N}$	-	1.0 (see note 5)	
Reduction factor, concrete breakout strength in tension (Condition B)[3]	ϕ	-	0.65	0.55
Mean axial stiffness in uncracked concrete	β_{uncr}	lbf/in	1,095,000	8,382,000
Mean axial stiffness in uncracked concrete	β_{cr}	lbf/in	122,000	127,000
PULLOUT STRENGTH IN TENSION (ACI 318-19 17.6.3 or ACI 318-14 17.4.3) AND PULLOUT STRENGTH IN TENSION FOR SEISMIC APPLICATIONS (ACI 318-19 17.10.3 or ACI 318-14 17.2.3.3)				
Characteristic pullout strength, uncracked concrete (2,500 psi)[6]	$N_{p,uncr}$	lb (kN)	Not Applicable[5]	
Characteristic pullout strength, cracked concrete (2,500 psi)[6]	$N_{p,cr}$	lb	Not Applicable[5]	
Characteristic pullout strength, seismic (2,500 psi)[6]	$N_{p,eq}$	lb (kN)	Not Applicable[5]	
Reduction factor, pullout strength in tension[3]	ϕ	-	0.65	0.55

For **SI:** 1 inch = 25.4 mm, 1lbf = 4.45 N, 1 psi = 0.006895 MPa. For **pound-in** units: 1 mm = 0.03937 inches.

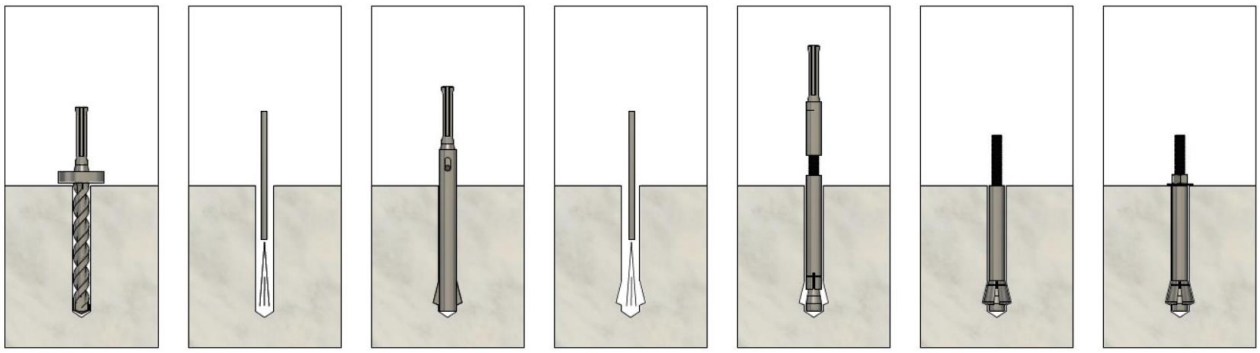
[1]The data in this table is intended to be used with the design provisions of ACI 318 (-19 or -14) Chapter, as applicable; for anchors resisting seismic load combinations the additional requirements of ACI 318-19 17.10 or ACI 318-14 17.2.3, as applicable, shall apply
[2]Installation must comply with published instructions and details.
[3]The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3 or ACI 318-14 17.3.3, as applicable, are met.
[4]The anchors are considered ductile steel elements as defined by ACI 318 (-19 or -14) 2.3, as applicable.
[5]Select the appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) and use $\psi_{c,N}$ = 1.0.
[6]Pullout strength does not control design of indicated anchors.

TABLE 4—SHEAR DESIGN INFORMATION FOR PAT UNDERCUT ANCHORS[1,2]

DESIGN INFORMATION	Symbol	Units	Nominal anchor diameter	
			$^3/_8$	$^1/_2$
Anchor Nominal Outer Diameter	d_a	in. (mm)	$^5/_8$ (15.9)	$^3/_4$ (19.1)
Anchor category	1, 2 or 3	-	1	2
Effective embedment depth	h_{ef}	in. (mm)	4 $^1/_4$ (108.0)	6 (152.4)
STEEL STRENGTH IN SHEAR (ACI 318-19 17.7.1 or ACI 318-14 17.5.1)				
Effective shear stress area (anchor rod)	$A_{se,V}$	in^2	0.078 (50)	0.142 (91)
Minimum specified ultimate strength	f_{uta}	psi (N/mm^2)	75,000 (517.1)	75,000 (517.1)
Minimum specified yield strength	f_{ya}	psi (N/mm^2)	30,000 (206.8)	30,000 (206.8)
Steel strength in shear[4]	V_{sa}	lb (kN)	3,510 (15.6)	6,390 (28.4)
Steel strength in shear, seismic	$V_{sa,eq}$	lb (kN)	3,510 (15.6)	6,390 (28.4)
Reduction factor ϕ for shear, steel strength[3,4]	ϕ	-	0.65	
CONCRETE BREAKOUT STRENGTH IN SHEAR (ACI 318-19 17.7.2 or ACI 318-14 17.5.2) CONCRETE PRYOUT STRENGTH IN SHEAR (ACI 318-19 17.7.3 or ACI 318-14 17.5.3)				
Load-bearing length of anchor	ℓ_e	in. (mm)	2$^1/_2$ (63)	3$^1/_2$ (89)
Reduction factor, breakout strength in shear (Condition B)[3]	ϕ	-	0.70	
Coefficient for pryout strength	k_{cp}	-	2.0	
Reduction factor, pryout strength in shear[3]	ϕ	-	0.70	

For **SI:** 1 inch = 25.4 mm, 1lbf = 4.45 N, 1 psi = 0.006895 MPa. For **pound-in** units: 1 mm = 0.03937 inches.

[1]The data in this table is intended to be used with the design provisions of ACI 318 (-19 or -14) Chapter, as applicable; for anchors resisting seismic load combinations the additional requirements of ACI 318-19 17.10 or ACI 318-14 17.2.3, as applicable, shall apply
[2]Installation must comply with published instructions and details.
[3]The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3 or ACI 318-14 17.3.3, as applicable, are met.
[4]The anchors are considered ductile steel elements as defined by ACI 318 (-19 or -14) 2.3, as applicable.



1. Drill primary hole using PAT supplied Drill bit with depth stop.
2. Remove dust and debris from hole using any effective means.
3. Insert under-cut tool and apply pressure until stop reach-es maximum travel.
4. Remove dust and debris from hole using any effective means.
5. Insert anchor with setting tool. Drive setting tool until maximum travel is reached.
6. Remove setting tool and verify sleeve is flush or just below surface.
7. Install fixture, washer, and nut. Apply appropri-ate torque or load.

FIGURE 2— INSTALLATION INSTRUCTION FOR PAT UNDERCUT ANCHORS