ICC-ES Evaluation Report

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This report also contains:

- City of LA Supplement

Subject to renewal October 2025

- FL Supplement

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: ADOLF WÜRTH GmbH & CO. KG	EVALUATION SUBJECT: WÜRTH WIT-UH 300 ADHESIVE ANCHOR SYSTEM AND POST-INSTALLED REINFORCING BAR SYSTEM IN CRACKED AND UNCRACKED CONCRETE	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, 2012 and 2009 *International Building Code*® (IBC)
- 2018, 2015, 2012 and 2009 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

The Würth WIT-UH 300 Adhesive Anchor System is used as anchorage and the Post-Installed Reinforcing Bar System is used as reinforcing bar connection (for development length and splice length) in cracked and uncracked normalweight concrete with a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa) to resist static, wind or earthquake (IBC Seismic Design Categories A through F) tension and shear loads.

The anchor system complies with anchors as described in Section 1901.3 of the 2018 and 2015 IBC, Section 1909 of the 2012 IBC and is an alternative to cast-in-place and post-installed anchors described in Section 1908 of the 2012 IBC, and Sections 1911 and 1912 of the 2009 IBC. The anchor system may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

The post-installed reinforcing bar system is an alternative to cast-in-place reinforcing bar connection governed by ACI 318 and IBC Chapter 19.

3.0 DESCRIPTION

3.1 General:

The Würth WIT-UH 300 Adhesive Anchor System and Post-Installed Reinforcing Bar System is comprised of Würth WIT-UH 300 two-component adhesive filled in cartridges, static mixing nozzles, dispensing tools, hole cleaning equipment and adhesive injection accessories, and steel anchor elements, which are continuously threaded steel rods (to form the Würth WIT-UH 300 Adhesive Anchor System) or deformed steel reinforcing bars (to form the Würth WIT-UH 300 Adhesive Anchor System or the Post-Installed Reinforcing Bar System).

The primary components of the Würth WIT-UH 300 Adhesive Anchor System and Post-Installed Reinforcing Bar System, including the Würth WIT-UH 300 adhesive cartridge, static mixing nozzle, and steel anchor elements, are shown in Figures 1 and 2 of this report. The manufacturer's printed installation instructions (MPII), included with each adhesive unit package, are shown in Figure 6 of this report.

3.2 Materials:

3.2.1 Würth WIT-UH 300 Adhesive: Würth WIT-UH 300 adhesive is an injectable two-component vinylester-urethane hybrid adhesive. The two components are kept separate by means of a labelled dual-cylinder cartridge. The two components combine and react when dispensed through a static mixing nozzle, supplied by Adolf Würth GmbH & Co. KG, which is attached to the cartridge. Würth WIT-UH 300 is available in: coaxial cartridges: 5-ounce (150 mL), 9.5-ounce (280 mL) up to 11-ounce (333 mL) and 13 up to 14-ounce (380 up to 420 mL) and side-by-side cartridges: 8-ounce (235 mL), 11.5-ounce (345 mL) up to 12-ounce (360 mL) and 28-ounce (825 mL).

Each cartridge label is marked with the adhesive expiration date. The shelf life, as indicated by the expiration date, applies to an unopened cartridge stored in a dry, dark, and cool environment.

3.2.2 Hole Cleaning Equipment: Hole cleaning equipment is comprised of steel wire brushes supplied by Adolf Würth GmbH & Co. KG, and air blowers which are shown in Figure 6 of this report. The Würth dust removal system shown in Figure 3 of this report removes dust with a HEPA dust extractor during the hole drilling operation in dry base materials.

3.2.3 Dispensers: Würth WIT-UH 300 adhesive must be dispensed with manual dispensers, pneumatic dispensers, or electric powered dispensers supplied by Adolf Würth GmbH & Co. KG.

3.2.4 Steel Anchor Elements:

3.2.4.1 Threaded Steel Rods for use in Post-Installed Anchor Applications: Threaded steel rods must be clean and continuously threaded (all-thread) in diameters described in Tables 4 and 10, and Figure 6 of this report. Specifications for grades of threaded rod, including the mechanical properties, and corresponding nuts and washers, are included in Table 2 of this report. Carbon steel threaded rods must be furnished with a minimum 0.0002-inch-thick (0.005 mm) zinc electroplated coating complying with ASTM B633, SC1 or a minimum 0.0021-inch-thick (0.053 mm) mechanically deposited zinc coating complying with ASTM B695, Class 55. The stainless-steel threaded rods must comply with Table 2 of this report. Steel grades and types of material (carbon, stainless) for the washers and nuts must match the threaded rods. Threaded steel rods must be clean, straight, and free of indentations or other defects along their length. The embedded end may be flat cut or cut on the bias to a chisel point.

3.2.4.2 Steel Reinforcing Bars for use in Post-Installed Anchor Applications: Steel reinforcing bars must be deformed reinforcing bars as described in Table 3 of this report. Tables 7 and 13 and Figure 6 summarize reinforcing bar size ranges. The embedded portions of reinforcing bars must be clean, straight, and free of mill scale, rust, mud, oil, and other coatings (other than zinc) that may impair the bond with the adhesive. Reinforcing bars must not be bent after installation except as set forth in ACI 318-14 Section 26.6.3.1 (b) or ACI 318-11 Section 7.3.2, as applicable, with the additional condition that the bars must be bent cold, and heating of reinforcing bars to facilitate field bending is not permitted.

3.2.4.3 Steel Reinforcing Bars for Use in Post-Installed Reinforcing Bar Connections: Steel reinforcing bars used in post-installed reinforcing bar connections must be deformed reinforcing bars (rebars) as depicted in Figures 4 and 5. Tables 16, 17, and Figure 6 summarize reinforcing bar size ranges. The embedded portions of reinforcing bars must be clean, straight, and free of mill scale, rust, mud, oil and other coatings that may impair the bond with the adhesive. Reinforcing bars must not be bent after installation, except as set forth in Section 26.6.3.1(a) of ACI 318-14 or Section 7.3.2 of ACI 318-11, as applicable, with the additional condition that the bars must be bent cold, and heating of reinforcing bars to facilitate field bending is not permitted.

3.2.4.4 Ductility: In accordance with ACI 318-14 Section 2.3 or ACI 318-11 Appendix D Section D.1, as applicable, in order for a steel anchor element to be considered ductile, the tested elongation must be at least 14 percent and reduction of area must be at least 30 percent. Steel elements with a tested elongation less than 14 percent or a reduction of area less than 30 percent, or both, are considered brittle. Specifications and physical properties of various steel materials are provided for threaded rods in Table 2 and for threaded rods in Table 3 of this report. Where values are nonconforming or unstated, the steel must be considered brittle.

3.3 Concrete:

Normalweight concrete must comply with Sections 1903 and 1905 of the IBC. The specified compressive strength of the concrete must be from 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

4.0 DESIGN AND INSTALLATION

4.1 Strength Design of Post-Installed Anchors:

4.1.1 General: The design strength of anchors under the 2018 and 2015 IBC, as well as the 2018 and 2015 IRC, must be determined in accordance with ACI 318-14 and this report. The design strength of anchors under the 2012 and 2009 IBC, as well as the 2012 and 2009 IRC, must be determined in accordance with ACI 318-11 and this report.

The strength design of anchors must comply with ACI 318-14 17.3.1 or 318-11 D.4.1, as applicable, except as required in ACI 318-14 17.2.3 or ACI 318-11 D.3.3, as applicable.

Design parameters are provided in Tables 4 through Table 15 of this report.

Strength reduction factors, ϕ, as given in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, must be used for load combinations calculated in accordance with Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable.

Strength reduction factors, ϕ, as given in ACI 318-11 D.4.4 must be used for load combinations calculated in accordance with ACI 318-11 Appendix C.

4.1.2 Static Steel Strength in Tension: The nominal static steel strength of a single anchor in tension, N_{sa}, in accordance with ACI 318-14 17.4.1.2 or ACI 318-11 D.5.1.2, as applicable, and the associated strength reduction factors, ϕ, in accordance with ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are provided in Tables 4, 7, 10 and 13 of this report for the corresponding anchor steel.

4.1.3 Static Concrete Breakout Strength in Tension: The nominal static concrete breakout strength of a single anchor or group of anchors in tension, N_{cb} or N_{cbg}, must be calculated in accordance with ACI 318-14 17.4.2 or ACI 318-11 D.5.2, as applicable, with the following addition:

The basic concrete breakout strength of a single anchor in tension, N_b, must be calculated in accordance with ACI 318-14 17.4.2.2 or ACI 318-11 D.5.2.2, as applicable, using the values of $k_{c,cr}$ and $k_{c,uncr}$ as provided in Tables 5, 8, 11 and 14 of this report. Where analysis indicates no cracking in accordance with ACI 318-14 17.4.2.6 or ACI 318-11 D.5.2.6, as applicable, N_b must be calculated using $k_{c,uncr}$ and $\Psi_{c,N}$ = 1.0. For anchors in lightweight concrete see ACI 318-14 17.2.6 or ACI 318-11 D.3.6, as applicable. The value of f'_c used for calculation must be limited to 8,000 psi (55 MPa) in accordance with ACI 318-14 17.2.7 or ACI 318-11 D.3.7, as applicable. The value of f'_c used for calculation must be limited to 2,500 psi (17.2 MPa) maximum for metric reinforcing bars in cracked concrete. Additional information for the determination of nominal bond strength in tension is given in Section 4.1.4 of this report.

4.1.4 Static Bond Strength in Tension: The nominal static bond strength of a single adhesive anchor or group of adhesive anchors in tension, N_a or N_{ag}, must be calculated in accordance with ACI 318-14 17.4.5 or ACI 318-11 D.5.5, as applicable.

Bond strength values ($\tau_{k,cr}$, $\tau_{k,uncr}$) are a function of concrete compressive strength, concrete state (cracked, uncracked) and installation conditions (dry concrete, water-saturated concrete, water-filled holes). Special inspection level is qualified as periodic for all anchors except as shown in Section 4.3 of this report (the selection of continuous special inspection level does not provide an increase in anchor category or associated strength reduction factor for design). The following table summarizes the requirements:

CONCRETE STATE	BOND STRENGTH	CONCRETE COMPRESSIVE STRENGTH	PERMISSIBLE INSTALLATION CONDITIONS	ASSOCIATED STRENGTH REDUCTION FACTOR
cracked	$\tau_{k,cr}$	f'_c	Dry concrete	ϕ_d
			Water-saturated concrete	ϕ_{ws}
			Water-filled holes	ϕ_{wf}
uncracked	$\tau_{k,uncr}$		Dry concrete	ϕ_d
			Water-saturated concrete	ϕ_{ws}
			Water- filled holes	ϕ_w

Strength reduction factors for determination of the bond strength are given in Tables 6, 9, 12 and 15 of this report. Adjustments to the bond strength may also be made for increased concrete compressive strength as noted in the footnotes to the corresponding tables and this section.

The bond strength values in Tables 6, 9, 12 and 15 of this report correspond to concrete compressive strength f'_c equal to 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi and 8,000 psi (17.2 MPa and 55 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.10}$ [For **SI:** $(f'_c / 17.2)^{0.10}$]. The value of f'_c used for calculation must be limited to 2,500 psi (17.2 MPa) maximum for metric reinforcing bars in cracked concrete. Where applicable, the modified bond strength values must be used in lieu of $\tau_{k,cr}$ and $\tau_{k,uncr}$ in ACI 318-14 Equations (17.4.5.1d) and (17.4.5.2) or ACI 318-11 Equations (D-21) and (D-22), as applicable.

The resulting nominal bond strength must be multiplied by the associated strength reduction factor ϕ_d, ϕ_{ws} or ϕ_{wf}, as applicable.

4.1.5 Static Steel Strength in Shear: The nominal static steel strength of a single anchor in shear as governed by the steel, V_{sa}, in accordance with ACI 318-14 17.5.1.2 or ACI 318-11 D.6.1.2, as applicable, and the strength reduction factor, ϕ, in accordance with ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are given in Tables 4, 7, 11 and 13 of this report for the corresponding anchor steel.

4.1.6 Static Concrete Breakout Strength in Shear: The nominal static concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg}, must be calculated in accordance with ACI 318-14 17.5.2 or 318-11 D.6.2, as applicable, based on information given in Tables 5, 8, 12 and 14 in this report.

The basic concrete breakout strength of a single anchor in shear, V_b, must be calculated in accordance with ACI 318-14 17.5.2.2 or ACI 318-11 D.6.2.2, as applicable, using the values of d given in Tables 5, 8, 12 and 14 of this report for the corresponding anchor steel in lieu of d_a. In addition, h_{ef} must be substituted for ℓ_e. In no case shall ℓ_e exceed $8d$. The value of f'_c shall be limited to a maximum of 8,000 psi (55 MPa) in accordance with ACI 318-14 17.2.7 or ACI 318-11 D.3.7, as applicable.

4.1.7 Static Concrete Pryout Strength in Shear: The nominal static pryout strength of a single anchor or group of anchors in shear, V_{cp} or V_{cpg}, shall be calculated in accordance with ACI 318-14 17.5.3 or ACI 318-11 D.6.3, as applicable.

4.1.8 Interaction of Tensile and Shear Forces: For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-14 17.6 or ACI 318-11 D.7, as applicable.

4.1.9 Minimum Member Thickness h_{min}, Anchor Spacing s_{min}, Edge Distance c_{min}: In lieu of ACI 318-14 17.7.1 and 17.7.3 or ACI 318-11 D.8.1 and D.8.3, as applicable, values of s_{min} and c_{min} described in this report must be observed for anchor design and installation. The minimum member thicknesses, h_{min}, described in this report must be observed for anchor design and installation. For adhesive anchors that will remain untorqued, ACI 318-14 17.7.4 or ACI 318-11 D.8.4 applies, as applicable.

For anchors that will be torqued during installation, the maximum torque, T_{max}, must be reduced for edge distances less than the values given in Tables 5, 8, 11 and 14 as applicable. T_{max} is subject to the edge distance, c_{min}, and anchor spacing, s_{min}, and shall comply with the following requirements:

INSTALLATION TORQUE SUBJECT TO EDGE DISTANCE			
NOMINAL ANCHOR SIZE, d	MINIMUM EDGE DISTANCE, c_{min}	MINIMUM ANCHOR SPACING, s_{min}	MAXIMUM TORQUE, T_{max}
$^5/_8$ in. to 1 in. #5 to #8 M16 to M24 ø14 to ø25	1.75 in. (44.5 mm)	$5d$	$0.45 \cdot T_{max}$
$1^1/_4$ in. #9 to #10 M27 to M30 ø28 to ø32	2.75 in. (70 mm)		

For values of T_{max}, see Figure 6 of this report.

4.1.10 Critical Edge Distance c_{ac} and $\psi_{cp,Na}$: The modification factor $\psi_{cp,Na}$, must be determined in accordance with ACI 318-14 17.4.5.5 or ACI 318-11 D.5.5.5, as applicable, except as noted below:

For all cases where c_{Na}/c_{ac}<1.0, $\psi_{cp,Na}$ determined from ACI 318-14 Eq. 17.4.5.5b or ACI 318-11 Eq. D-27, as applicable, need not be taken less than c_{Na}/c_{ac}. For all other cases, $\psi_{cp,Na}$ shall be taken as 1.0.

The critical edge distance, c_{ac} must be calculated according to Eq. 17.4.5.5c for ACI 318-14 or Eq. D-27a for ACI 318-11, in lieu of ACI 318-14 17.7.6 or ACI 318-11 D.8.6, as applicable.

$$c_{ac} = h_{ef} \cdot \left(\frac{\tau_{k,\,uncr}}{1160}\right)^{0.4} \cdot \left[3.1 - 0.7\frac{h}{h_{ef}}\right]$$

(Eq. 17.4.5.5c for ACI 318-14 or Eq. D-27a for ACI 318-11)

where

$\left[\frac{h}{h_{ef}}\right]$ need not be taken as larger than 2.4; and

$\tau_{k,uncr}$ = the characteristic bond strength stated in the tables of this report whereby $\tau_{k,uncr}$ need not be taken as larger than:

$\tau k,uncr=kuncrheffc'\pi\cdot da$ Eq. (4-1)

4.1.11 Requirements for Seismic Design Categories C, D, E and F: In structures assigned to Seismic Design Category C, D, E or F under the IBC or IRC, anchors must be designed in accordance with ACI 318-14 17.2.3 or ACI 318-11 D.3.3, as applicable, except as described below.

The nominal steel shear strength, V_{sa}, must be adjusted by $\alpha_{V,seis}$ as given in Tables 4, 7, 11 and 13 for the corresponding anchor steel. The nominal bond strength $\tau_{k,cr}$ must be adjusted by $\alpha_{N,seis}$ as given in Tables 6 and 12 for threaded rods, and Tables 9 and 15 for reinforcing bars.

As an exception to ACI 318-11 Section D.3.3.4.2: Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 shall be deemed to satisfy ACI 318-11 Section D.3.3.4.3(d).

Under ACI 318-11 D.3.3.4.3(d), in lieu of requiring the anchor design tensile strength to satisfy the tensile strength requirements of ACI 318-11 D.4.1.1, the anchor design tensile strength shall be calculated from ACI 318-11 D.3.3.4.4.

The following exceptions apply to ACI 318-11 D.3.3.5.2:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or non-bearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane shear strength in accordance with ACI 318-11 D.6.2 and D.6.3 need not be computed and ACI 318-11 D.3.3.5.3 need not apply provided all of the following are satisfied:

   1.1. The allowable in-plane shear strength of the anchor is determined in accordance with AF&PA NDS Table 11E for lateral design values parallel to grain.

   1.2. The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).

   1.3. Anchor bolts are embedded into concrete a minimum of 7 inches (178 mm).

   1.4. Anchor bolts are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.

   1.5. Anchor bolts are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.

   1.6. The sill plate is 2-inch or 3-inch nominal thickness.

2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or non-bearing walls of light-frame construction to foundations or foundation stem walls, the in-plane shear strength in accordance with ACI 318-11 D.6.2 and D.6.3 need not be computed and ACI 318-11 D.3.3.5.3 need not apply provided all of the following are satisfied:

   2.1. The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).

   2.2. Anchors are embedded into concrete a minimum of 7 inches (178 mm).

   2.3. Anchors are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the track.

   2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.

2.5. The track is 33 to 68 mil designation thickness.

Allowable in-plane shear strength of exempt anchors, parallel to the edge of concrete shall be permitted to be determined in accordance with AISI S100 Section E3.3.1.

3. In light-frame construction, bearing or nonbearing walls, shear strength of concrete anchors less than or equal to 1 inch [25 mm] in diameter attaching a sill plate or track to foundation or foundation stem wall need not satisfy ACI 318-11 D.3.3.5.3(a) through (c) when the design strength of the anchors is determined in accordance with ACI 318-11 D.6.2.1(c).

4.2 Strength Design of Post-Installed Reinforcing Bars:

4.2.1 General: The design of straight post-installed deformed reinforcing bars must be determined in accordance with ACI 318 rules for cast-in place reinforcing bar development and splices and this report.

Examples of typical applications for the use of post-installed reinforcing bars are illustrated in Figure 5 of this report.

4.2.2 Determination of bar development length l_d: Values of l_d must be determined in accordance with the ACI 318 development and splice length requirements for straight cast-in place reinforcing bars.

Exceptions:

1. For uncoated and zinc-coated (galvanized) post-installed reinforcing bars, the factor Ψ_e shall be taken as 1.0. For all other cases, the requirements in ACI 318-14 25.4.2.4 or ACI 318-11 12.2.4 (b) shall apply.

2. When using alternate methods to calculate the development length (e.g., anchor theory), the applicable factors for post-installed anchors generally apply.

4.2.3 Minimum Member Thickness, h_{min}, Minimum Concrete Cover, $c_{c,min}$, Minimum Concrete Edge Distance, $c_{b,min}$, Minimum Spacing, $s_{b,min}$: For post-installed reinforcing bars, there is no limit on the minimum member thickness. In general, all requirements on concrete cover and spacing applicable to straight cast-in bars designed in accordance with ACI 318 shall be maintained.

For post-installed reinforcing bars installed at embedment depths, h_{ef}, larger than 20d (h_{ef} > 20d), the minimum concrete cover shall be as follows:

REBAR SIZE	MINIMUM CONCRETE COVER, $c_{c,min}$
$d_b \leq$ No. 6 (16mm)	$1^3/_{16}$ in. (30mm)
No. 6 < $d_b \leq$ No.10 (16mm < $d_b \leq$ 32mm)	$1^9/_{16}$ in. (40mm)

The following requirements apply for minimum concrete edge and spacing for h_{ef} > 20d:

Required minimum edge distance for post-installed reinforcing bars (measured from the center of the bar):

$c_{b,min} = d_0/2 + c_{c,min}$

Required minimum center-to-center spacing between post-installed bars:

$s_{b,min} = d_0 + c_{c,min}$

Required minimum center-to-center spacing from existing (parallel) reinforcing:

$s_{b,min} = d_b/2$ (existing reinforcing) $+ d_0/2 + c_{c,min}$

4.2.4 Design Strength in Seismic Design Categories C, D, E and F: In structures assigned to Seismic Category C, D, E or F under the IBC or IRC, design of straight post-installed reinforcing bars must take into account the provisions of ACI 318-14 Chapter 18 or ACI 318-11 Chapter 21, as applicable.

4.3 Installation:

Installation parameters are illustrated in Figure 1 of this report. Installation must be in accordance with ACI 318-14 17.8.1 and 17.8.2 or ACI 318-11 D.9.1 and D.9.2. Anchor and post-installed reinforcing bar locations must comply with this report and the plans and specifications approved by the code official. Installation of the Würth WIT-UH 300 Adhesive Anchor and Post-Installed Reinforcing Bar Systems must conform to the manufacturer’s printed installation instructions included in each unit package and provided in Figure 6 of this report.

The adhesive anchor system may be used for upwardly inclined orientation applications (e.g., overhead). Upwardly inclined and horizontal orientation applications are to be installed using piston plugs for the $^5/_8$-inch-through $1^1/_4$-inch-diameter (M16 through M30) threaded steel rods and No. 5 through No. 10 (14 mm through 32 mm) steel reinforcing bars, installed in the specified hole diameter, and attached to the mixing nozzle and extension tube supplied by Adolf Würth GmbH & Co. KG as described in Figure 6 in this report. Upwardly inclined and horizontal orientation installation for the $^3/_8$-inch- and $^1/_2$-inch-diameter (M10 and M12) threaded steel rods, and No. 3 and No. 4 (10 mm and 12 mm) steel reinforcing bars may be injected directly to the end of the hole using a mixing nozzle with a bore hole depth $d_0 \leq 10"$ (250 mm).

Installation of anchors in horizontal or upwardly inclined (overhead) orientations shall be fully restrained from movement throughout the specified curing period through the use of temporary wedges, external supports, or other methods. Where temporary restraint devices are used, their use shall not result in impairment of the anchor shear resistance.

4.4 Special Inspection:

Periodic special inspection must be performed where required in accordance with Section 1705.1.1 and Table 1705.3 of the 2018, 2015 and 2012 IBC, 1704.4 and 1704.15 of the 2009 IBC and this report. The special inspector must be on the jobsite initially during anchor or post-installed reinforcing bar installation to verify the anchor or post-installed reinforcing bar type and dimensions, adhesive expiration date, concrete type, concrete compressive strength, hole dimensions, hole cleaning procedures, spacing, edge distances, concrete thickness, anchor, or post-installed reinforcing bar embedment, tightening torque, and adherence to the manufacturers printed installation instructions.

The special inspector must verify the initial installations of each type and size of adhesive anchor or post-installed reinforcing bar by construction personnel on site. Subsequent installations of the same anchor or post-installed reinforcing bar type and size by the same construction personnel are permitted to be performed in the absence of the special inspector. Any change in the anchor or post-installed reinforcing bar product being installed or the personnel performing the installation requires an initial inspection. For ongoing installations over an extended period, the special inspector must make regular inspections to confirm correct handling and installation of the product.

Continuous special inspection of adhesive anchors or post-installed reinforcing bars installed in horizontal or upwardly inclined orientations to resist sustained tension loads must be performed in accordance with ACI 318-14 17.8.2.4, 26.7.1(h) and 26.13.3.2 (c) or ACI 318-11 D.9.2.4, as applicable.

Under the IBC, additional requirements as set forth in Sections 1705, 1706 or 1707 must be observed, where applicable.

4.5 Compliance with NSF/ANSI Standard 61:

The Würth WIT-UH 300 Adhesive Anchor System complies with the requirements of NSF/ANSI Standard 61, as referenced in Section 605 of the 2018, 2015, 2012, and 2009 *International Plumbing Code*® (IPC) and is certified for use as an anchoring adhesive for installing threaded rods less than or equal to 1.3 inches (33 mm) in diameter in concrete for water treatment applications.

5.0 CONDITIONS OF USE:

The Würth WIT-UH 300 Adhesive Anchor System and Post-Installed Reinforcing Bar System 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 Würth WIT-UH 300 adhesive anchors and post-installed reinforcing bars must be installed in accordance with the manufacturer's printed installation instructions included with each cartridge and provided in Figure 6 of this report.

5.2 The anchors and post-installed reinforcing bars described in this report must be installed in cracked and uncracked normalweight concrete having a specified compressive strength f'_c = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

5.3 The concrete shall have attained its minimum specified compressive strength, f'_c, prior to installation of the anchors and post installed reinforcing bars.

5.4 The values of f'_c used for calculation purposes must not exceed 8,000 psi (55 MPa). The value of f'_c used for calculation of tension resistance must be limited to 2,500 psi (17.2 MPa) maximum for metric reinforcing bars used as anchorage in cracked concrete only.

5.5 Anchors and post-installed reinforcing bars must be installed in concrete base materials in holes predrilled in accordance with the instructions provided in Figure 6 of this report.

5.6 Loads applied to the anchors and post-installed reinforcing bars must be adjusted in accordance with Section 1605.2 of the IBC for strength design.

5.7 In structures assigned to Seismic Design Categories C, D, E, and F under the IBC or IRC, anchor strength must be adjusted in accordance with Section 4.1.11 of this report, and post-installed reinforcing bars must comply with Section 4.2.4 of this report.

5.8 Würth WIT-UH 300 adhesive anchors and post-installed reinforcing bars are permitted to be installed in concrete that is cracked or that may be expected to crack during the service life of the anchors and post-installed reinforcing bars, subject to the conditions of this report.

5.9 Strength design values of the post-installed anchors are established in accordance with Section 4.1 of this report.

5.10 Post-installed reinforcing bar development and splice lengths are established in accordance with Section 4.2 of this report.

5.11 Minimum anchor spacing and edge distance as well as minimum member thickness must comply with the values described in this report.

5.12 Post-installed reinforcing bar spacing, minimum member thickness, and cover distance must be in accordance with the provisions of ACI 318 for cast-in place bars and Section 4.2.3 of this report.

5.13 Prior to installation of anchors and post-installed reinforcing bars, calculations and details demonstrating compliance with this report must be submitted to the code official. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.14 Anchors and post-installed reinforcing bars are not permitted to support fire-resistive construction. Where not otherwise prohibited by the code, the anchors and post-installed reinforcing bars are permitted for installation in fire-resistive construction provided that at least one of the following conditions is fulfilled:

- Anchors and post-installed reinforcing bars are used to resist wind or seismic forces only.
- Anchors and post-installed reinforcing bars that support gravity load-bearing structural elements are within a fire-resistive envelope or a fire-resistive membrane, are protected by approved fire-resistive materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- Anchors and post-installed reinforcing bars are used to support non-structural elements.

5.15 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of adhesive anchors and post-installed reinforcing bars subjected to fatigue or shock loading is unavailable at this time, the use of these anchors under such conditions is beyond the scope of this report.

5.16 Use of zinc-plated carbon steel threaded rods or steel reinforcing bars is limited to dry, interior locations.

5.17 Use of hot-dipped galvanized carbon steel and stainless-steel rod is permitted for exterior exposure or damp environments.

5.18 Steel anchoring elements in contact with preservative-treated and fire-retardant-treated wood shall be of zinc-coated steel or stainless steel. The minimum coating weights for zinc-coated steel shall be in accordance with ASTM A153.

5.19 Periodic special inspection must be provided in accordance with Section 4.4 in this report. Continuous special inspection for anchors and post-installed reinforcing bars installed in horizontal or upwardly inclined orientations to resist sustained tension loads must be provided in accordance with Section 4.4 of this report.

5.20 Installation of anchors and post-installed reinforcing bars in horizontal or upwardly inclined orientations to resist sustained tension loads must be performed by personnel certified by an applicable certification program in accordance with ACI 318-14 17.8.2.2 or 17.8.2.3 or ACI 318-11 D.9.2.2 or D.9.2.3, as applicable.

5.21 Würth WIT-UH 300 adhesive anchors and post-installed reinforcing bars may be used to resist tension and shear forces in floor, wall for overhead installations into concrete with a temperature between 23°F and 104°F (-5°C and 40°C) for threaded rods and rebar.

5.22 Anchors and post-installed reinforcing bars shall not be used for installations where the concrete temperature can vary from 40°F (5°C) or less to 80°F (27°C) or higher within a 12-hour period. Such applications may include but are not limited to anchorage of building facade systems and other applications subject to direct sun exposure.

5.23 Würth WIT-UH 300 adhesive is manufactured under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete (AC308), dated October 2017 (editorially revised March 2018), which incorporates requirements in ACI 355.4-11 for use in cracked and uncracked concrete; including, but not limited to, tests under freeze/thaw conditions, tests under sustained load, tests for installation including installation direction and condition, tests at elevated temperatures, tests for resistance of alkalinity, tests for resistance to sulphur and tests for seismic tension and shear.

7.0 IDENTIFICATION

7.1 Würth WIT-UH 300 adhesive is identified by packaging labelled with the company's name (Adolf Würth GmbH & Co. KG) and address, anchor name, the lot number, the expiration date, and the evaluation report number (ESR-4466). Threaded rods, nuts, washers, and deformed reinforcing bars must be standard steel anchor elements and must conform to applicable national or international specifications as set forth in Tables 2 and 3 of this report.

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

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TABLE 1—DESIGN STRENGTH - TABLE REFERENCE INDEX

DESIGN STRENGTH[1] - TREADED RODS		Fractional	Metric
	Steel Strength - N_{sa}, V_{sa}	Table 4	Table 10
	Concrete Strength - N_{pn}, N_{sb}, N_{sbg}, N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	Table 5	Table 11
	Bond Strength[2] - N_a, N_{ag}	Table 6	Table 12
DESIGN STRENGTH[1] – REINFORCING STEEL		**Fractional**	**Metric**
	Steel Strength - N_{sa}, V_{sa}	Table 7	Table 13
	Concrete Strength - N_{pn}, N_{sb}, N_{sbg}, N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	Table 8	Table 14
	Bond Strength[2] - N_a, N_{ag}	Table 9	Table 15
	Determination of development length for post-installed reinforcing bar connections	Table 16	Table 17

[1]Ref. ACI 318-14 17.3.1.1 or 318-11 D.4.1.1, as applicable.
[2]See Section 4.1.4 of this evaluation report.

TABLE 2—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON CARBON AND STAINLESS-STEEL THREADED ROD MATERIALS[1]

THREADED ROD SPECIFICATION			MINIMUM SPECIFIED ULTIMATE STRENGTH, f_{uta}	MINIMUM SPECIFIED YIELD STRENGTH 0.2 PERCENT OFFSET, f_{ya}	f_{uta}/f_{ya}	ELONGATION, MIN. PERCENT[11]	REDUCTION OF AREA, MIN. PERCENT	SPECIFICATION FOR NUTS[12]
CARBON STEEL	ASTM A193[2] Grade B7	psi (MPa)	125,000 (860)	105,000 (720)	1.19	16	50	ASTM A194 / A563 Grade DH
	ASTM A36[3] / F1554[4], Grade 36	psi (MPa)	58,000 (400)	36,000 (250)	1.61	23	40	ASTM A194 / A563 Grade A
	ASTM F1554[4] Grade 55	psi (MPa)	75,000 (515)	55,000 (380)	1.36	23	40	
	ASTM F1554[4] Grade 105	psi (MPa)	125,000 (860)	105,000 (725)	1.19	15	45	ASTM A194 / A563 Grade DH
	ASTM A449[5] (3/8" to1" dia.)	psi (MPa)	120,000 (830)	92,000 (635)	1.30	14	35	
	ASTM A449[5] (1 1/4" dia.)	psi (MPa)	105,000 (720)	81,000 (560)	1.30	14	35	
	ASTM F568M[6] Class 5.8 (equivalent to ISO 898-1)	psi (MPa)	72,500 (500)	58,000 (400)	1.25	10	35	A563 Grade DH DIN 934 (8-A2K)[13]
	ISO 898-1[7] Class 5.8	MPa (psi)	500 (72,500)	400 (58,000)	1.25	22	-	EN ISO 4032 Grade 6
	ISO 898-1[7] Class 8.8	MPa (psi)	800 (118,000)	640 (92,800)	1.25	12	52	EN ISO 4032 Grade 8
STAINLESS STEEL	ASTM F593[8] CW1 3/8 to 5/8 in.	psi (MPa)	100,000 (690)	65,000 (450)	1.54	20	-	ASTM F594 Alloy Group 1, 2 or 3
	ASTM F593[8] CW2 3/4 to 1 1/4 in.	psi (MPa)	85,000 (590)	45,000 (310)	1.89	25	-	
	ASTM A193/A193M[9] Grade B8/B8M2, Class 2B	psi (MPa)	95,000 (655)	75,000 (515)	1.27	25	40	ASTM A194/A194M
	ISO 3506-1[10] A4-70 M10-M24	MPa (psi)	700 (101,500)	450 (65,250)	1.56	40	-	EN ISO 4032
	ISO 3506-1[10] A4-50 M27-M30	MPa (psi)	500 (72,500)	210 (30,450)	2.38	40	-	EN ISO 4032

[1]Adhesive must be used with continuously threaded carbon or stainless-steel rod (all-thread) having thread characteristics complying with ANSI B1.1 UNC Coarse Thread Series.
[2]Standard Specification for Alloy-Steel and Stainless-steel Bolting Materials for High temperature of High Pressure service and Other Special Purpose Applications.
[3]Standard Specification for Carbon Structural steel.
[4]Standard Specification for Anchor Bolts, Steel 36, 55 and 105-ksi Yield Strength.
[5]Standard Specification for Hex Cap Screws, Bolts and Studs, Heat Treated, 120/105/50 ksi Minimum Tensile Strength, General Use.
[6]Standard Specification for Carbon and Alloy Steel external Threaded Metric Fasteners.
[7]Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, Screws and Studs.
[8]Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
[9]Standard Specification for Alloy-Steel and Stainless-Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
[10]Mechanical properties of corrosion-resistant stainless-steel fasteners - Part 1: Bolts, Screws and Studs.
[11]Based on 2-in. (50 mm) gauge length except for ASTM A193, which is based on a gauge length of 4d.
[12]Nuts and washers of other grades and style having specified proof load stress greater than the specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than the minimum tensile strength of the specified threaded rod.
[13]Nuts for metric rods.

TABLE 3—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON STEEL REINFORCING BARS

REINFORCING SPECIFICATION	UNITS	MINIMUM SPECIFIED ULTIMATE STRENGTH, f_{uta}	MINIMUM SPECIFIED YIELD STRENGTH, f_{ya}
ASTM A615[1], A767[3], A996[4] Grade 60	psi (MPa)	90,000 (620)	60,000 (414)
ASTM A706[2], A767[3] Grade 60	psi (MPa)	80,000 (550)	60,000 (414)
ASTM A615[1], Grade 40	psi (MPa)	60,000 (415)	40,000 (275)
DIN 488[5] BSt 500	MPa (psi)	550 (79,750)	500 (72,500)

[1]Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
[2]Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
[3]Standard specification for Zinc-Coated (Galvanized) steel Bars for Concrete Reinforcement.
[4]Standard specification for Rail-Steel and Axle-steel Deformed bars for Concrete Reinforcement.
[5]Reinforcing steel, reinforcing steel bars; dimensions and masses.

TABLE 4—STEEL DESIGN INFORMATION FOR U.S. CUSTOMARY UNIT THREADED ROD[1]

DESIGN INFORMATION		Symbol	Units	Nominal Rod Diameter (inch)						
				3/8	1/2	5/8	3/4	7/8	1	1 1/4
Threaded rod O.D.		d	in. (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)
Threaded rod effective cross-sectional area		A_{se}	in.² (mm²)	0.0775 (50)	0.1419 (92)	0.2260 (146)	0.3345 (216)	0.4617 (298)	0.6057 (391)	0.9691 (625)
ASTM A36/F1554, Grade 36	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	4,495 (20.0)	8,230 (36.6)	13,110 (58.3)	19,400 (86.3)	26,780 (119.1)	35,130 (156.3)	56,210 (250.0)
		V_{sa}	lb (kN)	2,695 (12.0)	4,940 (22.0)	7,860 (35.0)	11,640 (51.8)	16,070 (71.4)	21,080 (93.8)	33,725 (150.0)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.75						
	Strength reduction factor for shear[2]	ϕ	-	0.65						
ASTM F1554 Grade 55	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	5,815 (25.9)	10,645 (47.6)	16,950 (75.5)	25,090 (111.7)	34,630 (154.1)	45,430 (202.1)	72,685 (323.1)
		V_{sa}	lb (kN)	3,490 (15.5)	6,385 (28.6)	10,170 (45.3)	15,055 (67)	20,780 (92.5)	27,260 (121.3)	43,610 (193.9)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.75						
	Strength reduction factor for shear[2]	ϕ	-	0.65						
ASTM A193 Grade B7 ASTM F1554 Grade 105	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	9,685 (43.1)	17,735 (78.9)	28,250 (125.7)	41,810 (186.0)	57,710 (256.7)	75,710 (336.8)	121,135 (538.8)
		V_{sa}	lb (kN)	5,810 (25.9)	10,640 (47.3)	16,950 (75.4)	25,085 (111.6)	34,625 (154.0)	45,425 (202.1)	72,680 (323.3)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.75						
	Strength reduction factor for shear[2]	ϕ	-	0.65						
ASTM A449	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	9,300 (41.4)	17,030 (76.2)	27,120 (120.9)	40,140 (178.8)	55,405 (246.7)	72,685 (323.7)	101,755 (450.0)
		V_{sa}	lb (kN)	5,580 (24.8)	10,220 (45.7)	16,270 (72.5)	24,085 (107.3)	33,240 (148)	43,610 (194.2)	61,055 (270.0)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.75						
	Strength reduction factor for shear[2]	ϕ	-	0.65						
ASTM F568M Class 5.8	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	5,620 (25)	10,290 (46)	16,385 (73)	24,250 (108)	33,470 (149)	43,910 (195.5)	70,260 (312.5)
		V_{sa}	lb (kN)	3,370 (15)	6,175 (27.6)	9,830 (43.8)	14,550 (64.8)	20,085 (89.4)	26,350 (117.3)	42,155 (187.5)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.65						
	Strength reduction factor for shear[2]	ϕ	-	0.60						
ASTM F593 CW Stainless	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	7,750 (34.5)	14,190 (63.1)	22,600 (100.5)	28,430 (126.5)	39,245 (174.6)	51,485 (229.0)	82,370 (366.4)
		V_{sa}	lb (kN)	4,650 (20.7)	8,515 (37.9)	13,560 (60.3)	17,060 (75.9)	23,545 (104.7)	30,890 (137.4)	49,425 (219.8)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.65						
	Strength reduction factor for shear[2]	ϕ	-	0.60						
ASTM A193/A193M Grade B8/B8M2, Class 2B	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	7,365 (32.8)	13,480 (60.3)	21,470 (95.6)	31,780 (141.5)	43,860 (195.2)	57,540 (256.1)	92,065 (409.4)
		V_{sa}	lb (kN)	4,420 (19.7)	8,090 (36.2)	12,880 (57.4)	19,070 (84.9)	26,320 (117.1)	34,525 (153.7)	55,240 (245.6)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.75						
	Strength reduction factor for shear[2]	ϕ	-	0.65						

[1]Values provided for common rod material types based on specified strengths and calculated in accordance with ACI 318-14 Eq. 17.4.1.2 and Eq. 17.5.1.2 b or ACI 318-11 Eq. (D-2) and Eq. (D-29), as applicable. Nuts and washers must comply with requirements for the rod.

[2]The tabulated value of ϕ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4.

TABLE 5—CONCRETE BREAKOUT DESIGN INFORMATION FOR U.S. CUSTOMARY UNIT THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION	Symbol	Units	Nominal Rod Diameter (inch)						
			3/8	1/2	5/8	3/4	7/8	1	1 1/4
Effectiveness factor for cracked concrete	$k_{c,cr}$	in-lb (SI)	17 (7)						
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	in-lb (SI)	24 (10)						
Min. anchor spacing	s_{min}	in. (mm)	1 7/8 (48)	2 1/2 (64)	3 (76)	3 3/4 (95)	4 1/4 (108)	4 3/4 (121)	5 7/8 (149)
Min. edge distance	c_{min}	in. (mm)	1 5/8 (41)	1 3/4 (44)	2 (51)	2 3/8 (60)	2 1/2 (64)	2 3/4 (70)	3 1/4 (82)
					For smaller edge distances see Section 4.1.9 of this report.				
Min. member thickness	h_{min}	in. (mm)	h_{ef} + 1 1/4 (h_{ef} + 30)		$h_{ef} + 2d_0$[3]				
Critical edge distance - splitting (for uncracked concrete)[2]	c_{ac}	-	See Section 4.1.10 of this report.						
Strength reduction factor for tension, concrete failure modes, Condition B[2]	ϕ	-	0.65						
Strength reduction factor for shear, concrete failure modes, Condition B[2]	ϕ	-	0.70						

[1]Additional setting information is described in Figure 6, installation instructions.
[2]Condition A requires supplemental reinforcement, while Condition B applies where supplemental reinforcement is not provided or where pullout or pryout governs, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. The tabulated value of ϕ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in 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 318-11 D.4.4.
[3] d_0 = hole diameter.

TABLE 6—BOND STRENGTH DESIGN INFORMATION FOR U.S. CUSTOMARY UNIT THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION			Symbol	Units	Nominal Rod Diameter (inch)						
					3/8	1/2	5/8	3/4	7/8	1	1 1/4
Minimum embedment			$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	5 (127)
Maximum embedment			$h_{ef,max}$	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)
Temperature range A[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	psi (N/mm²)	2,600 (17.9)	2,415 (16.6)	2,260 (15.6)	2,140 (14.8)	2,055 (14.2)	2,000 (13.8)	1,990 (13.7)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	psi (N/mm²)	1,040 (7.2)	1,040 (7.2)	1,110 (7.7)	1,220 (8.4)	1,210 (8.4)	1,205 (8.3)	1,145 (7.9)
Temperature range B[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	psi (N/mm²)	2,265 (15.6)	2,100 (14.5)	1,970 (13.6)	1,865 (12.8)	1,785 (12.3)	1,740 (12.0)	1,730 (11.9)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	psi (N/mm²)	905 (6.2)	905 (6.2)	965 (6.7)	1,060 (7.3)	1,055 (7.3)	1,050 (7.2)	995 (6.9)
Temperature range C[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	psi (N/mm²)	1,630 (11.2)	1,515 (10.4)	1,420 (9.8)	1,345 (9.3)	1,290 (8.9)	1,255 (8.6)	1,250 (8.6)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	psi (N/mm²)	650 (4.5)	655 (4.5)	695 (4.8)	765 (5.3)	760 (5.2)	755 (5.2)	720 (5.0)
Dry concrete	MAC[4] cleaning	Anchor category	–	-	2	2	2	Not applicable			
		Strength reduction factor	ϕ_d	-	0.55	0.55	0.55				
	CAC cleaning	Anchor category	–	-	1	1	1	1	1	1	1
		Strength reduction factor	ϕ_d	-	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Water-saturated concrete	MAC[4] cleaning	Anchor category	–	-	3	2	2	Not applicable			
		Strength reduction factor	ϕ_{ws}	-	0.45	0.55	0.55				
	CAC cleaning	Anchor category	–	-	2	2	2	2	2	2	2
		Strength reduction factor	ϕ_{ws}	-	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Water-filled holes	CAC cleaning	Anchor category	–	-	3	3	3	3	3	3	3
		Strength reduction factor	ϕ_{wf}	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Reduction factor for seismic tension			$\alpha_{N,seis}$	-	0.95						

[1]Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi. For concrete compressive strength, f'_c between 2,500 psi and 8,000 psi, the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2500)^{0.10}$. See Section 4.1.4 of this report.
[2]Temperature range A: Maximum short term temperature = 176°F (80°C), maximum long term temperature = 122°F (50°C); Temperature range B: Maximum short term temperature = 248°F (120°C), maximum long term temperature = 161°F (72°C); Temperature range C: Maximum short term temperature = 320°F (160°C), maximum long term temperature = 212°F (100°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g. as result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

(Continued)

[3]Characteristic bond strengths are for sustained loads including dead and live loads. For load combinations consisting of short-term loads only such as wind, bond strengths may be increased by 23 percent for temperature range C.
[4]MAC cleaning is only permitted for installation in uncracked concrete up to an embedment depth of 10 times anchor diameter.

TABLE 7—STEEL DESIGN INFORMATION FOR U.S. CUSTOMARY UNIT REINFORCING BARS [1]

DESIGN INFORMATION		Symbol	Units	Nominal Bar Size							
				No. 3	**No. 4**	**No. 5**	**No. 6**	**No. 7**	**No. 8**	**No. 9**	**No. 10**
Reinforcing bar O.D.		d	in. (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)	1.125 (28.6)	1.250 (31.8)
Reinforcing bar effective cross-sectional area		A_{se}	in.² (mm²)	0.110 (71)	0.200 (129)	0.310 (200)	0.440 (284)	0.600 (387)	0.790 (510)	1.000 (645)	1.270 (819)
ASTM A615, A767, A996 Grade 60	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	9,900 (44.0)	18,000 (80.1)	27,900 (124.1)	39,600 (176.0)	54,000 (240.0)	71,100 (316.0)	90,000 (400.0)	114,300 (508.0)
		V_{sa}	lb (kN)	5,940 (26.4)	10,800 (48.0)	16,740 (74.5)	23,760 (105.7)	32,400 (144.1)	42,660 (189.8)	54,000 (240.2)	68,580 (305.0)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.65							
	Strength reduction factor for tension[2]	ϕ	-	0.65							
	Strength reduction factor for shear[2]	ϕ	-	0.60							
ASTM A706 Grade 60	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb	8,800	16,000	24,800	35,200	48,000	63,200	80,000	101,600
			(kN)	(39.1)	(71.2)	(110.3)	(156.6)	(213.5)	(281.1)	(355.9)	(452.0)
		V_{sa}	lb	5,280	9,600	14,880	21,120	28,800	37,920	48,000	60,960
			(kN)	(23.5)	(42.7)	(66.2)	(93.9)	(128.1)	(168.7)	(213.5)	(271.2)
	Reduction for seismic shear	$\alpha_{V,seis}$	----	0.65							
	Strength reduction factor ϕ for tension[2]	ϕ	----	0.75							
	Strength reduction factor ϕ for shear[2]	ϕ	----	0.65							
ASTM A615 Grade 40	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	lb (kN)	6,600 (29.4)	12,000 (53.4)	18,600 (82.7)	26,400 (117.4)	In accordance with ASTM A615, Grade 40 bars are furnished only in sizes No. 3 through No. 6			
		V_{sa}	lb (kN)	3,960 (17.6)	7,200 (32.0)	11,160 (49.6)	15,840 (70.5)				
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.65							
	Strength reduction factor for tension[2]	ϕ	-	0.65							
	Strength reduction factor for shear[2]	ϕ	-	0.60							

[1]Values provided for common bar material types based on specified strengths and calculated in accordance with ACI 318-14 Eq. 17.4.1.2 and Eq. 17.5.1.2 b or ACI 318-11 Eq. (D-2) and Eq. (D-29), as applicable.
[2]The tabulated value of ϕ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4.

TABLE 8—CONCRETE BREAKOUT DESIGN INFORMATION FOR U.S. CUSTOMARY UNIT REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION	Symbol	Units	Nominal Bar Size							
			No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No.10
Effectiveness factor for cracked concrete	$k_{c,cr}$	in-lb (SI)	17 (7)							
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	in.-lb. (SI)	24 (10)							
Min. anchor spacing	s_{min}	in. (mm)	1 7/8 (48)	2 1/2 (64)	3 (76)	3 3/4 (95)	4 1/4 (108)	4 3/4 (121)	5 1/4 (133)	5 7/8 (149)
Min. edge spacing	c_{min}	in. (mm)	1 5/8 (41)	1 3/4 (44)	2 (51)	2 3/8 (60)	2 1/2 (64)	2 3/4 (70)	3 (76)	3 1/4 (82)
					For smaller edge distances see Section 4.1.9 of this report.					
Min. member thickness	h_{min}	in. (mm)	h_{ef} + 1 1/4 (h_{ef} + 30)		$h_{ef} + 2d_0$[3]					
Critical edge spacing – splitting (for uncracked concrete)	c_{ac}	-	See Section 4.1.10 of this report.							
Strength reduction factor for tension, concrete failure modes, Condition B[2]	ϕ	-	0.65							
Strength reduction factor for shear, concrete failure modes, Condition B[2]	ϕ	-	0.70							

[1]Additional setting information is described in Figure 6, installation instructions.
[2]Condition A requires supplemental reinforcement, while Condition B applies where supplemental reinforcement is not provided or where pullout or pryout governs, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. The tabulated value of ϕ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in 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 318-11 D.4.4.
[3]d_0 = hole diameter.

TABLE 9—BOND STRENGTH DESIGN INFORMATION FOR U.S. CUSTOMARY UNIT REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION			Symbol	Units	Nominal Bar Size							
					No.3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No.10
Minimum embedment			$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	4 1/2 (114)	5 (127)
Maximum embedment			$h_{ef,max}$	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	22 1/2 (572)	25 (635)
Temperature range A[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	psi (N/mm²)	2,200 (15.2)	2,100 (14.5)	2,030 (14.0)	1,970 (13.6)	1,920 (13.2)	1,880 (13.0)	1,845 (12.7)	1,815 (12.5)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	psi (N/mm²)	1,090 (7.5)	1,055 (7.3)	1,130 (7.8)	1,170 (8.1)	1,175 (8.1)	1,155 (8.0)	1,140 (7.9)	1,165 (8.0)
Temperature range B[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	psi (N/mm²)	1,915 (13.2)	1,830 (12.6)	1,765 (12.2)	1,715 (11.8)	1,670 (11.5)	1,635 (11.3)	1,615 (11.1)	1,580 (10.9)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	psi (N/mm²)	945 (6.5)	915 (6.3)	980 (6.8)	1,015 (7.0)	1,020 (7.0)	1,005 (6.9)	995 (6.8)	1,010 (7.0)
Temperature range C[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	psi (N/mm²)	1,380 (9.5)	1,315 (9.1)	1,270 (8.8)	1,235 (8.5)	1,205 (8.3)	1,180 (8.1)	1,155 (8.0)	1,140 (7.8)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	psi (N/mm²)	680 (4.7)	660 (4.6)	705 (4.9)	735 (5.1)	735 (5.1)	725 (5.0)	715 (4.9)	730 (5.0)
Dry concrete	MAC[4] cleaning	Anchor category	–	-	2	2	2	Not applicable				
		Strength reduction factor	ϕ_d	-	0.55	0.55	0.55					
	CAC cleaning	Anchor category	–	-	1	1	1	1	1	1	1	1
		Strength reduction factor	ϕ_d	-	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Water-saturated concrete	MAC[4] cleaning	Anchor category	–	-	3	2	2	Not applicable				
		Strength reduction factor	ϕ_{ws}	-	0.45	0.55	0.55					
	CAC cleaning	Anchor category	–	-	2	2	2	2	2	2	2	2
		Strength reduction factor	ϕ_{ws}	-	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Water-filled holes	CAC cleaning	Anchor category	–	-	3	3	3	3	3	3	3	3
		Strength reduction factor	ϕ_{wf}	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Reduction factor for seismic tension			$\alpha_{N,seis}$	-	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00

[1]Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi. For concrete compressive strength f'_c between 2,500 psi and 8,000 psi, tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.10}$. See Section 4.1.4 of this report.
[2]Temperature range A: Maximum short term temperature = 176°F (80°C), maximum long term temperature = 122°F (50°C); Temperature range B: Maximum short term temperature = 248°F (120°C), maximum long term temperature = 161°F (72°C); Temperature range C: Maximum short term temperature = 320°F (160°C), maximum long term temperature = 212°F (100°C). Short term elevated concrete temperatures are those that occur over brief intervals, e.g. as result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
[3]Characteristic bond strengths are for sustained loads including dead and live loads. For load combinations consisting of short term loads only, such as wind and seismic, bond strengths may be increased by 23 percent for temperature range C.
[4]MAC cleaning is only permitted for installation in uncracked concrete up to an embedment depth of 10 times anchor diameter.

TABLE 10—STEEL DESIGN INFORMATION FOR METRIC THREADED ROD[1]

	DESIGN INFORMATION	Symbol	Units	Nominal Rod Diameter (mm)						
				M10	M12	M16	M20	M24	M27	M30
	Threaded rod O.D.	d	mm (in.)	10 (0.39)	12 (0.47)	16 (0.63)	20 (0.79)	24 (0.94)	27 (1.06)	30 (1.18)
	Threaded rod effective cross-sectional area	A_{se}	mm² (in.²)	58.0 (0.090)	84.3 (0.131)	157 (0.243)	245 (0.380)	353 (0.547)	459 (0.711)	561 (0.870)
ISO 898-1 Class 5.8	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN (lb)	29.0 (6,518)	42.2 (9,473)	78.5 (17,643)	122.5 (27,532)	176.5 (39,668)	229.5 (51,580)	280.5 (63,043)
		V_{sa}	kN (lb)	17.4 (3,911)	25.3 (5,684)	47.1 (10,586)	73.5 (16,519)	105.9 (23,801)	137.7 (30,948)	168.3 (37,826)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.65						
	Strength reduction factor for shear[2]	ϕ	-	0.60						
ISO 898-1 Class 8.8	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN (lb)	46.4 (10,428)	67.4 (15,157)	125.6 (28,229)	196 (44,051)	282.4 (63,470)	367.2 (82,528)	448.8 (100,868)
		V_{sa}	kN (lb)	27.8 (6,257)	40.5 (9,094)	75.4 (16,937)	117.6 (26,431)	169.4 (38,082)	220.3 (49,517)	269.3 (60,521)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.65						
	Strength reduction factor for shear[2]	ϕ	-	0.60						
ISO 3506-1, A4 stainless steel[3]	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN (lb)	40.6 (9,125)	59 (13,263)	109.9 (24,700)	171.5 (38,545)	247.1 (55,536)	229.5 (51,580)	280.5 (63,043)
		V_{sa}	kN (lb)	24.4 (5,475)	35.4 (7,958)	65.9 (14,820)	102.9 (23,127)	148.3 (33,322)	137.7 (30,948)	168.3 (37,826)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Strength reduction factor for tension[2]	ϕ	-	0.65						
	Strength reduction factor for shear[2]	ϕ	-	0.60						

[1]Values provided for common rod material types based on specified strengths and calculated in accordance with ACI 318-14 Eq. 17.4.1.2 and Eq. 17.5.1.2 b or ACI 318-11 Eq. (D-2) and Eq. (D-29), as applicable. Nuts and washers must comply with requirements for the rod.
[2]The tabulated value of □ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of □ must be determined in accordance with ACI 318-11 D.4.4.
[3]A4-70 Stainless steel (M8-M24); A4-50 Stainless steel (M27-M30).

TABLE 11—CONCRETE BREAKOUT DESIGN INFORMATION FOR METRIC THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION	Symbol	Units	Nominal Rod Diameter (mm)						
			M10	M12	M16	M20	M24	M27	M30
Effectiveness factor for cracked concrete	$k_{c,cr}$	SI (in-lb)	7 (17)						
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	SI (in-lb)	10 (24)						
Min. anchor spacing	s_{min}	mm (in.)	50 (2)	60 ($2^3/_8$)	75 (3)	95 ($3^3/_4$)	115 ($4^1/_2$)	125 (5)	140 ($5^1/_2$)
Min. edge distance	c_{min}	mm (in.)	40 ($1^5/_8$) .	45 ($1^3/_4$)	50 (2)	60 ($2^3/_8$)	65 ($2^1/_2$)	75 (3)	80 ($3^1/_8$)
					For smaller edge distances, see Section 4.1.9 of this report.				
Min. member thickness	h_{min}	mm (in.)	h_{ef} + 30 (h_{ef} + $1^1/_4$)		$h_{ef} + 2d_0$ [3]				
Critical edge distance - splitting (for uncracked concrete)[2]	c_{ac}	-	See Section 4.1.10 of this report.						
Strength reduction factor for tension, concrete failure modes, Condition B[2]	ϕ	-	0.65						
Strength reduction factor for shear, concrete failure modes, Condition B[2]	ϕ	-	0.70						

[1]Additional setting information is described in Figure 6, installation instructions.

(CONTINUED)

[2]Condition A requires supplemental reinforcement, while Condition B applies where supplemental reinforcement is not provided or where pullout or pryout governs, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. The tabulated value of ϕ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in 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 318-11 D.4.4.
[3] d_0 = hole diameter.

TABLE 12—BOND STRENGTH DESIGN INFORMATION FOR METRIC THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION			Symbol	Units	Nominal Rod Diameter (inch)						
					M10	M12	M16	M20	M24	M27	M30
Minimum embedment			$h_{ef,min}$	mm (in.)	60 (2.4)	70 (2.8)	80 (3.1)	90 (3.5)	96 (3.8)	108 (4.3)	120 (4.7)
Maximum embedment			$h_{ef,max}$	mm (in.)	200 (7.9)	240 (9.4)	320 (12.6)	400 (15.7)	480 (18.9)	540 (21.3)	600 (23.6)
Temperature range A[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	N/mm² (psi)	17.7 (2,571)	16.9 (2,453)	15.6 (2,256)	14.6 (2,112)	13.9 (2,020)	13.7 (1,985)	13.7 (1,980)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	N/mm² (psi)	7.2 (1,039)	7.2 (1,043)	7.7 (1,110)	8.4 (1,217)	8.3 (1,209)	8.3 (1,204)	7.9 (1,149)
Temperature range B[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	N/mm² (psi)	15.4 (2,237)	14.7 (2,134)	13.5 (1,963)	12.7 (1,837)	12.1 (1,757)	11.9 (1,727)	11.9 (1,723)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	N/mm² (psi)	6.2 (904)	6.3 (908)	6.7 (966)	7.3 (1,058)	7.2 (1,052)	7.2 (1,047)	6.9 (999)
Temperature range C[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	N/mm² (psi)	11.1 (1,612)	10.6 (1,538)	9.8 (1,415)	9.1 (1,324)	8.7 (1,266)	8.6 (1,245)	8.6 (1,241)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	N/mm² (psi)	4.5 (651)	4.5 (654)	4.8 (696)	5.3 (763)	5.2 (758)	5.2 (755)	5.0 (720)
Dry concrete	MAC[4] cleaning	Anchor category	–	-	2	2	2	Not applicable			
		Strength reduction factor	ϕ_d	-	0.55	0.55	0.55				
	CAC cleaning	Anchor category	–	-	1	1	1	1	1	1	1
		Strength reduction factor	ϕ_d	-	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Water-saturated concrete	MAC[4] cleaning	Anchor category	–	-	3	2	2	Not applicable			
		Strength reduction factor	ϕ_{ws}	-	0.45	0.55	0.55				
	CAC cleaning	Anchor category	–	-	2	2	2	2	2	2	2
		Strength reduction factor	ϕ_{ws}	-	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Water-filled holes	CAC cleaning	Anchor category	–	-	3	3	3	3	3	3	3
		Strength reduction factor	ϕ_{wf}	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Reduction factor for seismic tension			$\alpha_{N,seis}$	-	0.95						

[1]Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi. For concrete compressive strength, f'_c between 2,500 psi and 8,000 psi, the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2500)^{0.10}$. See Section 4.1.4 of this report.
[2]Temperature range A: Maximum short term temperature = 176°F (80°C), maximum long term temperature = 122°F (50°C); Temperature range B: Maximum short term temperature = 248°F (120°C), maximum long term temperature = 161°F (72°C); Temperature range C: Maximum short term temperature = 320°F (160°C), maximum long term temperature = 212°F (100°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g. as result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
[3]Characteristic bond strengths are for sustained loads including dead and live loads. For load combinations consisting of short-term loads only such as wind, bond strengths may be increased by 23 percent for temperature range C.
[4]MAC cleaning is only permitted for installation in uncracked concrete up to an embedment depth of 10 times anchor diameter.

TABLE 13—STEEL DESIGN INFORMATION FOR METRIC REINFORCING BARS [1]

DESIGN INFORMATION		Symbol	Units	Nominal Bar Size							
				ø 10	**ø 12**	**ø 14**	**ø 16**	**ø 20**	**ø 25**	**ø 28**	**ø 32**
Reinforcing bar O.D.		d	mm (in.)	10 (0.394)	12 (0.472)	14 (0.551)	16 (0.630)	20 (0.787)	25 (0.984)	28 (1.102)	32 (1.260)
Reinforcing bar effective cross-sectional area		A_{se}	mm² (in.²)	78.5 (0.112)	113.1 (0.175)	153.9 (0.239)	201.1 (0.312)	314.2 (0.487)	490.9 (0.761)	615.8 (0.954)	804.2 (1.247)
DIN 488 BSt 500	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN (lb)	43.2 (9,739)	62.2 (14,024)	84.7 (19,088)	110.6 (24,932)	172.8 (38,956)	270.0 (60,868)	338.7 (76,353)	442.3 (99,727)
		V_{sa}	kN (lb)	25.9 (5,843)	37.3 (8,414)	50.8 (11,453)	66.4 (14,959)	103.7 (23,373)	162.0 (36,521)	203.2 (45,812)	265.4 (59,836)
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	0.65							
	Strength reduction factor for tension[2]	ϕ	-	0.65							
	Strength reduction factor for shear[2]	ϕ	-	0.60							

[1]Values provided for common bar material types based on specified strengths and calculated in accordance with ACI 318-14 Eq. 17.4.1.2 and Eq. 17.5.1.2 b or ACI 318-11 Eq. (D-2) and Eq. (D-29), as applicable.
[2]The tabulated value of ϕ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4.

TABLE 14—CONCRETE BREAKOUT DESIGN INFORMATION METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION	Symbol	Units	Nominal Bar Size							
			ø 10	**ø 12**	**ø 14**	**ø 16**	**ø 20**	**ø 25**	**ø 28**	**ø 32**
Effectiveness factor for cracked concrete	$k_{c,cr}$	SI (in-lb)	7 (17)							
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	SI (in-lb)	10 (24)							
Min. anchor spacing	s_{min}	mm (in.)	50 (2)	60 ($2^{3}/_{8}$)	70 ($2^{3}/_{4}$)	75 (3)	95 ($3^{3}/_{4}$)	120 ($4^{5}/_{8}$)	130 ($5^{1}/_{4}$)	150 ($5^{7}/_{8}$)
Min. edge spacing	c_{min}	mm (in.)	40 ($1^{5}/_{8}$)	45 ($1^{3}/_{4}$)	50 (2)	50 (2)	60 ($2^{3}/_{8}$)	70 ($2^{3}/_{4}$)	75 (3)	85 ($3^{1}/_{8}$)
					For smaller edge distances, see Section 4.1.9 of this report.					
Min. member thickness	h_{min}	in. (mm)	$h_{ef}+1^{1}/_{4}$ (h_{ef} + 30)		$h_{ef}+2d_0$ [3]					
Critical edge spacing – splitting (for uncracked concrete)[2]	c_{ac}	-	See Section 4.1.10 of this report.							
Strength reduction factor for tension, concrete failure modes, Condition B[2]	ϕ	-	0.65							
Strength reduction factor for shear, concrete failure modes, Condition B[2]	ϕ	-	0.70							

[1]Additional setting information is described in Figure 6, installation instructions.
[2]Condition A requires supplemental reinforcement, while Condition B applies where supplemental reinforcement is not provided or where pullout or pryout governs, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. The tabulated value of ϕ applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in 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 318-11 D.4.4.
[3]d_0 = hole diameter.

TABLE 15—BOND STRENGTH DESIGN INFORMATION METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1]

DESIGN INFORMATION			Symbol	Units	Nominal Bar Size							
					ø 10	**ø 12**	**ø 14**	**ø 16**	**ø 20**	**ø 25**	**ø 28**	**ø 32**
Minimum embedment			$h_{ef,min}$	mm (in.)	60 (2.4)	70 (2.8)	75 (3.0)	80 (3.1)	90 (3.5)	100 (3.9)	112 (4.4)	128 (5.0)
Maximum embedment			$h_{ef,max}$	mm (in.)	200 (7.9)	240 (9.4)	280 (11.0)	320 (12.6)	400 (15.7)	500 (19.7)	560 (22.0)	640 (25.2)
Temperature range A[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	N/mm² (psi)	15.1 (2,183)	14.6 (2,121)	14.0 (2,025)	14.0 (2,025)	13.5 (1,954)	13.0 (1,886)	12.8 (1,852)	12.5 (1,813)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	N/mm² (psi)	7.5 (1,082)	7.3 (1,060)	7.9 (1,144)	8.2 (1,193)	8.2 (1,188)	8.0 (1,158)	7.9 (1,144)	8.0 (1,163)
Temperature range B[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	N/mm² (psi)	13.1 (1,899)	12.7 (1,845)	12.1 (1,762)	12.1 (1,762)	11.7 (1,700)	11.3 (1,640)	11.1 (1,611)	10.9 (1,577)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	N/mm² (psi)	6.5 (942)	6.4 (922)	6.9 (996)	7.2 (1,038)	7.1 (1,034)	6.9 (1,008)	6.9 (995)	7.0 (1,012)
Temperature range C[2,3]:	Characteristic bond strength in uncracked concrete		$\tau_{k,uncr}$	N/mm² (psi)	9.4 (1,369)	9.2 (1,329)	8.8 (1,270)	8.8 (1,270)	8.4 (1,225)	8.2 (1,182)	8.0 (1,161)	7.8 (1,136)
	Characteristic bond strength in cracked concrete		$\tau_{k,cr}$	N/mm² (psi)	4.7 (678)	4.6 (665)	4.9 (718)	5.2 (748)	5.1 (745)	5.0 (726)	4.9 (717)	5.0 (729)
Dry concrete	MAC[4] cleaning	Anchor category	–	-	2	2	2	2	Not Applicable			
		Strength reduction factor	ϕ_d	-	0.55	0.55	0.55	0.55				
	CAC cleaning	Anchor category	–	-	1	1	1	1	1	1	1	1
		Strength reduction factor	ϕ_d	-	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Water-saturated concrete	MAC[4] cleaning	Anchor category	–	-	3	2	2	2	Not Applicable			
		Strength reduction factor	ϕ_{ws}	-	0.45	0.55	0.55	0.55				
	CAC cleaning	Anchor category	–	-	2	2	2	2	2	2	2	2
		Strength reduction factor	ϕ_{ws}	-	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Water-filled holes	CAC cleaning	Anchor category	–	-	3	3	3	3	3	3	3	3
		Strength reduction factor	ϕ_{wf}	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Reduction factor for seismic tension			$\alpha_{N,seis}$	-	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00

[1]Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi. For concrete compressive strength f'_c between 2,500 psi and 8,000 psi, tabulated characteristic bond strength may not be increased. See Section 4.1.4 of this report.
[2]Temperature range A: Maximum short term temperature = 176°F (80°C), maximum long term temperature = 122°F (50°C); Temperature range B: Maximum short term temperature = 248°F (120°C), maximum long term temperature = 161°F (72°C); Temperature range C: Maximum short term temperature = 320°F (160°C), maximum long term temperature = 212°F (100°C). Short term elevated concrete temperatures are those that occur over brief intervals, e.g. as result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
[3]Characteristic bond strengths are for sustained loads including dead and live loads. For load combinations consisting of short term loads only, such as wind and seismic, bond strengths may be increased by 23 percent for temperature range C.
[4]MAC cleaning is only permitted for installation in uncracked concrete up to an embedment depth of 10 times anchor diameter.

TABLE 16—DEVELOPMENT LENGTH FOR U.S. CUSTOMARY UNIT REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT [1, 2, 4]

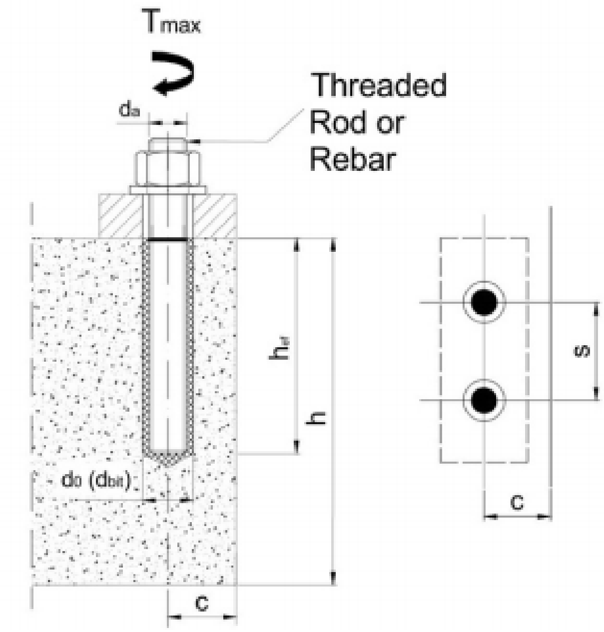
DESIGN INFORMATION	Symbol	Criteria Section of Reference Standard	Units	Bar size							
				#3	#4	#5	#6	#7	#8	#9	#10
Nominal reinforcing bar diameter	d_b	ASTM A615/A706	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250
			(mm)	(9.5)	(12.7)	(15.9)	(19.1)	(22.2)	(25.4)	(28.6)	(31.8)
Nominal bar area	A_b	ASTM A615/A706	in^2	0.11	0.20	0.31	0.44	0.60	0.79	1.00	1.27
			(mm^2)	(71.3)	(126.7)	(197.9)	(285.0)	(387.9)	(506.7)	(644.7)	(817.3)
Development length for f_y = 60 ksi and f'_c = 2,500 psi (normalweight concrete)[3]	l_d	ACI 318-14 25.4.2.3 or ACI 318-11 12.2.3	in.	12.0	14.4	18.0	21.6	31.5	36.0	40.5	45.0
			(mm)	(304.8)	(365.8)	(457.2)	(548.6)	(800.1)	(914.4)	(1028.7)	(1143)
Development length for f_y = 60 ksi and f'_c = 4,000 psi (normalweight concrete)[3]	l_d	ACI 318-14 25.4.2.3 or ACI 318-11 12.2.3	in.	12.0	12.0	14.2	17.1	24.9	28.5	32.0	35.6
			(mm)	(304.8)	(304.8)	(361.4)	(433.7)	(632.5)	(722.9)	(812.8)	(904.2)

For **SI:** 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi
[1] Development lengths valid for static, wind, and earthquake loads (SDC A and B).
[2] Development lengths in SDC C through F must comply with ACI 318-14 Chapter 18 or ACI 318-11 Chapter 21 and Section 4.2.4 of this report.
[3] f_y and f'_c used in this table are for example purposes only. For sand-lightweight concrete, increase development length by 33%, unless the provisions of ACI 318-14 25.4.2.4 or ACI 318-11 12.2.4 (d) are met to permit $\lambda > 0.75$.
[4] $\left(\frac{c_b + K_{tr}}{d_b}\right) = 2.5$, $\psi_t = 1.0$, $\psi_e = 1.0$, $\psi_s = 0.8$ for $d_b \le$ #6, 1.0 for $d_b >$ #6.

TABLE 17—DEVELOPMENT LENGTH FOR EU METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT [1, 2, 4]

DESIGN INFORMATION	Symbol	Criteria Section of Reference Standard	Units	Bar size						
				8	10	12	16	20	25	32
Nominal reinforcing bar diameter	d_b	BS 4449: 2005	mm	8	10	12	16	20	25	32
			(in.)	(0.315)	(0.394)	(0.472)	(0.630)	(0.787)	(0.984)	(1.260)
Nominal bar area	A_b	BS 4449: 2005	mm^2	50.3	78.5	113.1	201.1	314.2	490.9	804.2
			(in^2)	(0.08)	(0.12)	(0.18)	(0.31)	(0.49)	(0.76)	(1.25)
Development length for f_y = 72.5 ksi and f'_c = 2,500 psi (normalweight concrete)[3]	l_d	ACI 318-14 25.4.2.3 or ACI 318-11 12.2.3	mm	305	348	417	556	871	1087	1392
			(in.)	(12.0)	(13.7)	(16.4)	(21.9)	(34.3)	(42.8)	(54.8)
Development length for f_y = 72.5 ksi and f'_c = 4,000 psi (normalweight concrete)[3]	l_d	ACI 318-14 25.4.2.3 or ACI 318-11 12.2.3	mm	305	305	330	439	688	859	1100
			(in.)	(12.0)	(12.0)	(13.0)	(17.3)	(27.1)	(33.8)	(43.3)

For **SI:** 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi
[1] Development lengths valid for static, wind, and earthquake loads (SDC A and B).
[2] Development lengths in SDC C through F must comply with ACI 318-14 Chapter 18 or ACI 318-11 Chapter 21 and Section 4.2.4 of this report.
[3] f_y and f'_c used in this table are for example purposes only. For sand-lightweight concrete, increase development length by 33%, unless the provisions of ACI 318-14 25.4.2.4 or ACI 318-11 12.2.4 (d) are met to permit $\lambda > 0.75$.
[4] $\left(\frac{c_b + K_{tr}}{d_b}\right) = 2.5$, $\psi_t = 1.0$, $\psi_e = 1.0$, $\psi_s = 0.8$ for d_b < 20mm, 1.0 for $d_b \ge$ 20mm.



THREADED ROD

REINFORCING BAR

FIGURE 1—INSTALLATION PARAMETERS FOR THREADED RODS AND REINFORCING BARS

VARIOUS AVAILABLE TWO-COMPONENT CARTRIDGES

STATIC MIXING NOZZLE

WÜRTH DISPENSER

FIGURE 2—WIT-UH 300 ADHESIVE ANCHOR SYSTEM

Tool	Accessories and Shrouds	HEPA Dust Extractor
SDS-Max and SDS-Plus Drills		
 Rotary Drill Hammer	 SDS-Plus and SDS-Max Hollow Drill Bit	 Dust Extractor
	 SDS-Plus and SDS-Max Drill Bit  Capture Device CAT# 0903990010	

FIGURE 3— WÜRTH DUST REMOVAL DRILLING SYSTEM WITH HEPA DUST EXTRACTOR OPTIONS

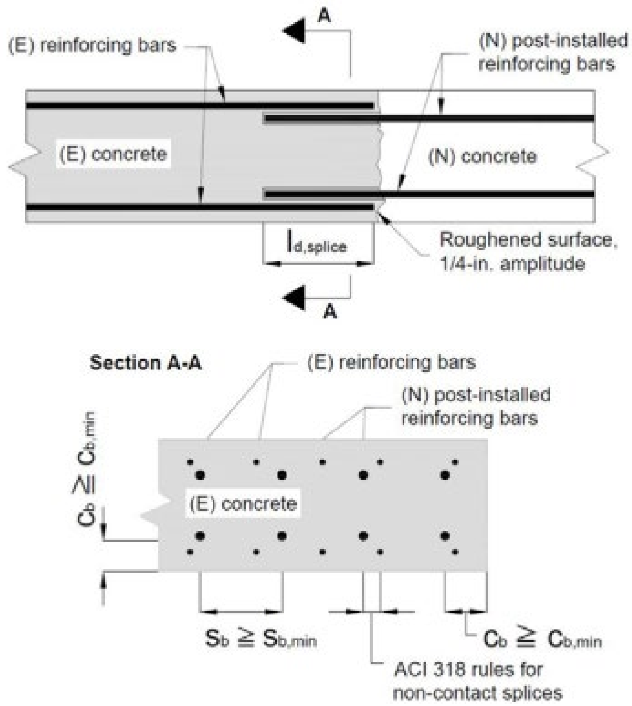


FIGURE 4—INSTALLATION PARAMETERS FOR POST-INSTALLED REINFORCING BARS

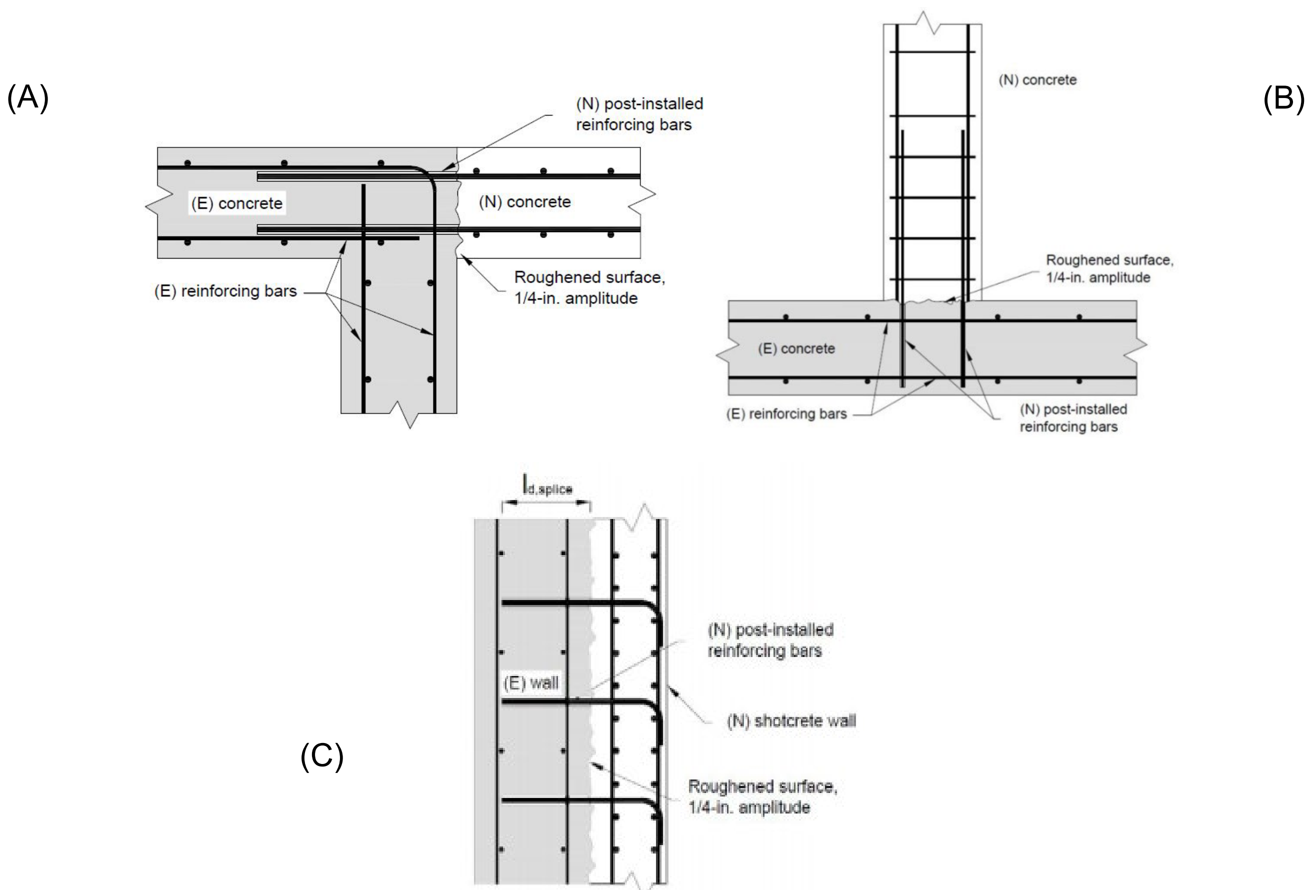
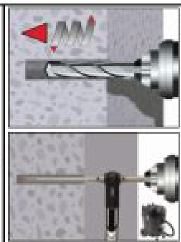


FIGURE 5—APPLICATION EXAMPLES FOR POST-INSTALLED REINFORCING BARS:
(A) TENSION LAP SPLICE WITH EXISTING FLEXURAL REINFORCEMENT; (B) TENSION DEVELOPMENT OF COLUMN DOWELS;
(C) DEVELOPMENT OF SHEAR DOWELS FOR NEWLY THICKENED SHEAR WALL

Würth WIT-UH 300 - Instruction Card

1. Setting instructions for solid base material - For any application not covered by this document please contact Adolf Würth GmbH & Co. KG (ESR-4466)

Drilling



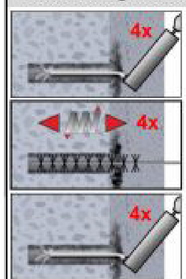
1. Drill a hole into the base material with a hammer drill tool to the size and embedment required by the selected steel hardware element (see Table 4). The tolerances of the carbide drill bit must meet the requirements of ANSI Standard B212.15.

Precaution: Wear suitable eye and skin protection. Avoid inhalation of dusts during drilling and/or removal. (see dust extraction equipment by Würth to minimize dust emissions)

In case of standing water in the drilled hole, all the water has to be removed from the hole (e.g. vacuum, compressed air, etc.) prior to cleaning.

Hole cleaning

MAC: Cleaning for bore holes $d_0 \le 3/4"$ (20mm) and bore hole depth $h_0 \le 10d_s$ (uncracked concrete only!)



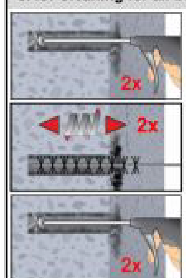
2a. Starting from the bottom or back of the anchor hole, blow the hole clean with handpump a minimum of four times.
If the back of the drilled hole is not reached an extension shall be used.

2b. Determine brush diameter (see Table 3) for the drilled hole. Brush the hole with the selected wire brush a minimum of two times (2x). A brush extension (supplied by Würth) must be used for drill hole depth > 6" (150mm).

The wire brush diameter must be checked periodically during use ($Ø_{brush} > D_{min}$, see Table 3a or 3b). The brush should resist insertion into the drilled hole - if not the brush is too small and must be replaced with the proper brush diameter. If the back of the drilled hole is not reached a brush extension shall be used.

2c. Finally blow the hole clean again with a handpump a minimum of four times. If the back of the drilled hole is not reached an extension shall be used. When finished the hole should be clean and free of dust, debris, ice, grease, oil or other foreign material.

CAC: Cleaning for all bore hole diameter in uncracked and cracked concrete

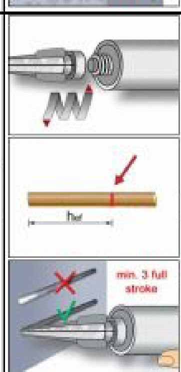


2a. Starting from the bottom or back of the anchor hole, blow the hole clean with compressed air (min. 6 bar / 90 psi) a minimum of two times, until return air stream is free of noticeable dust. If the back of the drilled hole is not reached an extension shall be used.

2b. Determine brush diameter (see Table 3) for the drilled hole. Brush the hole with the selected wire brush a minimum of two times (2x). A brush extension (supplied by Würth) must be used for drill hole depth > 6" (150mm). The wire brush diameter must be checked periodically during use ($Ø_{brush} > D_{min}$, see Table 3a or 3b). The brush should resist insertion into the drilled hole - if not the brush is too small and must be replaced with the proper brush diameter. If the back of the drilled hole is not reached a brush extension shall be used.

2c. Finally blow the hole clean again with compressed air (min. 6 bar / 90 psi) a minimum of two times, until return air stream is free of noticeable dust. If the back of the drilled hole is not reached an extension shall be used. When finished the hole should be clean and free of dust, debris, ice, grease, oil or other foreign material.

Preparing

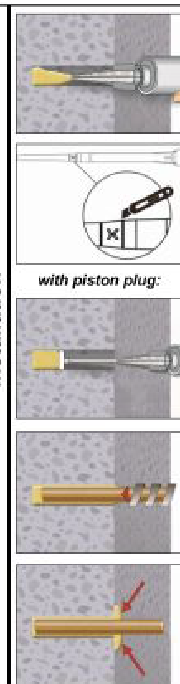


3. Check adhesive expiration date on cartridge label. Do not use expired product. Review Safety Data Sheet (SDS) before use. Cartridge temperature must be between 41°F - 104°F (5°C - 40°C) when in use. Review working and cure times. Consideration should be given to the reduced gel (working) time of the adhesive in warm temperatures. For the permitted range of the base material temperature see Table 2. Attach a supplied mixing nozzle to the cartridge. Do not modify the mixer in any way and make sure the mixing element is inside the nozzle. Load the cartridge into the correct dispensing tool.
Note: *Always use a new mixing nozzle with new cartridges of adhesive and also for all work interruptions exceeding the published gel (working) time of the adhesive.*

4. Prior to inserting the anchor rod or rebar into the filled drilled hole, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.

5. Adhesive must be properly mixed to achieve published properties. Prior to dispensing adhesive into the drilled hole, separately dispense at least three full strokes of adhesive through the mixing nozzle until the adhesive is a consistent gray color.
Review and note the published working and cure times (see Table 2) prior to injection of the mixed adhesive into the cleaned anchor hole.

Installation



6. Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids. If the bottom or back of the anchor hole is not reached with the mixing nozzle only an extension tube supplied by Würth (Cat# 0903488123 or Cat# 0903488122) must be used with the mixing nozzle.

In case of using the extension tube VL16/1,8 (Cat# 0903488122), cut the tip of the mixer nozzle at position "X".

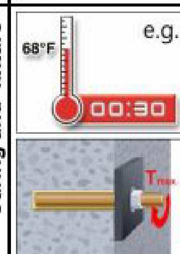
Piston plugs (see Table 3a or 3b) must be used with and attached to mixing nozzle and extension tube for:
- overhead installations and installations between horizontal and overhead
- all installations with drill hole depth d_0 >10" (250mm)

with anchor rod 5/8" to 1-1/4" (M16 to M30) diameter and rebar sizes #5 to #10 (Ø14 to Ø32).
Insert piston plug to the back of the drilled hole and inject as described in the method above. During installation the piston plug will be naturally extruded from the drilled hole by the adhesive pressure. **Attention!** Do not install anchors overhead or upwardly inclined without installation hardware supplied by Würth and also receiving proper training and/or certification. Contact Würth for details prior to use.

7. The anchor should be free of dirt, grease, oil or other foreign material. Push clean threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Observe the gel (working) time.

8. Be sure that the anchor is fully seated at the bottom of the hole and that some adhesive has flowed from the hole and all around the top of the anchor. If there is not enough adhesive in the hole, the installation must be repeated. For overhead applications and applications between horizontal and overhead the anchor must be secured from moving/falling during the cure time (e.g. wedges). Minor adjustments to the anchor may be performed during the gel time but the anchor shall not be moved after placement and during cure.

Curing and fixture



9. Allow the adhesive anchor to cure to the specified full curing time prior to applying any load (see Table 2).
Do not disturb, torque or load the anchor until it is fully cured.

10. After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque (shown in Table 4) by using a calibrated torque wrench.
Take care not to exceed the maximum torque for the selected anchor.

2. Gel (working) times and curing times

Temperature of base material	Gel (working) time	Full curing time
23 °F (-5 °C) to 31 °F (-1 °C)	50 min	5 h
32 °F (0 °C) to 40 °F (+4 °C)	25 min	3.5 h
41 °F (+5 °C) to 49 °F (+9 °C)	15 min	2 h
50 °F (+10 °C) to 58 °F (+14 °C)	10 min	1 h
59 °F (+15 °C) to 67 °F (+19 °C)	6 min	40 min
68 °F (+20 °C) to 85 °F (+29 °C)	3 min	30 min
86 °F (+30 °C) to 104 °F (+40 °C)	2 min	30 min
Cartridge temperature must be between 41°F (+5°C) and 104°F (+40°C)		

FIGURE 6—INSTALLATION INSTRUCTIONS

3a. Parameter cleaning and setting tools (fractional sizes)

Threaded Rod	Rebar	d_0 Drill bit - Ø	d_b Brush - Ø		$d_{b,min}$ min. Brush - Ø		Cat. #	Piston plug	Cat. #
[inch]	[inch]	[inch]	[mm]	[inch]	[mm]	[inch]	[-]	(No.)	[-]
3/8"	-	7/16	13.5	0.528	11.6	0.458	0903489512	No plugs required	
-	#3	1/2	14.3	0.562	13.2	0.520	0903489513		
1/2"	-	9/16	16.3	0.654	14.8	0.582	0903489515		
-	#4	5/8	18.3	0.720	16.5	0.650	0903489517		
5/8"		11/16	20.0	0.787	18.0	0.709	0903489518	11/16	0903488063
	#5	3/4	21.5	0.846	19.5	0.777	0903489519	3/4	0903488064
3/4"	#6	7/8	24.8	0.976	23.0	0.905	0903489523	7/8	0903488062
7/8"	#7	1	28.5	1.122	26.2	1.030	0903489526	1	0903488059
1"	#8	1 1/8	31.8	1.252	29.5	1.160	0903489530	1 1/8	0903488052
1-1/4"	#9	1 3/8	38.2	1.504	35.8	1.410	0903489536	1 3/8	0903488060
-	#10	1 1/2	41.4	1.630	39.0	1.535	0903489039	1 1/2	0903488065

3b. Parameter cleaning and setting tools (metric sizes)

Threaded Rod	Rebar	d_0 Drill bit - Ø	d_b Brush - Ø		$d_{b,min}$ min. Brush - Ø		Cat. #	Piston plug	Cat. #
[mm]	[mm]	[mm]	[mm]	[inch]	[mm]	[inch]	[-]	(No.)	[-]
M10	-	12	13.5	0.53	12.5	0.41	0903489512	No plugs required	
M12	10	14	15.5	0.61	14.5	0.49	0903489514		
-	12	16	17.5	0.69	16.5	0.57	0903489516		
M16	14	18	20	0.79	18.5	0.65	0903489518	VS 18	0903488057
-	16	20	22	0.87	20.5	0.73	0903489520	VS 20	0903488058
M20	-	22	24	0.94	22.5	0.81	0903489522	VS 22	0903488062
-	20	25	27	1.06	24.5	0.89	0903489525	VS 25	0903488059
M24	-	28	30	1.18	28.5	0.96	0903489528	VS 28	0903488052
M27	-	30	31.8	1.25	30.5	1.12	0903489530	VS 30	0903488066
-	25	32	34	1.34	32.5	1.20	0903489532	VS 32	0903488053
M30	28	35	37	1.46	35.5	1.28	0903489535	VS 35	0903488060
-	32	40	43.5	1.71	40.5	1.40	0903489540	VS 40	0903488061

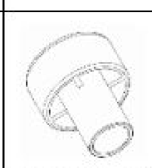
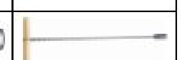
4. Anchor property / Setting information (fractional and metric sizes)

	Nominal threaded rod (fractional), inch; ft.-lb.							Nominal threaded rod (metric), mm; Nm						
Anchor size	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	M10	M12	M16	M20	M24	M27	M30
d_s = Nominal anchor rod diameter	0.375	0.500	0.625	0.750	0.875	1.000	1.250	10	12	16	20	24	27	30
d_o (d_{bit}) = Nominal ANSI drill bit size	7/16	9/16	11/16	7/8	1	1-1/8	1-3/8	12	14	18	22	28	30	35
Parameter valid for anchors														
T_{max} = Maximum torque	15[2]	30	44	66	96	147	221	20	40	80	120	170	250	300
$h_{ef,min}$ = Minimum embedment	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	5	60	70	80	90	96	108	120
$h_{ef,max}$ = Maximum embedment	7-1/2	10	12-1/2	15	17-1/2	20	25	200	240	320	400	480	540	600
s_{min} = Min. spacing	1-7/8	2-1/2	3	3-5/8	4-1/4	4-3/4	5-7/8	50	60	80	100	120	135	150
c_{min} = Min. edge distance with 100% T_{max}	1-5/8	1-3/4	2	2-3/8	2-1/2	2-3/4	3-1/4	45	45	55	60	70	75	80
c_{min} = Min. edge distance with 45% T_{max} [1]	-		1.75				2.75	-		45				70
h_{min} = Minimum member thickness	h_{ef} + 1-1/4		h_{ef} + $2d_o$					h_{ef} + 30		h_{ef} + $2d_o$				
Parameter valid for post-installed rebar														
$h_{ef,min}$ = Minimum embedment	-							-						
$h_{ef,max}$ = Maximum embedment (PIR)	-							-						

	Reinforcing bar (fractional), inch; ft.-lb.								Reinforcing bar (metric), mm; Nm							
Anchor size	#3	#4	#5	#6	#7	#8	#9	#10	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
d_s = Nominal anchor rod diameter	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	10	12	14	16	20	25	28	32
d_o (d_{bit}) = Nominal ANSI drill bit size	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	14	16	18	20	25	32	35	40
Parameter valid for anchors																
T_{max} = Maximum torque	15[2]	30	44	66	96	147	185	221	20	40	45	80	120	175	250	300
$h_{ef,min}$ = Minimum embedment	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	4-1/2	5	60	70	75	80	90	100	112	128
$h_{ef,max}$ = Maximum embedment	7-1/2	10	12-1/2	15	17-1/2	20	22-1/2	25	200	240	280	320	400	500	560	640
s_{min} = Min. spacing	1-7/8	2-1/2	3	3-5/8	4-1/4	4-3/4	5-1/4	5-7/8	50	60	70	80	100	125	140	160
c_{min} = Min. edge distance with 100% T_{max}	1-5/8	1-3/4	2	2-3/8	2-1/2	2-3/4	3	3-1/4	45	45	50	55	60	70	75	85
c_{min} = Min. edge distance with 45% T_{max} [1]	-		1.75				2.75		-		45				70	
h_{min} = Minimum member thickness	h_{ef} + 1-1/4		h_{ef} + $2d_o$						h_{ef} + 30		h_{ef} + $2d_o$					
Parameter valid for post-installed rebar																
$h_{ef,min}$ = Minimum embedment	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	4-1/2	5	60	70	75	80	90	100	112	128
$h_{ef,max}$ = Maximum embedment (PIR)	22-1/2	30	37-1/2	45	52-1/2	60	67-1/2	75	600	720	840	960	1200	1500	1680	1920

[1] $s_{min} = 5xd_s$. [2] for ASTM 36 and F1554 Grade 36, T_{max} = 11 ft.-lb.

5. WIT-UH 300 adhesive anchor system and accessories

Injection tools		Cartridge system	Extra mixing nozzles	Piston Plug	Handpump	Extension tube VL10/0,75	Extension with wood handle
9.5 to 11 fl. oz. dispenser	Cat. #0891003 – Manual tool Cat. #0891003330 – Battery tool	WIT-UH 300 5 fl. oz. WIT-UH 300 9.5 to 11 fl. oz.	WIT-UH 300 mixing nozzle Cat. #0903488102		 (Cat. #0903990001) **Compressed air nozzle (min. 90 psi)**	 (Cat. #0903488123) **Extension tube VL16/1,8**	 (Cat#0903489103) **Brush extension**
13 to 14 fl. oz. dispenser	Cat. #08910380 – Manual tool Cat. #0891004420 – Pneu. tool Cat. #0891003420 – Battery tool	WIT-UH 300 13 to 14 fl. oz.					
28 fl. oz. dispensers	Cat. #0891004825 – Pneu. tool Cat. #0891003825 – Battery tool	WIT-UH 300 28 fl. oz.		(Cat# Table 3a or 3b)	If the bore hole ground is not reached an extension shall be used.	(Cat. #0903488122)	(Cat#0903489111)

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[Rev. c]

6. Post-installed rebar hef ≥ 20d

Cartridge	Injection tools	d_s	h_{ef}	Extension tube
9.5 to 11 fl. oz. 11.5 to 12 fl. oz. 13 to 14 fl. oz.	Manual tool	≤ #5 ≤ 16 [mm]	≤ 27-1/2 [inch] ≤ 700 [mm]	VL10/0,75 (Cat.# 0903488123)
9.5 to 11 fl. oz. 11.5 to 12 fl. oz. 13 to 14 fl. oz. 28 fl. oz.	Pneumatic tool	≤ #5 ≤ 16 [mm]	≤ 39-1/2 [inch] ≤ 1000 [mm]	
9.5 to 11 fl. oz. 11.5 to 12 fl. oz. 13 to 14 fl. oz. 28 fl. oz.	Pneumatic tool	≤ #8 ≤ 25 [mm]	≤ 27-1/2 [inch] ≤ 700 [mm]	
28 fl. oz.	Pneumatic tool	≤ #10 ≤ 32 [mm]	≤ 75 [inch] ≤ 1920 [mm]	VL16/1,8 Cat.#0903488122

FIGURE 6—INSTALLATION INSTRUCTIONS (Continued)

ICC-ES Evaluation Report

ESR-4466 City of LA Supplement

Reissued October 2024

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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:

ADOLF WÜRTH GmbH & CO. KG

EVALUATION SUBJECT:

WÜRTH WIT-UH 300 ADHESIVE ANCHOR SYSTEM AND POST-INSTALLED REINFORCING BAR SYSTEM IN CRACKED AND UNCRACKED CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Würth WIT-UH 300 Adhesive Anchor System and Post-Installed Reinforcing Bar System in cracked and uncracked concrete, described in ICC-ES evaluation report ESR-4466, have also been evaluated for compliance with the codes noted below as adopted by Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2017 *City of Los Angeles Building Code (LABC)*
- 2017 *City of Los Angeles Residential Code (LARC)*

2.0 CONCLUSIONS

The Würth WIT-UH 300 Adhesive Anchor System and Post-Installed Reinforcing Bar System in cracked and uncracked concrete, described in Sections 2.0 through 7.0 of the evaluation report ESR-4466, comply with LABC Chapter 19, and LARC, and are subject to the conditions of use described in this report.

3.0 CONDITIONS OF USE

The Würth WIT-UH 300 Adhesive Anchor System and Post-Installed Reinforcing Bar System described in this evaluation report must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-4466.
- The design, installation, conditions of use and labeling of the anchors are in accordance with the 2015 *International Building Code®* (2015 IBC) provisions noted in the evaluation report ESR-4466.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- The allowable and strength design values listed in the evaluation report and tables are for the connection of the anchors to the concrete. The connection between the anchors and the connected members shall be checked for capacity (which may govern).

This supplement expires concurrently with the report, reissued October 2024.

ICC EVALUATION SERVICE®

ICC-ES Evaluation Report

ESR-4466 FL Supplement

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1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Würth WIT-UH 300 adhesive anchors, described in ICC-ES evaluation report ESR-4466, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2017 *Florida Building Code—Building*
- 2017 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Würth WIT-UH 300 adhesive anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-4466, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design and installation are in accordance with the 2015 *International Building Code*® provisions noted in the evaluation report.

Use of the Würth WIT-UH 300 adhesive anchors with stainless steel threaded rod materials and reinforcing bars has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential.*

Use of the Würth WIT-UH 300 adhesive anchors with carbon steel standard steel threaded rod materials for compliance with the High-velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential* has not been evaluated and is outside the scope of the supplemental report.

For products falling under Florida Rule 9N-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official, when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, reissued October 2024.