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SIKA ANCHORFIX®-2 ADHESIVE ANCHORING SYSTEM

CSI Section:
03 15 19 Cast-in Concrete Anchors
05 05 19 Post-Installed Concrete Anchors

1.0 RECOGNITION

Sika AnchorFix®- 2 Adhesive Anchoring System recognized in this report has been evaluated for use to resist static, wind, or earthquake (Seismic Design Categories A or B only) tension and shear loads. The structural performance properties of the Sika AnchorFix®- 2 Adhesive Anchoring System complies with the intent of the provisions of the following codes and regulations:

- 2012, 2009, 2006, 2003 International Building Code® (IBC)
- 2012, 2009, 2006, 2003 International Residential Code® (IRC)

2.0 LIMITATIONS

Use of the Sika AnchorFix - 2 Adhesive Anchoring System recognized in this report is subject to the following limitations:

2.1 Sika AnchorFix®-2 adhesive anchors shall be installed in accordance with the manufacturer's printed installation instructions included (MPII) in the adhesive packaging and shown in Figures 5a and 5b of this report.

2.2 Prior to installation, calculations and details demonstrating compliance with this report shall be submitted to the code official for review and approval. Calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

2.3 Anchors shall be installed in uncracked, normal-weight or light-weight concrete having a specified compressive strength f_c' = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa) only.

2.4 Values of f_c' used for calculation purposes shall not exceed 8,000 psi (55.1 MPa).

2.5 Anchors shall be installed in concrete base materials as set forth in Section 3.3 and Figure 5 of this report in holes predrilled with carbide-tipped drill bits complying with ANSI B212.15-1994 for imperial sizes or ISO 5468 for metric sizes.

2.6 Use of the anchors is limited to installation in concrete that is expected to be uncracked during service life of the anchors subject to the conditions in this report.

2.7 Anchors may be used to resist tension and shear forces in floor (downwardly inclined) or wall (horizontally inclined) orientations only if installation is within base material having a temperature between 32°F to 95°F (0°C to 35°C); or ceiling (upwardly inclined) orientations, if installation is within base material having a temperature between 50°F to 95°F (10°C to 35°C).

2.8 Anchors shall be installed in dry or damp (water-saturated) holes with dry or saturated concrete. Holes shall be free of any standing water.

2.9 Sika AnchorFix®-2 adhesive anchors are recognized for use to resist short and long-term loads, including wind and earthquake (Seismic Design Categories A and B only), subject to the conditions of this report.

2.10 Anchors shall be limited to installation in structures assigned to Seismic Design Category A or B only.

2.11 Strength Design values shall be established in accordance with Section 3.2.1 of this report. Loads applied to the anchors shall be adjusted in accordance with Section 1605.2 of the IBC for strength design.

2.12 Allowable Stress Design values shall be established in accordance with Section 3.2.2 of this report. Loads applied to the anchors shall be adjusted in accordance with Section 1605.3 of the IBC.

2.13 Use of zinc-plated carbon steel anchors or threaded rods is limited to dry, interior locations. Exterior anchor locations and water saturated conditions require the use of hot-dipped galvanized carbon steel or stainless steel anchors or threaded rods. The coating weights for zinc-coated steel shall be in accordance with ASTM A153 Class C or D.

2.14 Minimum anchor spacing and edge distance, critical edge distance, critical spacing, and minimum member thickness shall comply with the values described in this report.

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safely, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.

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ISO/IEC 17065 Product Certification Body #0675

2.15 Where not otherwise prohibited in the code, Sika AnchorFix®-2 adhesive anchors are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

i. Anchors are used to resist wind or seismic loads only.

ii. Anchors that support fire-resistance rated construction or gravity load bearing structural elements are within a fire resistance-rated envelope or a fire resistance-rated membrane, are protected by approved fire-resistance rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.

iii. Anchors are used to support nonstructural elements.

2.16 Steel anchoring materials in contact with preservative-treated and fire-retardant-treated wood shall be of zinc-coated steel or stainless steel. The coating weights for zinc-coated steel shall be in accordance with ASTM A153 Class C or D.

2.17 Sika AnchorFix®-2 adhesive anchors may be used for floor (downwardly inclined orientation), wall (horizontally inclined orientation), and ceiling (upwardly inclined orientation) applications. Upwardly inclined orientation applications are limited to use with the ⅜-, ½-, and ⅝-inch-diameter (9.5, 12.7, and 15.9, 19.1 mm) threaded rods.

2.18 Since a criteria for evaluating data to determine the performance of adhesive anchors 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.

2.19 Periodic special inspection shall be provided in accordance with Section 3.4.2 of this report. Continuous special inspection for overhead installations (vertical up) that are designed to resist sustained tension loads shall be provided in accordance with Section 3.4.3 of this report.

2.20 Anchors installed in a horizontally inclined or upward inclined orientation to resist sustained tension loads shall be performed by personnel certified by an applicable certification program in accordance with ACI 318 D.9.2.2 or D.9.2.3.

2.21 Sika AnchorFix®-2 adhesives are manufactured under a quality control program with inspections by IAPMO Uniform ES.

3.0 PRODUCT USE

3.1 General: Sika AnchorFix®- 2 Adhesive Anchoring System is used to resist static, wind, or earthquake (Seismic Design Categories A or B only) tension and shear loads in uncracked normal-weight or lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa). Anchors shall be located in a region of the concrete member where analysis indicates no cracking (uncracked) at service loads in accordance with ACI 318 D.5.2.6 and D.6.2.7. The analysis for the determination of crack formation shall include the effects of restrained shrinkage, as applicable, in accordance with 7.12.1.2 of ACI 318-11). The anchor system is an alternative to cast-in-place anchors described in Sections 1911 and 1912 of the IBC. The anchor systems may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.2 Design General: Strength design under the 2012, 2009, 2006 and 2003 IBC, as well as the 2012, 2009, 2006 and 2003 IRC shall be in accordance with ACI 318-11 (ACI 318) and Section 3.2.1 of this report. Allowable Stress Design shall be in accordance with Section 3.2.2 of this report.

3.2.1 Strength Design: Design strengths ϕN_n and ϕV_n shall be determined in accordance with ACI 318 Appendix D and this report. Post-installed Anchor Categories used to determine the strength reduction factors, ϕ, in D4.3 or D.4.4 of ACI 318 are given for each diameter in Tables 7, 8, and 9 of this report. Anchor designs shall satisfy the requirements of ACI 318 Sections D.4.1.1, D.4.1.2, and D.4.1.3. Anchor group effects shall be considered in accordance with ACI Section D.3.1.1. Design parameters including strength reduction factors, ϕ, corresponding to each limit state and anchor steel are provided in the tables. Strength reduction factors, ϕ, as described in ACI 318 D.4.3 and provided in Tables 5 to 9 shall be used for load combinations calculated in accordance with Section 1605.2 of the IBC and ACI 318 Section 9.2. Strength reduction factors, $\varnothing$, described in ACI 318 Section D.4.4 shall be used for load combinations calculated in accordance with Appendix C of ACI 318. In conformance with ACI 318, all equations are expressed in inch-pounds units.

3.2.1.1 Static steel strength in tension: Nominal strength of a single anchor in tension as governed by the steel, N_{sa}, in accordance with ACI 318 D.5.1.2, is given in this report for the corresponding anchor steel specification. Tables 4, 5 and 6 of this report provide nominal strength values and strength reduction factors, ϕ, depending on whether the steel is considered brittle or ductile in accordance with ACI 318 Section D.4.4, for computing design strengths of steel anchor elements.

3.2.1.2 Static concrete breakout strength in tension: Nominal static concrete breakout strength of a single anchor or group of anchors in tension, N_{cb} *or* N_{cbg}, shall be calculated in accordance with ACI 318 D.5.2 with the following addition:

Basic concrete breakout strength of a single anchor in tension, N_b, shall be calculated in accordance with ACI 318 D.5.2.2 using the values of h_{ef} and $k_{c,uncr}$ as described in Table 7 of this report. Corresponding strength reduction factors, ϕ, are given in Table 5 of this report for Condition B, as defined in ACI 318 D.4.3. For anchors in lightweight concrete, the modification factors λ and λ_a shall be applied in accordance with ACI 318-11 D.3.6. The value of f'_c used in design shall be limited to a maximum of 8,000 psi (55 MPa) in accordance with ACI 318 D.3.7.

3.2.1.3 Static bond strength in tension: The nominal static bond strength of a single adhesive anchor, N_{ba}, or group of adhesive anchors in tension shall be calculated in accordance with ACI 318-11 D.5.5 using $\tau_{k,uncr}$ from Table 8 or 9 of this report in lieu of τ_{cr}. Embedment depths shall comply with ACI 318-11 D.4.2.3 and Tables 8 to 10 of this report. Bond strength values are a function of concrete conditions (i.e., uncracked), installation conditions (i.e. dry, water saturated), concrete temperature, drilling method (i.e., hammer drill), and special inspection level (i.e., periodic). The Sika AnchorFix®-2 Adhesive system has been tested at elevated temperatures in uncracked concrete using a hammer drill in water saturated concrete holes. Therefore, permitted bond strengths anchor categories, and strength reduction factors, ϕ, for each anchor diameter for installation in normal weight concrete are listed in Tables 8 and 9 of this report. Elevated concrete temperatures arise from a number of factors, including sun exposure, proximity to operating machinery, or containment of liquids or gasses at elevated temperature. Permitted installation requirements are uncracked concrete, dry or water-saturated holes prepared using hammer drill bits, under periodic inspection (except for conditions as explained in Section 3.4.2 of this report, where continuous inspection is required). For anchors installed in lightweight concrete, the value of τ_{uncr} shall be taken from Tables 8 or 9 of this report and the corresponding modification factors, λ and λ_a, shall be applied to Eq. (D-22) in accordance with ACI 318-11 D.3.6.

3.2.1.3.1 Sustained Loads: For anchors designed to resist sustained tension loads, bond strength shall be calculated in accordance with ACI 318-11 D.3.5 and D.4.1.2. In addition to requirements in Section 3.2.1.3 of this report for the design of a single anchor in tension to resist sustained loads, ACI D.4.1.2 shall apply, using $\tau_{k,sust,uncr}$ from Table 8 or 9 of this report in lieu of τ_{cr}.

3.2.1.3.2 Splitting Controls: Replace Section D.5.5.5 of ACI 318-11 Appendix D, and add Sections D.5.3.7 and D.8.6.1 to ACI 318-11 as follows:

D.5.5.5) – The modification factor for adhesive anchors designed for uncracked concrete in accordance with D.5.5.2 without supplementary reinforcement to control splitting, $\psi_{cp,Na}$ *, shall be computed as:*

If $c_{a,min} \geq c_{ac}$ then $\psi_{cp,Na} = 1.0$ *(D-26 for ACI 318-11)*

If $c_{a,min} < c_{ac}$ then $\psi_{cp,Na\ a,min} = c_{a,min} / c_{ac}$ *(D-27 for ACI 318-11)*

where

c_{ac} *shall be determined in accordance with Eq. (D-27a) for ACI 318-11, for characteristic bond strengths in uncracked concrete less than or equal to 3000 psi.*

$c_{ac} = h_{ef}(\tau_{k,uncr} /1160)^{0.4} \times [3.1–0.7(h/h_{ef})]$ (inches) *(D-27a for ACI 318-11)*

$c_{ac} = h_{ef}(\tau_{k,uncr} /8)^{0.4} \times [3.1 – 0.7(h/h_{ef})]$ (mm)

$c_{ac} = h_{ef}(\tau_{k,uncr} /664)^{0.4} \times [3.1–0.7(h/h_{ef})]$ (inches) *(D-27b for ACI 318-11)*

$c_{ac} = h_{ef}(\tau_{k,uncr} /4.58)^{0.4} \times [3.1 – 0.7(h/h_{ef})]$ (mm)

where

(h/h_{ef}) *need not be taken as larger than 2.4; and* $\tau_{k,uncr}$ = *characteristic bond strength stated in Tables 9 through 12 of this Evaluation Report, whereby* $\tau_{k,uncr}$ *need not be taken as larger than:*

$\tau_{k,uncr} = k_{uncr} ((h_{ef} \times f'_c)^{0.5}/(\pi \times d))$

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

3.2.1.4 Static steel strength in shear: The nominal static strength of a single anchor in shear as governed by the steel, V_{sa}, in accordance with ACI 318 D.6.1.2, and corresponding strength reduction factors, $\varnothing$, for use with load combinations of ACI 318 Section 9.2 in accordance with ACI 318 D.4.3, depending on whether the steel is considered brittle or ductile, are given in Tables 5 and 6 of this report for the anchor steel specification.

3.2.1.5 Static Concrete breakout strength in shear: The nominal static concrete breakout strength of a single anchor or group of anchors in shear in shear, V_{cb}, or V_{cbg}, shall be calculated in accordance with ACI 318 D.6.2 based on information given in Table 7 of this report for the corresponding anchor steel type. The basic concrete breakout strength of a single anchor in shear, V_b, shall be

calculated in accordance with ACI 318 D.6.2.2 using the values of d and h_{ef} given in Tables 7 of this report for the corresponding anchor steel in lieu of d_o and l_e, respectively. In no case shall h_{ef} exceed $8d$. For anchors in lightweight concrete, the modification factors λ and λ_a shall be applied in accordance with ACI 318-11 D.3.6. The value of f'_c shall be limited to a maximum of 8,000 psi (55 MPa) in accordance with ACI 318 D.3.7. Corresponding strength reduction factors, ϕ, are given in Table 7 of this report for Condition B, as defined in ACI 318 D.4.3.

3.2.1.6 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 D.6.3.1.

3.2.1.7 Interaction of tensile and shear forces: For the designs that include combined tension and shear, the interaction of tension and shear shall be calculated in accordance with ACI 318 D.7.

3.2.1.8 Minimum member thickness h_{min}, anchor spacing s_{min} and edge distance c_{min}: In lieu of ACI 318 D.8.1 and D.8.3, values of c_{min} and s_{min} described in Table 7 of this report shall be observed for anchor design and installation. Likewise, in lieu of ACI 318 D.8.5, the minimum member thickness, h_{min}, described in Tables 3 and 7 of this report shall be observed for anchor design and installation. In determining minimum edge distances, c_{min}, the following section shall be added to ACI 318, Appendix D:

D.8.8 – For adhesive anchors that will remain untorqued, the minimum edge distances shall be based on minimum cover requirements for reinforcement in 7.7. For adhesive anchors that will be torqued, the minimum edge distance and spacing shall be taken as described in Table 7 of this report.

3.2.2 Allowable Stress Design (ASD)

3.2.2.1 ASD Derivation: Design values for use with allowable stress design load combinations shall be established as follows:

For anchors designed using load combinations in accordance with IBC Section 1605.3 (Allowable stress design), allowable loads shall be established using Eq. (4-3) and Eq. (4-4).

$$T_{allowable,ASD} = \frac{\phi N_n}{\alpha} \quad (4\text{-}3)$$

and

$$V_{allowable,ASD} = \frac{\phi V_n}{\alpha} \quad (4\text{-}4)$$

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

ϕN_n = lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318 Appendix D and as amended in Section 3.2 of this report and 2012 IBC Sections 1905.1.9 and 1905.1.10, 2009 IBC Sections 1908.1.9 and 1908.1.10, and 2006 IBC Section 1908.1.16.
ϕV_n = lowest design strength of an anchor or anchor group in shear as determined in accordance with ACI 318 Appendix D and as amended in Section 3.2 of this report and 2012 IBC Sections 1905.1.9 and 1905.1.10, 2009 IBC Sections 1908.1.9 and 1908.1.10 and 2006 IBC Section 1908.1.16 of the IBC.

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

Table 10 of this report provides an illustration of calculated Allowable Stress Design (ASD) values for each anchor diameter at minimum embedment depth. Requirements for member thickness, edge distance and spacing, as described in Table 3 of this report, shall also apply.

3.2.2.2 Interaction: In lieu of ACI 318 D.7.1, D.7.2 and D.7.3, interaction shall be calculated as follows:
For shear loads where $V \le 0.2 \cdot V_{allow,ASD}$, the full allowable load in tension $T_{allow,ASD}$ may be taken.
For tension loads where $T \le 0.2 \cdot T_{allow,ASD}$, the full allowable load in shear $V_{allow,ASD}$ may be taken.

For all other cases, Eq. (4-5) applies.

$$\frac{T}{T_{allow,ASD}} + \frac{V}{V_{allow,ASD}} \le 1.2 \quad (4\text{-}5)$$

3.3 Installation General: Installation shall be in accordance with the codes referenced in Section 1.0 of this report, this report and the manufacturer's printed installation instructions (MPII). Where conflicts occur, the more restrictive shall govern. Installation parameters are provided in Tables 2 and 3 and Figures 1 and 5 of this report. Installation of the Sika AnchorFix®-2 Anchoring System shall conform to the manufacturer's printed installation

instructions (MPII) included in each package unit and as described in Figures 5a and 5b of this report. Nozzles, brushes, dispensing tools and adhesive retaining caps shown in Figures 2, 3, and 4 and Table 11 as supplied by the manufacturer, shall be used along with the adhesive compound cartridges. Installation orientation of anchor elements may be downwardly inclined (floors), horizontally inclined (walls) and upwardly inclined (ceilings). The maximum diameter for upwardly inclined installations is 5/8 inch (15.8 mm).

Installation may occur into dry or water-saturated holes in normal-weight or lightweight concrete. Use of anchors in water-filled holes or submerged concrete is beyond the scope of this report.

3.3.1 Manufacturer's Printed Installation Instructions: A copy of the manufacturer's printed installation instructions (MPII) shall be maintained at the jobsite during installation of the product. These instructions are replicated in Figures 5a and 5b of this report.

3.3.2 Anchor Placement: Locations shall comply with this report and the plans and specifications approved by the code official.

3.4 Special Inspection

3.4.1 General: All adhesive anchor systems shall be installed with special inspection. Continuous special inspection is required for all cases where adhesive anchors are installed in horizontal or upwardly inclined orientations that are designed to resist sustained tension loads in accordance with ACI 318 D.9.2.4. Other installations shall be made under continuous or periodic special inspection as determined by the registered design professional and approved by the code official, based on the installation condition.

Installations made under special inspection shall be performed in accordance with Sections 1705.1 and 1705.3 of the 2012 IBC, Sections 1704.4 and 1704.15 of the 2009 IBC, or Sections 1704.4 and 1704.13 of the 2006 IBC, with continuous or periodic special inspection as defined in Section 1702.1 of the IBC and this report. Additional requirements in IBC Sections 1705, 1706, 1707 and 1709 shall be observed, as applicable.

3.4.2 Periodic Inspection: Periodic special inspection shall be provided in accordance with 2012 IBC Sections 202, 2009 IBC Sections 1704.4 and 1704.15 or 2006 IBC Section 1704.13 and this report. The special inspector shall verify the initial installations of each type and size of adhesive anchor by construction personnel on site. Subsequent installations of the same anchor size and type by the same construction personnel are permitted to be performed in the absence of the special inspector. Where there is any change in the anchor product being installed or the personnel performing the installation, another initial inspection is required. For ongoing installations over an extended period of time the special inspector shall make regular inspections to confirm correct handling and installation of the product.

As a minimum, the following items shall be verified by the special inspector:

- Hole drilling method in accordance with the manufacturer's printed installation instructions (MPII) shown in Figures 5a and 5b of this report.
- Hole depth, location, spacing, edge distances and diameter. Hole cleaning in accordance with the manufacturer's printed installation instructions (MPII) shown Figures 5a and 5b of this report.
- Anchor diameter, length, material, and element type.
- Tightening torque.
- Concrete type, compressive strength, and thickness.
- Adhesive installation in accordance with the manufacturer's printed installation instructions (MPII) shown in Figures 5a and 5b of this report.
- The adhesive expiration date.
- Product identification in accordance with Section 7.0 of this report.

3.4.3 Continuous Inspection: Continuous special inspection is required shall be provided in accordance with 2012 IBC Section 202, 2009 IBC Sections 1704.4 and 1704.15 or 2006 IBC Sections 1704.4 and 1704.13 and this report for all cases where anchors installed horizontally or upwardly inclined and are designed to resist sustained tension loads. The special inspector shall observe all aspects of the anchor installation except holes shall be permitted to be drilled in the absence of the special inspector provided the special inspector examines the drill bits used for the drilling and verifies the hole sizes. The special inspector shall verify the items listed in Section 3.4.1 of this report.

3.4.4 Proof Loading Program: Where required, a program for on-site proof loading, that is, proof loading program, to be conducted as part of the special inspection shall be established by the engineer or design professional of record and shall conform to the following minimum requirements:
1. Frequency of proof loading based on anchor type, diameter, and embedment.
2. Proof loads by anchor type, diameter, embedment, and location.
3. Acceptable displacements at proof load.
4. Remedial action in the event of failure to achieve proof load or excessive displacement.

Unless otherwise directed by the engineer or design professional of record, proof loads shall be applied as confined tension tests in accordance with ASTM E488. Proof loads shall not exceed the lesser of 67 percent of the load corresponding to the nominal bond strength as calculated from the characteristic bond stress for uncracked concrete modified for edge effects and concrete properties or 80 percent of the minimum specified anchor element yield strength ($A_{se,N} \cdot f_{ya}$). The proof load shall be maintained at the required load level for a minimum of 10 seconds.

4.0 PRODUCT DESCRIPTION

4.1 General: The Sika AnchorFix®- 2 Adhesive Anchoring System are post-installed anchors inserted into a pre-drilled hole in hardened normal weight or lightweight concrete and transfers loads to the concrete by bond between the anchor and the adhesive, and bond between the adhesive and the concrete.

4.2 Product Information

The components of the Sika AnchorFix®-2 Adhesive Anchoring System, include the Sika AnchorFix®-2 Adhesive cartridges, SAF KW static mixing nozzles, dispensers, and steel anchoring elements. Sika Services AG's printed installation instructions (MPII), guidelines, and parameters are included with each adhesive unit package, and are replicated in Figures 5a and 5b of this report. Installation may occur into dry or water-saturated normal-weight or lightweight concrete. Installation in water-filled holes is outside the scope of this report.

Continuously-threaded steel rods or deformed steel reinforcing bars shall be provided by the installer or a third party according to standard specifications and are not proprietary.

4.3 Material Information

4.3.1 Sika AnchorFix®-2 Adhesive: Sika AnchorFix®-2 adhesive contains two components: styrene-free epoxy acrylate resin and benzoyl peroxide catalyst. Shelf life is 15 months when in unopened cartridges stored at temperatures ranging from 41°F (+5°C) to 77°F (+25°C)) in accordance with the MPII.

4.3.2 Sika AnchorFix®-2 CIC cartridges: Sika AnchorFix®-2 CIC are single component cartridges containing Sika AnchorFix®-2 adhesive and labeled for volumes shown as CIC 300 – 300 ml (10.14 oz.), or CIC 850 – 850 ml (28.74 oz.). Figure 3 of this report depicts the cartridges.

4.3.3 Mixing nozzles: Figure 4 of this report illustrates the mixing nozzle SAF KW.

4.3.4 Dispensing Tools: Sika AnchorFix®-2 adhesive may be dispensed by manual dispensers or pneumatic dispensers. Figure 2 of this report shows the cartridge size and corresponding types of appropriate dispensers.

4.3.5 Permitted Component Combinations: Table 1 of this report contains the allowable combinations of cartridges, mixer nozzles, and dispensing tools.

4.3.6 Anchors

4.3.6.1 Threaded Rods: Threaded steel rods shall be clean, continuously threaded rods in diameters as described in Table 4 and Figure 1 of this report. Specifications for carbon and stainless steel rod, nut, and washer are provided in Table 4 of this report. Available rod diameters and steel design information are detailed in Tables 5 and 6 of this report. Carbon steel threaded rods shall be furnished with a 0.0002-inch-thick (0.005 mm) zinc electroplated coating complying with ASTM B 633 SC 1 or shall be hot-dipped galvanized complying with ASTM A153, Class C or D. Threaded steel rods shall be straight and free of indentations or other defects along their length. The embedded portions of the threaded rods shall be free of mill scale, rust, mud, oil, and other coatings that may impair the bond with the adhesive. The tensile strength of the threaded anchor rods shall not exceed 145,000 psi (1,000 MPa).

4.3.6.2 Ductility: In accordance with ACI 318 Appendix D.1, anchor elements are considered ductile if the tested elongation is at least 14 percent and reduction of area at least 30 percent. Steel elements not complying with these criteria are considered brittle. Values for various steel specifications are provided in Table 5 and Table 6 of this report. Where values are nonconforming or unstated, the steel shall be considered brittle for the purposes of design. Deformed reinforcing bars meeting the requirements of ASTM A615 or A706 shall be considered as ductile steel elements.

4.3.7 Concrete: Normal-weight and lightweight concrete shall comply with Sections 1901 and 1903 of the 2012 IBC or Sections 1903 and 1905 of the 2009, 2006, and 2003 IBC and have a compressive strength at the time of anchor installation of 2,500 psi (17.2 MPa) minimum, but not less than that required by the applicable code requirements, including IBC Section 1904 and ACI 318-11 Section 4.3, or the structural design, nor more than 8,500 psi (58.6 MPa).

4.3.8 Hole Preparation Equipment: Holes shall be cleaned with hole-cleaning brushes and air nozzles. Brushes shall be the appropriate size brush from the list shown in Table 11 of this report, and the MPII shown in

Figures 5a and 5b of this report, which provide additional information. Air nozzles shall be equipped with an extension capable of reaching the bottom of the drilled-hole and having an inside bore diameter of not less than 1/4 inch (6 mm). Holes shall be prepared in accordance with the installation instructions shown in Figures 5a and 5b of this report.

5.0 IDENTIFICATION

The adhesive material packaging shall be marked with a permanent label bearing the name and address of the manufacturers, the model number, IAPMO UES Mark of Conformity, evaluation report number (ER-327), lot number, packing date and shelf life or expiration date, to identify the products listed in this report. Either Mark of Conformity may be used as shown below:

IAPMO ES ® or UES TM

IAPMO UES ER-327

6.0 SUBSTANTIATING DATA

Testing and analysis data in conformance with ICC-ES Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements, AC308 approved January 2016. Test results are from laboratories accredited in accordance with ISO/IEC 17025.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on Sika AnchorFix®- 2 Adhesive Anchoring System to assess conformance to the codes shown in Section 1.0 of this report, and serves as documentation of the product certification.

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For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

Table 1 - ALLOWABLE COMBINATIONS OF CARTRIDGE, MIXER NOZZLE AND DISPENSER

Cartridge	Mixer Nozzle	Dispenser	
	SAF KW	C	D
CIC/300/EASF	X	X	X
CIC/850/EASF	X		X

Table 2 – PROCESSING TIME – CURING TIME					
Base Material Temperature[1]	32°F < T ≤ 50°F (0°C < T ≤ 10°C)	50°F < T ≤ 68°F (10°C < T ≤ 20°C)	68°F < T ≤ 77°F (20°C < T ≤ 25°C)	77°F < T ≤ 86°F (25°C < T ≤ 30°C)	86°F < T ≤ 95°F (30°C < T ≤ 35°C)
Processing Time	4 min	4 min	3 min	2 min	1 min
Curing Time	48 hours	70 min	40 min	40 min	40 min

For SI: (°F - 32) x 5/9 = °C

[1] When base material temperature is 32°F < T ≤ 50°F, cartridge shall be conditioned to 68°F (20°C) prior to use.

Table 3 – SPECIFICATION FOR INSTALLATION OF ANCHORS IN CONCRETE																	
Anchor Size	d	in. mm	5/16 M8		3/8 M10		1/2 M12		5/8 M16		3/4 M20						
Nominal drill diameter size	d_0	in. mm	3/8 10		7/16 12		9/16 14		11/16 18		13/16 22						
Minimum effective embedment depth	$h_{ef,min}$	in. mm	2-3/8 60	3-3/4 96	2-3/8 60	4-1/2 120	2-3/4 70	6 144	3-1/8 80	7-1/2 192	3-1/2 90	9 240					
Maximum effective embedment depth	$h_{ef,max}$	in. mm	3-3/4 96		4-1/2 120		6 144		7-1/2 192		9 240						
Minimum slab thickness	h_{min}	in. mm	4 100	5 127	4-1/4 108	6-1/2 165	5-1/4 133	7-1/4 184	6-1/2 165	9 240	8 203	11-1/4 285					
Maximum tightening torque	T_{inst}	ft-lb N-m	7.5 10		15 20		25 35		55 75		80 110						

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m

TABLE 4– SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON FRACTIONAL AND METRIC THREADED CARBON AND STAINLESS STEEL ROD MATERIALS

Threaded Rod Specification		Units	Minimum Specified Ultimate Strength, $f_{u,ta}$	Minimum Specified Yield Strength, f_{ya}	f_{uta} – f_{ya}	Minimum Percent Elongation	Minimum Percent Reduction of Area	Specification for Nuts and Washers
Carbon Steel	ASTM F1554 Grade 36 (A 307 Gr.C)[1]	psi (MPa)	58,000 (400)	36,000 (250)	1.61	23	40	ASTM A563 Grade A
	ASTM A193 Grade B7[1]	psi (MPa)	125,000 (860)	105,000 (725)	1.19	16	50	ASTM A194
	ASTM A307 Grade A[1]	psi (MPa)	60,000 413	-	-	18	-	ASTM A563 Grade A
	ISO 898-1 Class 5.8[1]	psi (MPa)	72,500 (500)	58,000 (400)	1.25	22	35	DIN 934 (Grade 6)
	ISO 898-1 Class 8.8[2]	psi (MPa)	116,000 (800)	92,800 (640)	1.25	12	52	DIN 934 (Grade 8)
Stainless Steel	ASTM F593 CW1 (¼ -⅝)[2]	psi (MPa)	95,000 (690)	60000 (450)	1.58	20	-	F 594
	ASTM F593 CW2 (¾-1¼)[2]	psi (MPa)	80,000 (585)	40,000 (310)	2.00	25	-	F 594
	ASTM F593 SH1 (¼ - ⅝)[2]	psi (MPa)	115,000 (800)	90,000 (620)	1.28	12	-	F 594
	ASTM F593 SH2 (¾ - 1)[2]	psi (MPa)	105,000 (725)	70,000 (480)	1.50	15	-	F 594
	ISO 3506-1 A4-70[2]	psi (MPa)	101,500 (700)	65,250 (450)	1.56	40	-	ISO 4032
	ISO 3506-1 A4-80[2]	psi (MPa)	116,000 (800)	87,000 (600)	1.33	30	-	-

[1] Rods are considered ductile steel elements in accordance with Sections 3.2.1.1, 3.2.1.4, and 4.3.6.2 of this report.

[2] Rods are considered brittle steel elements in accordance with Sections 3.2.1.1, 3.2.1.4, and 4.3.6.2 of this report.

Table 5 – STEEL DESIGN INFORMATION FOR FRACTIONAL THREADED ROD[1]

Design Information		Symbol	Units	Nominal Rod Diameter (in.)				
				5/16	3/8	1/2	5/8	3/4
Rod outside diameter		d	in.	5/16	3/8	1/2	5/8	3/4
Rod effective cross-sectional area[2]		A_{se}	in^2	0.0524	0.0775	0.1419	0.2260	0.3345
ASTM F1554 Grade 36	Nominal strength as governed by steel strength	N_{sa}	lb	3,039	4,495	8,230	13,108	19,401
		V_{sa}	lb	1,824	2,697	4,938	7,865	11,641
	Strength reduction factor for tension[3]	ϕ	-	0.75				
	Strength reduction factor for shear[3]	ϕ	-	0.65				
ASTM A307 Grade A	Nominal strength as governed by steel strength	N_{sa}	lb	3,144	4,650	8,514	13,560	20,070
		V_{sa}	lb	1,886	2,790	5,108	8,136	12,042
	Strength reduction factor for tension[2]	ϕ	-	0.75				
	Strength reduction factor for shear[33]	ϕ	-	0.65				
ASTM 193 Grade B7	Nominal strength as governed by steel strength	N_{sa}	lb	6,550	9,688	17,738	28,250	41,813
		V_{sa}	lb	3,930	5,813	10,643	16,950	25,088
	Strength reduction factor for tension[2]	ϕ	-	0.75				
	Strength reduction factor for shear[3]	ϕ	-	0.65				
ASTM F593, CW	Nominal strength as governed by steel strength	N_{sa}	lb	5,240	7,750	14,190	22,600	28,433
		V_{sa}	lb	3,144	4,650	8,514	13,560	17,060
	Strength reduction factor for tension[2]	ϕ	-	0.65				
	Strength reduction factor for shear[3]	ϕ	-	0.60				
ASTM F593, SH	Nominal strength as governed by steel strength	N_{sa}	lb	6,288	9,300	17,028	27,120	36,795
		V_{sa}	lb	3,773	5,580	10,217	16,272	22,077
	Strength reduction factor for tension[2]	ϕ	-	0.65				
	Strength reduction factor for shear[3]	ϕ	-	0.60				

For SI: 1 inch = 25.4 mm, 1 in^2 = 645 mm^2, 1 lb. = 4.448 N

[1] Values provided for common rod material types are based on specified strength and calculated in accordance with ACI 318 Eq. (D-3) and Eq. (D-20). Nuts and washers shall be appropriate for the rod as set forth in Table 4 of this report.

[2]Effective Area is minimum area applicable for either tension or shear.

[3]Tabulated value of ø complies with ACI 318 D.4.3 and applies when load combinations of IBC Section 16.5.2 or ACI 318 Section 9.2 as set forth in ACI 318 D.4.3. If the load combinations of ACI 318 Appendix C are used, the value of ϕ shall be determined in accordance with ACI 318 D.4.4.

Table 6 – STEEL DESIGN INFORMATION FOR METRIC THREADED ROD[1]

Design Information		Symbol	Units	Nominal Rod Diameter				
				M8	M10	M12	M16	M20
Rod outside diameter		d	mm in.	8 0.31	10 0.39	12 0.47	16 0.63	20 0.79
Rod effective cross-sectional area[2]		A_{se}	mm^2 in^2.	36.6 0.057	58.0 0.090	84.3 0.131	157 0.243	245 0.380
ISO 898-1 Class 5.8	Nominal strength as governed by steel strength	N_{sa}	kN lb	16.90 3,800	25.00 5,620	45.78 10,291	72.91 16,390	107.90 24,258
		V_{sa}	kN lb	10.14 2,280	15.00 3,372	27.46 6,174	43.74 9,834	64.74 14,555
	Strength reduction factor for tension[3]	ϕ	-	0.75				
	Strength reduction factor for shear[3]	ϕ	-	0.65				
ISO 898-1 Class 8.8	Nominal strength as governed by steel strength	N_{sa}	kN lb	27.05 6,080	40.00 8,992	73.24 16,465	116.65 26,223	172.65 38,813
		V_{sa}	kN lb	16.23 3,648	24.00 5,395	43.94 9,879	69.99 15,734	103.59 23,288
	Strength reduction factor for tension[3]	ϕ	-	0.65				
	Strength reduction factor for shear[3]	ϕ	-	0.60				
ISO 3506-1 Class A4-70 Stainless	Nominal strength as governed by steel strength	N_{sa}	kN lb	23.66 5,320	35.00 7,868	64.09 14,407	102.06 22,945	151.07 33,961
		V_{sa}	kN lb	14.20 3,192	21.00 4,721	38.45 8,644	61.24 13,767	90.64 20,377
	Strength reduction factor for tension[3]	ϕ	-	0.65				
	Strength reduction factor for shear[3]	ϕ	-	0.60				
ISO 3506-1 Class A4-80 Stainless	Nominal strength as governed by steel strength	N_{sa}	kN lb	27.05 6,080	40.00 8,992	73.24 16,465	116.65 26,223	172.65 38,813
		V_{sa}	kN lb	16.23 3,648	24.00 5,395	43.94 9,879	69.99 15,734	103.59 23,288
	Strength reduction factor for tension[3]	ϕ	-	0.65				
	Strength reduction factor for shear[3]	ϕ	-	0.60				

[1] Values provided for common rod material types are based on specified strength and calculated in accordance with ACI 318 Eq. (D-3) and Eq. (D-29). Nuts and washers shall be appropriate for the rod as set forth in Table 4 of this report.

[2]Effective Area is minimum area applicable for either tension or shear.

[3]Tabulated value of ø complies with ACI 318 D.4.3 and applies when load combinations of IBC Section 16.5.2 or ACI 318 Section 9.2 as set forth in ACI 318 D.4.3. If the load combinations of ACI 318 Appendix C are used, the value of ϕ shall be determined in accordance with ACI 318 D.4.4.

Table 7 – CONCRETE BREAKOUT DESIGN INFORMATION							
Design Information	Symbol	Units	Nominal Rod Diameter				
			5/16” M8	3/8” M10	1/2" M12	5/8” M16	3/4" M20
Effective embedment depth	$h_{ef,min}$	in.	2 3/8	2 3/8	2 3/4	3 1/8	3 1/2
		mm	60	60	70	80	90
	$h_{ef,max}$	in.	3 3/4	4 1/2	6	7 1/2	9
		mm	96	120	144	192	240
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	in.lb	24				
		SI	10				
Anchor Category	-	-	Anchor Category 2				
Min. anchor spacing	s_{min}	in.	1 1/4	1 5/8	1 7/8	2 1/2	3 1/8
		mm	32	40	45	65	80
Min. edge distance	c_{min}	in.	1 1/4	1 5/8	1 7/8	2 1/2	3 1/8
		mm	32	40	45	65	80
Critical edge distance	c_{ac}	in.	Section 4.1.1.10 of this report				
		mm					
Minimum member thickness	h_{min}	in.	$h_{min} \approx h_{ef} + \Delta h$ with Δh = max (1.25 in.; $2d_o$) ≥ 4 in.				
		mm	$h_{min} \approx h_{ef} + \Delta h$ with Δh = max (32 mm.; $2d_o$) ≥ 100 mm.				
Strength reduction factor for tension, concrete failure modes, Condition B[1,2]	ϕ	-	0.55				
Strength reduction factor for shear, concrete failure modes, Condition B[1,2]	ϕ	-	0.70				
Strength reduction factor for pryout failure, Condition B[1,2]	ϕ	-	0.70				

[1] For use with load combinations of IBC Section 16.5.2 or ACI 318 Section 9.2 as set forth in ACI 318 D.4.3. If the load combinations of ACI 318 Appendix C are used, the value of ϕ shall be determined in accordance with ACI 318 D.4.4.

[2] The ø values correspond to Condition B without supplementary reinforcement as described in Section D.4.3 of ACI 318-11 for post-installed anchors. For Condition A, ACI 318-11 D.4.3 shall be consulted.

Table 8 - BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL-SIZED THREADED RODS								
Design Information		Symbol	Units	Nominal Threaded Rod Diameter				
				5/16"	3/8"	1/2"	5/8"	3/4"
Effective Embedment Depth		$h_{ef,min}$	in. mm	2-3/8 60	2-3/8 60	2-3/4 70	3-1/8 80	3-1/2 90
		$h_{ef,max}$	in. mm	3-3/4 96	4-1/2 120	6 144	7-1/2 192	9 240
Temperature Category A[1]	Characteristic Bond Strength in uncracked Concrete[2]	$T_{k,uncr}$	psi MPa	1,404 9.68	1,337 9.22	1,270 8.75	1,135 7.83	1,000 6.90
Anchor Category		-	-	Anchor Category 2				
Strength Reduction Factor for Permissible Installation Conditions in Dry and Water-saturated Concrete[3]		ϕ	-	0.55				
Adjustment for Sustained Tension Loading[4]		k_{sust}	-	0.72				

[1] Temperature Category A: Maximum Long Term Temperature: 110°F (43°C); Maximum Short Term Temperature: 176°F (80°C).

[2] Bond strength values correspond to compressive strength of 2,500 psi (17.24 MPa). For higher values in the range 2,500 psi ≤ f'_c ≤ 8,000 psi (17.24 MPa ≤ f'_c ≤ 55 MPa), the characteristic bond strength may be increased by the ratio $(f'_c / 2500)^{0.1}$ for imperial units, or $(f'_c / 17.24)^{0.1}$ for SI units.

[3] The strength reduction factor ϕ corresponds to Condition B in accordance with ACI 318 D.4.3 for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318 Appendix C are used, the corresponding value of ϕ shall be determined.

[4] Additional reduction factor shall be applied if tension loads are sustained. $\tau_{k,sust,uncr} = \tau_{k,uncr} \cdot k_{sust}$

Table 9 - BOND STRENGTH DESIGN INFORMATION FOR METRIC-SIZED THREADED RODS								
Design Information		Symbol	Units	Nominal Threaded Rod Diameter				
				M8	M10	M12	M16	M20
Effective Embedment Depth		$h_{ef,min}$	in. mm	2-3/8 60	2-3/8 60	2-3/4 70	3-1/8 80	3-1/2 90
		$h_{ef,max}$	in. mm	3-3/4 96	4-1/2 120	6 144	7-1/2 192	9 240
Temperature Category A[1]	Characteristic Bond Strength in uncracked Concrete[2]	$T_{k,uncr}$	psi MPa	1,404 9.68	1,337 9.22	1,270 8.75	1,135 7.83	1,000 6.90
Anchor Category		-	-	Anchor Category 2				
Strength Reduction Factor for Permissible Installation Conditions in Dry and Water-saturated Concrete[3]		ϕ	-	0.55				
Adjustment for Sustained Tension Loading[4]		k_{sust}	-	0.72				

[1] Temperature Category A: Maximum Long Term Temperature: 110°F (43°C); Maximum Short Term Temperature: 176°F (80°C).

[2] Bond strength values correspond to compressive strength of 2,500 psi (17.24 MPa). For higher values in the range 2,500 psi ≤ f'_c ≤ 8,000 psi (17.24 MPa ≤ f'_c ≤ 55 MPa) the characteristic bond strength may be increased by the ratio $(f'_c / 2500)^{0.1}$ for imperial units, or $(f'_c / 17.24)^{0.1}$ for SI units.

[3] The strength reduction factor ϕ corresponds to Condition B in accordance with ACI 318 D.4.3 for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318 Appendix C are used, the corresponding value of ϕ shall be determined.

[4] Additional reduction factor shall be applied if tension loads are sustained. $\tau_{k,sust,uncr} = \tau_{k,uncr} \cdot k_{sust}$

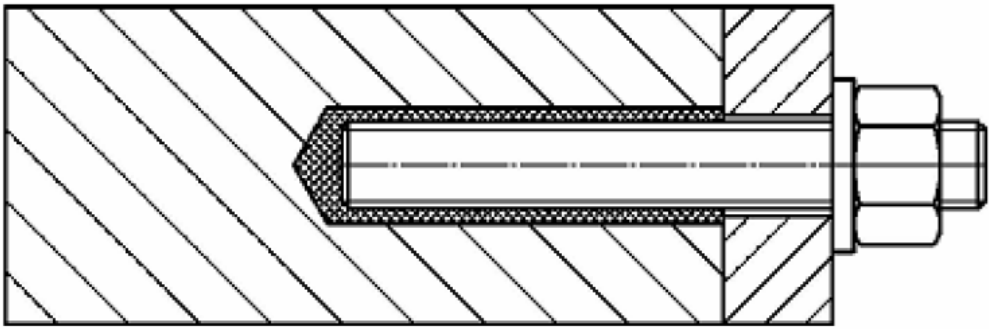


Figure 1a: Standard threaded rod with flat tip end

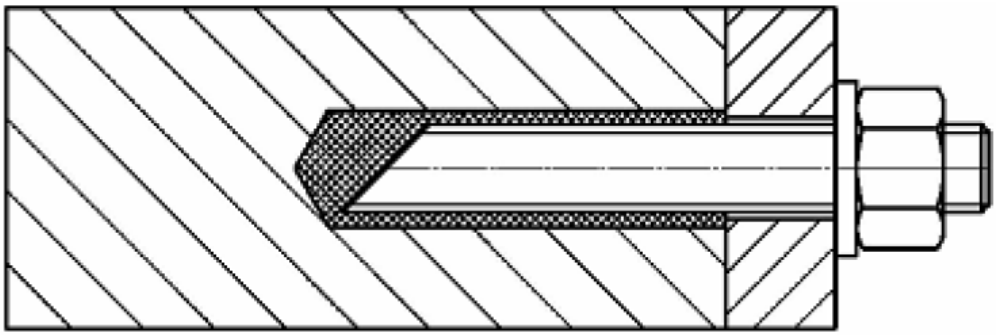


Figure 1b: Standard threaded rod with one side 45° chamfer

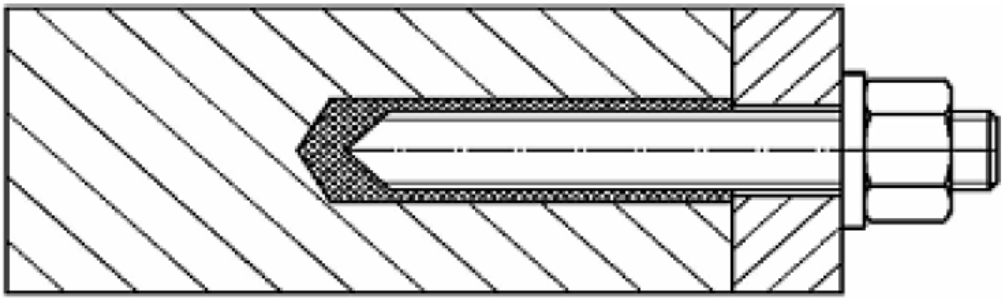


Figure 1c: Standard threaded rod with two side 45° chamfer

Figure 2: Allowable Dispenser Tools

Dispenser C- Cox 41004-2T

Dispenser D - Cox 41002

FIGURE 3: Sika Anchor Fix®-2 Adhesive Anchoring System

Sika Anchorfix®-2 CIC 300ml

Sika Anchorfix®-2 CIC 850ml

Single component cartridge with two part foil pack (CIC)

Figure 4: Allowable Mixer Nozzle Types

SAF KW nozzle

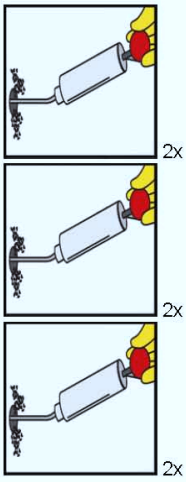
Figure 5a: Sika AnchorFix®-2 Installation Instructions

Solid Substrate Installation Method

1. Drill the hole to the correct diameter and depth. This can be done with either a rotary percussive or rotary machine depending upon the substrate.

2. Thoroughly clean the hole in the following sequence using a Sika Brush with the required extensions and a source of clean compressed air. For holes of 15 $^{3}/_{4}$" or less deep, a Sika Blow Pump may be used:

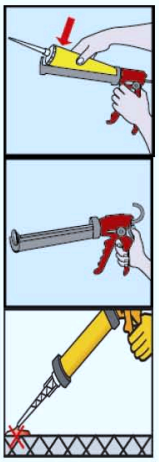
   2 x blows
   2 x brushes
   2 x blows
   2 x brushes
   2 x blows



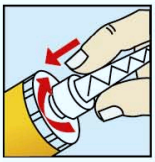
If the hole collects water after the initial cleaning this water must be removed before injecting the resin.

3. Select the appropriate static mixer nozzle for the installation, open the cartridge/foil and screw onto the mouth of the cartridge. Insert the cartridge into the correct applicator gun after checking that the applicator gun is in good working order.

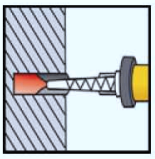
4. Extrude the first part of the cartridge to waste until an even colour has been achieved without streaking in the resin.



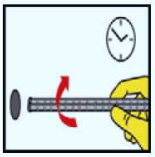
5. If necessary, cut the extension tube to the depth of the hole and push onto the end of the mixer nozzle, and (for rebars $^{5}/_{8}$" dia. or more) fit the correct resin stopper to the other end. Attach extension tubing and resin stopper.



6. Insert the mixer nozzle (resin stopper / extension tube if applicable) to the bottom of the hole. Begin to extrude the resin and slowly withdraw the mixer nozzle from the hole ensuring that there are no air voids as the mixer nozzle is withdrawn.
   Fill the hole to approximately ½ to ¾ full and remove the mixer nozzle and cartridge completely.

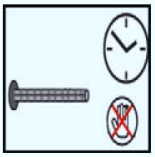


7. Insert the threaded bar (this should be free from oil or other release agents) to the bottom of the hole using a back and forth twisting motion ensuring all the threads are thoroughly coated. Adjust to the correct position within the stated working time.



8. Any excess resin should be expelled from the hole evenly around the steel element showing that the hole is full.
   This excess resin should be removed from around the mouth of the hole before it sets.

9. Leave the anchor to cure.
   Do not disturb the anchor until the appropriate loading/curing time has elapsed depending on the substrate conditions and ambient temperature.



10. Attach the fixture and tighten the nut to the recommended torque, DO NOT OVER TIGHTEN.

Note for decreased installation temperature:
When installing Sika AnchorFix-2001 at decreased installation temperature (32°F < T < 50°F) the cartridge must be conditioned to 68°F.

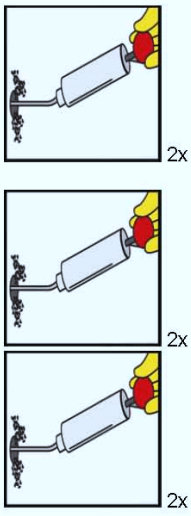
Figure 5b: Sika AnchorFix®-2 Installation Instructions (continued)

Overhead Solid Substrate Installation Method

1. Drill the hole to the correct diameter and depth. This can be done with either a rotary percussive or rotary machine depending upon the substrate.

2. Thoroughly clean the hole in the following sequence using a Sika Brush with the required extensions and a source of clean compressed air. For holes of 15 $^{3}/_{4}$" or less deep, a Sika Blow Pump may be used:

   2 x blows
   2 x brushes
   2 x blows
   2 x brushes
   2 x blows



If the hole collects water after the initial cleaning this water must be removed before injecting the resin.

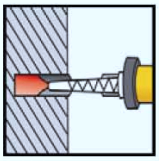
3. Select the appropriate static mixer nozzle for the installation, open the cartridge/foil and screw onto the mouth of the cartridge.

   Insert the cartridge into the correct applicator gun after checking that the applicator gun is in good working order.

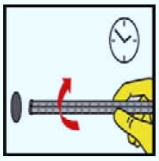
4. Extrude the first part of the cartridge to waste until an even colour has been achieved without streaking in the resin.

5. If necessary, cut the extension tube to the depth of the hole and push onto the end of the mixer nozzle, and (for rebars $^{5}/_{8}$" dia. or more) fit the correct resin stopper to the other end. Attach extension tubing and resin stopper.

6. Insert the mixer nozzle (resin stopper / extension tube if applicable) to the bottom of the hole. Begin to extrude the resin and slowly withdraw the mixer nozzle from the hole ensuring that there are no air voids as the mixer nozzle is withdrawn. Fill the hole to approximately ½ to ¾ full and remove the mixer nozzle and cartridge completely.

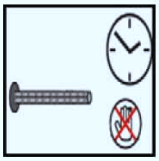


7. Insert the threaded bar (this should be free from oil or other release agents) to the bottom of the hole using a back and forth twisting motion ensuring all the threads are thoroughly coated. Adjust to the correct position within the stated working time.



8. Any excess resin should be expelled from the hole evenly around the steel element showing that the hole is full.
   This excess resin should be removed from around the mouth of the hole before it sets.

9. Leave the anchor to cure.
   Do not disturb the anchor until the appropriate loading/curing time has elapsed depending on the substrate conditions and ambient temperature.



10. Attach the fixture and tighten the nut to the recommended torque, DO NOT OVER TIGHTEN.

Note for decreased installation temperature:
When installing Sika AnchorFix-2001 at decreased installation temperature (32°F < T < 50°F) the cartridge must be conditioned to 68°F.

Notes for Overhead Installation:

- *Overhead installation is limited to a maximum effective embedment depth of 10 x rod diameter. All other directions may be installed up to a maximum effective embedment depth of 12 x rod diameter.*
- *The use of wedges is not required for overhead installations. However, when ambient temperatures exceed 70°F, it is advised to use wedges to fix anchors installed overhead until the full cure time has elapsed as a precautionary measure*

Table 10 – ADHESIVE ANCHOR ALLOWABLE STRESS DESIGN (ASD) TENSION VALUES FOR ILLUSTRATIVE PURPOSES			
Nominal anchor diameter (in.)	Drill bit diameter, d_0 (in.)	Effective embedment depth, h_{ef} (in.)	Allowable tension load, $\varphi N_n/\alpha$ (lbf)
5/16	3/8	2-3/8	828
3/8	7/16	2-3/8	946
1/2	9/16	2-3/4	1,388
5/8	11/16	3-1/8	1,762
3/4	13/16	3-1/2	2,920

For SI: 1 inch = 25.4 mm, 1 lb = 4.45N

Design Assumptions:
Single anchor with static tension load only; ASTM A193 Grade B7 threaded rod
Downwardly inclined orientation installation direction.
Inspection Regimen = periodic.
Installation temperature = 32°F to 95°F
Long term temperature = 110°F
Short term temperature = 176°F
Dry hole condition – carbide drilled hole
Embedment = $h_{ef,min}$
Concrete determined to remain uncracked for the life of the anchor.
Load combinations from ACI 318 Section 9.2 (no seismic loading).
30% Dead Load (D) and 70% Live Load (L); Controlling load combination is 1.2D + 1.6L
Calculation of α based on weighted average: α = 1.2D + 1.6L = 1.2(0.3) + 1.6(0.7) = 1.48
Normal weight concrete: f'_c = 2,500 psi
$c_{a1} = c_{a2} \geq c_{ac}$
$h \geq h_{min}$

Illustrative Procedure:
¾" Sika AnchorFix®-2 Adhesive Anchor (ASTM A193, Grade B7 Threaded Rod) with an Effective Embedment, h_{ef} = 3½"
Step 1: Calculate Static Steel Strength in Tension per ACI 318-11 Section D.5.1 = $\varphi_{sa}N_{sa}$ = 0.75 x 41,813 = 31,360 lbs
Step 2: Calculate Static Concrete Breakout Strength in Tension per ACI 318-11 Section D.5.2 = $\varphi_{cb}N_{cb}$ = 0.55 x 7,857 = 4,321 lbs
Step 3: Calculate Static Pullout Strength in Tension per ACI 318-11 Section D.5.3 = $\varphi_p N_a$ = 0.55 x 8,247 = 4,535 lbs.
Step 4: The controlling value (from steps 1 -3 above) per ACI 318-11 Section D4.1.2 = 4,321 lbs.
Step 5: Divide the controlling value by the conversion factor α as determined above: $T_{allowable,ASD}$ = 4,321 / 1.48 = 2,920 lbs

Table 11 – DIMENSIONS OF BRUSHES						
Design Information	Units	Nominal rod diameter				
		5/16 M8	3/8 M10	1/2 M12	5/8 M16	3/4 M20
Wire brush length	in. mm	2.95 75				
nominal brush diameter	in. mm	0.551 14		0.787 22		1.142 29
Brushes for cleaning drill holes