



Making the Right Anchor Choice: Best Practices in Anchor Design Webinar Q&A

This document includes questions submitted by attendees during the live webinar, *Making the Right Anchor Choice: Best Practices in Anchor Design*, held on August 28, 2018, along with presenter responses. In some cases, duplicate questions have been combined and noted as such. Please send any additional technical questions to AskSimpson@strongtie.com.

Question	Answer
Environment	
1 Is there a difference between "water-saturated" and "submerged", since the definitions are the same? <i>(Similar)</i> Water-Saturated Concrete, and Submerged Concrete, what is the distinction?	Yes, the definition for water-saturated on page 251 in C-A-2018 is incorrect. The correct definition for water-saturated concrete is a concrete that has been exposed to water over a sufficient length of time to have the maximum possible amount of absorbed water into the concrete pores. The definition of submerged is correct in C-A-2018 which is "Cured concrete that is covered with water and water saturated."
2 What is the distance from the body of water where it is considered severe conditions? <i>(Similar)</i> How far from ocean the area considered as in marine environment?	The distance from the body of water for severe conditions is based on the environment. Severe condition is an environment that has airborne chlorides and water that will be in contact with the anchor. If the anchor is far away enough from the body of water that will prevent airborne chlorides and water, then it can be considered a less severe classification.
3 Please address dissimilar metals corrosion with SS and HDG in a marine environment.	When two steel types with dissimilar metals are in contact, galvanic corrosion may occur. When dissimilar metals are being used, it is best to use a washer with a neoprene pad to break the contact with the dissimilar metals. A neoprene grommet may also be used to break the contact between dissimilar metals. See page 248, section III of C-A-2018 for more information.
4 Can HDG Titan be used in continuous exterior environment?	The Mechanically Galvanized Titen HD should not be used for permanent exterior use. Titen HDs are not available in HDG. 304 or 316 stainless steel Titen HDs would be suggested instead.
5 Would dry service still apply if an anchor is installed exposed to the elements for some time (say 30 days) but eventually protected if in a structure that eventually enclosed?	This depends on the environment that the anchor is exposed to within the 30 days. If the environment is in an area that is classified as higher than "Low" per page 249 of C-A-2018, then those environmental conditions will have to be considered when selecting an anchor.

- 6 For anchors into foundations in wind controlled regions on expansive soils, would the uncracked concrete condition still apply? No, ACI 355.2 and ACI 355.4 have criteria to test anchors in cracks for both seismic and non-seismic conditions. Foundations in expansive soils will tend to crack, even in a wind governed conditions.
- 7 What is the difference between 1000 lbs seismic shear in a low seismic area vs. 1000 lbs shear in a high seismic area? i.e. cracked vs uncracked Typically cracked concrete capacities in high seismic zones would result in lower shear capacities than uncracked shear capacities in low seismic design categories but this is not always the case. Download the [Anchor Designer software](#) to provide a detailed comparison
- 8 What type of corrosion resistance on mechanical anchors is necessary for Big ventilation units/condensers installed outside where there eventually will be snow and water? This depends on the type of moisture that will be in contact with the anchors during its lifetime. If chlorides are used to de-ice the snow, we recommend considering this condition a severe corrosive environment as indicated on page 249 of C-A-2018.
- 9 IS THERE ANY EPOXY THAT ALLOWS ANCHOR TO BE DRILLED AND INSTALLED IN -30 DEG C SUCH AS IN CANADA WINTER Adhesives comes in 2 types of chemical formulation, epoxy based and acrylic based. Epoxy based adhesives, such as SET-3G, are not ideal for installation into substrates below 40°F (4°C) while acrylic based adhesives are typically considered cold-weather adhesives that can be installed into substrates as low as 14°F (-4°C). Unfortunately, -30°C (-22°F) is below the range that Simpson current adhesives can be installed into.
- 10 Good idea to only specify adhesive anchors in exposed wet conditions with freeze/thaw conditions? Yes, Simpson's 'cracked concrete' qualified adhesives are tested to perform in conditions where the substrate can freeze and thaw. Simpson's SET-3G is capable of performing when in service temperatures drop to -40°F (-40°C) and increase up to 176°F (80°C).
- 11 For exterior mechanical anchors, does water that gets around the anchor and freezes ever cause problems. Simpson's 'cracked concrete' qualified adhesives are tested to perform in conditions where the substrate can freeze and thaw. Simpson's SET-3G is capable of performing when in service temperatures drop to -40°F (-40°C) and increase up to 176°F (80°C). Water tends to expand when frozen. Since mechanical anchors, especially expansion anchors, exert expansive forces onto the concrete when they are installed, the frozen water around the mechanical anchor may exert additional forces onto the concrete that may induce cracking. This can reduce the capacity of the mechanical anchor.
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12 At which coating type point down your corrosion resistance chart (pg 249) are the Titen HD anchors allowed to be used for permanent outdoor service?

Titen HD now comes in 304 and 316 Stainless Steel. 304 and 316 can be specified for permanent outdoor environments.

Substrates

13 I've heard that wedge anchors should not be used in masonry, bricks blocks? especially for seismic masonry installations

Simpson Strong-Tie's expansion (wedge) anchors, Strong-Bolt 2 and Wedge-All have approvals for use with grout-filled CMU. These approvals allow the use of the tested values for wind and seismic. In brick type systems, it is recommended to use adhesive anchors because of the voids that are typically found in brick. The adhesive with a plastic or steel screen are ideal to allow the adhesive to build around the voids to create a plug. Expansion anchors are not recommended in brick type substrates because the force developed to expand the clip may fracture the substrate.

14 Has any testing been done with Titen HD screw anchors into 6" CMU? We are unable to specify Simpson screw anchors into 6" CMU because it is not included in the catalog.

Testing into 6" thick CMU with our Titen HD anchor has not been conducted at this time.

15 Your photo for drilling into URM should show the drill at an angle, not perpendicular to the wall surface

Page 66 and 93 of C-A-2018 depicts 3 configurations for installation into URM. Perpendicular to the wall per configuration A is acceptable for shear loading only. Configuration C is acceptable for shear and tension but has a plate at the exterior of the wall. Configuration B, which depicts a 22.5 degree angle is appropriate for tension and shear and is often utilized.

16 Is there an anchor solution for hollow clay tile?

Simpson Strong-Tie currently does not have an approved product for installations into Hollow Clay Tile at this time.

17 What connector can be used in single wythe brick?

An adhesive with a plastic screen would be ideal for brick anchorage. At this time, Simpson does not have tested values for adhesive installations into single wythe brick.

Cracked Concrete

- 18 What about concrete floors with shrinkage cracks? Are they considered "cracked"?
- Yes, the analysis for the determination of crack formation should include the effects of restrained shrinkage. ACI 355.2 and ACI 355.4 testing require tested in cracks that are 0.012 inches wide which might be appropriate for shrinkage cracks depending.
- 19 Do you have more examples on cracked concrete and uncracked concrete anchoring?
- Contact your local Simpson Strong-Tie Field Engineer for additional examples on cracked and uncracked concrete.
- 20 Isn't all concrete considered cracked since it shrinks; therefore, what about slab on grade which probably won't have high enough loading to stress beyond modulus of rupture.
- ACI 355.2 and ACI 355.4 requires anchors to be tested in cracks that range from small cracks due to shrinkage and service condition loading and larger cracks that can be generated by a seismic event. Slabs on Grade have a potential of developing small cracks due to the movement of the soil it sits on. Depending on the type of soil, the cracks can vary in size. The loads in the anchors may be small and not cause cracks, but the slab itself may crack due to the differential movement of the soil it sits on. Therefore it is safe to assume the anchors specified need to be designed in cracked conditions.
- 21 Can anchors that are not for cracked concrete be used in cracked concrete when analysis indicates no cracking at service loads?
- ACI 318-14 section 17.2.3.1 requires anchors in Seismic Design Category (SDC) C, D, E, or F be designed with anchors that have been qualified for earthquake loading in accordance with ACI 355.2 and ACI 355.4. Cracks due to shrinkage may occur in the structures that are not induced by a service load conditions. Anchors qualified for uncracked concrete in accordance with ACI 355.2 and ACI 355.4 may be used when cracking is not anticipated at service loads. Strength Design analysis is still required.
- 22 Why is uncracked concrete assumed for wind applications?
- ACI 318-14 section 17.2.3.1 requires anchors in Seismic Design Category (SDC) C, D, E, or F be designed with anchors that have been qualified for earthquake loading in accordance with ACI 355.2 and ACI 355.4. Wind governed designs that are in Design Categories A and B are not required to be designed for cracked concrete unless service stresses would deem cracked concrete analysis appropriate.



Building Code Requirements

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| 23 | Are your products approved for use in Europe and compliant with Euro Codes, etc.? | Yes. Products for European approvals can be found from our website, strongtie.com . Change your location from the top left corner to a European country where the product will be used. The Anchor Designer software also includes ETAG (European Code) as a design option. |
| 24 | If this is your current report, what if we are on 2018 IBC? | All of our reports are currently being updated to the new 2018 IBC/IRC |
| 25 | ACI 318-11 appendix D and now ACI 318-14 chapter 17 require a minimum concrete age of 21 days for adhesive anchors. Does simpson provide a product for an adhesive anchor to be installed prior to the 21 days and still maintain bond strength? | Page 250 of C-A-2018 provides guidance on reduction factors when installing anchors into green concrete that has only cured for 7 and 14 days prior to adhesive installation. |
| 26 | Could you elaborate on the use of anchors for uncracked concrete in low seismic areas. How do you get around IBC requirements to use ACI 318 strength design? | ACI 318-14 section 17.2.3.1 requires anchors in Seismic Design Category (SDC) C, D, E, or F be designed with anchors that have been qualified for earthquake loading in accordance with ACI 355.2 and ACI 355.4. Wind governed designs that are in Design Categories A and B are not required to be designed for cracked concrete unless service stresses would deem cracked concrete analysis appropriate. That said, strength design analysis is still required per ACI 318 Chapter 17 |
| 27 | Any of these anchor approved by the canadian codes? | Design of Concrete Structures Canadian building code CSA A23.3-14 Annex D, section D.4.3.4 requires post installed anchors to be qualified in accordance with ACI 355.2 or ACI 355.4. Simpson Strong-Tie has several anchors that have been qualified in accordance with those standards. Please see C-A-2018 for a list of those anchors. |

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| 28 | If a non ICC approved anchor has been used, how can the EOR demonstrate compliance with the code? | Onsite pull test by a 3rd party test lab is typically done for anchors that were installed outside the specification. It is up to the Engineer of Record to work with the building official on the types of tests that is required. |
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Anchor Configurations

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| 29 | Is a construction joint considered an edge? | Yes. Since construction can interrupt the development of the concrete breakout cone, the breakout cone will be reduced similar to an edge condition. |
| 30 | anchorage for void CM with ledger type connection to support floor joists | For CMU that is not fully grouted, SET-XP with screen tubes could be used for ledger conditions if the loads are light. SS The Titen HD could also be used.. See the catalog for tested values and evaluation reports where applicable |
| 31 | I had a job where the contractor was using 1/4" Titans and they kept having issues where the anchors would shear off during install. What's the most likely cause for this? | Per the Evaluation Report IAPMO UES ER-449 and page 167 of C-A-2018, the hole must be blown with compressed air to eliminate any dust that may have accumulated during the concrete drilling process making the installation of the anchor difficult. |
| 32 | How do we treat anchorage through 2 layers of concrete? Eg. equipment anchored to housekeeping pad on top of concrete slab.
If the HKP is only 4" thk, but the 5/8" anchor requires 6-8" concrete, can we consider 2-4" material from the slab? | Typically these cold joints have to be considered as 2 sections of concrete unless it can be proven otherwise. The required embedment often negates the contribution of topping slab and h-nom has to be measured solely into the slab below. This is why it's important to check the lengths of anchors to see if they are available. |
| 33 | Can you define critical edge distance? | Critical edge distance is defined as the distance away from the edge at which the anchor capacity will no longer be reduced because of its proximity to the edge. |

Jobsite Obstacles / Installation

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| <p>34 Can you reuse screw anchors?
<i>(Similar)</i>
Are Titan anchors reusable?
<i>(Similar)</i>
Can the titan screw anchor be reused?</p> | <p>No. Titen HD screw anchors (THD) and Titen concrete and masonry screws (TTN) are removable but not recommended to be reused. The published values may not be achieved when a THD or TTN is re-used.</p> |
| <p>35 Regarding Q&A response: Titen HD anchors were allowed to be removed and reinstalled up to one time if undamaged (based on memory--but pretty sure). Has this changed?</p> | <p>It has changed, we no longer allow for THD screw anchors to be removed and reinstalled.</p> |
| <p>36 Can any installation equipment be used for your anchors?</p> | <p>Manual torque wrenches can be used to install screw anchors and expansion anchors. Electric or battery powered impact wrench can only be used for screw anchors and should not be used for expansion anchors.</p> |
| <p>37 There isn't a real world scenario that one of these bolts will not work in. correct?</p> | <p>Simpson Strong-Tie anchors can be used in various conditions and substrates. See pages 4-6 in C-A-2018 for a quick glimpse of the anchors and their approvals into various substrate installations</p> |
| <p>38 Is the dust removal system required for outdoor drilling?</p> | <p>A dust reduction method like the DXS system is required regardless of whether holes are drilled indoor or outdoor.</p> |
| <p>39 Do most Titan HD anchor bolt installations thru concrete foundations require cleaning of the hole and the use of epoxy?</p> | <p>Titen HD screw anchors are not meant to be used with any adhesive. They can be installed without hole cleaning if the hole is drilled a few inches deeper than is required and the concrete is thick enough to accommodate the additional drilled length.</p> |
| <p>40 Are the galvanized steel Simpson Titen HDs appropriate for anchoring aluminum window systems to concrete?</p> | <p>This question depends on if water intrusion is possible into the window cavity. If water intrusion is a possibility a different anchor would be better.</p> |

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| 41 | How long should concrete cure prior to installing mechanical or adhesive anchors? | Mechanical anchors should not be installed into concrete that is less than 7 days old. The allowable loads and design strengths of mechanical anchors that are installed into concrete less than 21 days old should be based on the actual compressive strength of the concrete at the time of installation. |
| 42 | In a shear connection, does shimming between the anchor fixture and the concrete affect the allowable shear strength if the shims are small, <1/2"? | It would depend on the diameter of the anchor, for smaller anchors 1/4" or 3/8" diameter the shim might affect the capacity. Unlikely for larger anchors. |
| 43 | Page 4 of the catalog shows SET we cannot use in concrete or CMU... what happened with the one already installed in the past... do we have to remove it? | Not to worry. Those anchors installed in the past with SET (or any of the 'Non-IBC' designated anchors) did meet the building code at one point. We tested those anchors to the valid testing criteria at the time which met the IBC building code requirements at that time. You do not need to be concerned. |
| 44 | Please explain more about the Over strength factor when using Titan's overhead. There is a deduction that must be applied off the ESR values on both tension and shear applications? | The overstrength factor is required per ASCE 7-16 section 13.3.1.1 as specified in Tables 13.5-1 and 13.6-1. This factor takes into account the inconsistencies found in concrete and masonry substrates. This factor is not limited to the Titen anchors; it is to be applied in all anchor types in all installation orientations when ASCE 7-16 design is required. |
| 45 | Can alternative threaded rod materials (i.e., not listed in the adhesive anchor's ESR/ER) be used? (Such as hasteloy or titanium rods) | Additional testing for alternative threaded rods has not been performed at this time however Simpson adhesives will have similar bond strength when steel types with standard UNC thread are used. |
| 46 | Can I attach a deck ledger with 100# load requirement to a hollow CMU | It is possible depending on the spacing of the anchors. See ICC-ES ESR-1056 tested values for the stainless steel THD into hollow CMU. |
| 47 | is the drill bit the same length as the anchor length or there is any effective embedment (min. req.) | Drill length is typically longer than 'h-nom' for mechanical anchors. For adhesive anchors 'h-nom' and drill depth is typically the same. |
| 48 | Is the sill can of a mullion frame considered an interior anchorage condition? | This would depend on if water intrusion is a possibility. If water intrusion is not possible then yes, it would be considered interior. |



Adhesive Anchors

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| 49 | WHAT IS THE AVERAGE SET TIME FOR ADHESIVE ANCHORS | There is no quote 'average' set time for an adhesive as it is different for each product depending on temperature. See the catalog for individual set times and gel times. |
| 50 | Is installation of epoxy to underside of metal deck allowed? And if so is breakout no applicable? | The acceptance criteria (testing criteria) do not allow adhesives to be tested into concrete o/ metal deck. Titen HD or STB2 would be better options. Breakout is not applicable for bottom of metal deck anchor installations. |
| 51 | Is there any published information or adjustments for adhesives used in conjunction with mechanically or hot-dipped galvanized all-thread? | No adjustments or reductions are necessary. |
| 52 | Should adhesive anchors be used in outdoor situations where water could enter the space between the anchor and the concrete and be subjected to freeze and thaw cycles? | Adhesives with valid evaluation reports are tested to multiple freeze thaw cycles as part of the ACI 355.4 testing criteria. |
| 53 | In general, in a corrosive environment would the adhesive anchor be better than an expansion anchor? | Hard to say. If it was chemical environment you'd have to check the chemical exposure chart. If the corrosion was due to water intrusion some Engineers think that the adhesive would help to protect the threaded rod from corrosion but it hasn't been proven to my knowledge. |
| 54 | Are your adhesive anchors rated for fatigue conditions? | Some fatigue testing was performed on our adhesive anchors several years ago and showed no reduction in capacity. |
| 55 | What is the definition of GEL TIME? | Page 255 of C-A-2018 provides a definition of Gel Time. It is the time it takes for the adhesive to harden enough where it can no longer flow. This is the time the installer has to install the threaded rod or rebar. |

Catalog / Literature

- 56 Is the catalog available online? Yes, you can find a digital copy of the catalog here: <https://www.strongtie.com/resources/literature/anchoring-systems-catalog>
- 57 How do I order Mechanical and chemical anchors catalogue from Simpson? You can order catalogs by mail here: https://www2.strongtie.com/catalog_order.asp
- 58 Does the new catalog give shear values for anchors installed in concrete using "SET-XP" and "AT-XP"? If now what is the reason? No, but the [Anchor Designer software](#) can take care of calculating this for you because edge distances are often different. For sill plates see this technical bulletin for some predetermined options: [T-A-SILPLANCH18](#)
- 59 Does the product literature stipulate which anchors can accommodate stand-off installation? Not really, you'd have to calculate the additional bending moments if anchor if standoff is a concern. [Anchor Designer Software](#) provides an option to include factors to account for standoff in anchor designs.
- 60 What is the link for the manuals to use in a IPAD App <https://www2.strongtie.com/software/lilbmobile.html>

Pricing

- 61 What anchors of similar strength are generally cheaper (SB2 or Titen HD)? When comparing only material costs only the STB2 may be less expensive but the contractor often saves on labor costs by using the Titen HD.
- 62 Cost comparison between cast in place anchors and Titen HDs? When comparing only material costs only the cast in place anchors may be less expensive but the contractor often saves money over all using the Titen HD because of correct placement and ease of finishing the concrete slab with post installed anchors.
- 63 If installation times, temperatures, water presence etc. are held constant, are the products typically listed in the order of increasing cost? Looking at pg 4 of the C-A-2018, for IBC approved into cracked concrete, will SET-3G be typically more costly per cartridge than SET-XP, ET-HP and AT-XP? The order of the products does not reflect the cost of the product. Cost to the end user is variable depending on volume purchased and which distributor is used to purchase each product.



Software

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| 64 | Most anchor software assumes that supplementary reinforcement exists in cracked concrete. This eliminates the consideration of critical edge distance. Installing anchors into existing concrete, what measures do I need to take to ensure this assumption is okay? | It is difficult to assume what reinforcement is in an existing concrete, therefore it is safe to assume that no supplementary reinforcement exists when designing an anchor adjacent to an edge in an existing concrete. If you have the capability of confirming that reinforcing does exist through scans of the concrete, then you may assume you have supplementary reinforcement. |
| 65 | What was the name of the software for anchor simulations again? | Anchor Designer, available free here:
https://www2.strongtie.com/software/anchordesigner.html |
| 66 | Is 3G adhesive included in the anchor designer software? | Yes, if you don't see it in there you may need to update it. |
| 67 | When will masonry be added to the anchor design software? | The addition of masonry to the existing Anchor Design software is currently being considered. Timeframe is currently unknown |
| 68 | We would like to attend a webinar on the Anchor designer software! | Great! If you ask at this link we will have your local field engineer contact you to set one up. https://www2.strongtie.com/asksimpson.html |



Miscellaneous

- 69 Does S/ST provide design services
- Yes for our Composite Strengthening Systems (CSS) product line. If you need anchor design help please contact your local field engineer or ask a question at this link <https://www2.strongtie.com/asksimpson.html>
- 70 Some of our projects require America Act or made in USA? do simpson anchors qualify ? Cliff H.
- Yes, several Simpson anchors qualify specifically every one of our cartridge adhesives. Find more information here: <https://www.strongtie.com/about/company/buy-american-act>
You can contact your local Field Engineer for a letter if needed or ask at this link <https://www2.strongtie.com/asksimpson.html>
- 71 Its seems the corrosion protection recommendations by Simpson for connectors in PT lumber has gotten more conservative over the years. Is that based on failures?
- It is based on the newer chemicals that are now used in PT wood treating
- 72 Do you have any additional guidance to help determine a recommended frequency of special inspections?
- Yes, see this link: http://www.concreteanchors.org/publications/special_inspection_guidelines_rev_6-6-11.pdf
- 73 Can you use HY 200 in cracked concrete?
- The Simpson product that's equivalent to HY-200 is Simpson's SET-3G and yes, it is valid for cracked concrete.
- 74 Any simple tables (like the old days) for wind or seismic uplift on an epoxy dowel in a 6" and/or 8" concrete stemwall?
- Sadly no.
- 75 You did not mention undercut anchors. Why not?
- Simpson Strong-Tie no long manufactures the TCA for general use, only for high volume special order applications.
- 76 As I missed the beginning of the seminar, do all structural uses of the anchors require special inspection?
- Yes, see IBC table 1705.3.



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- 77 CAN YOU PLEASE ELABORATE ON THE TITAN HD REPLACING POURED INPLACE A.B.'S See the online Technical Bulletin [T-A-SILPLANCH18](#).
- 78 What is appropriate for a 15% bleach solution AT-XP, SET-XP and ET-HP are all resistant to 10% Sodium Hypochlorite (Bleach).
- 79 When would a wedge type anchor be superior over a Titen anchor? It is possible that the Wedge-Type anchor would have higher values sometimes but mostly when the hole size in the steel plate is required to be 1/16" over. Titen HDs require holes that are 1/8" oversized.
- 80 So why tightenHD is worse corrosion resistant than galvanized threaded rods...? It is because of the way the zinc or mechanically galvanized Titen HD is heat treated that it isn't allowed for exterior use. Other mechanically galvanized threaded rods can be used if the exterior conditions allow it.