NCBC Webinar October 21, 2026: Post-Installed Deformed Reinforcing Bars/Dowels

Responses to Questions

The following excellent questions were raised during the presentation. In the following, all the questions are answered even though those that were answered quickly after the presentation. If there're additional questions or you need further clarifications about the answer, Dr. Shahrooz can be contacted via email: shahroozllc@gmail.com

1. I have one question regarding the guidance for anchoring the sill plate to the foundation CMU wall. Please discuss this topic as well.

   This topic is beyond the scope of this webinar, but it could be addressed in a future webinar focusing on CMU rather than reinforced concrete members.

2. ACI CODE 355.5 lets qualified post installed steel bars use standard ℓ_d. For nonferrous bars such as titanium alloy bars bonded in near surface mounted grooves, which have low cover and little confinement, do you see 355.5's reliability test structure as the right basis for a qualification pathway? Or should the focus be on direct pullout testing of the end anchorage detail instead of development length

   The primary focus of ACI CODE-355.5 is the testing requirements to qualify adhesive and cementitious grouts. If a qualified bonding material (adhesive or cementitious) is used, the standard development length can be used to calculate the necessary embedment into the concrete. This code does not address near-surface-mounted (NSM) bars. The bond transfer mechanisms of post-installed reinforcing bars and NSM bars are different. For example: (1) the bond transfer profile is axisymmetric uniform shear for post-installed reinforcing bars but eccentric shear for NSM bars, and (2) geometric confinement is uniform for post-installed reinforcing bars but nonuniform for NSM bars.

3. What are the main differences between adhesive and cementitious grout and what are the typical applications for both?

   Adhesive grouts gain strength through a chemical reaction between synthetic resins and a hardener, whereas cementitious grouts rely on hydration. Shrinkage and creep characteristics also differ: cementitious grouts tend to experience drying shrinkage, but adhesive grouts exhibit more pronounced creep. Field installation differs as well: adhesive grouts are prepackaged and manufacturer-controlled through mixing nozzles, but cementitious grouts are mixed on site, which may result in more variability.

   For post-installed reinforcing bars, either material can be used. However, adhesive grouts are more suitable for short embedment lengths because of their exothermic characteristics, unless the grout is specially formulated for low exotherm.

4. Thank you for the presentation. I know this is a very specific article and you might not have it off the top of your head, but I have a question regarding ACI 318-25 Commentary R17.1.3. It explicitly states: 'Post-installed reinforcing bar dowels are designed using the provisions for adhesive anchors in Chapter 17.'

   I'm struggling a bit with this concept of applying anchor criteria to post-installed bars. Going back to the photo of the pier widening you showed, where you called them

dowels, does that mean that application must be designed strictly under Chapter 17 anchor theory?

I appreciate that you caught this oversight. The post-installed reinforcing bars for the pier widening are not dowels. I inadvertently used the term "dowel" because these bars primarily resist interface shear, for which the shear-friction equations can be used.

A dowel is a structural bar designed only to transfer shear. In my opinion, dowels should be designed for their steel shear strength and for concrete edge breakout in shear. Regarding required length, I believe ACI 318 defaults to treating these bars as shear-friction reinforcement, so the full development length must be provided.

5. In order to grout the bars shown in slide 32, can the drilled holes extend through the top of the Cap Beam?

   This question is for slide 34. Yes, having the ducts pass through is preferable for filling, venting, and inspection. The figure shows a detail that some engineers prefer for durability. However, this detail would still require a vent for air removal and would limit inspection.

6. One time I reduced the required development length of the post-installed rebar using the excess reinforcement ratio, $A_{s,req'd}$ /$A_{s,prov}$. Should we be worried about that?

   I am not familiar with your particular case. However, the key design parameter is the embedment length, which is calculated as in any other case. The excess reinforcement ratio is used to reduce the development length, so I don't see any reason not to apply the $A_{s,req'd}/A_{s,prov}$ reduction factor.

7. What about adhesive anchors subject to sustained tension? AASHTO has creep requirements. Does ACI have similar requirements?

   ASHTO LRFD BDS Article 5.13 references ACI 355 for qualification and ACI 318 for the design of anchors in concrete, so the sustained load resistance is the same.

8. Is there any limitation for the drilled in length? What is the maximum drilling bit length? Note in the example the hole for widening deck rebar was 4 ft.

   The length depends on the drilling method. Please see slide 30.

9. Can you show where is the C_{min} comes from? Is that from ACI.

   This is the target minimum cover to the post-installed reinforcing bar. Please see Table 5.10.1-1 in AASHTO 10th Edition. ACI requires different minimum covers.

10. In ACI 355.5 Section 15.4, it says to design to 50% of the expected peak load based on grout bond strength, or 80% of the reinforcing bar yield strength. What is meant by 50% of the peak load? ACI 318 Chapter 17 calculates the bond strength for adhesive anchor design, and one check is 17.6.5.1 for adhesive bond check, is it 50% of this calculation, or 50% after you apply the phi factor?

    No, these are the requirements for one-site proof loading if required.

11. For adhesive anchors, the characteristic bond strength is required, when designing for tension, for the concrete bond strength, the concrete breakout strength, and the bar tension strength. But for adhesive dowels, you're calculating development and splice length, which does not use the characteristic bond strength. Will any materials qualified for ACI 355.5 and the relevant ICC-ES AC document list the characteristic bond strength?

    A dowel is a structural bar designed only to transfer shear. In my opinion, dowels should be designed for their steel shear strength and for concrete edge breakout in shear. Regarding required length, I believe ACI 318 defaults to treating these bars as shear-friction reinforcement, so the full development length must be provided. Characteristic bond strength is needed only for tensile loading and, hence, is not necessary for designing dowels.

12. Some adhesive systems are claimed by manufacturers that they can be installed without cleaning the hole. What are your thoughts on that claim?

    If the claim can be verified by test results, then I don't see an issue. I strongly recommend verifying any claim by examining the test results and report.

13. There are adhesive systems for which published test data require relatively short embedment length of rebar to resist shear or tension load. However, these lengths are much shorter than embedment lengths per ACI 318 equations. Can we rely on the published data by manufacturers to design required embedment depth? An example application would be enlarging a beam section to increase its shear capacity.

    Such short embedment lengths can be used if supported by test results. I strongly recommend verifying any claim by examining the test results and report.

14. Some adhesive systems are claimed by manufacturers that they can be installed without cleaning the hole. What are your thoughts on that claim?

    Any claim such as this needs to be supported by test results. I strongly recommend verifying it by examining the test results and report.

15. On the example provided, for the top bars of the extension drilled to the existing slab. How far it is drilled to the existing top bars. Also, what is the difference between the embedment of the top bars and the splice length in term of how it was calculated?

    The bars will be lap spliced, and the splice could be either a contact or a non-contact splice. For contact splices, the standard minimum clear spacing between bars must be provided. For non-contact splices, the distance between the spliced bars cannot exceed the lesser of one-fifth of the lap splice length and 6 in.

16. The mechanism of shear friction is premised on the interface reinforcement developing f_y in tension. Your example only considered (provided) development in compression. Unless I am misunderstanding your example and the shear friction mechanism, it appears your example is not consistent with ACI and AASHTO requirements for shear friction.

You are absolutely right to have caught this error. Thank you! The presentation has been revised.

17. If I am post-installing a deformed bar into a large footing such that I have a very large cover (edge distance), can I use ACI 318 Chp 17 to determine the required embedment depth to anchor the bar in the footing? In that case breakout or bond failure may govern as opposed to splitting failure upon which L_d is calibrated.

    Development length is the key design factor for post-installed reinforcing bars.

18. Did the development length comparison use AASHTO LRFD 10th edition?

    Yes, the values are based on the 10th Edition of AASHTO LRFD BDS.

19. Has any research been done on the coating factor used for epoxy coated bars that are post-installed using adhesive anchors?

    To the best of my knowledge, no research has examined the performance of epoxy-coated post-installed reinforcing bars used with adhesive anchoring systems.

20. Some manufacture refers to ICC_ES report for post installed anchors, which shows the capacity for shorter embedment length.

    Thank you for providing this information.