

Job-Task Analysis (JTA) for ACI Certification of Post-Installed Concrete Anchor Installation Inspector

The JTA is a detailed list of specific points of general knowledge (understanding concepts) and working knowledge (knowing facts or values) that may be included on the Installation and Inspection examinations.

RESOURCES:

ACI CP-80 Adhesive Anchor Installer Workbook

ACI 318-14 Building Code Requirements for Structural Concrete, Chapter 17 and Chapter 26

ICC International Building Code 2015, Chapter 17

ACI 355.4 Qualification of Post-Installed Adhesive Anchors in Concrete, Chapters 1–3 and 10–13

ACI 355.2 Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary, Chapters 1–3, 6, and R1–R4

ICC-ES ESR-2583 PE1000+®, Epoxy Adhesive Anchor System in Crack and Uncracked Concrete (Dewalt/Powers)

ICC-ES ESR-2502 Power-Stud®+ SD2 Carbon Steel Anchors, Power-Stud®+ SD4 Stainless Steel Anchors and Power-Stud®+ SD6 Stainless Steel Anchors in Crack and Uncracked Concrete (Dewalt/Powers)

CAMA Special Inspection Guidelines for Post-Installed Anchors

Adhesive Anchor Installation and Inspection, Concrete International, December 2008

Inspecting Adhesive Anchors, Concrete International, June 2017

INSTALLATION

ACI CP-80 Adhesive Anchor Installer Workbook

Preparing for Installation – Chapter 2

- Verify that adhesive is suitable for the intended application (dry, water-filled, submerged, overhead).
- Review manufacturers printed installation instructions (MPII).
- Review MSDS.
- Select appropriate personal protective equipment.
- Verify concrete temperature falls within range for selected product.
- Evaluate concrete condition, age, cracks, expansion joints, thickness, etc.
- Verify and layout anchor locations according to specifications.

Drilling Anchor Holes – Chapter 3

- Adjust equipment components according to MPII.
- Determine proper depth, diameter, and rod/bolt size for hole according to specifications.
- Select appropriate drilling machine and bits as per MPII.
- Drill hole perpendicular to concrete, or as specified on drawings.
- Verify that hole depth and diameter meet pre-determined specifications.
- Take appropriate action if drilling hits reinforcing steel or other obstructions.

Cleaning Anchor Holes – Chapter 4

- Determine appropriate cleaning method per MPII.
- Select appropriate equipment to clean holes.
- Visually inspect debris coming from hole during drilling.
- Remove water-concrete particle slurries.
- Remove debris from drill hole using appropriate cleaning method.

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Injecting Adhesive Using Cartridge Systems – Chapter 5

- Verify adhesive expiration date.
- Identify cartridge storage temperature requirements.
- Verify that proper nozzle is selected with complete mixing element.
- Assemble adhesive cartridge and nozzle per MPII.
- Confirm that hole is clean prior to injecting adhesive.
- Insert adhesive assembly into dispenser.
- Select equipment suitable for installation location (horizontal to overhead).
- Discard initial adhesive and confirm proper mixing.
- Inject adhesive per MPII (rate, application, method, avoid air entrapment).
- Determine minimum depth of adhesive fill.
- Determine appropriate adhesive working (gel) time.

Installing Anchors – Chapter 6

- Identify most appropriate installation technique per MPII.
- Select the anchor appropriate for the adhesive system in use.
- Inspect anchor element for contaminants and clean if needed.
- Inspect anchor element for damage and replace if needed.
- Insert anchor element into drilled hole per the MPII.
- Verify accurate final embedment depth based on length of protruding anchor element.
- Verify that adhesive fills hole uniformly around the anchor, approximately flush with surface.
- Take corrective action if air pockets are noted during installation.
- Ensure that anchor remains undisturbed until adhesive is fully cured.

Installing Adhesive Capsule Systems – Chapter 7

- Verify adhesive expiration date.
- Identify capsule storage temperature requirements.
- Confirm that material has not solidified inside capsule.
- Confirm that hole is clean prior to capsule insertion.
- Insert capsule into hole and mix adhesive and anchor per MPII.

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INSPECTION

CAMA Guidelines & Concrete International Articles

- Understand *Special inspector's* role on the jobsite.
- Understand the types of post-installed anchors and their function.
- Understand items of importance when inspecting adhesive anchors prior to, during, and following installation.
- Know warning signs of potential deviation from the construction documents and the MPII.
- Know and verify that the installation is in accordance with the MPII.
- Know requirements of Pre-Installation Inspection.
- Know proper tooling required for complete installation.
- Know installation differences between torque and displacement-controlled anchors, undercut anchors, screw anchors and the different types of adhesive anchors.
- Know importance of verification of the proper set through visual inspection or torque test.
- Understand what proof loading is.
- Know the essential elements of a proof load program.
- Verification of proper set of screw anchors.
- Understand cautions related to screw anchors.

ACI 318-14 Building Code Requirements for Structural Concrete, Chapter 17

- Understand scope of chapter.
- Understand Inspection requirements for adhesive anchors as specified in ACI 318.
- Know minimum age requirement of concrete relative to using adhesive anchors.
- Know post-installed expansion and undercut anchors must meet the requirements of 355.2.
- Know adhesive anchor systems installed horizontally or upwardly inclined must meet the requirements of 355.4.
- Know qualification requirements for installers.
- Know minimum edge distances for all types of anchor.
- Know minimum center-to-center spacing requirement.
- Know specifics related to proof loading of adhesive anchors: triggers for proof loading requirement, objective of proof loading, how proof loading of adhesive anchors is conducted, minimum requirements for definition of a proof loading program (Mattis, Silva paper).
- Know minimum installer certification and inspection intensity requirement for adhesive anchors installed horizontally or upwardly inclined and resisting sustained tension loads.
- Understand location and manner in which the req's of ACI 355.4 & 355.2 are ref'ed in ACI 318-14.

ACI 318-14 Building Code Requirements for Structural Concrete, Chapter 26 & International Building Code

- Understand basis for *special inspection* in the IBC.
- Know when periodic or continuous special inspection is required.
- Understand when anchors require continuous *special inspection*.
- Know the three sources for adhesive anchor inspection requirements.
- Know Special Inspector Qualifications.
- Know who retains the services of the Special Inspector.
- Understand employment of *approved agencies* for *special inspection*.
- Know about access to work for purposes of *special inspection*.
- Understand statement of *special inspections* – preparation, content.
- Understand potential conflict of interest situations for Special Inspectors.
- Know and understand minimum reporting requirements.
- Understand the relevant references to ACI 318 in the IBC.

Job-Task Analysis (JTA) for ACI Certification of Post-Installed Concrete Anchor Installation Inspector—Continued

ACI 355.2 Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary

- Understand the significance of the standard.
- Understand the scope of the standard.
- Know what would be considered a gross error when installing anchor.
- Understand impact of gross errors.
- Know Notations related to mechanical anchors:

C_{ac} - critical edge	C_{min} - minimum edge
d_a - outside diameter of Post-installed anchor	h - thickness of concrete
h_{ef} - effective embedment depth	h_{min} - minimum member thickness
h_{hole} - overall depth of drilled hole	s_{min} - minimum spacing
T_{inst} -specified tightening torque	T_{screw} - maximum setting torque
T_u -mean ultimate torque	
- Know definitions of terms specific to mechanical anchors:

Anchor system	Anchor category
Anchor group	Displacement-control expansion anchor
Undercut anchor	Concrete breakout and pullout failures
Torque-controlled expansion anchor	Screw anchor
Setting of an anchor	

ACI 355.4 Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary

- Understand the significance of the standard.
- Understand the scope of the standard.
- Know Notations and Definitions:

C_{ac} - critical edge	C_{min} - minimum edge
d_a - outside diameter of Post-installed anchor	d_o - diameter of drilled hole
h_{ef} - effective embedment depth	h_{min} - minimum member thickness
s_{min} - minimum spacing	T_{inst} -specified tightening torque
- Know definitions of terms specific to AAI:

Adhesive anchor system	Anchor
Anchor category	Anchor installation
Bulk adhesives	Capsule anchor system
Cartridge systems	Cure time
Dry concrete	Gel time
MPII	Saturated concrete
Shelf life	
- Know and Understand the variables and options for qualification.
- Understand definition of Special Inspection.
- Know who specifies inspection procedures for each type of anchor system and where to find this information.
- Understand definition of Continuous Special Inspection.
- Know the seven minimum items to verify.
- Understand definition of Periodic Special Inspection.
- Understand what proof loading is.
- Understand the contents of a proof loading program.
- Know the minimum and maximum load levels.
- Know the minimum amount of time the proof load is applied.

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ICC ESR-2583 (Adhesive) and ICC ESR-2502 (Mechanical)

- Verification of the applicability of the *evaluation report* to the anchor system being installed.
- Verification of the *evaluation report* expiration date or reaffirmation date.
- Know how to identify the product and equipment necessary for the installation.
- Understand the scope, significance, and information in the evaluation report.
- Understand general information about the product, including its characteristic identification.
- Understand parameters of installation of specific product.
- Know when periodic and continuous Special Inspection are required.
- Understand Conditions of Use.
- Understand content and importance of Manufacturers Printed Installation Instructions.
- Know installation procedures per MPII.
- Know limitations related to concrete condition, strength and temperature.
- Understand handling and storage of the product.
- Know types of anchors allowed.
- Know information related to spacing, edge distance, and member thickness.
- Understand embedment requirements.
- Understand limitations on anchor types.
- Know product-specific requirements for special inspection.
- Understand product-specific installation directions.