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## What About Adhesive Anchors? Part 1(B)


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**Brian Gerber** is Principal Structural Engineer of the ICC Evaluation Service, LLC in Whittier, CA. He is a graduate of the University of California, Davis, and California State Polytechnic University, Pomona. A licensed structural engineer, Mr. Gerber is a member of ACI and participates in Committees 355, 363, 408, and 560.





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## What About Adhesive Anchors?

### Building Code Requirements For Inspections Of Adhesive Anchors In Concrete


ACI Chicago Convention

Brian Gerber, P.E., S.E.  
Mahmut Ekenel, Ph. D., P.E.  
ICC Evaluation Service, Inc.

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## The Building Code



The *International Building Code (IBC)* is the predominant model building code in the U.S.

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## Building Inspections



Building inspection assures the building will be safe and durable

"I haven't found anything wrong yet, but it's OK for you to go ahead and worry a bit longer."

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## IBC and Special Inspections

### SECTION 1704 SPECIAL INSPECTIONS

**1704.1 General.** Where application is made for construction as described in this section, the owner or the registered design professional in responsible charge acting as the owner's agent shall employ one or more approved agencies to perform inspections during construction on the types of work listed under Section 1704. These inspections are in addition to the inspections identified in Section 110. The special inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the building official, for the inspection of the particular type of construction or operation requiring special inspection. The registered design professional in responsible charge and engineers of record involved in the design of the project are permitted to act as the approved agency and their personnel are permitted to act as the special inspector for the work designed by them, provided those personnel meet the qualification requirements of this section to the satisfaction of the building official. The special inspector shall provide written documentation to the building official demonstrating his or her competence and relevant experience or training. Experience or training shall be considered relevant when the documented experience or training is related in complexity to the same type of special inspection activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code.

**Exceptions:**

1. Special inspections are not required for work of a minor nature or as warranted by conditions in the jurisdiction as approved by the building official.
2. Special inspections are not required for building components unless the design involves the practice of professional engineering or architecture as defined by applicable state statutes and regulations governing the professional registration and certification of engineers or architects.
3. Unless otherwise required by the building official, special inspections are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.

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### Special Inspector Duties

Special inspectors need to have training and experience to perform their duties:

- Read plans and specifications for special inspection requirements
- Observe the assigned work
- Report nonconforming items to the contractor's attention for correction
- Notify the building official and the RDP if the contractor does not fix the nonconforming item

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### Special Inspection Reports

The final report needs to:

- State that all items requiring special inspection were observed and in conformance with the approved plans
- State whether unresolved items remain
- State whether any inspections were missed per statement of special inspections

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### RDP and Special Inspection

- May hire the special inspector
- Prepares the statement of special inspection
- Must respond when the special inspector issues a notice of non-complying item with solution to the problem
- May have to revise plans to accommodate the situation

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### Statement of Special Inspections

IBC Section 1705 requires the engineer or architect (RDP) to prepare a statement of special inspections for the building official's approval:

- Where is the project
- What needs to be inspected
- Who are involved (building official, RDP, contractor, special inspector)
- What the special inspector's duties are

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### Building Contractor and Special Inspection

- Notifies the special inspector when work is ready for inspection.
- Provide access to approved plans.
- Must prepare a statement of responsibility where construction of a lateral force resisting system is involved.

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## Building Official and Special Inspection


The building official is charged with approving:

- Building plans, statement of special inspections and other documents
- The special inspection program
- The special inspectors



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## Building Official and Special Inspection




- Monitors special inspection activities by onsite visits
- Reviews special inspection reports
- Has authority to stop work if nonconforming items are not resolved
- Perform final inspection after special inspections have been completed
- Issues certificate of occupancy after all construction has been satisfactorily completed

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## Anchorage to Concrete



The IBC permits anchorage to concrete in Section 1911 and Section 1912. Section 1912 allows post-installed expansion anchors as described in ACI 318 Appendix D.



Adhesive or bonded anchors are not directly referenced by the codes

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## Special Inspection of Concrete Anchors under the IBC

TABLE 1704.4  
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION (excerpt)



VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	IBC REFERENCE
Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased or where strength design is used.	X		ACI 318: 8.1.3, 21.2.8	1911.5, 1912.1
Inspection of anchors installed in hardened concrete.		X	ACI 318: 3.8.6, 8.1.3, 21.2.8	1912.1

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## Special Inspection of Concrete Anchors under the IBC

The IBC requirements only apply to cast-in-place bolts and mechanical anchors.

What about adhesive anchors?

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## Adhesive Anchors


**104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability and safety.

**104.11.1 Research reports.** Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources.

- IBC Section 104.11 allows alternative materials
- Since adhesive anchors are not within the IBC, adhesive anchors are alternative materials
- IBC Section 104.11.1 allows research reports as a source of information on alternative materials

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## Special Inspection of Adhesive Anchors




ICC-ES issued AC308, the *Acceptance Criteria of Post-Installed Adhesive Anchors in Concrete Elements*.

AC308 addresses testing, design, installation and inspection of adhesive anchors in concrete.

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## Research Reports



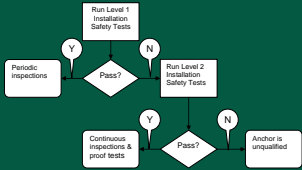
ICC Evaluation Service (ICC-ES) issues reports on adhesive anchors.

Because the codes do not have information on adhesive anchors, ICC-ES issues acceptance criteria to more clearly state the requirements needed to qualify the product as code complying.

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## Inspection Requirements

- AC308 permits either periodic or continuous inspections with on-site proof testing
- Inspection level is taken from performance in installation safety tests
- Tests include sensitivity to hole cleaning, mixing, wet holes, water-filled holes, and submerged holes



```

            graph TD
            A[Run Level 1 Installation Safety Tests] --> B{Pass?}
            B -- Y --> C[Periodic Inspections]
            B -- N --> D[Run Level 2 Installation Safety Tests]
            D --> E{Pass?}
            E -- Y --> F[Continuous Inspections & proof tests]
            E -- N --> G[Anchor is unqualified]
            
```


Continuous inspection is needed for overhead installations and sustained tension loads.

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## Special Inspection Tasks

Since adhesive anchors are not within the codes, inspection details need to be provided:


- If periodic inspections are allowed, the schedule for visits needs to be in the statement of special inspections
- Components (adhesive, steel, rod, accessories) must match the materials specified on the approved plans and specifications



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## Special Inspection Tasks



- Published instructions and research reports available
- Check expiration dates, storage temperatures, matching cleaning brushes, matching dispensers
- Steel rod: size, grade, type (carbon or stainless), coatings (galvanized), condition (straight or bent; damaged threads)
- Cleaning method (brushing, compressed air or vacuum)

Continued

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## Special Inspection Tasks

- Orientation: Down, up (overhead), horizontal
- Anchor location in structure: per approved plans
- Anchor position: spacing, edge distance, concrete thickness
- Concrete type (normal weight or lightweight) and compressive strength

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## Hole Preparation

- Drill bit type (ANSI B212-1994) and size
- Hole diameter and depth
- Damage to concrete
- Cleaning method (brushing, compressed air or vacuum) and size of brush; cleaning steps
- Hole condition: wet, dry, water-filled submerged

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## Placement of Components

- Temperature conditions
- Adhesive mixing (usually multi-component)
- Dispensing adhesive into hole
- Placement of steel insert
- Gel time limits
- Adhesive fills hole




Continued

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## Placement of Attachments

- Usually after the adhesive has fully cured
- Hole size in attachment
- Maximum torque applied



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## Proof Testing

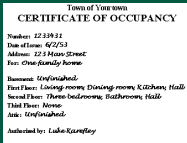
Proof testing is required under AC308 where continuous special inspection is required. The RDP or the building official may also require proof testing if there is a question on the reliability of the connection.

- Test schedule in statement of special inspections
- Test laboratory approved by the building official
- Tests should be in groups of same adhesive, concrete, diameter, embedment
- Tension load level and duration per statement of special inspection

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## Final Inspections

- Special inspector prepares final report for building official, RDP, owner
- Building official conducts final inspection
- Certificate of occupancy issued by building official



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## Summary

- Adhesive anchors are versatile, flexible fasteners
- Installations are subject to many conditions. Not all adhesive anchors are alike
- Clear, detailed documentation is critical
- Successful inspection programs require coordination of all participants
- Good communications important

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**Building Code Requirements for Inspections Of Adhesive Anchors In Concrete**

Questions?



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**Related Documents**

**Anchorage to Concrete**

- 355.2-07: Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary
- 349.2R-07: Guide to the Concrete Capacity Design (CCD) Method - Embedment Design Examples
- 503.5R-92: Guide for the Selection of Polymer Adhesives in Concrete (Reapproved 2003)
- SP-103: Anchorage to Concrete
- SP-130: Anchors in Concrete--Design and Behavior
- 318-08: Building Code Requirements for Structural Concrete and Commentary

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