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What About Adhesive Anchors? Part 1(B)

ACI Spring 2010 Xtreme Concrete Convention
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IBW

ACI Spring 2010 Convention
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Installation of Adhesive Anchors - Theory and Practice -

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Installation of Adhesive Anchors - Theory and Practice -

Motivation

- Post-installed anchoring technology has found widespread use in concrete construction.
- Continuous improvement and advancement in post-installed fastening technology has yielded different products with certain fields of application and differing installation procedures.
- In many cases a post-installed anchor seems to be the perfect choice. But the use of post-installed anchors requires in depth knowledge in fastening technology of all people involved.

Producers Designers Installers Inspectors ...

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Selection of the appropriate anchor system

- application
- loads (direction, short-term, sustained,...)
- design method
- location of the fixing point
- source (gravity, wind, seismic,...)
- environmental conditions
- installation procedure and requirements
- ...

↓

Prequalified anchor

↓

FASTENER DESIGN

↓

FASTENING ← Special inspection

Theory / Engineering Office

Practice / On site

Fastener installation acc. to the MPI

- drilling
- hole cleaning
- installation of the adhesive and anchor
- curing process

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Special inspection

Excerpt from an ESR

Adhesive anchor installations require special inspection in accordance with Section 1701 of the UBC and Section 1704 of the IBC. The special inspector must record strength and age of base material; drill bit compliance with ANSI B212.15-1994; hole diameter, depth and cleanliness; hole location; hole edge distance and spacing; installation temperature; adhesive product description, including product name; adhesive expiration date; use of proper mixing nozzles; verification of properly mixed adhesive prior to injection of adhesive in anchor hole; anchors undisturbed during gel time; rod type, grade, diameter, length and cleanliness; and verification of anchor installation in accordance with the manufacturer's published instructions and this report.

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In Theory: Knowledge is available

In Practice: Failure of adhesive anchor applications happen

➔ Use of adhesive anchors has been called into question


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To counteract and avoid lack of safety it is necessary to identify the problems!

2007 / Europe: survey (questionnaire) on the installation of adhesive anchors → n = 212 installers

- "Some" hole cleaning was performed in most cases, but it does not seem that the requirements of Approvals have been always followed
- Different bonded anchor systems require a high variety in bore hole cleaning procedures: confusion of the installer
- Personal interviews on site would help to get more precise and reliable data

2009 / United States: field research project to identify the situation on construction sites with regard to adhesive anchor installation in practice.


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Field research project

Protocol: On-site all information relevant to the installation was monitored

On site survey: Installers were interviewed




	Job sites	applications	surveys
Σ	23	26	31

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Fields of application

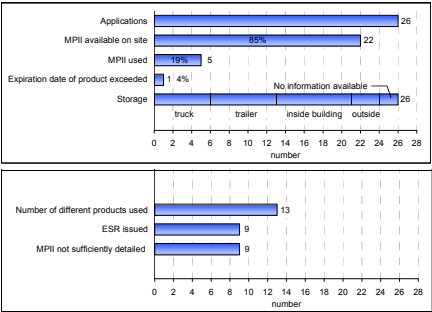
- Structural engineering / bridge construction / road construction / hydraulic engineering
- Structural and non-structural applications
- Threaded rods / rebars
- Installation: downwards / horizontally / overhead



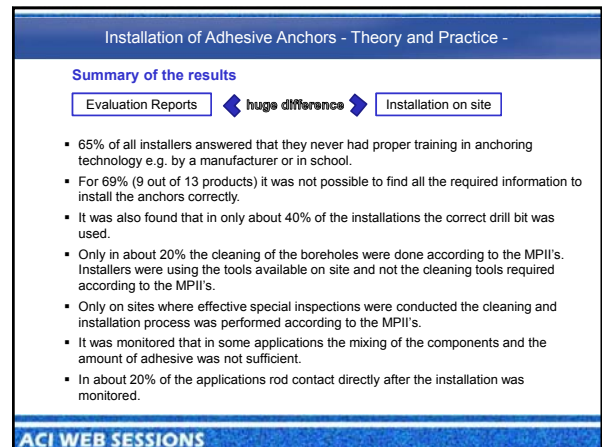
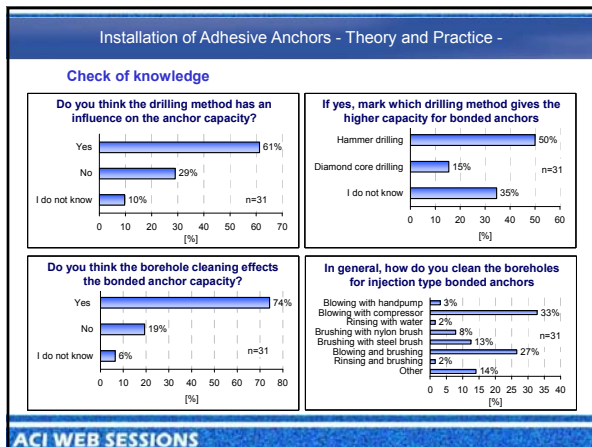
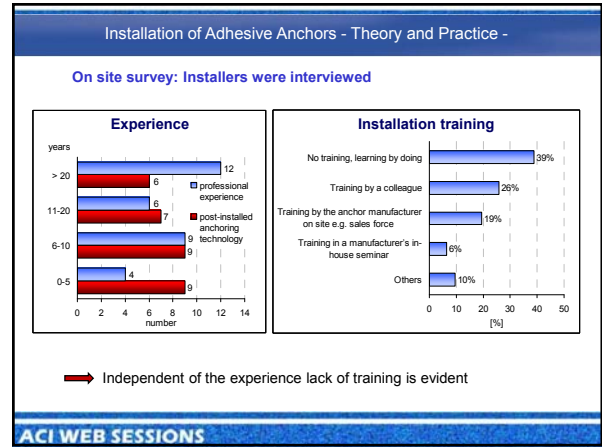
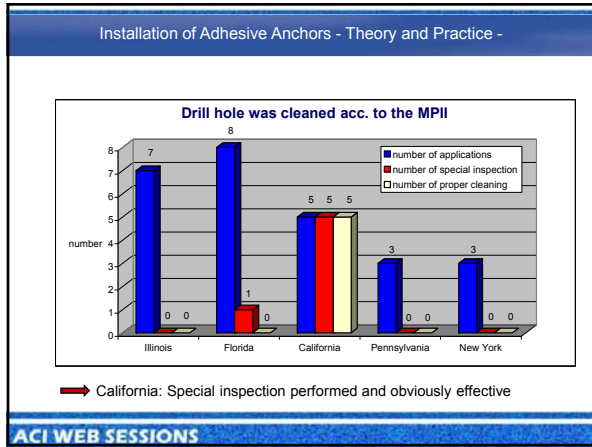
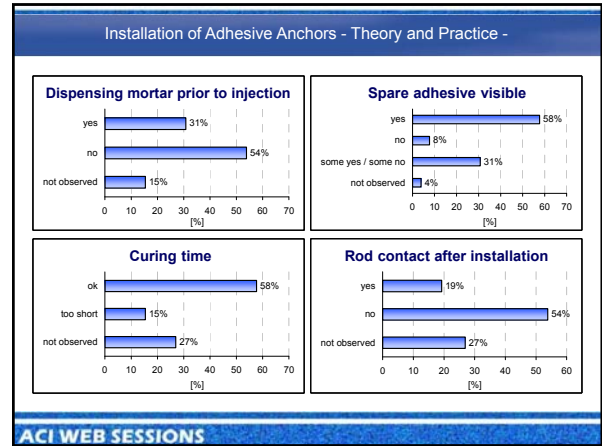
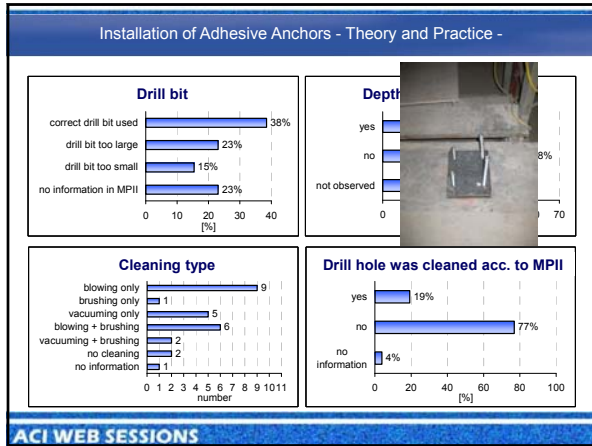
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General observations



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Conclusion

- Sufficient and proper knowledge is available
- Acceptance Criteria are available
→ prequalified product
- ↳ products with an ESR should be used

THEORY

- Correct MPII
- Well trained installers
- Effective special inspection

REALIZATION ON SITE

Safe fastening

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Why should
this not be
possible for a
MPII?

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When using adhesive anchors the **human factor** comes into play

findings demonstrate: lack of knowledge insufficient installation instructions

- ➔ **Installers need a more detailed education**
(ACI Committee C601-A "Adhesive Anchor Installer"
→ new certification program for installers)
- ➔ **Criteria for uniform MPIIs should be demanded**

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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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