What About Adhesive Anchors?
Part 1(B)
ACI Spring 2010 Xtreme Concrete Convention
March 21 - 25, Chicago, IL

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Installation of Adhesive Anchors - Theory and Practice -
ACI Spring 2010 Convention
March 21-25, 2010
Chicago, IL, USA
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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.

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
Practical/On site
Fastener installation acc. to the MPI
- slitting
- hole cleaning
- installation of the adhesive and anchor
- curing process

Theory/Engineering Office
Special inspection
Excerpt from an ESR
Adhesive anchor installations require special inspection in accordance with Section 1701 of the IBC and Section 776 of the IBC. The special inspector must record strength and age of base material, material compliance with ANSI 2212.15-1994, hole diameter, depth and cleanliness, hole location, hole size distance and opening, installation temperature, adhesive product description, including product name, adhesive expiration date, use of proper mixing ratio, verification of properly mixed adhesive prior to injection of adhesive in anchor hole, anchoring undisturbed during gel time, rod type, grade, diameter, length and cleanliness, and verification of anchor installation in accordance with the manufacturer’s instructions and this report.
In Theory: Knowledge is available
In Practice: Failure of adhesive anchor applications happen

Use of adhesive anchors has been called into question

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.

General observations

<table>
<thead>
<tr>
<th>Applications</th>
<th>MPR available on site</th>
<th>MPR used</th>
<th>Expiration date of product respected</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>2</td>
<td>22</td>
<td>22</td>
<td>20</td>
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</table>

<table>
<thead>
<tr>
<th>Number of different products used</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPR not sufficiently obtained</td>
<td>19</td>
</tr>
</tbody>
</table>
Drill hole was cleaned acc. to MPII

Installation on site

Rod contact after installation

Cleaning type

Drill hole was cleaned acc. to MPII

Dispensing mortar prior to injection

No information

Vacuuming + brushing

Rod contact after installation

Experienced

Independent of the experience lack of training is evident

Check of knowledge

If yes, mark which drilling method gives the higher capacity for bonded anchors

In general, how do you clean the boreholes for injection type bonded anchors?

Summary of the results

• 65% of all installers answered that they never had proper training in anchoring technology e.g. by a manufacturer or in school.
• For 69% (9 out of 13 products) it was not possible to find all the required information to install the anchors correctly.
• It was also found that in only about 40% of the installations the correct drill bit was used.
• Only in about 20% the cleaning of the boreholes were done according to the MPII’s. Installers were using the tools available on site and not the cleaning tools required according to the MPII’s.
• Only on sites where effective special inspections were conducted the cleaning and installation process was performed according to the MPII’s.
• It was monitored that in some applications the mixing of the components and the amount of adhesive was not sufficient.
• In about 20% of the applications rod contact directly after the installation was monitored.
**Conclusion**

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

**Safe fastening**

**THEORY**

- Correct MPII
- Well trained installers
- Effective special inspection

**REALIZATION ON SITE**

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**REALIZATION ON SITE**

**Why should this not be possible for a MPII?**

**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)
- SIP-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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