EVALUATION AND DESIGN OF POST-INSTALLED REINFORCING BARS IN FIRE

1) BACKGROUND RESEARCH FOR A EUROPEAN ASSESSMENT DOCUMENT 330087-00-0601: SYSTEMS FOR POST-INSTALLED REBAR CONNECTIONS WITH MORTAR

2) CURRENT TASKS FOR DEVELOPING EVALUATION THROUGH AC308

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**The 3 Step Method in Europe**

**Temperature distribution**

**Bond strength – temperature relationship**

**Load capacity by integration of bond strength**

\[ F_{Fire} = 2\pi r \int_0^L f_b(\theta(x)) \, dx \]
Partie 1 - 2

Temperature distribution

Justifications on thermal calculation

- Accuracy of the thermal profiles (using the Eurocode method)
Justifications on the test procedure

- Type of heating curve (standardized or not)
- Thermal boundaries
- Type of test (constant load or stabilized temperature)
- Bond geometry and temperature measurements

Justifications on the bond strength – temperature relationship

- Spacing between data points
- Stress threshold (caused by ambient temperature design)
- Trend curve and interpolation
Justifications on the Resistance Integration Method

- Theoretical quantification of the influence of displacements
- Validation of the method with a **full-scale test**

\[
F_{\text{Fire}} = 2.\pi. r. \int_0^L f_b(\theta(x)).dx
\]
CURRENT TASKS FOR DEVELOPING EVALUATION THROUGH AC308

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR POST-INSTALLED ADHESIVE ANCHORS IN CONCRETE ELEMENTS (AC308)

Annex 1: Post-installed reinforcing bars under fire conditions

Status:
- CAMA submitted a revised draft for ICC-ES on the 13/10/2020
- Scheduled for the ICC hearing in February 2021

Test sample at high temperature

Bond resistance – temperature relationship

\[ \tau_{\text{fire}(\theta)} = a \cdot e^{-b \cdot \theta} \text{psi (1 MPa)} \]
FUTURE TASKS

- Proposed testing and evaluation method awaiting validation by ICC-ES (February 2021 hearing)

- Design method needs to be formalized based on:
  - Temperature profiles
  - Increase of development length under fire

<table>
<thead>
<tr>
<th>European Design</th>
<th>American Design</th>
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<tbody>
<tr>
<td>Ambient Temperature</td>
<td>Bond strength ($f_b$)</td>
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<td>Bond strength integration</td>
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<tr>
<td>Fire Situation</td>
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<tr>
<td>$F_{Fire} = 2.\pi.r \int_0^{\text{bond length}} f_b(\theta(x)) \cdot dx$</td>
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