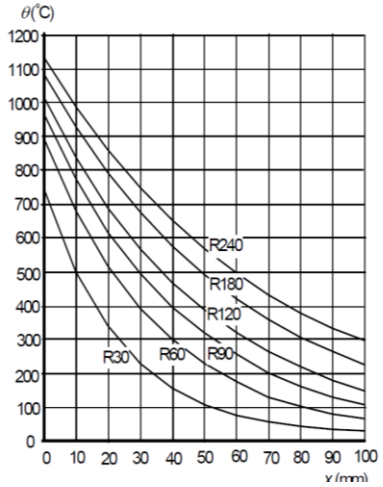
EVALUATION AND DESIGN OF POST-INSTALLED REINFORCING BARS IN FIRE

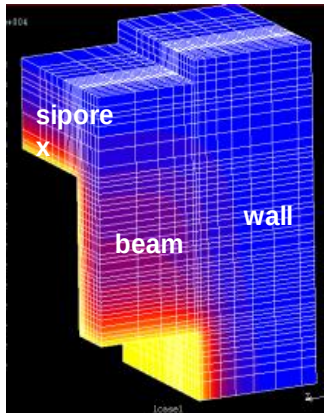
1) BACKGROUND RESEARCH FOR A EUROPEAN ASSESSMENT DOCUMENT 330087-00-0601: SYSTEMS FOR POST-INSTALLED REBAR CONNECTIONS WITH MORTAR

2) CURRENT TASKS FOR DEVELOPING EVALUATION THROUGH AC308

THE 3 STEP METHOD IN EUROPE

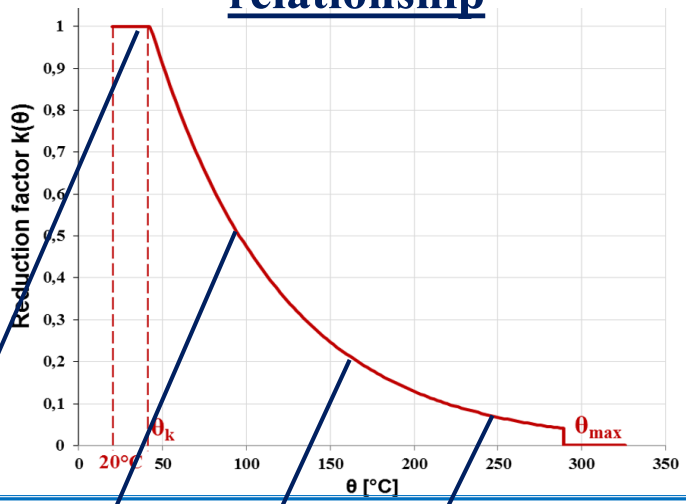
Temperature distribution





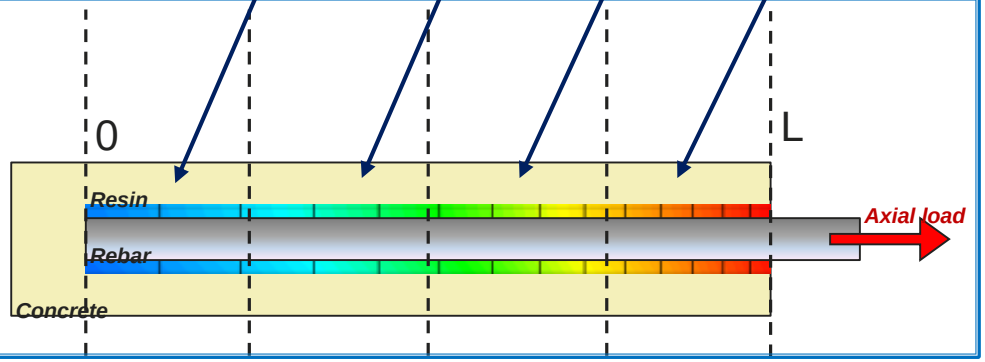
EC2, part 1-2

Bond strength – temperature relationship



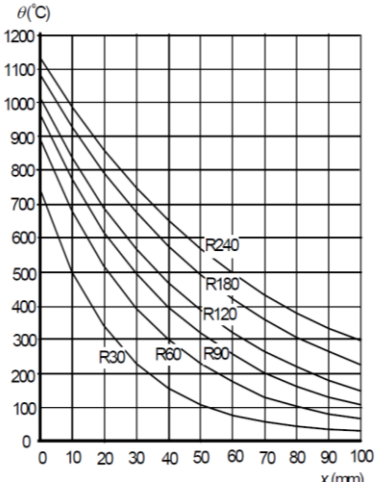
Load capacity by integration of bond strength

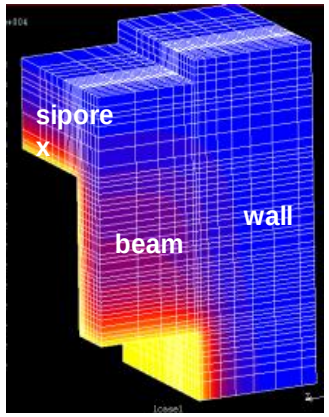
$$F_{Fire} = 2.\pi.r.\int_0^L f_b\left(\theta(x)\right).dx$$



STEP 1 : JUSTIFICATIONS

Temperature distribution





EC2, partie 1-2

Justifications on thermal calculation

- Accuracy of the thermal profiles (using the Eurocode method)

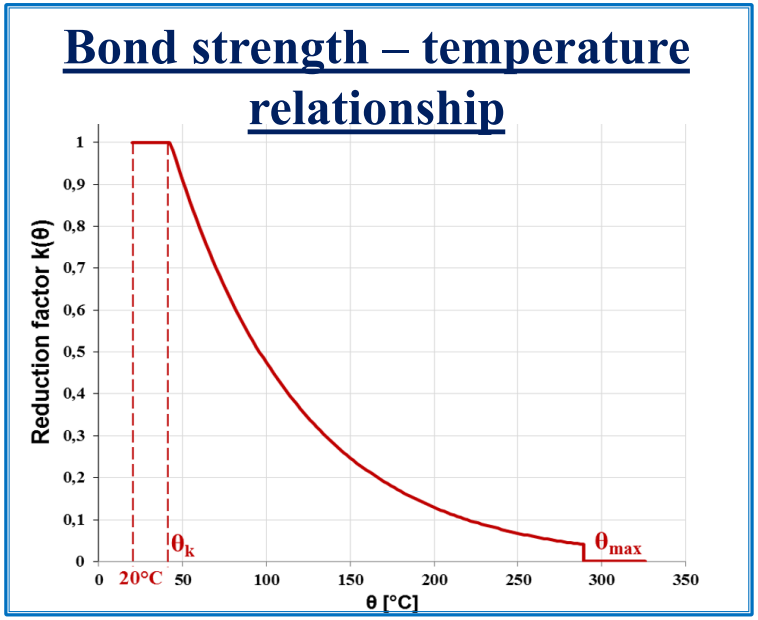
STEP 2 : JUSTIFICATIONS

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



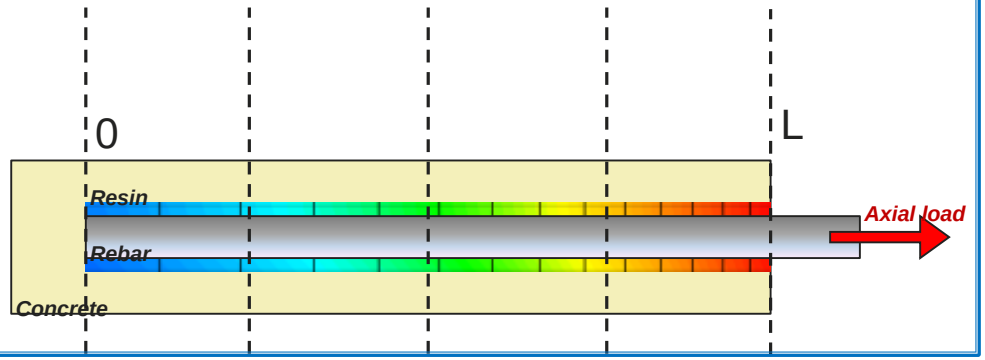
STEP 3 : JUSTIFICATIONS

Justifications on the Resistance Integration Method

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

Load capacity by integration of bond strength

$$F_{Fire} = 2.\pi.r.\int_0^L f_b\left(\theta(x)\right).dx$$



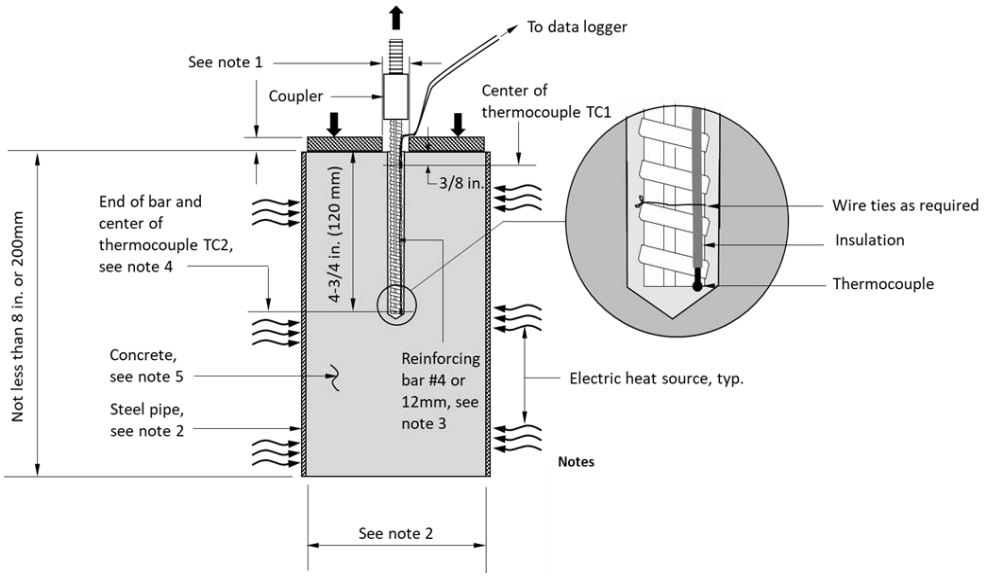
PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR POST-INSTALLED ADHESIVE ANCHORS IN CONCRETE ELEMENTS (AC308)

Annex 1: Post-installed reinforcing bars under fire conditions

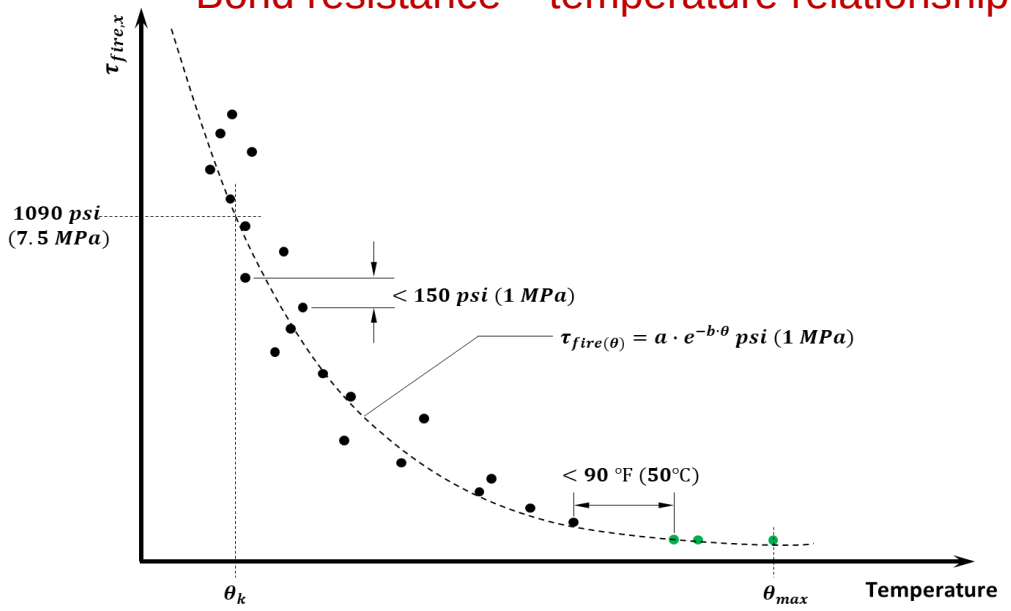
Status:

- 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



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

	European Design	American Design
Ambient Temperature	Bond strength (f_b)	Development length (ACI 318-19) $\ell_d = \left(\frac{3}{40} \frac{f_y}{\lambda \sqrt{f'_c}} \frac{\Psi_t \Psi_e \Psi_s \Psi_g}{\left(\frac{c_b + K_{tr}}{d_b} \right)} \right) d_b$
Fire Situation	Bond strength integration $F_{Fire} = 2.\pi.r.\int_0^{L} f_b(\theta(x)).dx$ (L: bond length)	**Currently being established**