Damaged Reinforced Concrete and Fire

Tensile Cracking and Fire Resistance

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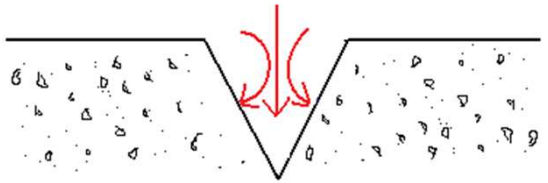
How does tensile cracking affect the fire resistance?

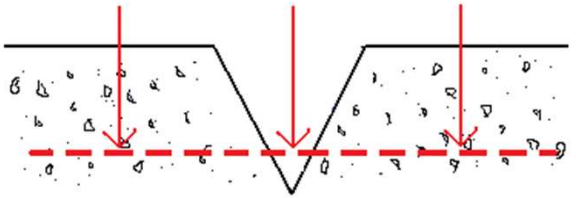
There are THREE possible outcomes

- Hypothesis I
  - The **air** within the tensile cracks **acts as an insulator**
  - **Thermal propagation decreases**
  - **Temperature** at rebar level **rises less quickly**

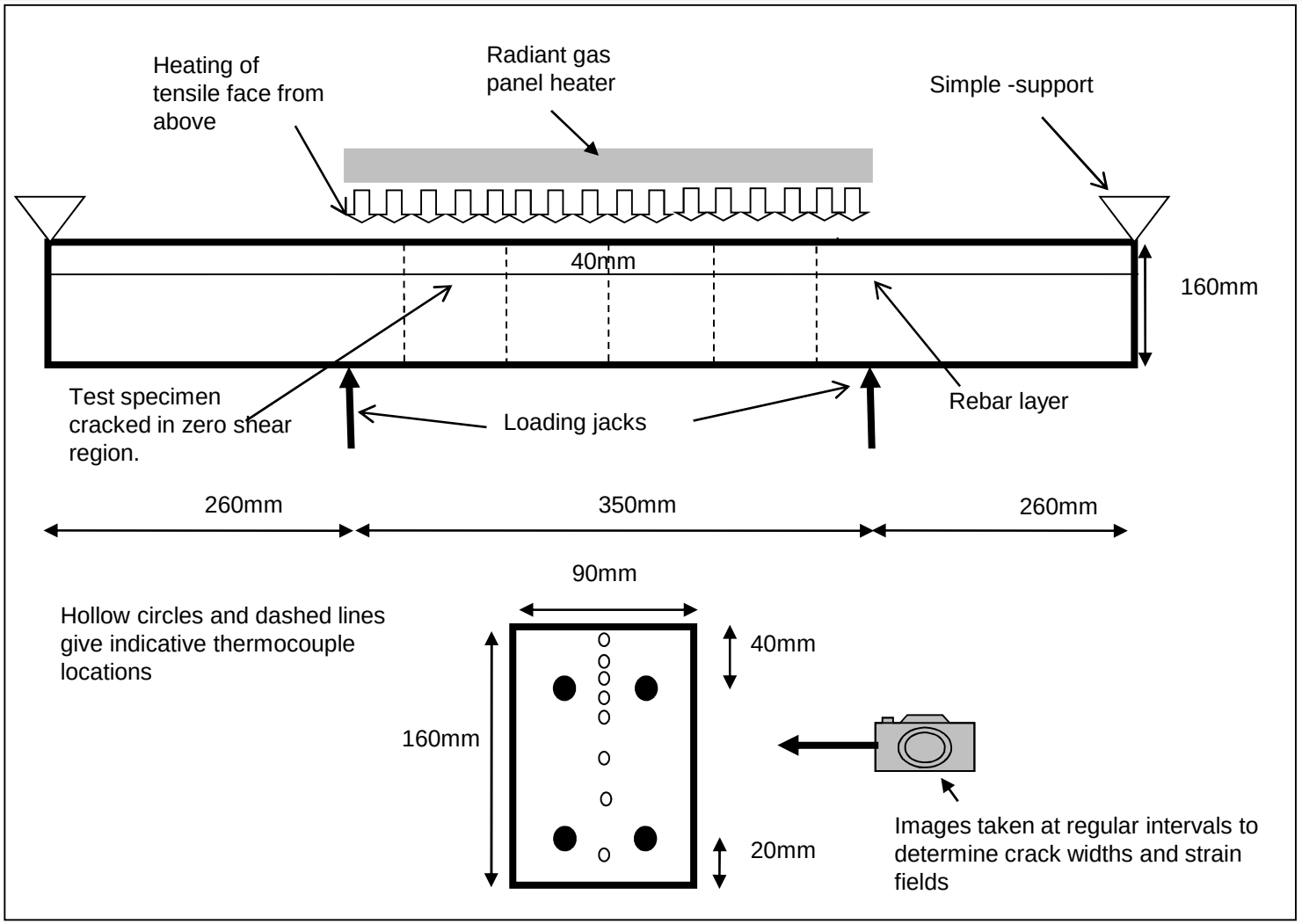
- Hypothesis II
  - The tensile cracks allows **radiation and buoyancy** effects to become **more dominant**
  - **Thermal propagation increases**
  - **Temperature** at rebar level **rises more quickly**



- Hypothesis III
  - The tensile cracks causes **no significant difference** to the thermal propagation of the structure
  - Temperature at rebar level experiences **similar temperatures**

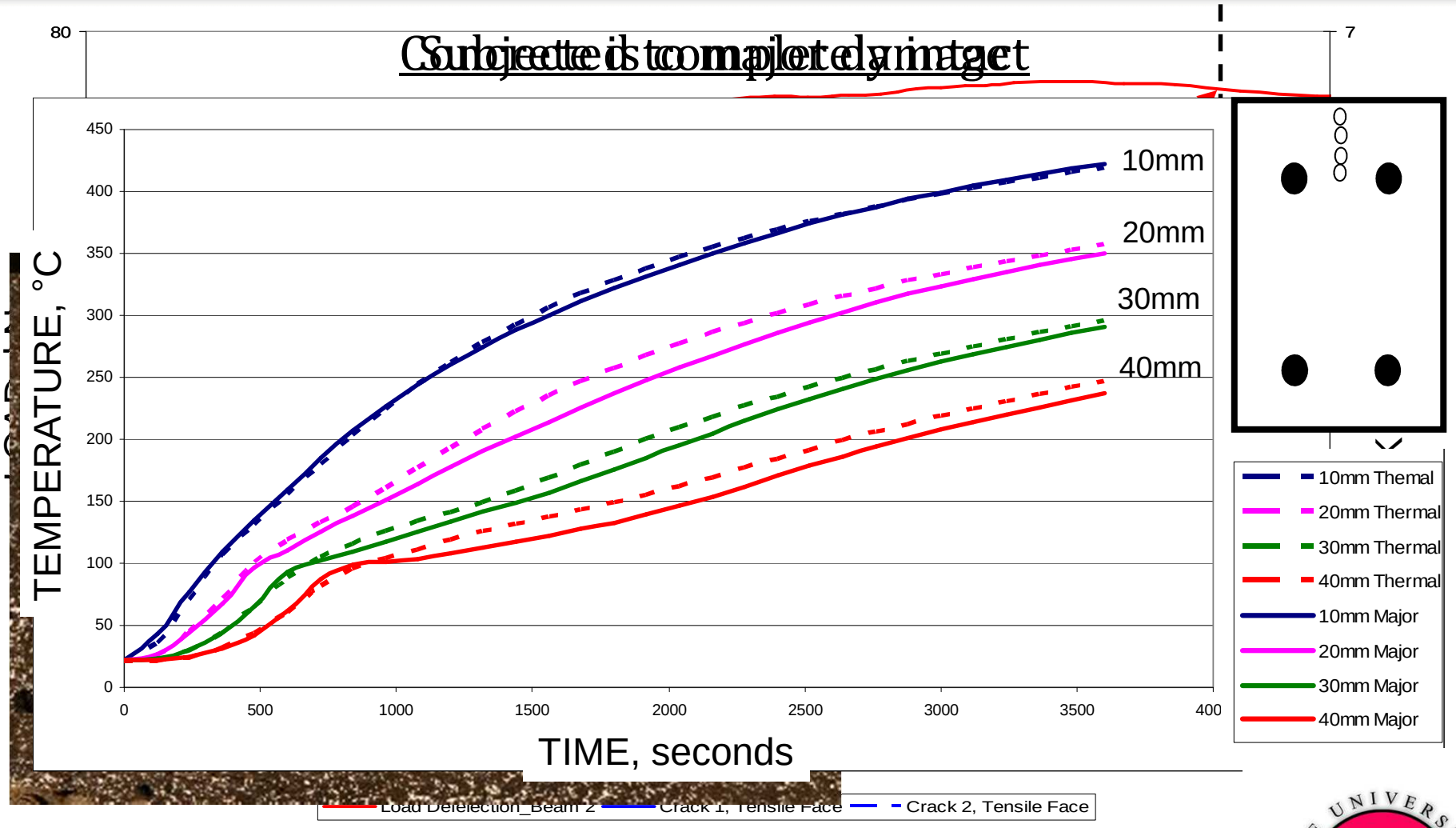


Experimental Set-up?



- Thermal Load of 35kW/m^2
- Crack widths are kept constant throughout heating phase
- Beam side images enable measurements throughout the heating phase

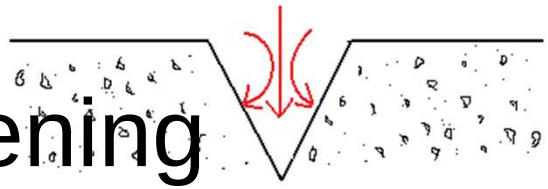
Defining the level of "damage"



Conclusions

- Hypothesis I
  - The air within the tensile cracks acts as an insulator
  - Thermal propagation decreases
  - Temperature at rebar level rises less quickly

- Hypothesis II
  - The tensile cracks allows radiation and buoyancy effects to become more dominant
  - Thermal propagation increases
  - Temperature at rebar level rises more quickly



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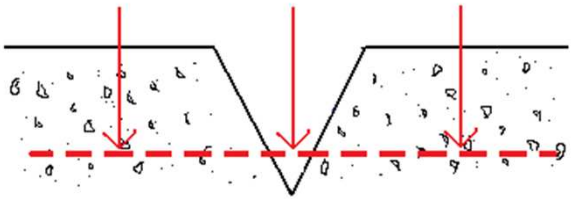

Computational modelling of damaged reinforced concrete structures in fire does not have to include thermal effects brought about by "tensile cracking"

Thank you for listening

Questions?