MOTIVATION - SPALLING IN CONSTRUCTION
- Flaking from the exposed surface, sometimes explosively
- Reduces cover, exposes reinforcement to high temperature
- Has been shown to be primary mechanism of structural failure in some building fires
- High strength concrete particularly susceptible
- Polypropylene Fibres currently used as countermeasure

MECHANISMS OF SPALLING
- Three major mechanisms of spalling:
  1. Thermo-mechanical
  2. Thermo-hydraulic
  3. Thermo-chemical
- Other minor mechanisms, including but not limited to:
  1. Boundary Stress
  2. Aggregate type and mixture
  3. Compaction
  4. Sample size
- Problem is complex, and after 150 years of research, no study has shown a clear mechanism which dominates the spalling problem

APPROACH
- Three variables to be tested:
  1. Free Water Content (0% - Full Saturation)
  2. Heating Regime (ISO 834, Hydrocarbon, Parametric)
  3. Polypropylene Fibre Content (0 – 5 kg/m³)
- Aim is to determine the dominant mechanism behind the phenomenon
- Use thermocouples set at depth to determine temperature profile at time of first spalling occurrence

WORKS TO DATE AND PRELIMINARY RESULTS
- Samples cast:
  39 Samples cast (300mm x 300mm x 220mm)
  39 cubes for testing moisture content
  30 cylinders for testing tensile and compressive strength
- Preliminary masses of moisture cubes taken for reference to show evolution during curing

CONCLUDING REMARKS AND FUTURE WORK
- Still to complete:
  1. 28 Day compressive tests
  2. Spalling Test
  3. Compressive and Tensile testing
  4. Moisture Gradient Testing