Modelling of Reinforced Concrete Frames in Fires Following an Earthquake

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Introduction

Earthquake and fire resistant design are two different fields in structural engineering. Earthquake motion may trigger fires in the damaged structure. As a result the fire resistance of the structure may be significantly impaired.

(a)

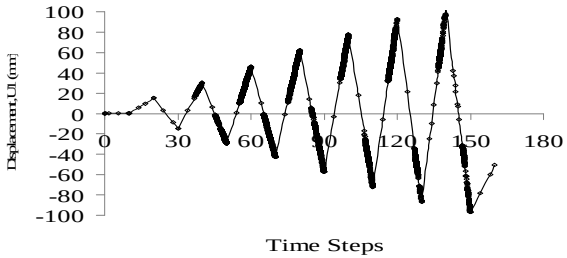
(b)

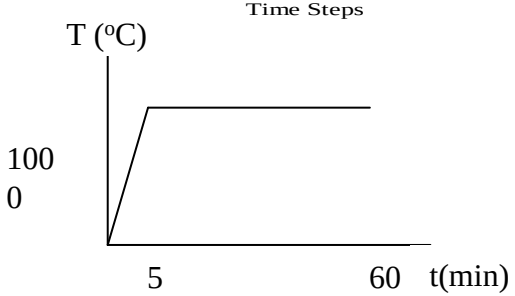
Figure 1 (a) The 1906 San Francisco Earthquake (b) The Famous Maruzen Bookstore after The 1923 Tokyo Earthquake

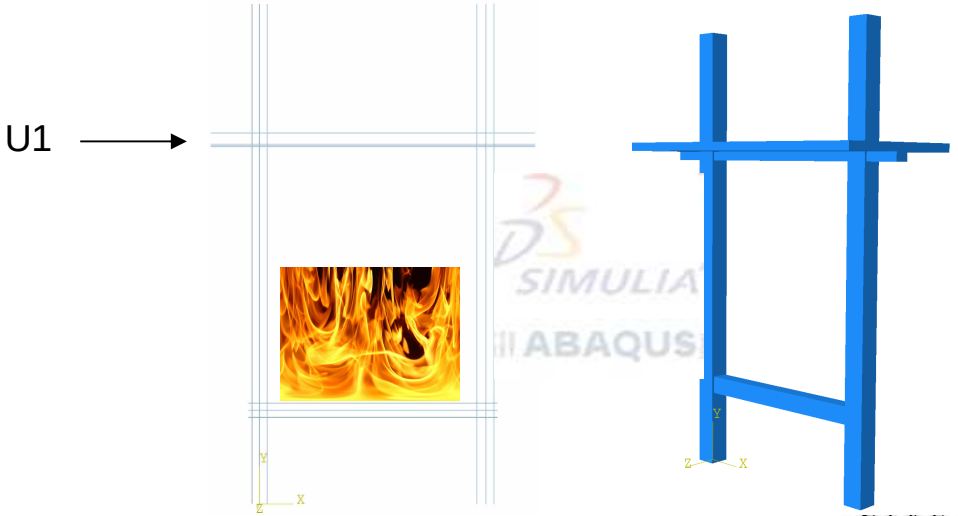
This research is particularly concerned with the response of reinforced concrete (RC) frames in a fire following an earthquake.

Numerical Modelling

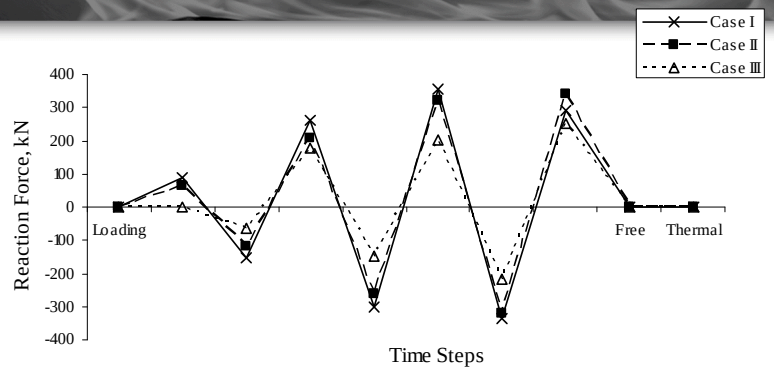
- 2D Finite element beam model
- (B21-Timonshenko Beam-Shear Flexible)
- Material properties of the frame are assigned from EuroCode2-Part 1
- Concrete Damaged Plasticity-Concrete Model in ABAQUS
- 7 cycles of lateral displacement are applied at slab level and the lateral reaction at the base of the frame is observed
- The frame is exposed to heating for 1 hour. (at a constant 1000^{0}C)



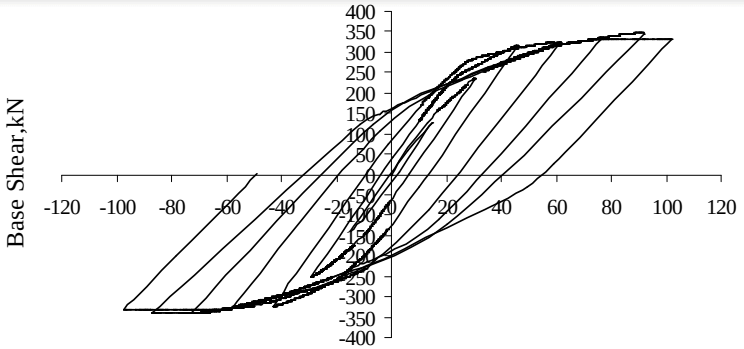




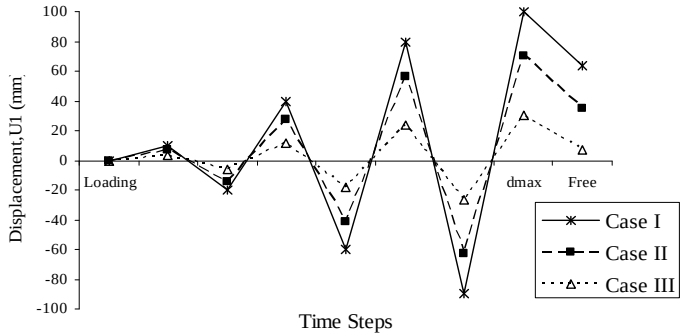
Result Analysis



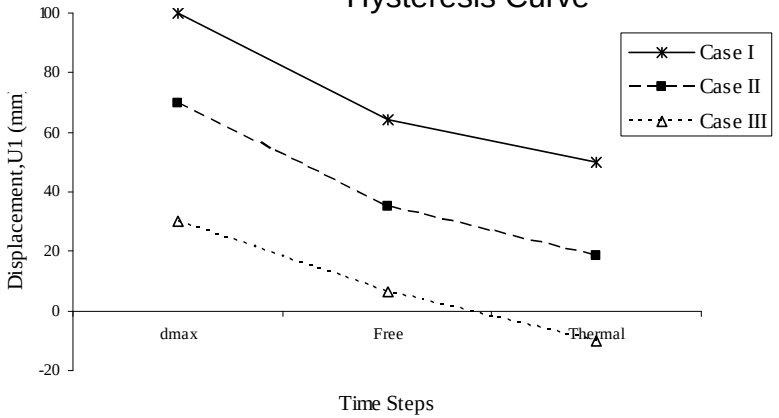
Reaction force of the frame



Hysteresis Curve



Displacement History



Displacement of the frame after the heating

•There is a reduction in the residual displacement of the frame after heating.

Future Research

The computational results will be compared with the test results on real frames currently being carried out at IIT Roorkee, India.

Frame Test in IIT Roorkee,India

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