

## Experimental and Analytical Studies of the Compression Zone within a Steel Joint at Elevated Temperatures



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## Introduction

The purpose of this research contract is to:

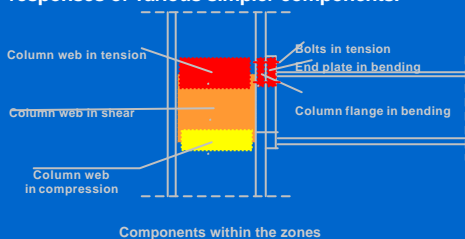
- investigate analytically and experimentally the behaviour of steel beam-to-column joints at elevated temperatures.

How to carry out the analytical investigation?

- By using the principles of "component method" at ambient temperature and then simulate the behaviour at elevated temperatures.

## "Component method"

- In the "component method" the overall joint behaviour is assumed to be the sum of the responses of various simpler components.

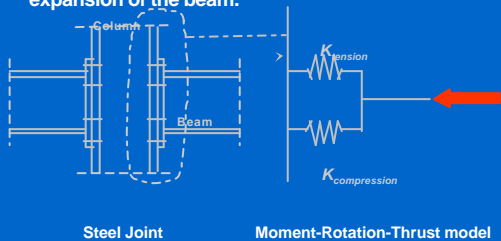


## Objectives

- Experimental investigation of an individual or a group of components at elevated temperatures.
- Use the principles of the "component method" in order to calculate the effects on strength and stiffness of a steel beam to column joint.
- Assemble the components and thus predict Moment-Rotation-Thrust relationships across a range of temperatures.

## Moment-Rotation-Thrust model

- Moment-Rotation-Thrust model takes into account the high axial force that occur due to thermal expansion of the beam.



## Experimental Program

- Four different column sizes have been tested at elevated temperatures

Phases	Column Size	Depth Between Fillets d (mm)	Thickness of Web s (mm)	Web Ratio for Local Buckling d/s
A	UC152x152x30	123.6	6.5	19.0
B	UC203x203x46	160.8	7.2	22.3
C	UC203x203x71	160.8	10.0	16.1
D	UC203x203x86	160.8	12.7	12.7

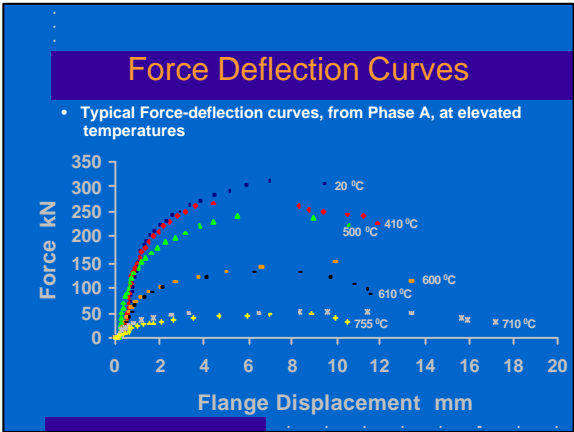
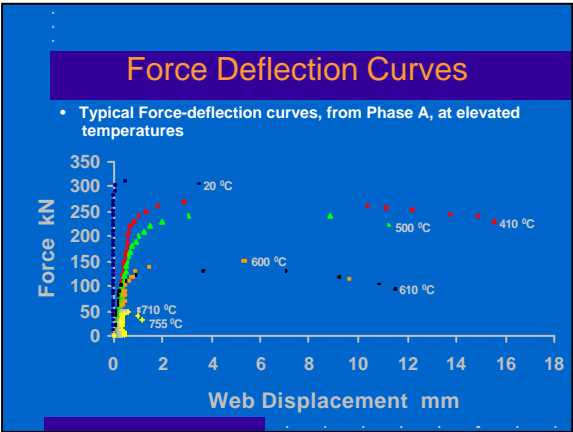
### Experimental Program

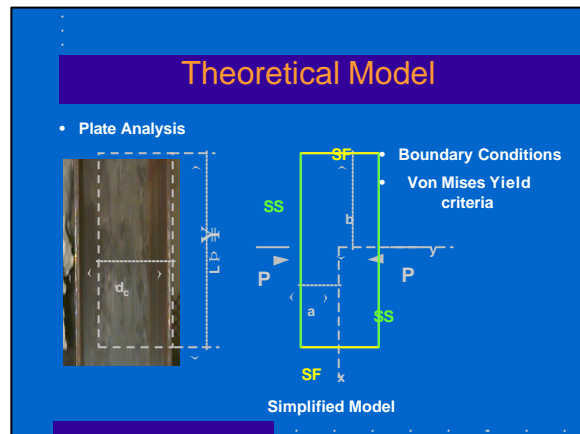
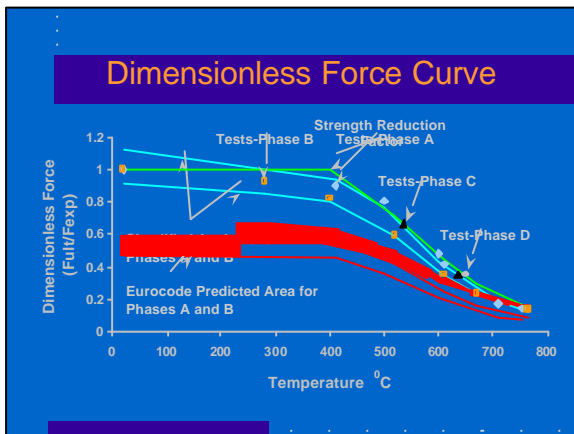
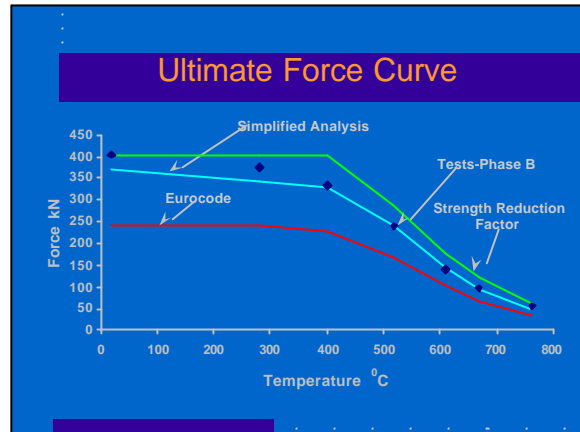
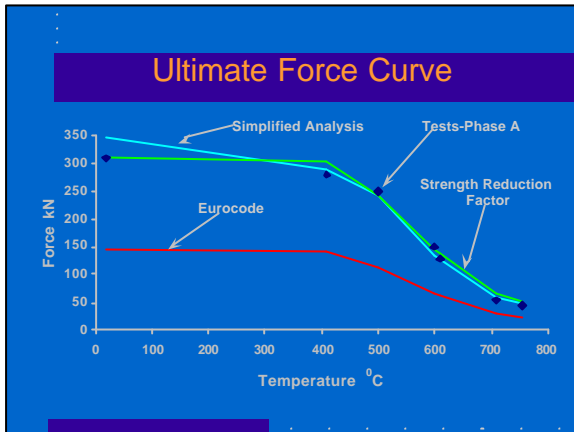
- Compression zone high temperature test arrangement

### Experimental Program

### Typical Test Specimen

### Camera Images





### Future development

- Complete the experimental investigation on the behaviour of the component within the compression zone.
- Assembly of the Moment-Rotation-Thrust curves for a steel beam to column joint at elevated temperatures.
- Perform simulations incorporating Moment-Rotation-Thrust curves.

$K_{compression}$

Thank you