Axial restrain effects on fire resistance of statically indeterminate RC beams

Cvetkovska M., Todorov K., Lazarov Lj.

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Support conditions of structural beam elements

Influence of structural system on the beam axial stiffness restrain

The level of axial restrain depends on many factors, such as:
- type of structural system,
- dimensions of surrounding elements,
- their lengths,
- type of connections,
- characteristics of used structural materials,
- etc.

Axial stiffness dependence of node displacements
Support conditions of structural beam elements
Influence of structural system on the beam axial stiffness restrain

Rotational stiffness dependence of node displacements
AXIAL RESTRAIN EFFECTS ON FIRE RESISTANCE OF BEAMS

Case 1

Fire induced axial force for different spring stiffness

Maximal induced axial force in case of different spring stiffness
AXIAL RESTRAIN EFFECTS ON FIRE RESISTANCE OF BEAMS

Maximal induced axial force in case of different spring stiffness

Maximal support displacements in case of different spring stiffness
AXIAL RESTRAIN EFFECTS ON FIRE RESISTANCE OF BEAMS

Case 1

Maximal induced axial force in case of different spring stiffness

Fire resistance of the beam in case of different spring stiffness

Meri Cvetkovska, Koce Todorov, Ljupco Lazarov, "Axial restrain effects on fire resistance of statically indeterminate RC beams"
FIRE RESISTANCE OF A BEAM AS A PART OF A STRUCTURE

FS1-fire scenario 1

$t=0.0 \text{ h}$

$K_1=40\text{MN/m} \quad K_3=850\text{MNm/rad}$

$t=1.0 \text{ h}$

$K_1=20\text{MN/m} \quad K_3=850\text{MNm/rad}$

Meri Cvetkovska, Koce Todorov, Ljupco Lazarov, "Axial restrain effects on fire resistance of statically indeterminate RC beams"
Fire resistance of a beam as a separate element and as a part of a structure

<table>
<thead>
<tr>
<th>t (h)</th>
<th>Fire scenario</th>
<th>Fire resistance (h)</th>
<th>Spring stiffness (MN/m)</th>
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$K_1 = 10\text{MN/m}$ on one side, $K_3 = \infty$
THANK YOU FOR THE ATTENTION