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Faculty of Civil Engineering, Skopje
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Axial restrain effects on fire resistance of statically indeterminate RC beams

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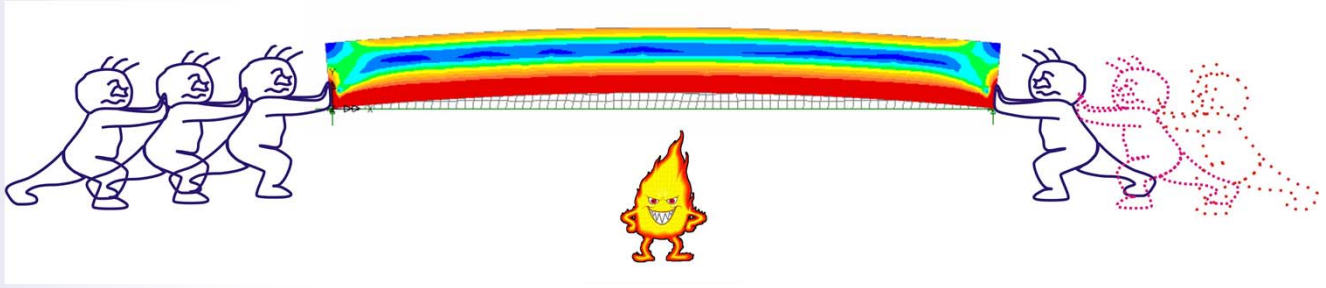
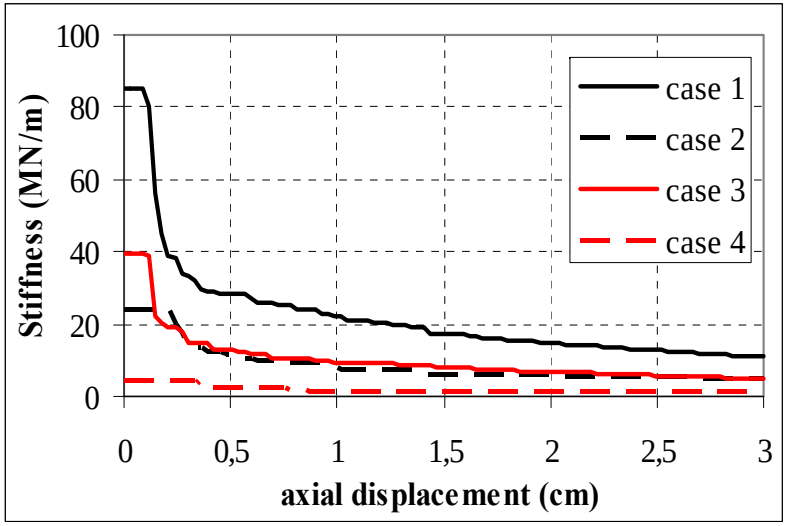


Support conditions of structural beam elements

Influence of structural system on the beam axial stiffness restrain



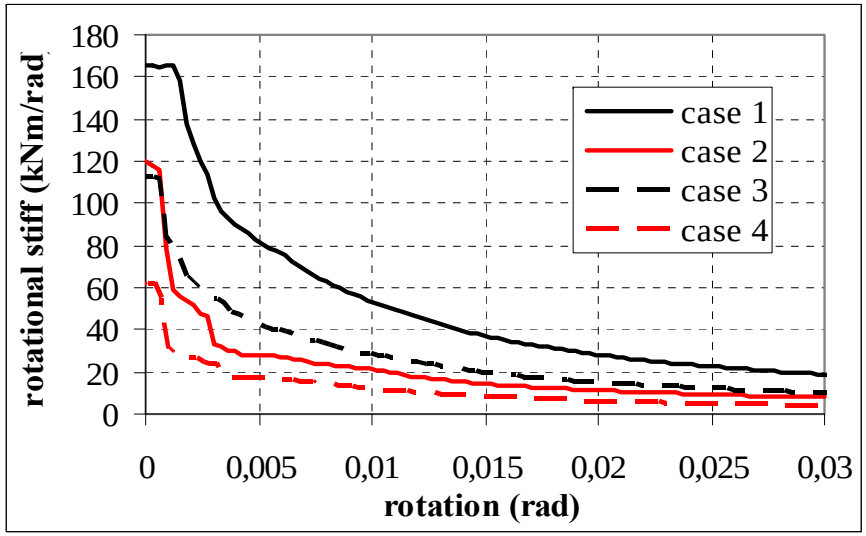
Axial stiffness dependence of node displacements

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.

Support conditions of structural beam elements

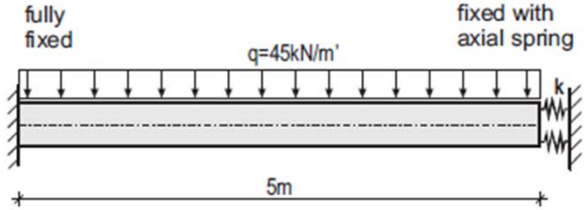
Influence of structural system on the beam axial stiffness restrain

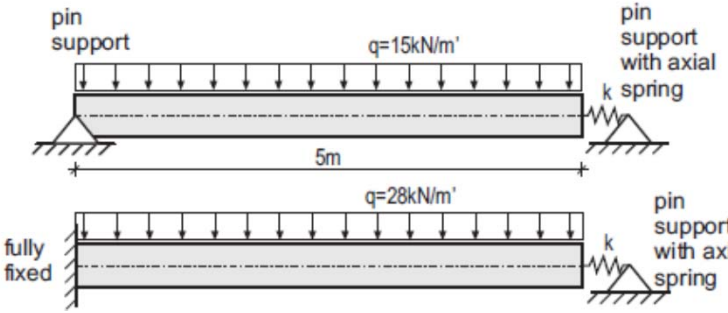


Rotational stiffness dependence of node displacements

AXIAL RESTRAIN EFFECTS ON FIRE RESISTANCE OF BEAMS

Case 1

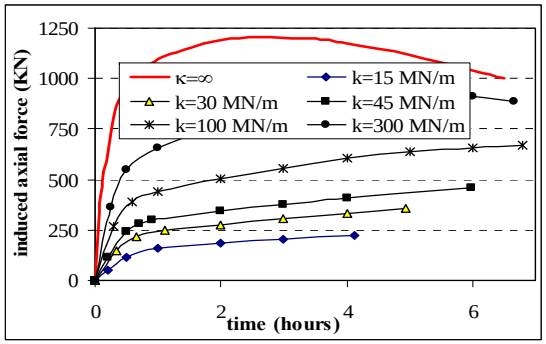


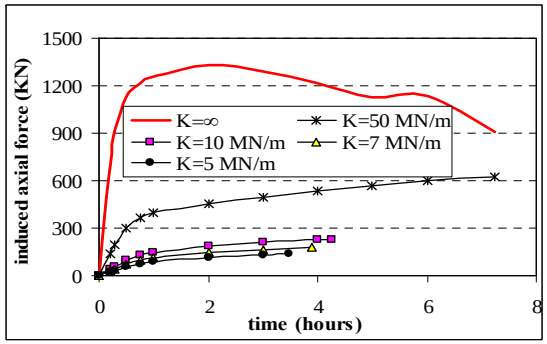


Case 2

Case 3

Case 1

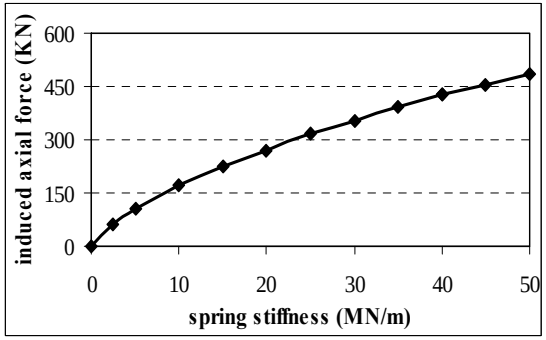


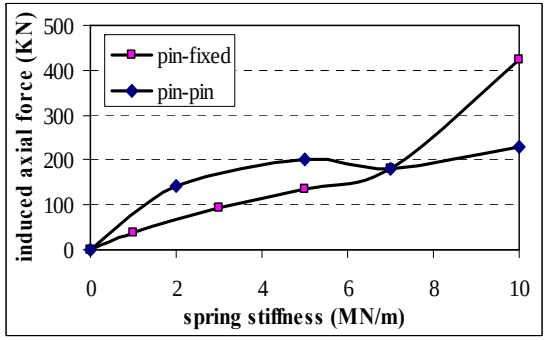


Case 2

Fire induced axial force for different spring stiffness

Case 1





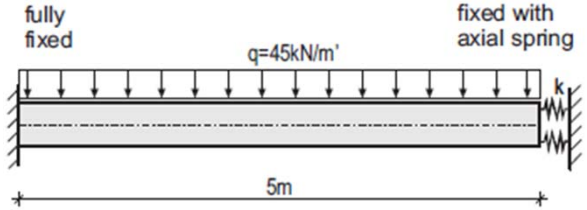
Case 2

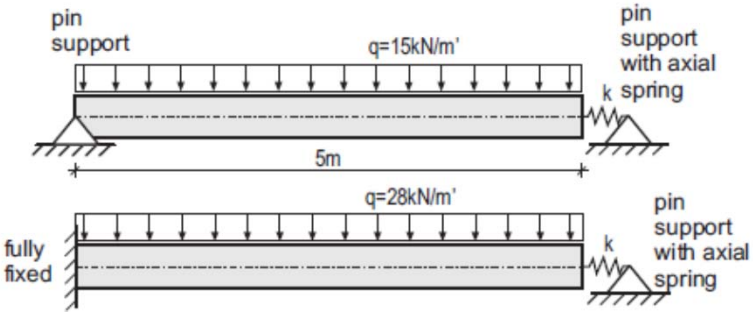
Case 3

Maximal induced axial force in case of different spring stiffness

AXIAL RESTRAIN EFFECTS ON FIRE RESISTANCE OF BEAMS

Case 1

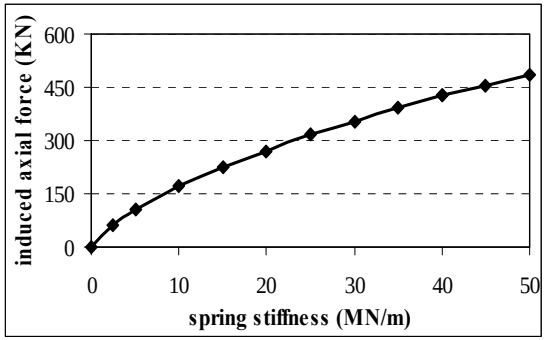


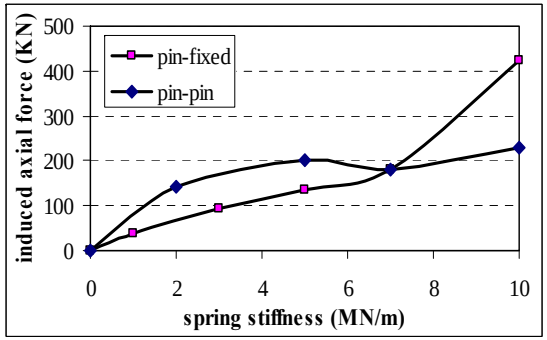


Case 2

Case 3

Case 1



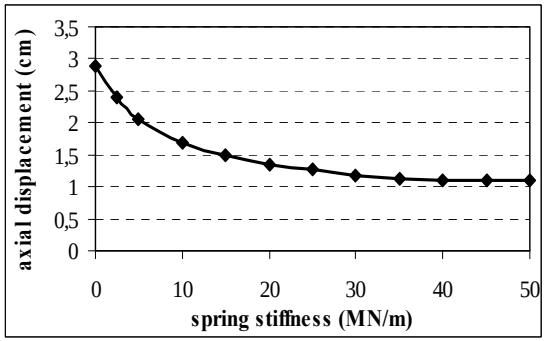


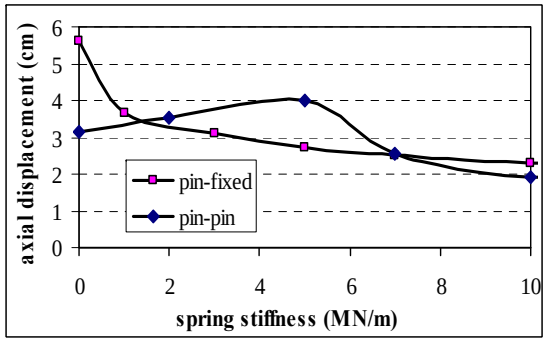
Case 2

Case 3

Maximal induced axial force in case of different spring stiffness

Case 1





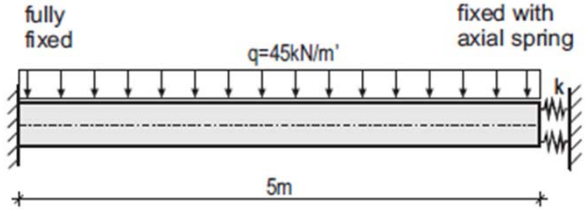
Case 2

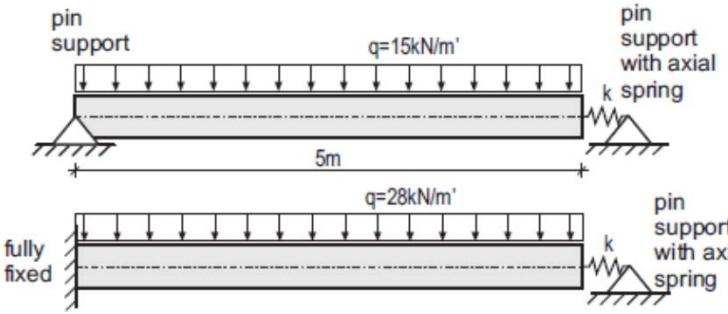
Case 3

Maximal support displacements in case of different spring stiffness

AXIAL RESTRAIN EFFECTS ON FIRE RESISTANCE OF BEAMS

Case 1

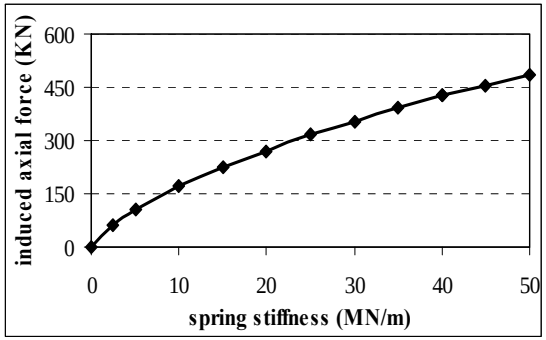


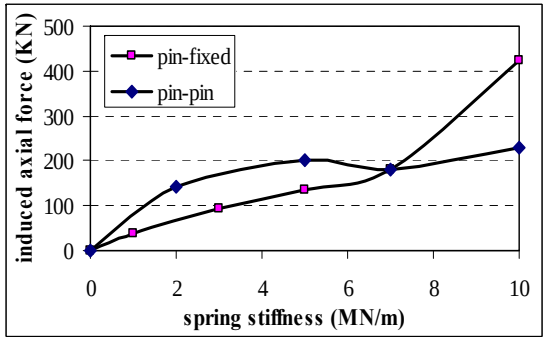


Case 2

Case 3

Case 1



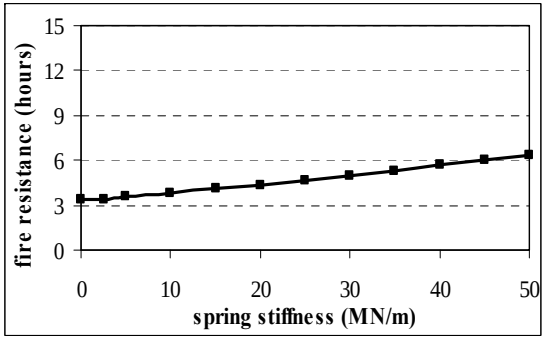


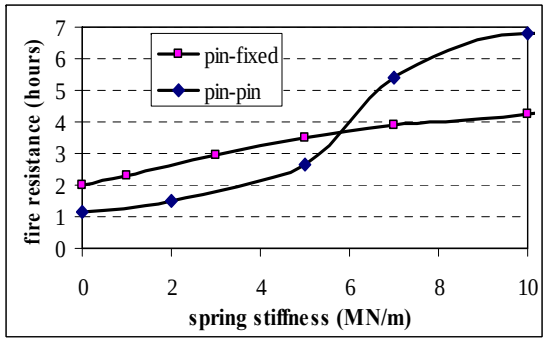
Case 2

Case 3

Maximal induced axial force in case of different spring stiffness

Case 1





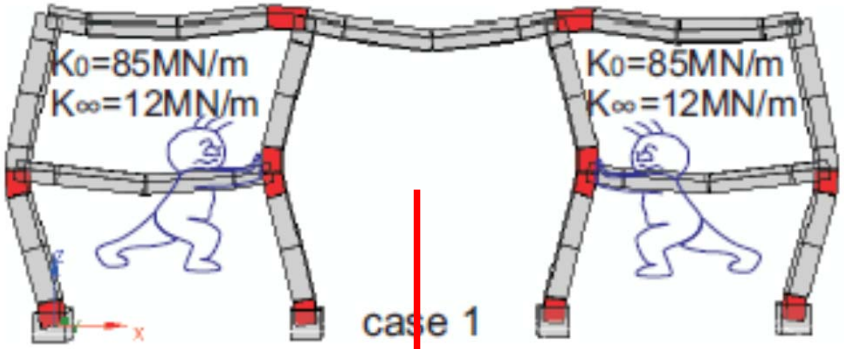
Case 2

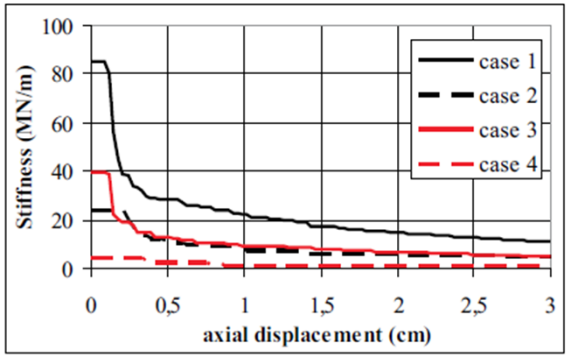
Case 3

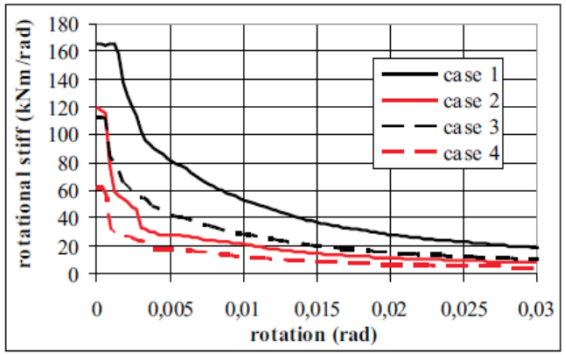
Fire resistance of the beam in case of different spring stiffness

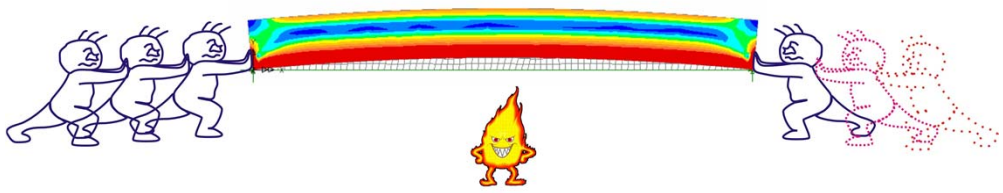
FIRE RESISTANCE OF A BEAM AS A PART OF A STRUCTURE

FS1-fire scenario 1









t=0.0 h

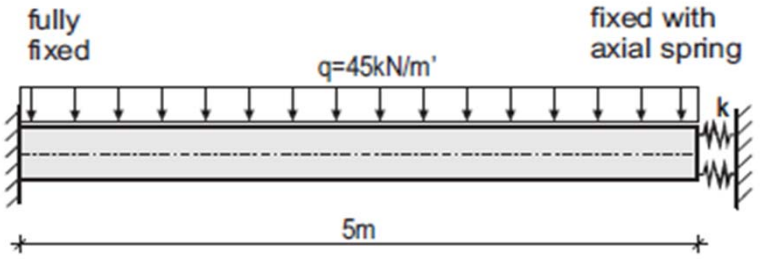
K_1=40MN/m , K_3=850MNm/rad

t=1.0 h

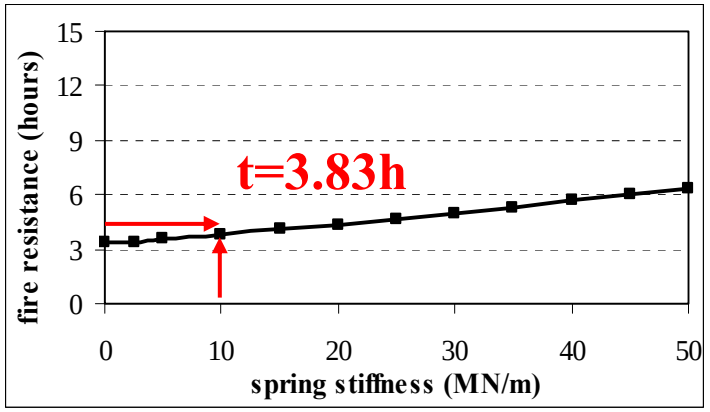
K_1=20MN/m , K_3=850MNm/rad

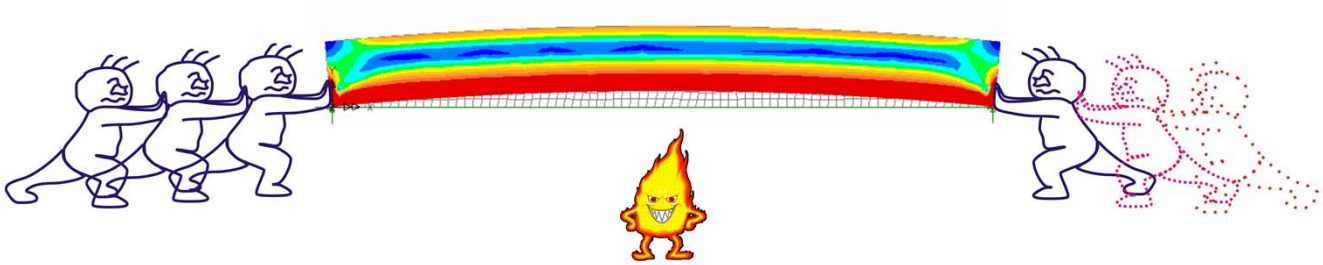
FIRE RESISTANCE OF A BEAM AS A PART OF A STRUCTURE

Fire resistance of a beam as a separate element and as a part of a structure

	fire scenario		induced axial force N (KN)
t=0.0	FS1		0
	FS2		0
t=1.0	FS1		-114
	FS2		-128
t=2.0	FS1		-139
	FS2		-140
t=3.47	FS1		161
	FS2		147
t=3.75	FS1		166

K_1=10MN/m on one side, K_3=∞





THANK YOU FOR THE ATTENTION