

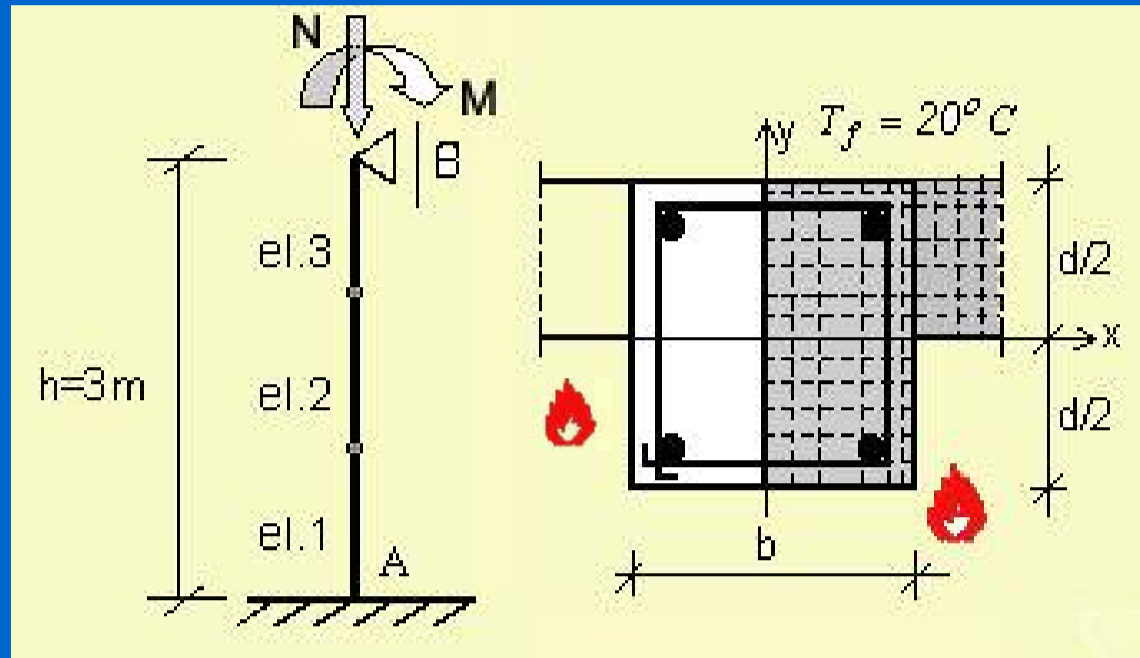


FIRE RESISTANCE CURVES FOR RC COLUMNS



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Geometry, support conditions and discretization of the cross section of the column



LOAD COEFFICIENTS FOR:

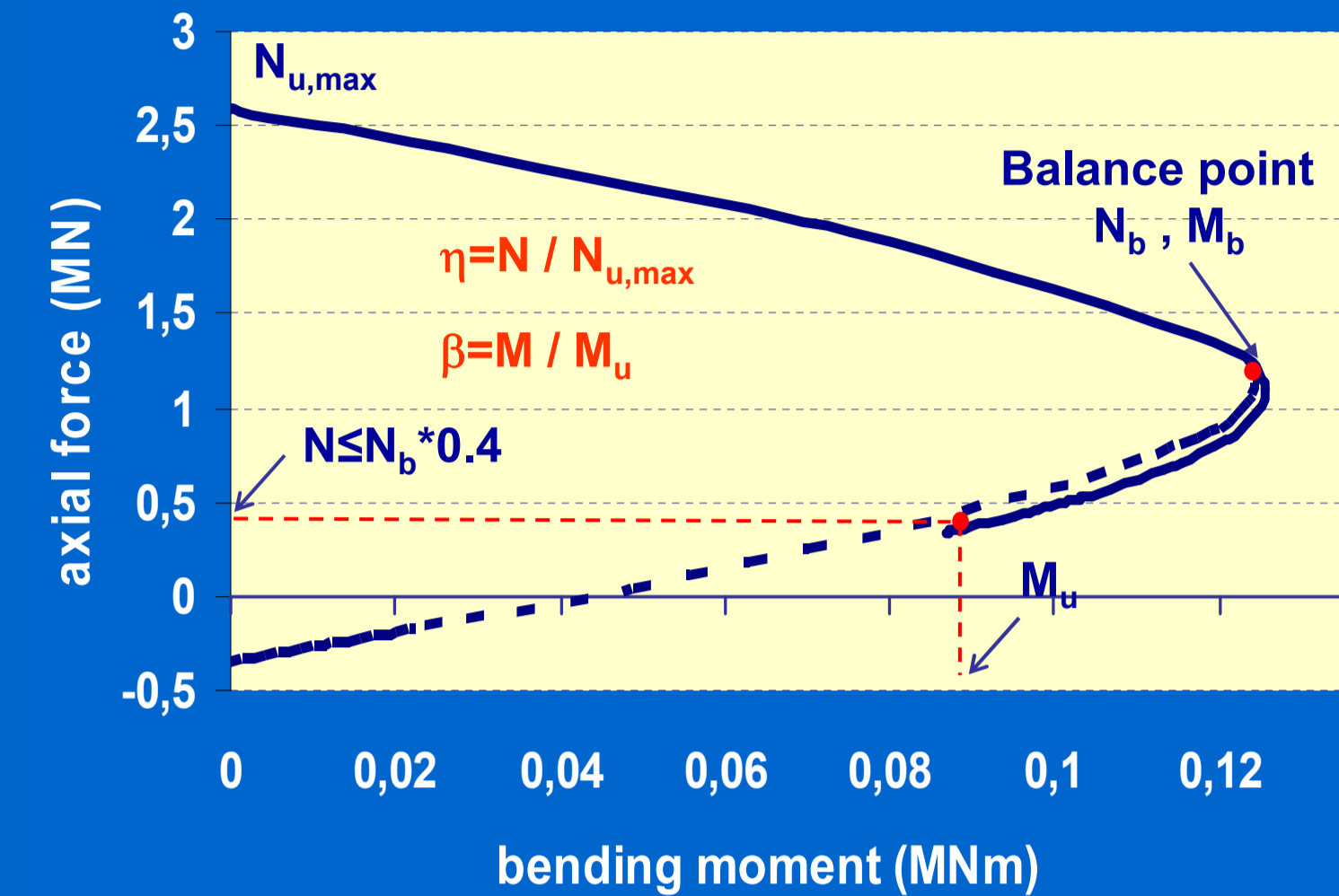
axial force:

$$\eta = \frac{N}{N_{u,max}}$$

bending moment:

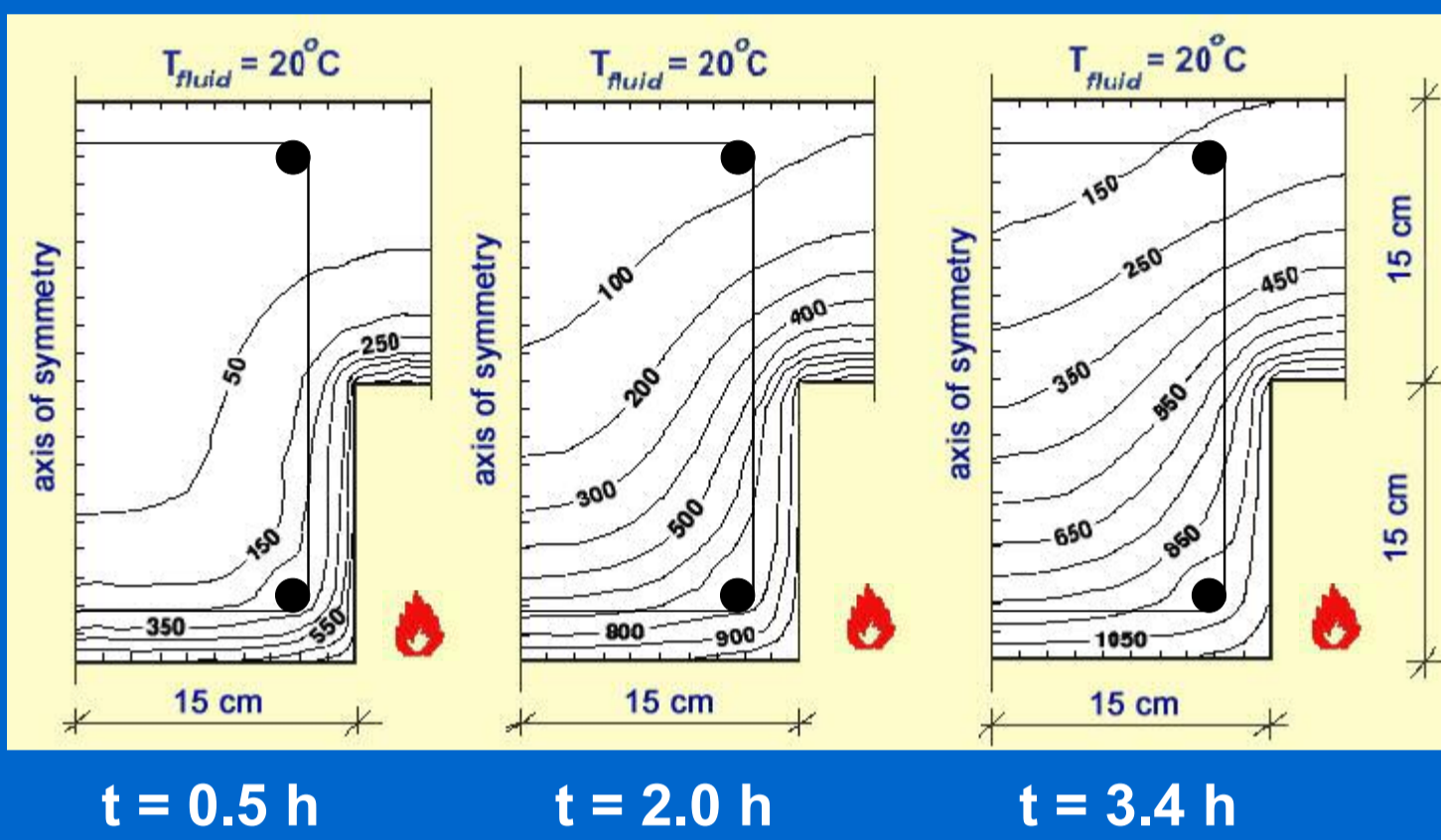
$$\beta = \frac{M}{M_u}$$

M-N diagram of the column at ambient temperature



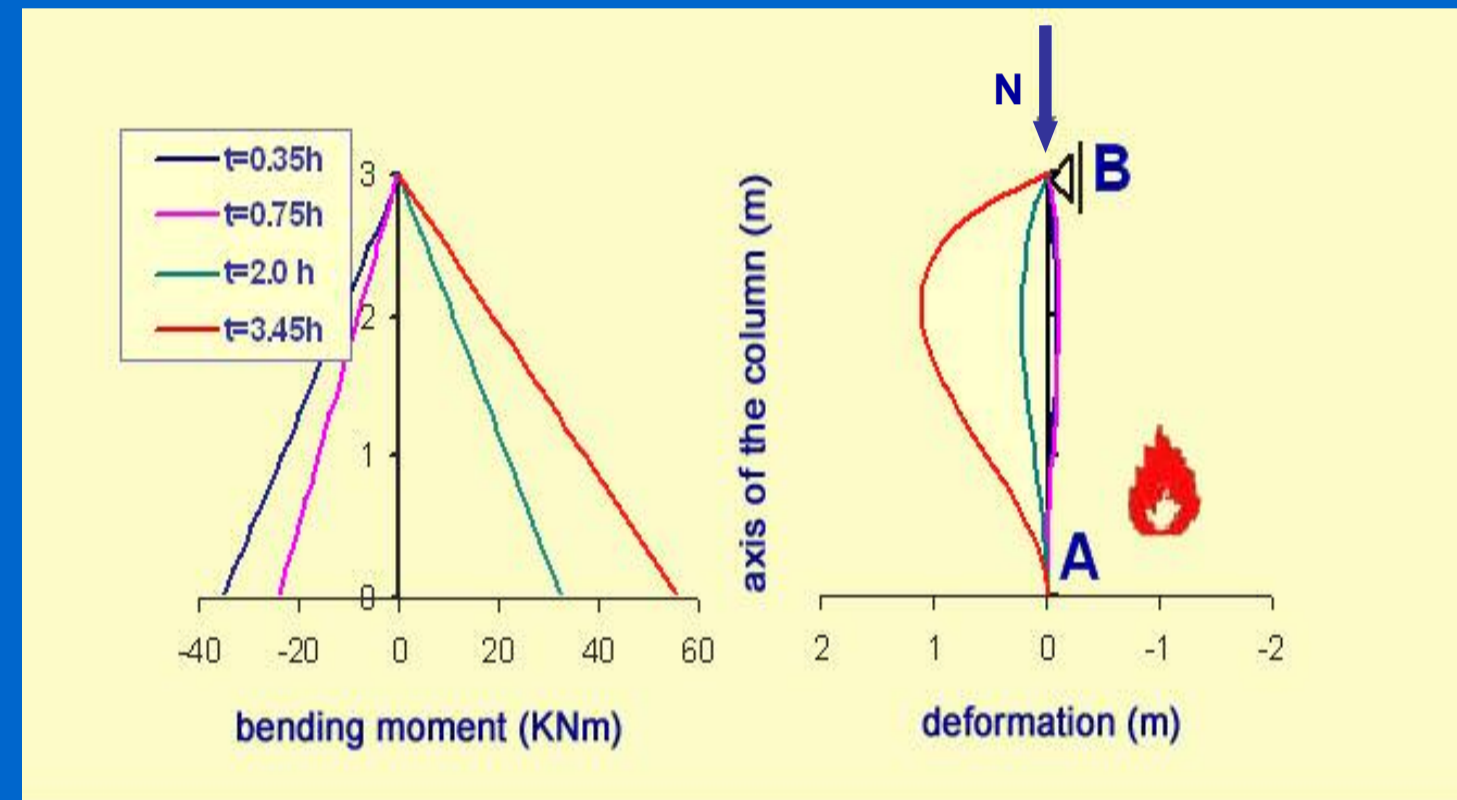
Isotherms in the cross section of column 30*30cm, as a part of a wall that separates the fire compartment

Fire model: ISO 834

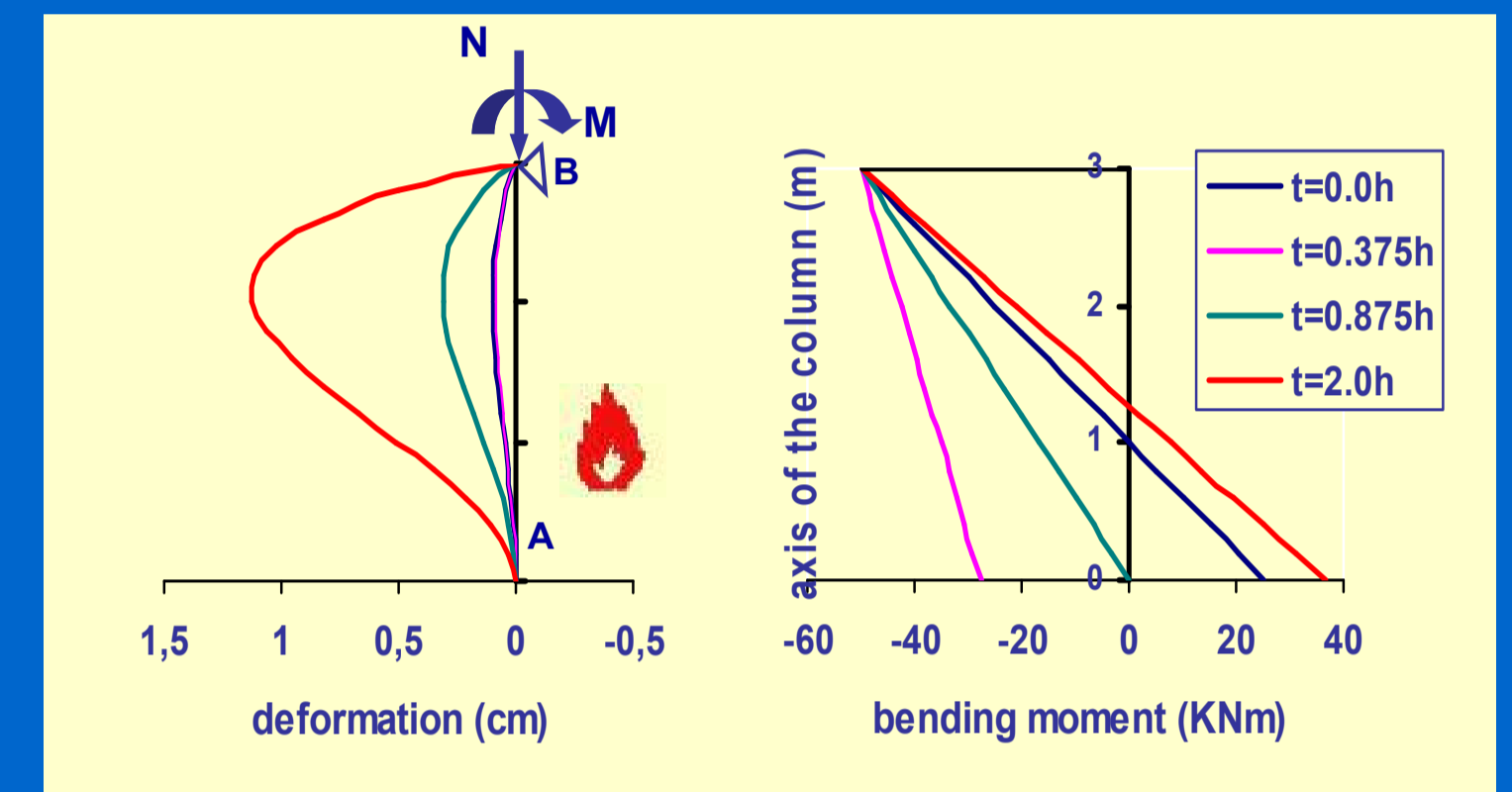


Time redistribution of bending moment and deformation, of siliceous concrete column 30*30cm, a=2cm

μ=1%, RA 400/500, η=0.3, β=0

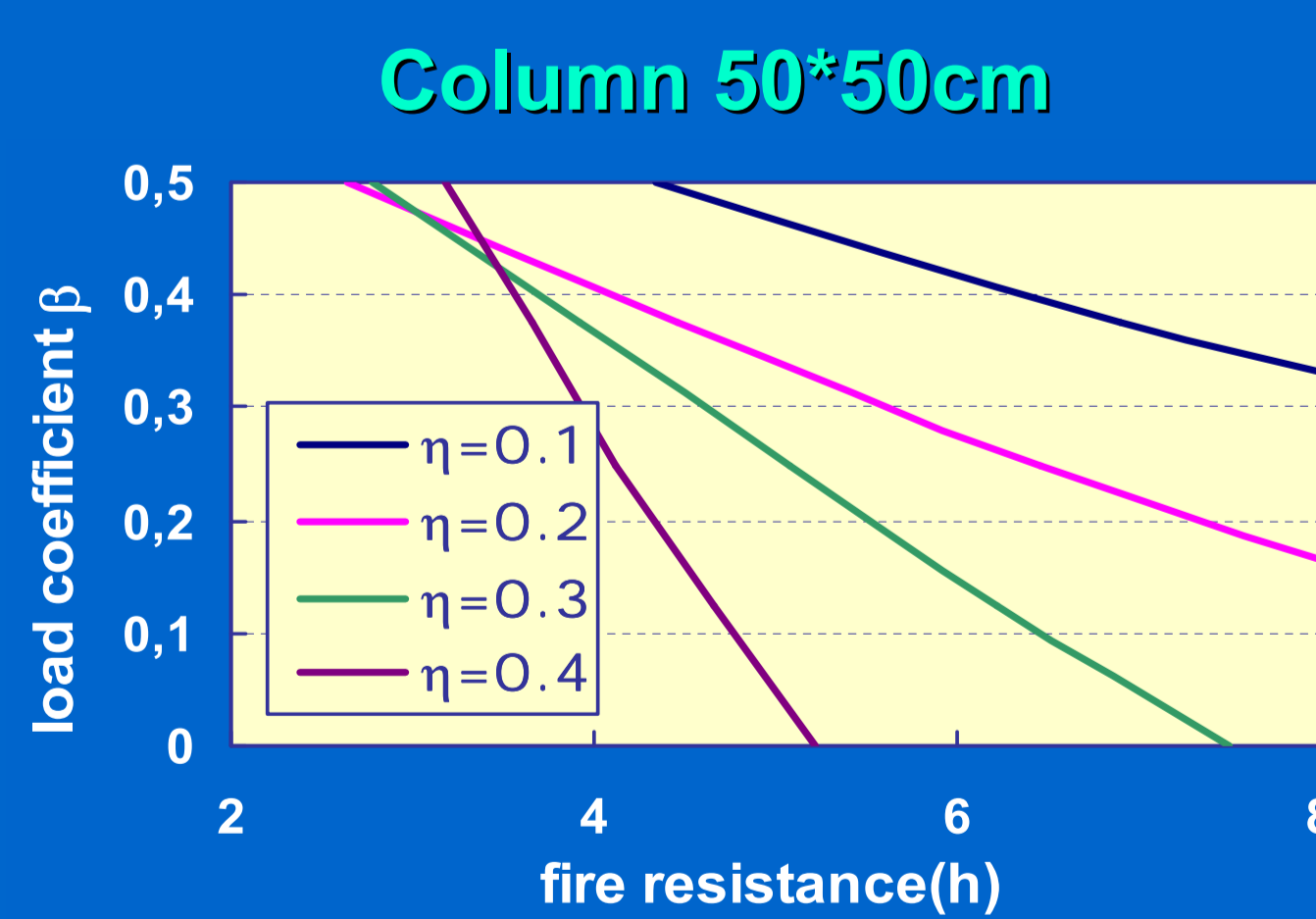
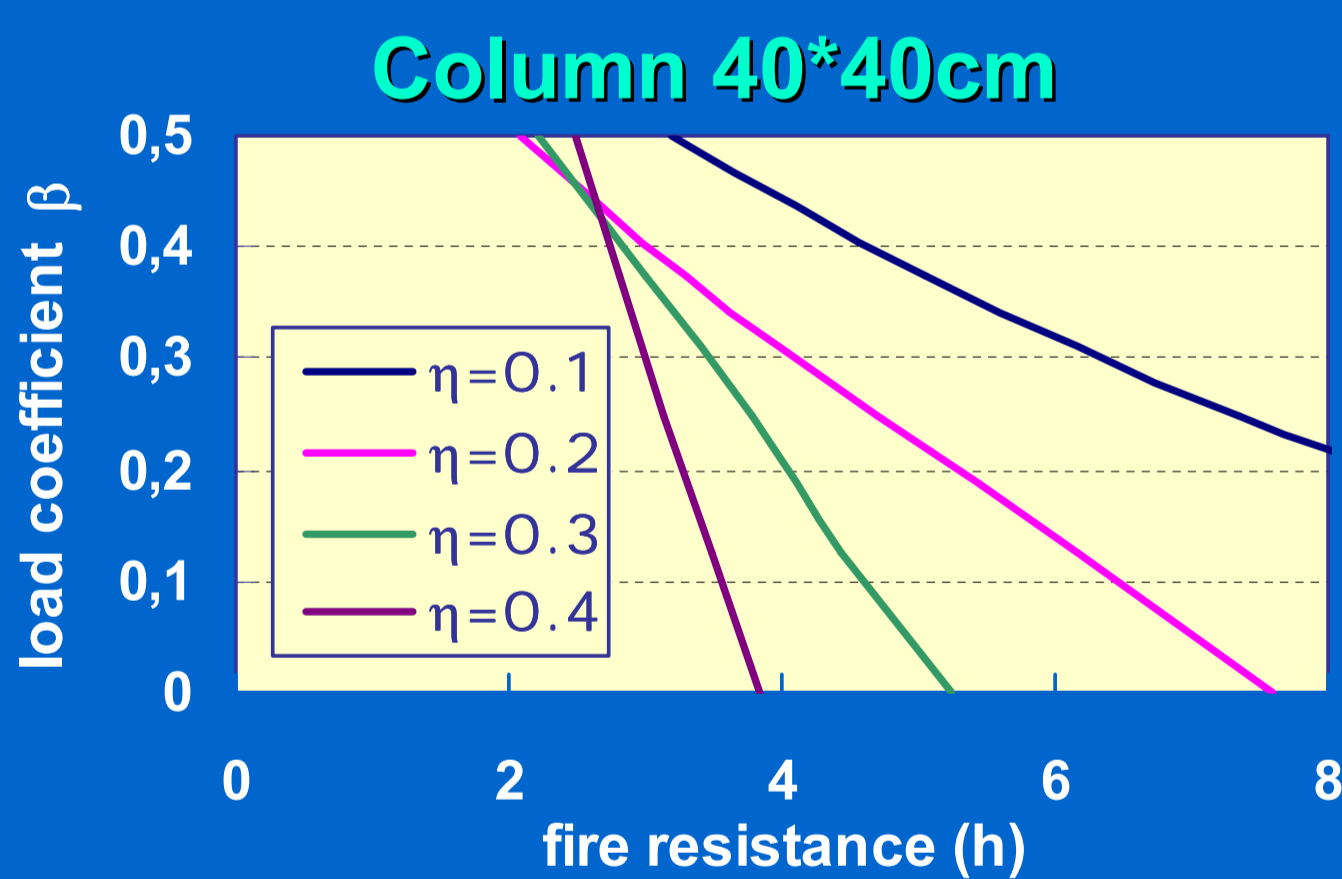
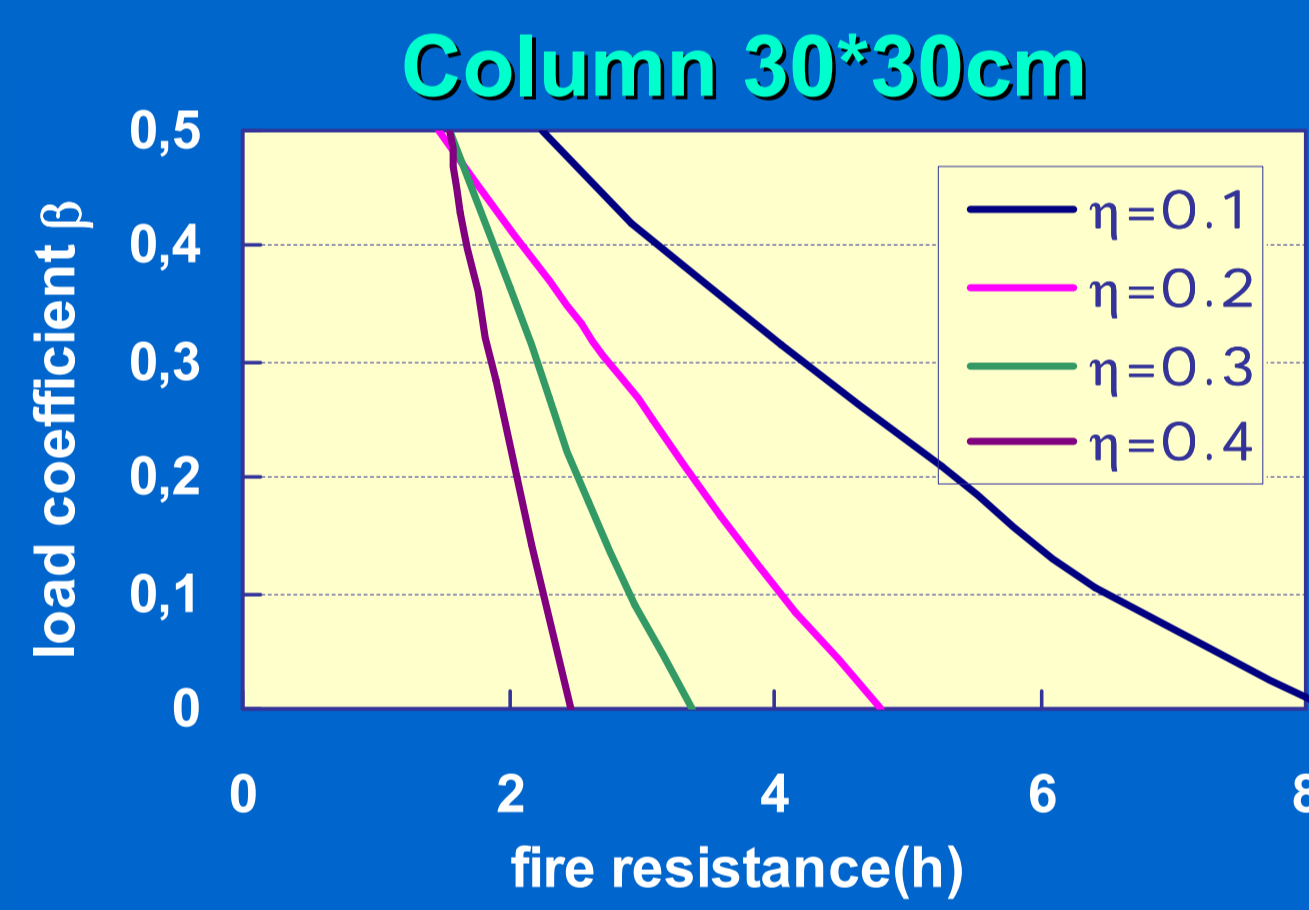


μ=1%, RA 400/500, η=0.2, β=0.4



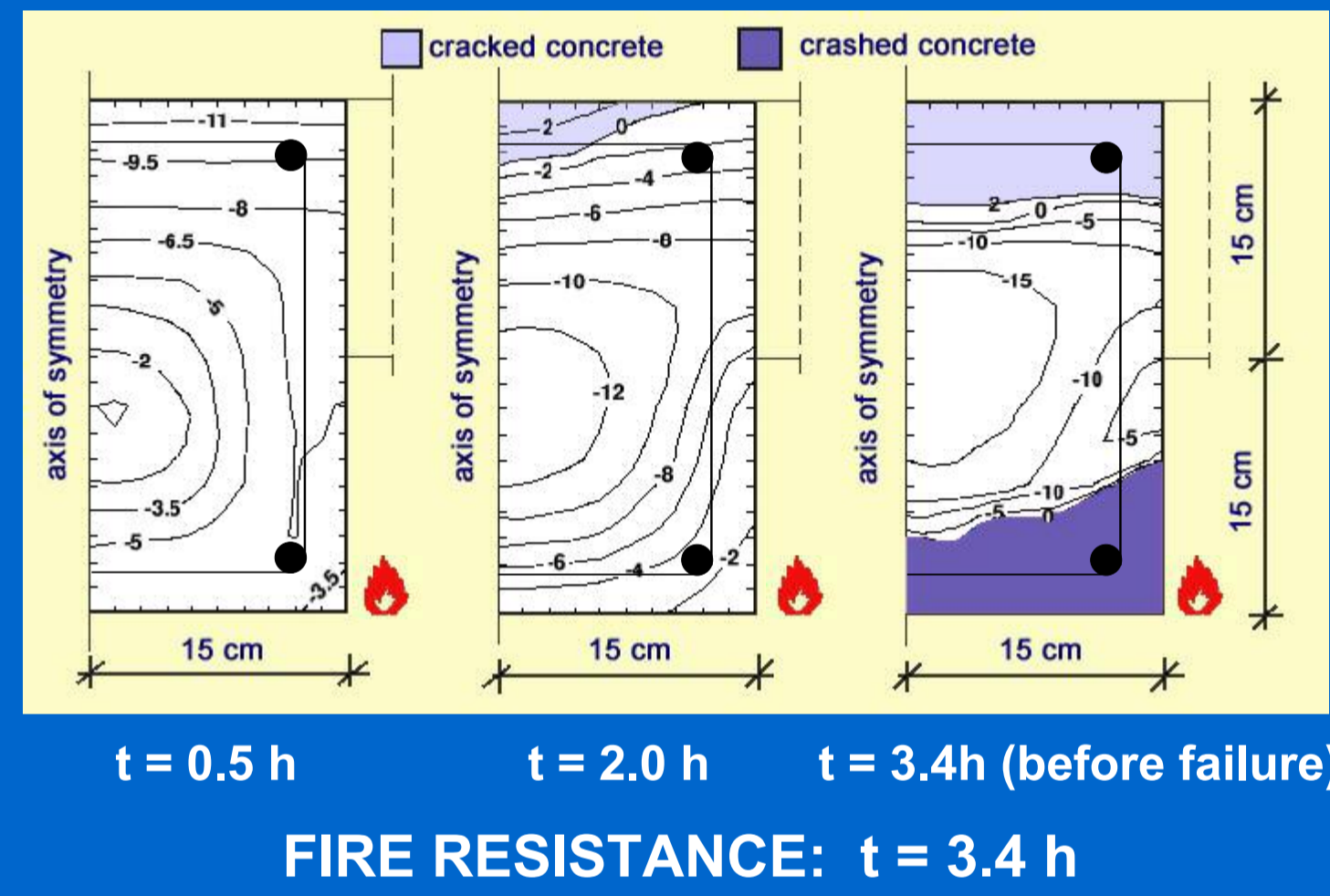
FIRE RESISTANCE CURVES

siliceous aggregate concrete, a=2cm, μ=1%, RA 400/500

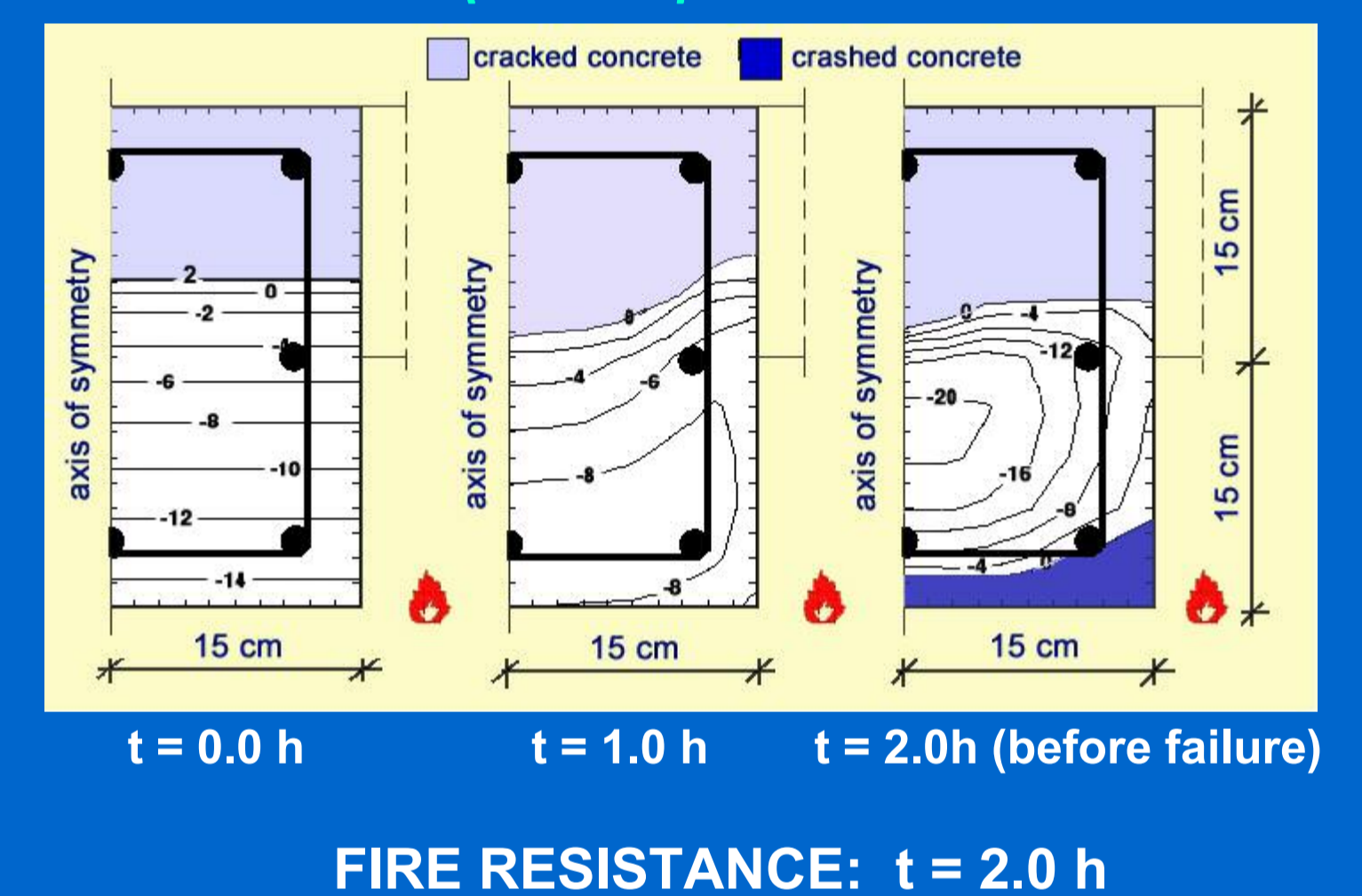


Time redistribution of stresses in concrete at support B

η=0.3 β=0

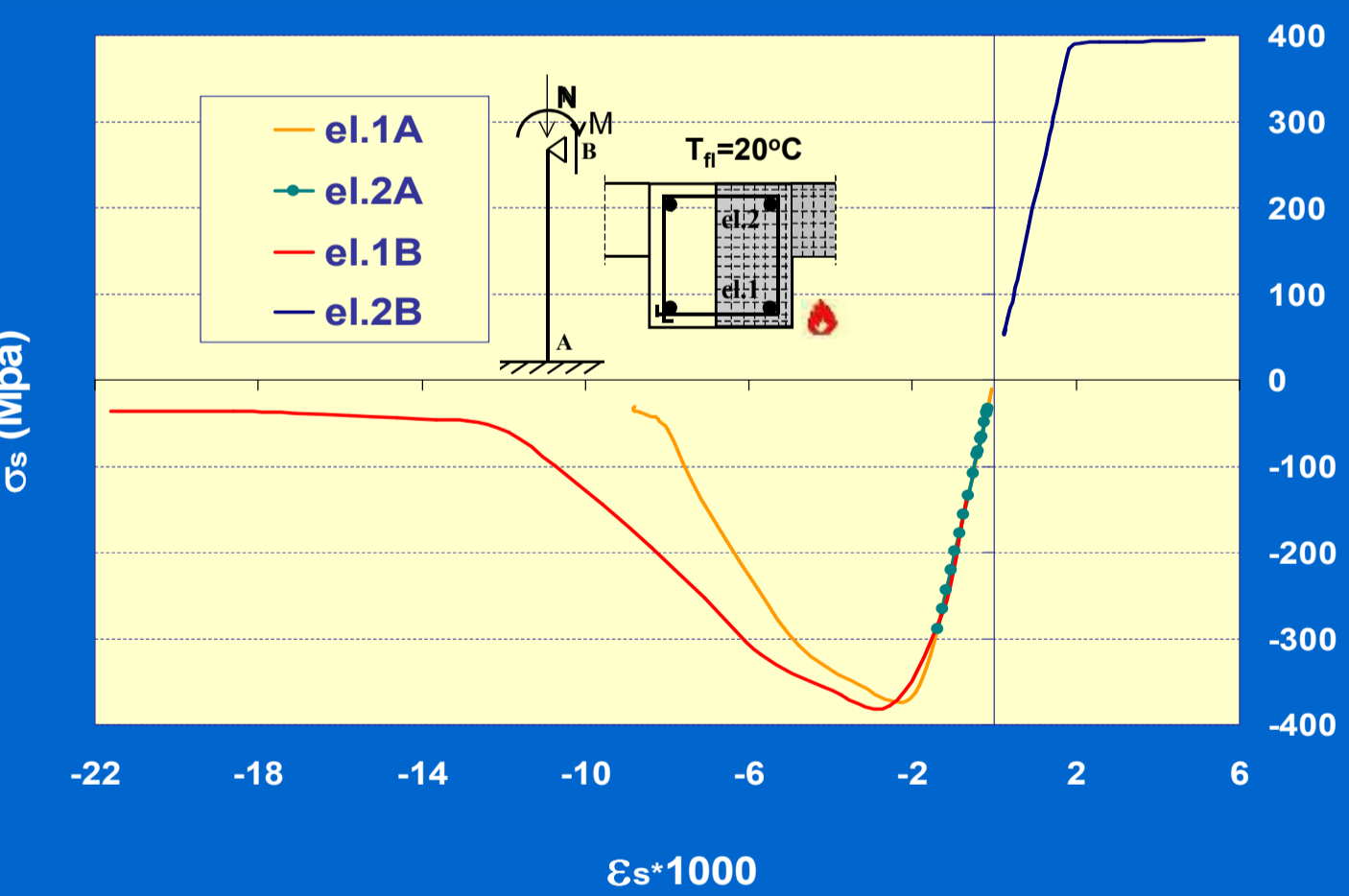
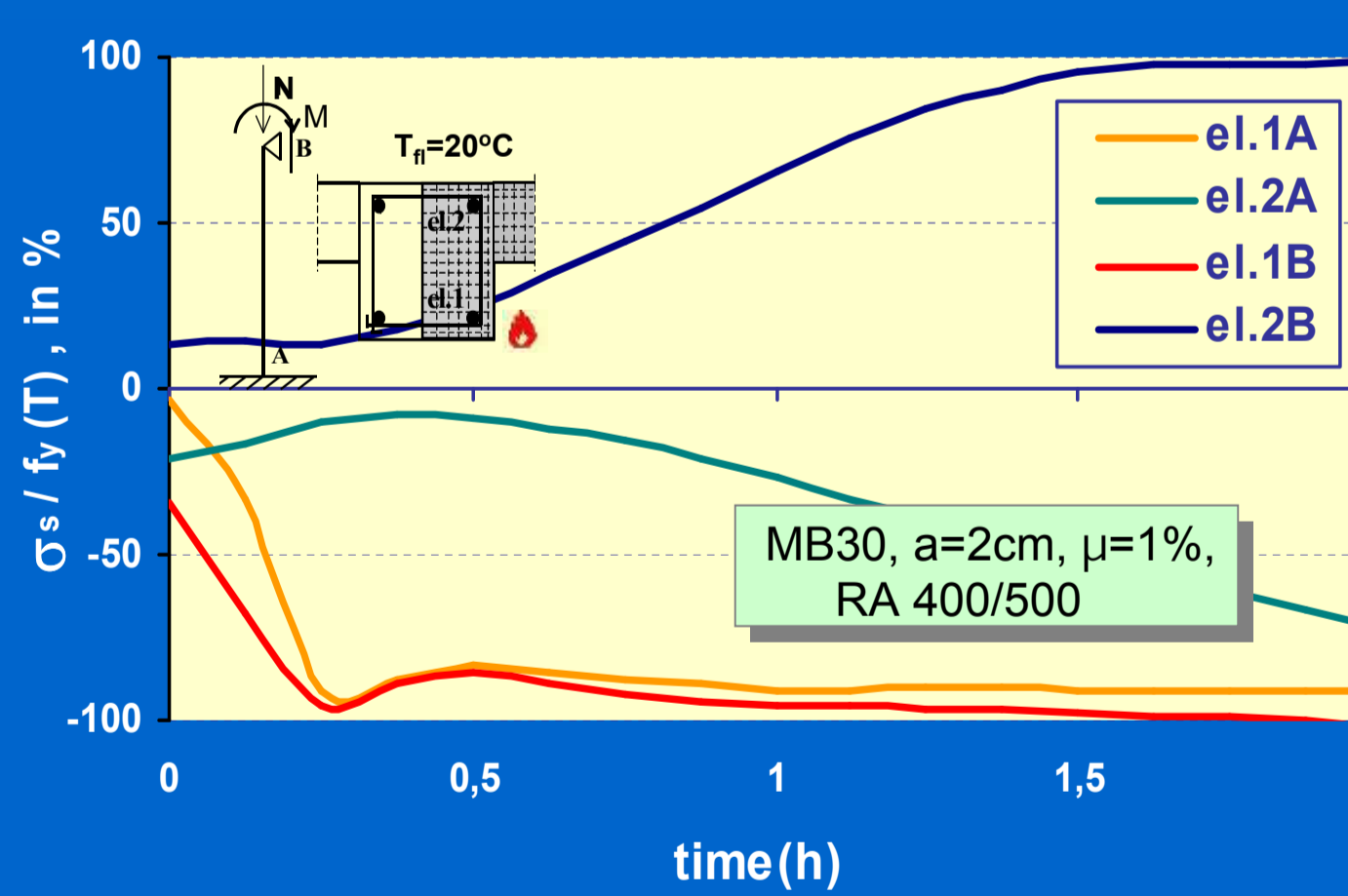


η=0.2, β=0.4

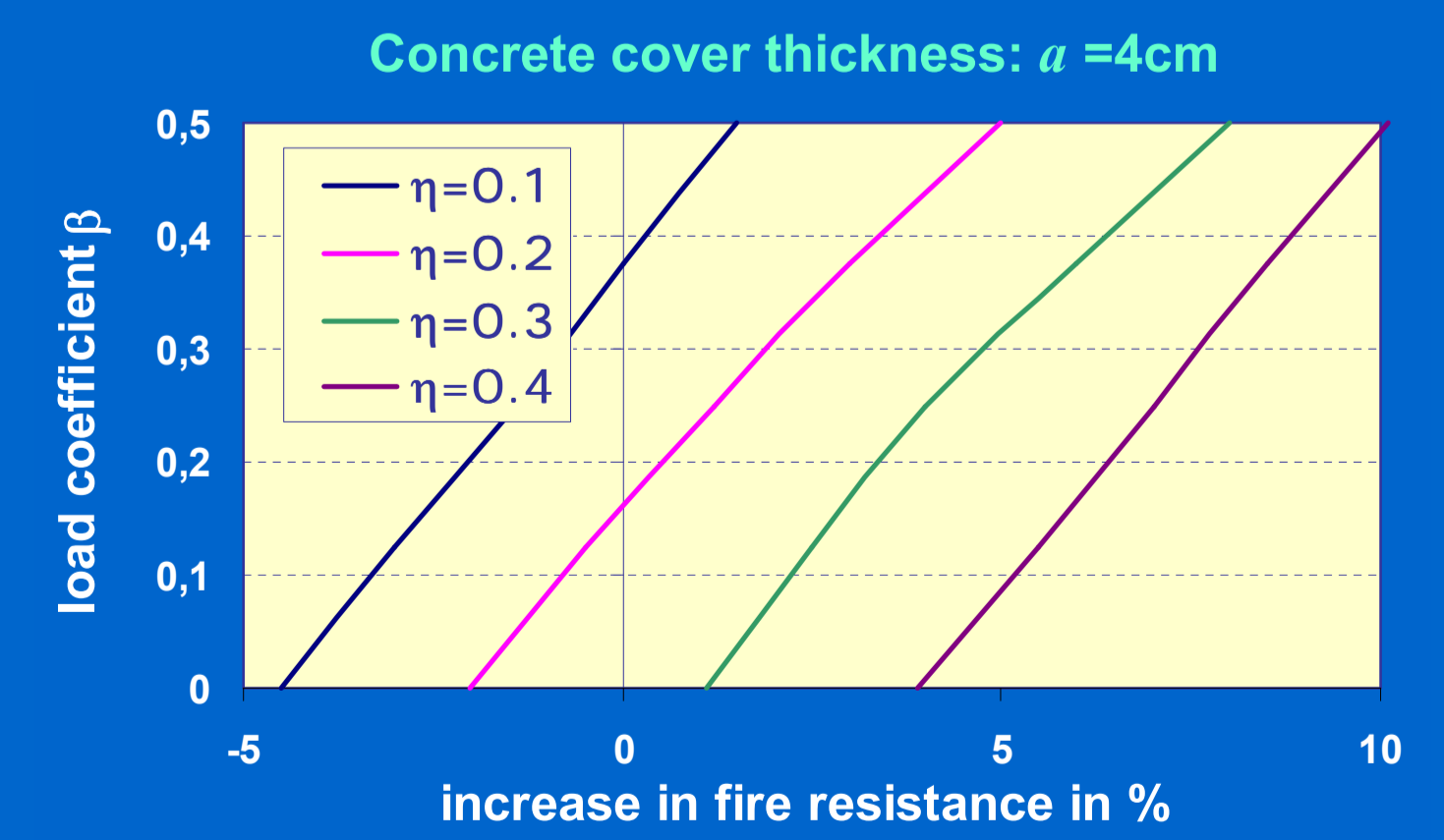
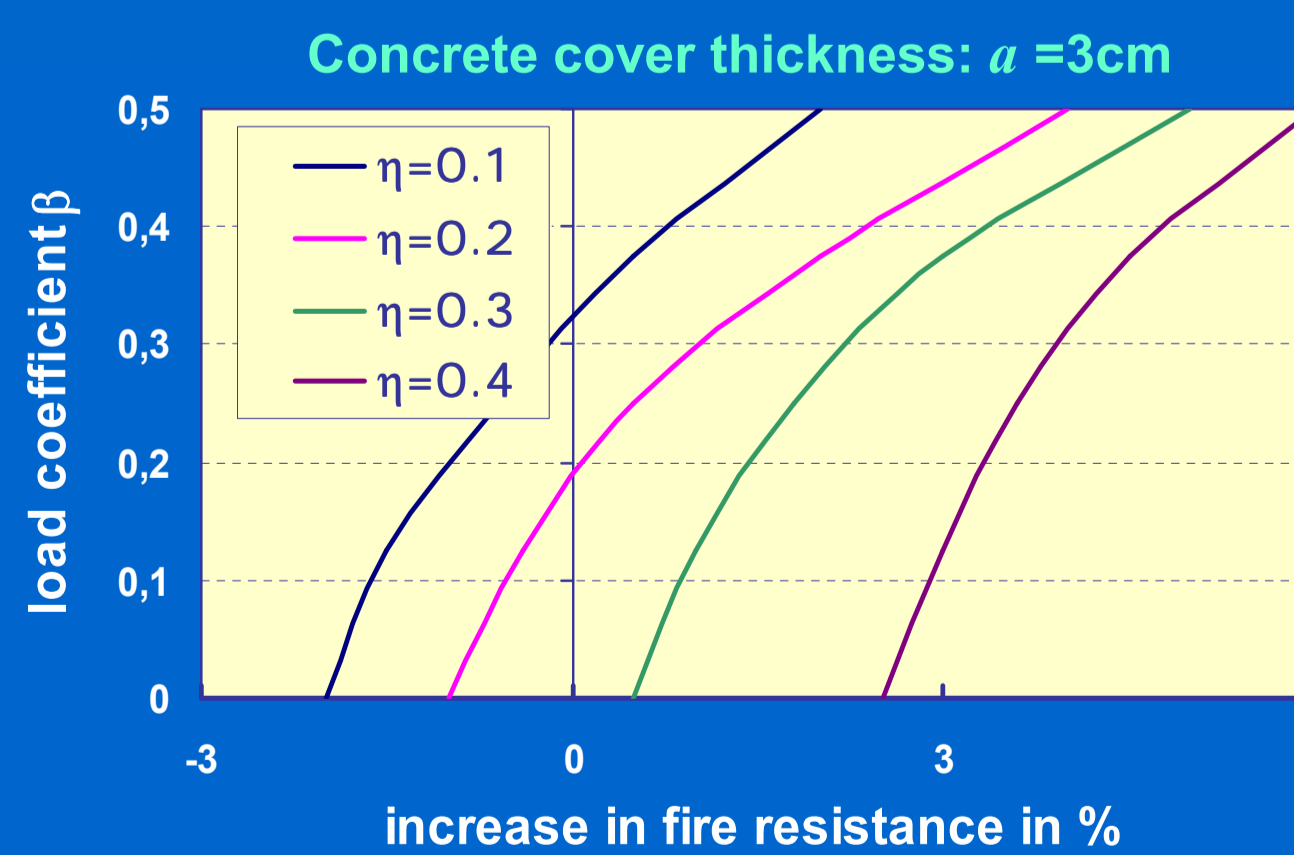


Time redistribution of stresses in reinforcement

η=0.2, β=0.4



Increase in fire resistance of eccentrically loaded columns when the concrete cover thickness is increased, reference column: a=2cm



CONCLUSIONS

Dimensions of the cross section; concrete cover thickness; steel ratio; support conditions and intensity of the axial force and bending moment are significant factors affecting fire resistance of these columns.

- 1/ When dimensions of the cross section are small, temperature penetrates deeper in a short time period and the fire resistance is lower.
- 2/ For optimally loaded columns (η≤3) the concrete cover thickness has a positive effect on fire resistance increasing, but not more than 5% for columns with small dimensions, and up to 10% for larger columns.
- 3/ The effect of steel ratio increasing is positive. That is not a case when the column is centrally loaded (β=0). When the bending moment is increased and the axial force is decreased the positive effect is more expressive.