

## INTRODUCTION

- Relations between different Eurocodes
- Scope of EN 1993-1-2
- Layout of the book

## MECHANICAL LOADING

- General
- Examples
- Indirect actions

## THERMAL ACTION

- General
- Nominal temperature-time curves
- Parametric temperature-time curves
- Zone models
- CFD models
- Localized fires
- External members

## TEMPERATURE IN STEEL SECTIONS

- Introduction
- The heat conduction equation and its boundary conditions
- Advanced calculation model. Finite element solution of the heat conduction equation
- Section factor
- Temperature of unprotected steelwork exposed to fire
- Temperature of protected steelwork exposed to fire
- Internal steelwork in a void protected by heat screens
- External steelwork
- View factors in the concave part of a steel profile
- Temperature in steel members subjected to localized fires
- Temperature in stainless steel members

## MECHANICAL ANALYSIS

- Basic principles
- Mechanical properties of carbon steel
- Classification of cross-sections
- Effective cross-sections
- Fire resistance of structural members
- Design in the temperature domain. Critical temperature
- Design of continuous beams
- Fire resistance of structural stainless steel members
- Design examples

## ADVANCED CALCULATION MODELS

General  
Thermal response model  
Mechanical response model  
Some comparisons between the simple and the advanced calculation models

## JOINTS

General  
Strength of bolts and welds at elevated temperature  
Temperature of joints in fire  
Bolted connections  
Design fire resistance of welds  
Design examples

## THE COMPUTER PROGRAM "ELEFIR-EN"

General  
Brief description of the program  
Default constants used in the program  
Design example  
CASE STUDY  
Description of case study  
Fire resistance under standard fire  
Fire resistance under natural fire

## REFERENCES

### ANNEX A THERMAL DATA FOR CARBON STEEL AND STAINLESS STEEL SECTIONS

A.1. Thermal properties of carbon steel  
A.2. Section factor  $A_m$  /  
 $V$  [m<sup>-1</sup>] for unprotected steel members  
A.3. Section factor  $A_p$  /  
 $V$  [m<sup>-1</sup>] for protected steel members  
A.4. Tables and nomograms for evaluating the temperature in unprotected steel members subjected to the standard fire curve ISO 834  
A.5. Tables and nomograms for evaluating the temperature in protected steel members subjected to the standard fire curve ISO 834  
A.6. Thermal properties of some fire protection materials  
A.7. Thermal properties of stainless steel  
A.8. Tables and nomograms for evaluating the temperature in unprotected stainless steel members subjected to the standard fire curve ISO 834  
A.9. Thermal properties of some fire compartment lining materials

### ANNEX B INPUT DATA FOR NATURAL FIRE MODELS

B.1. Introduction  
B.2. Fire load density  
B.3. Rate of heat release density

B.4. Ventilation control

B.5. Flash-over

#### ANNEX C MECHANICAL PROPERTIES OF CARBON STEEL AND STAINLESS STEEL

C.1 Mechanical properties of carbon steel

C.2. Mechanical properties of stainless steel

#### ANNEX D TABLES FOR SECTION CLASSIFICATION AND EFFECTIVE WIDTH EVALUATION

#### ANNEX E SECTION FACTORS OF EUROPEAN HOT ROLLED IPE AND HE PROFILES

#### ANNEX F CROSS-SECTIONAL CLASSIFICATION OF EUROPEAN HOT ROLLED IPE AND HE PROFILES

F.1. Cross-sectional classification for pure compression and pure bending

F.2. Cross-sectional classification for combined, compression and bending moment