



International Conference Application of Structural Fire Engineering
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FIRE DESIGN OF CONCRETE AND MASONRY STRUCTURES

Software Tools Developed at the Czech Technical University in Prague

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INTRODUCTION

- **TempAnalysis**
Computer program for thermal analysis of rectangular cross-sections exposed to fire
- **HygroThermAnalysis**
Computer program for hygro-thermal analysis of concrete rectangular cross-sections exposed to fire
- **FiDeS (Fire Design Software)**
Software package to fire design of concrete and masonry structures according to Eurocodes

These tools have been developed in MATLAB environment.
They are available for free on:

<http://concrete.fsv.cvut.cz/~stefan/research.htm>

TempAnalysis

Material

Dimensions

Insulation

TempAnalysis 1.1 - 2D (Preprocessor)

Material

- Material with Constant Material Properties
- Material with Non-Linear Material Properties
- Concrete (EN 1992-1-2)

Define Material Properties

Cross-Sectional Dimensions

Width b [m] Height h [m]

Protective Layer

Enter Protective Layer? No Yes

Thickness of the Insulation d_{ins} [m]

Density ρ_{ins} [kg/m³]

Heat Capacity $c_{p,ins}$ [J/kgK]

Thermal Conductivity λ_{ins} [W/mK]

Design Fire Scenario

Temperature-Time Curve:
 Standard Parametric

Fire Load Density $q_{t,d}$ [MJ/m³]
<50,1000>

Opening Factor O [m^{1/2}]
<0.02,0.20>

Thermal Inertia b [J / m² s^{1/2} K]
<100,2200>

Fire Growth Rate

Temperature-Time Curve

Fire Exposure

Time in Fire Exposure t [min]

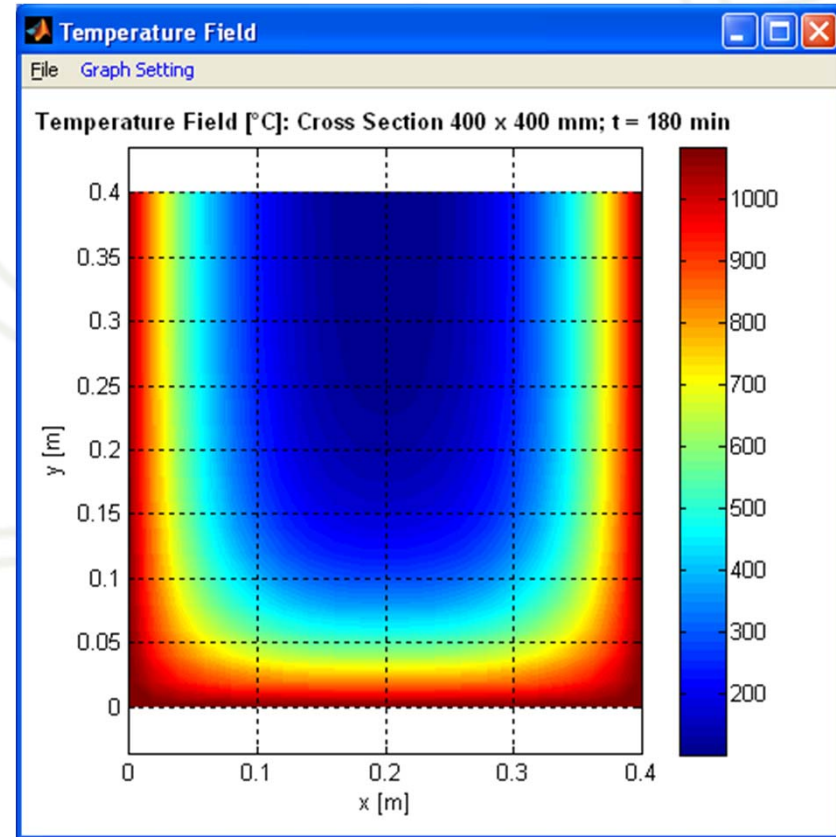
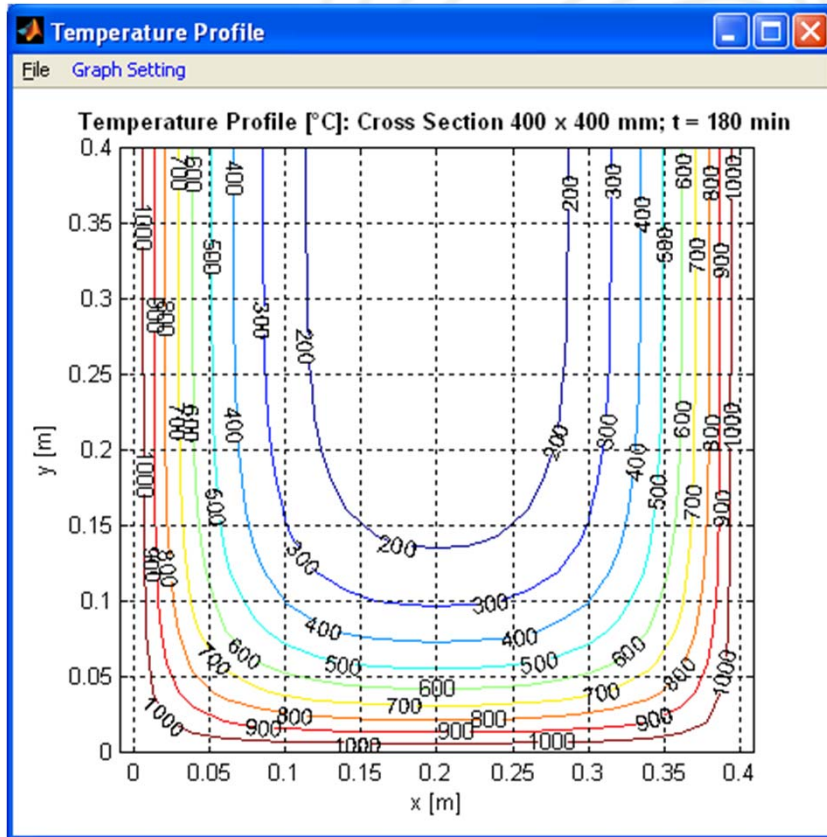
CALCULATION

FEA SETTING **NEW** **EXIT**

Fire scenario

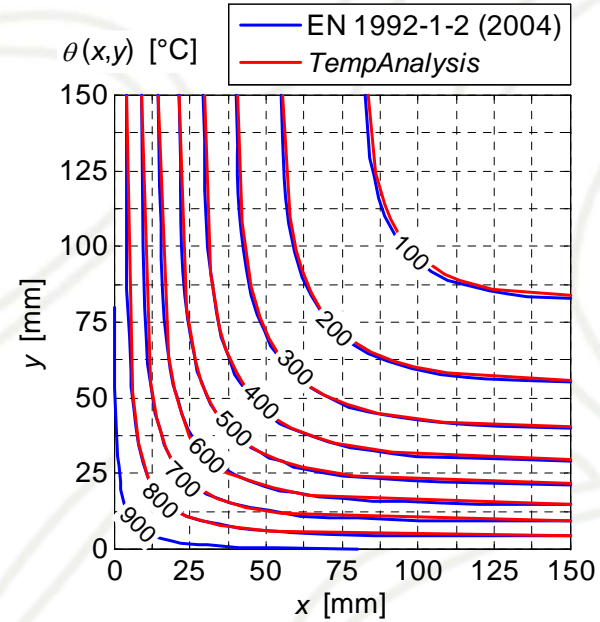
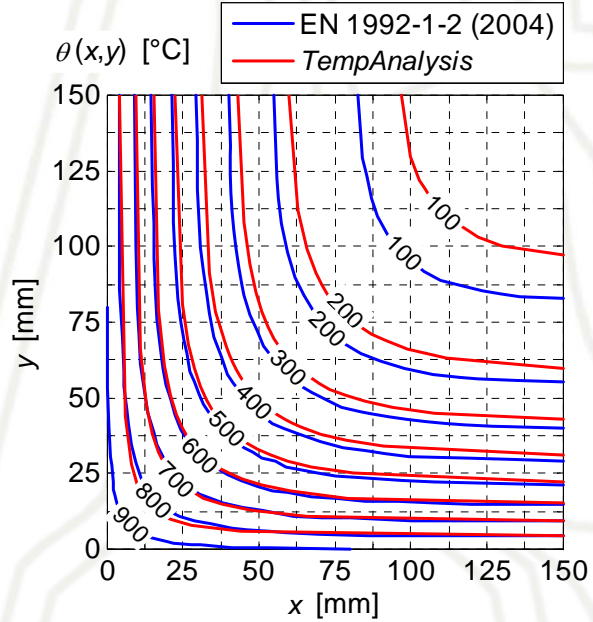
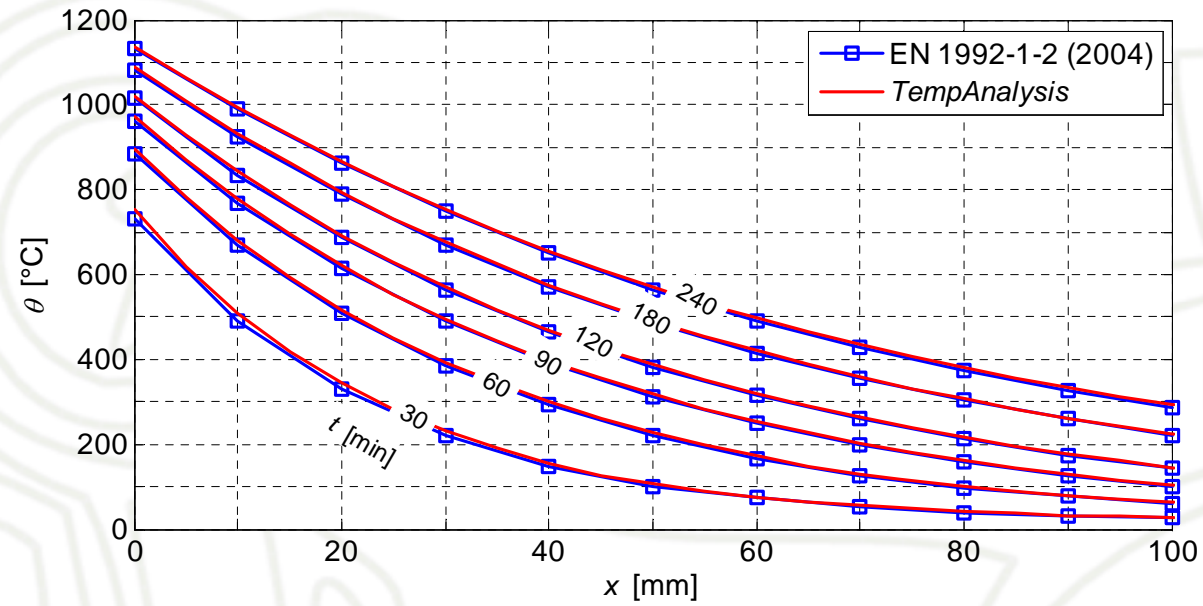
Exposure

TempAnalysis



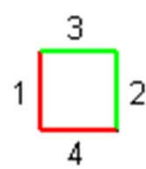
Temperature profile of a beam cross-section 400 x 400 mm² exposed to standard fire from three sides for 180 minutes

TempAnalysis

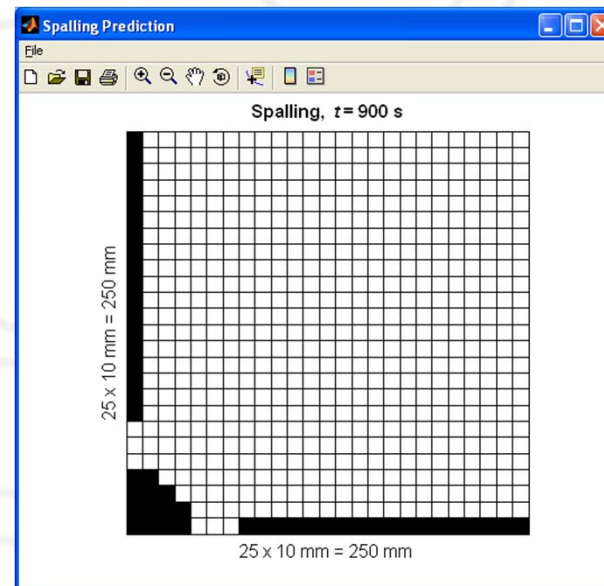
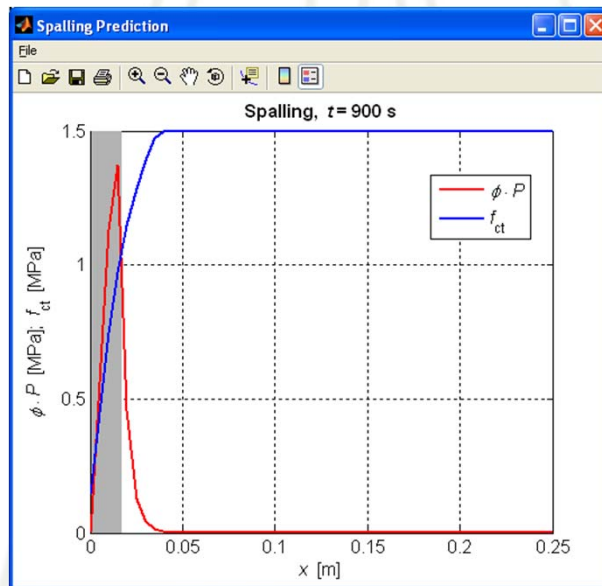
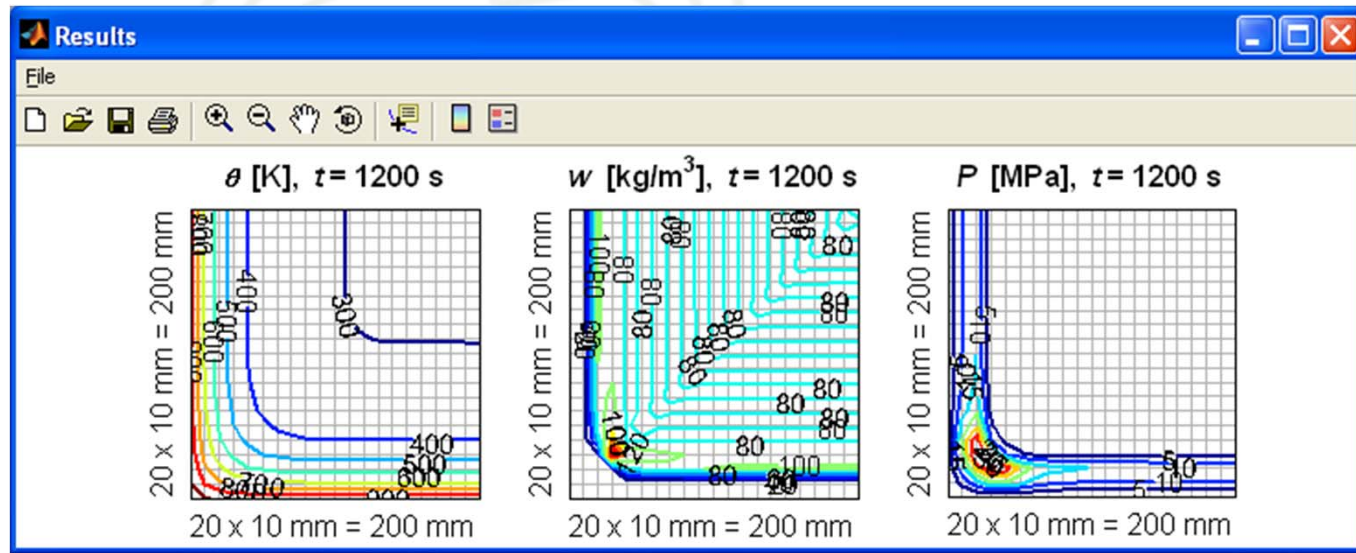


HygroThermAnalysis

2D HygroThermAnalysis 1.0 - Preprocessor

Dimensions b [m] <input type="text" value="0.25"/> ? h [m] <input type="text" value="0.25"/> ?	Boundary Conditions Fire exposure on: <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 	Initial Conditions θ_0 [K] <input type="text" value="298.15"/> ? RH_0 [-] <input type="text" value="0.8"/> ?
Material Properties $w_{s,25}$ [kg/m ³] <input type="text" value="100"/> ? c [kg/m ³] <input type="text" value="300"/> ? ρ_{25} [kg/m ³] <input type="text" value="2400"/> ? $c_{p,25}$ [J/(kg·K)] <input type="text" value="900"/> ? a_{25} [m/s] <input type="text" value="1*10^(-14)"/> ?	α_c [W/(m ² ·K)] <input type="text" value="25"/> ? β_c [m/s] <input type="text" value="0.02"/> ? e [-] <input type="text" value="0.7"/> ?	Computational Time <input type="text" value="Computational Time"/> Calculation will take ???? min.
Fire Exposure t_f [s] <input type="text" value="15*60"/> ? <input checked="" type="radio"/> [K] <input type="radio"/> [°C] <input type="text" value="Plot Fire Curve"/>	FEA Setting n_x [-] <input type="text" value="25"/> ? n_y [-] <input type="text" value="25"/> ? <input type="text" value="Plot FE Mesh"/> Δt [s] <input type="text" value="5"/> ?	<input type="text" value="CALCULATION"/> <input type="text" value="NEW"/> <input type="text" value="EXIT"/>

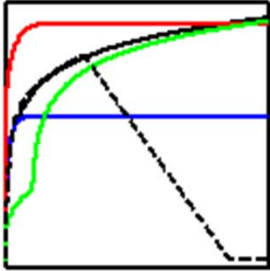
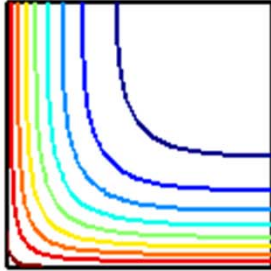
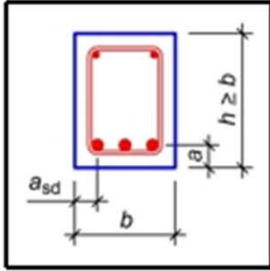
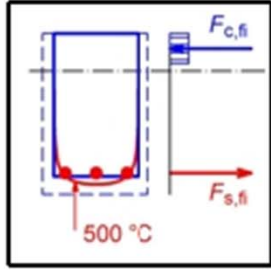
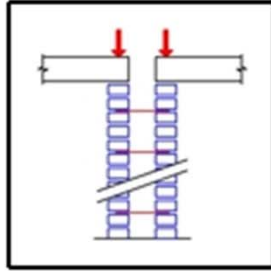
HygroThermAnalysis



FiDeS (Fire Design Software)

FiDeS 1.0 *Software Package to Fire Design of Concrete and Masonry Structures according to Eurocodes*
Version en-1.0 (1. 3. 2011)

Temperature Analysis of Fire Compartment Temperature Analysis of Cross-section Concrete Members Tabulated Data Concrete Members Calculation Methods Masonry Members Tabulated Data

Enter **Enter** **Enter** **Enter** **Enter**

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The program has been developed with the financial support of the projects FRVŠ 730/2010/G1 and MSM 6840770001.
The author will not be held liable for any damages arising from the use of this software!

A faint, light green line-art illustration of a rooster is visible in the background. The rooster is shown in profile, facing right, with its head turned slightly towards the viewer. It has a large, wavy comb and a long, curved beak. The illustration is composed of simple, clean lines and is centered on the page.

Thank you for your attention.