

3.9 Utilization of different processes in fire design (short version)

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Faculty of Safety Engineering
VSB – Technical University of Ostrava

Integrated Fire Engineering and Response
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**Utilization of different processes
in fire design**

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Fire Safety Engineering in Czech Republic

**Czech Technical Standard
& Fire Safety Engineering**

↓


Recommended approach
for nonstandard buildings

↓

Acceptable degree of
safety!



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Designer and/or Investor → Authorities → Dependent conditions


Application of more exact computing methods

- Fire severity, development and spread of fire a smoke, evacuation conditions, influence of operation...

Partial or total fire safety design

- e.g. only properties of constructions...
- System concept more or all aspects

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TOPIC 1:

**Two variants of fire
compartmentation of tunnel tubes**

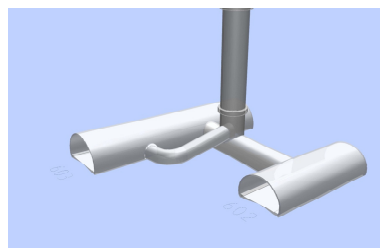
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Topic 1 – Fire Safety of Road Tunnel


Common solution of dividing into fire compartments:

- Every tunnel tube
- Tunnel cross connection
- Evacuation shafts
- Airways for operational ventilation
- Others technological important spaces



KP Consulting Engineers

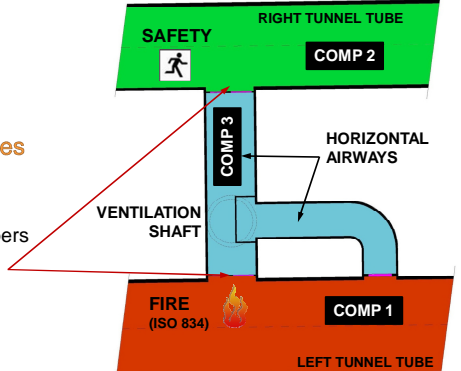
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Task:
separate airways
from the tunnel tubes

Model situation 1
certify ventilation dampers
of fire performance
EW 90 SC DP1



SAFETY (with person icon)

RIGHT TUNNEL TUBE

COMP 2

HORIZONTAL AIRWAYS

VENTILATION SHAFT

COMP 3

FIRE (ISO 834) (with flame icon)

COMP 1

LEFT TUNNEL TUBE

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Task:
 separate airways
 from the tunnel tubes

Model situation 2
 used smoke-tight
 dampers S_m DP1
 (the functionality is certified
 at temperature of 200 °C)

RIGHT TUNNEL TUBE
 SAFETY
 $T \leq 200 \text{ °C}$
 COMP 2
 HORIZONTAL AIRWAYS
 VENTILATION SHAFT
 FIRE (50 MW)
 COMP 1
 LEFT TUNNEL TUBE

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Model of temperature distribution in airways of ventilation

Fire Scenario

- centre of a fire (nearby smoke-tight dampers)
- fire load 50 MW (truck)
- air flow velocity
 1 m/s (two-way traffic in LTT)
 3 m/s (one-way traffic in LTT)

Suitable mathematical model?

➔ **Fire Dynamics Simulator**

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DESIGN	PURPOSE OF MODEL	MODEL	RESULTS
PARAMETERS OF TUNNEL • Dimensions – length, width • Type of ventilation • Slope, curvature PARAMETERS OF FIRE • Fire load • Position... PARAMETERS OF VENTILATION • Dimension • Supply • Position PARAMETERS OF ENVIRONMENT • Direction, Air velocity • Temperature, Pressure • Elevation	FIRE SCENARIO Variants	Determination of measures values FIRE MODEL Parameters of simulation	Smokeview, MayaVI, ... VIZUALIZATION 3D Data Grafy Tables

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Section through tunnel tubes, tunnel cross connection and airways

modified drawing of IKP Consulting Engineers

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Temperature curves

Temperature in the point of fire affected damper

Temperature next to unaffected damper

smoke-tight dampers S_m DP1 aren't destroyed!

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Visualization of behaviour of temperatures in airways

BUILDING NOUZOV
 VENTILATION SHAFT
 TUNNEL CROSS CONNECTION
 FIRE IN TUNNEL TUBE

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