

TURISMO. THE AUSTRIAN TUNNEL RISK MODEL.

ENGINEERING EXCELLENCE.

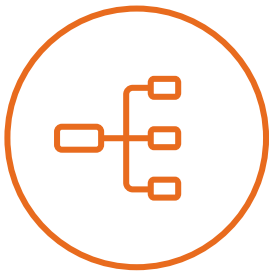


TuRisMo

The Austrian Tunnel Risk Model (TuRisMo) is the first comprehensive, system-based tool for assessing collision and fire risks in road tunnels. It allows virtually all parameters influencing tunnel safety – across all tunnel types – to be quantified. By using this model, tunnel owners and operators can optimize safety measures while keeping costs to a minimum.

TuRisMo consists of two core steps, namely quantitative frequency and quantitative consequence analyses.

TuRisMo combines a set of different methodical elements to analyze a tunnel system in its entirety. As a result, the expected societal risk to tunnel users can be calculated for the tunnels under investigation.



FREQUENCY ANALYSIS > COLLISIONS AND FIRES

Event tree analysis is used to quantify the frequency of incident scenarios involving collisions and fires



CONSEQUENCE ANALYSIS > COLLISIONS

Damage values of collisions are determined through statistical analysis of tunnel collision data, taking into account scenarios, vehicles involved, and impact velocities



CONSEQUENCE ANALYSIS > FIRES

Consequences (casualties) of different tunnel fire scenarios are estimated using either default values (the standard method) or detailed smoke-propagation and evacuation simulation models



TuRisMo

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Detailed consequence analysis workflow for fire incidents in TuRisMo

- Linear fire model: Defines fire growth up to maximum heat release rates of 5 MW, 30 MW, and 100 MW. 1D airflow simulation – transient one-dimensional
- 1D airflow simulation: Performs transient one-dimensional CFD simulations to determine the temporal development of longitudinal airflow velocity. 3D smoke propagation simulation – three-dimensional
- 3D smoke propagation simulation: Uses three-dimensional CFD (FDS) to determine the spatial and temporal distribution of smoke and temperature
- Egress simulation: Simulates human behavior during a fire emergency, accounting for the effects of fire hazards on evacuation speed and survivability by applying an accumulation-based intoxication model
- Exposure projection: Combines survivability likelihood with the distribution of persons to estimate the expected number of fatalities



Our Tunnel Risk Model (TuRisMo) offers a pioneering approach to quantitatively assessing safety in tunnels.

Florian Diernhofer, Tunnel Safety Expert

APPLICATIONS OF TURISMO IN RISK-BASED STUDIES

TuRisMo can be used to:

- demonstrate sufficient levels of safety in case of deviations from prescriptive requirements
- select the best design alternative, or combination of risk mitigation measures, to minimize risk
- identify the most cost-efficient solution to fulfil minimum safety requirements
- support decision-making in the planning phase, during operation or for the upgrade of existing tunnels
- quantify the effects of specific shortcomings (e.g. aging of ventilation system) in existing tunnels upon user risk
- quantify the effects of potential compensation measures upon risk, and identify the most cost-efficient combination of these compensation measures



50+ years of experience in traffic safety planning and assessment



Lay By in Tunnel



Closure of Ofenauer Tunnel



Tunnel Control Room Arlberg Tunnel



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