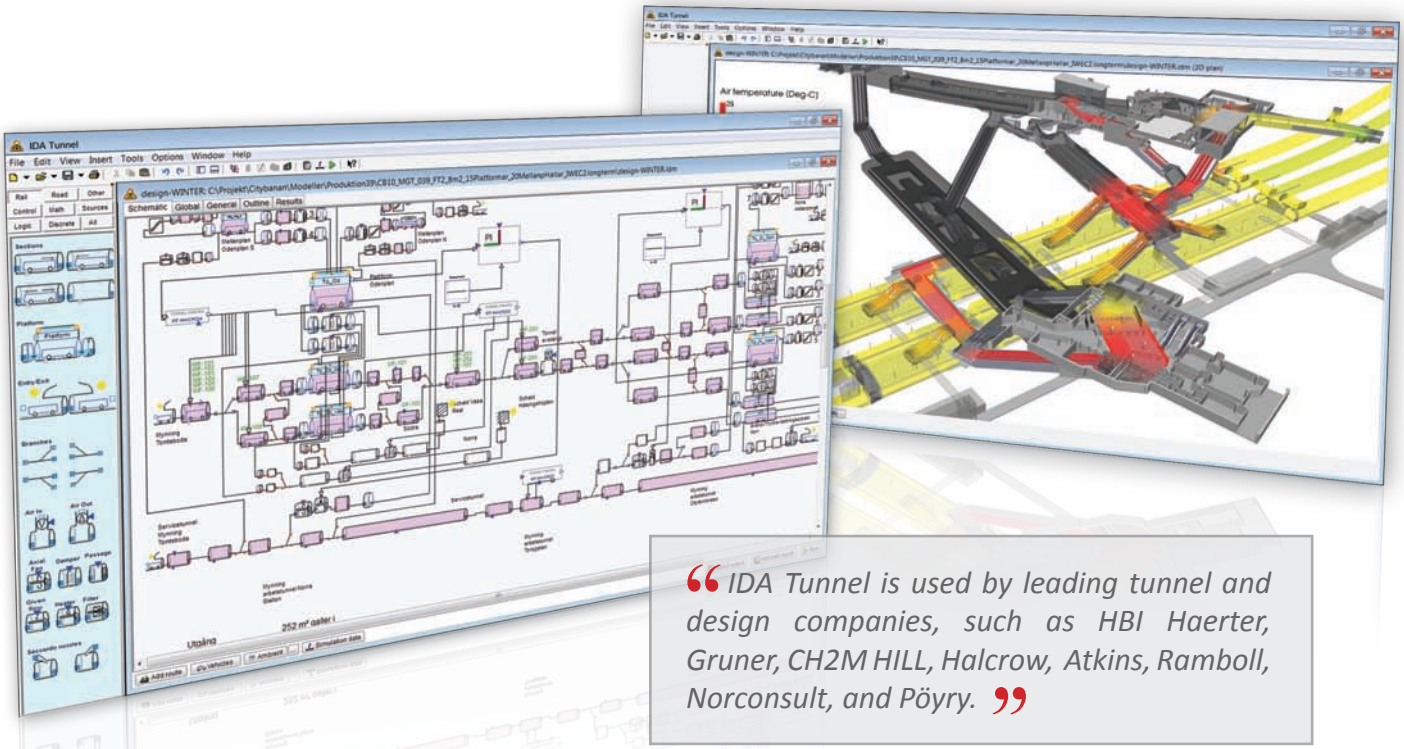
IDA Tunnel

A new generation tunnel ventilation and fire simulation software



"IDA Tunnel is used by leading tunnel and design companies, such as HBI Haerter, Gruner, CH2M HILL, Halcrow, Atkins, Ramboll, Norconsult, and Pöyry."

IDA Tunnel is a comprehensive road and rail tunnel ventilation and fire simulation software, used by leading tunnel design companies worldwide.

IDA Tunnel allows you to simulate road and rail tunnel design projects, including full range of ventilation and fire design tasks. You will be able to get computed results that can be animated in the context of a full 3D representation of the tunnel network.

Rail tunnel simulations

IDA Tunnel addresses the main climate and safety issues in underground rail systems (except pressure transient discomfort), and it relies on a graphical user interface for definition of the tunnel model. A schematic representation of computational components, such as tunnel sections, branches, platforms, fans, etc. are accompanied by a 3D view, where computed results and moving trains can be animated in the context of a full 3D representation of the tunnel network.

IDA Tunnel permits long-term studies using measured climatic data, including moisture, and complex schedules. Train movement under normal traffic and emergency conditions are simulated, based on user-supplied acceleration, retardation, and maximum power and speed parameters. Stochastic traffic patterns may be described to avoid artificial train synchronization effects.

1D (one-dimensional) air movement driven by train piston effect, buoyancy (stack effect) and wind pressure is modeled as well as air moisture with wall evaporation, condensation and ice build-up. The following additional air properties are presently computed:

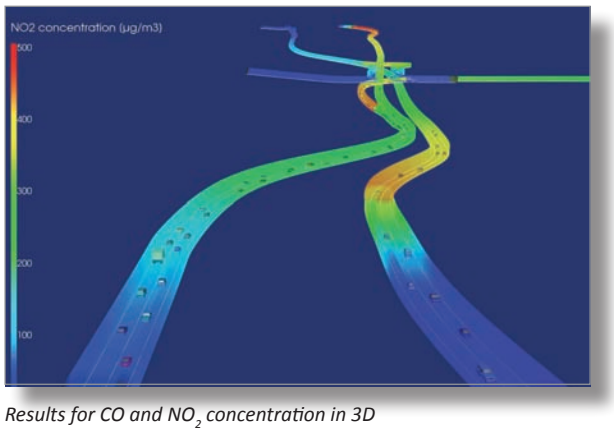
- Age, i.e. total time spent underground.
- Carbon dioxide - mostly generate by occupants.
- Particle concentration, e.g. PM10 as generated by train movements.
- Optical extinction coefficient of fire and diesel smoke.
- CO, NO_x and HC, as generated by diesel engines.

EQUA.
SIMULATION TECHNOLOGY GROUP

Road tunnel simulations

IDA Tunnel also handles air flows in road tunnels and related problem of pollution concentration due to emission from vehicles. Results from simulations include air pressure and temperatures, flow rates, and pollution concentrations along the tunnel. Input data are tunnel geometry, including flow friction factors and loss coefficients, plus traffic, emission data and air pressures at boundaries.

IDA Tunnel can be used for realistic studies of phenomena associated with real traffic such as congestion, bi-directional multi-lane traffic, vehicle and slope dependent maximum.

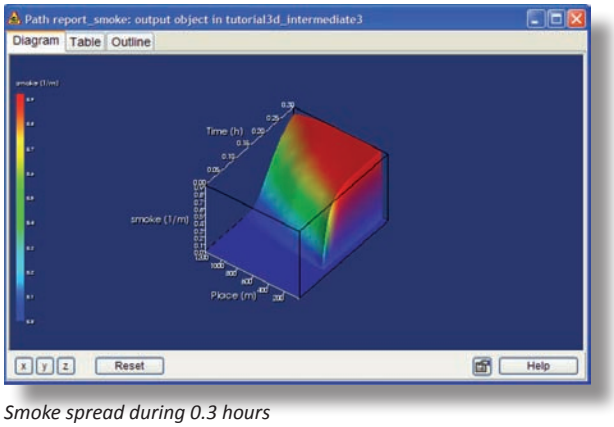


Results for CO and NO_2 concentration in 3D

Ventilation and fire simulations

Both hygienic and emergency fire ventilation can be studied. Ventilation may be longitudinal or transversal, with air supply and exhaust terminal devices distributed along the tunnel. For momentum jet fans the user specifies cross-sectional area, efficiency and air velocity.

Tunnel fire scenarios can be simulated, in which case a user specified heatflux is added in a limited section of the tunnel. Models for smoke production depending on fire type and combustion materials are available as well as fire size limitations according to available oxygen. Temperature profile into the wall and smoke radiation is modelled.



Smoke spread during 0.3 hours

Features and modules

	IDA Tunnel	+ IDA HIL Console	IDA Road Tunnel Ventilation	+ IDA Control Toolbox	+ IDA 3D Tunnel Editor
Bi-directional, multi-lane, dynamically congested road traffic	■		■		
1D prediction of air-flow, pressure, temperature, CO, NO_2, and smoke	■		■		
Fire and critical velocity	■		■		
Longitudinal ventilation with jet fans	■		■		
Transversal ventilation	■		■		
Air-in and air-out stations, axial fans	■		■		
Saccardo nozzles	■		■		
Wall temperature profile (heat sink)	■		■		
PIARC emission tables	■		■		
Arbitrarily complex tunnel systems	■		■		
3D plots (value vs. time and path length)	■		■		
80+ feedback control components	■			■	
3D tunnel system editor with traffic lanes	■				■
3D animation of traffic flows	■				■
3D animation of computed results	■				■
3D tunnel system editor with rail lines	■				
Discrete vehicle electric and diesel rail traffic	■				
Variable train headways and stochastic traffic patterns	■				
1D prediction of moisture, CO_2, age of air, HC and PM10	■				
Long-term temperatures, incl. radial water seepage	■				
Tunnel-to-ground and tunnel-to-tunnel thermal coupling	■				
Ice and mould (mildew) build-up	■				
Realistic schedules and measured climate files	■				
Library of HVAC components	■				
Platform passenger comfort (PPD)	■				
Import and SI conversion of SES input files	■				
Hardware-in-the-loop (HIL), real-time console		■			
OPC client for PLC communication		■			
Operator training simulator toolkit		■			

EQUA Simulation AB
Råsundavägen 100
169 57 Solna
Sweden

Phone: +46 8 546 20 110
Fax: +46 8 546 20 101
Email: info@equa.se
Web: www.equa.se

EQUA
SIMULATION TECHNOLOGY GROUP