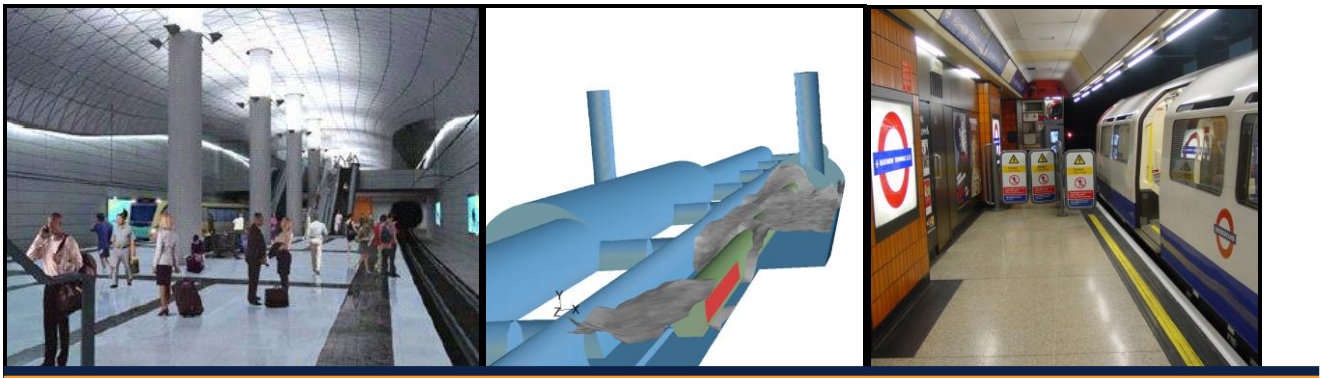


Improving Tunnel Safety

Tunnel Ventilation and Fire & Life Safety Design

Our innovative approach to tunnel ventilation and fire safety designs has benefited projects across the globe. Our commitment to achieving cost-effective solutions has made us a favoured partner for a wide range of clients, both public and private.

Mosen has expert capabilities in the field of tunnel ventilation and fire & life safety in underground spaces, which is underpinned by the extensive experience of its highly qualified staff members. This experience ranges across all types of vehicular transport tunnels (both road and rail) and utility tunnels (e.g. for gas transport and HV cables), and spans all phases of project work (from preliminary design through to detailed design and commissioning).

In designing tunnel ventilation and fire safety systems, we employ international standards combined with an assessment of local conditions to provide systems that achieve their performance goals while remaining robust, simple and with minimum life-cycle costs. Our in-depth knowledge allows us to propose innovative solutions for the most difficult ventilation and fire safety problems, including special expertise in undertaking feasibility studies, risk assessments and cost/benefit analyses for fixed fire suppression systems in tunnels.

A particular strength of the Mosen service in this field is the capability provided by its engineering tools (including three-dimensional Computational Fluid Dynamics, CFD) to model potentially dangerous fire scenarios in tunnels and other underground spaces. These models allow an assessment of the risk to human life, and allow alternative ventilation strategies to be tested for their effectiveness in removing smoke.

Expertise in Metro Tunnels and Stations

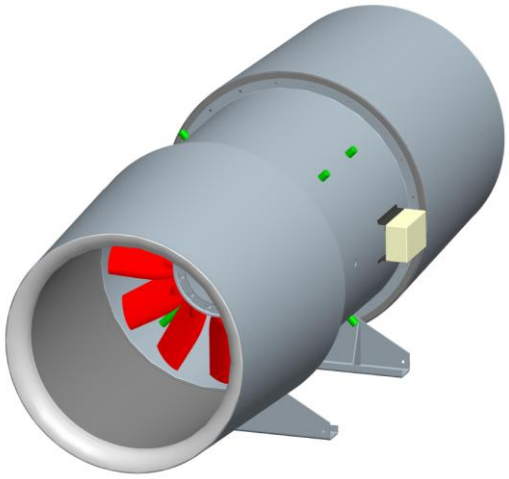
Mosen provide expert advice on the most appropriate type of ventilation system for metro tunnels under design, including push-pull, Saccardo, jetfan and MoJet® longitudinal ventilation systems. This advice is based upon an intimate knowledge of the relevant international standards relating to metro tunnel ventilation (e.g. NFPA), in addition to being cognisant of local features that may have an important bearing on the relevance of these standards, such as the assessment of the potential fire loads from metro trains.

We provide fire and life safety consultancy services in all areas of underground rail infrastructure, including both design of new facilities, and safety system inspection and audit of existing facilities. These capabilities are complemented by a highly skilled rail infrastructure and underground spaces group, which both hold an enviable position in the market and who provide advice on the design, construction and safe utilisation of underground spaces, including subterranean railway tunnels and stations. Mosen's range of fire and life safety expertise for underground railway infrastructure includes:

- fire and life safety engineering
- fire and life safety system inspections and audits
- mechanical / electrical equipment surveying and analysis
- hazard analysis and classification
- fire risk assessment
- tunnel and underground station ventilation and smoke management design
- fire suppression design
- passive fire protection optimisation
- egress and escape analysis

Innovation

Mosen has patented the unique MoJet® tunnel ventilation system, which has been adopted in a number of metro and road tunnels worldwide. This patented device provides significantly greater thrust from a single axial fan, leading to substantial savings in the costs of fan procurement and cabling.



Bi-directional MoJet®

Experience List (Extract)

- Singapore Metro: Review of tunnel ventilation and fire safety design for 29 new underground stations.
- Sofia Metro: Tunnel ventilation design, including one-dimensional network analysis.
- New Tyne Crossing, UK: risk assessments for scenarios involving large-scale property damage.
- Belsize and Elstree Tunnels, UK: calculations of aerodynamic pressure pulse due to in-tunnel train crossings.
- A55 Road Tunnels, UK: engineering advice related to tunnel fire suppression.
- Kolkata Metro, India: Tender design of tunnel ventilation for two new metro lines.
- HSL Zuid, Netherlands: review of pressure pulse calculations in Groene Hart Tunnel.

Contact us

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