Tunnels and underground spaces
CSTB’s multi-disciplinary service at all stages of the project

A complete and tailored service for all professionals involved in tunnels and underground spaces. Exceptional experimental facilities and numerical tools.

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CSTB support throughout the project lifetime

1. **Design**
   - Studies and modelling of: ventilation, vibration, lighting, acoustics, smoke extraction, aeraulics

2. **Concrete mix selection**
   - Concrete behavior at high temperatures and fire resistance screening tests

3. **Segment manufacturing**
   - Full-scale fire resistance tests under mechanical load (up to 1,000 tons)

4. **Construction**
   - Smoke extraction strategy, in-situ measurements, in-situ tests

5. **Operation**
   - Fire safety, in-situ tests, acoustic and visual comfort of users, indoor air quality, fungal contamination

### Tunnels and underground spaces
- Fire safety engineering (smoke extraction, fire resistance of structures, active protection, fire evacuation plan)
- In-situ measurements: monitoring of vibration level during construction stage, concrete spalling under fire
- Project management assistance
- Design studies (ventilation, acoustics, vibration, lighting, aeraulics)
- Virtual reality
- Modelling and numerical simulation

### Component
- Fire resistance tests under mechanical load
- Thermo-mechanical modelling
- Regulation assessments
- Vibration tests on floating slab or track laying system

### Material
- Mechanical tests at high temperature

### Product
- Fire reaction tests
- Fire resistance tests
- Mechanical tests
- CE marking
- BIM modelling for integration into BIM library

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People travelling on a subway platform
Montreal underground town center
References in France and around the world

**France**
- Cut-and-cover tunnel of the L2 ring road
- Cut-and-cover tunnel of La Parette - Marseille
- Angers cut-and-cover
- La Défense cut-and-cover
- Fréjus tunnel
- Orelle tunnel
- Chamoise tunnel
- Perthus tunnel
- Caluire tunnel
- Nogent tunnel
- Paris area tunnels
- Jenner tunnel
- Lyon-Turin project
- Mont-Blanc tunnel
- A86 tunnel
- Eurotunnel
- Prado tunnel - Marseille
- Grand Paris Station

**Wales**
- Tunnel of Conwy

**Qatar**
- Subway tunnel of Doha

**Switzerland**
- Sargans

**Egypt**
- Ismaïlia and Port Said Suez canal tunnels

**Trainings**
- Optimising indoor air quality
- Optimising lighting
- Optimising comfort of public spaces in operation
- Fire safety

**Environmental certification**
HQE™ infrastructures delivered by our subsidiary Cerway

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