Safety in Tunnel

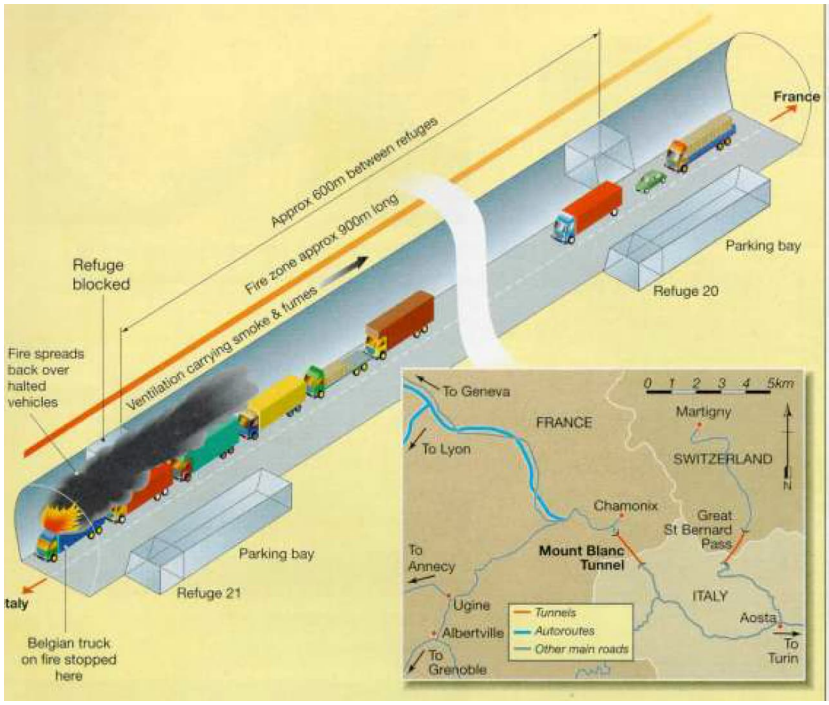
4th Chinese Tunnelling Symposium,
Beijing, November 11-12-1999



by
Bernd Aberle
Manfred Kühne
Yuanwen Bao

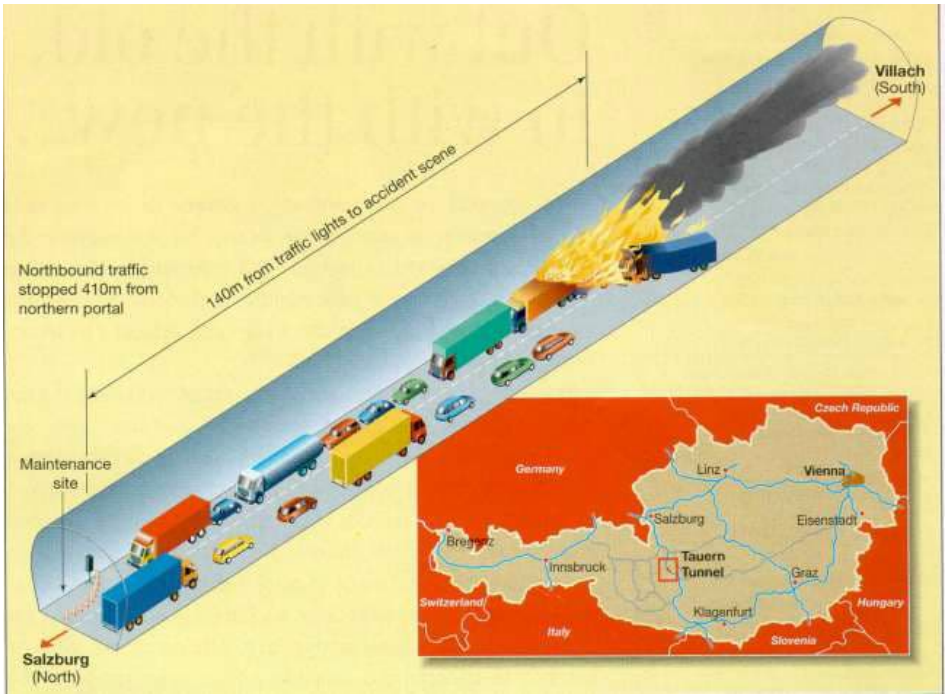
DMT-MinTec

Mont Blanc Tunnel



DMT-MinTec

Tauern Tunnel



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fire test in a subway tunnel



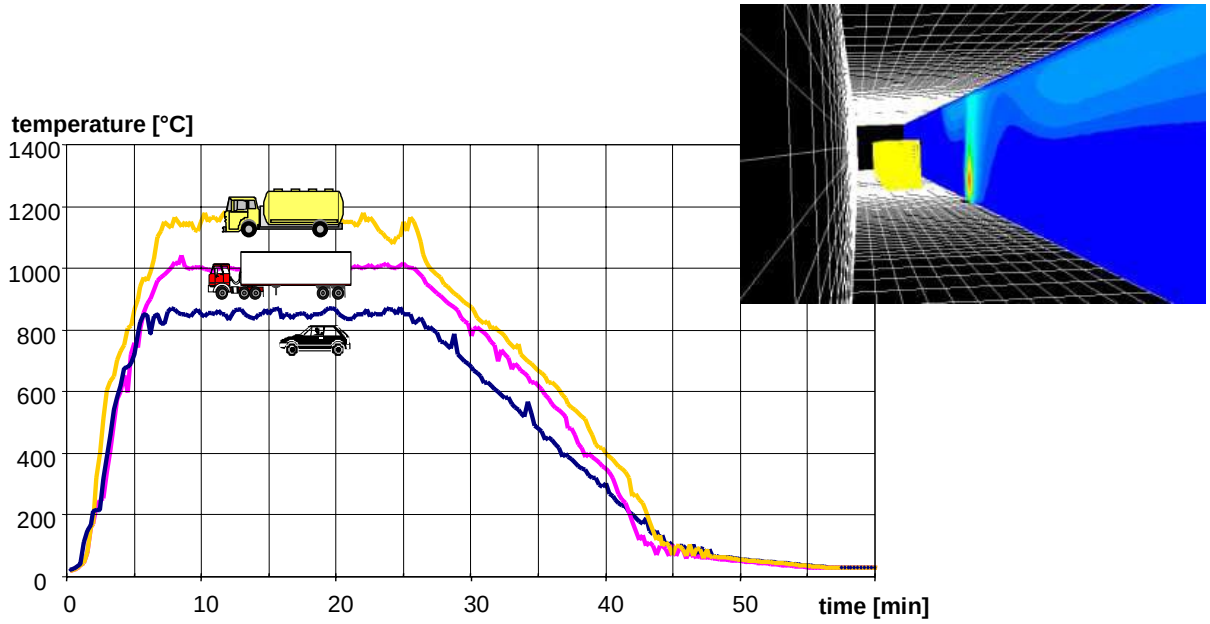
In case of fire there is smoke with:

- high temperature
- no visibility
- toxin gases

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Temperature of a fire in a tunnel

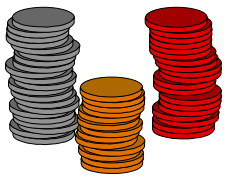


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The cost of a fire in a tunnel

- Compensation for personal demages
- structural renovation
- refurbishing of installations





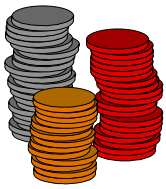
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The cost of a fire in a tunnel

- no toll revenues
- less users in future
- further harm to the economy of the area

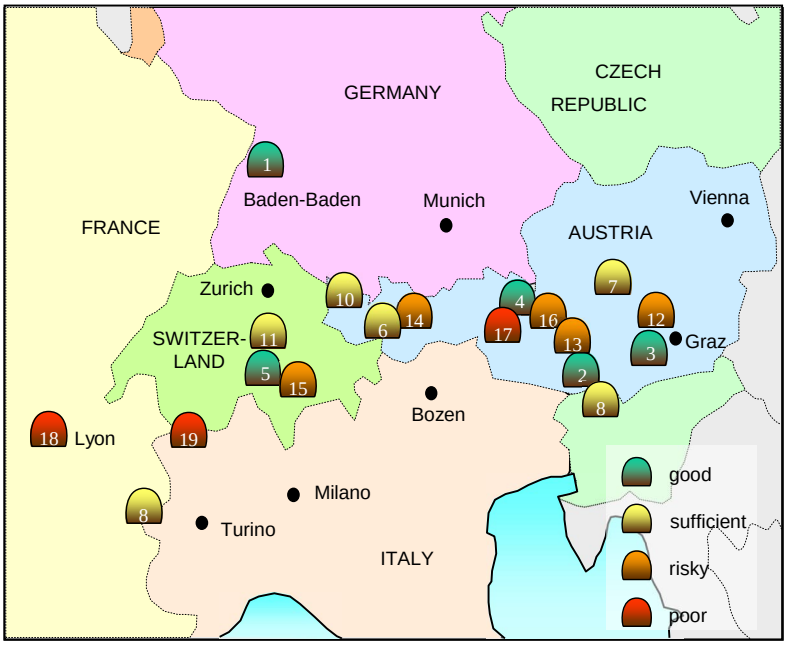




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ADAC- Tunneltest



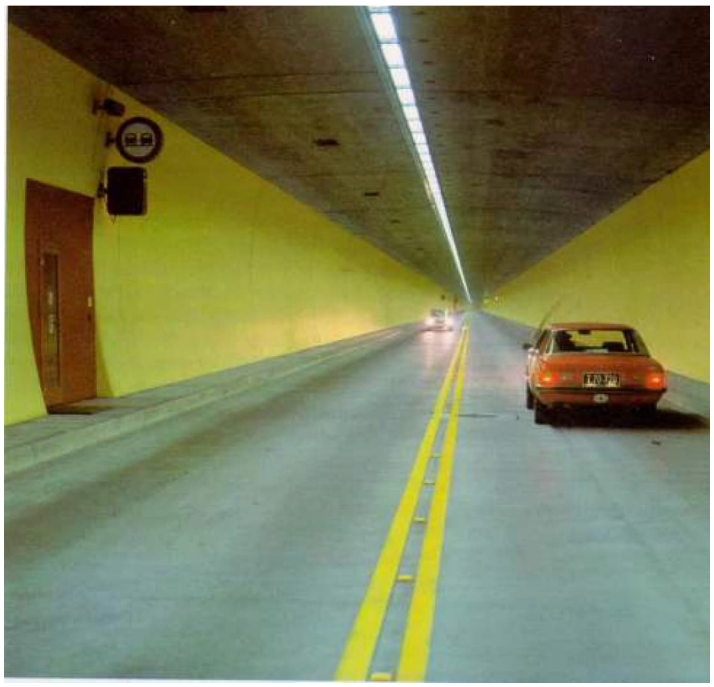
Tunnel tested:

1 Michaelsberg
2 Oswaldiberg
3 Plabutsch
4 Schmitten
5 St. Gotthard
6 Arlberg
7 Bosruck
8 Fréjus
9 Krawanken
10 Pfänder
11 Seelisberg
12 Gleinalm
13 Katschberg
14 Roppener
15 San Bernadino
16 Tauern
17 Felbertauern
18 Fourvière
19 Gr. St. Bernhard
20 Elbtunnel (not in picture)

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Factors for safety in tunnels



- tunnel system
- construction state
- kind of traffic

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Factors for safety in tunnels

- traffic monitoring
- traffic control measures
- emergency bays
- communication



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Factors for safety in tunnels



- fire protection measures
- ventilation system
- escape possibilities
- emergency facilities
- tunnel fire service

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Railway tunnel





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Training of fire fighting





Demonstration at RISC Ruhr's training centre

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Training at RISC Ruhr's training centre



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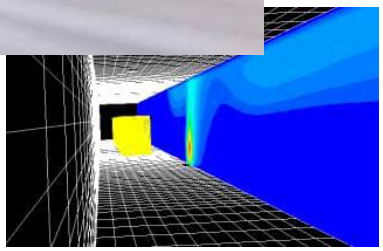
Safety in Tunnels











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