



## Rescue Trains – Requirements and Limitations

4th International Mines Rescue Conference 2009

Ostrava, 21.-26. September 2009, Urs J. Weder

# Rescue Trains – Requirements and Limitations

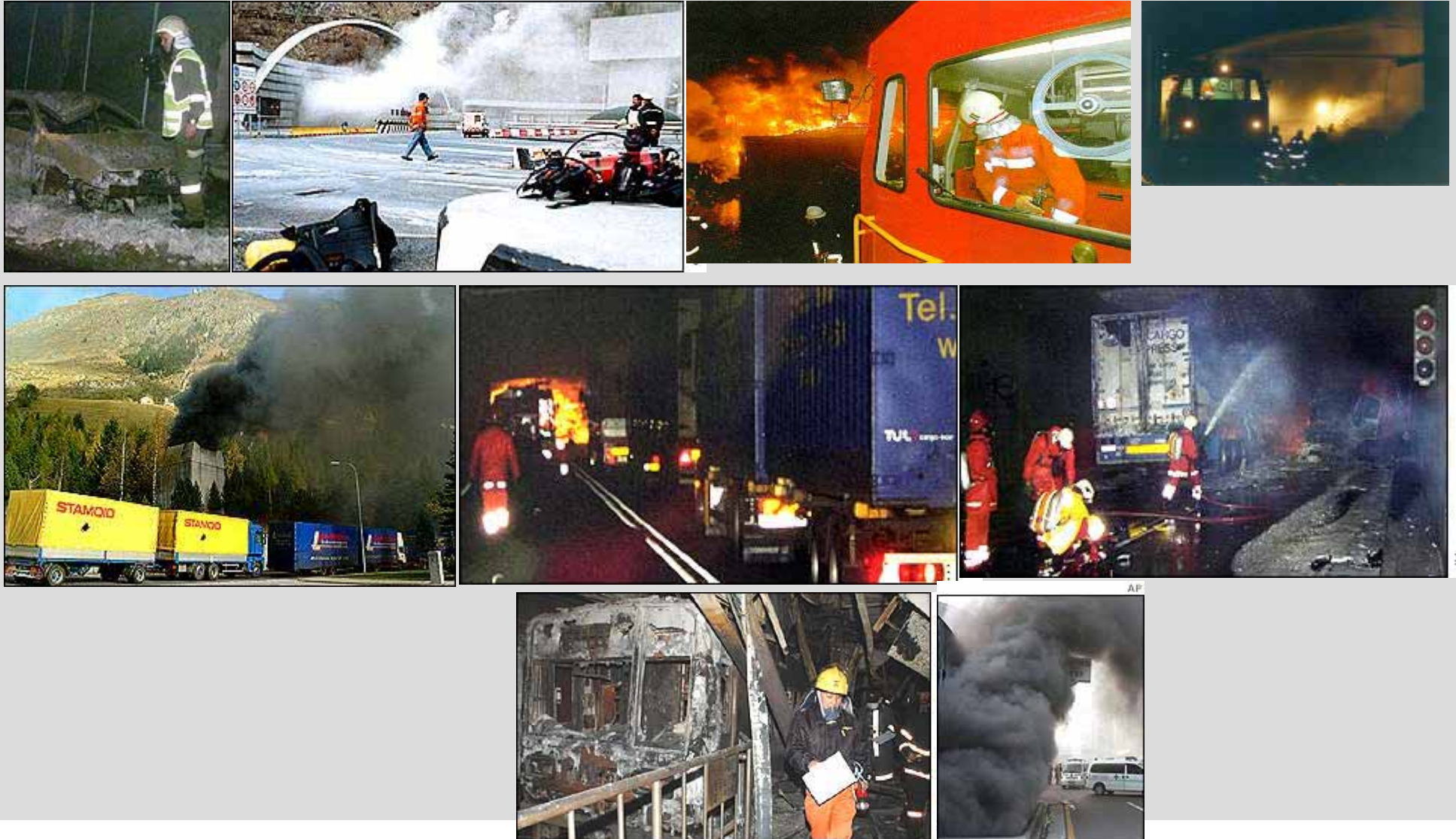
## Facts on SBB Infrastructure

- 3011 Kilometers route network
- 7400 Kilometers catenary
- 804 Stations
- 727 control centres to operate 13'642 switches and 31'231 signals
- 307 Tunnels of totaly 259 Kilometers
- 5873 Bridges of totaly 87 Kilometers
- 10 Power stations for the production of electricity
- Total costs for operation and maintenance CHF 1.4 Billion



# Rescue Trains – Requirements and Limitations

## Recent Tunnel Fires



# Rescue Trains – Requirements and Limitations

## Fire Development in Tunnels

Motorcar:	full scale fire after 10 min
Lorry:	full scale fire after 20-30 min
Train:	full scale fire after 20-30 min

# Rescue Trains – Requirements and Limitations



Time is crucial

A life-threatening Carbonmonoxide (CO) content of 0.05 vol.-% in the air can form after only 5 to 10 minutes after the fire starts; a dangerous mixture of gas and air results which affects the senses or brings on unconsciousness after only 5 to 7 breaths of air.

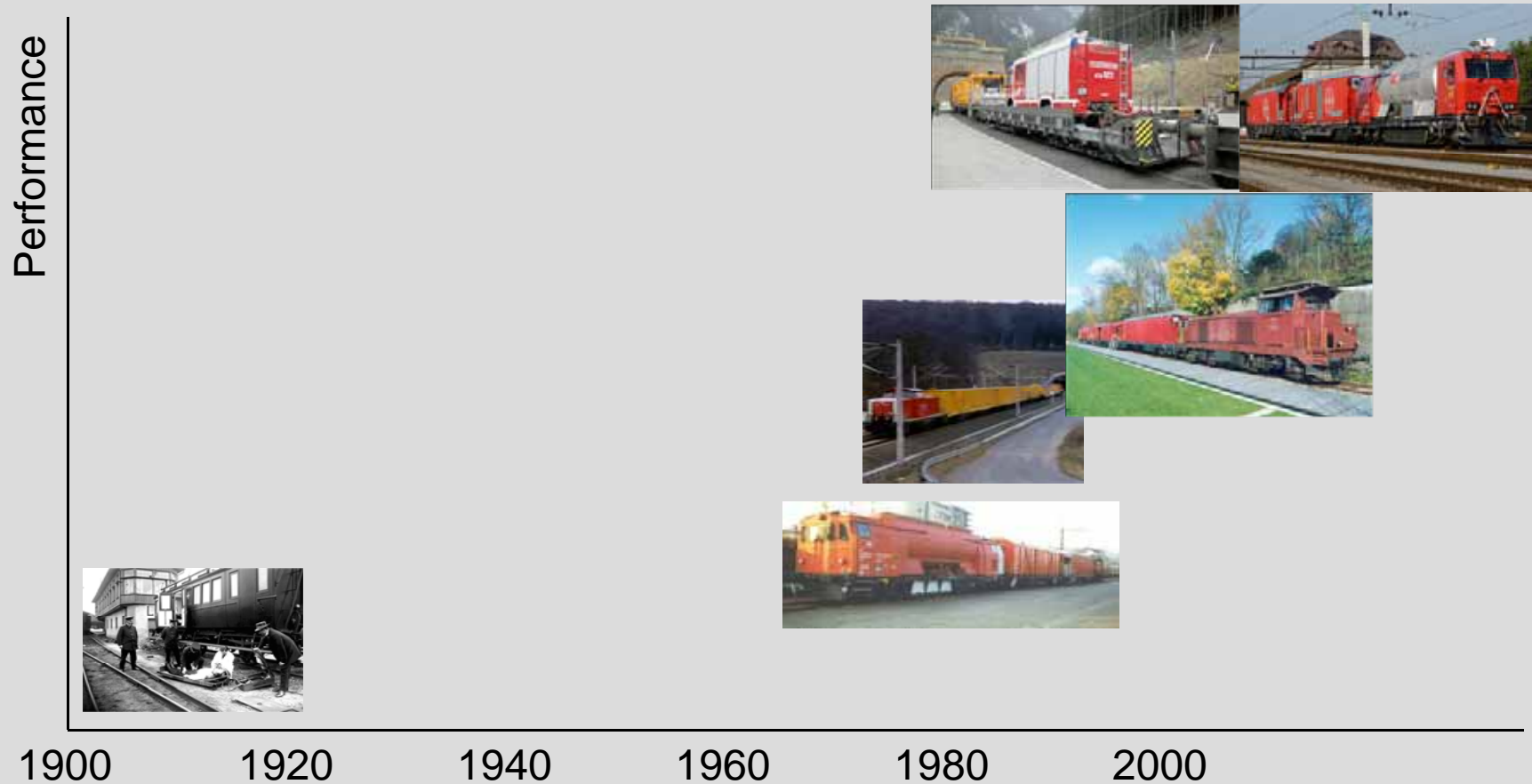
# Rescue Trains – Requirements and Limitations

## FFRT's in Switzerland

- |             |  |
|-------------|--|
| <b>1964</b> | Installation of the first „Tunnel Rescue Train“ in Göschenen used mainly for the Gotthard Tunnel   |
| <b>1976</b> | Installation of 10 FFRTs consisting of 1 Fire Fighting-, 1 Rescue- and 1 Utilities- Waggon. Air supply via hose and mask only.<br>BLS has also installed an identical train in Spiez |
| <b>1978</b> | The „Tunnel Rescue Train“ from Göschenen has been re-designed several times and has finally be stationed in Luzern   |
| <b>1996</b> | Delivery of 6 new FFTR with an air tight Rescue Car. Masks no longer needed.   |
| <b>2000</b> | 2 Trains on either side of the Veraina Tunnel (RhB)  |
| <b>2004</b> | 1 Train each for SBB and BLS   |
| <b>2008</b> | 8 Trains for SBB   |

# Rescue Trains – Requirements and Limitations

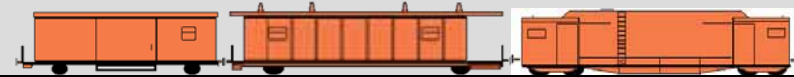
## Evolution of Rescue trains



# Rescue Trains – Requirements and Limitations

## Operational concept of SBB (1996)

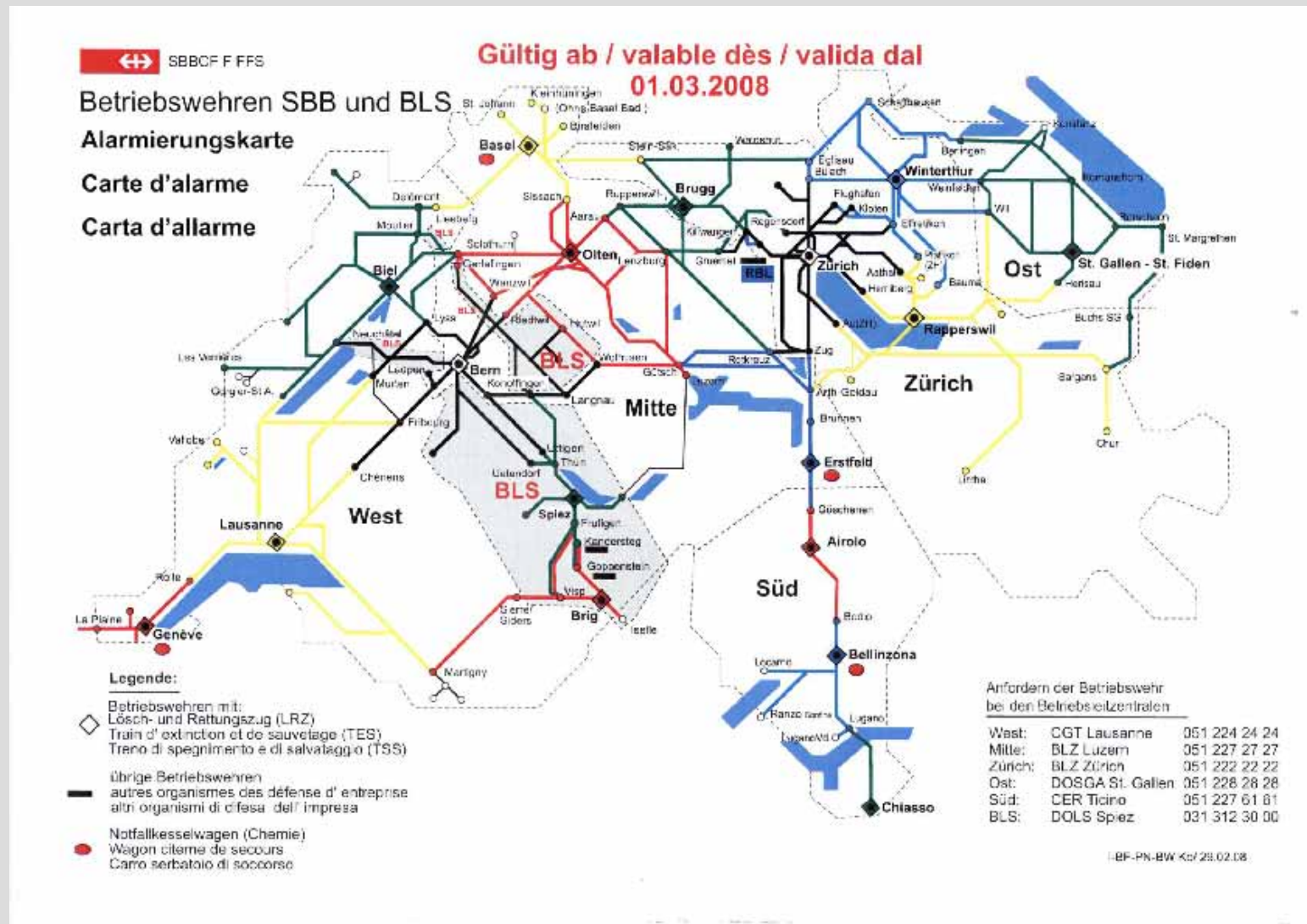
Dräger





# Rescue Trains – Requirements and Limitations

Faster respond time due to lesser area covered



# Rescue Trains – Requirements and Limitations

## The new concept



The FFRT is based on a MPV® comprising a driver cab, a loading deck with container interlocks, and the drive system in the under frame.

Dimensions: 59560/3150/4420mm

Rated power: 4 x 390 kW

Max. speed: 100km/h

It can pull max. 730t

## Rescue Trains – Requirements and Limitations

### The rescue car



- Airtight container with air lock and air curtain.
- 491'000 litres air stored in 36 cylinders.
- Designed to hold casualties and other passengers to be evacuated.
- Holds 60 persons standing or alternatively 9 persons on stretchers.

MPV and Rescue Container

## Rescue Trains – Requirements and Limitations

### The equipment car



- The Equipment Car is permanently coupled to the Fire Extinction Car.
- Container with workshop and storage room for fire fighting equipment
- Holds an breathing air compressor to recharge the cylinders
- Electric power generator rated at 50 kW

MPV and Equipment Container



# Rescue Trains – Requirements and Limitations

## The fire extinction car



- Fire Fighting media are Water/Foam/CAFS
- Tank volume approx. 50'000 litres
- Pump output of 6'000 litres/min at 10 bar allowing jet distance of 60 - 70 meters.
- The fire fighting monitor on the roof can be remotely controlled from the driver's cab.

Tank Waggon with machinery and Cab



# Rescue Trains – Requirements and Limitations

## Interior of the train



# Rescue Trains – Requirements and Limitations

## Operational concept of SBB (2004 + 2008)



# Rescue Trains – Requirements and Limitations

## Operational concept of BLS (2004)



## Rescue Trains – Requirements and Limitations

Personell required to run the train

In case of an emergency it needs 4 people to operate the FFRT:

1 Chief of Operation

1 Group leader

2 Drivers

additional fire fighters if necessary



# Rescue Trains – Requirements and Limitations

## Organisation and working hours

### Organisation

Professional organisation since July 1st, 2006

1 Centre of competence in Berne (3 FTE)

1 Logistic centre in Härkingen (5 FTE)

15 Professional intervention sites (182 FTE)

2 Non-professional intervention sites in Chiasso and RB Limmattal (ca. 40 FTE)

### Working hours

24 hours on 365/366 days in Zurich (at the BF Zurich)

All other intervention sites Mo – Fr 06:00 – 20:00. Pikett from 20:00 – 06:00



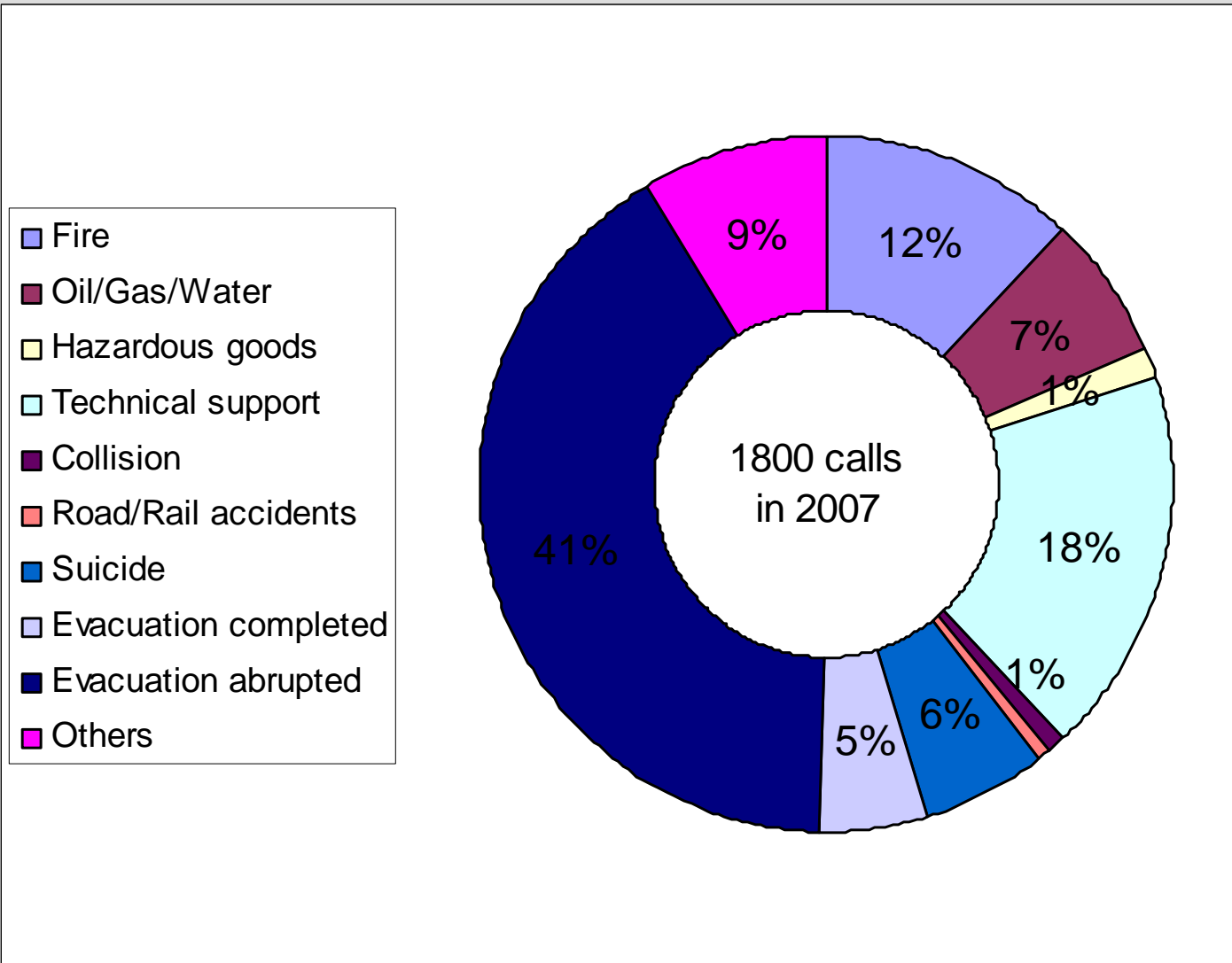
# Rescue Trains – Requirements and Limitations

## Dispatch times

- 2 Minutes in Zurich
- 5 Minutes at the other sites from 06:00 – 20:00
- 15 Minutes from 20:00 – 06:00 and Sat/Sun

## Rescue Trains – Requirements and Limitations

### Statistics on interventions



# Rescue Trains – Requirements and Limitations

## Limitations

1. Temperature  $-20^{\circ}\text{C}$  –  $60^{\circ}\text{C}$
2. Oxygen content  $>15\text{Vol}\%$
3. Evacuation capacity 60 people
4. Defective tracks
5. Availability of resources (personnel, equipment, etc)

## Conclusion

1. **Preventive constructional fire protection** on the one hand, in order to prevent serious damage occurring to the structure, and on the other, to ensure that users can escape or be rescued, have highest priority.
2. **Time is crucial.** Passengers should ,whenever possible, be able to rescue themselves and make their way to the nearest emergency exit. Suitable rescue means need to be provided to rescue people and limit infrastructure damage.
3. Fire Fighting and Rescue Trains are used to save people, fight fires, deal with accidents involving hazardous freight and to protect property. FFRTs offer the possibility to operate where road based vehicles don't have access, in particular in remote areas and rail tunnels.
4. The **Organisation** has to be adequate too.

**Thank you for your attention!**