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Bundesamt für Verkehr



Safety Concept Gotthard Base Tunnel

ERA Training in Budapest

27th June 2017

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Agenda

- Specification of Gotthard Base Tunnel
- Safety Concept
- Safety Targets
- Overall Safety Analysis
- Responsibilities





Operational requirements

Gotthard Base Tunnel:

- part of european corridor 1
- Technical standards in accordance with european Technical Specification of Interoperability (TSI)
- Tunnel length of 57 km
- Mixed operation (passenger and freight trains)
- 200 km/h passenger train operation
- 100 km/h freight train operation
- High capacity operation (260 freight + 65 passenger trains per day)



Analysis of Gotthard Base Tunnel Operation

Due to the length of 57km the following operating scenarios occur on a regular basis:

- Several trains running at the same time through the tunnel
- Dangerous goods and passengers can be in the tunnel at the same time
- More than 1'000 persons can be in the tunnel at the same time



Safety concept (1)

Principle:

Safety had first priority in the definition of the Gotthard Base Tunnel



Two single track tubes

Fire detection on vehicles

Traction, Auxiliaries, Passengerrooms, Toilets

Emergency running capability

emergency override, 15 Min capability

Safe stations in the tunnel

Sedrun, Faido to be reached within 15 Min

Transverse galleries

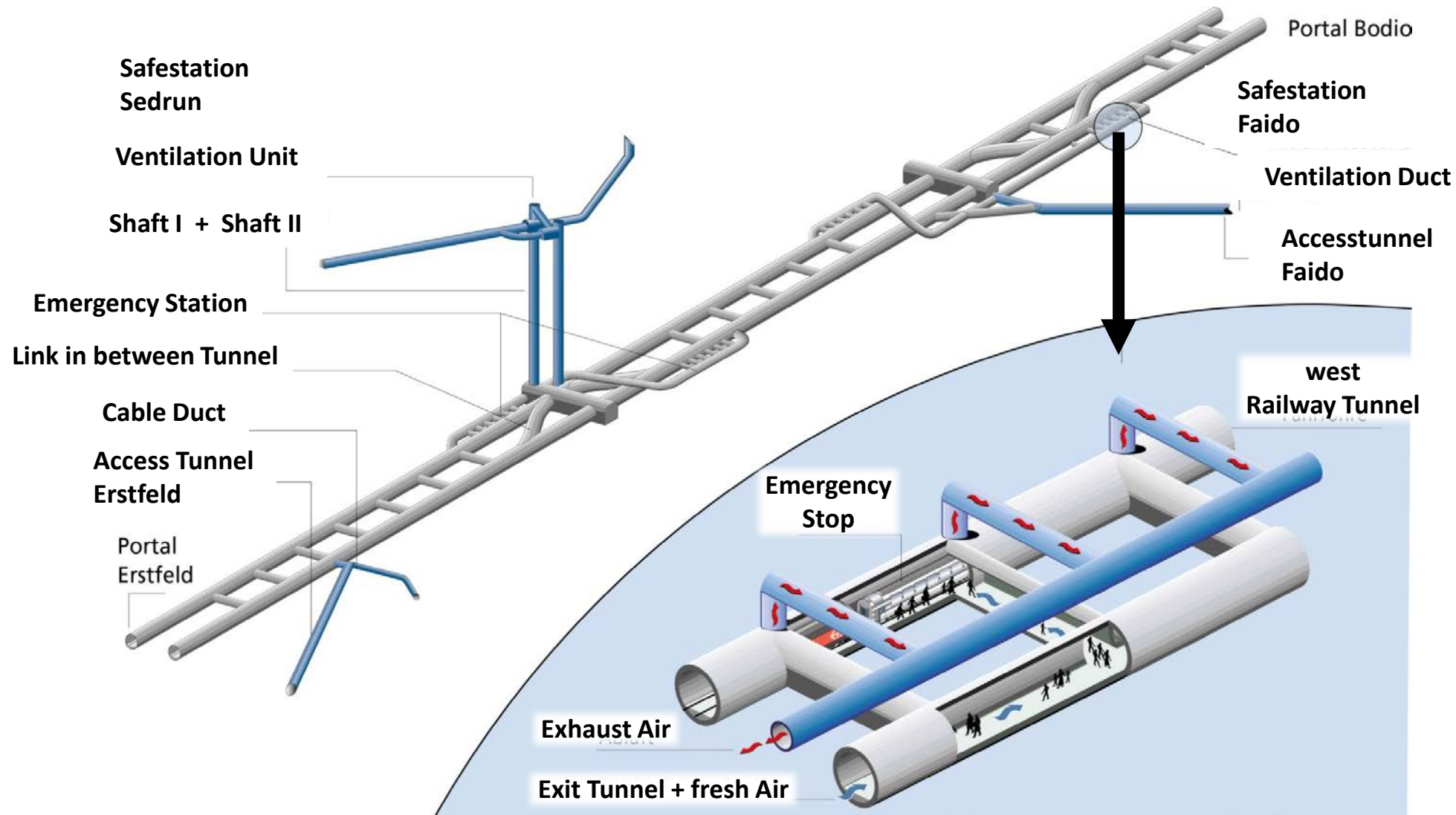
every 375 m to leave the tube

Forced ventilation

Supply and exhaust air ducts



Safety concept (2)





Safety concept (3)



Principle:

No defective trains enter into the Gotthard Base Tunnel



Train checkpoints

Equipped with:

- Hotspot detection
- Detection of overheated brakes
- Shifted load weight detection
- Loading gauge detection
- Fire detection
- Gas detection
- Panto detection

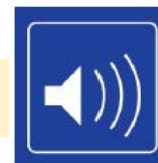


Safety concept (4)

Principle:

15 Min after detection of fire on a passenger train, the passenger train stands at a safe station and can be evacuated

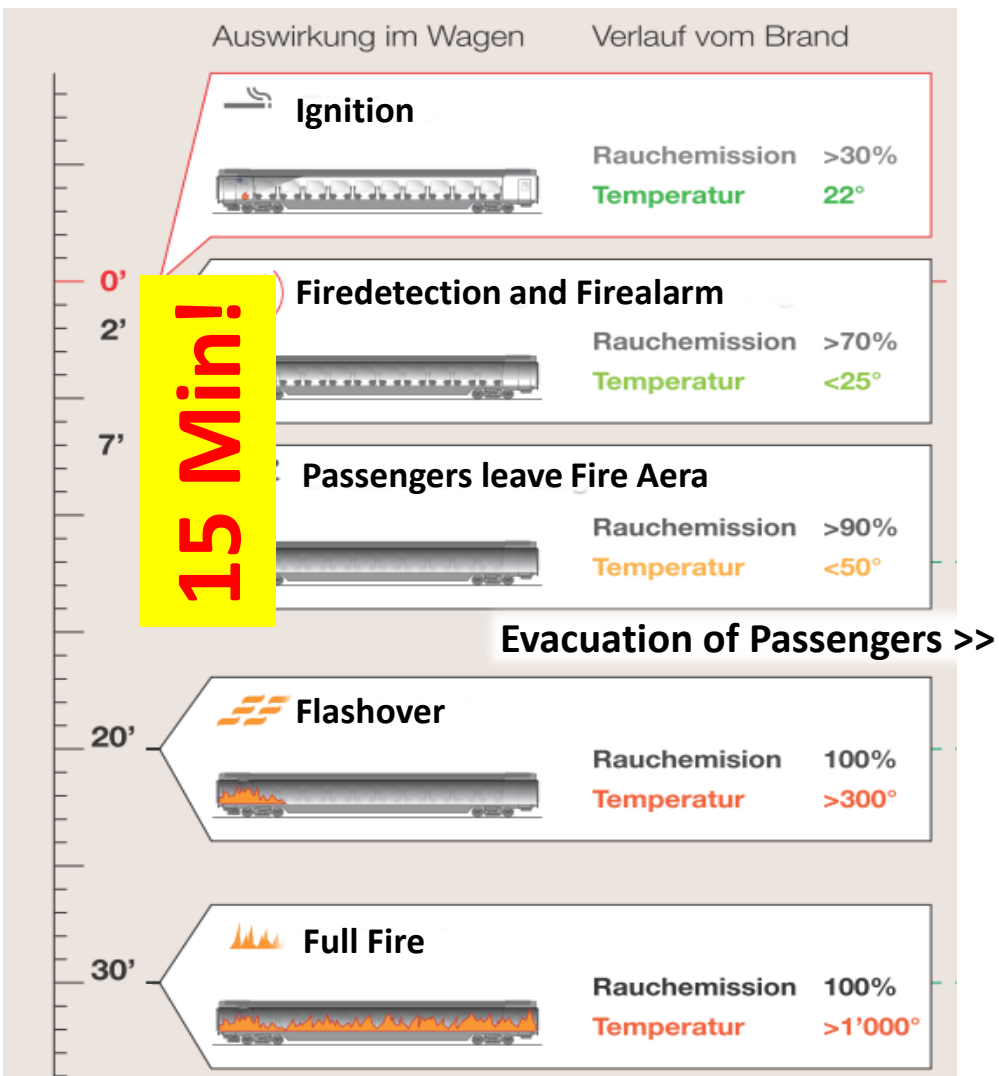
1 Detect fire as early as possible



2 Passengers go away from fire



3 Train runs in emergency operation to safe station
Passengers are evacuated in the safe station





Safety concept (4)

Principle:

Rescue and evacuation in the Gotthard Base Tunnel take place exclusively via rail



Two intervention centers operated (Erstfeld, Biasca)
Two emergency trains are ready to intervene

Trains with detected technical problems are stopped before they enter the tunnel

Following trains stopped in the tunnel by a stalled train will leave via ETCS reverse mode

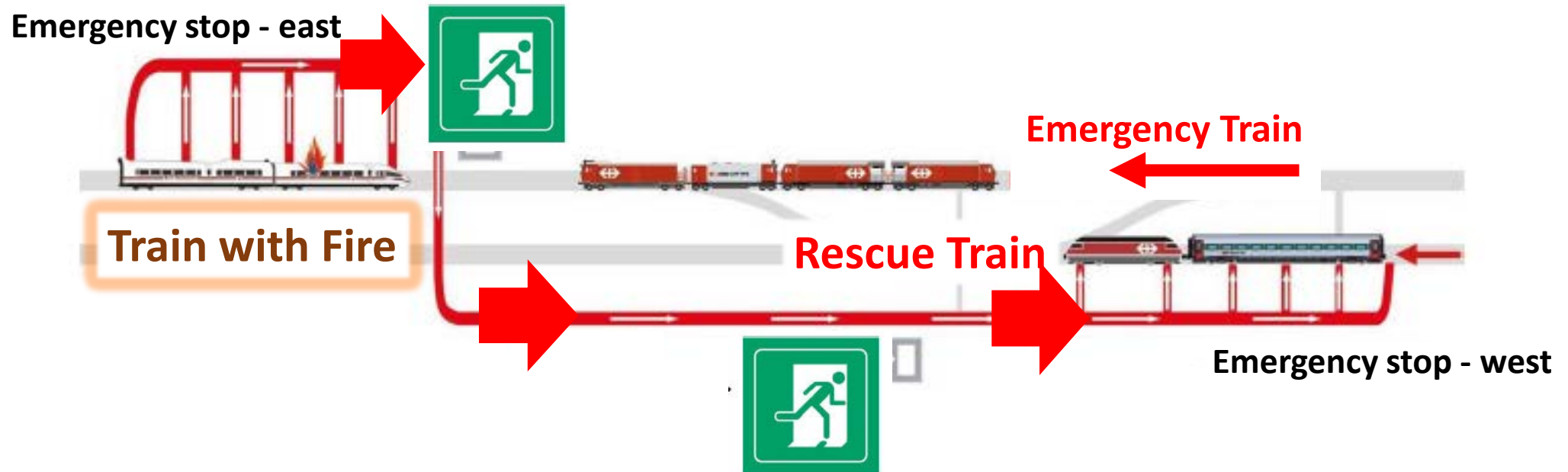
Defective train will be towed out of the tunnel with the emergency train

Evacuation of passengers will be the last measure

- At the closest emergency station if possible
- or via transvers galleries into the safe tunnel



Evacuation of passengers



Philosophy: Passengers rescue themselves and help handicapped persons to escape



Safety Targets

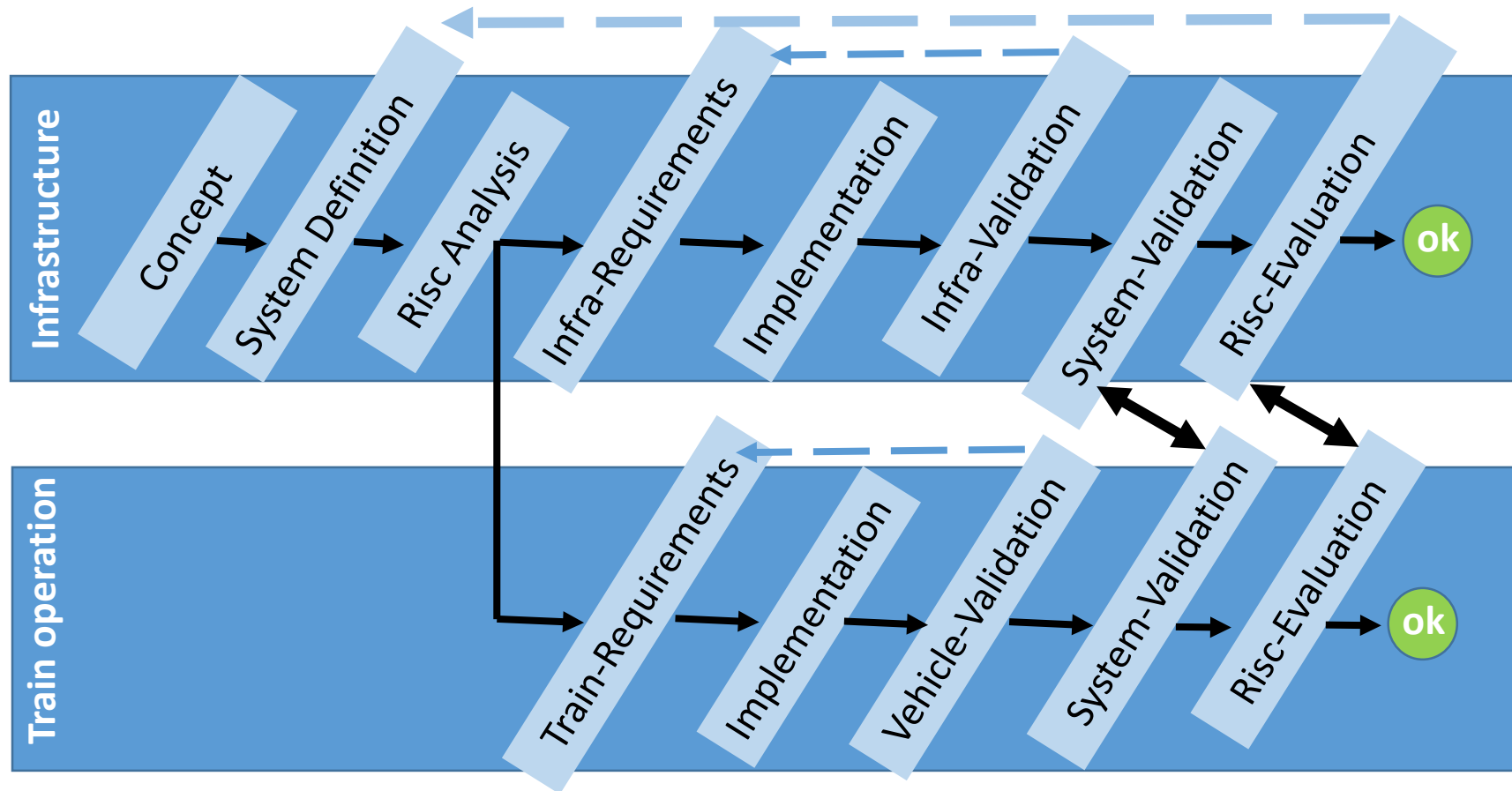
Target values for safety interventions:

- Operation Center: Operator has 90 sec to override an automatic alarm from a checkpoint
- Train with fire: With the alarm the train driver has 15 Min to reach the emergency station
- Rescue train: Crew has 45 Min to reach the stopped train in the tunnel
- Evacuation: Passengers of a stopped train should be out of the tunnel within 90 Min



Safety analysis

Risc based process of the over all safety analysis with defined steps





Responsibilities

Infrastructure Manager (IM)

- Ensures functionality of all safety relevant systems
- Tunnel operators are instructed and ready to react in emergency situation
- Emergency crews are ready to intervene

Railway Undertaking (RU)

- Rolling stock fulfills requirements (network access)
- Train crews are instructed to react in emergency situation



Conclusions



- Safety validation process starts at the projects kick off
- A clear project structure is the key to the success
- Clear tasks with allocated responsibilities lead to a complete result
- Requirements have to be defined at the project start

