Tunnels Solutions from Bosch Security Systems
Tunnel Solutions

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Content

Definitions and examples

Solution

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How a tunnel looks like
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How a tunnel looks like

Security cameras and/or radars

Fire sensors and call points
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Definitions and examples – what set the standards

- Mont Blanc tunnel
  - Finished in 1965
  - Serves 1/3 cargo from Italy to Northern Europe
  - Tragic fire in 1999
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Definitions and examples – what set the standards

► Tauern tunnel
  – Completed in 1975
  – Among the longest frequently-travelled road tunnels in Austria
  – Tragic Fire in 1999
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Definitions and examples – what set the standards

- Gotthard tunnel
  - Completed in 1980
  - Longest road tunnel at the time it was opened
  - Tragic Fire in 2001
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Consequences and Trends

► EU directive 2004/54
  - National regulations commonly follow EU directive also on shorter tunnels
  - Deadline for implementation in 2019
  - Still 14 countries needs to align
  - EU partners like Switzerland and Norway follow
    - ca. 1100 tunnels in Norway
    - ca. 480 tunnels in Switzerland

► New technologies in incident detection and traffic management
  - Intelligent video analytics
  - Thermal cameras
  - Smart radar applications
  - Reliable fire and smoke detection
## EU directive 2004/54

### INFORMATIVE SUMMARY OF MINIMUM REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Traffic ≤ 2000 veh. per lane</th>
<th>Traffic &gt; 2000 vehicles per lane</th>
<th>Additional conditions for implementation to be mandatory, or comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lighting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal lighting</td>
<td>§ 2.8.1</td>
<td>● ● ● ● ● ●</td>
<td></td>
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<tr>
<td>Safety lighting</td>
<td>§ 2.8.2</td>
<td>● ● ● ● ● ●</td>
<td></td>
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<tr>
<td>Evacuation lighting</td>
<td>§ 2.8.3</td>
<td>● ● ● ● ● ●</td>
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<tr>
<td><strong>Ventilation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>§ 2.9</td>
<td>● ● ● ● ●</td>
<td>Mandatory in bi-directional tunnels where there is a control centre.</td>
</tr>
<tr>
<td>Special provisions for (semi-) transverse ventilation</td>
<td>§ 2.9.5</td>
<td>● ● ● ●</td>
<td>Equipped with telephone and 3 extinguishers.</td>
</tr>
<tr>
<td><strong>Emergency stations</strong></td>
<td></td>
<td>§ 2.10</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td>At least every 250 m</td>
<td>§ 2.10</td>
<td>● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td><strong>Water supply</strong></td>
<td></td>
<td>§ 2.11</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td>At least every 250 m</td>
<td>§ 2.11</td>
<td>● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td><strong>Road signs</strong></td>
<td></td>
<td>§ 2.12</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td><strong>Control centre</strong></td>
<td></td>
<td>§ 2.12</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td><strong>Monitoring systems</strong></td>
<td></td>
<td>§ 2.13</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td>Video</td>
<td>§ 2.13</td>
<td>● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>Automatic incident detection and/or fire detection</td>
<td>§ 2.13</td>
<td>● ● ● ● ● ●</td>
<td>At least one of the two systems is mandatory in tunnels with a control centre.</td>
</tr>
<tr>
<td><strong>Equipment to close the tunnel</strong></td>
<td></td>
<td>§ 2.13.1</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td>Traffic signals before the entrance</td>
<td>§ 2.13.1</td>
<td>● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>Traffic signals inside the tunnel at least every 1000 m</td>
<td>§ 2.13.2</td>
<td>● ● ● ● ● ●</td>
<td>Recommended if there is a control centre and the length exceeds 3000 m.</td>
</tr>
<tr>
<td><strong>Communication systems</strong></td>
<td></td>
<td>§ 2.16</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td>Radio re-broadcasting for emergency services</td>
<td>§ 2.16.1</td>
<td>● ● ● ● ● ●</td>
<td>Mandatary where radio is re-broadcasted for tunnel users and where there is a control centre.</td>
</tr>
<tr>
<td>Emergency radio messages for tunnel users</td>
<td>§ 2.16.2</td>
<td>● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>Loudspeakers in shelters and exits</td>
<td>§ 2.16.3</td>
<td>● ● ● ● ● ●</td>
<td>Mandatory where evacuating users must wait before they can reach the outside.</td>
</tr>
<tr>
<td><strong>Emergency power supply</strong></td>
<td></td>
<td>§ 2.17</td>
<td>● ● ● ● ● ●</td>
</tr>
<tr>
<td><strong>Fire resistance of equipment</strong></td>
<td></td>
<td>§ 2.18</td>
<td>● ● ● ● ● ●</td>
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Needs

Safety and security of travelers and goods
Continuity of service
Audible information
Clamp down on fires
Cost effective design
One platform
Tunnel Solutions

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Safety and security of travellers and goods

**Challenge**

- Reliable traffic management 24/7
- Automatic Incident Detection 24/7
- Uncompromised situation awareness in all visual conditions
- Instant and proper reactions to threats
Tunnel Solutions
Safety and security of travellers and goods

Solution

▶ Radar based
  - Traffic management independent from visual conditions
    - Classification detecting cars, trucks and pedestrians
  - Reliable Automatic Incident Detection
    - Incidents triggered if traffic stops or slows down
    - Incidents triggered if pedestrians detected
    - Speeding vehicles
    - Vehicles going wrong way
    - Debris detection
  - Video verification of incidents detected
    - Fixed cameras providing constant overview
    - Radar guided PTZ cameras (reacting to incidents)
Tunnel Solutions
Safety and security of travellers and goods

Solution

- Camera based
  - Traffic management based on IVA
    - Classification detecting cars, bikes, trucks and pedestrians
  - Automatic Incident Detection based on Bosch IVA
    - Pedestrians
    - Stopped cars
    - Flow against the traffic
    - Speeding
    - Debris
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Needs

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Cost effective design
One platform
Tunnel Solutions
Continuity of service

**Challenge**

- Minimize disruptions in tunnel operations
  - During periodical maintenance works
  - During system upgrades and reconfigurations
- Failover system design
Tunnel Solutions
Continuity of service

Solution

- Redundancy by design in BVMS, VRM and ACS
  - System operates even when servers are down
- Support for virtualization (Microsoft and VMWare)
  - Supported by all Bosch SW platforms
- Remote commissioning and firmware upgrades
  - Quick and hassle free
  - Supported by VS, Fire, Access, Intrusion and PA solutions
- Authenticated and encrypted communication
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Needs

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One platform
Tunnel Solutions
Audible information

Challenge

- Intelligible voice communication despite
  - Sound reflections on tunnel walls
  - Specific sound propagation in tunnels
  - Sound absorbent linings
  - Noise level (car engines)
- Instant and accurate reactions to threats
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Audible information

Solution

- Careful acoustic design
- Supervised messaging (delays)
- Dedicated loudspeakers for powerful but controlled sound
- Mix of classic call stations with easy graphical user interface
- Redundant system’s topology
- Open integration standards
- Compliancy with EN-54 standards
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Audible information

Solution

Main Control Room

PC Call Station

PRS-1AIP1

Local area network

PRS-NCO3

PRS-xPxx

Praesideo Voice Alarm system

Praesideo system components are connected in a loop to create a redundant system
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Needs

Safety and security of travelers and goods
Continuity of service
Audible information
Clamp down on fires
Cost effective design
One platform
Tunnel Solutions
Clamp down on Fires

Challenge

- Detect threats quickly and reliably
- Minimize false alarm ratio
- Dependably protect people in all areas
- Efficiently manage even large scale evacuations
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Clamp down on Fires

Solution

- Tunnel dedicated sensors and solutions
- Addresable and modular Fire Alarm system
- Integrated voice evacuation
- Reduntant system’s topology
- Compliancy with EN-54 standards
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Needs

Safety and security of travelers and goods
Continuity of service
Audible information
Clamp down on fires
Cost effective design
One platform
Tunnel Solutions
Cost effective system design

Challenge

- Minimizing initial investment and TCO
- Ensuring easy maintenance
- Ensuring scalability and flexibility
- Providing ability for modernization
Cost effective system design

Solution

- **IP based Video Systems**
  - Reduced infrastructure and installation costs
    - Cabling costs reduced to 50% comparing to analogue
    - Remote commissioning and maintenance
    - Additional redundancy (design and virtualization)
    - Supervised networks
  - Open standards
    - Easy integration and interoperability
  - Scalability
    - Grow your system by simply adding cameras and storage space
  - Future proof
    - Software and firmware updates
Tunnel Solutions
Cost effective system design

Solution

- IP based Video Systems
  - Embedded intelligence (at the edge)
    - Content Based Imaging Technology
      » Intelligent Auto Exposure (iAE)
      » Intelligent Dynamic Noise Reduction (iDNR)
      » Intelligent Defog
      » Starlight technology
  - High Definition and Megapixel resolution
    - Replace multiple cameras with just a few
  - Dynamic transcoding
    - Bandwidth independent accessibility

Graph demonstrating the relative bandwidth conservation of various noise reduction methods.
Cost effective system design
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Cost effective system design

Solution

- Modular Fire Alarm and Intrusion Detection
  - Scalability
    - Adjust system size to the changing requirements
  - Logical Security Network (LSN)
    - Addressable components
  - IP and cloud based communication
    - Remote maintenance and supervision
  - Industry standards
    - Open for integration
  - Future proof
    - Software and firmware updates
Tunnel Solutions
Cost effective system design

Solution

- Modular Access Control
  - Scalability
    - Adjust system size to the changing requirements
  - IP based communication
    - Remote maintenance and supervision
  - Industry standards
    - Open for integration
  - Future proof
    - Software and firmware updates
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Tunnel Solutions
Control all systems with a single software platform

Challenge

- Have a complete overview of security information in easy and unified GUI
- Manage complex safety and security processes in an ordered and efficient way
- Handle different systems simultaneously from one unified working space
- Organize various operators groups the way they handle their task efficiently
Tunnel Solutions
Control all systems with a single software platform

Solution

- Complete integration of Security, Safety, Communication and Facility Automation
- All systems reporting to and managed from one platform
- More efficient prevention and quicker reactions
- Faster response respecting local policies (laws)
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Concept solution for tunnels
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Offering more than “just” products
Thank you for your attention!