TUNNEL FIRE PROTECTION

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TUNNEL FIRE PROTECTION

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- History
- Management System
- Protection Systems
- Suppression Systems Versus Ventilation
- Tunnel Fire Protection Development
- References & Information

TUNNEL FIRE PROTECTION

HISTORY

- Europe and USA

  Rely on Ventilation to Control Fires in Tunnels
- Japan

  Sprinkler Protection (1970's)
- Australia

  Use both Sprinkler and Ventilation

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Management System

- Tunnel Management System (Computer)
- Emergency Response Plans
- Training – Operator & Emergency Services
- Maintenance Plans
- Emergency Services Exercises
- Stakeholders – Designer, Operator & Responders

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Fire Protection Systems

- Passive Fire Protection Systems

  Sit & Wait For a Fire Event

- Active Fire Protection Systems

  Activate on Detection of Fire

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Passive Fire Protection Systems

- Fire Resistant Construction of Roof and Walls
- Fire Resistant Panels, Boards and Coatings
- Fire Resistant Doors
- Fire Resistant Electrical Services
- Exit Systems

  Distance to Exit Doors

  Exit Corridors

  Safe Refuges (Now Required to Discharge to Open Area)

  Tube Interconnection

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Active Fire protection Systems

- Emergency Power, Lighting & Exit Signage
- CCTV (Object & Smoke Detection)
- Occupant Warning Systems
  Visual (Signs)
- Audible (PA & Radio Rebroadcast)
- Communication (Radio & Phone)
- Tactical Fire Plans
- Security Systems
- Emergency Power Outlets
- Fire Detection System
  Smoke & Heat
- Hydrants
- Hose Reels
- Extinguishers
- Suppression Systems
- Smoke Hazard Management System
- Manual Call Point
  (Cabinet Door Switch)
- Drainage System (Flame Traps)
- Exit Pressurisation

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Fire Detection Systems

- Heat Detection
  - – Linear + Fixed Temperature
    + Rate of Rise
- Smoke Detection
  - CCTV System (Traffic Bores)
  - Point Detectors & Aspirating (Service Areas)

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Suppression Systems Versus Ventilation

+ Effect of Ventilation System on Fire

- Adds Oxygen - Fire Size Increases (15MW – 30MW)

+ Suppression System Effect on Fire

- Caps Fire at Design Size (10MW)
- Can Increase Obscuration
- Can Cool Smoke (Minimal)
- Can Appear to Increase Quantity of Smoke
- Will Affect Driver Visibility (Delay Suppression System Operation Until Warning Systems have Activated)
- Ventilation System - Minimal Effect on Spray Patten

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Suppression Systems

- Sprinkler System Zoned & Controlled by Deluge Valves
- Water Mist System Zoned and Controlled by Deluge Valves
- Simultaneous Operation of Three Zones
- Suppression System Activated by Thermal Detection System with Manual Override
- Water Supply for Four Zones
- Combined Water Supply for Suppression System, Hydrants and Hose Reels. (Single Pipe Supplied From Both Ends and Zoned with Isolation Valves)

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Tunnel Fire protection Development

- Swiss Fire Tunnel Test of Protection Systems (Siemens Building Technologies – Cerberus Division) Beall, Grosshandler and Luck
- Norway – UPTUN Full Scale Fire Tests - Runehamar

References

- WWW Google – Fire Accidents in Road Tunnels
- Current State of Road Tunnel Safety in Japan – H. Mashimo
- NFPA Standards
- AFEC Tunnel Fire Safety Standard

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QUESTIONS

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