



Recommendations to owners and operators of urban road tunnels

Jean-Claude MARTIN

- Centre d'Études des Tunnels (France)
- Chargé de mission
- jean-claude.martin@equipement.gouv.fr





Recommendations

The following recommendations have been prepared by the working group one (Committe 3.3 Road Tunnel Operations)

Properties of urban road tunnels



- ✓ High traffic volume
- ✓ Congestion during commuter periods
- ✓ Difficult closures

Goal of the recommendations

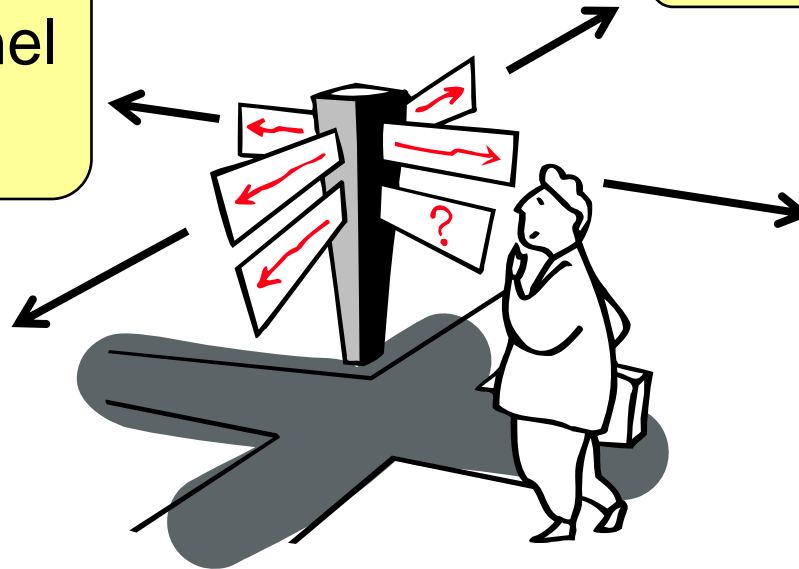
To minimize the potential conflict
between the differing needs

Needs of the tunnel
operator

Needs of
tunnel users

Difficult closures

High traffic
level





Recommendations

Two parts



Operation of existing urban road tunnels

Design and refurbishment of urban road tunnels

Existing urban road tunnels (1)

➔ traffic control



Coordination with the city traffic control centre

Existing urban road tunnels (2)

→ traffic control



Find roads for rerouting traffic in case of closure

Existing urban road tunnels (3)

→ traffic control



Tidal traffic (2 lanes in one way in the morning only 1 lane in the evening)

Existing urban road tunnels (4)

traffic control

→ maintenance



Processus
adequately planned

Existing urban road tunnels (5)

traffic control

→ maintenance

Partial closure
(if possible)



Existing urban road tunnels (6)

traffic control
maintenance

→ intervention management



Rapidity of action (use
CCTV and AID)

Existing urban road tunnels (7)

traffic control
maintenance

→ intervention management



Fast patrols inside the tunnel

Existing urban road tunnels (8)

traffic control

maintenance

intervention management

communication with users



Advance publicity for planned closures

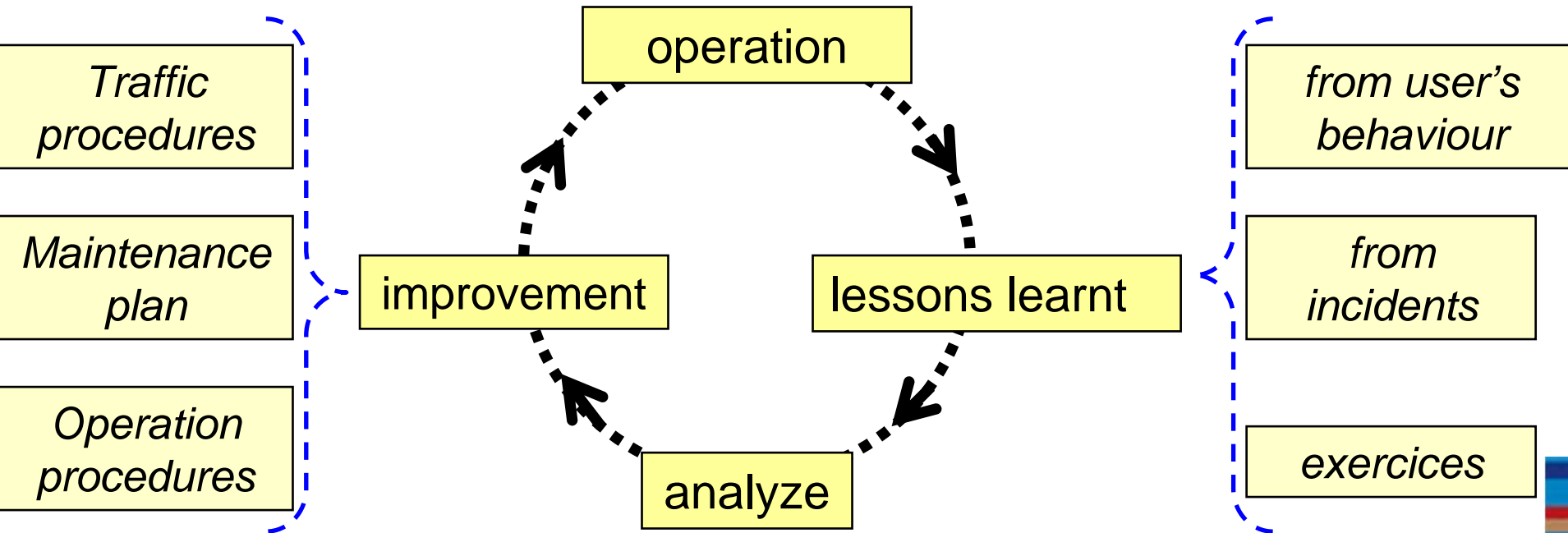
Upstream information on traffic level in the tunnel

'real time' information

Existing urban road tunnels (9)

traffic control
maintenance
intervention management
communication with users

continuous improvement



Second part

Existing urban road tunnels



*Design (and refurbishment)
of urban road tunnels*

Design and refurbishment of urban road tunnels (1)

general recommendations for initial design

Reduction of congestion

- *Number of lanes based on a realistic traffic intensity forecasts*
- *Do not reduce number of lanes in or just downstream from the tunnel*
- *Avoid access and exit junctions in or near the tunnel*

Reduction of incident frequency

- *Avoid, where possible, bi-directional traffic, to prevent head-on collisions*
- *Give a constant, predictable and unambiguous environment for the drivers*
- *Avoid steep ramps (frequency of breakdown rises)*

Design and refurbishment of urban road tunnels (3)

➔ general recommendations for initial design



Reduction of incident frequency
(avoid entrance in the interior
zone)

Design and refurbishment of urban road tunnels (4)

➔ general recommendations for initial design



Reduction of incident frequency
(avoid junction near the portal)

Design and refurbishment of urban road tunnels (5)

➔ general recommendations for initial design

Reduction of incident effects

- *Special entranceways near the portals exclusively for emergency services*
- *Make sure the capacity of the entire escape route is sufficient for people expected in an urban tunnel*
- *Give adequate space for marshalling and holding vehicles in case of incident*

Design and refurbishment of urban road tunnels (6)

general recommendations for intial design

Reduction of
frequency and
duration of
maintenance (1/2)

- *Avoid to place equipment in the road space*
- *Position equipment located overhead so that maintenance is possible closing only one lane*
- *Place all distribution cabinets in niche enclosures where maintenance can be done wihtout closing lanes*
- *Positon equipment, such as main ventilation, to be accessible without the need to enter in the tunnel*

Design and refurbishment of urban road tunnels (6)

➔ general recommendations for initial design

Only one lane closed for lighting maintenance



Design and refurbishment of urban road tunnels (7)

general recommendations for initial design

Reduction of
frequency and
duration of
maintenance(2/2)

- *Design “plug and play” equipment*
- *Chose a durable and robust solution that requires low frequency and time saving maintenance*
- *Use as much as possible self-diagnostic equipment supported by a SCADA system*
- *Built in sufficient redundancy to continue to operate after a limited failure*

Design and refurbishment of urban road tunnels (9)

general recommendations for initial design

recommendations for individual equipment

Cables and ducts

- *Adequate spare capacity for tunnel future needs*
- *Provision of ducts for other services (public or private companies)*

Lighting

- *Harmonize tunnel lighting with the outside urban network lighting*

Design and refurbishment of urban road tunnels (10)

general recommendations for initial design

→ recommendations for individual equipment

Ventilation

- *Design must take into consideration air quality and environmental pollutions*
- *Congestion in the tunnel should be taken into account for design*

Traffic management system

- *In a tunnel, safety should take precedence over traffic movement in traffic management system*
- *Limit the congestion inside the tunnel*

Design and refurbishment of urban road tunnels (12)

general recommendations for initial design

recommendations for individual equipment

➔ Recommendations for refurbishment

**Use the same approach as new
equipment design**

special attention in case of SCADA
refurbishment



Conclusion

For an existing urban road tunnel key words are :

- rapidity of intervention
- communication with users
- maintenance optimization

For design goals are to reduce :

- congestion
- incident frequency
- incident effects
- frequency and duration of maintenance



Thank you for your attention