

**MAKING EUROPE'S ROAD TUNNELS SAFER FOR USERS**

**EUROPEAN TUNNEL ASSESSMENT PROGRAMME (EUROTAP) INSPECTIONS 2007**

**THE MERSEY QUEENSWAY TUNNEL**



## Foreword

On 19 January 2007 deep in the Ehrentalerberg tunnel on the A2 near Klagenfurt in Austria, 29 cars, nine HGVs and a bus collided. Despite the carnage no one was killed and only 12 people were injured, none of them seriously. Around 150 people were able to leave the tunnel safely. The rescue services described the outcome as ‘a miracle’.

But was it a miracle or a result of improving safety standards, good tunnel management and more public understanding of the dangers inherent in using road tunnels, which ensured that danger was minimised as much as possible? The Ehrentalerberg tunnel was inspected in 2006 and rated ‘Good’. To achieve this rating the tunnel operators had to satisfy inspectors that the systems in place would be capable of dealing quickly and effectively with any emergency, clearly this turned out to be the case.

Since 2000, firstly EuroTest and subsequently EuroTAP (which is supported by the EU Commission and 13 European motoring organisations of which the AA is a leading member) have been engaged in a programme of tunnel inspections designed to highlight weaknesses in tunnel safety, encourage improving standards and promote driver awareness. And standards continue to improve, with well over half the 51 tunnels inspected rated as ‘Very good’ or ‘Good’. Add to that the 12 tunnels judged to be ‘Acceptable’ and it leaves only 10 tunnels which could be described as having failed the inspection.

This year the Mersey Queensway tunnel was inspected for the third time since 2000 and was rated ‘Acceptable’. It is a busy urban tunnel used by around 32,000 cars per day. However, compared with many others inspected it is a relatively old tunnel and whereas most new tunnels are uni-directional, ie traffic travelling in different directions are in separate tunnels, the Queensway Tunnel has only one tube with oncoming traffic separated simply by double white lines.

The inspector noted many positive features of the Queensway Tunnel:

- Traffic information radio can be received through the tunnel and the operator can broadcast messages
- Adequate escape and rescue provision with exits well signed
- Full video surveillance
- Adequate provision of emergency phones and fire extinguishers
- A sufficiently powerful ventilation system
- Sufficient protection against smoke and heat in the escape routes
- Adequate radio communication for emergency services throughout the tunnel
- Tunnel control centre is manned around the clock by trained personnel
- Control staff receive regular training
- Emergency drills are held regularly

Shortcomings were also identified. In particular:

- No automatic detection of traffic incidents
- No automatic fire alarm system
- No automatic detection of emergency phone or fire extinguisher use by emergency services
- No lay-bys or emergency lane provided
- Neither the ventilation system or tunnel closure activated automatically if a fire alarm is triggered

Britain has a good record for tunnel safety and good management continues to help the UK's limited number of long tunnels achieve reasonable scores for our generally older tunnels.

Many of the other UK tunnels which have been inspected in recent years, such as the Mersey Kingsway tunnel, the Blackwall tunnels, the Dartford and Rotherhithe tunnels and the Tyne tunnel have been improved and upgraded - with more work planned - often as a direct result of the findings of the previous EuroTest/EuroTAP inspections. Rising standards and increasing public awareness of how to behave in a tunnel should help to ensure that the UK avoids a major tunnel disaster in the future.

## **1. Key points from the 2007 European Survey**

- Tests are designed to examine the safety standards of a selection of European road tunnels on major routes
- The AA is a leading partner in the European Tunnel Assessment Programme (EuroTAP), established in 2004 and funded by the European Commission and European motoring organisations. EuroTAP evolved from the EuroTest programme, which was set up in 2000 by motoring organisations to inspect and report on road-user facilities across Europe, such as motorway service areas and car ferries. The motoring clubs continue to fund EuroTest
- The project was managed by the ADAC (the German AA) and the inspections were carried out by experts from Deutsche Montan Technologie GmbH (DMT)
- Fifty-one tunnels were inspected between December 2006 and February 2007, across 13 European countries, including the Queensway Tunnel on Merseyside
- The Queensway Tunnel was rated "Acceptable" and given a 'medium' risk potential
- The top rated tunnel was in Croatia, the Brinje Tunnel on the A1 between Zagreb and Split
- The lowest rated tunnel was the Paci 2 tunnel in Italy on the A3 between Salerno and Reggio Calabria
- Since 2000, the Mersey Kingsway and Queensway tunnels, the Medway, Dartford, Rotherhithe, Tyne, and Blackwall North and South tunnels have been inspected, along with around 250 others across Europe

## 2. 2007 EuroTAP tunnel inspections

		Belgium	Switzerland	Germany	Spain	France	Croatia	Italy	Netherlands	Norway	Czech Republic	Sweden	Cross-Border	GB	Total
<b>VG</b>	<b>5</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>18</b>
<b>G</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>1*</b>	<b>0</b>	<b>11</b>
<b>A</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1**</b>	<b>1</b>	<b>12</b>
<b>P</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>VP</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>

VG = very good; G = good; A = acceptable; P = poor; VP = very poor

\* Fréjus Tunnel between France and Italy

\*\*Great St Bernard tunnel between Switzerland and Italy

### 3. Strengths /weakness of the Queensway Tunnel between Birkenhead and Liverpool

<b>Location:</b>	Great Britain, in Liverpool Mersey Queensway,
<b>Tunnel opened:</b>	1934
<b>Length:</b>	3,240m
<b>Portal height level:</b>	11.5m above sea level
<b>Number of tubes:</b>	1/bi-directional
<b>Speed limit:</b>	30 mph
<b>Vehicles per day:</b>	32,000
<b>Share of HGVs:</b>	None – HGVs banned
<b>Breakdowns in 2006:</b>	145
<b>Accidents in 2006:</b>	7
<b>Fires in 2006:</b>	1
<b>Risk:</b>	Medium

#### Strengths

- 😊 Traffic information radio can be received throughout the tunnel, the operator can broadcast messages
- 😊 Full video surveillance
- 😊 Emergency phones provided every 50 metres
- 😊 Fire extinguishers provided every 50 metres
- 😊 Signs in the tunnel show the escape direction and distance to the nearest exit
- 😊 Emergency exits provided every 180 to 500 metres
- 😊 Smoke and heat cannot penetrate the external escape routes
- 😊 Ventilation is sufficiently powerful to move smoke away from a fire
- 😊 Tunnel control centre manned around the clock by trained personnel
- 😊 Radio communications possible throughout the tunnel for tunnel staff, police and fire brigade
- 😊 Regular training for personnel
- 😊 Regular emergency drills
- 😊 Fire brigade is well-trained and well-equipped

### Weaknesses:

- ☹️ Only one tube with bi-directional traffic
- ☹️ No automatic detection of traffic or traffic disruption
- ☹️ No automatic alert of **emergency phone or fire extinguisher use to the emergency services**
- ☹️ No lay-bys or emergency lanes provided throughout the tunnel
- ☹️ No evacuation lighting on the **escape route on road tunnel deck**
- ☹️ No automatic fire alarm system
- ☹️ If a fire alarm is triggered, neither ventilation nor tunnel closure are automatically activated

### General remarks:

- ◆ Tunnel designated as 'Medium risk' due to bi-directional traffic and the high volume of traffic (32,000 vehicles per day)
- ◆ HGVs are not permitted to enter the tunnel. The transport of hazardous goods is restricted and takes place only rarely
- ◆ The impact of narrow traffic lanes is lessened by the ban on HGVs
- ◆ The tunnel control centre is manned around the clock by trained staff
- ◆ No automatic fire preventive measures, operators rely on **environmental** monitoring and video surveillance
- ◆ No lay-bys or emergency lanes provided
- ◆ Incidents in the tunnel are not automatically reported to the tunnel control centre
- ◆ Tunnel staff rely on video surveillance, their regular patrols or motorists using either the emergency phones or their own mobile phones to locate incidents before they can trigger the necessary measures (i.e. activate the ventilation system, close the tunnel, and notify the fire brigade)
- ◆ Motorists can be guided using traffic lights and information provided via traffic radio and loudspeakers.
- ◆ The short distances which the fire brigade have to cover to arrive at the tunnel and the supply of fire-fighting **water ensure effective** fire fighting
- ◆ An emergency response plan and regular drills ensure good co-operation between the tunnel control centre and the emergency services
- ◆ The facilities allow for effective self-rescue. The spread of smoke is reduced by an adequate ventilation system allowing people to follow well-signposted emergency exits and escape through a largely smoke-free environment

#### 4. 2007 inspection of 52 tunnels across Europe

##### Results

Tunnel	Country	Grade awarded	Risk potential
Arisdorf	Switzerland	Very good	Medium
Avenida de Portugal	Spain	Very good	Medium
Brinje	Croatia	Very good	Low
Bruyères	Switzerland	Very good	Medium
Burgholz	Germany	Very good	High
Herzogberg	Austria	Very good	Medium
Hurtières	France	Very good	Low
Langen	Austria	Very good	Low
Lundby	Sweden	Very good	Medium
Malberg	Germany	Very good	Medium
Mrázovka	Czech Republic	Very good	Medium
Nollinger Berg	Germany	Very good	Medium
Rannersdorf	Austria	Very good	Medium
Schartnerkogel	Austria	Very good	Medium
Seelisberg	Switzerland	Very good	Medium
Spier	Switzerland	Very good	Medium
Strengen	Austria	Very good	Low
Tiergarten Spreebogen	Germany	Very good	Medium
Benelux 1	The Netherlands	Good	High
Dalaas	Austria	Good	Medium
Frèjus	Cross Border*	Good	Medium
Fourvière	France	Good	Medium
Granfoss	Norway	Good	Medium
Niklasdorf	Austria	Good	Medium
Rælings	Norway	Good	Medium
St Germain	France	Good	Medium
Sartego	Spain	Good	Low

Södra Länken	Sweden	Good	High
Trebesing	Austria	Good	High
Casares	Spain	Acceptable	Medium
Colle Giardino	Italy	Acceptable	Medium
Fabares	Spain	Acceptable	Low
Great St Bernard	Cross Border**	Acceptable	Medium
Hugenwald	Germany	Acceptable	High
Joanet	Spain	Acceptable	Medium
l'Olleria	Spain	Acceptable	Medium
Mersey Queensway	GB	Acceptable	Medium
Monaco	France	Acceptable	Medium
Mont Chemin	Switzerland	Acceptable	High
Staufer	Germany	Acceptable	Medium
Velser	Netherland	Acceptable	Medium
Gernsbach	Germany	Poor	High
Kennedy	Belgium	Poor	High
Mosi	Switzerland	Poor	Medium
Colle Capretto	Italy	Very poor	Low
Grua	Norway	Very poor	Medium
Hagan	Norway	Very poor	High
Los Yébenes	Spain	Very poor	Medium
Paci 2	Italy	Very poor	Low
Serra Rotonda	Italy	Very poor	Very low
Strømsås	Norway	Very poor	High

**The risk potential is assessed on the following factors:**

- Traffic volumes
- Proportion of heavy goods vehicles
- Tunnel gradients
- One-or two-way traffic and traffic density
- Hazardous material on lorries

## 5. The safety of UK tunnels

The AA is a leading partner in both the EuroTest and EuroTAP tunnel inspections. Under the two programmes, all the major tunnels in the UK have been inspected. The results are shown in the table:

<b>Name of Tunnel</b>	<b>Year tested</b>	<b>EuroTAP rating</b>	<b>Risk potential</b>
Mersey Kingsway	2000	Good	Not calculated
Mersey Kingsway	2002	Good	Medium
Mersey Kingsway	2005	Good	Medium
Mersey Queensway	2000	Acceptable	Not calculated
Mersey Queensway	2002	Acceptable	Medium
Mersey Queensway	2007	Acceptable	Medium
Dartford	2002	Acceptable	Medium
Dartford	2004	Acceptable	Medium
Tyne	2000	Poor	Not calculated
Tyne	2002	Poor	Medium
Tyne	2003	Poor	Medium
Rotherhithe	2003	Poor	Low
Blackwall S	2003	Poor	Medium
Blackwall N	2002	Very poor	Medium
Blackwall S	2002	Very poor	Medium
Blackwall N	2003	Very poor	Medium
Medway	2006	Very poor	Medium

## 6. Future Investment

Since 2000, around 250 road tunnels have been inspected and rated across Europe. UK tunnel operators have responded positively and are continuing to invest in improved safety systems.

- **Mersey Queensway** A major investment, including the construction of a network of escape routes and refuges has been completed. A new PA system will be commissioned shortly. Other ongoing work includes the provision of new Variable Message Signs and enhanced Traffic CCTV with incident detection. Portal closure barriers are also planned. Speaking in January 2007, . Neil Scales, Chief Executive and Director General of Merseytravel, said: *“Safety is always our top priority and we are consistently looking to invest where we can to improve the safety and security of our tunnels, such as the £9million we have recently invested in seven new emergency refuges for Queensway. We volunteered to take part in these EuroTAP inspections and they have been valuable in giving us an independent view on how we need to deal with the legacy of the way this tunnel was built in comparison with modern practices.”*
- **Mersey Kingsway** A new PA system will be commissioned shortly. Other ongoing work includes the provision of new Variable Message Signs and enhanced Traffic CCTV with incident detection.
- **Blackwall Tunnel (southbound)** No current information available.
- **Blackwall Tunnel (northbound)** Consultants have reviewed its safety with a view to a major refurbishment, planned to start in 2007 and be completed by 2009.
- **Rotherhithe** A new state-of-the-art emergency communication system has been installed. Further refurbishment may be postponed to avoid the Olympic games in 2012.
- **Tyne** Construction of the second Tyne tunnel is due to start late 2007/early 2008 with completion set for 2011.
- **Dartford** No current information available.
- **Medway** Improvements plans are being developed to upgrade the CCTV, environmental monitoring and fire detection systems, which will then be linked to the control centre for 24/7 monitoring. Fire protection systems are also currently being investigated.

## 7. How to act in a tunnel emergency

The UK has an excellent record for tunnel safety. Very few users have been killed or injured in an accident in a UK tunnel: in the rest of Europe, tunnel fires have killed around 90 people in the last 10 years.

A fire in a tunnel can be lethal. The heat builds up very quickly. That is why fire detection and ventilation systems, and emergency exits, must be provided, why the emergency services must be summoned immediately, and why tunnel operators must be able to put emergency plans into operation seamlessly. If there is a fire, the occupants of the vehicles in a tunnel are not spectators to an accident, they are participants in a potential disaster.

Tunnel users also need to know how to behave in road tunnels, and what to do in an emergency. This includes:

- Driving safely at the appropriate speed for the conditions, leaving plenty of space between their car and the vehicle in front;
- Not waiting to be told what to do if there is a fire ahead, and knowing that they should pull over to the left, switching off the engine, leaving the keys in the ignition and moving swiftly away from the fire to the nearest emergency exit, or to the tunnel entrance. MerseyTunnels has produced a leaflet giving clear and simple advice on how to drive safely through both their tunnels and what to do in an emergency. This is shown at the end of this report and copies are also available by going to [www.merseytunnel.co.uk](http://www.merseytunnel.co.uk).

*The AA is a leading member of the EuroTAP consortium, established in 2004. The programme is funded jointly by the European Commission and European motoring organisations and has evolved from the EuroTest programme, established in 2000 by Europe's motoring organisations, with an annual programme of inspections of services used by tourists across Europe. Since 2000 EuroTest/EuroTAP has carried out inspections of more than 200 motorway service areas, 250 road tunnels and 60 car ferries. The inspections have identified shortcomings and dangerous practices, and have led to improvements that benefit road-users across the European Union.*

*The EuroTAP consortium acknowledges the support of the European Commission in helping to make it possible to continue to conduct tunnel inspections; the content of this report is not the responsibility of the European Commission, however.*

*Reports of tunnel inspections undertaken under the EuroTest banner, as well as other consumer tests, may be found at*

[http://www.theaa.com/public\\_affairs/consumer.html](http://www.theaa.com/public_affairs/consumer.html)

**Categories inspected**

**Tunnel characteristics**

- Number of tubes
- Brightness of tunnel walls
- Width and layout of traffic lanes
- Layout of emergency lanes and breakdown bays
- Additional items such as portal design, road surface, tunnel route

**Lighting and power supply**

- Lighting throughout and transition zones
- Power and emergency power supply

**Traffic and traffic surveillance**

- Type of traffic: unidirectional / bi-directional traffic
- Congestion in the tunnel
- Restrictions on and/or registration of vehicles carrying hazardous goods
- Measures to close the tunnel: traffic lights, barriers, information displays
- Traffic signs
- Traffic management and control: traffic lights, variable message traffic signs, signs
- Visual guidance equipment
- Automatic detection of traffic and congestion
- Video surveillance
- Tunnel control centre
- Additional measures: for instance for heavy goods vehicles, speed limits, monitoring the distance between vehicles and speed, automatic identification of hazardous goods transports, height control

**Communication**

- Traffic radio
- Loudspeakers
- Emergency telephones: distance signs, functions, insulation against traffic noise
- Tunnel radio

### **Escape and rescue routes**

- Evacuation lighting and escape route signs in the tunnel
- Preventing smoke from penetrating escape routes, fire resistant doors
- Distance between emergency exits and marking
- External access and access for rescue services
- Additional measures: special lighting for emergency exits, signs showing what to do, barrier-free emergency exits

### **Fire protection**

- Fire protection on the tunnel structure
- Fire resistance of cables
- System for draining flammable and toxic liquids
- Fire alarm systems: automatic/manual
- Extinguishing systems: arrangement, signs, function
- Time to reach the tunnel, fire brigade training and equipment

### **Ventilation**

- Normal mode to thin out vehicle emissions
- Control of the longitudinal flow in the tunnel and consideration of this in ventilation control
- Temperature stability of facilities and equipment
- Special fire programmes
- Proof of correct functioning in fire trials and by flow measurements
- Longitudinal ventilation: airflow speed, length of the ventilation section, airflow in the direction of traffic, reversible fans.
- Transverse / semi-transverse ventilation: extraction volume flow, longitudinal flow control, opening / closing the exhaust air outlets can be controlled

### **Emergency management**

- Regular training for tunnel control centre staff
- Maintenance plan
- Emergency response plans
- Automatic linking of emergency systems
- Measures in the case of accident or fire
- Regular emergency drills

## Mersey Tunnel Safety Leaflet

## APPENDIX 2

**EMERGENCY NUMBER**


Tunnels Police: 0151 236 8602 ext 452


**LOCAL TRAFFIC & TRAVEL INFORMATION**


Radio Merseyside 95.8 FM  
Radio City 96.7 FM


**OTHER INFORMATION**

Fast Tag: 0151 236 8602  
Website: [www.merseytunnels.co.uk](http://www.merseytunnels.co.uk)

As you pass through the Tunnel note the location of Fire Exits marked by a Green Running Man sign. 

 Listen to Local radio, Tunnel Police can interrupt broadcast with safety information and instruction.

In the event of a breakdown stay in your vehicle - you will be monitored via CCTV. 

 In the event of an emergency follow instructions of Tunnels Police and other Emergency Services personnel. In the event of a fire proceed to Fire Exits (nearest point of evacuation).

**Drive Safely, obey all speed limits, signs and signals. Keep your distance. KEEP IN LANE**



Head Office: George's Dock Building,  
Pier Head, Liverpool L3 1DD

