The AA Motoring Trust

EUROTEST 2005

MOTORWAY ROADWORKS

Safety and Quality of Motorway Roadwork Sites in Europe

www.AAtrust.com

EuroTest 2005 is a consortium of motoring organisations in Europe: The AA Motoring Trust (UK), ACI (Italy), ACP (Portugal), ADAC (Germany), AL (Finland), AMZS (Slovenia), ANWB (Netherlands) FFAC (France), HAK (Croatia), NAF (Norway), ÖAMTC (Austria) RACE (Spain), RACC (Spain), TCB (Belgium) and TCS (Switzerland)

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Background

Britain's motorways are the busiest in Europe. Major roadworks on them, and the delays they cause, are frequently the scourge of drivers. "If we had only known about the roadworks, we would have taken a different route," is the exasperated comment heard from many.

But Britain's motorways have to be kept in tip-top condition, and upgraded regularly, to cater for fast-growing traffic levels.* Roadworks are unavoidable – and the way that they are planned, managed and conducted is crucial to traffic flow and safety. Good journey planning or on-road information may sometimes help drivers to avoid roadworks altogether - or at least the periods when congestion is at its worst - but most will encounter some delay sooner or later.

Two decades ago, roadwork sites on British motorways were routinely the scene of serious accidents. Crashes, when they occurred, were nearly always very severe, with vehicles, often lorries, crossing into the path of oncoming traffic. The toll of death and injury was unacceptably high.

Happily, the risk of death or serious injury at major roadwork sites on British motorways today is dramatically lower – no higher, in fact, than the chance of being involved in an accident on a motorway without roadworks. This has come about because there has been a huge improvement in the past decade in risk assessment, traffic management techniques, signing, speed management, and driver behaviour. However, for roadworkers the risks remain high with four workers having been killed and five seriously injured at English motorway and trunk road roadwork sites in the first half of 2005.

There will always be major roadworks on Europe's motorways, despite their potential to cause additional risk and irritating hold-ups. They can also worry and confuse drivers and can be distracting at night, with masses of bright signs and deviations disrupting what would normally be a straight run. An added problem is that many journeys are now made across national boundaries and roadworks are often managed very differently in different countries, posing greater risk for drivers who are unfamiliar with the different regimes. This is why the AA Motoring Trust** has worked with Europe's other motoring organisations to benchmark the safety and efficiency of major roadworks on Europe's motorways through the EuroTest inspections.

The Survey

EuroTest is a consortium of 15 European motoring organisations. The AA Motoring Trust is a leading member. EuroTest carried out a comprehensive survey of 50 major roadwork zones on motorways in 11 European countries between May and June 2005. The work was conducted by traffic experts from the University of Dresden, Germany, using two observers in a specially-equipped vehicle to make daylight and darkness surveys of the roadwork zone and approaches. Detailed assessments using video, touch screen 'data-tablet' and GPS systems were made of:

- Signs and markings;
- Traffic guidance;
- The road surface;
- Night-time clarity; and
- Information

Desk analysis and final scoring was then carried out and comparisons made against pre-agreed criteria. The assessment criteria are shown in Section 17 of the full report.

How did Britain compare?

Britain performed very well and was third overall in the survey. It was the highest scoring country for the night-time clarity of roadworks, with six out of seven roadwork zones rated 'Very Good'. Austria took the overall honours for having the best roadworks and the only 'Very Good' overall assessment in the survey.

Britain was commended for having a large number of roadwork sites where night-time work was underway. This is unusual in the rest of Europe, but very much a necessity in Britain because of the high traffic flow on motorways.* Britain won praise as well for the policy of modifying road markings when carriageway layouts are changed – which makes following a temporary route much easier, especially in the dark.

Britain was also the only country to provide a free 24-hour recovery service at most of the work zones in the survey.

On the minus side, points were lost in Britain because of a frequent lack of solid barriers separating opposing traffic lanes (eg, at contraflows) and work zones. In Europe, the use of solid barriers is more extensive, but there has to be a trade-off between the flexibility to move work around to get early completion and reduced speed limits to preserve safety. There are significant disadvantages to the use of solid barriers because of the length of time it takes to install them and the fact that sites are frequently reconfigured at night in Britain, requiring versatile traffic management systems.

Highly-visible speed cameras and enforcement systems to deter speeding are a significant feature of British roadworks. In Germany, speed cameras and police speed checks at motorway roadwork sites are usually hidden; in Austria, drivers are warned of speed checks but not in such a clear manner as in Britain.

The full table of results is shown in Section 6 of the full report.

How can Britain's motorway roadworks be further improved?

- Explore the benefits of varying the speed limit to adjust it to match the prevailing conditions - when work stops at the weekend or overnight, for example. The survey shows that Britain undertakes a great deal of work on motorways at night to improve traffic flow during the day. But speed limits nearly always stay the same no matter what the layout is or how much work is going on.

- While the risk of a personal injury accident is greatly reduced at motorway roadworks compared to the past, there are still many accidents that result in vehicle damage but which, in different circumstances, could lead to death or serious injury. Official data is not kept on these, though a recent TRL report says that it should be. The Highways Agency (HA) should research the number and likely causes of damage-only accidents at motorway roadworks to determine if there are common themes.

- Drivers feel more secure if sites have solid barriers that can prevent vehicles straying into the path of oncoming traffic. Barriers are used more widely in other European countries to permit higher speeds, but work is often undertaken in a more inflexible manner than in Britain. There is less night-time working, for example. The HA should review policy in this area to see if experience elsewhere in Europe can be adapted to suit British needs.

- The HA should pilot suitable innovative concepts that have emerged from the EuroTest research, such as the Austrian 'changing face' shown in the attached illustrations, flashing warning lights at the start of a roadwork zone and flag waving mannequin.

Sharing innovative practices
The survey found a number of measures peculiar to individual countries that could be tried elsewhere. They include

- A face that changes from a frown at the start of a roadworks site to a smile towards the end of the work (Austria);
- A mannequin waving a red flag to slow traffic (Belgium);
- Banning cruise control in roadworks to prevent close following (Belgium);
- The use of highly-visible speed cameras and enforcement (Britain); and
- The use of a free recovery service in the work zone (Britain)

* **Background facts**

- Britain has 2,130 miles of motorway – less than 1 per cent of total road length
- Britain's motorways carry nearly one-fifth of all traffic
- Motorway traffic in Britain has increased by 37 per cent in 10 years
- In England around 7 per cent of the motorway network (130 miles) has reached a point where repairs will be needed within four years
- Only 4 per cent of all road accidents occur on motorways
- In the first half of 2005 four maintenance workers have died and five have been seriously injured on England's trunk roads and motorways.

*** The AA Trust is a leading member of the EuroTest consortium of Europe's motoring organisations, which undertakes annual programmes of inspection of services used by tourists across Europe. Since 2000 EuroTest has carried out inspections of over 200 motorway service areas, 107 road tunnels and 60 car ferries. The EuroTest inspections have identified shortcomings and dangerous practices and have led to improvements that benefit road-users across the European Union. EuroTest results can be found on the AA Trust website www.AAtrust.com*

3 Key Point Summary

- The tests were designed to examine the quality and safety of a selection of European motorway roadwork sites
- Fifty roadwork sites were inspected in 11 European countries
- Only one of the roadwork sites tested was rated 'Very Good'; 18 were rated 'Good'; 25 were rated 'Acceptable' and 6 'Poor'. None was rated 'Very Poor'
- The project was funded by the EuroTest consortium of motoring organisations, of which the AA Motoring Trust is a leading member
- The tests were managed by ADAC (the German AA), undertaken by experts from the University of Dresden
- The tests were carried out during March and June 2005
- Of the seven UK sites inspected, four were rated 'Good' and 3 'Acceptable'
- The highest rated roadwork site was on the A1 in Austria near the town of Traun near Linz
- The highest-rated UK site was on the M5 between junctions 21 and 22 near Weston-super-Mare
- The lowest-rated site was on the M3 in Spain, near Madrid

4 UK results

Overall rating

Roadworks	**Overall Rating**
M5 nr Weston-Super-Mare	Good
M5 nr Cheltenham	Good
M5 nr Bristol (West)	Good
M4 nr Bristol (East)	Acceptable
M25 nr London	Acceptable
M60 nr Manchester	Acceptable
M62 nr Pontefract	Acceptable

The European rankings were calculated from a checklist of five categories with points allocated in each and weighted in importance (see pages 22 to 23 for scoring schedule).

5 UK versus the rest of Europe

	Number of European roadwork sites given this rating	Number of UK roadwork sites given this rating
Very good	1	0
Good	18	4
Acceptable	25	3
Poor	6	0
Very poor	0	0
Total	50	7

6 Results in order of rating by country

Austria		
Map	**Road works site**	**Overall rating**
	A1 near Traun	Very Good
	A10 nr Amstetten	Good
	A1 nr St Georgen	Good
	A10 nr Golling	Good
	A7 nr Linz	Acceptable
	A13 nr Gries am Brenner	Acceptable
Belgium		
	A4 nr Libramont-Chevigny	Acceptable
	A26 nr Houffalize	Acceptable
	A4 nr Neufchâteau	Acceptable
Switzerland		
	A2 nr Zofingen	Good
	A1 nr Rorschach	Acceptable
	A2 nr Arisdorf	Acceptable
	A9 nr Clarens	Acceptable
Germany		
	A7 nr Göttingen	Good
	A1 nr Hamburg	Good
	A6/A620 nr Saarbrucken	Good
	A6 nr Heilbronn	Good
	A13 nr Berlin (south)	Good
	A3 nr Cologne	Good
	A9 nr Munich	Good
	A9 nr Bayreuth	Acceptable
	A9 nr Hermsdorf	Acceptable
Spain		
	A7 nr Valencia	Good
	C31 nr Barcelona	Acceptable
	A64 nr Villaviciosa	Acceptable
	M30 nr Madrid	Poor
France		
	A46/A6 nr Lyon (north)	Good
	A9 nr Mèze	Good
	A7 nr Lyon (south)	Acceptable
	A26 nr Bully les Mines	Acceptable
	A7 nr Vienne	Acceptable
Croatia		
	A3 nr Kutina	Acceptable
	A3 nr Ivanic Grad	Poor
Great Britain		
	M5 nr Weston-Super-Mare	Good
	M5 nr Cheltenham	Good
	M4 nr Bristol (East)	Good
	M5 nr Bristol (west)	Good
	M60 nr Manchester	Acceptable

	M25 nr London	Acceptable
	M62 nr Pontefract	Acceptable
Italy		
	A28 nr Pordenone	Acceptable
	A28 nr Portogruaro	Poor
	A 6 nr Mondovi	Poor
	A10 nr Taggia	Poor
	A15 nr Pontrémoli	Poor
Netherlands		
	A15 nr Sliedrecht A50/A59 nr Oss	Acceptable
	A16 nr Breda	Acceptable
	A59 nr Waalwijk	Acceptable
		Acceptable
Slovenia		
	A2 nr Brežice	Acceptable

7 Rating in each category inspected - Great Britain

Categories	**M5 Weston-super-Mare**	**M5 Cheltenham**	**M4 Bristol (E)**	**M5 Bristol (W)**	**M60 Manchester**	**M25 London**	**M62 Pontefract**
Signing/ road markings	acceptable	acceptable	acceptable	acceptable	good	acceptable	acceptable
Traffic routing	good	good	acceptable	good	acceptable	acceptable	good
Road surface	good	very good	acceptable	very good	good	Good	very good
Night-time clarity	very good	very good	very good	very good	very good	Good	very good
Information	acceptable	very poor	acceptable	poor	Good	acceptable	very poor
Overall results	good	good	good	good	acceptable	acceptable	acceptable

8 Strengths and weaknesses of M5 near Weston-Super-Mare

Overall Rating:	Good
Location:	M5 between junction 22 Burnham-on –Sea and junction 21 Weston-Super-Mare
Type of work	Carriageway reconstruction
Length of road works	2.1 miles
Work undertaken between	April to May 2005
Traffic direction	4+0
Test date:	11 May 2005

Strengths and weaknesses

 Signs provided information on the type and duration of the work. There were also signs showing the length of specific traffic arrangements within the site

 Sufficient carriageway width for HGVs at crossovers

 Traffic signs and road markings in good condition and conspicuous

 All the necessary traffic signs in place, signs showing the speed limit provided at least every 1,000 metres together with speed camera warning signs

 Clear layout of roadwork site at night, crossovers floodlit, traffic guidance and protection equipment, road markings and cats-eyes

 Constant speed limit of 50 miles per hour (80 kph) allowed smooth traffic flow

 Traffic lanes sufficiently wide

 Good, clear road markings

 Road surface in good and clean condition

 Adequate safety protection for staff working on site

 There were no signs giving information about the overall length of the site

 Number of traffic lanes reduced through roadwork site

 No flashing warning lights in advance of roadworks

 Insufficient notice of speed reduction in advance of site

 Sudden change in camber at crossovers

 No physical barrier separating two-way traffic

 No lay-bys

 Too little notice of exit crossovers on the southbound carriageway

9 Strengths and weaknesses of M5 near Cheltenham

Overall Rating:	Good
Location:	M5 between junction 11 Cheltenham and junction 11a Gloucester
Type of work	Carriageway reconstruction
Length of road works	2.7 miles
Work undertaken between	April to June 2005
Traffic direction	4+0
Test date:	10 May 2005

Strengths and weaknesses

 Signs provided information on the type and duration of the work. There were also signs showing the length of specific traffic arrangements within the site

 Sufficient carriageway width for HGVs at crossovers

 All necessary traffic signs in place, signs showing the speed limit provided at least every 1,000 metres together with speed camera warning signs

 Clear layout of roadwork site at night, crossovers floodlit, also traffic guiding and protection equipment, road markings and cats-eyes

 Constant speed limit of 50 miles per hour (80 kph) allowed traffic to flow smoothly

 Good, clear road markings

 Road surface in a good and clean condition

 Signs gave sufficient notice of acceleration/deceleration lanes

 Adequate protection for staff working on site

 There were no signs giving information about the overall length of the site

 Insufficient advanced notice of speed reduction in advance of roadworks

 Reduction in number of traffic lanes

 No flashing warning lights in advance of roadworks

 No guiding kerbs on traffic lanes at entry/exit points

 No physical barrier separating two-way traffic

 No lay-bys

10 Strengths and weaknesses of M4 near Bristol (East)

Overall Rating:	Good
Location:	M4 between junction 18 between Bath and junction 19 Bristol
Type of work	Carriageway reconstruction and construction of new crawler lane
Length of road works	3.2 miles
Work undertaken between	April to November 2005
Traffic direction	4+2
Test date:	13 May 2005

Strengths and weaknesses:

 Signs provided information on the type and duration of the work. There were also signs showing the length of specific traffic arrangements within the site

 No reduction in number of running lanes

 Sufficient room for HGVs at crossovers

 All necessary traffic signs in place, signs showing the speed limit provided at least every 1,000 metres together with speed camera warning signs

 Clear layout of roadwork site at night, crossovers floodlit, also traffic guidance and protection equipment, road markings and cats-eyes

 Good, clear road markings

 Road surface was clean

 Clearly indicated entry/exit points, acceleration/deceleration lanes provided

 Adequate safety protection for staff working on site

 Free breakdown tow-away service

 There were no signs giving information about the overall length of the site

 No flashing warning lights in advance of roadworks

 Insufficient advanced notice of reduction in speed limits

 Sudden change in camber at crossover, London bound

 Lanes too narrow in the direction of Bristol

 No physical barrier separating two-way traffic

 No kerbs on the traffic lanes at entry/exit points

11 Strengths and weaknesses of M5 near Bristol (west)

Overall Rating:	Good
Location:	M5 between junction 18a Avonmouth and junction 17 Bristol West
Type of work	Carriageway reconstruction
Length of road works	3 miles
Work undertaken between	May to November 2005
Traffic direction	3+3
Test date:	12 May 2005

Strengths and weaknesses:

 Signs provided information on the type and duration of the work. There were also signs showing the length of specific traffic arrangements within the site

 No reduction in number of traffic lanes throughout site

 Sufficient room for HGVs at crossovers

 All the necessary traffic signs in place, signs showing the speed limit provided at least every 1,000 metres together with speed camera warning signs

 Clear layout of roadwork site at night, crossovers floodlit, also traffic guidance and protection equipment, road markings and cats-eyes

 Good, clear road markings

 Road surface in a good and clean condition

 Signs gave sufficient notice of acceleration/deceleration lanes

 Adequate safety protection for staff working on site

 There were no signs giving information about the overall length of the site

 No flashing warning lights in advance of roadworks

 Insufficient advanced notice of reduction in speed limits

 No guiding kerbs on traffic lanes at entry/exit points

 No lay-bys

 No 100 metre buffer area between start of traffic management and actual works

12 Strengths and weaknesses of M60 near Manchester

Overall Rating:	Acceptable
Location:	M60 between junction 8 Manchester-Sale and junction 5 Manchester-Didsbury
Type of work	Carriageway widening
Length of road works	5 miles
Traffic direction	Variable
Work undertaken	Until March 2006
Test date:	9 May 2005

Strengths and weaknesses:

 Signs provided information on the type and duration of the work. There were also signs showing the length of specific traffic arrangements within the site

 No reduction in running lanes

 All necessary traffic signs in place, signs showing the speed limit provided at least every 1,000 metres together with speed camera warning signs

 Clear layout of roadwork site at night, crossovers floodlit, traffic guidance and protection equipment, road markings and cats-eyes

 Good, clear road markings

 Road surface in a good and clean condition

 Clearly indicated entry/exit points, acceleration/deceleration lanes

 There were no signs giving information about the overall length of the site

 No flashing warning lights in advance of roadworks

 Insufficient advanced notice of reduction in speed limits

 Sudden change in camber at crossover, in direction of Stockport

 Remains of original road markings Liverpool bound confusing at night

 Lanes too narrow Liverpool bound

 No physical barrier separating two-way traffic

 No guiding kerbs on traffic lanes at entry/exit points

 No lay-bys

 No 100 metre buffer area between start of traffic management and actual works

.

13 Strengths and weaknesses of M25 near London

Overall Rating:	Acceptable
Location:	M25 between junction 12 London-Chertsey and junction 16 Beaconsfield
Type of work	Motorway widening
Length of road works	7.1 miles
Traffic direction	Variable
Work undertaken	Until December 2005
Test date:	14 May 2005

Strengths and weaknesses:

 Signs provided information on the type and duration of the work. There were also signs showing the length of specific traffic arrangements within the site

 No reduction in running lanes

 Step by step reduction in speed limits

 All necessary traffic signs in place, signs showing speed limit provided at east every 1,000 metres together with speed camera warning signs

 Clear layout of roadwork site at night, crossovers floodlit, also traffic guidance and protection equipment, road markings and cats-eyes

 Clean road surface

 Clearly indicated entry/exit points, acceleration/deceleration lanes

 Adequate safety protection for staff working on site

 Free breakdown tow-away service on site

 There were no signs giving information about the overall length of the site

 No flashing warning lights in advance of roadworks

 Insufficient advanced notice of reduction in speed limits

 Not enough room for HGVs at crossover

 Confusing night-time layout on southbound carriageway

 Some guiding lane markings worn and original road markings still visible

 No guiding kerbs on traffic lanes at entry/exit points

14 Strengths and weaknesses of M62 near Pontefract

Overall Rating:	Acceptable
Location:	M62 between junction 33 Pontefract and junction 32 Castleford
Type of work	Carriageway widening and construction of a new bridge
Length of road works	5.8 miles
Work undertaken between	April to June 2005
Traffic direction	Variable
Test date:	8 May 2005

Strengths and weaknesses:

 Signs provided information on the type and duration of the work. There were also signs showing the length of specific traffic arrangements within the site

 No reduction in number of lanes, Leeds bound

 All required traffic signs in place, signs showing speed limit provided at least every 1,000 metres together with speed camera warning signs

 Constant speed limit of 50 miles per hour (80 kph) allowed traffic to flow smoothly

 Traffic guidance and protection equipment in addition to cats-eyes

 Road surface was clean

 Clearly indicated entry/exit points, acceleration/deceleration lanes

 Adequate protection for staff working on site

 Free breakdown tow-away service

 There were no signs giving information about the overall length of the site

 No flashing warning lights in advance of roadworks

 Insufficient advanced notice of reduction in speed limits

 Some lane marking confusing due to cross over lane markings, Hull bound

 Lane markings contradicted traffic cones following night-time changes to the configuration of site in direction of Hull

 No guiding kerbs on traffic lanes at entry/exit points

 Distance to the next roadwork site less than five kilometres in direction of Hull

15 Results: A comparison in the test categories

Half of the 50 sites examined as part of the EuroTest inspections of the standard of motorway roadworks across Europe were rated 'Acceptable' The inspections were coordinated by the ADAC (the German AA) and jointly funded by motoring organisations across Europe. Eighteen of the sites inspected were rated as 'Good' while six were found to be 'Poor'. None were rated 'Very Poor'.

Only one site, the A1 in Austria between Vienna-Salzburg near Traun, was rated 'Very Good'. Inspectors found that motorists were given sufficient information concerning the type of work being carried out, and about the length and duration of the roadwork site. Sufficient advance warnings were given and signs were understandable and well-positioned**.** Speed was reduced progressively well ahead of the site down to a constant speed limit of 100 kph. This allowed traffic to flow smoothly. Traffic information and protection signs were equipped with reflectors, the traffic lanes were clearly marked and were clean. Two-way traffic was separated by guiding/protective barriers. Entry/exit points had acceleration or deceleration lanes respectively, and motorists had plenty of time to react. However, there were no guiding kerbs. Lay-bys for motorists who breakdown were available, but in the direction of Salzburg they were spaced too far apart.

Bottom of the list of sites inspected was on the M30 (Valencia - Cordoba) in Spain's capital city, Madrid. Inspectors found a lack of adequate information signs and confusing lane markings.

A glance at the individual test categories highlights the weak points. When driving through roadwork sites on European motorways, drivers can often be left confused. The reason for the work and the duration are often not disclosed, nor the length of the roadwork site, not to mention the distance to the end when driving through a site. The poorest results were recorded in the 'Information' category, although this was more of an annoyance than automatically dangerous. In contrast to this, inadequate action in the 'Traffic Routing' category (where the results were also rather mediocre) could lead to dangerous situations. Tapering (ie, the point at the start of the cones where traffic has to move to accommodate lane narrowing, deviation and possible contraflow) was sometimes excessively sharp and fragile plastic guiding bollards separating two-way traffic or work areas would not provide proper protection of a car when out of control. Entry/exit points without acceleration or deceleration lanes hindered the flow of traffic, as did broken down or accident-damaged vehicles stranded in roadwork sites where no lay-bys where provided or where there was no quick, free recovery service.

On the other hand, the inspectors were by and large satisfied with roadwork signing, lane markings and night-time clarity, though even here there was still room for improvement. The condition and cleanness of the road surfaces were also found to be generally in order.

The categories in detail
Signs and road markings

Signs/road markings	Very Good	Good	Acceptable	Poor	Very Poor
UK total	-	1	6	-	-
Total across Europe	10	24	15	1	-

Germany and Belgium fared best in this category, with Spain bottom. The winner with the highest mark was the German roadwork site on the A7 near Göttingen.

The main points of criticism were:

- Too little distance between information road signs and items to which they refer;
- Signs indicating speed limits and overtaking prohibition not repeated often enough
- Speed limits and prohibitions not lifted immediately at the end of the roadwork site; and
- No flashing lights to give advanced notice of impending roadworks.

On the positive side inspectors found that:

- Variable message signs gave advance warning of impending roadworks these advance warning signs were found to be too close to the work zones in Spain, Italy, Croatia and Great Britain;
- Signs announcing speed reduction or lane tapering were often missing (inspectors noted that the space between signs differed significantly from custom and practice in other countries).

Traffic Routing

Traffic routing	Very Good	Good	Acceptable	Poor	Very Poor
UK total	-	4	3	-	-
Total across Europe	4	10	27	6	3

Leading the field in this category were sites in Austria, Switzerland and Great Britain. However, the rating of either 'Good; or 'Acceptable' given to British roadwork sites refers to day time inspections only because the configuration of sites often changes significantly at night (refer to the category titled 'Night-time clarity'). Croatia came last in this category. The best site was the A1 near Traun in Austria.

The main points of criticism were:

- The layout of lane tapering, separation of two-way traffic lanes and of work areas (this criticism applied across all countries); and
- Guiding kerbs on lanes of exit/entry points which were either too short or were not used.

On the positive side:

- Guiding beacons with arrows offered particularly good visual guidance for motorists (this type of equipment was used in Austria, Switzerland, Belgium and in some sites in Germany).

The layout of lane tapering was found to be poorest in Italy and Spain, where tapering was at times so acute that motorists had to slow down very abruptly. The taper area of the roadwork site on the A15 near Pontrémoli was particularly poor as this also merged with an entry point.

The separation of two-way traffic and of traffic from the work area was also very poor, not only in Italy, but also in Spain, Great Britain and Croatia. This was due to insufficient protective barriers, which would not be strong enough to prevent a vehicle from breaking through.

Only seven of the 50 roadwork sites tested had lay-bys with emergency phones. The following sites offered this: on the A1 near St Georgen, the A1 near Traun, and on the A1 near Amstetten in Austria; on the A2 near Zofingen and the A1 near Rorschach in Switzerland; on the A13 near Berlin (South) in Germany; and on the A7 near Valencia in Spain.

Points of entry/exit along the roadwork site were frequently criticised by inspectors. Deceleration and acceleration lanes were seldom provided. Where they were, they were often too short. Inspectors particularly criticised stop signs at points of entry as they hindered smooth traffic flow.

Road surface

Road surface	Very Good	Good	Acceptable	Poor	Very Poor
GB total	3	3	1	-	-
Total across Europe	29	16	2	2	1

Almost all sites were rated as 'Very Good' or 'Good' in this category. Leading the field were the Netherlands and France, with the single site inspected in Slovenia judged to be the poorest because of the sudden change in camber where the lanes tapered**,** as well as heavy dirt on the road surface.

Night-time clarity

Night-time clarity	Very Good	Good	Acceptable	Poor	Very Poor
GB total	6	1			
Total across Europe	7	24	14	5	-

Great Britain, the Netherlands and Slovenia led the field in this category. Roadwork sites in Great Britain, however, were unique in that sites were reorganized at night so that construction work could be carried out during times of low traffic flow. This resulted in a completely different traffic situation. A full comparison with the day time layout could not be made but GB sites scored very well for night-time clarity.

The roadwork sites in the Netherlands were fitted with stationary lighting. Furthermore, the original road markings were removed completely, giving the new road markings much more visibility at night - a fact particularly welcomed by the inspectors.

However, inspectors found an example of poor night-time clarity on the A9 near Hermsdorf, in Germany, where reflectors were missing on guiding equipment and taper areas without lights were not clear.

Information

Information	Very good	Good	Acceptable	Poor	Very Poor
GB total		1	3	1	2
Total across Europe	7	6	6	7	24

Poor standards of roadwork information across all countries meant that 'Information' was the poorest overall category, with many sites failing to achieve a rating better than 'Poor' (although this category represented to only 10 per cent of the total score). In Italy, Croatia, Belgium and Spain no information at all was provided about the works, while in Germany and Austria motorists were informed in advance of the reason, duration and length of the roadwork site. The distance to the end of sites was sometimes displayed. In the case of the test winner, the A1 near Traun, these signs were attractively designed with 'smilies'. In other countries, information was often provided at the beginning of the site, even though this was not always complete. Information about the distance to the end of the roadwork site was frequently omitted.

16 Eleven countries put to the test: room for improvement almost everywhere

Roadworks design in Europe differs greatly. Motorists travelling from one country to another must cope with different setups, and there are no standard European regulations.

This is the conclusion of the first ever roadwork inspections undertaken by the the EuroTest programme across 11 European countries. In Spain, inspectors found very acute lane tapering when traffic lanes were diverted onto the opposite carriageway. In Britain, on the other hand, some roadwork sites had a free tow-away service available at all times to remove broken-down and accident-damaged vehicles. The tests highlighted the strong and weak points in each of the countries and these individual findings give an overview of the broader European situation. Countries can share best practice to achieve a high degree of uniform standards.

The following section lists the most important points in each of the countries tested:

Austria
Austria, which led the field, achieved good results throughout. Particularly positive was:

- The majority of road work zones in the test had lay-bys with emergency phones;
- Two way traffic lanes were well separated by guiding/protective barriers;
- Information about the remaining length of the works was well presented with by 'smilies' with a drooping mouth at the beginning of the work zone that gradually transformed into a big grin towards the end of the roadworks; and
- Guiding beacons with arrows were frequently used for lane tapering and speed-reduction, offering particularly good visual guidance for motorists. Furthermore, two of the roadwork sites were designed with innovative layouts so that a speed limit of 100 kph generally kept traffic flowing.

Data sheets from the operators showed that work at the sites tested was carried out during the day only. Daily newspapers and radio announcements informed motorists two to four weeks in advance of any major roadworks and of each change in the building phase. Motorway operator ASFINAG also provided comprehensive information on the current status of roadworks on its website.

According to ASFINAG, roadworks staff were available 24 hours a day and could be on site within one hour to deal with any unexpected problems. Staff were trained to deal with emergencies, and emergency plans were in place. Control checks were performed regularly to monitor the sites. Traffic was monitored and speed limits enforced. For instance 6,000 speeding offences were recorded in the first week of operation at the winning roadwork site near Traun.

Belgium
Good lighting, which is a feature of motorways in Belgium, contributed to a high level of night-time clarity. Unfortunately, motorists received no information about the work being carried out. Furthermore, lay-bys were not provided. The speed limit was low (70 kph, at the sites tested) and this slowed the flow of traffic.

The operator provided no details of information or emergency management.

Switzerland
The standard of roadwork sites inspected in Switzerland differed considerably. In the 'Information' category ratings from 'Very Good' to 'Very Poor' were recorded. At half of the sites inspected, two-way traffic lanes were insufficiently separated and there were no emergency phones. At only one site, on the A9 near Clarens, were flashing warning lights used in advance to warn motorists of the impending works.

As in Austria, daily newspapers, radio announcements and websites informed motorists two to four weeks in advance of any major works and of each change in the building phase, together with the length and reason for the construction work and the likely traffic

disruptions. The speed limit was also often given.

In Switzerland, work was usually carried out both during the day and at night. According to the operator, staff were available 24 hours a day and could be on site within one hour to deal with any unexpected safety problems. Staff were trained to deal with emergencies and emergency plans were in place. The sites were usually checked during the day and at night, and were monitored regularly via video. Traffic was monitored and the speed limit was enforced.

Germany

Germany came second in this European comparison. Inspectors found that:

- Two-way traffic was mostly separated by physical traffic guiding and protection equipment; and
- The tapering zones left sufficient room for HGVs, points of entry/exit were clearly indicated and there were acceleration/deceleration lanes. Almost all the sites were clearly laid out at night, and featured non-blinding warning/flashing lights as well as additional reflectors.

However:

- Unlike the Austrian winner, motorists in Germany received very little information throughout roadwork sites; and
- Lay-bys were not generally available, The speed limit was often only 60 kph, which hindered traffic flow.

According to the operator, daily newspapers, radio announcements and websites informed motorists of any major roadworks, of the start and completion dates, the reason for the work, and of the traffic disruption likely to occur. Motorists were also informed of the length of the site and the speed limit in force. This information was provided on the Internet by the Federal Ministry of the Interior and also by the motorway administrations of the respective Lander.

In the event of any unexpected problems with site safety, staff were available 24 hours a day and could be on site within one hour. Staff were trained to deal with emergencies and emergency plans were in place. Control checks were performed regularly to monitor the sites. Traffic was monitored and the speed limits were enforced.

Spain

In Spain, few sites had lay-bys or signs with general information about the roadwork sites. Signs which were provided were often positioned too close to the incidents to which they referred. The road markings were not always clear and the tapered areas were often very sharp and short, so that the speed limit was reduced to 20 kph. The general speed limit of 40 to 60 kph was too low. The quality of sites varied significantly. At the roadwork site on the A64 near Villaviciosa, kerbs were fitted before the lane tapering in order to slow traffic down ahead of this critical area.

In the case of larger sites, daily newspapers, radio and the Internet informed motorists of the start and completion dates of the works, the length and the reason for the construction work, and, in some instances, the likely traffic disruption to be expected.

According to the operator, roadwork staff were generally available 24 hours a day, but in some cases during the day only, and could be on site within one hour to deal with any sudden defects or safety problems. Staff were trained to deal with emergencies and emergency plans were in place. Lists with the telephone numbers of the police, emergency services and the motorway maintenance unit were available. The sites were checked regularly, usually both during the day and at night. With the exception of the site on the C31 in Barcelona, traffic and speed were monitored and speed limits were enforced.

France

The French roadwork sites did particularly well in the Road Surface 'Condition and Cleanness' category. The number of lanes was reduced at almost all the sites, which could hinder traffic flow leading to congestion. In the case of the sites near Vienne and Bully les Mines, the right lane was closed and this made it difficult for motorists to merge with traffic in the left fast lane. There was either no information provided about the speed limit throughout the site, or where there were signs, they were spaced too far apart. There was insufficient notice of the end of traffic restrictions at the end of the roadwork site. There were generally no lay-bys and frequently no flashing lights giving advance warnings. In three of the five road sites, no information whatsoever was provided about the roadworks, and very little information was provided at the two remaining sites.

The operator provided no details of information or emergency management.

Great Britain

The British results put it third overall and first in the category 'Night-time Clarity'. However, roadwork sites were reconfigured significantly at night in Great Britain, so that more work could be carried out during times of low traffic flows. The test, however, rated day time layout only and concentrated on the clarity of the site at night. Unlike the rest of Europe, most British sites offered a free tow-away breakdown service on sites at all times, as an effective alternative to lay-bys, which enabled a speedy removal of broken-down or accident-damaged vehicles. British sites were also commended for removing the original lane markings completely. This enabled new lane marking to clearly route traffic through the site. In the tapered area, additional, wider lanes were generally provided for HGVs.

British sites were criticised for not adequately separating two-way traffic, and road workers from traffic. The inspectors highlighted an incident where two workers were killed in an accident on a roadwork site in Manchester. The quality and quantity of information provided differed greatly between sites. Inspectors criticised several English-only text signs, which were not supplemented by generally understandable symbols.

In the case of major roadworks, daily newspapers, radio and the Internet gave advance warning of start and finish dates, the work being undertaken and the length of road affected, the speed limit and usually, the likely traffic disruption.

According to the operator, roadwork staff were available 24 hours a day and could be on site within one hour to deal with any sudden defects or safety problems. Staff were trained to deal with emergencies and emergency plans were in place. A list with the telephone numbers of the police, emergency services and the motorway maintenance unit was available on site. Roadwork sites were checked regularly, around every two hours, and were video monitored. Traffic was monitored and speed enforcement measures were in place. On the M4, for instance, over a two-month period, more than 200,000 motorists were caught by speed cameras in the roadwork site, the equivalent to one motorist every five minutes. Fines amounted to £1.2 million.

Croatia

As only two sites were tested, it was difficult to give a representative country rating. However, inspectors found that lanes were very narrow and there were no advance flashing lights. Work areas were either not separated from the traffic or separation measures were inadequate. Where the number of lanes was reduced, the slow, right lane was closed making merging difficult. There was no information provided regarding the type, duration and length of the roadwork sites.

Italy

The operator provided little information about roadwork sites in Italy and traffic guidance at night did not aid clarity. Lane tapers were too short and too sharp, leading to abrupt reduction in speed limits. Two-way traffic was not adequately separated. Some vital road signs were not

in place and/or the signs provided were often too low to the ground. The speed limit through the sites was only 40 to 60 kph, which hindered traffic flow. Entry/exit points were sometimes difficult to see, and it was necessary to stop at entry points, which could result in problems for merging traffic.

The operator provided no details of information, roadwork sites or emergency management.

The Netherlands

All the sites in The Netherlands were given top marks for road surface conditions and their cleanness. Two-way traffic lanes were generally separated by guiding/protective barriers traffic guiding and protection equipment, and night-time clarity received top marks thanks to permanent motorway lighting. Inspectors also praised the removal of the original line markings and the placing of new markings to guide motorists through sites. Exit/entry points in the sites were clearly marked and featured acceleration/deceleration lanes. However, there were no lay-bys and the lanes were often very narrow. On-site information was insufficient at all the roadworks surveyed.

As a rule, daily newspapers informed motorists in advance of any major roadwork site with the Internet providing information about start and finish dates, the type of work being undertaken, the length of the roadwork site and likely traffic disruption.

Work was usually carried out during the day only. According to the operator, roadwork staff were available 24 hours a day and could be on site within one hour to deal with any sudden defects or safety problems. Staff were trained to deal with emergencies and emergency plans were provided at half of the sites inspected. A list with the telephone numbers of the police, emergency services and the motorway maintenance unit were available on site. Control checks were carried out at only half of the sites. In most cases, speed enforcement measures were in place.

Slovenia

Only one roadwork site was tested in Slovenia and the operator provided no background information. It was not, possible, therefore, to draw any conclusions regarding the general quality and handling of sites or to identify any trends.

17 EuroTest methodology: how we tested

This is the first time that EuroTest, the international consumer-testing programme, has inspected motorway roadwork sites. In some countries, the risk of being involved in an accident is much higher in roadworks than on the open road and this is a timely pan-European study. The evaluation and comparison of sites provides the first-ever opportunity to identify shortcomings, to recognise best practice, and to consider how safety at sites can be improved. In order to encourage correct driving behaviour, motorists must have sufficiently clear information to drive safely through a site. The report will also to help make drivers aware of country-specific features.

A total of 50 motorway road work zones were inspected in 11 European countries: nine in Germany, seven in Great Britain, six in Austria, five in France and in Italy, four in Switzerland, Spain and the Netherlands, three in Belgium, two in Croatia and one in Slovenia. All of the sites tested were long-term sites on main European travel routes. The shortest site inspected was one kilometre long, the longest 21.5 kilometres.

ADAC (the German AA), which oversaw the project, commissioned the Transport Infrastructure Institute at the Faculty of Transport and Traffic Science at Dresden University of Technology to perform the tests. The inspections were carried out between 8 March and 15 June 2005 and were undertaken in both directions, twice during the day and once at night. A BMW 525d Touring fitted with state-of-the-art measuring systems was used in the test. The equipment included a positioning system (comprising GPS, reference station, inertial system and position measuring equipment), digital stereo cameras with their own computers for storing images which were used to measure distances and lane widths, an analogue scenery camera and a central measuring computer. The position of signs and the location of lay-bys etc were recorded using a touchscreen. A comprehensive appraisal of the site was conducted as a starting point in daylight. The data was captured, documented per video both in digital and analogue form and subsequently analysed in the laboratory.

The ARROWS study (Advanced Research on Road Work Zone Safety Standards in Europe), which was carried out on behalf of the European Commission and which is the only basic study in Europe to be performed on this topic, provided the methodological basis for the inspections. From 1996 to 1998, this study examined the safety and design of roadwork sites in Europe. The national road administrations of Belgium, Germany, the Netherlands, Sweden, Slovenia and the Czech Republic were involved in the study, which was managed by the National Technical University of Athens. The result was a practical handbook with recommendations for uniform European safety standards for roadwork sites. This was not designed to replace but to supplement national guidelines.

This handbook was used by EuroTest and traffic experts to develop the criteria for a comprehensive checklist. This checklist contains, for instance, the most important safety-related issues, but also matters concerning the layout and quality of a roadwork sites, and is broken down into two sections: data collection via the software in the test vehicle and the evaluation by the test team on site.

Using the checklist, the following five theme blocks were checked:

Signs/road markings **Weighting: 35 percent**

- Signs in advance of the roadwork site
- Signs through the roadwork site
- Signs at the end of the roadwork site
- The frequency, clarity, easy recognition and condition of road signs
- Quality of road markings and their clarity

Traffic routing **Weighting: 35 percent**

- Width of traffic lanes
- Lead-in taper onto opposite lane
- Contraflows
- Exit taper onto the original lane

- Points of entry/exit within the roadwork site
- Points of entry/exit for roadwork vehicles
- Flow of traffic
- Safety-relevant equipment

Road surface **Weighting: 5 percent**

- Condition
- Cleanliness

Night-time clarity **Weighting: 15 percent**

- Visibility of signs and road markings
- Protective equipment with reflectors
- Illumination of the lead-in/exit tapers
- Clear layout

Information **Weighting: 10 percent**

- Information about the type and duration of roadworks
- Information regarding the overall length of roadworks
- Information repeated throughout the length of the roadworks

The roadwork sites were rated ‘Very Good’, ‘Good”, ‘Acceptable’, ‘Poor’ and ’Very Poor’.

18 International co-operation with European motoring clubs

The 2005 roadwork inspections were carried out within the scope of the international EuroTest programme. A total of 15 motoring clubs from 14 European countries, coordinated by the FIA (Fédération Internationale de l´Automobile) took part in the inspection. ADAC was responsible for the performance and methodological management of the test. The test results will be published in all the countries represented by the partner clubs. These partner clubs are:

United Kingdom The AA Motoring Trust www.AAtrust.com	Germany ADAC www.adac.de	Belgium TCB www.touring.be
Finland AL www.autoliitto.fi	France FFAC www.automobileclub.org	Italy ACI www.aci.it
Croatia HAK www.hak.hr	Netherlands ANWB www.anwb.nl	Norway NAF www.naf.no
Austria ÖAMTC www.oeamtc.at	Portugal ACP www.acp.pt	Switzerland TCS www.tcs.ch
Slovenia AMZS www.amzs.si	Spain RACE www.racenet.es	Catelonia RACC www.racc.es

19 Recommendations: how to make roadwork sites safer

Planners and operators should:

- Install traffic signs showing the length, duration and reason for the roadworks in advance of the roadwork site, as well as regular signs throughout the works to give motorists advanced warning of what is ahead

- Ensure that traffic signs both in advance of the roadwork site and through the site are of similar appearance to avoid confusing motorists

- Inform motorist well in advance of lane reduction and tapering, enabling them to adapt their behaviour accordingly

- Consider adding additional lane routing within the tapered area, such as, using reflecting guidance beacons with arrows or curve signs so that traffic lanes can be clearly identified at night

- Remove all road markings from the former traffic lanes, at least in critical areas, such as in tapered area, so that motorists can clearly follow the new road layout

- Install rounded kerbs ahead of critical areas such as steep taper zones, so that motorists can reduce their speed on time

- Put in place physical barriers to separate two-way traffic lanes, using mobile safety barriers made of steel or concrete to prevent vehicles from crossing into oncoming traffic

- Put in place physical barriers to protect on-site road workers

- Install emergency telephones in lay-bys or provide 24 hour tow-away service so that broken down vehicles cause as little traffic congestion as possible

- Shift certain construction phases to times of low-traffic flows (for example, at night) so that traffic is disrupted as little as possible

Administrations and politicians should:

- Put in place a standard analysis of accidents at roadwork sites throughout Europe to enable its findings to lead to the safer installation of roadwork sites, giving special consideration to motorists' perceptions of roadwork sites and how difficult they find navigating the sites

- Produce guidelines for roadwork site equipment, such as site design and traffic signs to bring about a standardised system across European as far as possible

- Not skimp on funding roadworks to the detriment of safety

- Earmark sufficient funds at a European level for accident research in this area.

20 Tips: how to drive safely through roadwork sites

Drivers should:

- Seek information on roadwork sites before setting off, especially when travelling outside their home country. Be prepared for different rules, road markings in different colours (for instance, white, yellow, orange or red) and for unfamiliar and poorly visible traffic signs. In some countries, traffic signs are positioned near the ground.

- Keep strictly to speed limits, and obey all traffic signs and instructions

- Keep a good distance from the vehicle in front, and drive carefully, paying attention to the road ahead. This is particularly important in the case of one-lane traffic routing where there is no room to swerve out of the way if the vehicle in front comes to a sudden halt. The most frequent accident at roadwork sites is the rear-end collision

- Expect the unexpected and the unfamiliar, above all, in the lead-in/exit tapers. These areas were often extremely short and steep, particularly in Spain and Italy

- Remember that in some countries drivers are required by law to observe the so-called *zipper system* of merging when lanes are closed. This means remaining in the lane until the road narrows, looking into the mirror, indicating and then merging alternately with traffic in the other lane according to the zipper system of merging, ie, one vehicle after an other

- Remember that a wide HGV or a car and trailer will need more room at the beginning of the lead-in/exit tapers

- Where possible remain in the inside lane. This lane is usually wider than the off-side lane and is more likely to avoid conflict with oncoming traffic

- Only overtake if you are allowed to and if you feel that you are capable of doing so. Do not forget that the off-side lane is often narrower than the inside lane

- Concentrate carefully when driving through roadworks

- In the event of a breakdown, switch on hazard warning lights immediately**.** If there are no lay-bys or if these are impossible to reach, try to park the vehicle as close to the inside edge of the road left as possible. You and your passengers should then immediately leave your vehicle by the passenger door and find a safe place to wait. Be aware of heavy vehicles, works machinery, and other dangers. In Italy, Spain, Portugal and Austria, all passengers must put on reflective vests before leaving the vehicle. Do not attempt to push your vehicle. Punctures should be treated in the same way as a breakdown

- Take care when work is being carried out at night and be prepared for the transition from the illuminated working area to unlit motorway.