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Road quality service levels and innovations to meet user expectations

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SUMMARY

Highway authorities in the United Kingdom have made good progress in developing and maintaining their networks to provide the best service to road users and to keep inconvenience to a minimum.

The UK's response to user demands has been evidenced by:

- The development of high-level strategies and plans for road-based transportation in each of the 4 countries making up the United Kingdom, all of which have been subject to wide-ranging public consultation.

- The emergence of the Best Value initiative which uses a structured process to determine the needs and expectations of local people, and through the use of benchmarking and competition has developed key performance indicators, within a performance management framework, as a hallmark of good service.

There have been technological innovations to reduce inconvenience to road users:

- Smarter network management through the increasing use of Intelligent Transport Systems. This includes incident detection and traffic information services to provide the road user with timely and credible data on which to base decisions about route selection, travel time and choice of travel mode.

- Urban Traffic Management and Control systems to optimise travel time through the network and give public transport priority over other vehicles.

- Advances in winter service management systems for faster dissemination of forecasts and real-time weather data to those making treatment decisions, so helping to keep traffic moving on the busier roads by applying treatment at the optimum times.

Technical advances have provided better service to road users through:

- The use of innovative materials such as thin wearing course systems, and the quality assurance procedures necessary to ensure fitness for purpose.

- Improved design methods and standards to produce better and more economical solutions to difficult problems such as poor ground conditions.

- The Code of Practice for Highway Maintenance and more rigorous pavement assessment systems have improved the management of road maintenance.

- New techniques to reduce the impact of roads on the communities they pass through.

- Intelligent Transport Systems to improve public transport systems for those without access to a car.

Improvements in the organisation of construction and maintenance works have provided better service by:

- Better procurement strategies, designed to produce more economical projects through a partnership approach among the construction team.
- The use of Public/Private partnerships to promote innovation and to optimise whole life project costs and delivery of service outcomes.
- The increasing use of performance specifications to reduce works cost and encourage innovation.
- Better management of utility companies to reduce the disruption caused when they place equipment under the road.
- Robust regimes for routine safety inspections to improve safety for road users.
- Increased awareness of good environmental practice to improve the sustainability of road projects.

1.0 The administration of road functions in the United Kingdom

The United Kingdom comprises the countries of England, Scotland, Wales and Northern Ireland. In the late 1990s, ultimate responsibility for roads functions outside England was devolved to the Scottish Parliament, the Welsh Assembly and the Northern Ireland Assembly.

Responsibility for the various classes of road in the 4 countries is as follows:

Country	Motorways and Trunk Roads	Local Roads
England	Highways Agency on behalf of the Department for Transport www.highways.gov.uk	the relevant local authority (Council)
Scotland	The Development Department of the Scottish Executive www.scotland.gov.uk	the relevant local authority (Council)
Wales	The Transport Directorate of the National Assembly for Wales www.wales.gov.uk/subitransport `	the relevant local authority (Council)
Northern Ireland	Roads Service on behalf of the Department for Regional Development www.drdni.gov.uk/roads	Roads Service on behalf of the Department for Regional Development

It can be seen that Northern Ireland is unique in having an integrated road authority responsible for all parts of the public road network.

1.1 Service quality indicators to evaluate the level of response to user demands.

1.1.1. Transportation strategies/plans to meet future user needs.

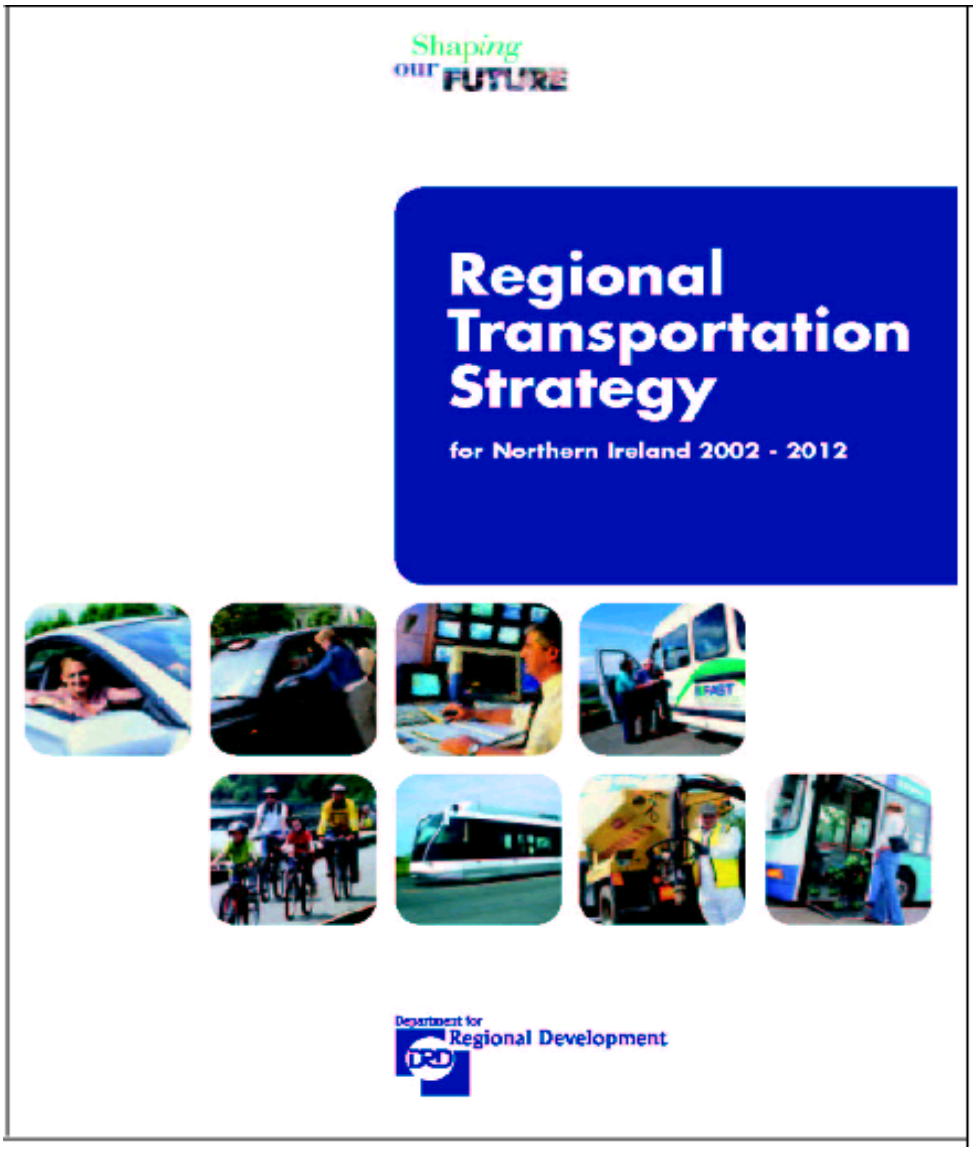
Transportation strategies for the four jurisdictions within the United Kingdom exist or are well advanced:

- **Transport 2010 – The 10 Year Plan** published in 2000 as a long-term strategy for England sets out an ambitious but realistic view of what can be achieved in the 10-year period;

- **The Transport Framework for Wales** published in November 2001 sets out the Welsh Assembly's aims for leading and supporting the delivery of transport infrastructure and services and the **Trunk Road Forward Programme** which sets out strategic priorities for the medium term;

- **Scotland's Transport – Delivering Improvements** sets out the Scottish Executive's transport vision and includes the transport improvements that will be delivered in the short-term; and

- **Regional Transportation Strategy for Northern Ireland 2002-2012** published in September 2002 identifies strategic transportation investment priorities over that 10-year period.



Regional Transportation Strategy for NI 2002-2012

Each of these strategies and plans have been developed in the light of the UK Government's overarching objectives for Economy, Environment and an Inclusive Society, but they take account of both current and forecast problems for road users in the individual jurisdictions.

During their preparation much effort has been directed at determining the needs and views of road users. For example, the Highways Agency continues to conduct a rolling programme of monthly road user satisfaction surveys to determine the needs and priorities of network users as they develop and change over time.

Some examples of key service quality indicators that are incorporated in the strategies and plans are:

DESIRED OUTCOME	PERFORMANCE INDICATOR
Easing Congestion	% change in average journey time per veh-km
	% change in average speeds
Effective Maintenance	condition index (whole life cost) based on pavement, structures, technology and lighting
	availability of network
Safer Travel	% reduction in the number of people killed or seriously injured
	% reduction in the number of children killed or seriously injured
	% reduction in the slight casualty rate
Improved Environment	% of network with quieter surfacing
	improvements in water, air, landscape, biodiversity, waste, heritage and noise
Improved public transport	exceed a range of passengers' charter targets
	average vehicle age of <X years
	% patronage increase
Accessibility	% increase in the proportion of households that are within X minutes walk of an hourly public transport service
	% of buses/trains accessible to people with disabilities by a specified date.

The actual targets in individual strategies/plans vary but there is a common theme of improving the level of response to user demands. In addition, each have a built-in monitoring and review mechanism to ensure they take account of changing circumstances and thereby remain up-to-date.

1.1.2. The Best Value Initiative

The UK Government continues to promote initiatives to reduce the cost and improve delivery of central and local government services, including the development and maintenance of road networks.

The Best Value initiative emerged in 1997 and became a requirement for local authorities in England and Wales from 1 April 2000 under the Local Government Act 1999. Similar legislation is currently being progressed through the Scottish Parliament and Northern Ireland Assembly. Central government agencies, such as the Highways Agency, are subject to the Better Quality Services initiative, which is very similar to Best Value.

Under Best Value, each local authority has a duty to secure continuous improvement in the way in which its functions are exercised, having regard to a combination of economy, efficiency and effectiveness.

This means that authorities must review all their activities in line with Best Value legislation and implement action plans to ensure improvement. Each review must consider 'the 4Cs':

- **challenge** – questioning the way the authority has traditionally organised the particular service, whether it is really needed and identifying the customer needs;

- **consult** - consult local people, key local stakeholders and staff about the service and monitor customer satisfaction;

- **compete –** demonstrate that in-house services are cost effective by subjecting them to external competition and, if more expensive consider switching the activity to the private sector; and

- **compare** – benchmark the service against other authorities, and private sector providers. This has encouraged the development of regional benchmarking clubs where members identify best practice and a range of relevant local performance indicators.

As well as publishing annual improvement plans, authorities have to report and publish their performance against National Best Value Performance Indicators. Those relevant to roads are:

BVPI No.	UK Best Value Performance Indicators: Transportation
96	Condition of principal roads: Percentage of the network with negative residual life, derived from deflectograph surveys.
97	Condition of non-principal roads: Coarse Visual Inspection of the non-principal road network, to be carried out using the UK Pavement Management System
99	Road Safety: Number of road accident casualties per 1000,000 population broken down by both nature of casualties and by road user type
100	Number of days of traffic restrictions on traffic sensitive streets due to local authority road works or utility street works per kilometre of traffic sensitive streets.
165	Fair access: Percentage of controlled pedestrian crossings with facilities for disabled people.
186	Cost and efficiency: Roads not needing major repair a) Percentage of the principal road network where major structural treatment is not considered necessary divided by the authorities' average structural expenditure per kilometre on the principal road network over the past 3 years. b) Percentage of the non-principal road network where major structural treatment is not considered necessary divided by the authorities average structural expenditure per kilometre on the non-principal road network over the past 3 years
187	Condition of footways: Measures the percentage length of the footway network with a Footway Condition Index greater than the threshold value indicating treatment need, based on Detailed Visual Inspection (DVI) surveys of the whole network on a cycle of 15% per year, covering the entire footway network within 7 years.

Although local authorities can set their own targets for these indicators, they are expected to achieve performance levels that were achieved by the top 25% of councils at the start of the five year process and to secure improvements in performance that reflect the targets in the relevant national public service agreement/10-year Plan. Examples include:

- maintenance - to halt the deterioration in the condition of local roads by 2004, and eliminate the backlog by the end of the 10-year Plan; and

- road safety - to reduce the number of people killed or seriously injured in Great Britain in road accidents by 40% by 2010 and the number of children killed or seriously injured by 50% compared with the average for 1994-98.

The Best Value process is subject to comprehensive external audit and inspection, which test compliance with the Best Value legislation and judge the quality of the service and the improvement plan.

Early indications are that the Best Value regime is being successful in improving the performance generally of local authorities. A survey undertaken by the Audit Commission on the performance of all English councils during 2000/01 showed that the average performance of four out of five councils is improving, and that in many service areas the gap between top and bottom performers is narrowing. These performance improvements are also reflected in improving customer satisfaction levels, with nearly two-thirds of the general public now satisfied with the overall service provided by their local authority.

1.2 Technological innovations which make it easier to reduce inconvenience to road users.

Throughout the United Kingdom innovative techniques to improve the management and use of the road network are a vital tool in the ongoing drive to minimise inconvenience to road users.

1.2.1. Smarter Network Management

Background

Throughout the UK, increased road travel demand is putting pressure on existing networks. Government is emphasising the need for smarter road network management and a modal shift from the private car to public transport. Greater priority is being given to the needs of pedestrians, cyclists, public transport and commercial vehicles as they compete in congested conditions with the private car for scarce road space. Considerable investment has been made in Intelligent Transport Systems (ITS) which enhance road safety, manage demand, maximise existing capacity and provide the road user with timely and credible information upon which to base decisions on choice of travel mode, travel time and route selection. The private sector is encouraged to take an active role in the provision and dissemination of travel information, an example being Trafficmaster plc providing in car real time information. Also, to provide an end to end service to the traveller, Transport Direct is a government initiative which will provide information on route and mode choice, the facility to book and pay for journeys and also provide pre and on-trip real time information.

Inter-Urban Road Network

Incidents cause significant delays and disruption of the road network and UK road authorities have made significant investments in incident detection systems. An incident of duration over 2 hours becomes a strategic rather than a local issue, and will require a wide area response for effective management and dissemination of information.

In England, the Highways Agency has developed the MIDAS (**M**otorway **I**ncident **D**etection and **A**utomatic **S**ignalling) system for the early detection of incidents. This was initially installed on the M25 and is now being extended to other parts of the trunk road network. Characteristics of the traffic flow are monitored, and speed limits are set automatically when congestion is likely to occur. Systems such as MOLA use real time data to assess the likely impact of an incident and identify the best diversion route. Driver Information Systems such as those operating in the Midlands (MDIS) and Yorkshire (YDIS) monitor the traffic flow through in-road loop sensors and cameras (CCTV). In the event of an incident, the system provides information to drivers by a series of variable message signs (VMS) located at key decision points on the network.

The English Traffic Control Centre (TCC) project will manage demand on the trunk road network by providing accurate and relevant real time information. The 10 year, £160m contract is a public/private partnership and was awarded to Traffic Information Services (TiS) is March 2001, and full delivery of services is expected by March 2004. TiS will be responsible for real time monitoring of the network, providing a co-ordinated response to incidents, improving journey time reliability and providing alternative route advice to minimise the effects of congestion and incidents. Other technological initiatives are the Travel Information Highway (TIH) that will facilitate the exchange of information between network operators and users of the network. Also, the Active Traffic Management (ATM) initiative will automatically warn drivers of queues and incidents ahead and what action to take, and will include facilities such as ramp metering on motorway entry slip roads to assist traffic join the mainstream flow in a safe and controlled manner. CCTV coverage of the network and extensive traffic monitoring will be used to improve safety and ensure management of the network is effective.

Active Traffic Management *(Copyright Highways Agency)*

The Welsh Assembly had made a significant investment in ITS technology to manage traffic and provide relevant travel information on the M4 corridor link with England and the A55 in North Wales. Two separate control centres have been developed, M4NTAIS in South Wales and the North Wales Traffic Control Centre. The incident detection and driver information systems being used include MIDAS, CCTV monitoring and variable message signs (VMS). There is also a system for incident detection in tunnels (IDRIS). The Welsh Assembly has developed facilities for the processing and integration of real time data to assist in the provision of traveller information services. A website pre-trip travel information service indicates vehicle speeds on various sections of the road network, and uses real time information to indicate journey times. CCTV images are displayed on the website and a cross border interface exists with the TCC project in England. Initiatives using pictogram VMS and variable lanes are underway, and the feasibility of closer co-operation with public transport and haulage organisations to improve productivity is being investigated.

The Scottish Executive's **NADICS** (**N**ational **D**river **I**nformation and **C**ontrol **S**ystem) provides drivers with timely and credible travel information on the Scottish trunk road network. The system is controlled from the National Network Control Centre in Glasgow, and includes incident detection systems, variable message signs (VMS), CCTV, journey time monitoring and ramp metering. When an incident occurs, it is analysed by the NADICS system, which subsequently displays information on VMS located at key strategic points on the trunk road network. NADICS can deploy the VMS to provide local, tactical and strategic responses from the one centre providing a truly national service. Information on incidents is also displayed on the NADICS website and communicated for broadcast to the news media and the motoring organisations. CCTV images from NADICS are supplied to a number of traffic organisations with BBC Television Scotland showing them on their morning travel news broadcasts. The COMPANION incident warning system is used to warn drivers of disruption of traffic flow. Current developments in Scotland include journey time prediction on major routes, journey time through roadworks and the deployment of OPERA, an application with a real time learning algorithm to make best use of available network capacity.

In Northern Ireland, there has been considerable investment in ITS on the inter-urban network, mainly on the most heavily trafficked sections in Belfast. A motorway control system includes facilities for lane control signals, automatic incident detection, and the operation of electronic and rotating prism variable message signs. The motorway control system has been integrated with the urban traffic control systems and this ensures seamless traffic control at the important urban/inter-urban interfaces. The system architecture permits control by either the police or Roads Service Traffic Information and Control Centre (TICC). Traffic flows on the network are monitored by CCTV, and real time pictures from 4 CCTV cameras are displayed on the internet. Traffic information is disseminated widely via the www.trafficwatchni.com website and the media. with local BBC radio broadcasting traffic and travel information live from TICC during peak traffic times.

The importance of ITS is fully appreciated by inter-urban roads authorities in the UK who, together with the National Roads Authority in the Republic of Ireland, have formed a partnership in the EU project STREETWISE, which aims to provide a **S**eamless **TR**avel **E**nvironment for **E**fficient **T**ransport in the **W**estern **IS**les of **E**urope. STREETWISE in turn is one of six Euro-regional projects involved in the TEMPO (Trans-European Intelligent Transport Systems projects) programme for the harmonised deployment of ITS on the trans-European road network.

Urban Road Network

Network management in congested urban conditions must resolve the conflicting requirements of road users such as pedestrians, cyclists, public transport, commercial vehicles and the private car. Over 130 towns and cities throughout the UK have implemented Urban Traffic Control systems using SCOOT (**S**plit **C**ycle **O**ffset **O**ptimisation **T**echnique) to optimise the management of the network. Many cities also have traffic monitoring by CCTV, VMS for the display of driver information, car park guidance systems, air quality monitoring and also the provision of public transport priority. The development of UTMC (Urban Traffic Management and Control) with its open architecture now means that information transfer can be facilitated between systems that formerly operated in isolation. Many cities are developing their Traffic Control Centres into Travel Information Centres and making extensive use of the internet for the display real time data and CCTV images to the public.

To encourage a change of travel mode and thereby assist in reducing city centre congestion, many cities in the countries comprising the UK are implementing bus priority facilities and providing real time passenger information to the public at bus stops and other key locations. Public transport information is also made available to the public via web sites, WAP phones and SMS text messages. Other initiatives to manage congestion levels include demand management measures such as allocating road space to High Occupancy Vehicles (HOVs) and road user charging.

1.2.2. Winter service

Winter conditions can inconvenience road users, make travel conditions hazardous, increase the potential for accidents, increase delays and give unreliable journey times. Severe conditions such as heavy snow falls and ice can close routes completely. In the UK, weather can be unpredictable and the occurrence of wintry conditions varies considerably through the season and from year to year.

Road authorities have reviewed and improved their winter service operations, especially in relation to snow and ice clearance, and have produced revised plans and procedures in keeping with customer expectations for a quality service.

There has been considerable attention in disseminating forecasts and real-time weather data to those making treatment decisions, so helping to keep traffic moving on the busier roads by applying treatment at the optimum times. Research has been carried out into the effect of spreading salt on the network, the improved gathering of weather information, and the winter performance of road infrastructure innovations such as thin surfacings.

Intelligent Transport Systems (ITS) are also an integral part of the winter maintenance operation. Examples are the use of global positioning to locate and manage the winter maintenance fleet on the network, and the provision of timely information to the road user via the internet, teletext, radio broadcasts and variable message signs.

2.0 Part 2 - Technological advancements and improved organisation of maintenance and repair works in order to provide the best service to road users

2.1 Technological advancements in order to provide best services to road users

2.1.1. Innovative materials

The choice of surfacing materials plays a vital role in providing roads that are safe and give value for money. For many years the UK relied upon hot rolled asphalt as the main surfacing material for trunk roads and motorways. However, recently innovative surfacings have been widely used such as thin wearing course systems, surface dressing, micro-surfacings and porous asphalt. Systems have been introduced to assure the client of the fitness for purpose of many road making materials, for example the Highway Authorities Product Approval Scheme (HAPAS), managed and operated by the British Board of Agrément.

Asphalt technology has made significant advances in recent years. The emergence of these new materials present opportunities for clients and manufacturers to develop sustainable solutions while maintaining a competitive edge. Additionally there is pressure from society to supply aesthetic products that meet environmental obligations through re-cycling, to reduce noise and enhance bio-diversity. The challenge is to continually be more innovative in areas such as; materials recycling, durability and extended lifespan of road surfacing materials yet still main the required technical standards.

On average, 20,000 tonnes of aggregate are used for each mile of motorway construction. Increasingly there is a demand to reduce dependence on raw materials and look towards the use of recycled or secondary aggregates, either as bulk fill in unbound layers or with careful selection and grading as aggregate in cement or bitumen bound material.

Recent research carried out by TRL Ltd, (formerly known as the Transport Research Laboratory in UK), identified the design and specification criteria for the use of cold in-situ recycling techniques in highway pavements construction. In this context the procedure requires specialist plant to pulverise and stabilise existing road materials, at ambient temperature, with the addition of hydraulic cement and/ or bitumen binders. The process, carried out on site allows for the road construction to proceed, re-using existing material. The concept is referred as ‘linear quarrying’. At the end of the 3-year research period it was found that in all but one case the predicted life of the recycled road was at least as long as its design life.

2.1.2. Design methods and standards

Designers in the UK use the latest technologies to improve road design including the use of CAD and related design software as well as simulation, modelling and analysis tools that take advantage of modern computer technology. Project management software allows better planning of projects whilst Internet based systems allow the sharing of information on a world-wide basis.

Design standards are continually reviewed and the Design Manual for Roads and Bridges is regularly updated to take account of the latest technological advances

Earthworks design and standards have advanced significantly over recent years, with many new methods of crossing poor ground now incorporated in schemes. The increased use of geotextiles and piling/stone columns to support load transfer platforms significantly reduces the need for virgin quarried material and disposal of spoil off-site.

Good road design can contribute to an improved service to road users by reducing disruption due to future maintenance. For example:

- provision of hardshoulders strong enough to run diverted traffic during maintenance work; and
- hard surfaces to avoid grass cutting in the central median of motorways.

Advances in highway safety design and risk assessment methods combined with technological advances in vehicle safety are contributing to government targets to reduce the numbers killed on our roads.

A recent development is the use of CAD based systems for the design of maintenance works allowing engineers to design better road profiles in resurfacing schemes. The introduction of GIS and GPS systems also assist designers and improve maintenance procedures thereby improving levels of service to road users.

The traditional over-conservative methods previously used in bridge assessment programmes resulted in unnecessary strengthening works. New assessment techniques take fuller consideration of the residual strength of existing structures and avoid unnecessary disruptive bridgeworks. Also new methods of design and strengthening such as the placement of anchored steel reinforcement into masonry arch bridges has reduced the time needed to strengthen substandard bridges thereby minimising disruption to road users.

2.1.3. Code of Practice for Highway Maintenance/Pavement Condition Assessment

Proper maintenance of the existing network is vital for social and economic development. This is recognised by high level strategies such as a plan to eliminate the backlog in local authority road maintenance by 2010 (England) and to reduce by 75% the maintenance backlog for road structures and surfaces (Northern Ireland).

A new Code of Practice for Highway Maintenance was published in July 2001, following a UK-wide review by a wide range of representatives and practitioners. The new Code is founded on the key principle of Best Value, that services should be based upon the needs of the users and the community rather than the convenience of service providers. The new Code is applicable throughout the UK, but recognises the need for local discretion and diversity, and essential regional differences.

Responsibility for monitoring progress towards implementation of the new Code and reviewing and updating it will fall to the newly created Roads Liaison Group (RLG). This Group is made up of members from local, devolved and central Government representing road authorities across the UK. Its purpose is to contribute to the formulation of roads policy by co-ordinating and advising on standards and policy relating to construction and maintenance of all classes of highway, taking into account differing needs in the four UK countries where appropriate.

The RLG has also specific responsibility for the UK Pavement Management System (UKPMS). This computer-based system provides sophisticated pavement management for both national and local roads. It is designed to accept input from a variety of visual and machine based road condition survey sources. The project has been a collaborative effort between the Department of Transport and around 100 local Highway Authorities.

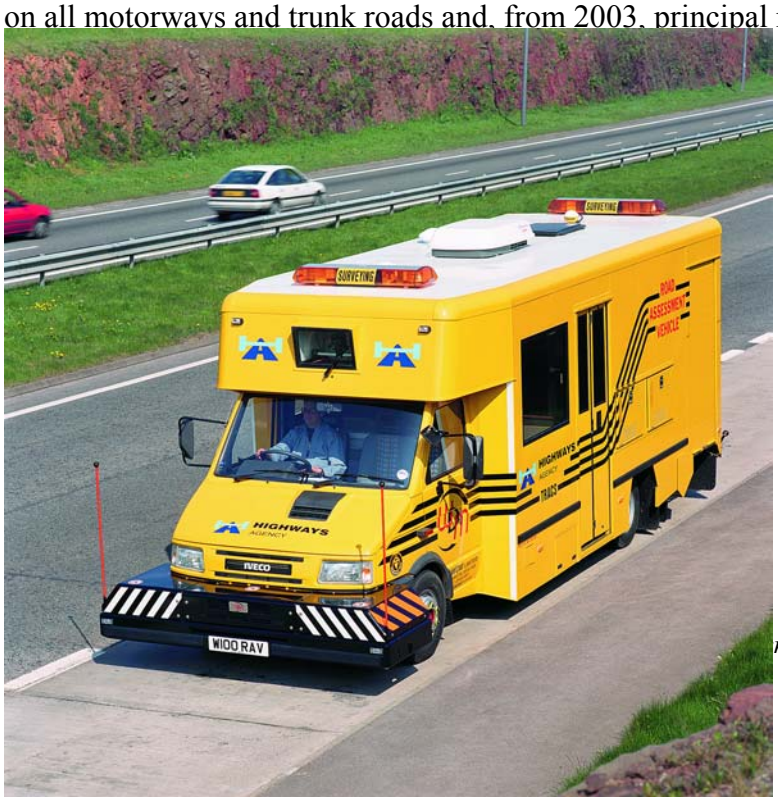
The development of this system was first announced at the X1Xth World Road Congress in Marrakech in 1991. Since that announcement significant progress has taken place and the UKPMS project has now delivered the key tools required through an independent accreditation scheme for relevant computer software packages. This innovative project has harnessed private sector investment in software systems to the benefit of highway authorities, the result that systems, which have met the UKPMS standards, are now available nationally.

The Code of Practice for Highway Maintenance identifies UKPMS as being the 'standard' for road pavement management in the UK.

The output from UKPMS road condition surveys from both footways and carriageways will allow local authorities to report on Best Value Performance Indicators (BVPIs) as part of their local transport plans. In addition, the resulting output will also form an essential part of the revamped National Road Maintenance Condition Survey (NRMCS), which has been in existence in England and Wales for over twenty five years.

On motorways and trunk roads, visual assessments are supplemented by machine-based automatic systems of road condition data collection such as the High-Speed Road Monitor, SCRIM and Deflectograph.

A new machine called TRACS (**TRA**ffic speed **C**ondition **S**urveys) has been developed by the Highways Agency and uses the latest video and laser technology to monitor conditions such as pavement cracking and provides faster, more consistent and accurate data economically. One of the key advantages of this vehicle is that it operates at normal road traffic speed, collecting road surface information which can then be examined later to identify areas in most need of repair. In England, TRACS type surveys are now recommended for use on all motorways and trunk roads and, from 2003, principal roads.



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2.1.4. Measures to lessen the impact of the highway on communities - Trunk Roads and people living together.

The Welsh Assembly Government has taken an innovative approach to the problems faced by some of its communities living on, or close to trunk roads. Its guidance paper "***The Rural Town and Village Trunk Road Initiative - Reducing Accidents and Making Life Better"*** sets out objectives for improving the quality of life in these communities.

A speed policy has been developed that takes account of the contribution of reduced speeds to environmental and social objectives as well as to road safety. The speed limit should be set as that which is deemed to be the most appropriate for the community and most hamlets and small villages can expect to be protected by a 40mph speed limit, with some traffic calming measures installed to make this limit realistic.

In towns and villages, safe routes to schools, shops or other amenities are facilitated by ensuring there are footways of appropriate width. It may not always be possible to provide the usual 1.5m – 2.0m width, but anything greater than 1m allows for use by wheelchairs. Consideration is given to reducing carriageway width to gain extra space for footways - the trunk road should share the community, not dominate it!

There is frequently a perception of danger, particularly in the hamlets and smaller villages, which is not evidenced by a history of injury accidents. Nevertheless, the inhabitants are entitled to a reasonable standard of life, and although they may have chosen to live on a trunk road, they may not necessarily have expected the increase in traffic volume or weight. Those fears must be addressed, with the objective of designing measures to alleviate them.

The standard of maintenance through towns and villages will also come under close scrutiny. Loose manhole covers, poor utility reinstatements, noisy surfacing, dirty or faded signs all impact adversely on the community.

An important feature of Town and Village Initiative work is that, to reinforce the message to drivers that they are passing through a speed-limited community, they must see the environment through which they are passing as being appropriate to the speed limit and to believe that the limit is sensible. Signing of limits, gateway signing and community boundary signs along a route must be consistent, so drivers can readily recognise that they are entering a community and relate that to the presence of a speed limit.

There is no doubt that some of the measures suggested will have an impact by increasing journey times. However, set against the disbenefit of delays are the benefits from reductions in the numbers and severity of accidents; from reduced stress levels of those who live in the communities; from reduced air and noise pollution. All of those benefits could generate savings in health costs to counterbalance any additional costs from delays.

Feedback from the first trials, carried out in 2000, indicates that this care is appreciated by those communities and that the initiative provides good value for money.

2.1.5. Technological advances to assist accessibility

New technology is helping UK road authorities to improve access to everyday facilities for those without access to a car – one of the UK Government's key transport objectives.

Information on public transport services is being gathered at local and national level to provide Internet based timetable and route planning services such as Transport Direct.

Buses have a major role to play in achieving better accessibility to jobs and services and road networks are being adapted in the UK to facilitate this mode of public transport. Most UK cities have introduced high quality bus routes incorporating bus lanes, improved bus infrastructure, maps and timetable information in association with higher frequency, better quality services. Many bus operators use GPS to provide accurate information about the location of their vehicles which in turn facilitates the provision of real time passenger information for users at bus stops and elsewhere. SCOOT urban traffic control systems can alter signals in favour of buses if detected either by GPS systems or by transponders. New bus gate technology has been adopted in UK cities allowing limited access for buses only to city centres. Southampton provides a good example of urban bus priority and Gwynedd in the rural environment.

A number of UK cities have introduced, or are actively considering, systems for the automatic guidance of buses (optical or kerb based guidance). Guided buses have the flexibility to run on-road as well as on fixed infrastructure and provide some of the benefits of light rail - but at much lower cost.

As road authorities seek to improve overall accessibility to city centres by reducing car penetration , interchange facilities in the form of Park and Ride sites with high frequency bus services subject to minimal delay are increasing in number. The concept of Park and Share has been developed in Northern Ireland for the same reason.

The UK National Cycle Network now extends to over 10,000 km, much of it on public roads and access to town centres is facilitated by local networks of designated routes with coloured surfaces and advanced stop lines at traffic signals. New technology in the form of special signal controlled crossings (Toucan Crossings) are widely used in the UK to facilitate the interface between cycle networks and the road network – over 200 have been introduced to date.

Park and Share Site

2.2 Improved organisation of construction and maintenance works in order to provide the best service to road users.

2.2.1. Procurement strategies

Capital Schemes

All key personnel should be involved as early as possible in the development of a construction project to allow the proper integration and co-ordination of all design inputs.

Traditional forms of construction procurement, where the detailed design is largely completed before the main contractor becomes involved, limits the opportunities for innovation and achieving value for money. In the UK, therefore, there is a trend to involve the contractor as early as possible in the design process. This allows construction difficulties to be fully addressed in the design and encourages partnership working between the various parties. This has been promoted by a central government initiative arising from the Egan and Latham reports.

The primary consideration in the choice of a procurement strategy is the need to obtain value for money in the whole life cost of the scheme. This can be achieved through procurement options such as:

- Public Private Partnerships;
- design and construct (and where appropriate maintain and operate);
- prime contracting; and
- framework agreements.

The Conditions of Contract to be used along with the Procurement Strategy is also an important consideration. The Engineering and Construction Contract (formerly the New Engineering Contract) produced by the Institution of Civil Engineers is becoming widely used.

Maintenance Works

In the continuing effort to achieve Best Value in procurement for road maintenance, trends in recent years have been to:

- use competitive tendering for the management and maintenance of the English and Scottish trunk networks;
- rationalise contracts by using multi-function contracts (eg Environmental Maintenance Contracts incorporating grass cutting, gully emptying and weed control), contracts covering larger areas, and longer period contracts, say up to five years;
- use revised tendering procedures with tenders based on quality and price; and
- use Partnering as a facilitation process outside the formality of the contract.

2.2.2. PPPs/PFI

The 10-Year Plan for the English trunk road and motorway network allows for up to 25% of the additional capital investment required to come from private finance, and similar arrangements apply in the other jurisdictions. There are benefits in involving private companies in long-term partnered contracts for service delivery; it brings opportunity for innovation, offers guaranteed levels of work and allows operators to plan properly to ensure that best whole life cost decisions are made.

The Highways Agency first used private finance to procure new infrastructure through the Design Build Finance and Operate (DBFO) contracts let in 1995. The original contracts were policy neutral and relied on shadow toll service payments. The Highways Agency has reviewed the payment mechanisms and contractual provision to ensure that the new DBFO contracts incentivise the efficient and effective delivery of good levels of service. Recent DBFO contracts have aligned their payment mechanisms to the service delivery outcomes, eg, maximise roadspace availability, maintain traffic speeds, improve safety, etc.

Major road improvements that have emerged from the route management and multi-modal studies are currently being assessed for their suitability for private finance contracts. The assessment uses a public sector comparator to gauge the potential benefits of the PPP approach over traditional procurement routes. This takes account of the value of the scheme, the size of the associated network, the nature and size of the risks associated with project delivery and other value for money considerations which may not be quantifiable but may be significant such as the impact on the environment or policy objectives.

The Highways Agency aims to speed up the delivery of major projects by offering the opportunity to innovate at an earlier stage in the project delivery. It is developing a private finance version of the Managing Agent Contractor (MAC) maintenance contract to offer flexibility in the delivery of projects through either public or private funding. The private sector is also being involved more widely in the new active traffic management initiative and other areas of network management. Other UK Highway Authorities, encouraged by central government loans and grants, have also been investigating new forms of public private partnership that will help deliver major maintenance and improvement schemes.

2.2.3. Performance Specifications

In recent times there has been an increased use of performance or part performance based specifications in construction contracts, usually communicating the user's requirements to the manufacturer under three main headings:-

- functional;
- performance; and
- technical.

Functional specifications define the function or duty to be performed by the product eg: a document filing system. Performance specifications define the performance required of an item eg: a device capable of moving 50 tonnes of grain an hour. Technical specifications define the technical and physical characteristics of an item in terms of such things as physical dimensions, power input and output, etc.

Performance specifications are usually preferred as they can result in reduced costs, improved access to the new technology and contribute to a positive impact on the industries involved by encouraging other parties (eg, a manufacturer who may be more expert) to offer alternative innovative solutions.

Services such as a consultancy or cleaning contract can easily be defined in performance terms. Although construction specifications tend to deal more with detailed standards and very technical requirements these can often be defined by performance specifications.

A performance specification states requirements in terms of the required results and provides criteria for verifying compliance, but it does not state methods for achieving results. It defines the functional requirements for the product, the environment in which it must operate, and the interchangeability requirements.

It also requires the Client to consider what the market place has to offer by way of possible solutions, and establish suitable criteria on which to judge the acceptability of proposed solutions. This will involve establishing a framework of targets from which individual systems can be compared.

2.2.4. Roadworks by Statutory Utilities

In the UK, utility companies such as electricity, water, gas and telecoms providers have a statutory right to install their pipes, cables or other equipment in public roads. Installation and maintenance of these works can cause severe traffic disruption. The role of highway and road authorities in the management and supervision of street works by utilities has changed enormously during the past 20 years.

In the early 1980s, there were relatively few utility organisations working in the UK and those that did were generally in the public sector. Now almost all utility organisations working in the UK are in the private sector and their numbers have swollen to almost 400. Much of this increase has been in the telecommunications sector, which experienced huge growth during the 1990s.

Following a major review in 1983, the New Roads and Street Works Act (1991) was introduced in England, Scotland and Wales and similar legislation followed in Northern Ireland. The new arrangements emphasised the benefits of cooperation, good coordination and better quality reinstatements. These aims were to be achieved through the enactment of various regulations and codes of practice. The five current codes set standards for reinstatements, co-ordination of works, inspections of the work, signing/guarding of openings and for diverting utility equipment in the course of major road works. A further code is planned to cover the keeping of records of underground plant.

In an attempt to reduce congestion caused by utility works, highway authorities in England can now apply charges for works that take unreasonably long to complete. A few English authorities are also piloting lane rental regimes for utility works. Both arrangements are at an early stage, but their effects are being closely monitored.

Operation of the new street works arrangements requires a large volume of data transfer between utilities and highway and road authorities. Computerised systems have been developed to carry out this data transfer, to keep registers of work and help manage the inspection regime. In Scotland and Northern Ireland, this function is carried out by fully integrated systems that are shared by road and highway authorities and utility organisations.

Increasingly, utility companies are using trenchless technology to reduce the overall costs of their works. These innovative methods can reduce the needs for expensive signing, excavation and reinstatement, while also allowing work to progress during normal working hours within minimal disruption to traffic flow. Other benefits of this technology are the reduced impacts on carriageway structure. However, care is required with these techniques and well trained operatives are essential if costly mistakes are to be avoided.

2.2.5. Routine Maintenance Management/Safety Inspections

Highway and road authorities throughout the UK have a duty to maintain their networks and ensure that they are safe for road users. While long term maintenance is achieved through condition inspections and programmed maintenance, safety responsibilities are met through safety inspections and the completion of any reactive maintenance that is necessary to remove potentially hazardous defects.

The subject of safety inspections was addressed in the 2001 Code of Practice for Maintenance Management referred to in section 2.1.3. Taking account of Best Value principles, the code gave highway authorities freedom to develop their own policies for identifying and repairing safety defects, but it also established some important principles. These included the recommendation that routine safety inspections be carried out at frequencies depending on the levels of use of the roads and footways concerned. The code also made a clear distinction between safety and serviceability defects and suggested that authorities should set timescales for repairing safety defects, taking account of defect severity and location in the network.

Some UK authorities are carrying out trials or already favour "Find and Fix" arrangements. Instead of identifying defects in advance and then organising repairs, a single squad is used to inspect the network and carry out any repairs immediately. These arrangements can potentially improve service to road users while reducing overall maintenance costs – particularly on lightly trafficked rural roads.

2.2.6. Environmental appraisal

Road authorities are fully aware of their responsibility to maintain and protect the environment. All larger capital schemes undergo an extensive environmental impact assessment (EIA) as required by EU legislation. Any mitigation measures triggered by the EIA are designed to minimise as far as possible future maintenance requirements and disruption to road users. For example, modern planting schemes have proved to be very successful, providing screening for residents, a pleasant outlook for drivers and a valuable habitat for wildlife, all with a minimum of maintenance required.

Sustainable drainage, such as the use of swales and settlement ponds, is being used more widely in roads schemes. The main reasons are to reduce pollution and the risk of flooding. However, the provision of sustainable drainage, while not perhaps reducing the overall burden of maintenance, can also help to transfer the physical maintenance away from the road and thus improve levels of service for travellers. As with most innovations, there are problems surrounding sustainable drainage which require careful consideration; for example, the safety of members of the public, especially children, near areas of open water; and the protection of groundwater where soakaways are used.

Current Government policy in this area is intended to encourage environmentally friendly innovation. The landfill tax has encouraged more thought to the disposal of surplus material from construction activities. The recently introduced tax on each tonne of aggregate extracted from quarries is designed to encourage a reduction in the use of new materials and increase recycling.

A good example of reducing waste and minimising the amount of raw materials is the emergence of a new technique for the repair of small potholes called Jet-Patching. This forces a mixture of bitumen and aggregate at pressure into the pothole and produces a long-lasting repair. Only a fraction of the material used in the traditional "cut-out" method is required and there is less waste to be removed to the tip.

'Velocity Patcher'

3.0 Conclusion

Highway authorities in the four countries making up the United Kingdom have made good progress in developing and maintaining their networks to provide the best service to road users and to keep inconvenience to a minimum.

Much has been achieved, but of course much remains to be done. This has been and will be achieved mainly through the skill and professionalism of highway engineers working for road authorities, engineering consultants and road contractors. Their efforts may not always be appreciated by the general public, but there is no doubt that they have made a major contribution to the social and economic well-being of the United Kingdom through the maintenance and development of the public road network.