

Customer requirements

1. Durability and Quality

Durability of materials/fabric

- Durability eg of road surfaces, is particularly important on a motorway in order to keep road repairs to a minimum. Repairs a nuisance for drivers and create congestion, which is a major cause of accidents. Also maintenance on motorways is usually done off peak or overnight and causes noise nuisance for people living nearby.
- Some road surfaces become rutted with use, particularly in the slow lanes as a result of the heavy lorries that use these lanes. The stone mastic asphalt used on the new motorways is harder wearing with less tendency to rut as well as being quieter than older types of surface.
- The hard shoulders in particular should be designed for durability as these often become badly rutted because of lorry use, creating dust and dirt that flies onto the motorway.

2. Operation and maintenance factors

Ease of cleaning

- Cleaning of the motorway and surrounding areas has to be done regularly so should be easy to carry out as litter is dangerous as well as an eyesore. As well as the carriageway itself, hard shoulders should be easy to keep clean, as these are often the only routes for safety vehicles. eg Police cars sometimes get punctures on the way to an accident as a result of debris.

Ease of maintenance

- Maintenance on a motorway has particular safety implications for personnel so ease of maintenance is an important factor. A particular area of concern is the design of drainage channels. These should be designed to reduce blockages. An open channel is felt to be easier to maintain than a pipe that can block up easily. However the newer high tech drains are seen as a great improvement.

Accessibility for cleaning and maintenance

- On older motorways access routes for maintenance staff often had to be added after construction, eg narrow steps to electrical cabinets in the embankments but on new ones these can be designed in from the start, which is safer and more efficient.
- Other maintenance requirements include the provision of sanctuaries on the motorway for maintenance staff and demountable safety barriers to provide easier access to carry out repairs.
- Some areas can be difficult to access for cleaning eg spaces between the motorway fence and the fencing and bunding that is installed to reduce noise in built up areas.

3. Environmental conditions

Aural comfort/Noise

- Noise is always a problem on a motorway for those living close by. This can be reduced by the installation of planting, barriers, noise fencing etc where the road runs through residential areas.
- Some road surfaces are particularly noisy eg concrete and this can be irritating for drivers. The new surfaces such as porous asphalt are felt to be much quieter and much smoother in terms of ride.

Electric lighting

- Full overhead lighting on motorways was preferred by all users. They felt that a well lit motorway was safer and more pleasant to drive upon particularly at night and for those who drive a lot, eg lorry drivers.

Lighting is very important for eyestrain. It affects me at night and in the winter in particular.

- Lights should be designed to minimise light pollution ie to shine downwards not outwards. They should also be chosen for energy efficiency.
- Full lighting makes the work of the breakdown services easier, particularly at night, as they can see the vehicle they are looking for. It also reduces the risk of crashes when dealing with breakdowns on motorways.

Wind

- Some motorways are affected by wind, eg high bridges or areas of high ground. Wind affects high-sided vehicles in particular but car drivers also feel unsafe in windy conditions. In places where high wind speeds often occur signs and warnings are needed.

Water

- Drainage is a key factor on a motorway. If it is inadequate water lies on the surface of the road and causes spray and aquaplaning.
- Floods are a particular hazard on motorways. These occur as a result of inadequate drains and partly the camber of the road although low-lying areas add to the problem.

Visibility

- A good, clear view of the road ahead with no tight curves or inclines is important feature for motorway users, particularly lorry drivers, for safety and ease of driving.
- Spray, particularly from lorries in the rain is a problem for car drivers as it may cause reduced visibility. This can be an effect of the type of road surface as well as the drainage.

4. Business aims (inc. financial factors)

Long term costs

- The Highways Agency expect a 40 year life for roads and 120 years for bridges. Whole life costs should be incorporated into the design at the outset. Cost benefit analyses take into account traffic hold up costs, accident costs, time taken to get from A to B etc. Also as the country as a whole can save money as a result of a new motorway this can be offset against the cost of building.
- From a maintenance point of view it is felt that a new motorway should not need a great deal of capital investment over the first few years, particularly where all the latest materials and methods have been used. Road repairs increase costs as well as congestion.
- Even when a motorway has been completed there are outstanding financial issues eg of compensation, compulsory purchases of land etc. These have to be taken into account at an early stage as they can take time and money to sort out.

Impacts on local economy

- There is often an increase in the value of land in an area when a new motorway is built. Developers are interested in developing land around motorway corridors eg to build industrial estates, multiplex cinemas, retail parks etc as it is so much quicker and easier to travel to them using the motorway.
- A motorway can bring regeneration to areas which were difficult to access in the past and were consequently neglected by businesses. A Local Authority would therefore see a motorway as a great asset to the area.
- Bringing new business into an area can have a knock on effect on existing businesses eg improved opportunities for road haulage, local retail parks.
- Local job opportunities can be increased as, in addition to the new business openings, staff are able to travel further afield to other areas to find work. There may also be an increase of different types of industry, bringing better quality jobs.
- Reduced journey times lead to reduced costs for businesses and have a knock on effect in terms of a significant reduction in travel time throughout an area. A good motorway link nearby reduces staff travel time to and from work. This in turn reduces lateness etc and costs associated with this. For road haulage companies in particular, cutting journey times is very important financially as this cuts costs, time, fuel etc.
- Reduced travel times and hold ups and easy access increase custom for local businesses. Most customers come by car and a nearby motorway attracts local people as well as

If this sort of saving can be made in time it must save industry, business and the country as a whole a lot of money.'

customers from further afield. A motorway is seen as a vital part of the infrastructure underpinning any business.

- Motorways can affect the value of homes nearby and also blight the area if they are a long time in planning. Homes can be subject to a CPO for many years before decisions are made.

Motorway usage

- The amount of usage of a motorway is an important factor. On a new motorway this may be fairly light at first but as people get to know about the new road and understand the best routes to access it, usage usually increases steadily.
- The motorway should change driving patterns eg drivers changing their routes and using the motorway instead of local roads.

Support for flexibility

- An advantage of a motorway designed as a ring road is that it gives the opportunity to maintain traffic flows around the system. If there is an accident that closes one carriageway, traffic can be directed round the other way rather than closing the whole motorway and diverting traffic which causes gridlock on minor roads.

Relief of congestion on local roads

- Motorways should relieve traffic in other areas. Surrounding areas become much less congested and therefore less busy and less dangerous.
- Reduced congestion enables Local Authorities to consider measures on local roads that were not previously viable to improve the quality of life for local people eg more crossings for pedestrians on A-roads, more bus lanes and cycle lanes.
- Reduced amounts of traffic on local roads smoothes out journeys. Drivers can travel at a steady speed resulting in fewer risks being taken.
- However sometimes areas of the network can be adversely affected by the motorway in terms of traffic flow - for example congestion at junctions from the additional traffic entering and leaving the motorway. This can cause problems with traffic backing up the slip road back onto the motorway.

Support for social activities

- A motorway can make a big difference socially as people from a wide area can travel to cultural events or to visit friends etc more easily.

5. Sustainability factors

Environmental impacts

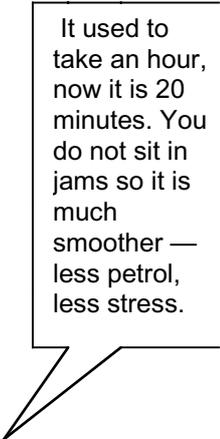
- A lot more time and energy is spent on reducing the environmental impacts of a new motorway as compared with 20 years ago. The Highways Agency is using more recycled materials as long as they are of the same standard and are economic. In fact these often result in a cheaper product.

Waste

- Waste management has become more important from a maintenance point of view. A large amount of litter is gathered from motorways. This used to be picked up and disposed of but now recycling schemes are being introduced.

Impact on local area

- It is felt that a motorway should have as little effect on the environment as possible although some effect on the environment and on natural habitats is inevitable.
- Visual pollution is reduced by earth banks with fences on top, hard and soft landscaping, planting etc. Landscaping shields homes from noise as well as being pleasant to look at. The expectation of what should be done in terms of environmental screening is much higher today and is this is now designed in from the start. In many areas the motorway is so well screened by cuttings etc that it can hardly be seen.
- Flora and fauna around the motorway provides a more pleasant environment to drive on. Users like to see trees and colour in the planting. However animals living nearby can be a hazard for drivers. They can also be knocked down on motorways and have to be cleared. If



It used to take an hour, now it is 20 minutes. You do not sit in jams so it is much smoother — less petrol, less stress.

there is an area where this is a particular problem the area should be fenced, ie to stop horses and cattle wandering onto the road.

Pollution caused by development

- A motorway can vastly improve the local environment by taking traffic off local roads and reducing congestion. This can make a big difference to residents by reducing the amount of lorries, noise, pollution, fumes in their neighbourhood.
- Air pollution from traffic is a concern for those who work on and live around the motorway but it is difficult to reduce. Avoiding queues/holdups on the motorway can reduce pollution.

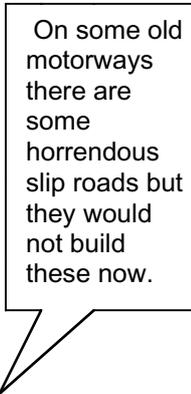
6. Access factors

Wayfinding

- Clear signage is seen as very important as if mistakes are made on a motorway this can lead to wasted time, longer journeys and increased risk of accidents. Some of the signs on motorways are not very clear. For example where there are gantry signs, there is not always enough warning further back on the motorway as to which lane to change into. Signs at junctions should also be very clear with enough advance warning to enable safe lane changing. Where there are independent lanes for exits and entrances, these should be very clearly signed to avoid confusion.
- Clear signs are very important for local businesses to assist clients and customers. These should include signage on the motorway to direct drivers and variable message signs that redirect people to alternative exits if there are hold ups.
- On a ring road there can be confusion about the direction of travel if the signs are not clear or if people do not know the area. It was suggested that the terms Clockwise and anticlockwise should be used for clarity rather than East/West and North/South.
- Some numbered junctions on motorways have either an entrance or an exit but not both, or have an exit when travelling one way but not in the other direction. As this is confusing it should be avoided if possible or should be clearly signed eg at the exit before.
- Variable Message Systems and MIDAS systems provide up to date information to drivers. If too much information is put on them they can be hard to read when driving past but in general they are useful to give advance warnings and enable routes to be changed.

Adequacy of access

- Easy access to and from the motorway is important for users. For local businesses this is vital for their staff and customers. Accessibility can be improved eg for major retail centres or industrial parks if they are served by two motorway exits.
- Slip roads to access the motorway should not be too short or with too tight a bend as drivers cannot get up speed in time to join the motorway. Short exit slip roads are also a problem as these cause traffic to back up onto the motorway particularly in busy areas eg around shopping centres, sports facilities etc.



On some old motorways there are some horrendous slip roads but they would not build these now.

7. Health and safety factors

Adequate provision for local security

- There is sometimes concern that parapets on some motorway bridges are not high enough and that people, eg school pupils could fall over accidentally. In some places where there is particular danger, the height can be increased although the cost of doing this on a regular basis would be excessive.
- Where a motorway crosses built-up areas subways are installed to enable people to cross the road. These can become a magnet for local youths who intimidate users. The installation of riot proof lights and CCTV cameras enable people to feel more secure when using subways.
- Pedestrians particularly children, are a major problem on motorways. One solution is to raise fencing and make it more difficult to climb although it is impossible to keep people off the carriageway altogether.
- There is a concern that a motorway increases crime in the locality as it encourages the travelling criminal and facilitates access to new areas.

Adequate provision for safety for drivers

- Increasing safety for drivers on motorways is a key factor for the police and breakdown services such as the AA. They welcome any features that will help to reduce accidents. These include:
 - Speed chevrons to slow down the traffic in certain danger spots and help drivers keep their distance.
 - Safety barriers should be designed to minimise the risk of injury. Thick wire cables, used in place of traditional barriers in some places are seen as more dangerous as they can cut a car in half if hit at an angle. Barriers in the central reservation also shield drivers eyes from the lights of oncoming traffic and reduce rubber necking at accident sites.
 - Breakdowns on motorways are usually more serious than those on A-roads so when a vehicle breaks down it is likely to be on the hard shoulder for some time. There are many fatal accidents on the hard shoulder when cars and patrols are hit by passing vehicles so these should be made as safe as possible. In some areas on motorways there is no hard shoulder or it is very narrow which is dangerous both for motorists and for the breakdown services.
 - Motorists are advised in case of a breakdown to get out of the car and wait at the side of the road. On the hard shoulder there should therefore be a place of safety for drivers to wait away from the road.
 - It is felt that for some psychological reason, bridges seem to attract accidents on motorways with drivers crashing into them on bends etc. Markings eg chevrons could be put on bridges to guide drivers away.
 - A particular danger for drivers comes from missiles thrown from bridges onto the motorway. There are different designs for bridge parapets and other features to address this problem eg height of rails, signs, cages, better lighting but many of these increase the weight and cost of bridges.
 - Cats eyes are vital for night driving but these can be dangerous if they become loose as they have metal spikes. New types are now being introduced which are long lasting and much safer as well as easier to install.

Other safety impacts mentioned by users include:

- Clear white lines/road markings that are not obstructed when it is raining and at night.
- Narrow lanes in some areas are felt to be dangerous, particularly for lorries. Although there are signs to warn of narrow lanes, users feel it is nerve racking to drive on these sections because of the speed of the cars and lorries.
- If the entrances and exits are very close at road junctions this is seen as a cause of accidents due to traffic changing lanes.
- Some new/nervous drivers prefer to remain in the near side lane but have problems where the motorway is designed so that this becomes the exit lane at the next junction. This entails a lot of lane changes which they find stressful.

'Lanes always used to be 10ft wide, now they seem to be less. It cannot be so safe especially for HGVs'

Adequate provision for health effects

- In addition to safety, there are general health effects of driving on motorways. These include tiredness during long journeys and stress, particularly for those who drive for a living, eg lorry drivers. These can be alleviated by a reduction in congestion and traffic jams on the motorway as well as the provision of adequate facilities for breaks.

8. Amenities (features that are 'nice to have' but do not directly impact on business)

Adequacy of rest/catering facilities

- Adequate service stations are needed for rest, fuel etc. Services are thought to be expensive and poor quality and it was felt that they are too infrequent on British motorways, particularly if drivers are making a long journey using a number of motorways. Services are essential for HGV drivers for breaks and overnight stops as motorway driving is tedious and the law imposes regular breaks.
- Where there are no services on the motorway but facilities nearby it was suggested that there could be signs on the motorway or a symbol on the junction sign to indicate the nearest petrol/shops/restaurant etc off the motorway eg a mile before the junction, as in the USA.

Although by law there is no advertising allowed on motorways this is information that would be very useful as there is no way of knowing where these are. Often users drive out of their way for long distances looking for toilet facilities or petrol.

9. Image

Appearance

- For the Highways Agency the image, ie that the motorway should look good and feel good to drive on, is what is important to the public, as this is what people can see.
- Landscaping relieves the monotony of driving and improves the appearance of the area. However too many trees/bushes could be a safety hazard due to increased leaves on the road, animals etc.
- Quite often a motorway runs through some areas with attractive scenery — countryside etc. However there is felt to be a tendency to position industrial units that look ugly along the motorway because of ease of access, spoiling the view along the motorway area.
- Retaining walls and fencing should be designed to give a good appearance, ie stones in mesh baskets, rather than a bland concrete finish.

Tidiness

- Keeping the verges and litter on the motorway in good order is felt to be very important. Local businesses especially retail centres feel that the image and look of a nearby motorway affects their image.

PR aspects

- A high profile and visible motorway scheme can receive a good press and help people to see the advantages for the local areas.
- A motorway can also raise the profile of local towns and other areas by making them more visible and putting them on the map.

10. Features that provide support for carrying out function/job effectively

Adequacy of technical facilities

- Emergency phones should be well maintained and numbered correctly for ease of pin pointing breakdowns.
- Phone boxes should be designed so that the caller can hear and be heard. For safety reasons the caller should face the traffic and the phonebox should be positioned as far back as possible. Some phone boxes are difficult to access for the elderly, disabled etc as they are behind the crash barrier or across the drainage channel. Where the barriers are split at the emergency phones, access is easier and safer as the barrier protects the phone user from traffic.
- The system of marker posts to the phones is not always very clear. Most motorists do not know that they point to the nearest phone.

Support for information sharing

- Modern technology for relaying information eg MIDAS (electronic traffic warning systems) and variable message signs on the motorway are very helpful. These could be provided by access roads/roundabouts etc to warn people of jams in time to change their minds about getting onto the motorway at the junction.
- Traffic master systems are seen as a useful facility on motorways. These are paying systems using mobile phones to plot position/routes and give alternative routes if there are jams.

Support for ensuring an efficient flow of traffic

- Sometimes the very success of a motorway can reduce traffic flow. Increased usage and major developments that are built around the motorway bring more traffic to the area and increase congestion.
- In some places the junctions themselves cause congestion eg when motorways converge, particularly at rush hours and this should be considered in the design.
- Motorways should, if possible, be designed to the right size to handle future traffic volume, eg four lanes if necessary, as it is much more expensive to alter this after construction. In some areas there are only two lanes and this causes traffic build up and tailbacks. Where a

Consider what lies beneath, the quality, as this is not visible, although this is what a motorway should really be judged on.'

motorway becomes two lanes the effect is like a lane closure and leads to stationary or slow moving traffic, which is a big cause of accidents.

Supporting efficiency for the travelling public

- A motorway makes things much easier for the travelling public in general as it reduces journey times.
- It is seen to be much simpler to get to unfamiliar places without the risk of getting lost using a motorway than using side roads.

Factors affecting ease of driving

- One problem for HGV drivers is moving high loads. The safe height for motorway bridges is about 4.9 m but they feel that this should be higher, 6 m, as high loads have to be diverted onto other routes. Also the height is reduced over the years as the road is resurfaced.
- The road surface is an important factor affecting ease of driving.
- The motorway should be uncomplicated and should be designed so that a child could understand it. Most drivers do not plan their journeys very well and are ill prepared as to where they are getting off etc. Therefore although good clear signage and information is vital, the design should take the psychology of the user and the way people behave when driving into account.
- The way the road is constructed is also important for ease of driving, eg there should not be too many sharp bends, particularly on the slip roads.

Factors affecting the efficiency of the work of the police/breakdown services

- Cameras on the motorways are very useful for the police and breakdown services to view the sections and monitor traffic flows. If a motorway is fully covered by cameras this helps to pinpoint the location of breakdowns. Cameras at roadworks are also useful to stop people speeding.
- Police refuges provide visibility so their patrols can be seen from far off. The locations of these are agreed between the Police and Local Authorities. However these can cause traffic jams as drivers slow down when they see a police car.

Communication and consultation

When considering the construction of a new motorway it is useful to involve end users at appropriate times to allow any input they may make to be taken into account. In the case of a motorway the end users include:

- Highways agency personnel
- Maintenance/operational staff
- Local Authority
- Local businesses
- Police and break down services
- Businesses situated close to the motorway
- Other users eg drivers
- Local residents

Much of this consultation will take place via the planning process and statutory procedures. If there is on- going dialogue throughout the project between the various end user groups and the project team, where there are differing priorities, these can be discussed and acceptable compromises reached. In the case of the M60 there were regular monthly meetings throughout the project between the Highways Agency, the Police and the Local Authority representatives so that any issues could be dealt with easily. Businesses near the motorway were consulted and surveys of traffic flows and travel patterns were carried out before and after the opening of the motorway. Feedback is also obtained from the operation and maintenance teams who report any issues to the Highways Agency who use the information to modify their design standards.