

# ASECAP

SAFETY,  
THE FIRST PRIORITY  
OF THE EUROPEAN  
TOLL MOTORWAYS



European Road Safety Charter



Association Européenne des Concessionnaires  
d'Autoroutes et d'Ouvrages à Péage

# SAFETY IN DESIGN, REALISATION...

## 1. Main features



A motorway is an infrastructure specially designed and built for motor traffic and for consistent vehicle classes, according to the highest quality and technological standards, in order to guarantee to all the users the best safety conditions, high levels of service and driving comfort. Actually, motorways are provided with dual carriageways for the two directions of traffic flows, completely separated by a central reserve and with

no possibility of interferences between them, and lay-bys or appropriate parking zones for emergency stop. Moreover, it is characterised by other leading features such as the lack of intersections at level with any road, railway or footpath and the presence of grade-separated interchanges to obtain full control of access and to prevent any disturbance to traffic.

## 2. Design characteristics

Motorway design takes into account a large number of features such as travel time, user comfort and convenience, environmental impact, etc, and above all, safety. The most up-to-date safety requirements are included since the planning and the design stages: motorways are indeed characterised by a road section which has to ensure a capacity suitable for the high levels of service required. First of all, the road alignment is primarily studied to maintain along the whole length of the motorway specific sight distances, i.e. sufficient visibility in order to give drivers the necessary time to carry out any manoeuvre in safety. Every section of the motorway respect prescribed

geometrical standards (i.e., minimum radius, vertical curve...) and proper balance between horizontal and vertical alignment in order to guarantee a right perception of road characteristics and to prevent optical misguidance. All the above features are strictly related to the design speed (and in particular maximum design speed), as the main design input, being also functional to proper enjoyment of the road and to the achievement of high levels of service. To merge into traffic flow in safety or to permit the vehicle to leave the motorway, there are acceleration and deceleration lanes specially designed, which separate traffic flows with different operating speeds.



## 3. Pavements



The quality and the maintenance of the pavement are strictly involved in enhancing safety conditions and in reducing accidents. Since the design level, a particular attention is to be paid to the factors that can affect performance of pavements (traffic, climatic conditions, materials, etc.). One of the most important elements in its realisation concerns the tire-pavement friction,

which is related to pavement roughness and evenness. The motorway pavements must have high safety levels, especially with respect to slipperiness and aquaplaning. In particular, to prevent this phenomenon and to improve visibility on rainy days, drainage pavements are often used, guaranteeing, in that way, adequate grip and high performances also in bad weather conditions.

## 4. Road Equipment

Safety is embedded in road equipment too. There are indeed other relevant design and realisation aspects that are very important and useful to reduce or prevent collisions, or to protect from roadside hazards. In particular, there are safety barriers installed, wherever necessary, along the whole length of the motorway both at the edges of the carriageways to prevent out-of-control vehicles from leaving the motorway, and on central reserve to avoid crossing into the opposite

carriageway. These barriers - of different types and dimension according to location, traffic volume and traffic flow composition - should represent an insurmountable barrier, but, at the same time, be deformable to absorb impacts. In addition to that, there are lighting systems in correspondence of interchanges, fences, wind protections, antiglare devices on central reserve and high quality road signs adhering to regulations, always maintained in excellent conditions.



## 5. Tunnels



A particular and careful attention is to be paid to the design of tunnels and the respect of high safety standards. These standards are guaranteed both by structural features (e.g. dual-bore tunnel), and by management and emergency systems. Actually, tunnels are equipped with a large number of devices to control and regulate traffic, to communicate with users

and to manage emergency. The most up-to-date technological equipment is used such as traffic management system, lighting, ventilation, emergency telephones, emergency exits, fire detectors, fire extinction equipment, hydrants, monitoring cameras, energy supply, etc., and especially devoted personnel ensure a continuous monitoring as well as prompt reaction.

## 1. Traffic Management



Traffic management involves all the software and hardware systems (operators, technological devices, policies, procedures, etc.) used for ensuring the safest and most efficient traffic conditions. Directing traffic flow using technology applications, collecting and analysing data represent some of the elements used to manage a motorway in a more effective way. The

core of traffic management is represented by Traffic Control Centres operating 24 hours a day, collecting different information about traffic, road and weather conditions, connecting and co-ordinating all the resources and the operators (Road and Police Patrol Cars, assistance centres, etc.) involved in road and traffic management, supplying also traffic information.

## 2. Integrated Management

One of the most powerful operating tools refers to specific Traffic Management Plans: these plans contribute to manage properly the motorway and to face any situation, both in a preventive way and in case of specific emergency events (related to bad weather conditions, dangerous goods treatment, casualties with vehicle removals, etc.), guaranteeing the quickest resolution and the management in safety

conditions. This process permits the competent bodies to timely take measures to ensure traffic safety and adequate service levels, involving many different elements such as road operators and other specialised operators (fire brigades, police, medical assistance and other authorities) who work together, handling any situation in fast and effective way, following accurate and advanced procedures.



## 3. Information Systems



Road information is provided in real time in order to inform drivers about many aspects, so that they can make their choice according to those aspects, by means of the most various and up-to-date technological devices, such as radio and TV broadcast, call-centre, cellular phones, internet,

Variable Message Signs and information boards. In particular, the information is delivered on traffic conditions (i.e. days and hours of heaviest traffic and congestion), weather and motorway conditions, road works, presence of accidents, closures and possible alternative routes.

## 4. Intelligent Transportation Systems

They refer to the utilisation and the development of technologically advanced systems aimed at alleviating traffic jams and reducing accidents, in order to provide a safer driving. These systems include a broad range of wireless and wire line

communications-based information and electronics technologies, such as monitoring cameras, vehicle detectors, weather monitoring devices and SOS posts. ITS can be a reliable and effective tool to improve safety and mobility conditions.



## 5. Regular and Planned Maintenance



Regular and planned maintenance is indispensable for traffic safety and it plays a fundamental role in motorway operations and management, since it aims at preserving and maintaining structures and every motorway element in high-performance condition. Suitable services and procedures are continuously applied to prevent and evaluate

the progressive degradation of quality of elements such as pavement, road signs and facilities, in order to ensure to users the best possible level of service. One of the most important activities is related to winter maintenance, with regular use of special vehicles to remove snow from carriageways and to spread anti-icing products on the road surface to prevent freezing.

## 6. Work Zones

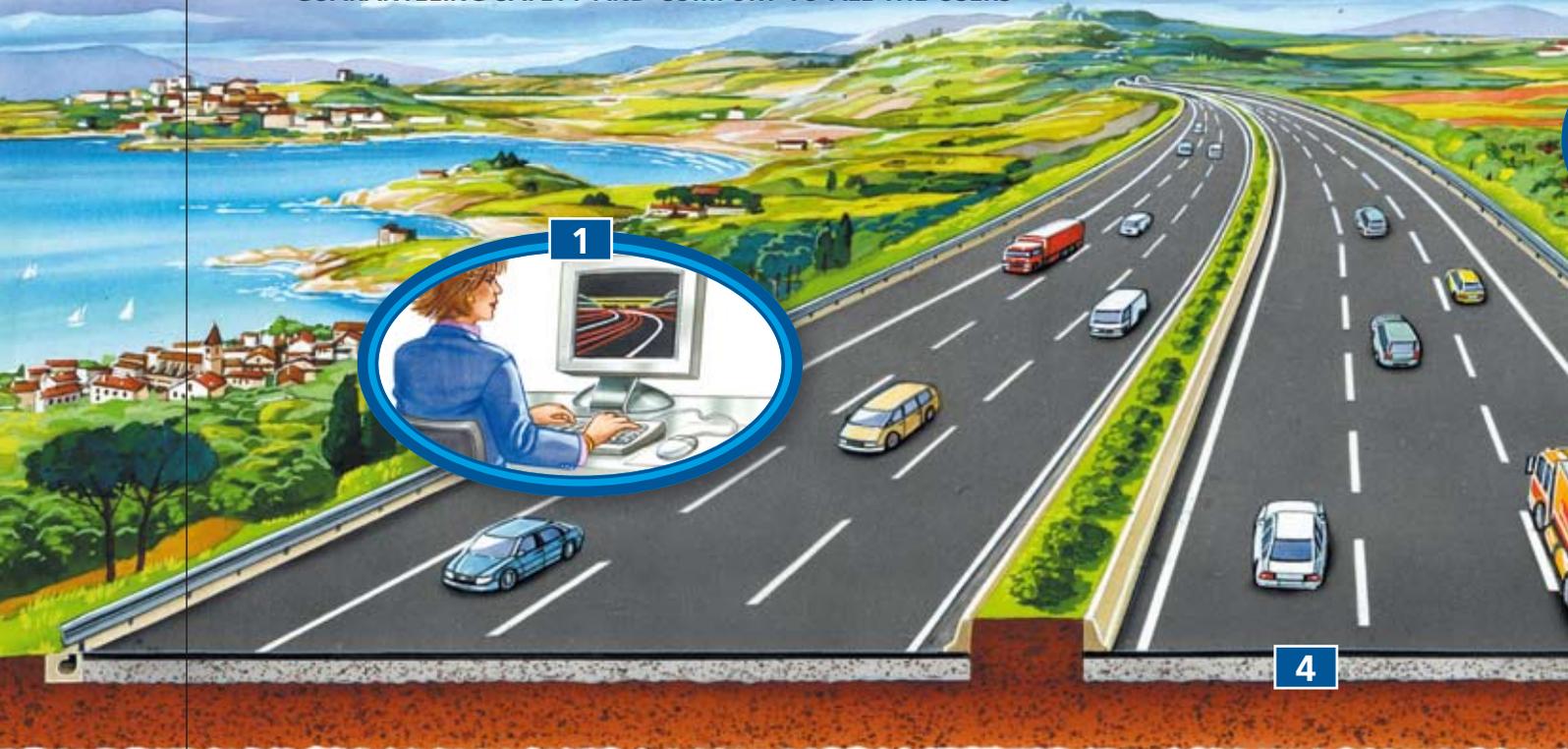
Although necessary to ensure maintenance and upgrade, work zones can perturb traffic and driving conditions. Thus, their management is intended to enhance the safety and operational efficiency of work zones for all road users and roadway workers, by means of special protection devices and specific horizontal and vertical signals,

traffic management or work interruption in peak hours. Moreover, ITS is used to supply specific information on media (radio, TV, internet...) to drivers and to manage in a dynamic way carriageways and lanes, e.g. changing lane configurations within work zones and adapting them to traffic and road conditions.



## ➤ Motorways main features and design characteristics

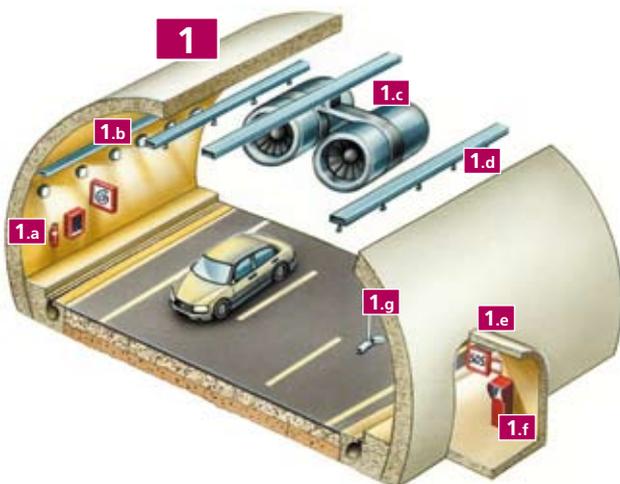
**GEOMETRIC DESIGN, OPTIMAL ALIGNMENT AND VISUAL GUIDANCE, STATE-OF-THE-ART EQUIPMENT ARE FUNDAMENTAL ELEMENTS THAT CHARACTERISE MOTORWAYS, GUARANTEEING SAFETY AND COMFORT TO ALL THE USERS**



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| <p><b>1 Road design</b></p> <p>A properly designed motorway takes into the greatest consideration safety issues. The development of the project requires particular care and attention and it fulfils the highest quality standards and the most up-to-date regulations.</p> | <p><b>2 Sight Distances</b></p> <p>Safe sight distance is the distance needed by drivers to verify road and traffic conditions, in order to carry out correct manoeuvres and to avoid conflicts with other vehicles. It's the result of the best co-ordination between horizontal and vertical geometry.</p> | <p><b>3 Road section</b></p> <p>To ensure safety, high level of services and comfort, motorways feature lanes of adequate width, emergency lanes and adequate central reserve to completely separate the opposite traffic flows.</p> | <p><b>4 Pavement</b></p> <p>Pavement is carefully designed in order to deliver high performance and to optimise durability and wearing resistance.</p> |
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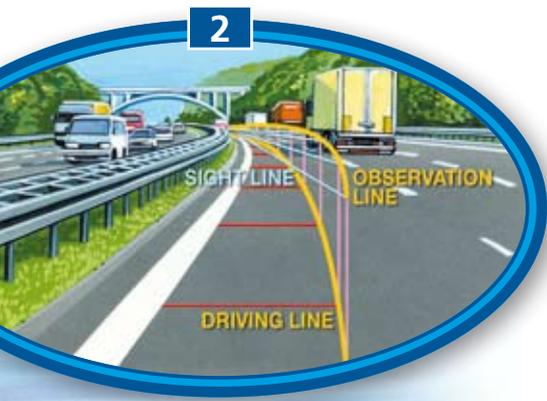
## ➤ Tunnels and bridges

**SPECIFIC SOLUTIONS ARE ADOPTED IN SPECIAL STRUCTURES SUCH AS TUNNELS AND BRIDGES.**

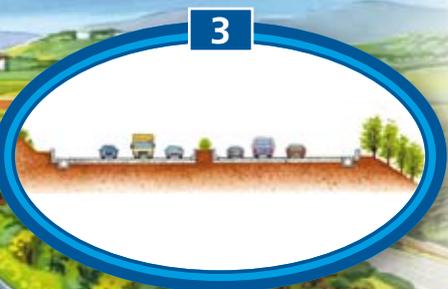


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| <p><b>1.a</b> Alarm Devices<br/>Fire hydrants</p> <p><b>1.b</b> Lighting Systems</p> <p><b>1.c</b> Jet Fans<br/>Ventilation Devices</p> <p><b>1.d</b> Fire detectors</p> | <p><b>1.e</b> Emergency Exits</p> <p><b>1.f</b> Emergency Telephones</p> <p><b>1.g</b> Monitoring Cameras</p> |
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## ➤ Separation of traffic flows

**MOTORWAYS ARE DESIGNED TO ENSURE NO INTERFERENCES BETWEEN CONFLICTING TRAFFIC FLOWS.**

### 1 Grade-separated levels

The intersections between motorways and any other type of roads are grade-separated in order to divide different traffic flows.

### 2 Acceleration and deceleration lanes

All intersections are provided with proper lanes for on/off merging in the safest conditions.



## ➤ Pavements

**DIFFERENT PAVEMENTS ARE USED ON THE BASIS OF VARIOUS CONDITIONS (TRAFFIC LOADING AND VOLUMES, WEATHER CONDITIONS, QUALITIES OF MATERIALS, ETC.). ACTUALLY, NO MOTORWAY PAVEMENT CAN BE CONSIDERED "CONVENTIONAL" SINCE THE VARIOUS LAYERS AND THE WEARING COURSE ARE ALWAYS ADAPTED TO THE LOCAL CONDITIONS. NEW MATERIALS AND MIX ARE USUALLY TESTED TO IMPROVE SAFETY.**



### 1 Drainage pavement

The presence of proper voids prevents water layers accumulation and spraying in rainy days, improving visibility and reducing slipperiness.

## ➤ Safety equipment

**ALONG THE WHOLE LENGTH OF MOTORWAY, CRITICAL SECTIONS ARE PROTECTED BY SAFETY BARRIERS, PLACED IN ORDER TO ABSORB POSSIBLE IMPACTS AND TO PREVENT VEHICLES FROM LEAVING THE CARRIAGEWAY.**



### 1 Concrete and steel barriers

Concrete and steel barriers are very useful safety restraint to avoid vehicle to leave the carriageway and to prevent serious motorway accidents such as the crossover.



### 2 Special bridge barriers

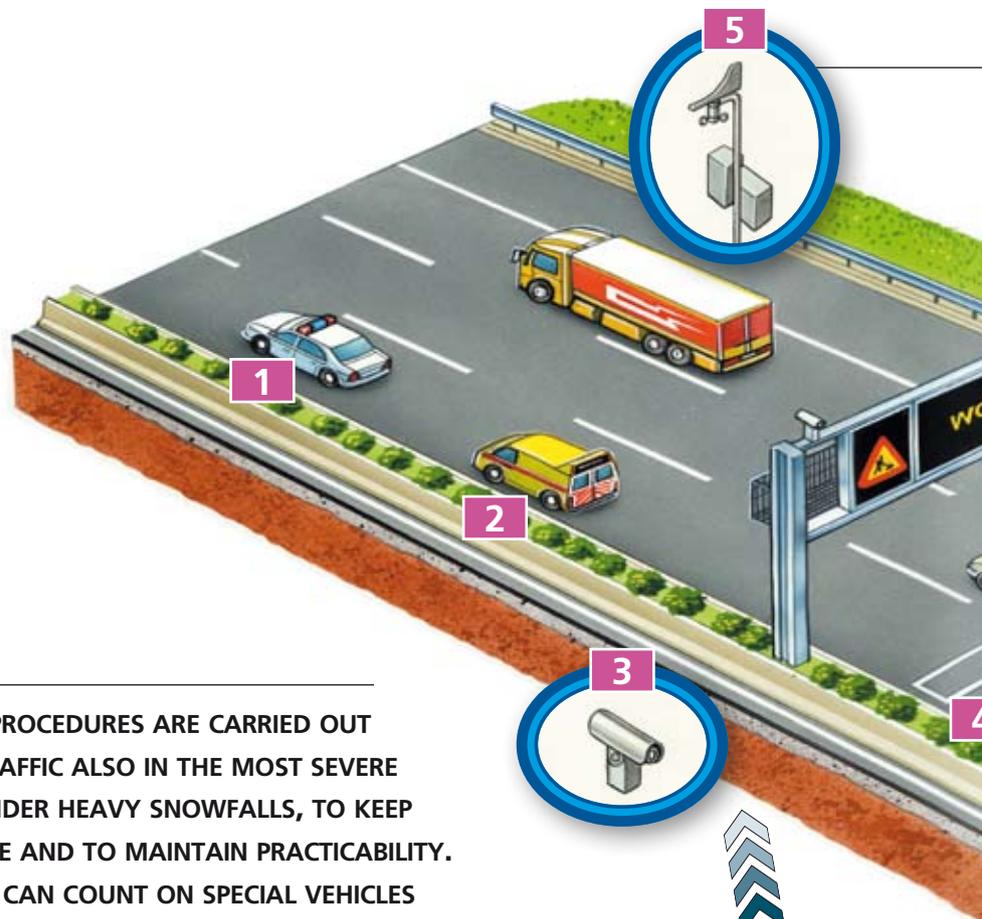
All along the bridge length, special barriers of adequate height are usually adopted as a restraint for people and vehicles.

### 2 Energy absorption system

Specific devices are usually adopted and placed before fixed object to absorb and dissipate collision energy, reducing in that way the severity of the collisions.

### 3 Control of access

Motorway is designed for being used exclusively by consistent vehicle classes. Pedestrians, bicycles, mopeds, etc. shall not be allowed to enter motorway, in order to ensure traffic safety.



### Winter maintenance

SPECIAL ACTIVITIES AND PROCEDURES ARE CARRIED OUT IN ORDER TO MANAGE TRAFFIC ALSO IN THE MOST SEVERE CONDITIONS, SUCH AS UNDER HEAVY SNOWFALLS, TO KEEP CLEAN THE ROAD SURFACE AND TO MAINTAIN PRACTICABILITY. MOTORWAY OPERATORS CAN COUNT ON SPECIAL VEHICLES (LIKE GRITTERS AND SNOWPLOWGS), READY FOR ACTION 24 HOURS A DAY, TO GUARANTEE ADEQUATE GRIP AND THE SAFEST TRAFFIC CONDITIONS.



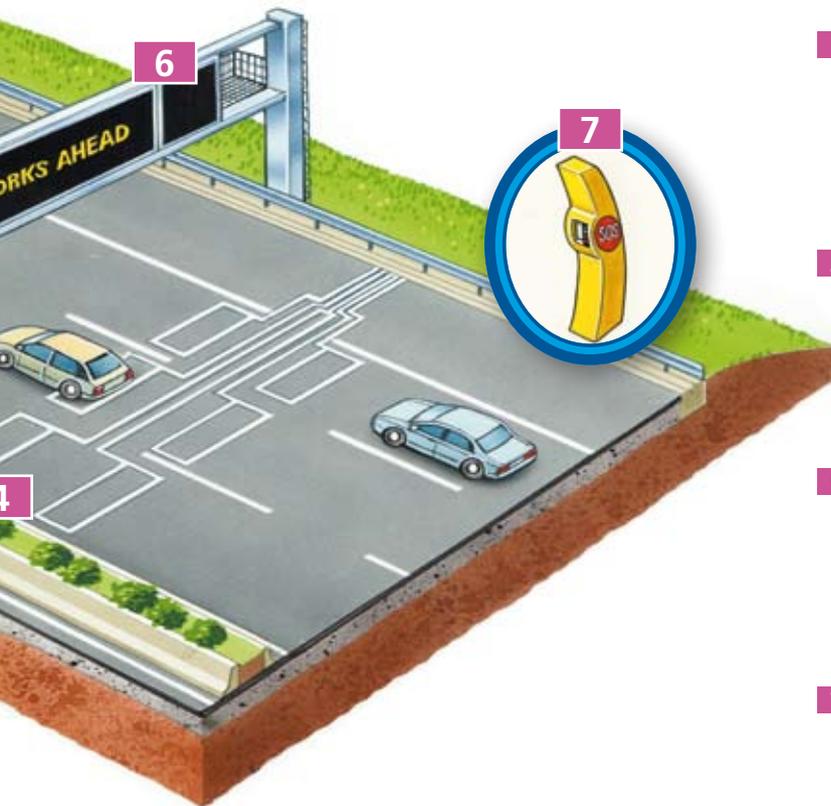
### Hazardous Materials Management

A GREAT QUANTITY OF HAZARDOUS MATERIALS, EVEN THOUGH NECESSARY FOR THE DAY-TO-DAY LIFE OF EUROPEAN CITIZENS (SUCH AS FUELS), ARE TRANSPORTED ALONG MOTORWAYS AND COULD BE INVOLVED IN ACCIDENTS.

TO MANAGE THIS KIND OF MATERIALS, MOTORWAY OPERATORS FOLLOW DIFFERENT STRATEGIES AND TECHNOLOGIES WHICH ENABLE TO DETECT VEHICLES, TO GIVE THE ALARM AND TO PROPERLY INTERVENE IN CASE OF ACCIDENTS.



**MOTORWAY MANAGEMENT INVOLVES HIGHLY SPECIALIZED HUMAN RESOURCES, PROCEDURES AND TECHNOLOGICAL SYSTEMS TO IMPROVE THE SAFETY AND EFFICIENCY OF THE INFRASTRUCTURE.**



## 1 Road patrols

Motorway specialized operators monitor traffic road and weather conditions, in order to guarantee optimal levels of service.

## 2 Assistance vehicles

Special patrols control the observance of traffic regulations and provide assistance to road users.

## 3 Monitoring cameras

Video cameras provide visual surveillance of the motorway and of traffic conditions and performance.

## 4 Traffic detectors

Detectors on the roadside and on the carriageway are used to monitor continuously different elements (traffic flow, speed, vehicle size, etc.).

## 5 Weather monitoring devices

These technological systems allow to monitor air and pavement temperature and all the climatic information, playing a fundamental role in motorway management.

## 6 Variable Message Signs

These signs provide real-time information to users as regards travel time, traffic and weather conditions, accidents, closures, etc.

## 7 SOS Posts

Emergency telephones are placed at regular and short intervals to allow drivers to contact operation centre or assistance for every emergency situation.



## Regular and planned maintenance ◀

**DAILY AND CONSTANT MAINTENANCE IS A PRIORITY TO ENSURE SAFETY AND THE HIGHEST LEVEL OF SERVICE AND ROAD PERFORMANCE.**

### 1 Maintenance

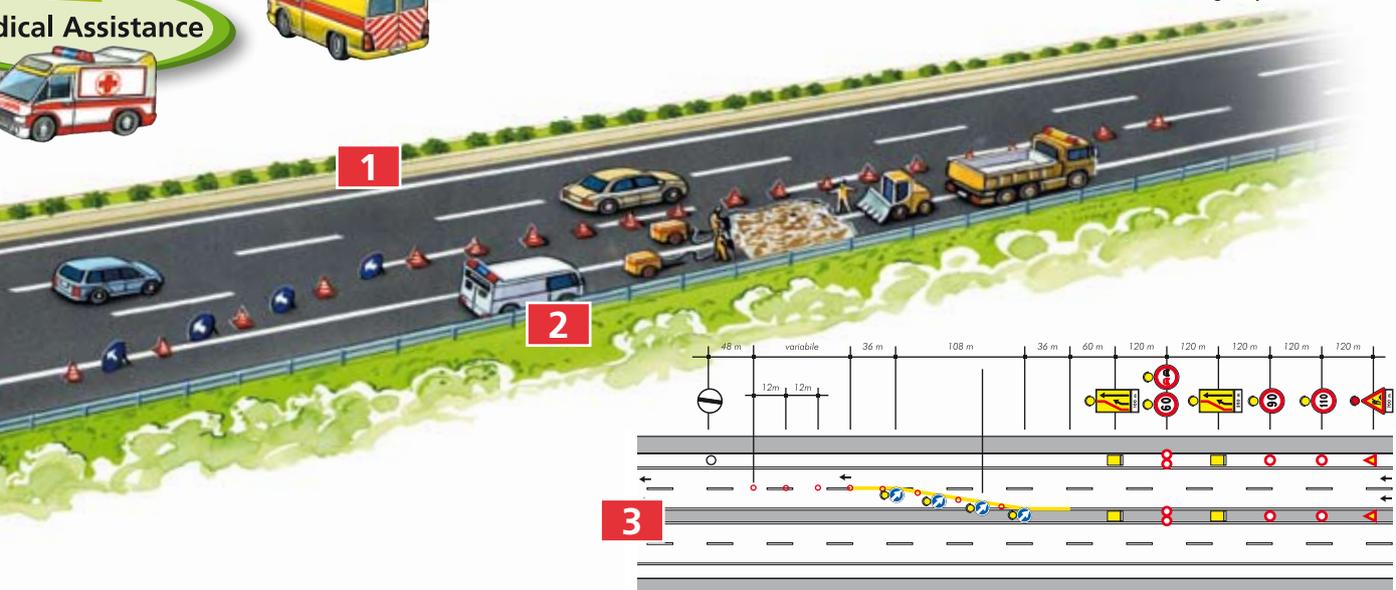
Each element of the motorway (bridges, fences, safety barriers, pavement, etc.) is maintained in order to be preserved in the best conditions.

### 2 Work zones settings

Work zones are organized so to ensure safe traffic flow, minimize disturbance and guarantee working personnel safety under any condition.

### 3 Temporary signs

They notify lane closure, traffic deviation and working area to the drivers, allowing a proper and safe distribution of the vehicles on the carriageway.



## **ASECAP Mission**

**ASECAP** is the European professional Association of Operators of Tolloed Road Infrastructures. It gathers and represents 148 organisations that manage a toll network of over 41,000 km in 21 countries.

**ASECAP's** mission is to promote toll as the most efficient tool to finance the construction, operation and maintenance of motorways and other major road infrastructures.

**ASECAP** and its members are committed to:

*exchanging information and experience, participating in research programmes and further developing and enhancing the direct "user payer" toll system as an instrument of a sustainable, safe and environmentally friendly transport policy;*

*strengthening the efficiency of their networks and permanently improving the level of service provided to the European citizens, by keeping up with the latest technology developments and the best operational practises.*

## **ASECAP for Safety**

SAFETY IS THE MAIN PRIORITY FOR OPERATORS OF THE EUROPEAN TOLL INFRASTRUCTURES. THEY ARE COMMITTED TO ASSIST IN ACHIEVING THE GOALS FIXED BY THE EUROPEAN UNION AND TO THIS END, MAKE IMPORTANT EFFORTS ON INVESTMENTS AND DAY-BY-DAY MOTORWAY MANAGEMENT. SINCE THE PLANNING AND THE DESIGN LEVEL, SPECIFIC SAFETY CRITERIA ARE TAKEN INTO ACCOUNT, RESPECTING THE MOST UP-TO-DATE REQUIREMENTS, IN ORDER TO ENSURE HIGH QUALITY STANDARDS AND EXCELLENT LEVELS OF SERVICE OF THE INFRASTRUCTURES.

MOREOVER, **ASECAP'S** MEMBERS APPLY SUITABLE MAINTENANCE SERVICES AND PROCEDURES TO PRESERVE AND MAINTAIN EVERY MOTORWAY ELEMENT IN HIGH-PERFORMANCE CONDITION. TO MONITOR AND MANAGE MOTORWAYS AND TRAFFIC FLOWS, STATE-OF-THE-ART TECHNOLOGIES ARE IMPLEMENTED, IMPROVING ROAD SAFETY AND EFFICIENCY.

ALL THESE ELEMENTS MAKE TOLL MOTORWAYS SAFER THAN ANY OTHER TYPE OF ROAD, THANKS ALSO TO THE CONSTANT ENGAGEMENT OF ALL THE OPERATORS. BUT THE ENGAGEMENT OF **ASECAP'S** MEMBERS GOES OVER AND IT REGARDS CONTINUOUS AND CONSIDERABLE FUNDING FOR ROAD SAFETY RESEARCH AND FOR THE PROJECTS OF NEW AND MORE EFFICIENT SYSTEMS TO PRESERVE CITIZENS' LIFE.

THIS LEAFLET SHOWS THROUGH IMAGES AND SHORT EXAMPLES ALL THE MAIN FEATURES CONCERNING SAFETY, DISTINGUISHING IN ITS LAYOUT - LOGICALLY AND GRAPHICALLY - TWO DIFFERENT SAFETY COMPONENTS: THE "STATIC" ONE (INCLUDING DESIGN AND REALISATION FEATURES) AND THE "DYNAMIC" ONE (REGARDING MANAGEMENT AND OPERATIONAL FEATURES).

TO BE CONTINUED ON [WWW.ASECAP.COM...](http://WWW.ASECAP.COM...)



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