

## EUROPEAN COMMITTEE FOR NORMALIZATION STANDARDS FOR ROAD RESTRAINT SYSTEMS

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### OVERVIEW OF EUROPEAN STANDARDIZATION FOR ROAD RESTRAINT SYSTEMS

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The European Committee for Normalization (CEN) decided in 1990 to initiate a standardization program in the field of road equipment. For this purpose, a technical committee was created — TC 226. On the occasion of its first meeting in April 1990, TC 226 entrusted Working Group 1 (WG1) with the standardization of safety barriers, crash cushions, and, in a general way, of road restraint systems.

#### European Objectives

##### *Road Safety and the Internal Market in 1993*

Accidental exits from the carriageway is one of the major factors of road accidents: 25 to 40 percent of all accidents, according to the type of road. The solution to this safety problem consists in removing dangerous obstacles when possible and in implementing road vehicle restraint systems between the carriageway and the obstacle, or of the change of level.

Because of the complex aspects of road accidents, most of the European national road administrations have long since carried out their own safety studies. This has led authorities to require safety devices well designed for their specific road conditions. As a consequence, the devices and their manufacture differ from one country to another. Different prohibitions are therefore provided in the diverse European national regulations. Figure 1 displays the variety of test conditions for safety barriers and crash cushions in various countries.

In the opinion of the European Economic Community (EEC), such nonuniform regulations provide technical hindrances to trade that should now be removed in order to achieve the European internal market. For this purpose, the CEN could be mandated to harmonize the technical specifications that shall eventually become compulsory national regulations.

Concerning the roadways system market, the framework for all this action is established in a European directive, the so-called Construction Products Directive, adopted in 1988. The directive states that the

harmonization of the European regulations should maintain in the different member states of EEC the present level of such restriction of the safety essential requirement for roadway users.

#### *The Role of CEN*

Technical specifications ensuring compatibility between products, appropriate levels for their safety, quality of efficiency, and the test methods needed to establish conformity to these specifications have so far been set by national standards bodies, sometimes very differently from one country to another, sometimes in an equivalent manner thanks to international cooperation, notably within the framework of the International Organization for Standardization (ISO).

However, a major part of these national documents is gradually being replaced by a single set of several thousand European standards forming a coherent technical background for the internal market, to the benefit of all involved in the European economic area.

CEN is the European organization responsible for the planning, drafting, and adoption of these standards (with the exception of those pertaining to the two sectors of electrotechnology and telecommunications, which are entrusted respectively to CENELEC, the European Committee for Electrotechnical Standardization, and ETSI, the European Telecommunications Standards Institute) through procedures that guarantee respect for the following principles:

- Openness and transparency: All interested concerns take part in the work program.
- Consensus: European standards are developed on the basis of voluntary agreement between the interested parties.
- National commitment: Formal adoption of European standards is decided by a majority vote of CEN national members, which is binding on all of them.
- Technical coherence at the European and national level: Standards form a collection, which ensures its own continuity for the benefit of users, both at the European and national level through compulsory national implementation of European standards and withdrawal of conflicting national standards.

The CEN has the advantage of grouping together not only the 12 states of the EEC but also the 6 states of the EFTA — European Free Trade Association:

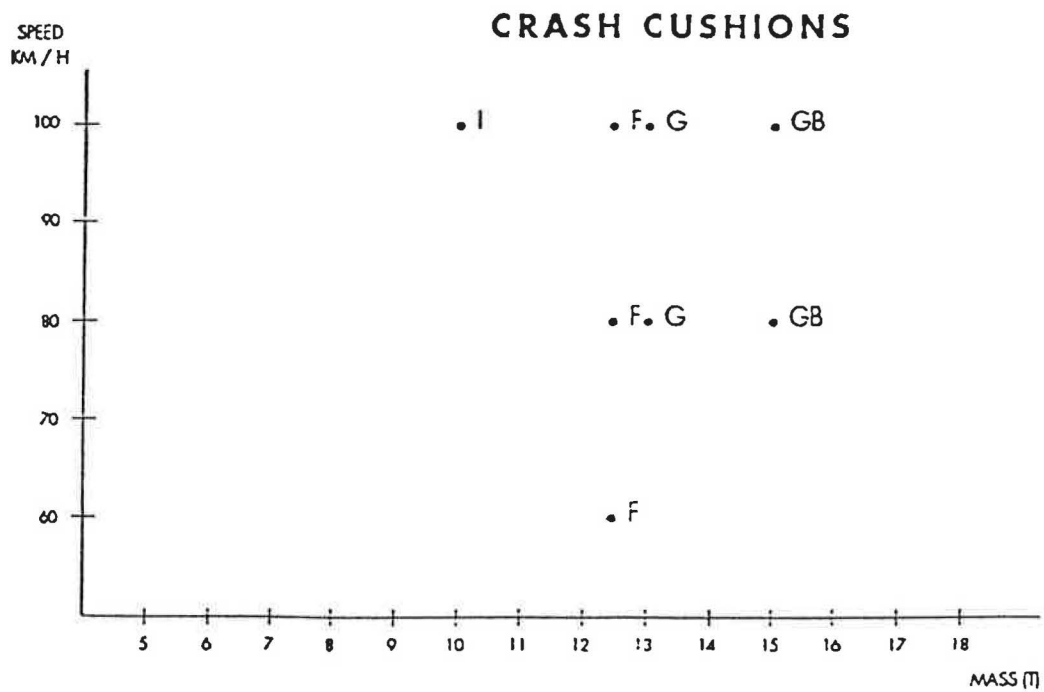
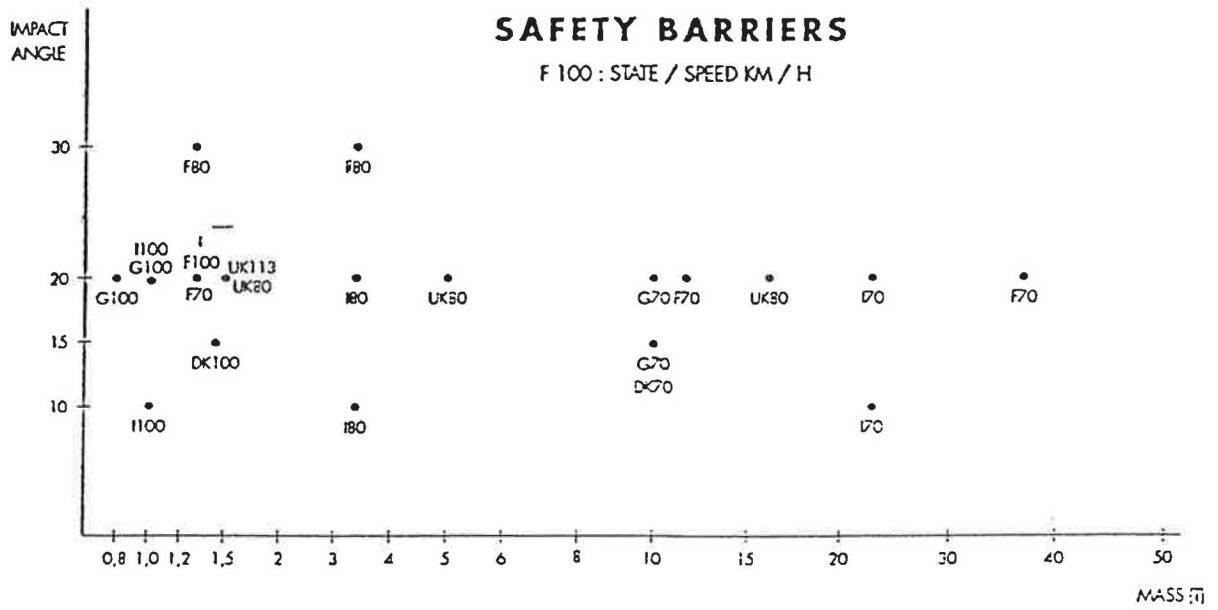


FIGURE 1 Test conditions in Europe 1990, situation testing characteristics.

Austria	Greece	Norway
Belgium	Iceland	Portugal
Denmark	Italy	Spain
Finland	Ireland	Sweden
France	Luxembourg	Switzerland
Germany	United Kingdom	Netherlands

Since 1991, seven countries from Eastern Europe have been affiliated with CEN:

Bulgaria	Hungary	Romania
Cyprus	Poland	Turkey
Czechoslovakia		

As a consequence, industries, administrations, and research laboratories of these 18 states have already begun the standardization process in the framework of the CEN. The first aim of this international activity consists in achieving the objectives on which the completion of a single European market depends.

To provide a technical force to establish all the standards, 270 technical committees inside the CEN are charged with establishment of the standards. Due to the action toward harmonization within the EEC, in 4 years the number of technical committees have doubled.

In CEN standard organizations, as it is in all European standardization processes, all interested concerns take part in one program. Industries, administrations, and research laboratories may participate in a committee or working group.

### **Basis for Standardization**

Focusing on roadside devices, it has been unanimously agreed that satisfactory behavior under impact tests will be the basis for the standard. Within the short time fixed by the CEN, this appears to be the criterion on which a consensus may be reasonably reached. By harmonizing the performances with several levels, the standards could possibly foster innovation. The industries are thus free to design products as far as they meet the conditions of standard performance, while using various materials such as metal, concrete, plastic or wood. But the standards also remain open to include other devices with complementary functions, such as noise protection, pedestrian restraint, or aesthetic aspects.

### **Work of TC 226/WG1**

The beginning of standardization came from the question of the technical committee dealing with all road equipment. This technical committee was created in

1988-89. During its first meeting in April 1990, the technical committee charged Working Group 1 with the standards in the field of roadway systems.

The scope of the Working Group 1 is divided into road restraint systems and pedestrian way systems. The object of the CEN/TC226/WG1 consists in dealing with all the restraint systems used on central reserves of motorways and on verges of roads, including bridge and retaining wall structures for permanent and temporary use, with priority being given to the road vehicle restraint systems that are the most used devices. Focus will be on crash cushions and safety barriers and connections between barriers, terminals, and pedestrian barriers.

Participating within the TC226, WG1 has about 40 experts from 14 different national organizations, plus two U.S. observers, Mr. Harry Taylor and Dr. Hayes Ross.

It has been unanimously agreed to raise the harmonization of the performance levels on crash tests, which appears to be the criteria from which a consensus may be reasonably reached in the short term. Initially, standards have to define impact test conditions and acceptance criteria.

The work that began 2 years ago consisted first of gathering the test conditions as applied in the research laboratories or provided in national regulations. In the area of safety barriers, there have been 2 years of work. To determine current European standards, attention was focused on the necessity of being clear about the development of the types of vehicles in the future without going too far from the present conditions. The maturity of existing systems will find their place eventually.

Documents concerning terminology on safety barriers, performance classes accident criteria, and test results are now ready for inquiry. As work progresses, crash cushions will be well advanced, but terminals will require a bit more time.

### **Choice of Performances**

Future systems to be agreed on in the market should meet the various and complex needs of the road design.

In a general way, the choice of a suitable safety barrier depends on the risk to be covered, and the risk is a function of the road and traffic characteristics as well as the nature of the obstacles in the vicinity.

WG1 has chosen a classification based on restraint capacity. The normal level of restraint capacity concerns the containment of light vehicles, the high level concerns the containment of current lorries and buses, and the very high level concerns the containment of the heaviest authorized lorries (i.e., approaching 40 t).

The tests for all the containment levels are specified in terms of impact speed and angle as well as mass and dimensions of the colliding vehicle.

### Acceptance Criteria

The principal acceptance criteria for these tests are as follows:

1. Behavior of the vehicle:
  - The vehicle shall not breach the barrier, and
  - The vehicle shall be redirected.
2. Behavior of the barrier:
  - No major part of the barrier shall fracture and become detached.
3. Severity index:
  - Both the acceleration severity index (ASI) and the theoretical head impact velocity (THIV) will be used before reaching any agreement on a single index.
4. Vehicle deformation:
  - The deformation of the vehicle interior shall be evaluated by completing the vehicle compartment deformation index (VCDI) form.

Generally, these criteria may not be evaluated on only one representative test. They may not be critical under the same impact conditions. In particular, a high containment level system that can meet the conditions of restraint for lorries might not meet the correct performance for the impact severity required for a light vehicle.

It has therefore been decided to carry out two impact tests for each specified performance class:

- One test for checking the maximum containment level, and
- An additional test on a small passenger car for checking the behavior of the vehicle and the impact severity for the safety of the occupants.

Drafted test methods are not yet ready. To determine them, attention was focused on the necessity of being coherent with the development of the types of vehicles of the future, without going too far from the previous conditions. A majority of existing barrier systems should easily find their place in the new scheme.

### Conclusion

Work yet to be defined concerns all necessary prohibitions to achieve the harmonization. The European

Construction Products Directive asks for labeling, so-called the "seal" or "mark," of all devices that are based on the conformity to harmonize European standards. What remains is to define all prohibitions of evaluation of conformity and an attestation procedure that will permit industries to put the seal on their products. The standards for the pedestrian barrier system will also be started.

European harmonization must obviously go further, particularly concerning performance standards for safety barriers, crash cushions, and pedestrian guardrails. Standardization in this field might be more difficult and require more time than expected. The current objective is to create a document and have it approved.

### PERFORMANCE CLASSES AND IMPACT TEST CRITERIA FOR SAFETY BARRIERS AND CRASH CUSHIONS

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The first meeting of Working Group 1 took place in September 1990, when about 40 people from about 14 member countries met to produce harmonized standards for safety barriers and other systems. Representatives at the meeting included civil servants, scientists, manufacturers, and experts from research laboratories and universities. There were many problems: different languages, national standards, procedures, and regulations and perhaps a degree of national protectionism. It was soon discovered that there were different names for systems and components, and the first priority was to sort out the terminology to be used.

### Safety Barriers

The following represent draft proposals. These proposals are nearing completion but are still subject to all necessary CEN voting procedures.

The idea of having performance classes for safety barriers is that a product will be able to be tested and assessed against a set of established performance criteria. Once these criteria have been complied with, a product can then be approved and registered against a particular performance class. It will be up to each member nation of the EEC and EFTA to decide what level of performance it requires on its roads. A product, therefore, does not have to comply with all the performance classes listed in the standard.

When Working Group 1 started, all participating nations entered their national performance standards on a large board. There was a great disparity of vehicle