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## THE ASSESSMENT PROGRAM OF ACI FOR SAFER PEDESTRIAN CROSSINGS

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## **ABSTRACT**

Every year many vulnerable road users are killed or serious injured worldwide. About 8.000 pedestrians die yearly on European roads and many accidents occur on or close to a pedestrian crossing.

For this reason, the Automobile Club of Italy (ACI) conducted, together with others Automobile Clubs members of FIA (Fédération Internationale de l'Automobile), the European Pedestrian Crossings Assessment (EPCA). An assessment methodology was developed together with La Sapienza University of Rome. One of the main criteria adopted is that it should be allowed to all users to utilise a pedestrian crossing without putting their life at serious risk. The methodology can be used to safety audits and safety reviews.

The project has three aims:

1. Disseminate safe behaviours among road users (pedestrians and drivers): Included in the project, there was also the realization of an awareness campaign, named “Walk Safe”, and was developed a leaflet and an educational video.
2. Share good practices to avoid danger situations: The tests have shown a wide variety of design solutions adopted from city to city. The evaluation and comparison of crossing systems in Europe provide the opportunity to identify shortcomings, possibilities for improvement and solutions.
3. Standardize the rules of pedestrian crossings at the European level: The tests have shown the need of greater harmonization of pedestrian crossing system among European cities. With this aim, ACI has developed guidelines for the design of safe pedestrian crossings. This book indicate when, where and how to realise a safe and accessible pedestrian crossing.

The project confirms that Authorities need to give in-depth attention to safety issues concerning pedestrian crossings and that road users need to improve their awareness of the risks involved in sharing part of road infrastructure with other categories of road users and consequently adopt safer behaviours.

## INTRODUCTION

ACI is in the lead of studies on pedestrian crossings within the scope of EuroTEST, the European test programme for the protection of consumers/road users involving 18 Automobile Clubs of 17 European countries, members of the Fédération Internationale de l'Automobile (FIA). The FIA EuroTEST has the following objectives:

- Apply to mobility infrastructures the same approach successfully adopted for the EuroNCAP program, a methodology that has enabled remarkable improvements in terms of vehicles quality and safety;
- Carry out independent assessments to check the quality and safety of mobility infrastructures / services and promote best practices for planning and design.

The reasons for implementing a EuroTEST on pedestrian safety and pedestrian crossings can be found in the following considerations:

- At least 22 pedestrians are killed each day on European roads (about 8.000 in the 27 EU member countries);
- Pedestrians are involved in 15% of road accidents;
- In 30% of road accidents involving a pedestrian and a car travelling at 40 km/h, the pedestrian will be killed;
- One in four pedestrian fatalities occur on or close to a pedestrian crossing (ACI research);
- It is a matter of “behaviours”, but safer pedestrian crossings help to discourage unsafe behaviours and facilitate the sharing of urban space among different transport modalities.

EPCA has the following specific objectives:

- Highlight “potential risks” of pedestrian crossings in different countries;
- Make pedestrians and drivers more aware of their respective limits / risks and duties;
- Identify “best and worst” solutions adopted in each country as to pedestrian crossing design and management;
- Promote improvement of the most critical situations;
- Foster the spreading of a “technical culture” aimed to meet the requirements of pedestrian safety;
- Sensitize national and local authorities on the need to adopt all possible measures to increase safety standards, so as to reduce the number of accidents involving pedestrians, in particular on pedestrian crossings;
- Adopt common rules at European level for safe behaviours (harmonisation!)

Comparison of the different solutions adopted throughout Europe enables the identification of a series of simple, but effective actions - for immediate or short-term implementation - to improve the safety standard of the most critical pedestrian crossings.

## METHODOLOGY

The evaluation methodology has been defined by the Automobile Club d'Italia in cooperation with Rome University “La Sapienza” (1). The weighting process is based on the cross-comparison technique. The relevant results are then submitted to a qualified group (analytic hierarchy process) and subsequently validated by means of in-depth investigations on serious accidents involving pedestrians. Two checklists have been developed: one for pedestrian crossings at intersections and another one at non intersection crossings. The 27 factors defined in the evaluation process have been clustered into 4 safety categories:

- **Crossing system** (12 safety factors, Weighting: 23%).
- **Daylight visibility** (5 safety factors, Weighting: 26%).
- **Night-time visibility** (4 safety factors, Weighting: 32%).
- **Accessibility** (10 safety factors, Weighting: 19%).

Ratings of crossings include an overall evaluation plus an evaluation for each safety category. Assessment has been carried out based on a point system with 5 ratings: Very Good, Good, Acceptable, Poor, Very Poor. Furthermore, the inspections highlighted the points of strength and weakness of each crossing, as well as recommended action to improve crossing safety.

## SURVEY

In the framework of the EPCA Program, the following activities have been carried out during 2007-2011:

- Statistical Analysis (2007);
- European comparison among regulations and crossing design standards of pedestrian crossings (2007);

- Observatory on road accidents involving pedestrians (2008);
- Pedestrian crossing tests carried out in 17 European cities (2008);
- Survey on European pedestrian traffic lights (2008);
- “Walk Safe” Awareness campaign – Leaflet (2008);
- Pedestrian crossing full-scale tests carried out in other 30 cities (2009);
- “Walk Safe” Awareness campaign – Educational Video (2009);
- Pedestrian crossing full-scale tests carried out in other 18 cities (2010);
- Guidelines for pedestrian crossing design (2010-2011).

The test has involved 795 pedestrian crossings of 46 cities in 22 European countries. The European survey has included the following Italian cities : Florence, Milan, Naples, Rome (twice) and Turin.

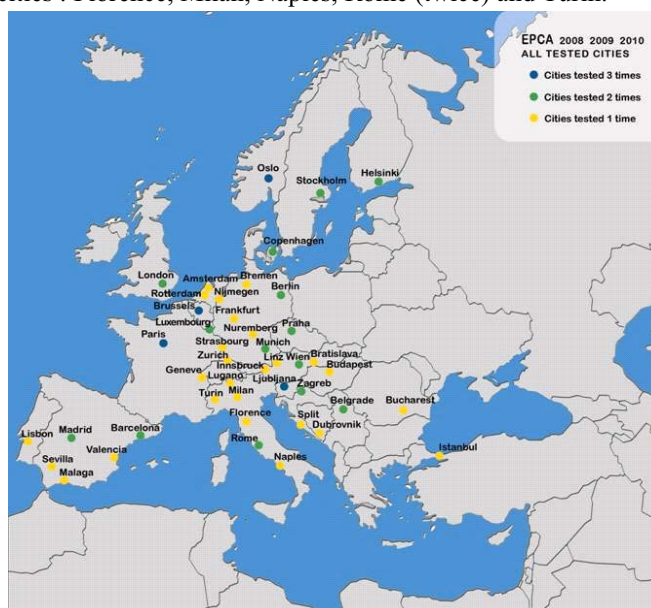


Figure 1 – Cities tested during the 3-year survey

## OUTCOMES

The outcomes show remarkable differences concerning technical aspects and traffic rules with special regard to:

- Pedestrian traffic lights with 2 / 3 colours with / without transition phases;
- Road markings different by colour and type of zebra stripes;
- Priority rules;
- Solutions and devices for disabled users.

The following positive solutions deserve attention:

- + New technology (LED) traffic signal lanterns enabling better visibility under any light conditions (full sun, night time, adverse weather conditions).
- + Road markings realised with new, high-quality materials (thermoplastic paints) ensuring longer duration, enhanced visibility and better performance in terms of grip.
- + Pedestrian traffic lights equipped with countdown devices, displaying the remaining time of green and/or red phases.
- + Curb extensions for improved reciprocal visibility of pedestrians / drivers.
- + High-efficiency lighting systems, directly focused on the crossing section, for improved visibility by oncoming traffic.



Figure 2 – Best pedestrian crossing 2008 (London-UK)

Among the negative situations that should be avoided:

- Poor or irregular road maintenance.
- Poor accessibility (absence of ramps and tactile paving).
- Legal / illegal parking of cars impairing both accessibility and visibility.
- Cycle paths running on sidewalks (which may cause conflict points, especially in case of heavy bicycle traffic).
- Absence of road markings and traffic signs indicating pedestrian crossings in 30 km/h speed areas (which may cause problems in case of heavy traffic).
- Slow uptake of new technologies (only a few pedestrian traffic lights are equipped with a countdown device displaying how many seconds are remaining for the crossing phase).

With reference to first safety category (**Crossing System**), the outcomes concerning space/time planning show a number of difficult aspects. One crossing in three did not score an acceptable rating in this category, owing to many deficiencies, as follows (in descending order of importance):

- a) Absence of pedestrian refuge islands in very long crossing sections;
- b) Non-exclusive pedestrian green-signal phases;
- c) Conflict points between motor vehicles and pedestrians;
- d) Poor effectiveness of traffic lights (too long pedestrian red-signal phase, too short pedestrian green-signal or transition phases).

As for **Daylight Visibility**, only the crossings of London scored the highest rating, thanks to the very good visibility of signs and markings - with special regard to the road markings indicating the directions of oncoming traffic (“Look Right/Look Left”), so as to ensure adequate reciprocal visibility between pedestrians and drivers. As for other crossings, there is only one very good result in five tests. Positive solutions also include curb extensions to improve reciprocal visibility between drivers and pedestrians. Critical aspects are listed here below:

- a) Legal / illegal parking of cars impairing visibility
- b) Poor maintenance of traffic signs and road markings
- c) Absence of traffic signs



Figure 3 – Best pedestrian crossing 2010 (Brussels-Belgium)

**Night-time visibility** is one of the most important requirements for safe pedestrian crossings. That is why its weighting in the evaluation process is so high (32%). Unfortunately, one crossing in five scored poorly in this category. Solutions for improving night-time visibility have been found in Rotterdam, Brussels, London and Seville, where three crossings in four gained a positive evaluation thanks to very good lighting and excellent conditions of road markings and traffic signs. Good solutions have also been found in Copenhagen and Brussels, with lighting systems perfectly focused on the crossing section (high contrast with the surrounding areas makes the crosswalk particularly visible to the approaching drivers, even from a far distance). The negative results of the night-time test are mainly due to insufficient lighting and poor visibility of road markings and signs.



Figure 4 – Best pedestrian crossing 2009 (Bratislava-Slovak Republic)

**Accessibility for all!** All the users should be able to go through a pedestrian crossing without putting their lives at serious risk. This was one of the most sensitive criteria for the building of the assessment methodology ACI-EuroTEST. For this reason the ACI inspectors checked the presence of the most common devices and measures for allowing all the users to access pedestrian crossings and safely cross the road: dropped or ground level kerbs, tactile paving and acoustic/vibrating devices for visually impaired people, adequate angle (90°) between sidewalks and crossings, presence of obstacles - like parked vehicles, utility poles, signs, holes - that could be a hazard for approaching pedestrians or a cause pushing them to cross outside the crossings, adequate width of sidewalks, etc..

Unfortunately, one pedestrian crossing in three failed the accessibility test. Here below the main deficiencies:



- a) lack of ramps or ramps with a steep gradient;
- b) lack of tactile paving;
- c) presence of parked vehicles behind/over the crossing or the sidewalk;
- d) conflict points with cycle paths;
- e) poor maintenance conditions of road surface.

Good situations were found in Barcelona, Malaga and Valencia, (wide sidewalks, adequate tactile paths, wide ramps with suitable gradient, no presence of fixed or temporary obstacles). Also Stockholm deserves to be mentioned for the layout of its pedestrian crossings (half width / step - half width / ramp).

## THE INFORMATION CAMPAIGN

The project includes an information campaign named “Walk Safe”, with the realization of a leaflet and a video. **The leaflet** – developed in cooperation with the other 17 Clubs participating in the EuroTEST program – provides behavioural tips beyond the national rules in force in the different European countries. The leaflet includes 3 different sections specifically targeted to pedestrians, pedestrians crossing and drivers, with an additional section – “Did you know...?” – containing important statistical information.



Figure 5 – The “Walk Safe” leaflet

The **educational video** was developed from the leaflet to present the main road crossing situations. Each situation is illustrated twice: first with reference to the wrong behaviours to be avoided and then showing the safe behaviours to be adopted.



Figure 6 – The “Walk Safe” video

The video consists of 7 short cartoons (30” each), with 4 scenes illustrating pedestrians’ behaviours and 3 scenes dedicated to drivers’ behaviours.

The video has limited spoken content (only with reference to safe behaviours). Special audio effects help with understanding the different situations.

The video was produced in 4 languages (English, Italian, German and French).

## GUIDELINES FOR SAFE PEDESTRIAN CROSSINGS

As a natural conclusion of the project was developed the booklet “Guidelines for the design of safe pedestrian crossings” (September 2011).

The booklet includes 4 sections (2):

1. Comparison among the main International standards;
2. The crossing system
3. The technical elements
4. The constructive components

In the first section the technical regulations on pedestrian crossings coming from the most relevant Countries were gathered, highlighting the parameters more closely considered while developing the standards for the guidelines.

Within this section a separated paragraph was reserved for the behavioural rules for pedestrians and drivers in the focussed Countries.



Figure 7 – “Guidelines for the design of safe pedestrian crossings”

The second section analyzes where (location) and how (kind of cross) crossings should be built up in order to pursue the following objectives:

- o accessibility, safety and comfort for pedestrians;
- o crossing visibility;
- o speed reduction for drivers;
- o improvement of mutual visibility between drivers and pedestrians.

In the third section a detailed analysis of the design criteria for all the relevant technical elements is reported: signs and road markings, sidewalk ramps, pedestrian refuge islands, pedestrian traffic lights, lighting conditions, raised pedestrian crossings, tactile paving.

In the fourth section several graphical schemes and solutions for pedestrian crossings are presented, according to content of the Guidelines.

The main design innovations mentioned, some of which require an amendment of existing laws, are listed below:

- o pedestrian traffic light: replacement of amber light (very widely adopted in Italy), deployment of countdown devices, assumption of a standard pedestrian speed of 0.75 m/sec;





Figure 8 – Pedestrian traffic light equipped with countdown

- o special lighting/flashing signs: introduction of special signs warning the drivers well in advance about the crossing approaching (new technologies, ...);
- o road markings: white on black contrast, zig-zag warning markings, quality of paint materials, use of additional devices (reflective or LED lights);
- o artificial lighting: technical parameters for the specific artificial lighting of the cross section;
- o sidewalk layout: steps and ramps for strollers and wheelchairs for disabled users to be built parallel to the vehicular traffic flow;

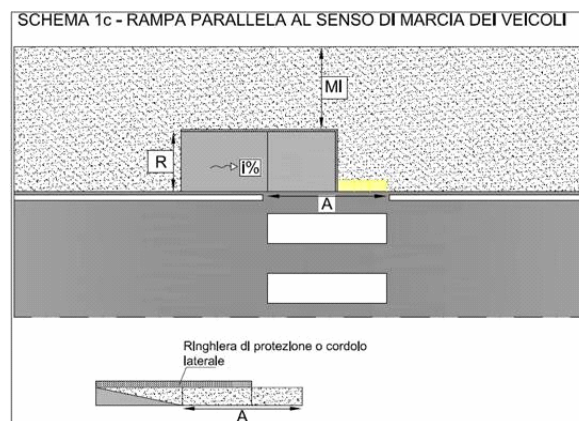


Figure 9 – Ramp parallel to the vehicular traffic flow

- o pedestrian refuge island recommended in case of sections crossing more than 3 lanes;
- o position of crossings in relation to public transport stops;
- o orthogonal crossing direction compared to the curb edge;

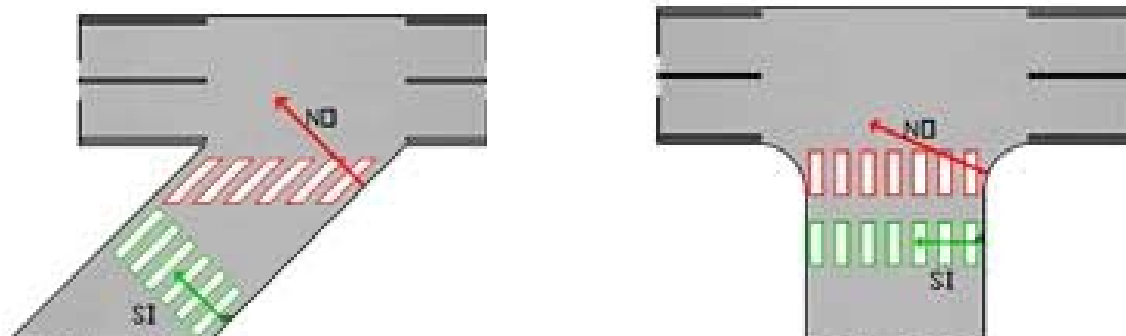


Figure 10 – Orthogonal crossing direction compared to the curb edge

- o separation of pedestrian and bicycle paths;
- o raise crosswalks: technical specifications are listed (overall height, slopes, special signs, ...).

Currently the proposed technical standards is addressed only to Italy, but is planned to develop an International version in English, to share with the FIA and the partner Automobile Clubs for the proposal of a common European technical standard.

## CONCLUSIONS

Here below, some **final recommendations** for the different actors involved in mobility planning, design and management to make pedestrian crossing safer.

Planners and administrations should ensure:

- o Good visibility for pedestrians to see/ be seen from oncoming traffic, also by means of curb extensions (placed in advance of on-street parking) or backing of the parking places and adoption of special road markings (zigzag markings).
- o Refuge islands, to avoid potentially dangerous situations or in case the pedestrian crossing is too long to be crossed in one traffic light cycle.
- o Good visibility for drivers also by means of adequate road signs and markings (visibility and grip).
- o Good quality and good maintenance of road markings and signs (quality and durability).
- o Good lighting conditions of the pedestrian crossing (high contrast to enable increased perception even from a distance).
- o Elimination of conflict points with other road users (e.g.: bicycle paths in conflict with ground level curbs provided for disabled pedestrians or tramlines running too close to sidewalks).
- o Ramps with adequate width and gradient to be safely accessible for wheelchair users.
- o Technical devices for the visually impaired (tactile paving and acoustic/vibrating devices).
- o Enforcement of efficient measures to counter illegal parking on pedestrian crossings and curbs.

As regards traffic lights it is recommended to adopt:

- o Technology devices for the hearing impaired (countdown timer displaying how many seconds are remaining for the crossing phase).
- o Pedestrian signal phases allowing sufficient time also for vulnerable users - such as elderly and disabled people - to safely cross the road.
- o In case of non-exclusive pedestrian signal phases, use of additional flashing lights to warn approaching drivers that there are pedestrians attempting to cross.
- o Push-to-walk buttons.

Politicians and legislators involved in establishing relevant **regulations** should aim at a wider uniformity at European level with reference to:

- o Behavioural rules;
- o Traffic lights transition phases from green to red;
- o Road markings at pedestrian crossings (shapes and colours);
- o Type-approval procedures for the technological devices (countdown, LED based traffic lights, etc.).

## REFERENCES

(1) Eurotest, Quality, Safety, Mobility (2008-2010). “Pedestrian Crossing Assessment”, *Automobile Club d'Italia*, <http://www.eurotestmobility.com>

(2) Automobile Club d'Italia (2011). “Linee Guida per la progettazione degli attraversamenti pedonali”, <http://www.aci.it>.