Design of the road versus the behaviour of the drivers. Overtaking, Speed and Sight Distance.

Author: Miguel Ángel Pérez Peñalva
Tutor: Ole Thorson

During the last years there has been a great deal of debate about one of the most important roads of Catalunya: the Eix Transversal. In the last five years there has been a significant number of head-on collisions, where a lot of people have died. Head-on collisions are mostly the result of an improper overtaking, which is considered to be the most dangerous manoeuvring that has to be done while driving.

There is a wide range of possible causes for those improper overtakings: imprudence, exceeding the speed limit, breakdowns, but we must also consider the fact of overtaking allowance in unsuitable sections of the road.

The current minor Thesis is structured in two clear parts, being the second consequence of the first. First of all, the casuistry of the Eix Transversal is analysed with the purpose of checking the security in this road: the accident rates of all inter-cities roads in Spain have been compared to those in the Eix Transversal from 1998 to 2000. A conclusion was clear: the Eix Transversal had, in general, lower accident rates than other roads. However, it had a high rate of head-on collisions, which turns out to be one of the most spectacular and deadly car accidents.

As a result of these conclusions, investigating this problem was decided. It was necessary to make a detailed analysis of head-on collisions in the Eix, trying to find the main causes that provoke them (curves, atmospherical conditions). The results of this study were not concluding due to the wide range of causes for the accidents, therefore it was imposible to determine any TAC (sections with an important rate of accidents).

In the last part of the minor-thesis there has been an analysis of overtaking-section guidelines with the objective of eliminating head-on collisions in the Eix. Finally, the widening of the road has been suggested; an option that has been studied both from a technical and an economical point of view.

The second part focuses on the facts that may cause head-on collisions. It first analyses, in a general way, the factors that take part in the accidents, paying special attention to human and road factors. In a further chapter, one of the most important studies in this minor thesis is done: the passing sight distance analysis.

The methodology used in different parts of the world to obtain the passing sight distance is analysed in this section: methods used by AASHTO and Wang and Cartmell are examined and compared. The security factors of the design parameters are also studied. European guidelines about passing sight distances are examined with the purpose of knowing how this theme is treated in Europe, concluding that there are important differences between them. After comparing the different methodologies and guidelines, an EXCEL programme has been developed, which is able to calculate (depending on several parameters) the rates of overtaking that will be successful according to the passing sight distance chosen.

As it will be shown in the different method analysis, acceleration is the most controversial parameter. According to the experts consulted, a representative value would be around 4 -5 Km/h/s, which is in the middle of the AASHTO and MUTCD values. Nevertheminor, a study has been made to determine a value of acceleration for middle-class vehicles and this result has been used to calculate the successful overtakings for every distance.

The final conclusion of all the process done in the minor thesis shows that current passing sights have to be enlarged in spite of comfort and time. Nowadays, with the current guidelines, the security factor is minor than one, including the enlargement done by Generalitat in Eix, where passing sight distance has risen from 300 meters to 390 meters. A security factor minor than one means that a number of accidents are assumed to happen, which is specially serious in the Eix transversal, where three out of four victims are a result of car overtakings.