Requirements for Roadside Equipment for the Case of Using Hard Shoulders for Moving Traffic (VSS2000/348)

Anforderungen an die strassenseitige Ausrüstung bei der Umwidmung von Standstreifen

Funding: National (Switzerland)
Duration: Jun 2003 - Nov 2009
Status: Complete with results

Background & policy context:

Continuing traffic increases on the national road system lead increasingly to regular overloading during peak hours, especially on motorway sections in agglomeration areas. Therefore, the hard shoulder usage has been considered a possible measure for quite some time by which short term capacity overload and road safety problems associated with it can be decreased. We can distinguish between small-scale, local hard shoulder usage as the extension of entry and exit zones, weaving sections or auxiliary lanes on upgrades (group A applications) and section-wise conversions between two or several grade-separated interchanges or junctions (group B applications). The small-scale applications of group A are usually permanently implemented, i.e. that the road marking of the cross section is there to last for a long period of time and the former hard shoulder is no longer recognisable as such for the road user. These applications can be found on Swiss motorways already today and the experiences made with regard to the defusing of conflict situations have been positive. However, in Switzerland section-wise conversions between two or several grade-separated interchanges or junctions have not yet been realised (group B applications). With these applications the question arises whether the hard shoulder should be converted permanently or only temporarily. Both modes of operation have their advantages and disadvantages regarding traffic flow, road safety, maintenance and operations as well as costs. Additionally they strongly differ from each other regarding the requirements for road side equipment.

In the project "Requirements for the roadside equipment at the rededication of hard shoulder", the foundations for a Swiss standard were be developed.

To assess the application of the reclassification concrete and the ability normalise criteria are formulated. A distinction is made dynamic applications, static applications and cases where no application is possible. The assessment of equipment requirements will be based on traffic engineering, safety and legal criteria depending on the application.

Objectives:

Prepare basis for a draft standard to reflect whether and how the hard shoulder as an additional lane (limited in time) could be used. Demands on transport systems including the lane light signals will be defined including application criteria and constraints.

Methodology:

- Elaboration of specific and standardised application criteria for dynamic and static use of hard shoulders at motorways as carriageways.
- Collection of standards of road equipment on behalf of criteria of traffic engineering, safety engineering (in particular to avoid accidents and incident detection) and infrastructure (usability, load capacity, road structure).
- Analysis of law aspects and formulation of a possible amendment of federal law.

Parent Programmes:
ARAMIS - ARAMIS information system

Institute type: Public institution
Institute name: Swiss Government: State Secretariat for Education and Research
Funding type: Public (national/regional/local)
Key Results:

Section-wise hard shoulder usage should be considered only if development is planned at a later stage. Otherwise there is the danger of initial capacity gain being set off again by more traffic in the medium term and road safety being impaired unfavourably. From a traffic volume point of view, a section-wise conversion is appropriate, if on the motorway section considered the level of service (LOS) D is exceeded at least for 30 hours p.a. and the annual average daily traffic on a 2x2-lane and 2x3-lane motorway exceeds 60'000 veh/day and 85'000 veh/day, respectively. Threshold values were defined for two and three-lane motorways with respect to the traffic-related operational criteria for the hard shoulder's temporary opening and closing. These criteria are derived from the volume of traffic or from the average speeds and traffic concentration. In doing so, the opening happens either by reaching the theoretical capacity or a traffic concentration in the area of LOS D. The hard shoulder's closing is recommended at the change from LOS D to C – regarding the initial cross section. The analysis of accidents provides another important evaluation basis for possible hard shoulder usage. Thus, the accident rates specific to each type of accident and their proportions of the total event of accidents are of special interest. A high number of rear end collisions due to congestion deliver an important conversion's decision criterion, if a detected capacity overload can be eliminated thereby as much as possible. Short weaving sections or strong merging and diverging traffic streams combined with grade-separated interchanges in short distance cause malfunctions in the traffic flow and unfavourably affect road safety in the form of an above average number of lane crossing accidents. For all applications, prerequisite with respect to the geometrical requirement is the existence of a satisfactory carriageway width within the whole conversion section on which lanes with sufficient width can be realised. For lanes which are driven by passenger vehicles exclusively, widths of ≥ 3,25 m are favored. However, the minimal width should not be less than 3,00 m. On the other hand, lanes suitable for heavy vehicles should have a width of ≥ 3,50 m. At least, the minimal width should not fall below 3,35 m. With lane widths in such a way reduced a reduction of the permissible maximum speed is necessary. With these suggested benchmarks a hard shoulder usage can be realised if the lane width corresponds to the FEDR