

ANNEX II
to SWOV report
Safety effects of road design standards
R-94-7

Assumptions used in road design

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Notice to the reader

This volume is one of the annexes to a main report on safety effects of road design standards which was compiled by SWOV in collaboration with other European partners, in 1993-1994.

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The main report is a composition of contributions from various authors, edited by SWOV and published in both English and French. The annexes were not re-edited but were published in the form in which they were furnished by the authors. SWOV is not responsible for the contents of annexes that were produced by authors from outside the institute.

The full publication consists of the following volumes.

Main report: Safety effects of road design standards
H.G.J.C.M. Ruyters & M.Slop (ed.); SWOV Institute for Road Safety Research, Leidschendam, The Netherlands

Annex I: Road classification and categorization
S.T.M.C. Janssen; SWOV Institute for Road Safety Research, Leidschendam, The Netherlands

Annex II: Assumptions used in road design
M. Slop; SWOV Institute for Road Safety Research, Leidschendam, The Netherlands

Annex III: Methods for investigating the relationship between accidents, road user behaviour and road design standards
G. Maycock & I. Summersgill; Transport Research Laboratory, Crowthorne, England

Annex IV: International organizations and road design standards
H.G.J.C.M. Ruyters; SWOV Institute for Road Safety Research, Leidschendam, The Netherlands

Annex V: National road design standards
H.G.J.C.M. Ruyters; SWOV Institute for Road Safety Research, Leidschendam, The Netherlands

Annex VI: Road cross-section
L. Michalski; Technical University of Gdansk, Gdansk, Poland

Annex VII: Road design standards of medians, shoulders and verges
C.C. Schoon; SWOV Institute for Road Safety Research, Leidschendam, The Netherlands

Annex VIII: Design features and safety aspects of exit and entry facilities on motorways in the EC (in German)
J. Steinbrecher; Aachen, Germany

Annex IX(E): Curves on two-lane roads
Annex IX(F): Virages sur routes à deux voies (in French)
T. Brenac; Institut National de Recherche sur les Transports et leur Sécurité, Salon-de-Provence, France

Annex X: "Bicycles at intersections" in the Danish Road Standards
L. Herrstedt; Danish Road Directorate, Copenhagen, Denmark

Annex XI: Bicycle facilities at intersections
M.P. Hagenzieker; SWOV Institute for Road Safety Research, Leidschendam, The Netherlands

Annex XII: Bibliography

Assumptions used in road design

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In this Annex, a tentative list is given of elements that could be regarded as underlying assumptions. The information was taken from the following sources:

- 1 Richtlijnen voor het Ontwerpen van Autosnelwegen (ROA); I: Basiscriteria; November 1992 (NL)
- 2 Richtlijnen voor het ontwerpen van niet-autosnelwegen buiten de bebouwde kom (RONA); I: Voorlopige richtlijnen Basiscriteria; January 1992 (NL)
- 3 Roads and Traffic in Urban Areas; June 1987 (UK)
- 4 Byernes trafikarealer; Hæfte 1: Forudsætninger for den geometriske udformning; June 1991 (DK)
- 5 Portuguese data collected by personal communication
- 6 Incidental finding

When going through the sources a first selection was made by omitting all subjects of less importance in view of this project, i.e. those which have minor impact on road safety and/or offer poor possibilities for harmonization. The remaining subjects were only included in the list if distinct figures were found in more than one of the sources.

The code mentioned in the list is according to the distinctions made in Section 2.7.2 of the main report. Under 'Ref.' source and page # are given where the information was found.

| <u>Subject</u> | <u>Value</u> | <u>Code</u> | <u>Ref.</u> |
|---|--------------|-------------|-------------|
| <i>a. Figures found given here</i> | | | |
| Perception-reaction time | 2.5 s | A1 | 1:43 |
| | 2.0 s | | 3:321 |
| for braking | 2.0 s | | 4:42 |
| | 2.0 s | | 5 |
| Eye height | | A1 | |
| cars: | 1.10 m | | 1:45 |
| trucks/buses: | 2.50 m | | |
| motor bicycles: | 1.50 m | | |
| lower limit for private vehicles (95%-ile): | 1.05 m | | 3:321 |
| upper limit: | 2.00 m | | |

| | | | |
|--|----------------------|----|-----------------------|
| cars: | 1.00 m | | 4:42 |
| trucks/buses: | 2.05 m | | |
| | 1.05 m | | 5 |
| Obstacle height | | A2 | |
| | 0.26 m | | 3:321 |
| | 0.15 m | | 4:42 |
| | 0.15 m | | 5 |
| Deceleration | | A2 | |
| on deceleration lanes (comfortable): | 1.5 m/s ² | | 1:58 |
| on exit ramps (max.): | 2.5 m/s ² | | |
| comfortable (maximum): | .25g | | 3:321 |
| absolute maximum: | .375g | | |
| (Germany) normal: | 1.5 m/s ² | | 5 |
| engine braking: | .8 m/s ² | | |
| <i>b. Figures found not given here</i> | | | |
| Maximum tolerated dimensions and weight of specific vehicles | | A2 | 2:95,97 3:277 |
| Skid resistance as a function of speed | | A2 | 1:223 4:43 5 |
| Pcu values | | A1 | 2:69,71,74,84 4:11 |
| Capacity of various road types | | A1 | 2:67,71,73,77 4:13 |
| Design vehicle characteristics | | A1 | |
| car, bus, lorry, trailer, articulated vehicle: | | | 2:103 |
| heavy vehicles | | | 5 |
| various types of slow moving vehicles: | | | 2:110 |
| mopeds, bicycles, pedestrians, wheel chairs: | | | 2:112 |
| various types of motorized vehicles: | | | 4:27-29 |
| pedestrians, mopeds, bicycles: | | | 4:36,38 |
| Recommended areas per pedestrian for various circulation areas | | A2 | 3:286 4:17 |
| Geometric characteristics of and requirements for turning vehicles | | FR | 3:264,293 4:31-34 |

Finally, mention is made of a very useful document in this respect: Nielsen, B.L. & Jensen, H N. *Fysiske forudsætninger*. Vejdirektoratet, Vejregelsesekretariatet, [København] 1978 (in Danish).