

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

National road design standards

An overview of geometric road design standards of the Member States of the European Union

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Notice to the reader

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Main report: Safety effects of road design standards
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Annex I: Road classification and categorization
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Annex II: Assumptions used in road design
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Annex III: Methods for investigating the relationship between accidents, road user behaviour and road design standards
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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
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Annex VI: Road cross-section
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Annex VII: Road design standards of medians, shoulders and verges
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Annex VIII: Design features and safety aspects of exit and entry facilities on motorways in the EC (in German)
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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

Summary

In this summary, the correct names of the road design standards in vigour today in the Member States of the EU are given. A short description of the status of the standards is given, as well as comments on ongoing work on the standards.

In the conclusion, a table is presented in which a distinction is made between road design standards for rural areas and urban areas, with a further distinction between mandatory and non-mandatory standards. In an annex, a list of addresses is added where copies of the standards can be ordered or demanded.

In this document, geometric road design standards are mainly treated and summed up. Standards on signing and marking and operational regulations are sometimes mentioned, sometimes not.

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1. Introduction

National road design standards are existing in all the twelve countries of the European Union. The form in which they are existing, their date of publication, their use, their legal status, their updating are different in all countries. It is impossible to deal with all those aspects in this chapter. It is virtually impossible to analyse the contents, differences and resemblances, of the standards in this chapter. But this is not the purpose of this chapter.

It is a work that already has been done by other studies. In 1986-1987, the "Technische Hochschule Darmstadt, Fachgebiet Straßentwurf und Straßenbetrieb" did a study, entitled "Vergleich der Richtlinien für den Straßentwurf in den Ländern der Europäischen Gemeinschaft", for the Commission of the European Community (at that time). It was an action that started in the European Year of Road Safety and was supported by the Directorate General of Transport of the Commission. The same Directorate General decided in May 1993 to support a study effected by the SWOV and foreign partners, which could build upon the experience gathered by the Darmstadt' study, but which should not have the aim of comparing road design standards. That work was already done. The study should analyse the effects of road design standards on road safety.

To tackle this problem correctly, the participants decided to analyse a certain number of subjects in depth (See introduction). As these subjects comprise large parts of what is covered by road design standards, it remained necessary to have in possession the standards of the twelve Member states and to have some basic information on them. The Darmstadt' study provided important information and also another study, effected in 1992-1993 with the support of the Directorate General of Telecommunications, was of great help. The lastmentioned study, entitled "Comparison of Road Design Standards and Operational Regulations in EC and EFTA Countries", was effected by the Traffic Research Unit of the University College Cork. It provided many figures out of studies and standards, as well as a short overview of the standards in force in the EU Member states and EFTA-Countries.

A second source of information was provided by our partners abroad. A workshop in July 1993 generated a large amount of documentation and insight into standards of Denmark, France, Germany, Ireland and the United Kingdom. Correspondance with Belgium, Greece, Italy, Luxemburg, Portugal and Spain enlarged our collection of standards. At the second workshop in January, this information was consolidated.

The purpose of this chapter is to give the correct names of the road design standards in vigour today in the Member States of the EU. A short description of the status of the standards is given, as well as comments on ongoing work on the standards.

In the conclusion, a table is presented in which a distinction is made between road design standards for rural areas and urban areas, with a further distinction between mandatory and non-mandatory standards. This

table gives some overview, but it must be emphasized that it is much too general as it is practically always impossible to capture the real status of a standard in one word like mandatory or the field of appliance in a word like rural. Some comments are therefore added.

In an annex, a list of addresses is added where copies of the standards can be ordered or demanded.

In this document, geometric road design standards are mainly treated and summed up. Standards on signing and marking and operational regulations are sometimes mentioned, sometimes not. The reason for this is the limited amount of information we could require from national offices or our partners. Given the enormous volume of geometric road design standards alone, we think this project was really succesful in collecting these standards and we would like to thank all our partners and correspondents in all the Member States of the European Union for their help and all the time generously spent in collecting these data.

2. Belgium

Standards:

-AGR, Wet houdende goedkeuring van de Europese Overeenkomst inzake internationale hoofdverkeerswegen en van de Bijlagen, opgemaakt te Genève op 15 november 1975, 15 maart 1985, Belgisch Staatsblad, 19 november 1985

-Caractéristiques routières et autoroutières, Circulaire n. A/WA/205/9 1/-02685, Ministère Wallon de l'Équipement et des Transports, Décembre 1991

-Normen voor Wegen en Autosnelwegen, Ministerie van Openbare Werken, Bestuur der Wegen, 1985

Comments:

The recent regionalisation of Belgium makes it difficult to get an overview of the real actual situation concerning road design standards in Belgium. The motorways resort under the responsibility of the state. The road design standards for motorways are those given in annex II of the AGR-treaty which Belgium has signed and ratified. These standards are respected.

All other roads fall under regional competence. The Walloon region has published standards in 1991. These standards replace all older standards and are in conformity with the AGR-provisions and are mandatory for all roads to construct, except for built-up areas. Deviations from the standards have to be approved by the Ministry. The Flemish region has no new standards published yet. The standards of 1985 are still in use. Standards of the Brussels region are not known and seem not to be existing.

3. Denmark

Standards:

-Road Standards for Urban Areas, Danish Road Directorate, June 1991

Road Planning in Urban Areas

1. Premises for the Geometrical Design
2. Alignment Elements
3. Cross Sections
4. Intersections
5. Path/Road Crossings
6. Path Intersections
7. Speed Reducers
8. Pedestrian Streets
9. Areas for Parking, Stopping, etc.
10. The visual Environment

-"4.30.01. Traffic engineering, Road and path types, Catalogue of types for new roads and paths in rural areas, The Road Directorate, The Technical Committee on Road Standards, May 1981"

-"5.30.01. VejtekniK, Knudepunkter i et plan, Vejregler for vejKryds i åbent land, Vejdirektoratet, Vejregeludvalget, Oktober 1983"

-Afmaerkning på kørebanen, Vejdirektoratet, September 1992: Generelt, Laengdeafmaerkning, Pilafmaerkning, Tvaer-afmaerkning, Standsning og parkering, Tekst og symboler, Dimensioner, Eksempler

-9.10.03. Afmaerkning med vejvisningstavler, Vejdirektoratet, January 1986

-9.10.17. Afmaerkning Motorvejsvejvisning, Vejdirektoratet, November 1989: Katalog over vejvisningsmaal m.v., Vejregler for vejvisning på motorvej, Tegningsbilag

-Vejregler for signalanlaeg, Vejdirektoratet, April 1985

-"Projekteringsregler for Motorveje", Vejdirektoratet, 1976

-Fysiske forudsætninger, Vejdirektoratet, Vejregel-sekretariat, 1978 (giving a.o. a list of older standards up to 1976)

Comments:

Road design standards in Denmark are not mandatory. If standards are mandatory, it is explicitly mentioned. This is the case concerning the standards for road markings and for traffic lights. This is though an exception to the general rule. All Danish road standards are updated every five years.

4. France

Standards:

-Instruction sur les conditions techniques d'aménagement des autoroutes de liaison (ICTAAL), SETRA, Bagnaux, 1985

-Instruction sur les conditions techniques d'aménagement des voies rapides urbaines (ICTAVRU), CETUR, Bagnaux, 1990

-Instruction sur les conditions techniques d'aménagement des routes nationales (ICTARN), SETRA, Bagnaux, 1970 (mod. 1975)

Comments:

Standards are documents made for the Ministry of Transport, which is responsible for the national road network. These documents are widely used, even for the regional (under responsibility of sub-divisions of the region: the "départements") and the local network (under responsibility of the community, "communes"). These standards have a compulsory character: "Les prescriptions de l'ICTAVRU s'imposent aux infrastructures réalisées par l'Etat à statut d'autoroute ou de route express en milieu urbain. Son utilisation est recommandée pour toutes les autres infrastructures nationales susceptibles d'être perçues par les usagers comme des voies rapides urbaines." And in a translation from ICTAAL into English one can read: "The following instructions are applicable to linking motorways. Permission to depart from these may in exceptional circumstances be granted on ministerial decision, on presentation of a proposal giving due justification."

Some standards may be compulsory for all roads, like those for road marking. Smaller documents of less importance and without any compulsory character are existing for the introduction of new techniques or for particular questions.

The "Instruction sur les conditions techniques d'aménagement des routes nationales" are under revision and should be published in spring 1994.

5. Germany

Standards:

- Richtlinien für Außerortsstrassen (RAS), Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe Strassenentwurf, Köln:
 - ✧ Leitfaden für die Funktionale Gliederung des Straßenbahnnetzes, (RAS-N), 1988
 - ✧ Linienführung: RAS-L1: Elemente, 1984
 - RAS-L2: Räumliche Linienführung, 1970
 - ✧ Querschnitt (RAS-Q), 1982
 - ✧ Knotenpunkten: RAS-K1: Plangleiche Knoten, 1988
 - RAS-K2: Planfreie Knoten, 1976
 - ✧ Landschaftsgestaltung (RAS-LG), 1980+1983
 - ✧ Entwässerung, (RAS-EW), 1987
 - ✧ Anlagen des öffentlichen Personennahverkehrs:
 - RAS-Ö1: Straßenbahn, 1977
 - RAS-Ö2: Omnibus, 1979
 - ✧ Vermessung, (RAS-Verm.), 1990
 - ✧ Landschaftspflege: RAS-LP, 1992
- Hinweise zur Anwendung der Richtlinien für die Anlage von Straßen (Teile RAS-N, L, Q, K) beim Um- und Ausbau von Straßen in den neuen Bundesländern, Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe Strassenentwurf, Köln, 1992
- Aktuelle Hinweise zur Gestaltung planfreier Knotenpunkten außerhalb bebauter Gebiete (Ergänzungen zu den RAL-K2, 1976) Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe Strassenentwurf, Köln, 1993
- Mindestbreiten des Verkehrsraumes von 11m.50 bei zweibahnigen Bundesfernstraßen mit Standstreifen. Allgemeines Rundschreiben Straßenbau Nr.25/1991 des Bundesministers für Verkehr, Bonn, 1991 (Ergänzung zur RAS-Q, 1982)
- Zwischenquerschnitte für Bundesstraßen, Allgemeines Rundschreiben Straßenbau Nr.32/1993 des Bundesministers für Verkehr, Bonn 1993 (Ergänzung zur RAS-Q, 1982)
- Empfehlungen für Innerortsstrassen, Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe Strassenentwurf, Köln:
 - ✧ Empfehlungen für die Anlage von Erschliessungsstrassen (EAE), 1985
 - ✧ Empfehlungen für die Anlage von Hauptverkehrsstrassen (EAHV), 1993
 - ✧ Empfehlungen für die Anlage von Ruhender Verkehr (EAR), 1991
 - ✧ Empfehlungen zur Straßengestaltung innerhalb bebauter Gebiete, ESG 87, 1987
 - ✧ Empfehlungen für Radverkehrsanlagen, 1982
- Richtlinien für die Markierung von Straßen, Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe Strassenentwurf, Köln, 1980
- Richtlinien für passive Schutzeinrichtungen an Straßen, Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe Strassenentwurf, Köln, 1989
- Empfehlungen für die Gestaltung von Lärmschutzanlagen an Strassen,

Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe
Strassenentwurf, Köln, 1985

Comments:

Road design standards in Germany were regularly updated and their structure changed several times. From 1930 until 1975, three types of standards were existing: for motorways, for rural areas (non-motorways) and for urban areas. In a second phase (1975-1985), all road design standards were put together: 'Richtlinien für Straßen (RAS)'. Cross-section or alignment for all types of roads were dealt with in a single document.

From 1985 on, a new philosophy saw the light. Guidelines for roads outside urban areas and recommendations for roads in built-up areas. One single standard is standing apart from these two groups of standards: it deals with classification (Richtlinien für Netzgestaltung). Though this new structure for the standards was approved, older standards were partly replaced, other standards were amended only or they continued to be used.

For roads that mainly have a connecting function, the standards have an obligatory character. A certain space for variation is allowed by the standards themselves. For roads having a residential function, the standards are recommendations.

The reunification of Germany accelerated the updating process of the standards. In 1994, new standards for cross-sections and for alignment are foreseen.

6. Greece

Standards:

Cross-sections of Greek roads , Ministry of Public Works , 1962

Comments :

The standard "Cross-sections of Greek roads" is the only formal source of road design standards in Greece today. However, in road design practice, the German guideline RAS-L-1 and the AASHTO Design Policy (Green Book) are mainly used by Greek engineers.

In the last three years, road design standards have been proposed in the bidding documents for the construction of the Athens-Corinth motorway (a major motorway in Greece). These standards are almost identical to the German guidelines and have been approved by the Ministry of Public Works for the project .

The Department of Transportation has recently carried out a project titled 'Contribution to the development of geometric design Guidelines for Greek interurban roads', under supervision of Dr.G.Kanellaidis . In the context of this project, measurements of speeds on roadway curves as well as on pavement friction were carried out. Proposals for interurban geometric design based on the abovementioned measurements and the emerged relationships, and a comparative analysis of relevant guidelines, have been included in the final report of the project (December 1993).

Really mandatory guidelines are thus not existing, diverse standards are applied on an ad hoc basis.

7. Ireland

Standards:

-Geometric Design Guidelines RT180, An Foras Forbartha (The National Institute for Physical Planning and Construction Research), Dublin, May 1986

Comments:

The Irish standards for road design contain recommendations. In practice though, they are applied most of the time. As these guidelines are only recommendations, no approval for deviations has to be given.

The abovementioned document of 1986 concerns classification, alignment, cross-section and intersections at-grade. Further guidelines were foreseen for grade separation and for principles of design. It is not clear whether this announced "Road Design Manual" is going to be finalized.

8. Italy

Standards:

- Norme sulle caratteristiche geometriche e di traffico delle strade Urbane, Consiglio Nazionale delle Ricerche C.N.R., Bollettino Ufficiale (Norme tecniche) del C.N.R., Anno XII, pt.IV, no.60, 26 aprile 1978
- Norme sulle caratteristiche geometriche delle strade extraurbane, Consiglio Nazionale delle Ricerche C.N.R., Bollettino Ufficiale (Norme tecniche) del C.N.R., Anno XIV, pt.IV, no.78, 28 luglio 1980
- Norme sulle caratteristiche geometriche e di traffico delle intersezioni stradali urbane, Consiglio Nazionale delle Ricerche C.N.R., Bollettino Ufficiale (Norme tecniche) del C.N.R., Anno XVII, pt.IV, no.90, 15 aprile 1983

Comments:

The standards for rural roads (strade extraurbane) apply to all rural roads to be constructed and are guidelines. Existing roads have that still have to be brought in line with these standards when possible. An exactly similar system applies to urban roads (strade urbane) and to urban intersections (intersezioni stradali urbane). Deviations from standards have to be justified. No updating work is ongoing.

9. Luxemburg

No Luxemburg' road design standards as such are existing . In Luxemburg the standards from France and from Germany are used. On some occasions Belgian or Swiss road design standards are used .

10. The Netherlands

Standards:

-Richtlijnen voor het ontwerpen van autosnelwegen (ROA), DVK, Rijkswaterstaat, Rotterdam

- ✧ Hoofdstuk I, Basiscriteria, november 1992
 - ✧ Hoofdstuk II, Alignement, mei 1991
 - ✧ Hoofdstuk III, Dwarsprofielen, maart 1993
 - ✧ Hoofdstuk IV, Knooppunten en aansluitingen, maart 1993
 - ✧ Hoofdstuk V, Verlichting, december 1990
 - ✧ Hoofdstuk VI, Veilige inrichting van bermen, juli 1989
 - ✧ Hoofdstuk VII, Diversen, juli 1992
1. Wegbeeld
 2. Landschap

-Richtlijnen voor het ontwerpen van niet-autosnelwegen buiten de bebouwde kom (RONA), DVK, Rijkswaterstaat, Rotterdam

- ✧ Hoofdstuk I, Basiscriteria, 1992
- ✧ Hoofdstuk II, Dwarsprofielen, 1986
- ✧ Hoofdstuk III, Kruispunten, 1986
- ✧ Hoofdstuk IV, Alignement, 1989
- ✧ Hoofdstuk V, Verlichting, 1991
- ✧ Hoofdstuk VI, Wegen in plattelandsgebieden, 1986

-Aanbevelingen voor stedelijke verkeersvoorzieningen (ASVV), CROW, Ede, 1988

-Richtlijnen Bebakening en Markering van Wegen, DVK, Rijkswaterstaat, 1991

-Richtlijnen voor het ontwerp van Geluidbeperkende Constructies langs Wegen, DVK, Rijkswaterstaat, 1986

-Richtlijnen Bewegwijzering, CROW, Ede, 1993

-Richtlijnen Maatregelen bij Werken in Uitvoering, DVK, Rijkswaterstaat, 1987+1988

Comments:

Road design standards in The Netherlands have a varying status. The standards for non-motorway rural roads (RONA) are only published as a draft version, which still has to be confirmed. They are not mandatory guidelines, but deviations have to be well argued. The road design standards for built-up areas (ASVV, 3rd edition) are not mandatory. They are only recommendations. The other road design standards, like those for rural motorways (ROA) or for specific subjects, like guardrails or work under construction, are mandatory. Deviations have to be approved by the Ministry.

Standards to be reviewed in a near future are those for work under construction (Richtlijnen Maatregelen bij Werken in Uitvoering) and for noise barriers (Richtlijnen voor het ontwerp van Geluidbeperkende Constructies langs Wegen). Also, parts of the RONA-standards are going to be reviewed in the next years.

11. Spain

Standards:

- Normativa vigente en proyectos de la Direccion de Carreteras, Ministerio de Obras Públicas y Transportes, January 1993
- Instruccion 3.1.-IC sobre características geométricas y trazado, Ministerio de Obras Públicas y Urbanismo, Direccion General de Carreteras, 1964
- Norma complementaria de la 3.1.-IC, Trazado de Autopistas, Ministerio de Obras Públicas y Urbanismo, Direccion General de Carreteras, March 1976, fifth edition 1988
- Instruccion 3.1.-IC/1990 "Trazado", Ministerio de Obras Públicas y Urbanismo, Direccion General de Carreteras, June 1990
- Borrador de Instruccion 3.1.-IC/93 "Trazado", Ministerio de Obras Públicas y Urbanismo, Direccion General de Carreteras, September 1993
- Recomendaciones sobre Glorietas, Ministerio de Obras Públicas y Urbanismo, Direccion General de Carreteras, May 1989
- Borrador de Instrucción 8.1.-IC/91, Señalización vertical, Ministerio de Obras Públicas y Transportes, Direccion General de Carreteras, June 1991
- Norma de carreteras 8.2.-IC, Road marking, Ministerio de Obras Públicas y Urbanismo, Direccion General de Carreteras, September 1987
- Norma de carreteras 8.3.-IC, Señalización de Obras, Ministerio de Obras Públicas y Urbanismo, Direccion General de Carreteras, September 1987
- Orden Circular 317/91TyP sobre Sistemas de Contención de Vehículos, Ministerio de Obras Públicas y Transportes, Direccion General de Carreteras, May 1991 (Still unofficial, because of legal problems)

Comments:

The document "Normativa vigente" gives an overview of all standards published by the Ministry of Public Works, Transport and Environment. This Ministry is managing some 20.000 km. of the total network. The rest of the network is managed by Regional Governments, who sometimes issue their own standards, but usually follow the trend set by the Central Government.

The standards have to be approved by a Ministerial Order ("Orden Ministerial") to be mandatory. Some of the abovementioned standards have not been approved, but are currently used.

The first two documents on "Trazado" (1964 and 1976) are approved by a Ministerial Order and thus mandatory, but they are more or less obsolete. The two other documents on "Trazado" (1990 and 1993) are not approved yet, but parts of them are currently used and applied through project approval.

These main road design standards entitled "Trazado" apply to all rural roads and to all arterial urban roads. If mandatory (versions of 1964 and 1976), deviations have to be justified and approved. Project approval is

another instrument for state control.

The "Recomendaciones sobre glorietas" are not mandatory, and deviations are allowed if deemed justified (through project approval). The "Norma de carreteras 8.2.-IC" on road markings is mandatory, as approved by a Ministerial Order. The "Norma de carreteras 8.3.-IC" on working zones is mandatory as well. The "Borrador de Instrucción 8.1.-IC" has not yet been formally approved, but it is widely accepted as a standard, with departures usually allowed through project approval. It replaces an old standard of 1961.

No updating work is going on for the moment.

12. Portugal

Standards:

- Plano Rodoviário Nacional, Ministério das Obras Públicas, Transportes e Comunicações, JAE (Junta Autónoma de Estradas), 1985
- Normas de Projecto, Ministério das Obras Públicas, Transportes e Comunicações, JAE, 1977
- Normas de Intersecções, Ministério das Obras Públicas, Transportes e Comunicações, JAE, 1990
- Normas de Nós de Ligação, Ministério das Obras Públicas, Transportes e Comunicações, JAE, 1990
- Normas de Traçado, Elementos básicos, Geometria, Ministério das Obras Públicas, Transportes e Comunicações, JAE, 1992

Comments:

The standards actually in vigour in Portugal are the ones in the volume "Normas de Projecto". The standards in this volume are mandatory on roads belonging to the National Road Network, both in rural and in urban areas. Theoretically, no deviations are allowed.

These standards are also applied (although not mandatory) in rural roads of the local network. In this case, some deviations are allowed by the road administrations, especially if they are associated with a considerable reduction in the construction costs. Concerning these deviations, there is a possibility that the "normal" maximum or minimum values are replaced by "absolute" maximum or minimum values. There are no standards for urban roads belonging to the local network.

The two volumes on "Traçado" contain a version of the future portuguese standards. They are intended to substitute the ones in the volume "Normas de Projecto". Although not required by law, some of the proposed standards in the "Traçado" volumes are already common practice within the Portuguese road administration (JAE). These standards are to be applied on all roads of the National Road Network, both in rural and urban areas.

13. United Kingdom

Standards:

- Highway Link Design, TD 9/93, The Department of Transport, June 1993
- Cross Sections and Headroom, TD 27/86, The Department of Transport, 1986 (Not applicable for use in Scotland. There SH 2/92 applies)
- Layout of Grade Separated Junctions, TA 48/92, The Department of Transport, 1992
- Geometric Design of Roundabouts, TD 16/93, The Department of Transport, 1993
- Access to Highways - Safety Implications, TA 4/80, Scottish Addendum applicable for use in Scotland, 1980 (TA 20/84 and TA 23/81, both on Junctions and Accesses, also apply to Scotland only)
- Junction Layout for Control by Traffic Lights, TA 18/81, The Department of Transport, 1981
- Traffic flows and carriageway width assessment, TD 20/85, The Department of Transport, Scottish Addendum applicable for use in Scotland, November 1985 (TA 46/85:idem, for rural roads)
- Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions, TD 36/93, The Department of Transport, 1993
- Police Observation Platforms on Motorways, TD 10/81, The Department of Transport, 1981
- Roadside Features, TA 57/87, Scottish Addendum applicable for use in Scotland, 1987
- Institution of Highways and Transportation, August 1990, 'Highway safety guidelines: accident reduction and prevention. International edition', London

Comments:

In the important road design standard TD 9/93, that applies to both single and dual carriageway roads in both urban and rural areas, a coherent philosophy concerning the status of the standards is presented: the three tier hierarchy. "This three tier hierarchy enables a flexible approach to be applied to a range of situations where the strict application of Desirable Minimum Standards would lead to disproportionately high construction costs or severe environmental impact upon people, properties or landscape. Designs with at least Desirable Minimum Standards will produce a high standard of road safety and should be the initial objective. However, the level of service may remain generally satisfactory and a road may not become unsafe where these values are reduced. This second tier of the hierarchy is termed a relaxation. In situations of exceptional difficulty which cannot be overcome by Relaxations, it may be possible to overcome them by adoption of Departures, the third tier of the hierarchy. Proposals to adopt Departures from Standard must be submitted to the Overseeing Department for approval before incorporation into a design

layout to ensure that safety is not significantly reduced.¹

No ministerial approval is required for a relaxation, but 'the preferred option should be compared against options that would meet Desirable Minimum Standards.'² Furthermore, a list of principles exist when one wants to adopt a relaxation. This means that certain relaxations cannot be applied in a certain situation and that for another situation a Desirable Minimum Standard can be a required parameter, whilst other parameters may be "relaxed".

The whole complex of standards in the United Kingdom is rather fragmented and presented in TD's (standards), TA's (advisory notes) and still other documents. Updating work is decided ad hoc.

¹"Highway Link Design", TD 9/93, The Department of Transport, 1993, point 1.15, p.1/4 and point 1.27, p.1/6

²Id., point 1.17, p.1/5

14. Conclusion

Conclusions for this chapter can merely be presented. This conclusion can only be seen as an attempt to give a more concise overview of geometric road design standards that differ so much from country to country. In a table, without mentioning the names of the standards themselves, the road design standards of the Member States of the European Union are regrouped in two categories: rural and urban. For each category, a distinction is made between mandatory and non-mandatory standards.

This table is concerning geometrical road design standards only. It is, given the amount of standards existing, likely to be incomplete, but the table has to be read in connection with the comments below.

	rural		urban	
	mandatory	non-mand.	mandatory	non-mand.
Belgium	X			
Denmark		X		X
France	X			
Germany	X			X
Greece				
Ireland		X		
Italy	X		X	
Luxemburg				
The Netherlands	X	X		X
Spain	X	X		
Portugal	X	X		
United Kingdom	X	X		X

Some further explanations have to be given for this table. In Greece and Luxemburg no specific standards are existing; both countries use standards of other countries. Greece is developing its own standards.

The other ten countries all have standards for rural roads. Only five countries have standards for urban roads, which are non mandatory in four cases (Denmark, Germany, The Netherlands and the United Kingdom), but which are mandatory for Italy. This seems a matter of competence: the national state is in general responsible for the national network which is of reduced length and of "high" quality. It is relatively easy to

motorways and express roads. The rest of the network is under the responsibility of regional or local administrations. As there are many different administrations in one country, road design differs a lot from one to the other situation, which is mostly due to the surrounding conditions that are differing so much. The road design standards for urban roads are therefore in most of the cases guidelines or recommendations. It is not clear what the Italian situation for urban road design standards is like. In all ten countries, road design standards of the rural network apply to urban areas as far as urban roads form part of the national, state-owned, network.

The situation concerning road design standards for rural areas is even more complex. A common practice in all countries, also in Greece and Luxemburg, is the appliance of standards through project approval. If there are deviations from standards, the project approval assures there is some control. According to the owner of the road, this approval is ministerial or given by a regional or local administration.

Standards in Denmark and Ireland are non-mandatory. This is also the case concerning non-motorways in The Netherlands, for which a separate set of standards are existing, and concerning the rural roads of the local network in Portugal. There, the difference is that the same standards as for the national network are used, but then not on a mandatory base, but more as guidelines. For all four mentioned countries, deviations have to be well argued.

Belgium has mandatory standards for both the national road network and for the regional (Flemish and Walloon) networks. In France and Spain mandatory standards are existing for the national network. These standards are mostly used by the regional authorities (départements in France, the countries in Spain) as well. In Spain, standards have to be approved by the Ministry in a long legal procedure. Some standards remain (voluntary) guidelines only.

Two special situations are existing in Portugal and the United Kingdom. In Portugal, the standards for the national road network that are used for the local network have a special system for deviations. If "normal" maximum or minimum values can not be met, or only by engaging high amounts for construction costs, "absolute" maximum or minimum values are applied. This system is also used in the United Kingdom. There a three tier system is used: desirable minimum standards, relaxations and departures. For relaxations of the desirable minimum standards no ministerial approval is necessary, but conditions for relaxations are formulated in the standards. Departures have to be approved by the Ministry (Overseeing Department).

The discussion on the status of the standard is an essential one. A designer of a road relies upon an approved, mandatory standard. If the information contained in the standard is insufficient to judge the consequences of deviations, it will be difficult to make a design in which the road safety component is well balanced.

In Europe, different approaches to this problem are existing: project approval, but uniform application can not be guaranteed in this way;

- status of the standard: mandatory standards , guidelines , recommendations, ..., but generally the designer is confronted to a lack of material to make a well balanced design;
- the two (Portugal) or three (United Kingdom) tier technique, which can give the designer more insight on the standard.

It can be recommended to look for a best practice concerning the existing approaches. The safety component would certainly be enhanced.

15. Annex I: Addresses where to order road design standards or persons to be contacted

1. Belgium

National administration:

Ir.K.Tacq
Ministerie van Verkeer en Infrastructuur
Bestuur van de verkeersreglementering en de infrastructuur
Directie wegen normen en databanken
Residence Palace
Wetstraat 155
B-1040 Brussel

Flemish region:

Ir.J.Vandeputte
Verkeerstechnische Dienst
Vlaams Gewest

Walloon region:

Ir.M.Peeters
Service Traffic
Région Wallonne

2. Denmark

Vejdirektoratet
Niels JuelsGade 13
1020 Copenhagen K

3. France

SETRA
46 Av. Aristide Briand
92223 Bagneux CEDEX

CETUR
Av. Aristide Briand
92223 Bagneux CEDEX

4. Germany

Forschungsgesellschaft für Strassen- und Verkehrswesen
Arbeitsgruppe Strassenentwurf
50973 Köln
Postfach 50 13 62

5. Greece

Information on the development of road design standards in Greece were obtained from:

Prof.G.Kanellaidis
National Technical University of Athens
Faculty of Civil Engineering
Department of Transportation and Engineering
5, Iroon Polytechniou Str.
Zografou Campus 157 73

6. Ireland

An Foras Forbartha
The National Institute for Physical Planning
and Construction Research
St.Martin's House
Waterloo Road
Dublin 4

7. Italy

Consiglio Nazionale delle Ricerche
Piazzale Aldo Moro , 7
Roma

8. Luxemburg

Information on the use of road design standards in Luxemburg was obtained from:

Mr.L.Nillis
President of P.R.I.
75, rue de Mamer
L-8081 Luxemburg

9 . The Netherlands

CROW
Galvanistraat 1
Postbus 37
6710 BA Ede

10.Spain

The Spanish road design standards were obtained from:

Mr.L.Serret
Consejero Técnico de Relaciones Internacionales
Dirección General de Carreteras
M.O.P.T.M.A.

11. Portugal

Ministério das Obras Públicas Transportes e Comunicações
Junta Autonoma de Estradas

12. United Kingdom

HMSO Publications Centre
PO Box 276
London SW8 5DT

Further information was obtained from the library of:
TRL, Transport Research Laboratory
Old Wokingham Road
Crowthorne
Berkshire RG11 6AU