Road Safety Audits in Europe

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1. Regulatory Framework
2. Features and Deployment
3. Methodological criteria in the road lifetime
4. Examples

The Directive 2008/96/EC: An integrated approach

- Vehicle Safety
- Driver's behaviour
- Road Infrastructure

- Acknowledge the role of the Road Infrastructure
- Recognise the importance of the TERN
- Set appropiate tools and procedures for improving safety
  - Road Safety Impact Assessments
  - Road Safety Inspections
  - Road Safety Audits
  - Best Practices
  - Guidelines
  - Research

Definitions: Road Safety Audits & Inspections

- ***Audit***: independent detailed systematic and technical safety check relating to the design characteristics of a road infrastructure project and covering all stages from planning to early operation

- ***Inspection***: ordinary periodical verification of the characteristics and defects that require maintenance work for reasons of safety

FEATURES & DEPLOYMENT

- Transposed in National Legislation (19/11/2010)
- Applies to TERN & EU financed roads (mainly motorways)
- Other roads (voluntary to MS)
- Examples of transposition timings:
  - I, B (W/FL), F, LV, NL, P, E, S, RO – on time
  - Later transposition: CZ, PL, EST

Benefits of Road Safety Audits

- Reduction of the risk of accidents occurring in the future as a result of unintended effects of the design of road schemes
- Reduction of long-term costs associated with a planning decision
- Minimising the risk of accidents occurring in the future as a result of planning decisions on new transport infrastructure schemes
- Enhancing the awareness of road safety needs among policy-makers and scheme designers

Stakeholders involved in Road Safety Audits

- ✓ **Client**: organisation responsible for the project (i.e. Road Authority)
- ✓ **Designer**: person or team commissioned by the client to develop the road schemes
- ✓ **Auditor**: person or team commissioned by the client to carry out the audit (at least 2 people)

Stakeholders involved in Road Safety Audits

Step	Client	Designer	Auditor
Identify project or road in-service to be audited	✓		
Order and finances the audit	✓		
Select RSA team	✓		
Provide all documents and background information	✓	✓	
Conduct a pre-audit meeting to review project information	✓	✓	
Review all document and perform field observation under various conditions			✓
Conduct audit analysis and prepare report of findings			✓
Present audit findings			✓
Prepare formal response		✓	
Implement the changes	✓	✓	

Article 9: **Appointment and training of auditors**

1. Member States shall ensure that, if they do not already exist**, training curricula for road safety** auditors are adopted by 19 December 2011.
2. Member States shall ensure that where road safety auditors carry out functions under this Directive, they undergo an initial training resulting in the award of a **certificate of competence,** and take part in periodic further training courses.
3. Member States shall ensure that road safety auditors hold a certificate of competence. Certificates awarded before the entry into force of this Directive shall be recognised.
4. Member States shall ensure that auditors are appointed in compliance with the following requirements:

a) they have **relevant experience or training** in road design, road safety engineering and accident analysis;

b) from two years after the adoption by the Member States of the guidelines pursuant to Article 8, **road safety audits shall only be undertaken by auditors** or teams to which auditors belong, meeting the requirements provided for in paragraphs 2 and 3;

c) for the purpose of the infrastructure project audited, **the auditor shall not at the time of the audit be involved in the conception or operation** of the relevant infrastructure project.

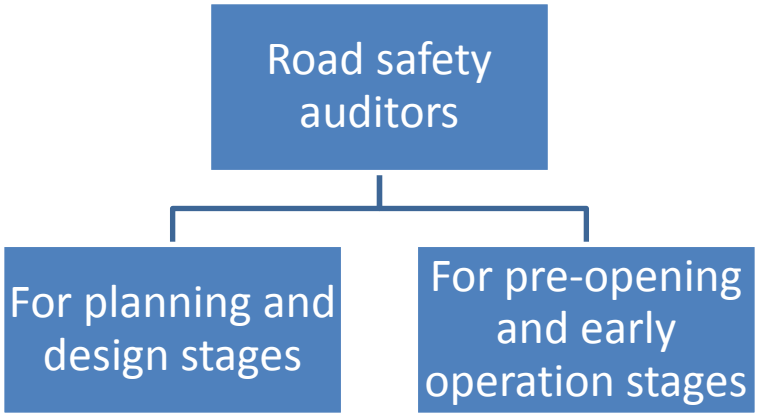
Requisites:

- ✓ Having attend to a **road safety auditor training course**; success in exam
- ✓ Aptitude exam
- ✓ **Independent** from the design team

Next steps:

- ✓ Initial certificate, 5 years duration
- ✓ Continuous training program

Methodological Criteria in the road lifetime



Methodological Criteria

Stage 1: Draft design (PLANNING)

Why road safety audits at this stage?

- Assessment of the nature and extent of the scheme (i.e. route options, number and type of intersections)
- Include all users
- Special treatment to specific spots and identification of non-identified ones
- Relationship to road network (consistency, dangerous sections, etc)

Methodological Criteria
Stage 1: Draft design (PLANNING)

- Geographical location (e.g. exposure to landslides, flooding, avalanches), seasonal and climatic conditions and seismic activity;
- Types of and distance between junctions
- Number and type of lanes;
- Kinds of traffic admissible to the new road;
- Functionality of the road in the network;
- Meteorological conditions
- Driving speeds;
- Cross-sections (e.g. width of carriageway, cycle tracks, foot paths);
- Horizontal and vertical alignments;
- Visibility;
- Junctions layout;
- Public transport and infrastructures;
- Road/rail level crossings

Methodological Criteria

Stage 2: Detailed design stage (DESIGN)

Why road safety audits at this stage?

- Follow-up completion of previous initial criteria
- Definition of horizontal and vertical alignments and junction layout
- Last check of all aspects before road construction
- Interaction between all infrastructure elements

Methodological Criteria
Stage 2: Detailed design stage (DESIGN)

- Layout
- Coherent road signs and markings
- Lighting of lit roads and intersections
- Roadside equipment
- Roadside environment including vegetation
- Fixed obstacles at the roadside
- Provision of safe parking areas
- Vulnerable road users (e.g. pedestrians, cyclists, motorcyclists)
- User-friendly adaptation of road restraint systems (central reservations and crash barriers to prevent hazards to vulnerable users).

Methodological Criteria

Stage 3: Pre-opening

Why road safety audits at this stage?

- In case no audit has been completed previosuly, and mainly as last check before users circulate
- Perfect interelation between all infrastructure elements
- Verification that roads has been built as iniatially designed
- Visibility during the night
- Some hazards not identified previously
- Check roads marking s and signs

Methodological Criteria

Stage 3: Pre-opening

- Safety of road users and visibility under different conditions such as darkness and under normal weather conditions
- Readability of road signs and markings
- Condition of pavements

Methodological Criteria

Stage 4: Early operation

- Assessment of road safety in the light of actual behaviour of users

Concluding remarks

- ✓ Audits are completed as checklist
- ✓ Audits at any stage may involve the need to reconsider criteria from previous stages
- ✓ Audit report: List of recommendations to improve the design

Example of RSA checklist

Sight, Visibility, Lighting Question	Stage 1	2	3	4	Type of roads
Is visibility and recognisability of all traffic facilities guaranteed? (e.g. accesses, crossings, public transport stops, traffic islands)		x	x	x	AR
Is stopping sight distance guaranteed along the entire section/on all approaches to junctions?		x	x	x	AR
Is good visibility ensured at the junctions, and are the required sight triangles free of obstruction?		x	x	x	AR
Can sight be obstructed by traffic, parked vehicles, or by fixed obstacles?		x	x	x	AR
Is lighting required/appropriately designed?		x	x	x	AR
Is the lighting of special situations (transition zones, changes in cross section, junctions, crossings) required / appropriately designed?		x	x	x	UR
Do remaining unlit areas present potential problems?			x	x	UR
Does the ambient lighting present any special requirements?			x	x	AR
Are anti-dazzle screens required?		x x	x x	x x	MW RR

Roadside equipment, Passive Safety Installations Question	Stage 1	2	3	4	Type of roads
Are game fences / facilities for crossing animals required / correctly determined?		x x	x x	x x	MW RR
Are obstacles avoidable / at a safe distance from the road / safeguarded (masts, abutments, walls, bridge railings, trees etc.)?		x	x	x	AR
Are passive safety devices correctly located and appropriately designed (beginning and end, barrier posts, distance between stanchions, stability, depth of stanchions)?		x	x	x	AR
Are special barriers for motorcyclists necessary?		x	x	x	RR
Can vegetation/roadside installations lead to unwanted optical leadings?		x	x	x	AR
Does any vegetation / roadside installation obstruct sight?		x	x	x	AR
Have sufficient measures been taken to prevent rockslides?			x	x	AR
Is visual contact motorist-pedestrian-cyclist restricted by vegetation?		x	x	x	UR
Will growth of vegetation lead to safety problems in future, (e.g. obstructed sight, trunk diameter greater than 8 cm, light and shadow effects, leaves on the road)?		x	x	x	AR

AR = All roads, UR = Urban roads, RR = Rural roads, MW = Motorways,

Stage 1 = Feasibility stage, Stage 2 = Preliminary design change, Stage 3 = Detailed design stage, Stage 4 = Before opening stage

Example of RSA checklist

Road Signs, Markings Question	Stage				Type of roads
	1	2	3	4	
Are the road markings/signs clearly recognisable and understandable and corresponding to the general road design?			x	x	AR
Do all signs and markings correspond without any contradictions?			x	x	AR
Are no-stopping zones required/appropriately designed/located (e.g. rest areas, accesses, junctions)?			x	x	AR

Junctions – Traffic Signals Question	Stage				Type of roads
	1	2	3	4	
Are the traffic signals clearly recognisable (at all weather and light conditions)?		x x	x x	x x	UR RR
Have the locations for the signals been selected correctly (additional signals, overhead signals)?			x x	x x	UR RR
Are advanced warnings planned for traffic signals that cannot be seen in time?			x x	x x	UR RR
Can perspectives that appear to be continuous (passage effect) be prevented/interrupted by highlighting the nearest signals?			x	x	UR
Are left-turning movements / fast driven approaches signaled separately?		x	x	x	RR
Are phase modifications required for pedestrians and cyclists (esp. handicapped persons)?			x x	x x	UR RR
Is the maximum delay reasonable for cyclists and pedestrians?			x x	x x	UR RR

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Example of RSA recommendation report

4.1. Alignment

4.1.1. **Problem**: The relation alignment (balanced relation of radii) has not been adhered to (radius R = XXXm connecting with a straight line).

Recommendation:
An arc with radius R =XXXm should be selected in accordance with RAS-L (1995).

4.1.2. **Problem**: unbalanced relation of radii (km x+zzz)

Recommendation:
Checks should be made to see if the selected compound curve (R1 = XXX m, R2 =XXX m) can be exchanged for an arc.

4.1.3. **Problem:** The selected cross falls are clearly above or below the cross falls prescribed by XXXX; the deviations are not comprehensible.

Recommendation:
Check cross falls

Example of RSA recommendation report

4.2. Junctions

4.2.1. **Problem**: Generally, the selected junctions are not fulfilling the capacity criteria .

Recommendation:
The junction types should be checked

4.2.2. **Problem**: Junction 2 has a disadvantageous geometry based on the neighbouring properties.

Recommendation:
Whether or not junction 2 is required should be checked. Connection via the neighbouring junctions should be weighed up

4.2.3. **Problem**: Due to the high volume of turning traffic, at the first junction, for example, the selected lengths of the left-turn lanes are probably too short (insufficient storage length, insufficient deceleration length).

Recommendation:
The left-turn lanes at the planned junctions should be checked with regard to the predicted traffic volume (movement volume plans).

Большое спасибо

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