



Support for implementing measures for the South East Europe Core
Regional Transport Network Multi Annual Plan 2008-2012
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WYG International part of the WYG group
creative minds safe hands



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SAMPLE ROAD SAFETY AUDIT REPORT

Annex 3 to Road Safety Audit Manual

(FINAL)

July, 2009

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Sample Road Safety Audit Report

(for confidentiality reasons
the specifics of the project are not presented)

Motorway M ...
Section from –
Subsection Interchange km ...+... – ...+...

Photograph or site map of location or section

Auditor

Team Leader: Dipl.-Eng. Lutz Pfeiffer,
Road Safety Auditor

Assisted by: Dejan Jovanov, PhD

Team Members: ...
 ...
 ...

Date: ddd/mmm/yyyy

General project details

Project description: Motorway M ... (E ...),
Section from -,
Subsection
km ...+... - ...+..

Client:

Designer:

Design phase/Audit phase: Preliminary design

Date of creation:

Audited documents:

- Layout drawing and longitudinal profile -
(sc. 1:2500 – drawing No. 3.3.2.5)
- Longitudinal profile of the interchange ramps –
(sc. 1:200/2000 – drawing
No. 3.3.2.2 and 3.3.2.3)
- Typical cross section
(sc. 1:50/100 – drawing No. 3.3.4)
- Signalization plan
(sc. 1:1000)

Inspection of the section: No

Peculiarities: Earlier planning phases have not been audited

Specific project details

| | |
|----------------------|---|
| Project description: | Motorway M ... (E ...), Section from –, Subsection km ...+... – ...+... |
| Type of project: | New design |
| Length: | ... m |
| Cross section: | Typical Shoulders 1.00 m Typical emergency lane 2.50 m Typical outer bordering lane 0,20 m Typical width of lanes 2 x 3.50 m Typical inner bordering lane 0.50 m Typical median width 4.00 m Typical width of lanes 2 x 3.50 m Typical outer bordering lane 0,20 m Typical emergency lane 2.50 m Typical inner bordering lane 0.50 Typical Shoulders 1.00 m |
| Traffic volume: | n.a. |
| Design speed: | $V_E = 120$ km/h |
| Legal speed | $V_I = 100$ km/h |
| Guidelines: | The Audit was performed with the SEETO Road Safety Audit Manual, different European guidelines and actual recommendation for a safe road design like the PIARC Road Safety Manual. |
| Construction costs: | n.a. |

Audit result

Preface

The audited project contains the construction of a section of a 4 lane motorway.
In the audited subsection contains also the motorway interchange

The findings of the RSA will be presented in two parts, the first part contains identified problems and the second are remarks. This procedure is following the RSA Manual for the SEETO Participants.

The following points were established during the audit of the above mentioned project:

➤ **PROBLEMS:**

Function, design and operating elements

No problems are identified, please see chapter remarks.

Cross section

- (1) The typical width of the verges is 1 m. Especially regarding the needs of the passive safety installation this dimension should be checked. In addition the verges should be stabilised with gravel to ensure the necessary stability in the case of an accidentally use by cars and trucks.
- (2) Regarding the drainage of the road the RSA has identified problems at km ...+... of the ... There is the turning point of the direction of the cross fall of the right carriageway (crossfall 0). The design longitudinal fall of 0.4 % is not sufficient to ensure a safe drainage of the carriageway and should be increased (pls. see mark "A" in the sketch last page).

Alignment

No problems regarding the motorway, for further comments please see "interchange"

Interchange, Intersection

- (3) The Speed difference at interchange ramp 3 ("krak 2") is too high (from 100 km/h to 40 km/h, pls. see mark "B" in the sketch last page). The Radius of 30 m is too small for 40 km/h it should be bigger (design solution for "krak 2" should be analysed for accommodate a speed of 60 km/h). To compare the needs the minimum radius was checked with the PIARC – design software for the calculation of superelevation. The result is the need of at least a radius of 42 m for the legal speed of 40 km/h.
- (4) The ramp 4 ("krak 4") is designed with large radii, that can lead to an unacceptable and risky speeding (pls. see mark "C" in the sketch last page). The Radius of 30 m is too small for 40 km/h it should be bigger (design solution for "krak 2" should be analysed for accommodate a speed of 60 km/h). To compare the needs the minimum radius was checked with the PIARC – design software for the calculation of superelevation. The result is the need of at least a radius of 42 m for the legal speed of 40 km/h.
- (5) Very difficult is also the design of the merging of the ramps (pls. see mark "D" in the sketch last page). It could be possible, that driver will use accidentally a ramp in the wrong direction. With a curbed median this could be avoided. Furthermore the driver which is using the ramp 4 should give priority to the driver from ramp 1 but the sight condition are insufficient (small angle). This should be redesigned.
- (6) Very difficult is also the design of the merging of the ramps (pls. see mark "D" in the sketch last page). It could be possible, that driver will use accidentally a ramp in the wrong direction. With a curbed median this could be avoided. Furthermore the driver which is using the ramp 4 should give priority to the driver from ramp 1 but the sight condition are insufficient (small angle). This should be redesigned.
- (7) For all ramps with 2-way traffic an analyse regarding the width in the curves is necessary. For example in the curve of the ramp 4 (please see mark "E" in the sketch) for the speed of 40 km/h the designed width of 7.7 m should be checked and revised (The auditors made a comparison with a PIARC design software from the PIARC Road Safety Handbook and the result for the

meeting of two single trucks is 8.7 m!)

- (8) With two intersections is the interchange connected with the adjacent road network. The presented design should be improved regarding the road safety.

The first intersection (pls. see mark "F" in the sketch last page) is designed as channelized intersection with 3 island. For the prognosis of the traffic volume is this design to large and leads to high speed from the secondary direction which should give way. The driver from and to the motorway have in that case the right of way. At least a reduction of the provisions of the secondary leg is recommended, there is no need for right turning lanes.

The second intersection (pls. see mark "G" in the sketch last page) is contrary to the first not designed as channelized intersection. Every leg is designed in the same way with left turning lanes. The right of way is not supported by design. In the opposite to the regulations in front of this intersection is there not anymore the priority given to the users of the motorway. This could be unexpected to the driver and could lead to accidents.

In the link between the two intersections the driver will pass the overpass-bridge over the motorway. The crest curve radius is very small ($R = 1000\text{m}$ – mark "H"), acceptable for this design with the low visibility is only a legal speed of 40 km/h (but better would be a redesign).

To improve the whole situation both intersection should be changed, two roundabouts would be safer and will support the speed limits by design.

Traffic Signing, Marking, Lighting

- (9) At least four additional speed limit signs at intersection motorway section (right carriageway to ... at km ...+... and ..., left carriage to ... at km ...+... and ...).

In addition add chevron signs in curves for secondary roads (at interchange)

- (10) Because of the rough alignment of the ramp 4 in the whole length a speed limit of 40 km/h is necessary.

Civil engineering structures

No problems are identified

➤ **REMARKS:**

Function, design and operating elements

- (11) The speed management of the motorway section should be checked. According to the design documentation a design speed of 120 km/h was used, but the legal speed is planned with 100 km/h. It is no clear if this is really necessary and in addition we expect a lack of speed acceptance.
- (12) To ensure a good performance of road safety it is recommended to have a obstacle free zone of about 9 m beside the road. If this is not possible sufficient passive safety installations should to be foreseen.
We found in the audited documents no information where the passive safety installations will be installed. In the next design stage detailed drawings with such information should be presented.

Interchange, intersection

- (13) The organisation of the pay toll station is not clear understandable. The design parameters, sight condition and organisational principle should be seriously checked during the next design stage.
- (14) In the inner area of the intersection a maintenance base is foreseen. The access point beside the toll station should be checked to ensure a safe access and exit to the base.
- (15) The length of acceleration and deceleration lanes should be checked in the next design stage. Obviously are there different length foreseen, this is not understandable for the auditors.

* * *

General remarks

- (16) For the next project steps and future projects it is recommended to use European Guidelines for passive safety installations.

Appendix: Sketch