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D 3.1 Road Safety Inspection Schemes Review

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Review of the RSI schemes across European Countries

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1 Introduction

The objective of this report is to give an overview of the different approaches and methodologies of Road Safety Inspection (RSI) in European countries.

The degree of implementation of RSI varies across Europe. While some countries have already published handbooks and guidelines, other countries have not even started the process of implementation. In this document, the implementation status of each country will be described as well as the different approaches in the countries. In addition to the EU-member countries Norway and Switzerland have been included, along with some information on RSI in Australia and New Zealand. A summary of the recent PIARC RSI Guidelines is also included.

Firstly, the European Directive on Road Infrastructure Safety Management will be described in order to provide a better understanding of the legal basis for the safety inspections in the European Union. After that the description of the approaches to RSI follows. The recent information about the RSI procedures is available for 25 European countries, from which two countries are not a member state (Norway, Switzerland) of the European Union. The information about these countries is based either on the methodological guides or handbooks issued by the particular country, or on the e-mail responses received from the authorities responsible for road safety, mostly road administrations and ministries of transport. For the following countries no information is available: Lithuania, Malta, Slovakia and Slovenia. Therefore the information for these countries is based on the project *Ripcord Iserest* conducted by Austrian Road Safety Board (*Kuratorium für Verkehrssicherheit*), which also presents a review of the approaches of RSI by different European countries and has been published in 2005.

In this report the road safety inspection procedures are described with an emphasis on the steps for conducting RSI, the composition of checklists and the inspection report, the qualification of inspectors and the safety issues which have to be identified during the inspection. The comparison of the various methodologies will make it possible to create a common approach in the European Union.

2 European Directive on Road Infrastructure Safety Management¹

The European Directive 2008/96/EC of the European Parliament and of the Council on road infrastructure safety management was issued on 19th November 2008 and represents a legal basis for RSI in the European Union. This EU-directive is compulsory for roads which are part of the trans-European road network (TEN). One of the reasons for issuing this directive was to ensure a high level of safety on the TEN-Network, which is of fundamental importance for the integration and cohesion of the European Union.

Road infrastructure is one of the policy areas for improving road safety and should contribute to the reduction of the number of collisions. The aim was to halve the number of road collision victims in the European Union between 2001 and 2010. Fundamental for improving the safety of road infrastructure is the establishing of appropriate procedures.

In the EU-directive it is stated that some member states already have road infrastructure safety management system that function well. These countries are allowed to continue using the existing methods if they are in accordance with the aims of the directive.

The EU-directive also says that the safety level of existing roads should be increased by investing financial resources in the road sections with the highest number of collisions and/or the highest collision reduction potential. Regular periodic safety inspections are an appropriate instrument for preventing possible dangers for all road users, including vulnerable road users, and RSI is also applied to roadworks sites.

This EU-directive defines four types of instruments which should help to improve road safety:

- Road Safety Impact Assessment
- Road Safety Audit
- Safety Ranking and Management of the Road Network in Operation and
- Safety Inspections

Within the Article “Safety Inspections” it is stated in the directive that the member states shall carry out safety inspections on existing roads in order to identify the road safety related features and to prevent collisions. These inspections should be performed periodically and by a competent entity.

¹ for more information refer to Directive EU 08/96/EC

In the EU directive “safety inspection” is defined as an “ordinary periodical verification of the characteristics and defects that require maintenance work for reasons of safety.”

The member states are encouraged to compose their own charts which should demonstrate their adherence to the requirements within the Directive, and to make them public. The member states are also encouraged to apply this directive on other national roads, which are not part of the Trans-European Road Network.

3 Approaches to Road Safety Inspection by Country in Europe

In this chapter the use of Road Safety Inspection within each country will be described separately. This report gives information about whether a legal basis for RSI exists, which steps have been taken to implement RSI, who is responsible for carrying out RSI, information about the content of the report and about checklists. The issues discussed can vary from country to country as there was not complete information available from all countries.

For some countries no recent information is available. Therefore the information for these countries is based on the project *Ripcord Iserest* conducted by Austrian Road Safety Board (*Kuratorium für Verkehrssicherheit*), which also presents a review of the approaches of RSI by different European countries and was published in 2005.

3.1 Austria²

The legal basis for RSI in Austria is the RVS guideline 02.02.34, which was published in 2007. After that a handbook ("Handbook for Carrying out Road Safety Inspection"³) was developed to supplement the guideline and support the systematisation and ensure a standardised and structured approach for this instrument in Austria. The implementation of RSI is not compulsory at present, but it will become compulsory (for the roads which are part of the trans-European road network) when EU-directive will enter in force on 19th December 2010. There are no consequences in cases of non-performance designated at present.

In Austria, Road Safety Inspections of motorways and expressways started in July 2003. Between 2003 and 2007 several sections have been inspected by nast consulting and Austrian Road Safety Board (*Kuratorium für Verkehrssicherheit*). In the following years pilot-inspections on the secondary road network were carried out. In the course of production of the RSI handbook pilot-inspections in urban areas and municipalities were conducted.

² cf. nast consulting et al. (2009)

³ cf. nast consulting et al. (2009)

According to the RVS guideline, RSI can be prompted in case of:

- spots where collisions often occur especially with various different collision types
- on demand, for example:
 - based on special accident analysis reports carried out by road authorities (for example follow up request due to fatal accidents with ramped terminals of guard rails, accidents involving trees or road side furniture),
 - due to high public alert as a consequence of media interest
 - upon request of authorised experts
- upon completion of new road sections

The responsibility is as follows: the initiation of an RSI can be made by the transport authority or by the authority responsible for maintaining the road. The road safety inspection itself is the responsibility of the RSI Inspectors. The inspectors are also obliged to organise the field inspection, inspection by vehicle and obtain the necessary documents. They also draft the inspection report.

Inspectors must be qualified experts with long experience in transport safety, transport technology and transport planning. Furthermore, an experience in road construction, road maintenance and traffic management is necessary. The independence of the inspectors must be guaranteed and is of course an important requirement for an unbiased and impartial inspection. There is mandatory training for Road Safety Inspectors in Austria since November 2009, carried out by *FSV* (Österreichische Forschungsgesellschaft Straße-Schiene-Verkehr – Austrian Association for Research on Road-Rail-Transport). This training takes one week, and also includes the subject of RSA.

The inspection can be carried out by a team or only one inspector.

In Austria the RSI consists of the following four steps:

- Preparation work
- On-site inspection
- Report drafting
- Implementation of the measures and monitoring of results.

Preparation work includes work such as analysing the documents and studying the collision situation. Within the framework of a Road Safety Inspection an analysis of the collision-frequency situation should be done as well.

The on-site inspection and inspection by vehicle is imperative. The participation of the police department and the road maintenance authority is helpful, because problems can be discussed directly at the particular road section. It is also recommended to document the inspected road section by video recording or by photographs.

Before or after the field inspection an on-site-discussion will be conducted with all personnel involved, as an aid to completing all the checklists. In addition to day-time inspections, it is recommended to carry out night-time inspections as well.

The Report contains the following chapters:

- “Basic information”
- “Results”
- “Assessment” and
- “Summary”

The chapter “Basic information” will contain general facts about the inspected road section, for example: road category, length of the section, names of inspectors etc.

The chapter “Results” is divided into a checklist with a short description of the important deficits and then a detailed assessment. Checklists are an important element of the RSI and serve as the basis for the examination and field inspection. All criteria contained within the checklists has to be examined. The compilation of the checklists guarantees that during the vehicle based inspection all necessary criteria have been examined.

There are extra checklists for different road categories:

- For motorways and express ways
- For rural roads and (Austrian checklist in Appendix 1)
- For roads in urban areas,

Specific checklists for junctions and intersections have also been developed:

- Intersections with traffic lights
- Intersections without traffic lights.

The structure of all the checklists for the different types of roads are the same. For example, the following categories are common to all: visibility, cross section, drainage, road surface condition, road marking, road signs, et al. (see Figure 1).

Check list for rural roads		Safety relevance		
		high	medium	low
D Equipment				
D1 Road signs/Directional signs	Deficit:			
	<i>Problem:</i>			
D2 Road marking	Deficit:			
	<i>Problem:</i>			

Figure 1: Part of the check list for rural roads⁴

In the chapter “Assessment” the likely problem spots and safety deficits are described and measures for improvement are suggested. The suggested measures are evaluated in two ways:

- The safety relevance has to be assessed, by filling in a chart with appropriate relevance in a spreadsheet. Measures, which have high safety relevance, are highlighted in red, measures with medium safety relevance yellow and measures with low safety relevance have a green colour (see Figure 2).
- The timing of the measures has to be specified, by filling in a box in a spreadsheet with the appropriate time demand: short-term/medium-term/long term (see Figure 2).

Finally, in the chapter “Summary”, a short summary with the most important results of the RSI will be provided. The appendix contains a section with photos, as well as the minutes of all the meetings.

As the last step of the RSI, Implementation and Monitoring, the inspectors have to discuss the results of the RSI with the road maintenance authority and have finally to document it in an RSI report. In the monitoring list every single measure with the exact location is described. Furthermore, it has to be documented who is proposed to carry out the works to rectify identified safety issues, (including the name of the company, when it will be done, in which time span, as well as a rough cost estimate).

⁴ cf. nast consulting et al. (2009)

If needed, further categories can be added by the inspector during the inspection.

<i>expressway, km XX – km YY</i> <i>Measure suggestions Road Safety Inspection</i>				<u>Safety relevance of the measure:</u>		high		
						medium		
						low		
Nr.:	Local allocation	Problem / deficit	Measure- suggestion	Expected improvement	Implementation			
					Short- term.	Medium -term	Long- term.	
					X			
							X	

Figure 2: Safety Relevance assessment⁵

EVES (Electronic Safety Recording System)

Nast consulting developed software to carry out the road safety inspection. The application fields of the system were divided into two groups, depending on the devices on which the system was supposed to run. For the higher road network, where the inspection is performed by car, the system has to run on a notebook computer. For the lower road network (e.g. cycle paths, footpaths et al.), where the inspection is performed on a bike or on foot, the system has to run on a mobile device. The focus of this software is mainly on improving time consuming parts of current practices.

This system is able to

- easily register safety relevant events during the inspections
- automatically locate the gathered events using GPS
- provide the user with a clear user interface to give an overview of the registered events
- facilitate post-processing of the registered events by providing editing by means of video synchronization
- facilitate reporting by automatically generating reports according to pre-defined structures

Figure 3 shows the graphical user interface for the survey task. The area on the right side contains the map and GPS data, and also the list of already surveyed areas. If you click on the icon for the event, a GPS point is automatically registered, as well as a video/photo being taken.

⁵ cf. *nast consulting et al.* (2009)

The main goal during the survey is to allow quick interaction of the inspector with the system, so that the inspector can still concentrate on the road. It is also possible to record an audio memo of all registered events. After the inspection itself, post processing (see Figure 4) is an important task of RSI, therefore software tools, such as *Eves* help to carry out the task quickly. *Eves* provides further features to make the task of controlling and editing the registered information easier. An additional facility allows for easy compilation of final reports.

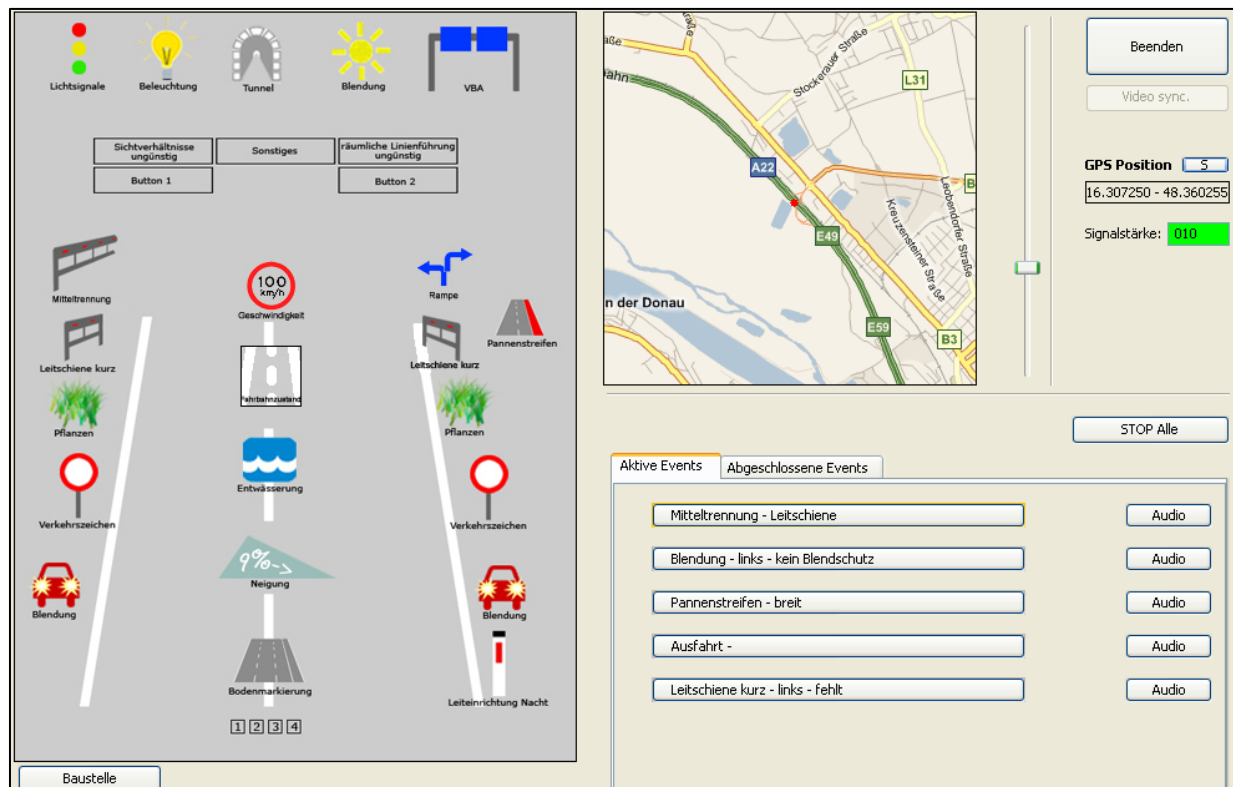


Figure 3: Screenshot of the graphical user interface of *Eves* during an inspection⁶

⁶ cf. nast consulting, screenshot of the user interface software *Eves* (2008)

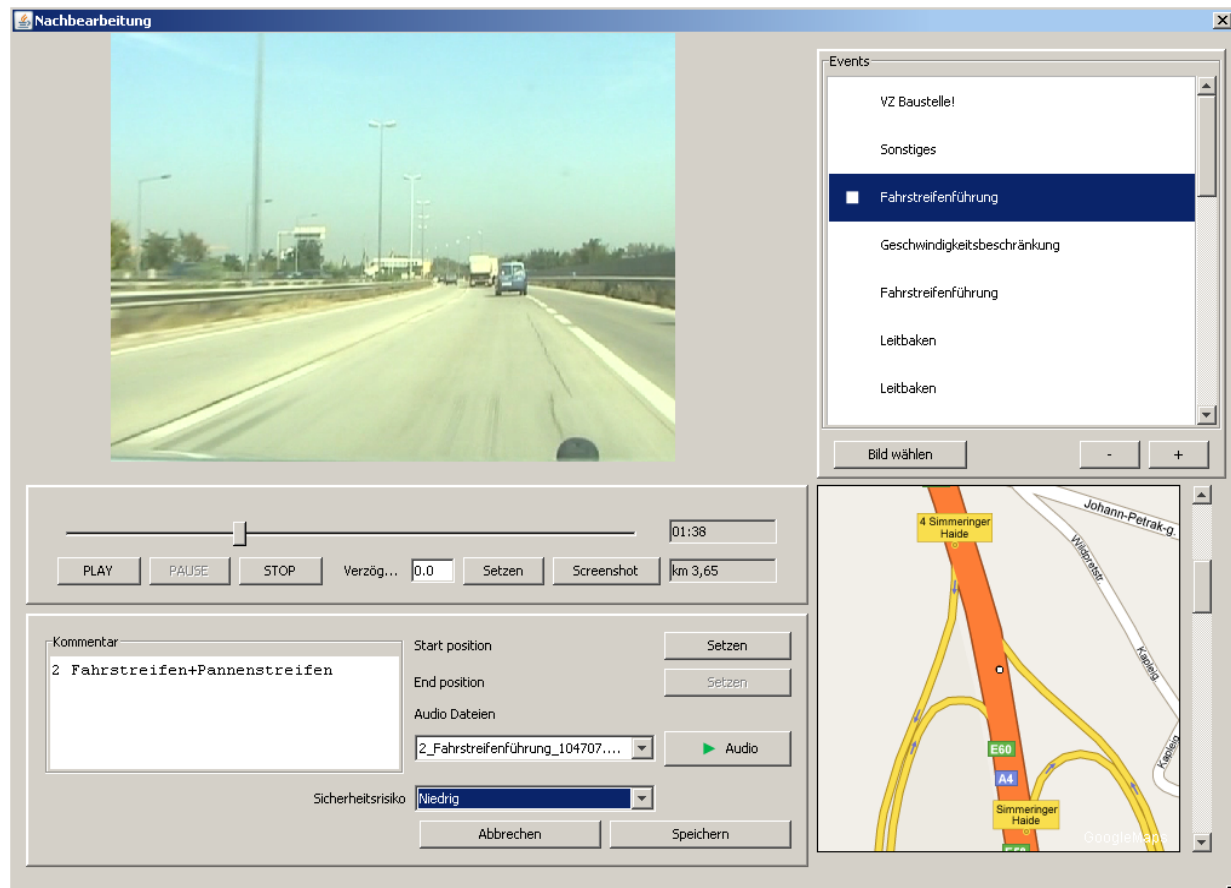


Figure 4: Screenshot of user interface for post-processing⁷

3.2 Belgium⁸

In Belgium there is an procedure similar to RSI, which also uses checklists. This procedure is not applied to the entire road network, but at high accident concentration sections or other sites where a demand from local authorities is received.

There is no different methodical approach of RSI due to different road categories. No legal basis for RSI exists in Belgium, and the implementation is not compulsory. There are no consequences in case of non-performance. The road administration is responsible for ordering, financing and carrying out safety inspections. It is recommended that the RSI should be carried out by someone who was not involved in the original road project, so the inspector can be independent. The qualification criteria for inspectors are not specified, but the qualification should be as broad as possible and should take into consideration all aspects of mobility.

⁷ cf. nast consulting, screenshot of the user interface software Eves (2008)

⁸ cf. Lutschounig/Nadler (2005)

3.3 Bulgaria⁹

In Bulgaria at the moment there is no established practice of regular inspections for road safety of the road infrastructure. Currently inspections are carried out in places with a concentration of collisions. There is no structured approach for this procedure.

Bulgaria as a state-member of the EU has agreed to implement the Directive of the EU for the road safety by the end of 2010. They have formed an interagency group of experts to work on implementation of the Directive, and in particular the audit and inspection of road safety of the road infrastructure.

3.4 Cyprus¹⁰

In Cyprus Road Safety Inspections have been carried out since April 2006.

The inspection team includes an engineer and a technician from the Transport Planning Section of the Public Works Department (PWD) and a representative of the district engineer. On some occasions, a representative of the Design Section of PWD attended RSI as well.

There is no legal basis for RSI in Cyprus and RSI are not compulsory. Because of the new *EU directive on Road Safety*¹¹ the government is anticipating a new legal framework which will apply to RSI.

A structured approach was decided once the RSI program started in 2006. An initial checklist was created and is adjusted accordingly depending on each road; for example mountainous roads versus coastal roads etc. This checklist is a tool to assist the RSI team in executing road safety inspections.

For financing and carrying out RSI funds for road maintenance from the Public Works Department are used. The inspected roads so far are under the jurisdiction of the Public Works

⁹ Information based on an e-mail response from Road Infrastructure Agency, Republic of Bulgaria, received 15.05.2010

¹⁰ Information based on an e-mail response from Mr Alexis Avgoustis, Ministry of Communications and Works, Public Transport Department – Transport Planning Section, received 03.02.2010

¹¹ for more information refer to Directive EU 08/96/EC

Department, therefore PWD funds are used. Where roads do not fall under PWD jurisdiction, District funds are used (through the Ministry of Interior).

Although RSI started in Cyprus in 2006, with the new EU Directive a new structure will be put in place in order to better organise the inspections throughout the road network. In the future the district engineers will be more involved, so they can carry out the inspections with their own teams. It is important to note that PWD staff had some basic training for executing road safety inspections through the Partners from *Roads Initiative*¹² that was organised by Ministry of Transport, Public Works and Water Management of the Netherlands.

3.5 Czech Republic¹³

In the Czech Republic the RSI instrument is not yet applied and there is no legal basis for it yet. At present simple regular maintenance inspections are carried out.

Although *Centrum dopravního výzkumu - Transport Research Centre* has developed guidelines for RSI which were published in 2009, but there is no obligation to use them. RSI are only done occasionally, when the road authority identifies safety problems such as a higher number of collisions on a certain road section. If the available budget is sufficient for solving the problem, then the authority asks for RSI.

The European Directive on Road Safety in the Czech Republic is presently in the implementation phase, but it will be applied only on the TEN-Network.

In the Czech Republic there are only a few professionals trained to carry out RSI and these are mainly traffic engineers and road safety auditors.

¹² cf. retrieved from <http://www.balticroads.org/conference25/files/goppel-m.pdf>

¹³ Information based on an e-mail response from Mr Petr Pokorný, Centrum dopravního výzkumu-Transport Research Centre, received on 31.03.2010

3.6 Denmark¹⁴

In Denmark the inspection team includes an engineer and a technician from the Transport Planning Section of the Public Works Department (PWD) and a representative of the district engineer. In some occasions, a representative of the Design Section of PWD attends RSI as well. Projects are inspected which were already audited during the design stage.

For several years traffic safety inspections has been a natural part of the yearly Black Spot system and the “Grey Road Sections” system. The technical methods used for traffic safety audit have been transferred to RSI. Road Safety Audit guidelines contain checklists, which can also be used for the inspection of existing roads. The system is not based on legal requirements.¹⁵

In Denmark results of RSI pilot projects show, that the cost-effectiveness of improvements is lower than the cost-effectiveness of well designed black-spot counter measures.

3.7 Estonia¹⁶

In Estonia RSI started in 2008, when the methodology for RSI was developed. Before 2008, for inspections of the existing road network Road Safety Audit procedures were used. RSI is not compulsory in Estonia and there is no legal basis for it. The decision about ordering RSI or not is to be made by road owner or other organisations which may be involved. Generally it is decided by the road owner when there is an indication that the road safety of a certain road section is not acceptable or if there will be a new road design. In this case RSI is more or less an input into the design process.

In Estonia check lists for RSI are used. The following criteria/attributes of the road are checked during the inspections:

- Road condition
- Roadside areas
- Visibility

¹⁴ cf. Lutschounig/Nadler (2005)

¹⁵ Information based on e-mail responses from Mr. Plovgaard, Head of Department of Danish Road Directorate, received on 17.05.2010

¹⁶ Information based on e-mail responses from Mr Reigo Ude, Head of Traffic Safety Program Division of the Traffic Safety Department of the Estonian Road Administration, received on 23.02.2010 and 25.02.2010

- Junctions
- Alignment
- Culverts
- Bridges and viaducts
- Public transport facilities
- Guardrails
- Signs
- Markings
- Parking areas
- Road works
- Road lighting

The Estonian Road Administration considers that the visibility, predictability and understandability of the road environment are the most important attributes to be considered during a RSI. During the inspection photographs are taken.

3.8 Finland^{17 18 19}

The implementation of the Directive on Road Infrastructure Safety Management will be completed in Finland in 2012 together with its transformation into the existing law dealing with state roads. Finland uses many different methods to find safety deficits, to plan and design corrective actions and evaluate the effects of them in a reliable way. Systematic road safety work has been started in Finland already in the second half of the 1970's.

In Finland, multivariate accident modelling has been applied for about twenty years. The Finnish methods to make impact assessments are called IVAR-tool and TARVA-tool. IVAR is used for big investments producing new road connections. TARVA is used for all other functions of the road authority. TARVA-tool has been evaluated internationally (in SUPREME-project) as to have a large Best Practice (PB) potential that was the best class in evaluations.

¹⁷ cf. Lutschounig/Nadler (2005)

¹⁸ Information based on an e-mail response from Ms Katharina Eder, FFG - Austrian Research Promotion Agency, received on 15.4.2011

¹⁹ Information based on an e-mail response from Ms Saara Toivonen, Finnish Transport Agency, received on 20.4.2011

More detailed information of Finnish methods are as followed:

- Road safety audits are performed for the investments on the important roads.
- Road safety monitoring is performed by regional road authorities (Centres for Economic Development, Transport and the Environment) together with inspections of road maintenance works and road investments that have been ordered from entrepreneurs. The Finnish Road Agency (FTA) has outsourced all production works of road investments and road maintenance. Road maintenance and road works are being checked periodically to confirm that they are performed in a correct way according to national guidelines.
- The monitoring checks that condition of roads, road sides, traffic signs, the sight areas, and the arrangements on road constructions sites, etc. match the guidelines and orders
- Network screening is implemented occasionally
- FTA uses a computerised system to search for "black spots" on the whole road network owned by the state. Nevertheless the FTA considers the method "black spots" as unreliable way to identify real safety problems. Instead, FTA considers the TARVA-tool more reliable in order to estimate the present safety situation and the tool is also used for impact assessments.
- Systematic safety impact assessments are carried out for big investments as well as for minor road arrangements / improving of road maintenance / speed limits etc.
- FTA does conflict studies occasionally.
- FTA monitors driving speeds on the main roads and conduct occasional researches on road user behaviour.
- FTA conducts in-depth studies of serious accidents. This activity has been carried out for almost 40 years.
- With the aid of the TARVA-tool it is possible to estimate safety effects in addition to the cost-efficiency of measures.
- The Finnish independent traffic safety organisation Liikenneturva conducts follow-up studies on road user behaviour.

The road safety monitoring in Finland is a less formal procedure than the Road Safety Inspection ruled by the EU-directive. Monitoring is performed as on-side-inspections. In addition to monitoring demand surveys of the higher standards for road lightening, the needs of updating speed limits, the higher standards for guard rails, etc. arrangements are ordered. From the viewpoint of road safety, the monitoring process is quite comprehensive and corresponds well with the goals of Safety inspection.

3.9 France²⁰

In France Road Safety Inspections are carried out periodically on the entire national road network at a three year interval. These periodical inspections have just started in 2009, after the decision of the *Inter-ministerial Committee for Road Safety* in February 2008. An extensive “Methodological Guide for Road Safety Inspections” has been published in 2008, which is the basis for this report.

The objective of the RSI is to give the road operator a tool which can help him by improving road safety. RSI in France consists of the following 7 steps:

- scheduling and request by operator
- preparation
- inspection visit
- presentation of observations
- examination of the inspection report,
- drafting the road operator’s report and
- follow-up and evaluation

The first step is the road operator’s responsibility; he has to schedule and request the on-site visit from a pool of inspectors. In the second step the road operator and the inspectors prepare the inspection visit at differing weather conditions. The next two steps, inspection visit and presentation of observations, are the responsibility of the inspectors, who then presents his findings, orally and in writing. For the remaining three steps the road operator is responsible. After studying the inspection report the road operator will prepare the road operator’s report. In the implementation of possible actions or corrective measures various authorities may also be involved, such as local officials and engineering offices.

The main part of the RSI are the inspection visits. These must be carried out by qualified inspectors, who were not familiar with the road section and therefore can take a fresh look at the situation. Such persons will see events which local operators no longer see. The road operator never participates in the visit. The inspection visit consists of a quick and practical rating of the main configurations which have registered with or surprised the road user. The inspection visit is carried out at day and night in both directions. It is carried out by car and during stops photographs are made or observations are noted.

²⁰ cf. Sétra (2008)

In the Methodological guide key challenges and known safety factors are described. There is a differentiation between two-way roads and roads with separated lanes.

The following safety factors should be inspected for two-way roads (factors for junctions - access roads and cross-sections are available in Appendix 2):

Overall legibility of the route²¹

- appropriateness of the layout and equipment for the type of road;
- consistency of road type;
- discontinuity and consistency of equipment and layout.

Bends

Geometry

- presence of an isolated bend with a small radius or a bend on an easy section (radius less than about 150 m);
- presence of a bend with a moderate radius (less than about 250 m) featuring either a dtightening radius or low grip.

Legibility

- presence of a bend with poor legibility; users do not clearly see the bend;
- inconsistent bend signage

Visibility

- presence of a bend hidden by a rise and presenting insufficient visibility of the bend (less than three seconds – MRD reference)

²¹ cf. Sétra (2008)

Roadside

Possibilities for avoidance and recovery:

- presence of grass or hard-core;
- presence of loose gravel;
- presence of a height difference of more than 6 cm between the road and the verge.

Limitating Crash Severity

- presence of obstacles in the safety zone (4 m): trees, posts, non-chamfered pipe heads, masonry, overly large sign supports, overly large guardrails, lighting columns etc;
- absence of a motorcycle barrier rail on bends with a radius of less than 250 m;
- presence of an abrupt change in level of more than 4 m;
- superfluous or improperly fixed restraint systems: unnecessary items, dangerous extremities, insufficient heights, insufficient lengths.

The inspection team consists of two inspectors. They evaluate events on the road and their environment from the user's point of view without looking at standards and regulations, therefore the visit is immediate and efficient. The role of the inspectors is not to make any judgements, they simply have to identify safety deficits and report them. The road operator is responsible for the courses of action which follows the RSI. Inspectors must attend proper training. After they have been trained, they will become part of the national pool of RSI inspectors. The inspection schedule is determined by the road operator. It is recommended to inspect a complete continuous section between two major locations.

The Inspection Report contains a "list of events", which consists, among other things, observations of the defects, comments and photographs (see Figure 5). The "list of events noted" in the Road Operator's Report also contains actions planned (see Figure 6).

List of events in increasing order					
No.	KM	Observations ⁵	Comments	RSS Criteria Affected ⁶	Photographs Thumbnails
1	1+600	Small 70 sign lost in visual pollution; blocks the footpath.	Poor legibility and visibility due to proximity of the shopping centre	L, V	
2	1+800	Trucks prohibited sign + small "directional" signs, including advertising.	Mix of sign types: interferes with signage visibility	V	

Figure 5: List of events in the Inspection Report²²

List of events noted in increasing direction						
No.	KM	Observations ¹⁷	Comments (in particular with respect to RSS criteria)	RSS ¹⁸ Criteria Affected	Photographs Thumbnails	ACTIONS PLANNED
1	1+600	70 sign small and in visual pollution; blocks the footpath.	Poor legibility and visibility due to proximity of the shopping centre	L, V		Contact the mayor (4)
2	1+800	Trucks prohibited sign + small "directional" signs, including advertising.	Mix of sign types: signage visibility	V		Contact the mayor (4)

Figure 6: List of events noted in the Road Operator's report²³

The Methodological guide also contains safety instructions for inspectors. There is also a description of the equipment needed for RSI.

²² cf. Sétra (2008) - methodological guide has been translated in English

²³ cf. Sétra (2008) - the list of events noted and the handbook were already in English language

3.10 Germany^{24 25}

Germany has several instruments which can be defined as RSI. One of these instruments is called „Streckenwartung“, an inspection to ensure the safe usability of the roads, including the control of traffic safety at work zones. The requirements for the „Streckenwartung“ are defined at the „Maßnahmenkatalog Straßenunterhaltung und Betrieb“ (package of measures for road maintenance and operation). The road authority is obliged to carry out these inspections regularly – at least weekly.

In addition, the road authorities can integrate also other methods into the road infrastructure safety management, i.e. the „Zustandserfassung und -bewertung“ (condition registration and assessment) or the so called „Verkehrsschau“ according to „VwV-StVO Verwaltungsvorschrift zur Straßenverkehrsordnung“ (Road Traffic Regulations) § 45, paragraph 3.

In addition to this legal regulations the German guidelines for road safety inspections („Merkblatt für die Durchführung von Verkehrsschauen, M DV“) distinguish 3 causes of road safety inspections with different corresponding frequencies (FGSV, 2007):

- Regular, periodic inspections performed on all roads, every 2 years on major roads and every 4 years on secondary and local roads;
- Special purpose inspections that include night time road safety inspections, railway crossing inspections, tunnel inspections, destination-sign inspections and inspections of other signs and traffic control devices taking place every 4 years;
- Ad-hoc road safety inspections performed as the need arises and that comprise signs and traffic control devices.

In general, the inspections concentrate on road signs, including road markings and traffic devices, which are important for road safety. Further hazards at the edge of the carriageway and in the roadside environment are inspected. The inspectors have to look at the junctions, road sections, and carriageway edge plus roadside environment separately. The inspection team consists of the representatives of the road traffic authority, road construction authorities and the police. The authority representatives should have the necessary qualification and knowledge of the inspected road section. Further it is recommended to include an expert who doesn't come from the region where the inspected road section is located and thus doesn't know the inspected road section.

²⁴ cf. Road and Transportation Research Association (2006)

²⁵ Information based on an e-mail response from Ms Katharina Eder, FFG - Austrian Research Promotion Agency, received on 15.4.2011

The steps are as follows: the invitation to the road safety inspection is sent by the road-traffic authority to the inspectors. It should include all necessary documents, such as the inspection schedule, a description of the planned route and a list of problem areas (if there are any). Before the inspection starts a short briefing should take place. The inspected road section has to be driven in both directions. The report must be written by the road traffic authority and contains the type of road safety inspection and the route, start and end time of the inspection, names of the inspectors and their authorities and a detailed description of each point including the precise location of the point, findings, recommendations to solve the problems and the reasons for them, as well as outstanding issues. After three months a progress review should be carried out in order to check whether the recommendations have been implemented or not.

Ad hoc road safety inspections can become necessary in the following cases: changes in or introduction of new traffic rules, opening of new routes, concentration on particular types of road user (e.g. cyclists), safe routes to schools, public transport stops, or installation and alteration of alternative routes for motorway traffic and inconsistencies in existing, long-term diversions including those for particular types of traffic. The intervals at which these inspections are conducted can vary. Depending on the topic at hand, certain experts have to attend the inspection, e.g. representative of transport provider in case of dealing with public transport stops. To ensure a proper performance of road safety inspections, road safety inspectors must have up-to-date specialist knowledge of issues relevant to road safety. Inspectors must be trained. This can be achieved through short courses and continuing training.

The inspection team has to be composed of members from traffic police, traffic and road authorities, road maintenance staff and there is the option of using external consultants if necessary.

3.11 Greece²⁶

In Greece safety inspections exist but do not fulfill the standards of RSI. They are carried out by the competent Maintenance Agencies. The legal basis is a ministerial decree which mandates maintenance agencies to respond within a very short time to reports on road damages which influence road safety.

The decisions on which road sections should be inspected are based on the budgets of the Road Agencies and they are made ad hoc. In some cases there are police reports relating to a high number of collisions on a certain road section, and the road agencies focus on this specific road section. Furthermore, there is a department for road safety in the Ministry of Infrastructure which monitors the collision frequencies, but only on the national road network. This department recommends road safety interventions on the specific road sections, based on the available budget.

Concerning the safety issues recorded by the inspections, all visually identifiable deficits are recorded. Photos are taken and occasionally videos are recorded during the inspection. A more systematic inspection takes place in the motorway concessionaire projects, where video recordings are made and measurements such as pavement roughness condition are carried out.

For safety inspections on motorways either Ministry for Infrastructure or the concessionaire is responsible, for the inspections on the rest of the National road network the Road Directorates of the County Peripheries are responsible. In Greece no methodological guide and no checklists exist.

Knowing that the European Directive on Road Infrastructure safety management will enter in force in December 2010, the Ministry of Infrastructure is considering the introduction of a methodology which will correspond with the European Directive. However it is estimated that the methodology will be introduced later than the European Directive requires.

²⁶ Information based on an e-mail response from Mr Basil Psarianos, National Technical University of Athens, received on 8.5.2010

3.12 Hungary²⁷

In Hungary an instrument called *Traffic Control Revision* was introduced in 1988²⁸, which has a legal basis. Checklists are not in use and also no standardised approach has been developed yet.

The road administration is responsible for carrying out the recommendations. The inspections have to be performed every five years, but in case of requests by police or the public an Extra Traffic Control Revision can be conducted. The inspection team should contain the following persons: delegate of police, traffic management, road authority and local municipality.

3.13 Iceland²⁹

Iceland is currently working on adopting the directive on Road Infrastructure Safety Management. During the preparation process the Icelandic Road Administration has established a new working procedure for Road Safety Inspection. However the process has not any legal basis yet as the formal adoption of the directive has not been finished.

It is planned that Road Safety Inspections will be undertaken on national roads on a regular basis every 3-5 years. The goal is to find hazardous locations and develop actions for necessary improvements. The main purpose is to prevent future accidents and decrease the severity of accidents that happen. The roads with the highest traffic volumes are inspected first. The method for RSI has been developed and tested. There are two phases.

In Phase 1 a team of three inspectors drives the road which needs to be inspected. One person concentrates on driving, the second inspector identifies safety issues of concern and the third inspector registers locations and remarks directly on a PC that is connected to GPS.

The registration system is part of the system that is used by the Icelandic Road Administration for registration of locations such as traffic signs, culverts and other road furniture.

During the process, the appropriate icon is chosen in every case. One can locate spots as well as sections of roads for which a certain situation (icon) applies.

²⁷ cf. Lutschounig/Nadler (2005)

²⁸ cf. Lutschounig/Nadler (2005)

²⁹ Information based on an e-mail response from Ms Audur Thora Arnadottir, Icelandic Road Administration (ICERA), received on 20.2.2011

After the inspection has been carried out the data is being processed: back in the office the data registered in phase 1 is copied into a central database. With the help of the special reporting tool Skyrslusmidur, one can have the results written in a Microsoft Word report. Photos can also be imported that have been taken during the inspection phase. After phase 1, only the upper part of the following report has been filled out.

In phase 2 the inspection team drives the same road again and brings the results from phase 1. In phase 2 the problem locations are examined further. Solutions and improvements are worked out and proposed. As part of the actions for example the length of proposed safety barriers, that need to be installed, are estimated. The inspectors have to estimate the amount of new filling material that is necessary to fill the ditches in question or to make embankments of roads flatter. All results are written in the lower part of the report which has been started in phase 1.

Finally, the inspection team writes a report on the results. There is a standard format for this inspection report:

- Chapter 1: Introduction - here is a description of the road that was inspected.
- Chapter 2: Inspection team - background and role of each person.
- Chapter 3: Background data - for example the road design rules, traffic counts and RSI-guidelines
- Chapter 4: Accident analysis of the road inspected. Note: This analysis is done after the inspection.
- Chapter 5: Summary of the inspection.
- Chapter 6: Estimation of costs for the improvements proposed.
- Appendix: Microsoft Word report for the inspected road; can be several pages.

Following is the list of icons that can be chosen (see figure on the next page):

Names of icons	Further instructions/explanations
Embankment too steep	The embankment is too steep (slope more than 1:3)
Sheer cliff along road	Sheer cliff (higher than 4 m) within one and a half width of the necessary safety zone.
Cliff close to road	Register the distance of the cliff from the edge of the road.
Cutting close to road	Register the distance of the cutting from the edge of the road.
Big tree close to road	Estimate the diameter of the trunk and register the distance of the tree from the edge of the road.
Single rocks close to road	Register the distance of the rocks from the edge of the road. Please note if the rocks are exceptionally big.
Rocks along road	Register the beginning and the end of the distance in question.
Water > 0,25m	Water deeper than 0,25 m along road
Ditch along road	Register the distance of the ditch from the edge of the road and also register the depth of the ditch.
Culvert > 1,5 m	Culvert with diameter bigger than 1,5m
Culvert ≤ 1,5 m	Culvert with diameter less than 1,5m
Road equipment	Road equipment, which is not passively safe, within the safety zone. Explain further which type of road equipment, f.ex. signal posts or lighting columns.
Path (for vulnerable road users)	Explain further which kind of path is within the safety zone.
Minor intersection	Explain further which kind of minor intersection.
Intersection	Explain further which kind of intersection.
Inadequate sight distance because of some fixed object	Describe further in remarks.
Inadequate sight distance because of vegetation	Describe further in remarks.
Narrow bridge	Register the width.
Bad vertical geometry	Register location at the highest point.
Safety barrier made of pipes	Register location (beginning and end).
Safety barrier made of steel, type 1	Register location (beginning and end).
Safety barrier made of steel, type 2	Register location (beginning and end).
Wire rope safety barrier	Register location (beginning and end).
Another type of safety barrier	Register location (beginning and end) and type of safety barrier.
Damaged safety barrier	Register if safety barrier is damaged or the end terminal is insufficient. Explain further in remarks.
Safety barrier is missing	Register location (beginning and end).
Rutting	Hazardous ruts in the road surface.
Sharp edge of asphalt	Hazardous edge of asphalt.
Cushion for signs	Cushion for signs with an embankment which is too steep
Miscellaneous	Something the other icons do not cover.

Figure 7: list of icons that are inspected during Road Safety Inspections in Iceland

3.14 Italy³⁰

In Italy there is a manual called “Operative procedures for Safety Inspections on Two-Lane Rural Roads”. This manual was developed by the University of Catania, and its use has spread out to all Italian provinces and the Local Agencies in Sicily, Calabria and Campania on a volunteer basis. The manual was published in 2005 and revised in 2008.³¹ It describes the road safety operative procedures adopted by the IASP³² research program. The information in this chapter is based on this manual.

The requirements for the inspection team are independence and qualification – this means that members have to be independent from design, maintenance and operation of the inspected road; so the inspectors can apply “fresh eyes” to the task.

The active participation of the client is important in the process. Discussions with the client are advantageous both for the inspection team and for the client. On the one hand the inspection team gets in-depth information about the inspected site from the client, on the other hand the client will have better understanding of the procedure and technical reasons relating to the identification of problems. The inspection team must consist of three or more people, since different backgrounds and approaches are beneficial. The exchange of ideas which can result from discussions is useful.

The manual “Operative procedures for Safety Inspections on Two-Lane Rural Roads” requires several site inspections. These are:

- Preliminary inspection
- General inspection
- Detailed Inspection and
- Night time inspection

The main objective of the “preliminary inspection” is trying to understand the general road safety conditions. The road environment is also important, because it interacts with the road and the road users. In this type of inspection at least three inspectors are needed: the driver, the front-seat inspector and the back-seat inspector. The road has to be navigated at normal speed and in

³⁰ cf. Cafiso et al. (2008)

³¹ Information based on e-mail responses from Mr. Salvatore Cafiso, Professor, University of Catania, Dept. of Civil & Environmental Engineering, received on 23.02.2010 and 01.03.2010

³² IASP - Identification of Hazard Locations and Ranking of Measures to Improve Safety on Local Rural Roads (Italian Acronym IASP)

both directions. Not more than 100km should be inspected in one single inspection. The equipment used for this inspection is a GPS receiver and a digital video camera. During the inspection a video recording is performed, on which the safety comments of the inspectors are recorded.

The main objective of the “general inspections” is to obtain information about the safety issues and their location. During a single inspection not more than 30km should be covered at low speed (about 30km/h), to allow inspectors to fill in the checklists.

Checklists contain safety problems which are usually present on local rural roads. Front-seat and back-seat inspectors, who have different views of the road, fill in different checklists. The checklists consist of two parts: part A and B. Whereas part A must be filled during the inspection, part B can be completed during the video examination in the office. Safety issues are ranked as high level problems and low level problems. In case of a high level problem the reviewer fills out the grey box, if a low level problem occurs, the reviewer fills out the blank box (see Figure 8). The evaluation has to be done for each 200m road segment.

	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
PART A										
Roadside										
Embankments										
Bridges										
Dangerous terminals and transitions										
Trees, utility poles and rigid obstacles										
Ditches										
Alignment										
Inadequate sight distance on horizontal curve										
Inadequate sight distance on vertical curve										
PART B										
Accesses										
Dangerous accesses										
Presence of accesses										

Figure 8: Check list for General Inspection: Module for Front-Seat Inspector³³

To complete the check lists as objectively as possible, basic criteria for identifying and evaluation of the safety problems were developed. For example, for the safety issue “bridges” a criteria for assessing high level problems is: “low containment barriers if high commercial vehicles traffic is present”, a criteria for assessing low level problems is: “medium containment barriers if the bridge overpasses roads or railways”.

³³ cf. Cafiso et al. (2008) - the checklist and the handbook were already in English language

In the office after the field inspection, the team analyses the video and completes part B of the checklists.

Checklists should not limit the flexibility of the procedure, so if general safety problems are identified which are not contained in the checklists, recommendations for these problems can be formulated.³⁴

In order to carry out a detailed inspection of the sites which present specific safety issues, the “detailed site inspections” are used. Within the framework of this inspection, road segments and intersections are inspected separately. The road is inspected at low speed, stopping the car at sites with the greatest safety problems. These have already been chosen during the general inspection, but if further problems are identified, they can also be “added”. The inspection is then performed by walking and observing the road features as well as the behaviour of the road users. During the inspection photographs are taken and will be included in the report. A video-recording is also performed. In this type of inspection the inspectors complete an *inspection module* for each site (see Figure 9), which is seen as an aid for them. This module shares some similarities with *general inspection checklists*, but contains more information, due to the more detailed observations. The additional information contained in the inspection module is: available sight distance, lane and shoulder widths, road user behaviour (speed, queues, braking, overtaking etc.) and evidence of previous accidents (damaged barriers, glass on the roadway etc.).

Site general description	
Street name:	Problem number:
ID GPS waypoint:	ID first and last photo:
– Curve: ☐ – Tangent: ☐ – Longitudinal grade: level ☐ slope ☐ – Embankment: ☐ Cut: ☐ Cut and fill: ☐ Bridge: ☐ Tunnel: ☐	
Problems description	
Horizontal alignment problems – Curve preceded by long tangent : ☐ – Series of curves: ☐ – Inadequate super elevation: ☐ – Super elevation measure: right lane _____ left lane _____ – Visibility obstructions: ☐ – Available sight distance: _____ Notes:	Vertical alignment problems – Crest: ☐ – Inadequate visibility: ☐ – Available sight distance: _____ – Sag: ☐ – High longitudinal grade: ☐ Notes:
Cross section – Lane width: _____ – Shoulder width: _____ Notes:	Roadsides – Embankment inadequately shielded: ☐ – Bridge inadequately shielded: ☐ – Dangerous terminals and transitions: ☐ – Trees, utility poles, rigid obstacles: ☐ – Unrecoverable ditches: ☐ – Others: _____ Notes:

Figure 9: Part of the Road Segments Inspection Module³⁵

³⁴ General safety problems are problems, which are present along a substantial section of the road. Recommendation typologies exist for these problems, but also suggestions of the team members can be added.

³⁵ cf. Cafiso et al. (2008)

The objective of the “night time inspections” is to understand how the road is perceived during the night. Consequently the main focus is on road signs, delineation and visibility. The procedure requires thorough documentation via video and a GPS receiver. The day after the inspection, a meeting in the office is carried out to examine the videos and annotate the identified problems in the report.

A draft version of the final report can be written by just two team members. The report is written in “problem/recommendation” format. The problem is described with regard to the safety issues and collision risks, and recommendations are given for potential engineering solutions to the reported problem. After discussing the draft version with the whole team the final report is written.

The report consists of the following sections:

- Introduction
- General problems of the segment
- Specific problems of the segment
- Problems at intersections
- Tables summarizing the problems and recommendations
- Concluding statement and signatures of the members of the inspection team.

In the chapter “introduction”, the following facts should be mentioned: the road name, date of the inspections, inspection team members and their qualification, etc. The next three chapters contain, for example: descriptions of the safety problems, recommendations how to eliminate or alleviate the problems etc.

3.15 Ireland³⁶

RSI are not yet applied on a large scale in Ireland. Road safety inspections at present are limited to analysis of high collision locations. Safety inspections are sometimes seen as part of the maintenance procedures, however they don't fulfil the formal criteria of RSI. These maintenance inspections are carried out by the Signing and Lining teams at regular intervals. Although these inspections, along with data from ARAN surveys supplemented by EuroRAP star rating surveys, could be seen as sufficient to meet the requirements of the EU-directive, the National Roads Authority are in the process of carrying out some pilot RSI with a view to developing RSI guidelines in 2011. Road Safety Audit has been carried out in Ireland since 2001. It is expected that the Road Safety Audit standards will form the core of the new RSI guidelines, as their Stage 4 Road Safety Audit would be very similar to a RSI.

3.16 Latvia³⁷

A similar inspection to RSI has been carried out in Latvia for the last 10 years. The inspections are carried out annually on the Latvian State Road network. During the inspection road signs and markings are checked to see if everything is correct according to schemes manuals and road maintenance issues are also checked. Checklists are not in use, the approach only specifies that signs, markings and road maintenance issues have to be examined. The operator, Latvian State Roads, is responsible for financing and carrying out this inspection.

3.17 Luxembourg³⁸

In Luxembourg the RSI instrument is not yet in use. The implementation of RSI and all technical, financial and responsibility matters will be clarified during the implementation process of the *EU Directive 08/96/EC*. Simple inspections are carried out on a regular basis, but not according to the standards of RSI.

³⁶ Information based on an e-mail response from Mr Harry Cullen, Senior Project Manager, Road Safety, National Roads Authority, Ireland, Received on 22.02.2010

³⁷ Information based on an e-mail response from Mr Ziedonis Lazda, Road Traffic Safety Directorate, Latvia, received 08.01.2010

³⁸ Information based on an e-mail response from Mr Paul Mangen, Direction des Ponts et Chaussées, received on 20.01.2010

3.18 Netherlands^{39 40}

The *EU Directive 2008/96/EC*⁴¹ makes RSI compulsory for roads which belong to the Trans-European Road Network. The RSI are not completely applied on a large scale in the Netherlands. The Directorate General for Public Works and Water management (Rijkswaterstaat) conducts a kind of RSI (not complete) at all national roads by making use of “traffic auditors” from the Netherlands Traffic Management Centre (VCNL). The traffic auditors use checklists and their experience to conduct a RSI. Rijkswaterstaat is now developing a procedure to complete the RSI just by putting together all the results of different type of Inspections they have already done and to add the inspection of the behaviour of the road users and a check of the design guidelines. On the basis of the results of these inspections, priorities are set and reconstruction designs are drawn up either for the shorter or the longer term. These measures can be combined with small or large road maintenance or with reconstructions.

For regional and local roads the regional and local road authorities can decide if there is a need to carry out the RSI.

There are two types of inspections:

In the first type, the national road network is to be inspected at regular intervals (once in 2 years), regardless of the number of road collisions.

In the second type, only road sections or junctions at the national road network with high collision rates are selected for RSI. This approach is called Network Safety Management and will be carried out every year for about 30 locations.

³⁹ cf. SWOV (2009)

⁴⁰ Information based on an e-mail response from Mr Herman Moning, Rijkswaterstaat Centre for Transport and Navigation / Safety, received on 23.2.2011

⁴¹ for more information refer to Directive Directive EU 08/96/EC

3.19 Norway⁴²

The Norwegian Public Roads Administration published the “Handbook Road Safety Audits and Inspections” in 2006. According to this handbook RSI in Norway consists of three steps: Preparation, Inspection and Reporting. The handbook suggests the use of the new method for Road Safety Inspection. In this new method more time is dedicated to preparation, while by the traditional method reporting was the most time-consuming step.

These changes were the result of the following developments: In the preparation step a *Vidkon*⁴³ inspection is carried out by using a *Vidkon* programme (the road section is driven through several times, pictures are taken every 20 meters or a video recording is performed, which will be reviewed afterwards in the office, see Figure 10). If this documentation is carried out beforehand, the field inspection will then be less time-consuming, when completed forms with pictures and comments are being used.

With the traditional method, little time was used on preparations, while the most time was spent on inspection and supplementary work.

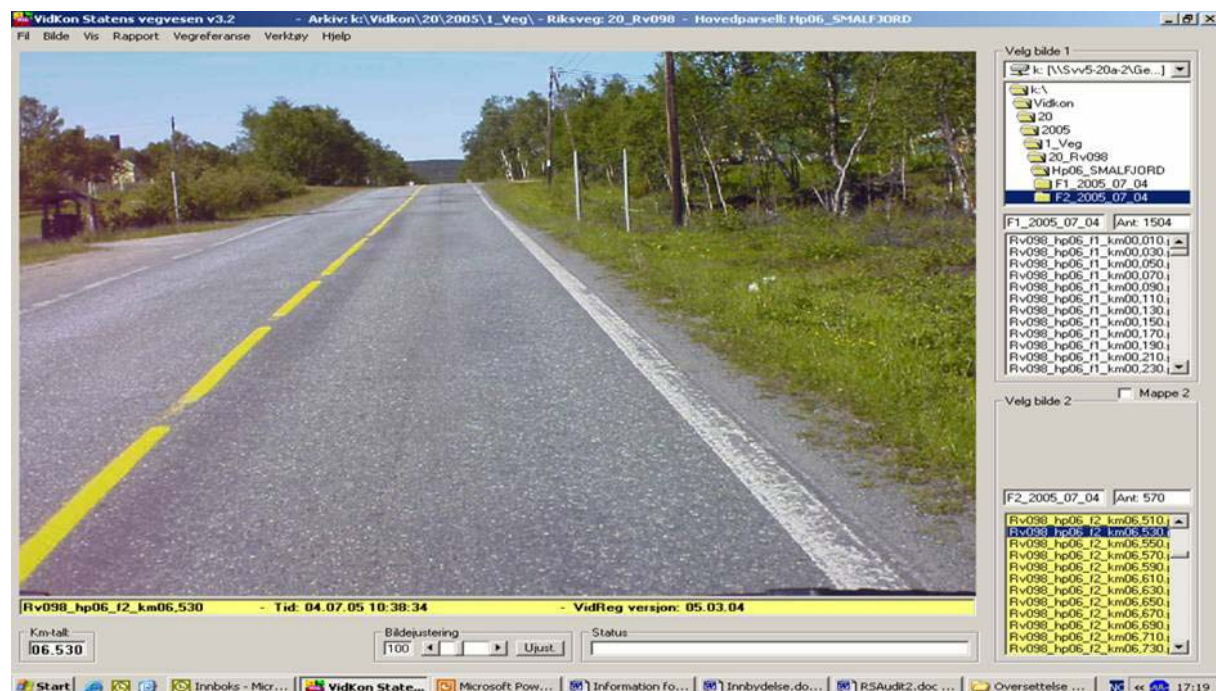


Figure 10: Road Safety Inspection in Norway using *Vidkon*⁴⁴

⁴² cf. Norwegian Road Administration (2006)

⁴³ *Vidkon*: software for on-site inspection before actual RSI

⁴⁴ Cardoso et al. (2007)

In Norway an agreement must be made between road safety inspector and project owner. In such an agreement the inspection sections must be described, what shall be included in the inspection (for example traffic safety deficiencies must be pointed out) a deadline for delivering inspection report as well as other things must be specified.

The inspection team should have an inspection leader, members with road safety knowledge, members with local knowledge of the road-network (this is different from France where the “fresh look” is decisive) and members with contracting competence. It can also be appropriate to involve the police, the municipality and specialist with knowledge of tunnels, bridges, signs and markings, operation and maintenance, as well as road users. The number of members can vary depending on complexity, area, type and length of the section. The inspection always starts with an initial meeting, with attendance by all parties.

There are standard road safety requirements which are used as a basis for road safety inspections, such as safety separation and safety zone. For example, the width of the safety zone is defined such that no hazardous obstacles or hazardous slopes should be found within the safety zone.

The focus concerning the collision occurrence, should not be on the past collisions, but rather anticipating what can happen in the future. The locations of individual collisions which occurred in the past should not be the focus, it should be the general collision picture of the section. A simple collision study should be carried out, which encompasses a survey of which collision types dominated on the section and which have resulted in fatal or serious injury. This study has to be carried out after the inspection, to check if something has been missed in the inspection. If it is found that there are many collisions at one specific location, a black-spot analysis should be recommended in the inspection report.

The Road Safety Inspection itself is composed of the following three stages:

- *Vidkon* “inspection”
- Reporting and
- Inspection

The *Vidkon* “inspection”, which is done in the office, must be carried out several times for the inspected road section. First of all overall factors should be checked, such as area type, speed limit etc. (There is a list of these factors, similar to the Austrian checklists, also including “control questions”, such as: “Speed limit - does this vary and could there be an justification for changing the speed limit after the road safety inspection?”).

After that a *Vidkon* inspection by the entire RSI team must be conducted as part of the initial meeting, which usually requires a whole day. Finally, the last *Vidkon* inspection is conducted in order to pinpoint each safety deficit which has been found. For these procedure criteria are available: for example in the category “Safety zone/side area”, there is a bullet point: “Pillars-impact hazards?” This is also similar to checklists with control questions. Further categories are: “Remaining sections (in addition to the side area)”, “Intersections and access drives”, “Bridges” and “Tunnels”. The more detailed checklists from the RSA can also be used for individual findings. (additional information about *Vidkon* in Appendix 3)

The description of all these problems is supplemented by pictures from the *Vidkon* System. This reduces the number of photos which have to be taken separately. During the *Vidkon* inspection the description of problems and remedial measure proposals have to be filled in the report form. The collection of all this data makes the field inspection simpler and quicker. The discussion of the problems is to be carried out before the field inspection. In this way it is ensured that everyone involved can participate in the discussion, which would not be possible during the field inspection. During the field inspection the critical defects should be examined as well as any complex problems picked up in the *Vidkon* inspection.

In general, there are areas which are not easily discerned at the *Vidkon* inspection and which will always have to be checked during the field inspection, for example ditch areas or roadside signing.

After the completion of the inspections some of the supplementary work follows. This consists of finalising the road safety inspection report (which is the responsibility of the road safety inspector), reporting that the inspection is completed (for which the project owner is responsible) and the follow-up of measures (for which the the project owner is responsible). In Norway, next to standard report forms (in MS Excel), additional software named *T-ess*⁴⁵ is used. This program includes listing of all the documentation, as well as using standard text blocks for typical situations. The report form also contains a risk matrix, which can help prioritising possible measures.

T-ess also contains a statistics sheet, which provides the total picture for the entire section. Also a unit costs data base has been established, to make a rough cost estimate for more typical road safety measures.

⁴⁵ *T-ess*: Program for standardization of reporting

3.20 Poland⁴⁶

Road safety inspection is performed twice a year in spring and autumn as a standard procedure. Within the framework of this inspection the signs, markings, pavement conditions and other road safety relevant aspects are examined. An extra survey is possible if deficiencies, which could affect road safety, are reported to the roads authority by the police. There is no standard form for reporting. Inspection teams consist of: road safety experts, traffic engineers from the roads authority and police officers working in traffic management.

3.21 Portugal⁴⁷

In Portugal no explicit legal basis exists for RSI, but the National Road Administration has a policy to carry out RSI. RSI has to be implemented within the framework of maintenance inspections which are regularly performed by the National Road Administration. A standardised and structured approach for this instrument exists, as well as a checklist, which contains all checkpoints to be made and a list of the most common problems on Portuguese roads. The National Road Administration uses this standardised list of deficiencies (checklist) as an internal document. Each road has to be inspected every five years, but RSI are not applied on the entire road network. The collision rate is decisive in choosing the road segments to be inspected. In charge of the inspection are the following persons: one inspector from the National Road Administration Central Headquarters and the engineer responsible for road safety issues at the National Road Administration District Agency of the road.

3.22 Romania⁴⁸

In January 30, 2010, the Government Ordinance no. 6/2010 was published and the transposition of EU Directive 2008/96/EC was carried out. The Government Ordinance no. 6/2010 is in process of approval by law. The EU Directive enters in force in December 19, 2010. Until then the Road Safety Inspections (RSI) will be performed like it was done before: by each road infrastructure administrator, based on its own maintenance norms.

⁴⁶ cf. Lutschounig/Nadler (2005)

⁴⁷ cf. Lutschounig/Nadler (2005)

⁴⁸ Information based on an e-mail response from Mr Sorin Sîrbu, Director of the Road Transport Directorate of the Ministry of Transport and Infrastructure, received on 11.02.2010

After December 19, 2010 RSI will be performed by Romanian Road Transport Authority (ARR), using trained and certified auditors. RSI will be mandatory from December 19, 2010 for TEN Network and, based on a five year time table, for the entire road infrastructure.

At present, the procedure for RSI is in drafting process. A systematic approach, with standardized instruments for the inspections, is planned. In Romania RSI will be performed regularly, with a two years period, alternative in summer and winter seasons.

The road administrator is responsible for financing of the inspection and ARR for carrying out of RSI.

3.23 Spain⁴⁹

Road safety inspections have been carried out in Spain for the last 15 years. They are part of the National Road Safety Improvement Programme. At present the methodology is being revised in order to adapt it on the European Directive on Road Infrastructure Safety Management. The European Directive will be applied to the entire National Road System, and will represent the legal basis for RSI in Spain. Within the framework of the revision of the methodology, RSI guidelines are being developed as this is one of the requirements of the European Directive. The current safety inspections in Spain consider signing, road markings, and other safety issues. During these inspections both photos and video recordings are taken. Road Safety Inspections of the National Road Network are carried out by the General Road Directorate of the Ministry of Infrastructure (Ministerio de Fomento).

3.24 Sweden⁵⁰

Procedures for RSI were under way in 2005. The idea of this approach is not to select certain sections of roads for an RSI, but rather the whole major road network should be inspected. There is a need for developing the knowledge of how road safety is related to the design of an existing road. That is possible by in-depth studies of collisions, simulations, tests and other analysis of collisions.

⁴⁹ Information based on an e-mail response from Mr Roberto Llamas, Road Safety Coordinator of the General Directorate for Roads, Ministry of Infrastructures, Spain, received on 13.4.2010

⁵⁰ cf. Lutschounig/Nadler (2005)

3.25 Switzerland⁵¹

There is still no RSI in Switzerland⁵². In particular, there is no periodic RSI, independent of collisions. In Switzerland there is only an instrument called *Gefahrenanalyse*⁵³ but this is not similar to RSI.

3.26 United Kingdom⁵⁴

Information about RSI in United Kingdom is based on the *Road Inspection Manual*, issued in 2004. The objectives of the manual were to define hierarchies of carriageways, footways and cycle tracks for inspections, to recommend the procedures and the minimum frequencies for the inspections used to determine routine maintenance tasks, and to encourage consistency in the standards for the inspections. RSI fall within the remit of Highways Authorities maintenance offices. The maintenance tasks mentioned above should include according to the manual “the maintenance operations or works necessary for maintaining and restoring the road network to serviceable and safe conditions”. In UK RSI is therefore part of the routine maintenance, and from that ensues the concentration on short term measures and improvements. The manual does not cover long-term measures, for example replacement of parts of the road which exceed the service life.

Along with carriageways the manual also covers footways and cycle tracks. All these three elements are part of the road network. A road network hierarchy was developed to allow for better allocation of resources. The footways are divided into “Footways within Pedestrianisation Schemes” and “Footways outside pedestrianisations Schemes”. Concerning the carriageways the following categories exist: “Expressway”, “Trunk Road (Urban)”, “Trunk Road (Rural)”, “Primary Distributor”, “District Distributor”, “Local Distributor”, “Rural Road” and “Feeder Road”. No categories exist for cycle tracks.

Beside the categorization of roads there is also a categorization of road defects. According to the manual two categories exist: Category (i) and Category (ii). Road defects in category (i) require

⁵¹ cf. Lutschounig/Nadler (2005)

⁵² Information based on an e-mail response from Mr Christoph Jahn, Project Manager at Federal Department of the Environment, Transport, Energy and Communications DETEC, Switzerland, Received on 17.05.2010

⁵³ cf. Lindenmann/Doerfler (2002)

⁵⁴ cf. Highways department (2004)

prompt attention as they represent an immediate or imminent hazard or there is a risk of short term structural deterioration. All other defects are included in category (ii). While the defects in category (i) should be corrected or made safe as soon as reasonably practicable, the correction of the defects in category (ii) should be included in the planned schedules of works.

During the inspections report forms and checklists should be used. The completion of the report forms should be done as much as possible at the time of the inspection. The inspectors should receive adequate training and have to be familiar with the inspection procedures.

In the UK the inspections are divided into two types: “Safety Inspections” and “Detailed Inspections”. During the Safety Inspections (SI) “all defects likely to create danger or serious inconvenience to users of the network”⁵⁵ have to be identified. Remedial measures to correct such defects should take place within 24 hours. SI may be carried out from a slow moving vehicle, or on foot. In order to ensure the safety of the inspection team, the on-foot inspection should be done along the footway, and not along the carriageway.

When scheduling the SI the maintenance offices should also take into account other factors such as incident and inspection history. For every carriageway category minimum frequencies for SI are recommended. The Rural Trunk Roads should be inspected every 7 days, Rural Roads every 3 months. Beside the scheduled inspections additional SI can also be carried out in case of complaints from the police, other authorities or the public. A part of the SI should be carried out either during or immediately following a period of wet weather.

According to the manual the following defects constitute an immediate or imminent hazard and should therefore normally be identified and reported during the inspection⁵⁶:

- i. Potholes and other local defects, including missing paving blocks, missing/broken ironware, gully grating and cover;
- ii. Excessive standing water and water discharging onto or from within, and/or flowing across the roads;
- iii. Missing safety fences;
- iv. Unguarded road openings;
- v. Damaged street furniture protruding into carriageway or footway/cycle track; and
- vi. Fallen boulders, landslip debris or any other hazardous obstructions on carriageways, footways or cycle tracks, particularly on Expressways and high speed roads.

⁵⁵ cf. Highways department (2004)

⁵⁶ cf. Highways department (2004)

The defects identified during the inspection should be filed in a report form (see Figure 11) during the inspection. The inspectors can add items to the forms if necessary. Beside the report form portable data collection devices can also be used. The electronic data or report forms including complaints as well as details of follow-up inspections and actions taken should be retained for at least 6 years.

The Detailed Inspections (DI) are designed according to the Road Inspection Manual (RIM) “to record only those types of defects likely to require routine maintenance.”⁵⁷. These defects do not require urgent repair. Nevertheless, in case of identifying immediate or imminent hazards during the DI, these should also be noted.

During the DI the locations of road defects should be marked in a plan which shows the inspected roads.

The focus of the DI is carriageways, footways and cycle tracks. In conjunction with the carriageway inspection the following items should be inspected:

- Covers, Grating, Frames and Boxes
- Fences and Barriers
- Grassed Areas
- Road Studs and
- Road Marking

Further an inspection of traffic signs is conducted. During the carriageway inspection the occurrence of the following defects are noted (in case of flexible pavement): cracking, corrugation, depression, rutting, shoving, surface deterioration, ravelling, potholes and hazardous obstructions. In case of rigid pavements the important defects are: cracking, joint stepping, rocking, loss of sealant, spalling, surface defects, and hazardous obstructions. During the inspection of footways and cycle tracks the defects which have to be identified are: defective surface, missing or loose blocks, defective kerbs, and hazardous obstructions. The inspection of covers, gratings, frames and boxes is to focus on damaged, misplaced, loosened or missing items. Fences and barriers are to be inspected, along with the additional aspects such as ponding / flooding. During the inspection of grassed areas the visibility at junctions, roundabouts and bends should be examined to see if it is affected by vegetation. The inspection of road studs concentrates on identifying missing or damaged road studs. Concerning the inspection of road markings, it should be noted if the road marking is faded. The inspection of traffic signs

⁵⁷ cf. Highways department (2004)

concentrates on observing the colour, serviceability and general conditions of traffic signs. The minimum frequencies for carrying out these inspections vary by the different types of inspections and extend from every 6 to every 24 months.

For the predefined defects, defect codes were developed. These codes are filled in the report form during the inspection.

The SI can be conducted together with the DI, so there is no need to carry these two types of inspections separately.

Highways Department <u>KLN</u> Region / Division District : <u>KC</u> Road : _____		Inspected By : <u>Lam</u> Date : <u>10-12-2002</u> Seen By : _____ Date : _____				
Locations	<u>Defects</u>					
	C. Carriageway	F. Footway/Cycle Track	D. Drainage	T. Street Furniture	M. Miscellaneous	
	a. Pot holes b. Subsided Trench c. Hazardous obstructions	a. Pot holes b. Subsidence c. Hazardous obstructions	a. Ponding /flooding b. Missing ironware/cover c. Broken ironware/cover	Damaged furniture protruding into carriageway/footway /cycle track a. guardrails b. signs/posts	To be specified by inspectors	
11	b					
12	b					
13	a,b					

Figure 11: Example of Safety Inspection Report⁵⁸

⁵⁸ cf. Highways department (2004)

3.27 Summary

Generally RSI or an instrument similar to RSI is regularly used in sixteen European countries (Austria, Belgium, Cyprus, Denmark, Estonia, France, Germany, Hungary, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Spain and United Kingdom).

Figure 12 shows an overview about RSI in each country.

Country	RSI ⁵⁹ regularly used?	RSI is in use since:	Existence of RSI guidelines or manual	Existence/u sage of checklists	Legal basis	Compulsory
Austria	yes	2003	yes	yes	yes	no
Belgium	yes	-	-	yes	no	no
Bulgaria	no	-	no	no	no	no
Cyprus	yes	2006	-	yes	no	no
Czech Republic	no	-	yes	-	no	no
Denmark	yes	-	-	yes	no	no
Estonia	yes	2008	yes ⁶⁰	yes	no	no
Finland	no ⁶¹	-	no	no	no	no
France	yes	2009	yes	yes	-	-
Germany	yes	-	yes	no	yes	yes
Greece	no	-	no	no	-	-
Hungary	yes	1988	no	no	yes	-
Iceland	yes	-	yes	-	no	No
Italy	yes ⁶²	2005	yes	yes	no	No
Ireland	no	-	-	-	-	-
Latvia	yes	2000	-	no	-	-
Luxembourg	no	-	-	-	-	-
Netherlands	partially	-	yes	yes	yes	Yes
Norway	yes	2004	yes	yes	-	-
Poland	yes	-	-	-	-	-
Portugal	yes		-	yes	no	no
Romania	no	-	no	no	no	no
Spain	yes	1995	yes	no	-	-
Sweden	-	-	-	-	-	-
Switzerland	no	-	-	-	-	-
United Kingdom	yes	1990	yes	yes	-	-

Figure 12: Overview of RSI in each country

⁵⁹ or an instrument similar to RSI

⁶⁰ methodology for RSI

⁶¹ there are other instruments like monitoring, black spot, investigation of accidents

⁶² only in regions Sicily, Calabria and Campania

4 Approaches to Road Safety Inspection by Overseas Countries – Australia and New Zealand⁶³

In Australia and New Zealand the inspection of existing roads is part of the Road Safety Audit (RSA). The guidelines for this instrument were first published in 1993 in New Zealand and in 1994 in Australia.

The responsible institution for RSA in these two countries is AUSTROADS, the association of Australian and New Zealand road transport and traffic authorities.

In New Zealand it is required to carry out RSA on the whole road network (both national and local government), in Australia only state road projects must be audited. In Australia local government projects must be audited only if these projects are fully or partly funded by the state. In both countries, Australia and New Zealand, inspectors must be trained and experienced. In most Australian states a register of road safety auditors exists.

They are divided in “senior road safety auditors” and “road safety auditors”, where senior road safety auditors must be more experienced than road safety auditors.

For these two countries the experience of the auditors is the key factor for the quality of the audits. The more experienced the auditors are, the better are the audits.

Besides daytime inspections, night time inspections are also carried out. Checklists are used in these two countries. They are considered as a help for auditors by identifying potential safety issues.

The Checklists in Austroads cover new road projects as well as audits of existing roads. While in Australia there is still a potential for improvements concerning RSA, as there is no obligation to use RSA for local authorities yet, in New Zealand the local authorities are already obliged to undertake RSA on their roads.

In Australia RSA has yet to be adopted as a routine practice.

⁶³ cf. Morgan (2005)

5 PIARC Road Safety Inspection Guideline

In November 2007 the road safety Technical Committee of PIARC (TC 3.1) produced a Guideline on Road Safety Inspections (RSI).

This document defines a Road Safety Inspection (RSI) as:

- a systematic, on site review, conducted by road safety expert(s), of an existing road or section of road to identify hazardous conditions, faults and deficiencies that may lead to serious collisions.

It is important to note that:

- A RSI is systematic – this means it is both comprehensive and carried out in a methodical way.
- A RSI needs to be carried out by an independent person or team with experience in road safety work, traffic engineering, road user behaviour and/or road design who are not involved in the maintenance of the road or road section.
- A RSI relates to an existing road not roads being constructed.
- A RSI is pro-active, trying to prevent collisions through the identification of safety deficiencies for remedial action rather than responding to recorded crashes.

The PIARC Guideline on Road Safety Inspections (RSI) further states that a RSI does not require collision data.

It is a systematic review of a selected road or relatively long section of a road, regardless of the number of collisions.

The traditional road engineering approach to safety has very often been to “wait and see”, i.e. safety countermeasures are not considered until the collision situation becomes unacceptable. This may occur at one or a few locations or for longer road segments. Then, the collision situation is analysed and countermeasures designed and implemented.

This approach, commonly known as “black spot” identification, analysis and remediation is a reactive approach, largely event-driven.

The RSI process is systematic and not just focused on a particular black spot identified by collision data or anecdotal collision or incident information from local police or local residents.

An RSI is comprehensive, with extensive preliminary work, on site appraisal including detailed check lists, analysis of the problems and suggested countermeasures.

RSI’s aim to identify any features that may lead to future collisions, so that remedial treatment may be implemented before collisions happen.

Road collision data can provide some guidance in terms of prioritising which roads should be inspected. If a road authority wishes to only inspect a limited number of roads, the priority could be on roads with a high number of collisions expressed as collision per kilometre of road or collisions per traffic volume using the road.

Collision data can also be used to simplify the inspection process – if data shows one type of collision is predominant, the inspection could focus on issues related to that type of collision.

For example if run off road collisions are the dominant type and there have been no head on collisions, the focus could be on the roadside, shoulders and hazards.

Network management tools can also provide valuable information in terms of selection of roads for inspections.

The document further states that RSI is not related to routine maintenance. Maintenance is a regular process where key infrastructure issues such as overhanging branches, the road surface, potholes and poor quality signage are reviewed and remedied.

This can be carried out by people who do not necessarily have road engineering or road safety experience but are simply following a planned process.

RSI’s can identify safety deficiencies that are a result of poor maintenance, for example poor signing and line marking or visibility issues caused by vegetation.

The Guideline contains information on what inspections should be carried out about the frequency of inspections. The inspection process is covered in some detail.

There are FOUR steps in the RSI process:

STEP 1 Preparatory Work In The Office

STEP 2 On Site Field Study

STEP 3 RSI Report

STEP 4 Remedial Measures and Follow Up

It should be noted that Step 4 may be considered as two separate processes – the first is the implementation of remedial measures, while the follow up is likely to be some time later to evaluate the impact of the countermeasures.

The Guideline also contains detailed checklists for Motorways and Freeways, Interurban Roads crossing small towns and villages and for Urban main roads. The process can involve small sections of the road with repeated check lists or several runs along the whole road using a single check list. The length chosen depends on the complexity of the road.

The checklists are quite detailed (as requested by representatives of developing countries) and consequently there should be a systematic collection of the deficiencies that were found.

This PIARC Road Safety Inspection Guideline 2007 is recommended to someone seeking a greater knowledge of RSI.

6 Analysis of Results

This report provides an overview of the different approaches and methodologies of Road Safety Inspection (RSI) in the European countries.

The basis for this report was the handbooks and methodological guides issued in the particular countries, and the e-mail responses received from the responsible authorities.

The legal basis for RSI in the European Union is the European Directive on Road Infrastructure Safety Management⁶⁴, which has been issued on 19th November 2008. This directive contains among other articles for improving road safety, an article on “Safety inspection”.

According to this directive the member states shall carry out safety inspections on existing roads in order to identify the road safety related features and prevent collisions.

This directive is compulsory for roads which are part of the trans-European Road Network (TEN) and enters in force in December 2010.

The recent information is available for Austria, France, Norway, Italy, United Kingdom, Netherlands, Czech Republic, Cyprus, Greece, Germany, Spain, Latvia, Luxembourg, Romania, Estonia, Bulgaria, Ireland, Finland and Iceland.

The information about the other countries described in this report is based on the *Ripcord Iserest* project from the year 2005. For the remaining European countries no information is available.

Comparing the countries included in this report for which the recent information is available, we find a number of differences, and some similarities as well.

⁶⁴ for more information refer to Directive EU 08/96/EC

Differences:

What is RSI?

- A RSI is pro-active, trying to prevent collisions through the identification of safety deficiencies for remedial action rather than responding to recorded crashes. (PIARC)
- The objective of the RSI is to give the road operator a tool which can help him by improving road safety.(France)
- The focus should not be on the past collisions, but rather anticipating what can happen in the future (Norway).

or

- RSI is part of routine maintenance, with a concentration on short term measures and improvements. (UK)
- RSI has to be implemented within the framework of maintenance inspections. (Portugal)

or

- RSI can be prompted by locations where collisions often occur (Austria)
- RSI is only done occasionally, when the road authority identifies safety problems such as a higher number of collisions on a certain road section. (Czech Republic)

Use of Collision Data

- The locations of individual collisions which occurred in the past should not be the focus, it should be the general collision picture of the section.(Norway)
- RSI does not require collision data. It is a systematic review of a selected road or relatively long section of a road, regardless of the number of collisions. (PIARC)

or

- Within the framework of a Road Safety Inspection an analysis of the collision-frequency situation should be done as well. (Austria)
- Evidence of previous accidents (Italy)
- Road safety inspections at present are limited to analysis of high collision locations. (Ireland)

Inspection Team

- The inspection can be carried out by a team or only one inspector. (Austria)

or

- The inspection team consists of two inspectors. (France)

or

- The inspection team must consist of three or more people, since different backgrounds and approaches are beneficial. (Italy)

Inspectors:

- The role of the inspectors is not to make any judgements, they simply have to identify safety deficits and report them. (France)
- or
- A draft version of the final report can be written by just two team members. The report is written in “problem/recommendation” format. After discussing the draft version with the whole team the final report is written. (Italy)

RSI – Number of Steps

RSI - 4 steps: (Austria & PIARC)

- Preparation work, On-site inspection, Report drafting, Remedial Measures

or

RSI in France - 7 steps: (France)

- scheduling and request by operator, preparation, inspection visit, presentation of observations, examination of the inspection report, drafting the road operator's report and follow-up and evaluation

or

RSI in Norway - 3 steps: (Norway)

- Preparation,
- Inspection and
- Reporting.

or

Australia & NZ -- The inspection of existing roads is part of the Road Safety Audit (RSA) procedure.

Types of road safety inspections

There are three types of road safety inspections in Germany. These are:

- Periodic road-safety inspections
- Dedicated road-safety inspections
- Ad hoc road safety inspections

or

There are two types of RSI: (Netherlands)

- In the first type, the entire road network is to be inspected at regular intervals, regardless of the number of road collisions.
- In the second type, only road sections with high collision rates are selected for RSI. This approach is similar to the black spot analysis.

or

In Italy there are several site inspections. These are:

- Preliminary inspection
- General inspection
- Detailed Inspection
- Night time inspection

The Team

- The participation of police department and road maintenance authority is helpful. (Austria)
or
- The inspection team has to be composed of members from traffic police, traffic and road authorities, road maintenance staff and optionally external consultants. (Germany)
or
- Inspection teams consist of: road safety experts, road traffic engineers from the roads authority and police officers working in traffic management. (Poland)

The road operator

- The road operator never participates in the inspections. (France)
or
- The active participation of the client is important in the process. (Italy)
or
- The road operator is responsible for the courses of action which follows the RSI.
or
- Implementation of the measures and monitoring of results. (France)
or
- The inspection schedule is determined by the road operator. (France)

Checklists:

- There are extra checklists for different road categories: (Austria)
 - For motorways and express ways
 - For rural roads (Austrian checklist in Appendix 1)
 - For roads in urban areas,
or
- Specific checklists for junctions and intersections have also been developed: (Austria)
 - Intersections with traffic lights
 - Intersections without traffic lights.

or

- In the Methodological guide there are different safety factors for two-way roads and for roads with separated lanes. (France)

Period:

Road Safety Inspections are carried out periodically on the entire national road network at a three year interval (France).

or

Road safety inspection is performed twice a year in spring & autumn as a standard procedure. An extra survey is possible if deficiencies, which could affect the traffic safety, are reported to the roads authority by the police. (Poland)

or

RSI will be performed regularly, with a two years period, alternative in summer and winter seasons. (Romania)

or

Each road is inspected every five years, but RSI is not applied on the entire road network. The collision rate is decisive in choosing the road segments to be inspected. (Portugal)

or

RSI will based on a five year time table, for the entire road infrastructure. (Romania)

Similarities:

Inspection:

- On-site inspection and inspection by vehicle is imperative. (Austria)
- Document the inspected road section by video recording or by photographs. (Austria)
- Carried out by car, during stops photographs are taken - observations are noted. (France)
- Before or after the field inspection and on-site-discussion will be conducted with all personnel involved, as an aid to completing all the checklists. (Austria)
- In addition to day-time inspections, it is recommended to carry out night-time inspections as well. (Austria, NZ, Australia, France, Germany, Italy)

RSA & RSI

- RSI guidelines expected to be very similar to Stage 4 Road Safety Audit, which takes place 1 year after new road has opened. (Ireland, Australia, NZ)
- Use, among other things, the RSA checklists. (Netherlands)
- The technical methods used for traffic safety audit have been transferred to the inspections. Road Safety Audit guidelines contain checklists, which can also be used for the inspection of existing roads. (Denmark)

Checklists

- Checklists should not limit the flexibility of the procedure, if general safety problems are identified which are not contained in the checklists, recommendations for these problems can be formulated. (Italy)
- Most countries recommend using some form of checklist.

Inspectors:

- The inspections must be carried out by qualified inspectors, who are not familiar with the road section and therefore can take a fresh look at the situation. (France)
- There is mandatory training for Road Safety Inspectors. (Austria)
- Inspectors must be qualified experts with long experience in transport safety, transport technology and transport planning. Experience in road construction, road maintenance and traffic management is necessary. (Austria)
- The independence of the inspectors must be guaranteed. (Austria, Italy, Belgium, NZ, Australia)

7 Conclusions

There are definitely different views on what an RSI entails. The PIARC RSI guidelines say that:

- An RSI is comprehensive, with extensive preliminary work, on site appraisal including detailed checklists, analysis of the problems and suggested countermeasures. However, RSI can be prompted by spots where collisions often occur.

A number of other countries have two types of RSI. They identify them as:

- Periodic road-safety inspections and
- Dedicated road-safety inspections (which in the context on the Directive would cross over into the area of Network Safety Management – NSM)

These two definitions are quite similar, and would appear to cover most of the Directive requirements.

The Periodic inspection is the major survey on the whole network, carried out every few years, with the focus not on past collisions, but rather anticipating what can happen in the future.

The Dedicated RSI, on the other hand, is prompted by locations where collisions often occur, and would be carried out on a regular basis at locations that would be highlighted as part of a collision cluster analysis programme.

Having reviewed all the responses from the various reports above, there seems to be general agreement on the main elements of RSI:

- Type of Inspection required for RSI.
- Possibility of using RSA standards as a starting point
- The use of checklists
- The role of the Inspectors & training requirement for the Inspectors

There also seems to be general agreement on expertise needed on the team; obviously the more complicated the problems to be faced, then the more expertise required on the team.

There is lots of common agreement on the role of the Road Operator; they determine the inspection schedule, implement the measures and monitor the results. Some disagreement as to whether or not they should be part of the actual RSI team, there are advantages to both scenarios so either option would appear to be satisfactory.

There is also general agreement that 'Fresh Eyes' are very important in the makeup of the team.

All countries seem to use checklists to a lesser or greater extent. The checklist will depend on the road type (Motorway, Dual or Single Carriageway); it would be an advantage to collect a number of different checklists, compare and contrast, and develop a 'best practice' checklist going forward.

Having two types of RSI would also get over the issue of whether or not to use the collision data as part of the RSI, as the collision data would be used for the Dedicated RSI; but for the Periodic RSI the locations of individual collisions which occurred in the past should not be the focus - it should be the general collision picture of the section.

There is still the debate about whether a comprehensive maintenance inspection qualifies as a RSI. There are no training stipulations in the Directive for RSI inspectors, and from our reading of the Directive, it is probable that a comprehensive maintenance inspection would meet the requirements of the Directive.

However, the added value of having RSI inspectors who are trained in the road safety audit and safety engineering process will mean that these inspectors will be concentrating on road safety issues more than maintenance issues, and are likely to generate a more comprehensive RSI at the end of the day.

8 Recommendations

Recommendation 1

It is recommended that the PIARC RSI guidelines definition of RSI be the definition chosen.

- An RSI is comprehensive, with extensive preliminary work, on site appraisal including detailed checklists, analysis of the problems and suggested countermeasures. However, RSI can be prompted by spots where collisions often occur.

Recommendation 2

Countries should investigate the possibility of using RSA standards as a starting point for RSI.

Recommendation 3

There should be two types of RSI, as alluded to in Recommendation 1 above.

- Periodic road-safety inspections and
- Dedicated road-safety inspections

Recommendation 4

It is recommended that collision data be analysed in advance of 'Dedicated road-safety inspections', but for 'Periodic road-safety inspections' the focus should not be on past collisions, but rather anticipating what can happen in the future.

Recommendation 5

If we take RSA as the starting point for RSI, then Inspection teams should have a minimum of two people.

Recommendation 6

There should be four main steps in an RSI:

- Preparation work,
- On-site inspection,
- Report drafting, and
- Remedial Measures.

Recommendation 7

'Fresh Eyes' are very important in the makeup of the team.

Recommendation 8

RSI inspectors should be trained. The added value of having RSI inspectors who are trained in the road safety audit and safety engineering process will mean that these inspectors will be concentrating on road safety issues more than maintenance issues, and are likely to generate a more comprehensive RSI report at the end of the day.

Recommendation 9

The use of checklists for RSI is recommended.

Recommendation 10

The Road Operator should determine the inspection schedule, implement the measures and monitor the results. (Some disagreement to whether or not they should be part of the actual RSI team, there are advantages to both scenarios so either option would appear to be satisfactory).

Recommendation 11

The Directive is not prescriptive regarding the period to carry out RSI. It will depend on the resources available in each country. As a guideline, an initial 5 year Periodic RSI on the TEN network would seem to be about the right level. This, of course, could be reviewed on an ongoing basis.

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10 Appendices

10.1 Appendix 1: Austria – Checklists for Rural Roads

RSI Check List for rural roads				
		Relevance for safety		
		High	Mid	Low
A DESIGN PARAMETERS				
A1 Road segment				
Layout	defect:			
	problem:			
Longitudinal section (geometry)	defect:			
	problem:			
Topology layout	defect:			
	problem:			
Cross section	defect:			
	problem:			
Visibility	defect:			
	problem:			
Drainage	defect:			
	problem:			
Cross roads	defect:			
	problem:			
Land gateway	defect:			
	problem:			
Station	defect:			
	problem:			
A2 Service/frontage roads	defect:			
	problem:			
A3 City entering/exits	defect:			
	problem:			
A4 Railway crossing	defect:			
	problem:			
B ROAD SURFACE				
	defect:			
	problem:			
C LIGHT CONDITIONS				
	defect:			
	problem:			

D TRAFFIC CONTROL DEVICES				
D1 Traffic signs/destination signs	defect:			
	problem:			
D2 Road markings	defect:			
	problem:			
D3 Plants	defect:			
	problem:			
D4 Crash barrier	defect:			
	problem:			
D5 Wild life protection	defect:			
	problem:			
D6 Traffic light	defect:			
	problem:			
D7 Crossings	defect:			
	problem:			
E SURROUNDING OF ROAD	defect:			
	problem:			
E1 External infrastructure	defect:			
	problem:			
Y ANALYSIS OF TRAFFIC OPERATIONS	defect:			
	problem:			
Z ACCIDENTS	defect:			
	problem:			

RSI Check List for intersections - roundabout				
		Relevance for safety		
		High	Mid	Low
A EQUIPMENT				
A1 Traffic signs/destination signs	defect:			
	problem:			
A2 Road markings	defect:			
	problem:			
A3 Plants	defect:			
	problem:			
A4 Crash barrier	defect:			
	problem:			
A5 Illumination	defect:			
	problem:			
B ROAD SURFACE	defect:			
	problem:			
C DESIGN				
C1 Type of intersection (roundabout)	defect:			
	problem:			
C2 Sight conditions at the intersection	defect:			
	problem:			
C3 Crossings	defect:			
	problem:			
C4 Turns	defect:			
	problem:			
C5 Priority rules	defect:			
	problem:			
D PUBLIC TRANSPORT	defect:			
	problem:			
E CYCLE PATH	defect:			
	problem:			
F PEDESTRIAN	defect:			
	problem:			
G SENIOR, HANDICAPPED PERSON	defect:			
	problem:			
Z ACCIDENTS				

RSI Check List for intersections - traffic light				
		Relevance for safety		
		High	Mid	Low
A EQUIPMENT				
A1 Traffic signs/destination signs	defect:			
	problem:			
A2 Road markings	defect:			
	problem:			
A3 Plants	defect:			
	problem:			
A4 Crash barrier	defect:			
	problem:			
A5 Illumination	defect:			
	problem:			
B ROAD SURFACE	defect:			
	problem:			
C DESIGN				
C1 Traffic signals	defect:			
	problem:			
C2 Sight conditions at the intersection	defect:			
	problem:			
C3 Crossings	defect:			
	problem:			
C4 Tums	defect:			
	problem:			
C5 Priority rules	defect:			
	problem:			
D PUBLIC TRANSPORT	defect:			
	problem:			
E CYCLE PATH	defect:			
	problem:			
F PEDESTRIAN	defect:			
	problem:			
G SENIOR, HANDICAPPED PERSON	defect:			
	problem:			
Z ACCIDENTS				

10.2 Appendix 2: France - Safety Factors

Junctions and access roads

Type of junction

- type of junction inconsistent with traffic;
- grade junction including more than one direct road per direction.

Reciprocal visibility

For users crossing the road or turning left at junctions with heavy traffic on the secant:

- presence of hidden markings on the horizontal alignment or the longitudinal profile;
- presence of occasional masking due to signing, vegetation etc;
- excessive width of a secondary road that encourages users to form two lanes.

Legibility

For users of a secondary road:

- poor legibility of the presence of a junction, as well as the way it works, trajectories to be followed and priorities

“Access only” roads

- presence of numerous “access only” roads

Cross-section

Three-lane road

- presence of a centre lane not allocated to either traffic direction;
- absence of lane for turning left at junctions or “access only” roads.

Overtaking zone

- absence of a merging area at the end of an overtaking zone;
- presence of a difficult point upstream: bend with a small radius, grade junction, urban crossing without anything to encourage users to slow down;
- overtaking zone longer than 2,000 m that encourages users to get accustomed to driving at speed.

Carriageway width

- poor distribution of carriageway width and shoulder width (MRD, page 54)

Vulnerable users

- absence of or interruption in pedestrian and cycle paths near scattered buildings or at the edge of a conurbation;
- presence of a zone of conflict between different types of users;
- no allowance for the disabled.

Vertical and horizontal signage

- discontinuity, lack of homogeneity, inconsistency, lack of legibility and visibility;
- speed limit inappropriate for location and users.

10.3 Appendix 3: Norway - Vidkon Inspection: factors that should be checked

The road section should be "driven" in the office using the software *Vidkon*. Firstly, to obtain an overview over the section and to check overall factors such as:

- Area type - does the road go through different area types? (concerns speed limits)
- Speed limit – does this vary and could there be occasion for changing the speed limit after the road safety inspection?
- Possible standard jumps – are there any pronounced jumps in the standard and in such case, should upgrading of parts of the section be considered?
- Curvature and visibility – is the section and adjoining areas such that stopping sight distance and passing sight distance requirements to a large extent remain unfulfilled?

Then the various elements are checked for correct, uniform and continuous design along the length of the section. Examples of conditions that should be checked include:

- Intersection types – are intersection types appropriate with regard to traffic safety? Are the intersections of a uniform design?
- Pedestrian crossings – are they located correctly? Are crossings secured well enough? Are they given a uniform design along the section?
- Guardrail – are guardrails used extensively along the section? Can this be reduced? Are there many elements within the safety zone in need of protection? Are there rock cuts that must be safeguarded against and can this be done using guardrail?
- Signing – is directional signing uniform and continuous? (check intersection signing)
- Road markings – are profiled road markings being used? (should be considered)
- Illumination – are all sections and intersection areas in need of lighting illuminated?
- Poles/pylons – which pylon and pole types are used along the section? Are there large variations and should wooden poles be considered replaced or cables buried?

It will make sense to discuss these principles before tackling individual findings. When certain design principles have been arrived at beforehand, suggested solutions for individual findings will be as uniform and continuous as possible.

Where such overall conditions are reviewed and discussed, it is recommended that *Vidkon* inspection be undertaken by the entire road safety inspection team established for the project. This is suggested done as part of the commencement meeting. Sufficient time must be made available at the commencement meeting for this (an entire day).

Finally, the section is "driven through" in order to pinpoint each traffic safety deficiency find. To ensure that all such finds are brought up, it may make sense to use the groupings and points listed below:

Safety zone /side area

- Ditch profile (design).
- Manholes – protruding?
- Poles and pylons – type, breakaway design lacking?
- Trees – is trunk diameter more than 10 cm?
- Walls and noise barriers – hazardous guardrail terminals?
- Pillars– impact hazards?
- Guardrail (unnecessary/lacking, wrong (height, post spacing.), wrong guardrail terminals).

Remaining sections (in addition to the side area)

- Passing – passing opportunities and visibility.
- Stopping sight distance – check curves and adjacent terrain/vegetation.
- Signing – are there any superfluous or lacking signs?
- Markings – are profiled markings used?
- Illumination – lacking, adequate illumination level?

Intersections and access drives

- Sight zones at intersections and access drives – satisfactory?
- Intersections – location, design.
- Signing – directional signing, yield signing.
- Markings – correct, satisfactory?
- Pedestrian crossings – location, design, visibility.

Bridges

- Alignment of bridge approach – is it good?
- Visibility at crests – is it satisfactory?
- Intersections, ramps at bridge end – is visibility and alignment satisfactory considering speed level?
- Bridge railing – dimensioning, transition between road guardrail and bridge railing, visibility obstruction.
- Pedestrian and bicycle traffic – is this attended to?

Tunnels

- Alignment towards tunnel – is it satisfactory?
- Tunnel portals – do they have a safe design?
- ATC – is there a need?
- Road markings – are profiled markings used? Is there a need for LED lighting?
- Equipment – is there sufficient equipment and is it placed correctly?

10.4 Appendix 4: Short Summary of Country Search

Summary of the various approaches in the countries that have implemented RSI.

Austria:

RSI on motorways since 2003

Handbook on RSI published in 2007

RSI can be prompted by:

- Collisions black spots, especially by various collision types
- On the basis of indications or other information
- By safety deficits, risk potentials or collisions of similar type on longer road sections

The inspection can be carried out by a team or only one inspector.

In addition to the RSI Inspectors all persons who were involved in the inspection process have to be included in the RSI

Inspectors must be qualified experts with long experience in transport safety, transport technology and transport planning.

An experience in road construction, road maintenance and traffic management is necessary.

The independence of the inspectors must be guaranteed and is of course an important requirement for an unbiased and impartial inspection.

There is mandatory training for Road Safety Inspectors in Austria since November 2009

In Austria the RSI consists of the following four steps:

- Preparation work
- On-site inspection
- Report drafting
- Implementation of the measures and monitoring of results.

The on-site inspection and inspection by vehicle is imperative.

The participation of the police department and the road maintenance authority is helpful, because problems can be discussed directly at the particular road section. It is also recommended to document the inspected road section by video recording or by photographs.

Before or after the field inspection, an on-site-discussion will be conducted with all personnel involved, as an aid to completing all the checklists. In addition to day-time inspections, it is also recommended to carry out night-time inspections.

There are extra checklists for different road categories:

- For motorways and express ways
- For rural roads and (Austrian checklist in Appendix 1)
- For roads in urban areas,

Specific checklists for junctions and intersections have also been developed:

- Intersections with traffic lights
- Intersections without traffic lights.

EVES (Electronic Safety Recording System) software developed as an aid to carrying out the road safety inspection.

Belgium:

Use checklists

Procedure is not applied to the entire road network, but on black spots or other sites where a demand from local authorities is received.

It is recommended that the RSI should be carried out by someone who was not involved in the original road project, so the inspector can be independent.

Cyprus:

Safety Inspections have been carried out since April 2006

The inspection team includes an engineer and a technician from the Transport Planning Section of the Public Works Department (PWD) and a representative of the district engineer. In some occasions, a representative of the Design Section of PWD attended RSI as well.

Denmark:

The inspection team includes an engineer and a technician from the Transport Planning Section of the Public Works Department (PWD) and a representative of the district engineer. In some occasions, a representative of the Design Section of PWD attended RSI as well.

The technical methods used for traffic safety audit have been transferred to the inspections. Road Safety Audit guidelines contain checklists, which can also be used for the inspection of existing roads.

Estonia:

RSI started in 2008, when the methodology for RSI was developed.

Check lists for RSI are used.

Finland:

The implementation of the Directive on Road Infrastructure Safety Management will be completed in Finland in 2012 together with its transformation into the existing law dealing with state roads. Finland uses many different methods to find safety deficits, to plan and design corrective actions and evaluate the effects of them in a reliable way.

In Finland, multivariate accident modelling has been applied for about twenty years. The Finnish methods to make impact assessments are called IVAR-tool and TARVA-tool.

The road safety monitoring in Finland is a less formal procedure than the Road Safety Inspection ruled by the EU-directive. Monitoring is performed as on-side-inspections. In addition to monitoring demand surveys of the higher standards for road lightening, the needs of updating speed limits, the higher standards for guard rails, etc. arrangements are ordered. From the viewpoint of road safety, the monitoring process is quite comprehensive and corresponds well with the goals of Safety inspection.

France:

Road Safety Inspections are carried out periodically on the entire national road network at a three year interval.

“Methodological Guide for Road Safety Inspections” was published in 2008

RSI in France consists of the following 7 steps:

- scheduling and request by operator
- preparation
- inspection visit
- presentation of observations
- examination of the inspection report,
- drafting the road operator’s report and
- follow-up and evaluation

The inspections must be carried out by qualified inspectors, who are not familiar with the road section and therefore can take a fresh look at the situation.

The road operator never participates in the visit.

The inspection visit is carried out at day and night in both directions.

It is carried out by car, and during stops photographs are taken or observations are noted.

In the Methodological guide there are different safety factors for two-way roads and for roads with separated lanes.

The inspection team consists of two inspectors.

The role of the inspectors is not to make any judgements, they simply have to identify safety deficits and report them.

The road operator is responsible for the courses of action which follows the RSI. Inspectors must attend proper training. After they have been trained, they will become part of the national pool of RSI inspectors.

The inspection schedule is determined by the road operator.

It is recommended to inspect a complete continuous section between two major locations.

Germany:

Germany has several instruments which can be defined as RSI. One of these instruments is called “Streckenwartung”, an inspection to ensure the safe usability of the roads, including the control of traffic safety at work zones. The requirements for the „Streckenwartung“ are defined at the „Maßnahmenkatalog Straßenunterhaltung und Betrieb“ (package of measures for road maintenance and operation). The road authority is obliged to carry out these inspections regularly – at least weekly.

There are three types of road safety inspections in Germany. These are:

- Regular, periodic inspections performed on all roads, every 2 years on major roads and every 4 years on secondary and local roads;
 - The inspection team consists of the representatives of the road-traffic authority, road-construction authorities and the police.
 - The authority representatives should have the necessary qualification and knowledge of the inspected road section.
 - Further it is recommended to include an expert who doesn't come from the region where the inspected road section is located and thus doesn't know the inspected road section.
- Special purpose inspections that include night time road safety inspections, railway crossing inspections, tunnel inspections, destination-sign inspections and inspections of other signs and traffic control devices taking place every 4 years;
- Ad-hoc road safety inspections performed as the need arises and that comprise signs and traffic control devices.

To ensure a proper performance of road-safety inspections, Inspectors must be trained.

The inspection team has to be composed of members from traffic police, traffic and road authorities, road maintenance staff and optionally external consultants.

Iceland:

It is planned that Road Safety Inspections will be undertaken on national roads on a regular basis every 3-5 years. The goal is to find hazardous locations and develop actions for necessary improvements. The main purpose is to prevent future accidents and decrease the severity of accidents that happen. The roads with the highest traffic volumes are inspected first. The method for RSI has been developed and tested. There are two phases.

Finally, the inspection team writes a report on the results. There is a standard format for this inspection report:

- Chapter 1: Introduction - here is a description of the road that was inspected.
- Chapter 2: Inspection team - background and role of each person.
- Chapter 3: Background data - for example the road design rules, traffic counts and RSI-guidelines
- Chapter 4: Accident analysis of the road inspected. Note: This analysis is done after the inspection.
- Chapter 5: Summary of the inspection.
- Chapter 6: Estimation of costs for the improvements proposed.
- Appendix: Microsoft Word report for the inspected road; can be several pages.

Italy:

Use manual called “Operative procedures for Safety Inspections on Two-Lane Rural Roads”

The requirements for the inspection team are independence and qualification – this means that members have to be independent from design, maintenance and operation of the inspected road; so the inspectors can apply “fresh eyes” to the task.

The active participation of the client is important in the process.

The inspection team must consist of three or more people, since different backgrounds and approaches are beneficial.

The manual requires several site inspections. These are:

- Preliminary inspection
 - Not more than 100km should be inspected in one single inspection.
 - The equipment used for this inspection is a GPS receiver & a digital video camera.
 - In this type of inspection at least three inspectors are needed: the driver, the front-seat inspector and the back-seat inspector.
 - The road has to be navigated at normal speed and in both directions.

- General inspection
 - During a single inspection not more than 30km should be covered at low speed (about 30km/h), to allow inspectors to fill in the checklists.
 - Safety issues are ranked as high level problems and low level problems.
- Detailed Inspection
 - at sites which present specific safety issues,
 - road segments and intersections are inspected separately.
 - The road is inspected at low speed, stopping the car at sites with the greatest safety problems. These have already been chosen during the general inspection. If further problems are identified, they can also be „added“.
 - The inspection is then performed by walking and observing the road features as well as the behaviour of the road users.
 - During the inspection photographs and video-recordings are taken.
 - additional information is: available sight distance, lane & shoulder widths, road user behaviour (speed, queues, braking, overtaking etc.) & signs of crashes (damaged barriers, glass on the roadway etc.).
- Night time inspection
 - main focus is on road signs, delineation and visibility.
 - The procedure requires a thorough documentation via video and a GPS receiver.

Front & back-seat inspectors, who have different views of the road, fill in different checklists. Checklists should not limit the flexibility of the procedure, if general safety problems are identified which are not in checklists, recommendations for these problems can be formulated.

A draft version of the final report can be written by just two team members. The report is written in “problem/recommendation” format.

After discussing the draft version with the whole team the final report is written.

Ireland:

New RSI guidelines expected to be very similar to Stage 4 Road Safety Audit, which takes place 1 year after new road has opened.

Netherlands:

The RSI are not completely applied on a large scale in the Netherlands.

The traffic auditors use checklists and their experience to conduct a RSI.

Now they are developing a procedure to show how the complete RSI could be carried out just by counting all the results of existing parts of Inspections they have already done.

There are two types of inspections:

- In the first type, the national road network is to be inspected at regular intervals (once in 2 years), regardless of the number of road collisions.
- In the second type, only road sections or junctions at the national road network with high collision rates are selected for RSI. This approach is called Network Safety Management and will be carried out every year for about 30 locations.

Norway:

“Handbook Road Safety Audits and Inspections” published in 2006.

RSI in Norway consists of three steps: Preparation, Inspection and Reporting.

More time is now dedicated to preparation

The inspection team should have an inspection leader, members with traffic safety know-how, members with local road-network knowledge and members with contracting competence.

It can also be appropriate to involve the police, the municipality and specialist with know-how of tunnels, bridges, signs and markings, operation and maintenance, as well as road users.

The number of members varies depending on complexity, area, type and length of the section.

The focus should not be on the past collisions, but rather anticipating what can happen in the future.

The locations of individual collisions which occurred in the past should not be the focus-it should be the general collision picture of the section.

A simple collision study should be carried out, which encompasses a survey of which collision types dominated on the section and which have resulted in fatal or serious injury.

This study has to be carried out after the inspection, to check if something has been missed in the inspection. If it is found that there are many collisions at one specific location, a black-spot analysis should be recommended in the inspection report.

The Road Safety Inspection itself is composed of the following three stages:

- *Vidkon* “inspection”
- Reporting and
- Inspection

During the *Vidkon* inspection the description of problems and remedial measure proposals have to be filled in the report form. The collection of all this data makes the field inspection simpler and quicker. The discussion of the problems is to be carried out before the field

inspection. In this way it is ensured that everyone involved can participate in the discussion, which would not be possible during the field inspection. During the field inspection the critical defects should be examined as well as any complex problems picked up in the *Vidkon* inspection.

Poland

Road safety inspection is performed twice a year in spring & autumn as a standard procedure.

Within the framework of this inspection the signs, markings, pavement conditions and other road safety relevant aspects are examined.

An extra survey is possible if deficiencies, which could affect the road safety, are reported to the roads authority by the police.

There is no standard form for reporting.

Inspection teams consist of: road safety experts, road traffic engineers from the roads authority and police officers working in traffic management.

Portugal

RSI has to be implemented within the framework of maintenance inspections which are regularly performed by the National Road Administration.

A standardised and structured approach for this instrument exists, as well as a checklist.

Each road is inspected every five years, but RSI is not applied on the entire road network.

The collision rate is decisive in choosing the road segments to be inspected.

In charge of the inspection are the following persons: one inspector from the National Road Administration Central Headquarters and the engineer responsible for road safety issues at the National Road Administration District Agency of the road.

Romania

RSI will be performed by Romanian Road Transport Authority (ARR), using trained and certified auditors.

RSI will be based on a five year time table, for the entire road infrastructure.

RSI will be performed regularly, with a two years period, alternative in summer and winter seasons.

Spain

Road safety inspections have been carried out in Spain for the last 15 years.

The European Directive will be applied to the entire National Road System. ,

The current safety inspections in Spain are not restricted only to signs and markings, but contain also other safety issues.

During these inspections both photos are taken and video recordings are made. Road Safety Inspections are carried out by the General Road Directorate of the Ministry of Infrastructure

United Kingdom

Information about RSI in UK is based on the *Road Inspection Manual*, issued in 2004.

In UK RSI is part of routine maintenance, with a concentration on short term measures and improvements.

Two categories exist: Category (i) and Category (ii).

Category (i) defects require prompt attention as they represent an immediate or imminent hazard or there is a risk of short term structural deterioration.

Category (ii) contains all other defects, and they should be included in the planned schedules of works.

During the inspections report forms and checklists are used, to be completed as much as possible at the time of the inspection.

The inspections are divided into two types: "Safety Inspections" and "Detailed Inspections". Safety Inspections (SI) are "all defects likely to create danger or serious inconvenience to users of the network" have to be identified.

Remedial measures to correct such defects should take place within 24 hours.

SI should be carry out by a slow moving vehicle, and under certain circumstances on foot.

In order to ensure the safety of the inspection team, the on-foot inspection should be done along the footway, and not along the carriageway.

The Detailed Inspections (DI) are designed according to the Road Inspection Manual (RIM) "to record only those types of defects likely to require routine maintenance."

These defects do not require urgent repair. Nevertheless, in case of identifying immediate or imminent hazards during the DI, these should also be noted.

The SI can be conducted together with the DI, so there is no need to carry these two types of inspections separately.

Australia and New Zealand

The inspection of existing roads is part of the Road Safety Audit (RSA).

In both countries inspectors must be trained and experienced. They are divided in "senior road safety auditors" and "road safety auditors", where senior road safety auditors must be more experienced than road safety auditors.

For these two countries the experience of the auditors is the key factor for the quality of the audits.

Besides daytime inspections, night time inspections are also carried out.

Checklists are used in these two countries.

PIARC Road Safety Inspection Guideline

In November 2007 PIARC produced a Guideline on Road Safety Inspections (RSI).

Defines a Road Safety Inspection (RSI) is a systematic, on site review, conducted by road safety expert(s), of an existing road or section of road to identify hazardous conditions, faults and deficiencies that may lead to serious collisions.

- A RSI is systematic – this means it is both comprehensive and carried out in a methodical way.
- A RSI needs to be carried out by an independent person or team with experience in road safety work, traffic engineering, road user behaviour and/or road design who are not involved in the maintenance of the road or road section.
- A RSI relates to an existing road not roads being constructed.
- A RSI is pro-active, trying to prevent collisions through the identification of safety deficiencies for remedial action rather than responding to recorded crashes.

PIARC Guideline states that a RSI does not require collision data. It is a systematic review of a selected road or relatively long section of a road, regardless of the number of collisions.

The traditional road engineering approach is that safety countermeasures are not considered until the collision situation becomes unacceptable. This approach, commonly known as “black spot” identification, analysis and remediation is a reactive approach, largely event-driven.

RSI's aim to identify any features that may lead to future collisions, so that remedial treatment may be implemented before collisions happen.

Road collision data can provide some guidance in terms of prioritising which roads should be inspected. If a road authority wishes to only inspect a limited number of roads, the priority could be on roads with a high number of collisions expressed as collision per kilometre of road or collisions per traffic volume using the road.

Collision data can also be used to simplify the inspection process – if data shows one type of collision is predominant, the inspection could focus on issues related to that type of collision.

An RSI is comprehensive, with extensive preliminary work, on site appraisal including detailed check lists, analysis of the problems and suggested countermeasures.

RSI is not related to routine maintenance. Maintenance is a regular process where key infrastructure issues such as overhanging branches, the road surface, potholes and poor quality signage are reviewed and remedied. This can be carried out by people who do not necessarily have road engineering or road safety experience but are simply following a planned process.

RSI's can identify safety deficiencies that are a result of poor maintenance, for example poor signing and line marking or visibility issues caused by vegetation.

There are FOUR steps in the RSI process:

- STEP 1: PREPARATORY WORK IN THE OFFICE
- STEP 2: ON SITE FIELD STUDY
- STEP 3: RSI REPORT
- STEP 4: REMEDIAL MEASURES and FOLLOW UP

The Guideline also contains detailed checklists for Motorways and Freeways, Interurban Roads crossing small towns and villages and for Urban main roads. The process can involve small sections of the road with repeated check lists or several runs along the whole road using a single check list. The length chosen depends on the complexity of the road.

The checklists are quite detailed and should lead to a systematic collection of the deficiencies in the network.

10.5 Appendix 5: Summary of Similarities & Differences

Similarities:

There seems to be general agreement about:

- Type of Inspection required for RSI.
- Possibility of using RSA standards as a starting point
- The use of checklists
- The role of the Inspectors & training requirement for the Inspectors

Who is on the Team

Depending on the size of the project, the Team can be quite large, including: road safety experts, road traffic engineers from the roads authority and police officers working in traffic management and optionally external consultants. 'Fresh Eyes' seen as very important.

The road operator

Differing views on the involvement of the road operator. However most agree that:

- The inspection schedule is determined by the road operator.
- The road operator is responsible for the courses of action which follows the RSI, for the implementation of the measures and monitoring of results.

Checklists:

All seem to agree that checklists are required, with specific checklists for differing road types.

Differences:

What is RSI?

Seems to be differing views on what RSI entails. UK and Portugal say its part of routine maintenance, while many other countries, including PIARC, say it is either not related to routine maintenance, or that RSI can also identify safety deficiencies that are as a result of poor maintenance. This would seem to be a more all encompassing definition.

Use of Collision Data

No agreement on use or otherwise of collision data for an RSI. Some say that the focus should not be on the past collisions, but rather anticipating what can happen in the future. Germany and Norway have suggested that there should be two types of RSI, Periodic road-safety inspections and Dedicated road-safety inspections. The Periodic RSI would be the all encompassing one,

along the lines of the PIARC model, while the Dedicated RSI would be the RSI prompted by sections where collisions often occur.

Inspection Team

No agreement on Inspection team numbers, however if we take RSA as starting point there should be a minimum of 2 Inspectors.

RSI - Steps

The number of steps in RSI differs, from 3 to 7. The majority of countries, however, seem to opt for 4 steps - Preparation work, On-site inspection, Report drafting, and Remedial Measures.

Period:

Different countries have gone with differing periods to carry out their RSI on the network. The values range from 2 to 5 years.