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Transport Infrastructure Ireland

TII Publications

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Road Safety Inspection Guidelines

AM-STY-06043
December 2017

Withdrawn

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TII Publication Title	<i>Road Safety Inspection Guidelines</i>
TII Publication Number	<i>AM-STY-06043</i>

Activity	<i>Asset Management & Maintenance (AM)</i>	Document Set	<i>Standards</i>
Stream	<i>Safety (STY)</i>	Publication Date	<i>December 2017</i>
Document Number	<i>06043</i>	Historical Reference	NRA HA 17

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TII Publications



Activity:	Asset Management & Maintenance (AM)
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**Updates to TII Publications resulting in changes to
Road Safety Inspection Guidelines AM-STY-06043**

Date: December 2017

Page No:

Section No:

Amendment Details:

This Standard supersedes the December 2014 version of AM-STY-06043. The principle changes are outlined below:

- a) Definitions and Background removed from Section 1 Introduction.
- b) Section 2 Road Safety Inspection removed.
- c) Section 3 Road Safety Inspection Process removed.
- d) Section 4 Road Safety Inspection Issues removed.
- e) New Appendices Introduced.

Withdrawn

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1. Introduction

This document provides guidance on undertaking Road Safety Inspections on national roads and should be read in conjunction with AM-STY-06044 Road Safety Inspection.

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2. Contents of Appendices

2.1 Appendix A – Inspection Report

The Inspection Team will prepare a written report, which will be forwarded directly to the Authority.

Standardisation of the report format is desirable for the following reasons:

- a) It indicates to the Inspection Team the quantity and quality of the information required;
- b) It enables TII to directly compare the safety performance of various routes, by reference to common report information;
- c) It enables the changes in assessed safety performance of a route to be easily monitored over the years, from inspection to inspection;
- d) It enables easier monitoring of the quality and consistency of Road Safety Inspections.

The standard template report format is provided in Appendix A1. The text in Italics is sample text, guidance notes or items requiring a response.

2.2 Appendix B – Checklist

It is worthwhile to provide a non-exhaustive list of the general items that will need inspection by the team, both on video and on site. An example of a road safety inspection checklist is given in Appendix B. Inspection Teams may use this or other lists when carrying out their work. However, checklists should be used intelligently, and not simply as a “tick box” system. They should be used to inform a robust set of elements to be reviewed and assessed at the beginning of the process. It is recommended that they are also used at the end of the process, to ensure that no major potential safety issue has been overlooked.

2.3 Appendix C – Recurrent Safety Factors

A list of recurrent road safety factors is provided in Appendix C. These are factors that are well documented, are understood to have a significant impact on safety and relate to the road environment; it is not intended that the inspector would use this as a checklist.

2.4 Appendix D – Flowchart of RSI Process

A flowchart of the Road Safety Inspection process is contained in Appendix D.

3. References

The collective experience of road safety professionals, both national and international, is an invaluable resource for the Inspection Team, and the following is a list of documents which can be consulted for guidance on the assessment of road safety issues:

3.1 TII Publications (Standards)

Transport Infrastructure Ireland. AM-STY-06044 (HD17) Road Safety Inspection Guidelines. TII Publications.

Transport Infrastructure Ireland. GE-STY-01024 (HD19) Road Safety Audit. TII Publications.

Transport Infrastructure Ireland. CC-STY-04002 (HD16) Temporary Safety Measures Inspection. TII Publications.

Transport Infrastructure Ireland. GE-STY-01027 Road Safety Audit Guidelines. TII Publications.

3.2 TII Publications (Technical)

Transport Infrastructure Ireland. AM-STY-06046 Road Safety Inspections - Inspection Team Qualifications. TII Publications.

Transport Infrastructure Ireland. PE-PMG-02041 Project Management Guidelines. TII Publications.

3.3 Other Publications

Institution of Highways and Transportation. Guidelines for the Safety Audit of Highways. IHT, London, 1996. European Parliament and the Council of the European Union, 2008. Directive 2008/96/EC of the European Parliament and of the Council of 19th November 2008 on Road Infrastructure Safety Management.

KW. Ogden, Department of Civil Engineering, Monash University, a report prepared for the Federal Office of Road Safety, "Traffic Engineering Road Safety: A Practitioner's Guide", Australia, 1994

PIARC, The World Road Association, "Road Safety Manual", France, 2003.

CEDR (Conference of European Directors of Roads), "Existing Treatment for the Design of Forgiving Roadsides. State of the Art Report", France, 2011.

University of Catania, European Union, Province of Catania, "Operative Procedures for Safety Inspections on Two-Lane Rural Roads", Italy, 2005.

Service d'études sur les transports, les routes et leurs aménagements, "Road Safety Inspections – Methodological Guide", France 2008.

Transfund New Zealand, "Safety Audit Procedures for Existing Roads", New Zealand, 1998.

Norwegian Public Roads Administration, "Road Safety Audits and Inspections", Norway, 2006.

PIARC, The World Road Association, "Road Safety Inspection Guideline for Safety Check of Existing Roads", 2007.

Appendix A:

Sample Road Safety Inspection
Report

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The text in italics is sample text, guidance notes or text requiring a response.

EXECUTIVE SUMMARY

Brief description of the;

- (i) *Route, (Number, length, single, hard shoulder, urban/rural)*
- (ii) *Dates (Appointment, site visits, draft report, final report)*
- (iii) *Number of issues identified*
- (iv) *Route wide issues*
- (v) *Exceptional items*
- (vi) *Total estimate cost of works.*

Introduction

1.0 Report

This report has been prepared in respect of the Road Safety Inspection (RSI) of the *[Insert route number including Section ID start and Section ID end]*. The RSI has been carried out by *[Insert entity]*.

The Inspection Team consisted of *[Insert names of Team Leader, Team Member(s) & Team Trainee Observers]*.

The RSI has taken place between *[insert date of appointment, include milestone dates for site visits, and each draft of this report]* and *[date of issue of final report]*

Description of the Route

The *[insert route number]* extends from *[insert town and county or suitable starting point description]* to *[insert town and county or suitable end-point description]*

The route is *[Insert details of the route, length, single/dual, hard shoulder/no hard shoulder, urban areas /rural areas, areas with large variation in cross section including section IDs, horizontal and vertical alignment, significant junctions (with other national routes, grade separated junctions)]*

Fig 1 Route Location Map

[Min 0.5 A4 page with background mapping with route clearly highlighted]

Scope of the RSI

The scope of work required for the Road Safety Inspection was as follows;

- (i) *Review of data supplied by TII (list data made available)*
- (ii) *Carry out the site visits taking video and photographs with suitable approved equipment (describe equipment used).*
- (iii) *Team Meeting to agree safety issues to be recorded*
- (iv) *Upload the video and photo footage using approved software (describe equipment used).*

- (v) For each issue identified assign and describe the following;
- Unique Tag Identification number
 - Associated TII Site ID and Hazard ID based on the section (usually 1km) of the network that the issue is located
 - Whether the issue occurs on the mainline or side road
 - Latitude and Longitude of the issue location (ITM)
 - A broad summary of the safety issue
 - A detailed description of the safety issue
 - The primary collision type
 - The severity of the primary collision
 - The likelihood of the primary collision
 - The risk rating of the collision
 - A broad solution to eliminate or mitigate the safety issue
 - A detailed description (including a sketch if the solution cannot be easily described in text) of an initial solution to eliminate or mitigate the safety issue.
 - A cost estimate of the initial solution
 - A cost band classification of the initial solution
 - The Application of a Collision Modification Factor (CMF) appropriate to the proposed solution/countermeasure.
 - The calculation of the residual risk associated with the issue after the solution is implemented.
 - The prioritisation of the issues agreed using a matrix of cost band and residual risk
- (vi) Produce a priority list of the issues in both a route wide and a county by county format.
- (vii) Produce an overall route wide and a county by county cost estimate.

2.0 Methodology

Data Gathering

- (i) Video survey undertaken *[insert dates and equipment used]*
- (ii) Videos were uploaded to *[insert location and names of videos]*
*[Note: The following naming convention should be used;
HD17 NXX RSI Dir Y – 20ZZ Note: Dir = Direction and can be 1, 2 or 1&2, Direction 1 is from lowest Section ID to Highest Section ID]*
- (iii) *[Add steps taken including any changes from the scope outlined above]*

Summary of Quantity of Issues Identified

The number of issues identified in the RSI was *[insert total]*. Of that number;

- *[Insert number]* of issues *[insert %]* relate to the mainline,
- *[Insert number]* of issues *[insert %]* relate to the side roads.
- *[insert number]* of issues *[insert %]* occur in rural locations,
- *[insert number]* of issues *[insert %]* occur in urban locations.

Route Wide and Exceptional Item Issues.

Route Wide Issues

A number of issues occur throughout the route that are a safety concern but have not been addressed as single issues as part of the RSI process. These issues will be highlighted to the relevant sections of TII to be addressed when larger schemes are being undertaken such as pavement reconstruction, carriageway widening schemes, on-line realignment schemes or bypass schemes.

These route wide issues include but are not limited to;

- (i) *[Example: Utility poles] [Note: text should be added regarding any future realignments or widening works that utility services should be diverted/service be buried to remove the existing hazard]*
- (ii) *[Example: Trees close to carriageway] [Note: Similar to utility poles, text to be added relating to this issue to be considered for any future works such as road widening or pavement reconstruction]*
- (iii) *[Example: if route has not been treated for replacement of ramped safety barrier terminals at locations where they occur in the line of traffic.]*
- (iv) *[Example: If there are large stretches of the route where boundary walls are close to the carriageway edge in a high-speed environment]*
- (v) *[Example: Post and rail fencing within the clear zone]*

For each county where such issues are identified there should be a tag created indicating example(s) of the common and frequently occurring item(s) along the route and an approximate length of the route in that county affected by the issue quantified.

Exceptional Items.

[Note: this section may be blank for a number of routes]

At a number of locations, it is recommended that significant works are required. These works may not be classed as road safety works given their scale and complexity. The cost of these works would be in excess of the cost bands assigned to the typical solutions identified as part of this process. These items include;

- (i) *[Example: Realign a series of severe bends]*
- (ii) *[Example: Realign the vertical alignment over a series of crests and sags over a number of sections]*

For each county where such issues are identified there should be a tag created indicating example(s) of the common and frequently occurring item(s) along the route and an approximate length of the route in that county affected by the issue quantified.

3.0 Prioritisation of Outstanding Issues

Methodology

To provide a prioritised list of the unresolved issues and their associated proposed solutions the following methodology was adopted.

- i) Each issue identified was given a **Risk Rating (RR)**. The risk rating was the product of the likelihood and the severity of a collision due to the issue.
- ii) Each issue was reassessed based on the proposed solution and assigned a **Residual Risk Rating (ResR)**.
- iii) Each issue was assigned a **Cost Band** for implementation of the proposed solution.
- iv) Each issue was prioritised based on a matrix of Risk Reduction and Cost Band.

Risk Rating

The risk rating (RR) for each issue was developed based on the default likelihood and severity ratings provided by TII and amended by the Inspection Team where they felt that the default rating did not accurately reflect the issue identified.

Collision Modification Factor

Once the potential solutions were identified a reassessment of the risk was undertaken based on the assumption that the treatment would be carried out.

To reassess the risk a factor called the Collision Modification Factor (CMF) was applied.

CMF is the ratio of the expected collision frequency after a solution is implemented to the estimated collision frequency beforehand;

e.g. if a particular solution is expected to reduce the number of collisions by 23% the CMF will be;

$$1 - (23/100) = 0.77.$$

A CMF of 1 would mean that there is an anticipation of no changes in the collision frequency and a CMF of 0 would mean an anticipation that the collision would no longer occur after the solution is implemented.

CMFs based on various solutions can be found in an online repository collated by PRACT.

PRACT (Predicting Road Accidents - a Transferable methodology across Europe) is a project funded by the National Road Administrations of Germany, Ireland, UK and Netherlands within the Conference of European Directors of Roads (CEDR) 2013 Transnational Research Programme - Safety.

Residual Risk Assessment

To allow the CMF to be applied to the risk rating (RR) numerical values were assigned to each risk rating as follows;

RR, High	3.5
RR, Medium	2.5
RR, Low	1.5

The residual risk is the product of the Risk Rating by the CMF

$$RR \times CMF = ResR$$

Residual risks are then classified in categories of; zero, low, medium or high if their values were as follows;

$ResR \leq 1$	= Zero
$ResR >1 \ \& \ \leq 2$	= Low
$ResR >2 \ \& \ \leq 3$	= Medium
$ResR >3$	= High

Cost of Implementation

The cost estimate of implementing the proposed recommendation of each issue was calculated. Costs include for design, land costs (where applicable) and construction costs. [State if Vat included or not]

- (i) Design costs are estimated at being from 10% to 25% of the construction costs.
Note: design costs may be applied as follows;

Construction Cost (€)	Design Cost (%)
0 – 10,000	25
10,000-50,000	20
>50,000	10

- (ii) Land costs are taken as follows;

Portion of Private Garden	€25,000
Agricultural land	€12,000 up to 0.5ha

- (iii) Construction costs are based on the Roadworks Unit Rate Database, Version (Version to be agreed with TII before commencement of the analysis).

The sum of the costs identified above were used to provide cost estimates for implementation of all solutions.

For the prioritisation exercise each solution was assigned to a cost band.

Cost bands were as follows;

Low cost	< €10,000
Medium Cost	>€10,000 < €50,000
High Cost	> €50,000

Prioritisation

The priority of each issue is based on a combination of the Cost of Implementation and the Risk Reduction.

The Risk Reduction is the difference between the untreated risk and the residual risk. The greater the reduction in risk the more effective the treatment. Risk Reduction is given a star rating as follows;

Risk Reduction		Residual Risk			
		High	Medium	Low	Zero
Original Risk	High	*	**	***	****
	Medium	-	*	**	***
	Low	-	-	*	**

The priority of each issue is assigned based on the table below;

Priority		Risk Reduction			
		****	***	**	*
Cost	Low	1	3	5	8
	Medium	2	4	6	
	High	3	5	7	

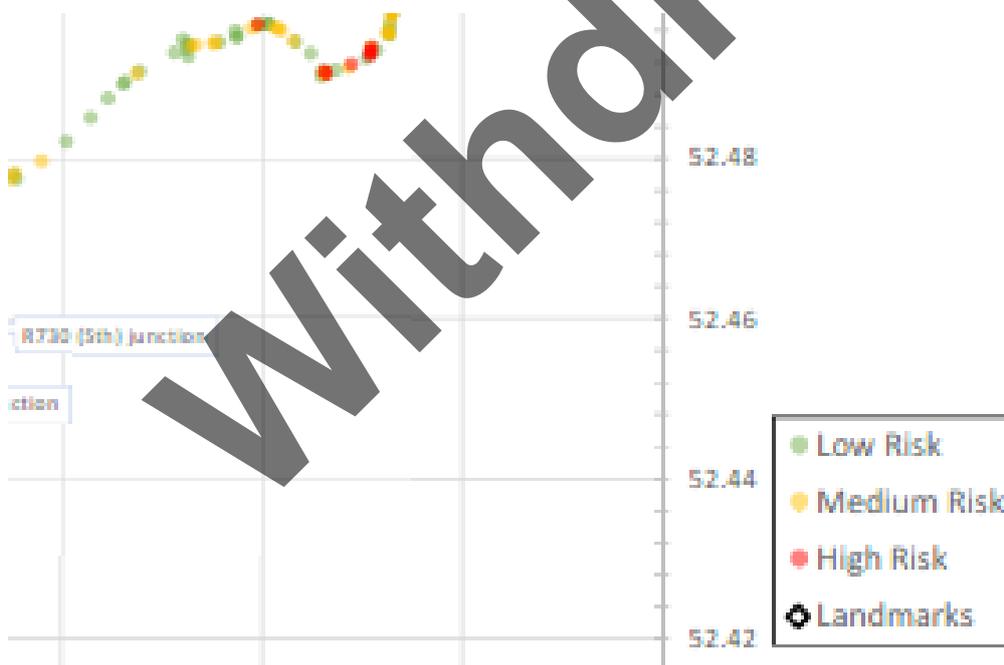
[Note: for a risk reduction of * (i.e. from high risk to high risk, medium risk to medium risk or low risk to a low risk then only low-cost solutions should be recommended as higher cost solutions would not represent value and should not be ranked]

4.0 Summary of Review

Location and Residual Risk Rating

Figure 2 shows the location of each of the issues raised. The locations are colour coded based on their ranking by Residual Risk.

Fig 2 Hazard Location by Residual Risk Rating [Note: Issues plotted by Long/Lat and colour coded based on Residual Risk Rating of Low, Medium or High, may need to be over a number of A4 pages for longer routes with continuity lines to be easily read.]



Priority and Cost

The tables below show the breakdown of the [insert number] issues into each priority rating from 1 to 8 for the entire route and subsequently by county.

Entire Route

Priority	Number of issues	% of issues	Total Cost [Note: this is the sum of the individual costs not cost bands]
1	[insert number]	[insert %]	[insert cost]
2	[insert number]	[insert %]	[insert cost]
3	[insert number]	[insert %]	[insert cost]
4	[insert number]	[insert %]	[insert cost]
5	[insert number]	[insert %]	[insert cost]
6	[insert number]	[insert %]	[insert cost]
7	[insert number]	[insert %]	[insert cost]
8	[insert number]	[insert %]	[insert cost]
		TOTAL COST	[Insert cost]

County X

Priority	Number of issues	% of issues	Total Cost [Note: this is the sum of the individual costs not cost bands]
1	[insert number]	[insert %]	[insert cost]
2	[insert number]	[insert %]	[insert cost]
3	[insert number]	[insert %]	[insert cost]
4	[insert number]	[insert %]	[insert cost]
5	[insert number]	[insert %]	[insert cost]
6	[insert number]	[insert %]	[insert cost]
7	[insert number]	[insert %]	[insert cost]
8	[insert number]	[insert %]	[insert cost]
		TOTAL COST	[Insert cost]

Location of Priority Issues

Figure 3 below shows the location of the priority issues along the route. The issues are colour coded to indicate the priority.

[Note: Similar chart to Fig 2 with priority replacing residual risk ranking]

Categories of Solutions

The tables below show the estimated cost for each of the unresolved design issues for each of the design type Broad Solutions. The first table relates to the entire route and subsequent tables relate to each county. These costs will be provided in the design brief by the Authority.

Entire Route

Feasibility Stage -Broad Solution	Total Cost
Drainage	[insert cost]
Safety Barrier	[insert cost]
Fencing & Boundary walls	[insert cost]
Lighting	[insert cost]
Lining / road studs	[insert cost]
Signage	[insert cost]
Surface / Pavement	[insert cost]
VRU Provision	[insert cost]
Minor Alignment - No Landtake required	[insert cost]
Minor Alignment - Landtake Required	[insert cost]
Informal Parking / Rest Areas	[insert cost]
Utility Provider	[insert cost]
Traffic Signal Review	[insert cost]
Additional Items	[insert cost]
TOTAL COST	[Insert cost]

County X

Feasibility Stage -Broad Solution	Total Cost
Drainage	[insert cost]
Safety Barrier	[insert cost]
Lighting	[insert cost]
Lining / road studs	[insert cost]
Signage	[insert cost]
Surface / Pavement	[insert cost]
VRU Provision	[insert cost]
Minor Alignment - No Landtake required	[insert cost]
Minor Alignment - Landtake Required	[insert cost]
Informal Parking / Rest Areas	[insert cost]
Utility Provider	[insert cost]
Traffic Signal Review	[insert cost]
Additional Items	[insert cost]
TOTAL COST	[Insert cost]

Appendix A1

Summary spreadsheet of all issues.

Appendix A2

Sketches of proposed solutions where applicable.

Appendix A3

Summary sheet of each issue.

Appendix A4

List of Collision Modification Factors used.

Appendix A5

List of Maintenance type issues.

[These are not to be recorded by the RSI Process as they are being identified by separate departments within TII]

Withdrawn

APPENDIX A1

To be produced on an overall route level and on a county by county level.

Tag ID	Hazard ID	Lat	Long	Mainline/Sideroad	Issue	Likelihood	Severity	Risk	Primary Coll Type	Broad Solution	Feasibility Stage Solution	Sketch Y/N	CMF	Residual Risk	Cost	Cost Band	Priority	Link to uploaded video/GPS	
[Table to be sorted in order of priority ranking]	[note: important to identify location]												Note [from list in Appendix D1 or if none appropriate provide CMF and rationale behind that choice]		[Note: Cost Estimate]				URL of video location and specific issues

[Note: MS Excel (or similar) versions of this table to be provided along with each Route Inspection Report]
[Example given in table below]

Tag ID	Hazard ID	Lat	Long	Mainline/Sideroad	Issue	Likelihood	Severity	Risk	Primary Coll Type	Broad Solution	Feasibility Stage Solution	Sketch Y/N	CMF	Residual Risk	Cost	Cost Band	Priority	Link to uploaded video/GPS
23411	N52LH_003.0_6_2	53.851509	-6.580994	M	The unprotected parapet end constitutes a hazard to an errant vehicle.	U	S	M	Bridge	Safety Barrier	Reconstruct parapet (with standard VRS-parapet connection detail) and install VRS in advance in accordance with TD 19.	N	0.49	1.225	12,900	M	6	https://www.xyz.ab
23536	N52MH_018.0_6_1	53.782161	-6.749655	S	The directional sign opposite the side road is located too far to the right to be clearly visible. May result in inadequate warning of the junction ahead.	U	M	L	Side-impact	Signage	Relocate signs to be centered opposite junction.	N	0.64	0.96	1,100	L	5	https://www.xyz.ab

APPENDIX A2

[Note: A4 sketch per issue as required, to include Tag and SITE ID references, to include north point. Background mapping subject to licence]

APPENDIX A3

[Note sample sheet given below, it may be used for consistency by each Review Team but is not necessary once the information listed below is contained within each sheet]

[Note: A4 sheet for each unresolved issue, to include;

Route

Tag ID

Hazard ID

RSI date

Screenshot of issue and location map showing tag suitable scale for others to identify location]

Latitude/Longitude

Mainline/Sideroad

Severity, Likelihood, Risk

Problem category

Issue

Broad solution

Feasibility stage solution

Sketch reference

Residual Risk

Priority

Cost Estimate

Link to video/GPS.]

APPENDIX A4

Collision modification factors are listed in the tables below. Table 1 contains CMFs based on solutions that predominantly reduce the severity of a collision. Table 2 contains CMFs based on solutions that predominantly reduce the likelihood of a collision. CMF values have been determined from the PRACT repository and other repositories when not available in PRACT or referred to by PRACT. *[Note: the list of CMFs will be expanded and updated on a shared platform on a regular basis]*

[Header; Company Logo and TII Logo]

TII, RSI NXX

Route: [Insert Route No.]

Hazard ID: [Insert Hazard ID]

Tag ID: [Insert Tag ID]

Insert screen grab from video or
photograph of issue

Mainline or Side Road: X

Lat/Long: [Insert latitude/longitude ITM]

Link to Video/GPS: [Insert link]

RSI Date: [Insert Date]

Problem Category XX [Hazards to be broken into categories]

Problem Description:

[Insert problem description]

Severity: X **Likelihood:** X **Risk Rating:** X

Broad Solution: [Insert category]

Feasibility Stage Solution: [Insert recommendation]

Sketch Reference: [Insert Where applicable]

Residual Risk: X [H,M,L]

Priority Ranking: x [1-8]

Cost Estimate: [Insert Cost estimate]

Table 1.

Solution	CMF	Source	Comment
Remove boundary wall	0.024	CMF Clearing house	
Protect bridge parapet with safety barrier	0.49	CMF Clearing house	
Realign side road to meet mainline at right angles	0.65	PIARC	
Revise junction layout to give clear priority	0.65	PIARC	
Remove substantial hazard	0.024	CMF Clearing house	e.g. utility pole/tree at outside of bend.
Replace sign supports with passively safe supports	0.7	PIARC	
Provide surfacing with a high skid resistance	0.74	TII road safety remedial measures programme	Reduces both likelihood and severity
Decrease embankment slope from 3:1 to 5:1	0.86	PRACT	ID 1125
Replace crossroads with a roundabout	0.62	PRACT	ID 1139-41 rural only, Reduces both likelihood and severity.
Provide safety barrier	0.65	Austrroads	

Table 2.

Solution	CMF	Source	Comment
Provide chevron signs around bend	0.75	Austrroads	Referred to as curve warning signs
Realign side road vertically to provide dwell area	0.66	PIARC	
Widen junction mouth to cater for vehicles meeting	0.69	CMF Clearing house	
Provide advance warning sign of hazard ahead	0.65	CMF Clearing house	
Provide additional Stop sign where sight through exists at side road	0.45	PIARC	
Provide additional street lighting	0.65	CMF Clearing house	
Provide directional sign opposite side road junction	0.64	PIARC	
Increase lane width	0.91	PRACT	Rural situations only
Provision of directional signs	0.85	Austrroads	Also referred to as guide signs
Prohibit overtaking at sections with inadequate overtaking sight distance	0.7	Austrroads	
Provide adequate sight distance at junctions	0.7	Austrroads	
Provision of parallel parking in lieu of angle parking	0.6	Austrroads	

APPENDIX A5

List of maintenance issues or issues being resolved by others. These are not to be recorded by the RSI Process as they are being identified by separate departments within TII.

[Note: These Tables will be expanded upon and updated in a shared platform on a regular basis]

Table Routine Maintenance Issues

Ref	Routine Maintenance Issue	Explanation
1	Vegetation	The routine maintenance issue includes growth between maintenance cycles. If vegetation needs to be cut back to a greater extent, this should be raised as an issue
2	Faded Road Markings	Faded markings will be renewed as part of a maintenance contract for TII/Other Roads Authority/Operator on a more regular basis that RSI is carried out.
3	Low skid resistance of pavement surfacing	Pavement surfaces are inspected and any skid resistance issues will be identified as on an annual basis as part of a separate contract
4	Faded signage	Faded signs will be renewed as part of a maintenance contract for TII/Other Roads Authority/Operator on a more regular basis that RSI is carried out.
5	Twisted signs	Twisted signs will be renewed as part of a maintenance contract for TII/Other Roads Authority/Operator on a more regular basis that RSI is carried out.
6	Falling signs	Falling signs will be renewed as part of a maintenance contract for TII/Other Roads Authority/Operator on a more regular basis that RSI is carried out.
7	Repairs or upgrades to safety barriers & bridge parapets.	Safety barrier repair and upgrade works are being carried out by the Network Operations Department within TII. This includes upgrades to barrier terminals and transitions to parapets. The length of need or need for new barriers is not included and should be identified during the RSI process. The RSI process should also identify areas where safety barriers may no longer be required and may be unnecessary hazards.
8	Public lighting lamps not working	Public lighting lamps not working will be renewed as part of a maintenance contract for TII/Other Roads Authority/Operator on a more regular basis that RSI is carried out. New or extended lengths of lighting should be identified in the RSI process.
9	Traffic signal heads not functioning	Traffic signal heads not working will be renewed as part of a maintenance contract for TII/Other Roads Authority/Operator on a more regular basis that RSI is carried out. New traffic signals installations or revised layouts/ phasing/ staging should be identified in the RSI process.
10	Sweeping	The sweeping of loose material on the pavement surface will be undertaken by road authorities/operators and need not be raised as part of the RSI process.
11	Drainage- Ponding	Ponding items are to be classified as design or maintenance dependent on site specific cases. It is up to the individual inspection team to determine what type each ponding occurrence is. Example If the ponding is at the edge of the carriageway is because a water cut/grip has not been cleaned out, then that is classified as maintenance as it will most likely be rectified by

Ref	Routine Maintenance Issue	Explanation
		<i>the area engineer during the annual programme but if the pond in in the middle of the carriageway due to a flat spot in the alignment then it is a design issue. Ponding in the middle of the carriageway due to pavement failure/ subsidence would be maintenance issue will be picked up by TII pavements section.</i>
12	<i>Drainage – Gully cleaning</i>	<i>Collected by Area Engineers (Using the GeoApp)</i>
13	<i>Damage to Footpaths /Cycletracks</i>	<i>Collected by Area Engineers (Using the GeoApp)</i>
14	<i>Pavement (potholes, cracking. Edge breakup, wheel rutting, Ironworks repairs)</i>	<i>Collected by Area Engineers (Using the GeoApp)</i>
15	<i>Missing or damaged JDPs</i>	<i>Collected by Area Engineers (Using the GeoApp)</i>

Withdrawn

Appendix B:

Road Safety Inspection Checklist

Withdrawn

The list of common changes to roads that need to be considered in periodic road safety inspections is:

- a) Improved road design and road safety standards;
- b) New products and technology which improve road safety;
- c) Layout changes arising from improvement works, such as road realignment, the occurrence of cut-off roads arising from improvement works, or junction improvement;
- d) Layout changes arising from works consented to in planning, such as additional roadside accesses;

The following is a non-exhaustive list of the general items that will need inspection by the team, both on video and on site:

- a) Roadside /verge area
 - i. Clear zones;
 - ii. Ditch profiles;
 - iii. Manholes;
 - iv. Poles and pylons;
 - v. Emergency phones (location, protection, exposure of users to passing traffic);
 - vi. Weather stations/IT equipment/traffic counter equipment;
 - vii. Trees;
 - viii. Walls and noise barriers;
 - ix. Non passively safe fences – e.g., post and rail fencing inside the clear zone;
 - x. Guardrails – both unnecessary and missing guardrail;
 - xi. Facilities for vulnerable road users.
- b) Roadway
 - i. Passing – passing opportunities and visibility;
 - ii. Stopping sight distance, hidden dips;
 - iii. Road curvature and super-elevation;
 - iv. Signing –superfluous and missing signs;
 - v. Inappropriate Markings;
 - vi. Illumination;
 - vii. Facilities for vulnerable road users;
 - viii. Road pavement
- c) Junctions and accesses
 - i. Visibility provision at junctions and accesses;
 - ii. Junctions – location, design;
 - iii. Signing – directional, warning and regulatory signage, clutter;

- iv. Markings;
 - v. Pedestrian crossings – location, design, visibility.
 - vi. Facilities for vulnerable road users
- d) Bridges
- i. Alignment of bridge approach;
 - ii. Visibility at crest;
 - iii. Visibility at intersections beside bridges (ramps of diamond junctions);
 - iv. Bridge parapet – height, transition to road guardrail, visibility obstruction;
 - v. Provision for pedestrian and bicycle traffic.

Withdrawn

Appendix C:
Road Safety Factors

Withdrawn

The following list has been gathered from various sources and it represents the principal factors encountered by professionals involved in road safety assessment. It may be of use to inspectors to refresh their thoughts in advance of inspections.

Two-way Roads

- a) Overall legibility of the road
 - i. non-appropriateness of the road layout;
 - ii. consistency of road type;
 - iii. discontinuity in the layout.
- b) Bends
 - i. Geometry
 - presence of an isolated bend with a small radius or a bend after a straight section (radius less than about 150 m);
 - presence of a bend with a moderate radius (less than about 250m) after either a larger radius or with low side friction;
 - unprotected hazards on outside of isolated bends.
 - ii. Legibility
 - presence of a bend with poor legibility; users do not clearly see the bend;
 - inconsistent bend signage.
 - iii. Visibility
 - presence of a bend hidden by a crest, leading to insufficient visibility of the bend.
 - iv. Roadside
 - Possibility of avoidance and recovery:
 - presence of grass or hard verge;
 - presence of loose gravel;
 - presence and depth of vee drain and distance from carriageway edge;
 - presence of a height difference between the road and the verge (edge drop-off).
 - v. Limitation of the severity of collisions
 - presence of obstacles in the safety zone: trees, posts, headwalls, masonry items, large sign supports, heavy guardrails, lighting columns;
 - presence of an abrupt change in level;
 - superfluous or improperly fixed restraint systems: unnecessary items, improper terminals, insufficient heights, insufficient lengths.

c) Junctions and access roads

i. Type of junction

- type of junction inconsistent with traffic flows;
- proliferation of junctions.

ii. Reciprocal visibility

For drivers crossing the mainline or turning right at junctions with heavy intersecting traffic:

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

iii. Legibility

For users of a secondary road:

- poor legibility of the presence of a junction, its priority or the driving lines to be followed.

iv. Accesses

- presence of numerous accesses;
- presence of numerous gate posts within the clear zone.

d) Cross-section

i. Three-lane sections (including climbing lanes)

- absence of lane for turning right at junctions;
- Accesses or junctions on climbing lanes.

ii. Overtaking zone

- absence of a merging area at the end of an overtaking zone;
- presence of a conflict point upstream: junction, urban crossing without anything to encourage users to slow down;
- long overtaking zone that encourages users to get accustomed to driving at speed.

iii. Carriageway width

- poor distribution of carriageway width and shoulder width, carriageway overly wide or too narrow.

iv. Vulnerable users

- absence of or discontinuity in pedestrian and cycle paths;
- presence of a zone of conflict between different types of users;

v. Signage

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

Divided Roads

- a) Overall legibility of road
 - i. unsuitability of road layout;
 - ii. consistency of road type.
- b) Bends
 - i. Geometry
 - presence of an isolated bend with a small radius or a bend on a straight section;
 - presence of a bend with a significantly diminishing radius.
 - ii. Legibility
 - presence of a bend with poor legibility; users cannot clearly see the bend.
 - iii. Visibility
 - presence of a bend hidden by a rise and with insufficient visibility of the bend.
- c) The roadside
 - i. Possibilities of avoidance and recovery, and emergency stops
 - absence or insufficient width of the hard shoulder;
 - absence of median strip.
 - ii. Limitation of gravity of crashes
 - absence of restraint system on the central median on motorways;
 - presence of obstacles in the clear zone: trees, posts, non-chamfered pipe heads, masonry, overly large sign supports, overly large guardrails, lighting columns;
 - superfluous or improperly fixed restraint systems: unnecessary items, poor terminals, insufficient heights, insufficient lengths;
 - absence of restraint systems for trucks at a sensitive installation (railway, road, river etc.) or on a structure for crossing a route (road, railway, river).
- d) Junctions and access roads
 - i. Type of junction
 - geometry accommodating entry in the wrong direction;
 - presence of non-isolated fixed obstacles inside a wider section of road or on the central island of a roundabout: trees, posts, headwalls, masonry, overly large sign supports, overly large guardrails, lighting columns.
 - ii. Legibility and visibility
 - poor visibility or legibility at interchange entries or exits;
 - gap in the median on dual sections.
- e) Discontinuity of cross-section
 - i. poor change from a dual-carriageway cross-section to a single-carriageway cross-section.

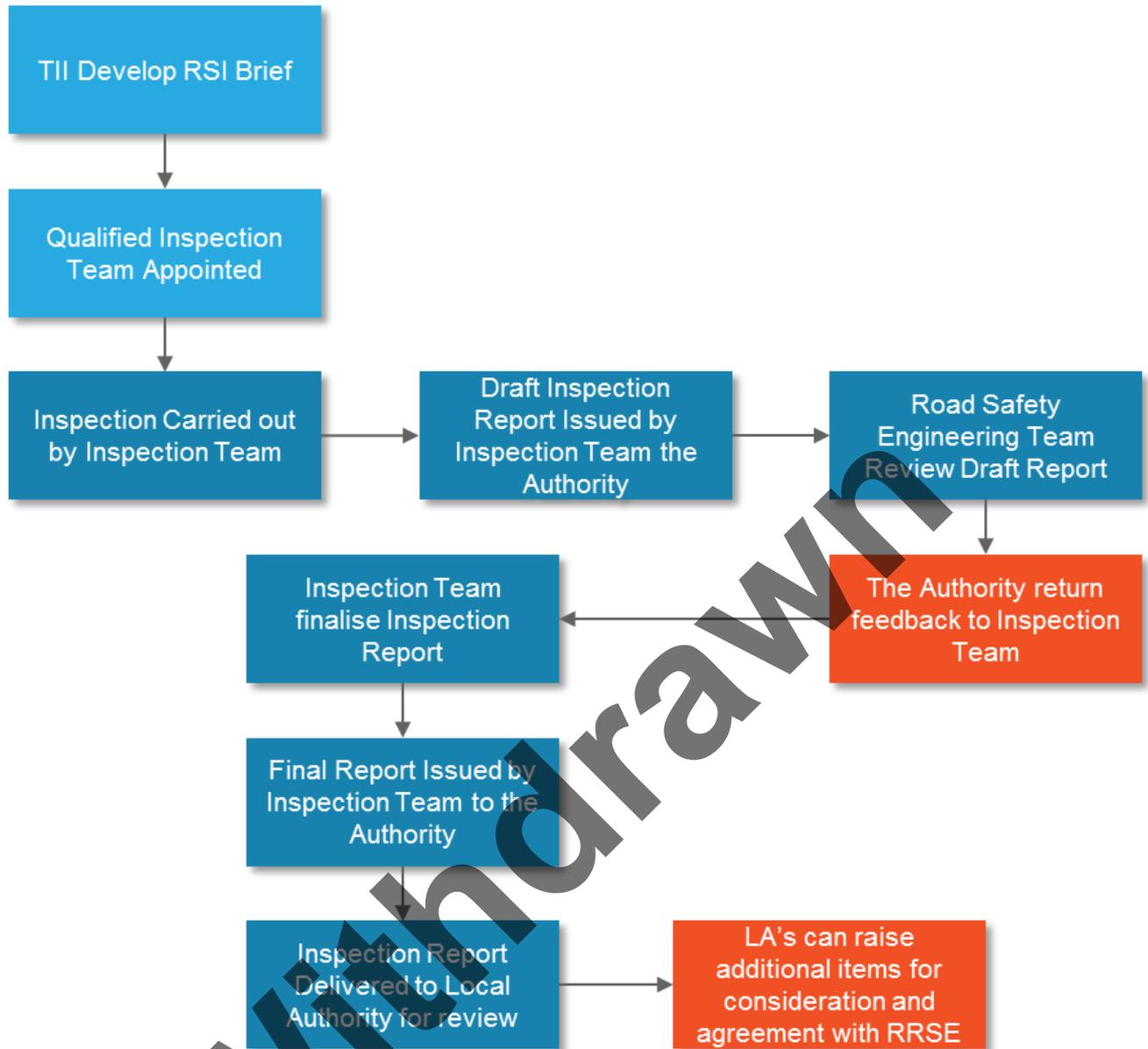
- f) Special users
 - i. bicycle, pedestrian or slow-moving vehicle travel on divided roads with a speed limit of 100 km/h or more.
- g) Vertical and horizontal signing
 - i. lack of consistency, legibility, visibility;
 - ii. speed limit not appropriate for location

Withdrawn

Appendix D:

Road Safety Inspection Flow
Chart

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