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Transport Infrastructure Ireland

# TII Publications

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## Network Safety Ranking

**GE-STY-01022**  
December 2014

**GE** General

**Standards**

## About TII

Transport Infrastructure Ireland (TII) is responsible for managing and improving the country's national road and light rail networks.

## About TII Publications

TII maintains an online suite of technical publications, which is managed through the TII Publications website. The contents of TII Publications is clearly split into 'Standards' and 'Technical' documentation. All documentation for implementation on TII schemes is collectively referred to as TII Publications (Standards), and all other documentation within the system is collectively referred to as TII Publications (Technical). This system replaces the NRA Design Manual for Roads and Bridges (NRA DMRB) and the NRA Manual of Contract Documents for Road Works (NRA MCDRW).

## Document Attributes

Each document within TII Publications has a range of attributes associated with it, which allows for efficient access and retrieval of the document from the website. These attributes are also contained on the inside cover of each current document, for reference. For migration of documents from the NRA and RPA to the new system, each current document was assigned with new outer front and rear covers. Apart from the covers, and inside cover pages, the documents contain the same information as previously within the NRA or RPA systems, including historical references such as those contained within NRA DMRB and NRA MCDRW.

## Document Attributes

<b>TII Publication Title</b>	<i>Network Safety Ranking</i>
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## NRA DMRB and MCDRW References

For all documents that existed within the NRA DMRB or the NRA MCDRW prior to the launch of TII Publications, the NRA document reference used previously is listed above under 'historical reference'. The TII Publication Number also shown above now supersedes this historical reference. All historical references within this document are deemed to be replaced by the TII Publication Number. For the equivalent TII Publication Number for all other historical references contained within this document, please refer to the TII Publications website.

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## **Network Safety Ranking**

**December 2014**

**Summary:**

This Standard covers the requirements for Safety Ranking on National Road Schemes. It describes the stage at which the assessment shall be carried out and the procedures to be followed.

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**VOLUME 5      ASSESSMENT AND  
PREPARATION OF ROAD  
SCHEMES**

**SECTION 2      PREPARATION AND  
IMPLEMENTATION**

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**PART 2**

**NRA HD 15/14**

**NETWORK SAFETY RANKING**

**Contents**

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# 1. INTRODUCTION

## General

- 1.1 The objective of this Standard is to identify sections or locations on the road network which have a high concentration of collisions and to rank the safety of the road network.

## Revisions since HD 15/12

- 1.2 This Standard supersedes NRA HD 15/12 Network Safety Ranking. This standard has been updated and minor revisions have been made throughout. The principal changes are as follows:
- a) The NRA Standards website address has been revised (paragraph 1.7)
  - b) Definition sources updated.
  - c) P.I. (potential for improvement) included (paragraph 1.6).

## Scope

- 1.3 This Standard sets out the procedures required to identify sections on the National Road Network with a high concentration of collisions and to rank the safety of the National Road Network.
- 1.4 The Standard is commended to other Roads Authorities for use in the assessment of their network.

## Definitions

- 1.5 *Ranking of high accident concentration sections or high collision concentration sections:*

Means a method to identify, analyse and rank sections of the road network which have been in operation for more than three years and upon which a large number of fatal accidents in proportion to the traffic flow have occurred. (EU Road Infrastructure Safety Management Directive).

- 1.6 *Network Safety Ranking:*

Means a method for identifying, analysing and classifying parts of the existing road network according to their potential for safety improvement (P.I.) and accident cost savings. (EU Road Infrastructure Safety Management Directive).

- 1.7 *Assessment Team:*

A site inspection is undertaken by a competent Assessment Team which consists of a minimum of two persons. The current NRA training and experience requirements for Assessment Teams are subject to change and are available to download from the NRA standards website: [http://nrastandards.nra.ie/images/stories/Standards/Other\\_Standards\\_Docs/nrahd15\\_quala.pdf](http://nrastandards.nra.ie/images/stories/Standards/Other_Standards_Docs/nrahd15_quala.pdf).

- 1.8 *Authority:*

For National Roads the Authority is the National Roads Authority (NRA).

1.9 *Accident / Collision:*

A road collision is a rare, random, multi-factor event preceded by a situation in which one or more road users have failed to cope with their environment (A Guide to Road Safety Engineering in Ireland, DoE, 1996).

Road collisions occur on a public road, are reported to and recorded by the Gardaí, and are classified as fatal, serious, minor injury or material damage.

1.10 *Fatal Collision:*

Where at least one person is killed as a result of the collision and death occurs within 30 days (Road Safety Authority, 2012 Road Collision Fact Book).

1.11 *Serious Injury Collision:*

Where there are no deaths, but a person or persons are seriously injured. The definition of “serious injury” is an injury for which the person is detained in hospital as an ‘in-patient’, or any of the following injuries whether or not detained in hospital: fractures, concussion, internal injuries, crushing, severe cuts and lacerations, severe general shock requiring medical treatment (Road Safety Authority, 2012 Road Collision Fact Book).

1.12 *Minor Injury Collision:*

Where there are no deaths or serious injuries. A ‘minor injury’ is an injury of a minor character such as a sprain or bruise (Road Safety Authority, 2012 Road Collision Fact Book).

1.13 *Material Damage Collision:*

Where no deaths or injuries occur but damage is caused to a vehicle or property (Road Safety Authority, 2012 Road Collision Fact Book).

1.14 *Network:*

The Network refers to all National Roads as prescribed in the Schedule of National Roads.

1.15 *Reference Populations (R.P.):*

Reference Populations are sub sets of the Network which have similar features and, as such, are expected to have a similar safety performance (PIARC, Road Safety Manual).

1.16 *Collision Frequency ( $C_f$ ):*

Is the total number of collisions which occur along a section of the Network (PIARC, Road Safety Manual).

1.17 *Collision Rates ( $R_{rp}$ ) & ( $R_j$ ):*

A Collision Rate is the ratio between the frequency of collisions over a length of road and an exposure measure, typically in the form of vehicle kilometres of travel over the same section. The Average Collision Rate ( $R_{rp}$ ) is the collision rate for a Reference Population, while the site Collision Rate ( $R_j$ ) is the collision rate for a specific site.

While the EU RISM Directive specifically requires the identification of High Collision Locations based on fatal accident numbers, the calculation of the Collision Rate on the road network is based on all Fatal, Serious and Minor Injury collisions as this data is readily available.

The vehicle kilometres of travel used when calculating the Collision Rate is the middle year of the assessment.

While the Average Collision Rate is calculated for the entire Reference Population, the site Collision Rate is initially calculated for each 1km length of the Reference Population. Following the initial review this 1km length can be further reduced to reflect the site of a cluster of collisions

1.18 *Potential for Improvement (P.I.):*

The Potential for Improvement is the difference between the Average Collision Rate for the Reference Population and the site Collision Rate.

1.19 *High Concentration of Collisions or High Collision Location (HCL):*

A High Collision Location is a site on the Network which has a Collision Rate twice above the Average Collision Rate for the Reference Population, and three or more collisions within the previous three years.



## **2. HIGH COLLISION LOCATIONS AND NETWORK SAFETY RANKING**

### **Roads to be Inspected**

- 2.1 Ranking of High Collision Locations shall apply to all National Roads except as noted in Paragraph 2.2.

### **Exemption**

- 2.2 To complete a review of the collisions on the Network it is necessary to have a number of years of historic collision data. Therefore, sections of the Network may be given an exemption from ranking if the section of the Network being assessed has been opened within the last three years.

### **Scope of Ranking High Collision Locations**

- 2.3 The primary purpose of ranking High Collision Concentration Sections or High Collision Locations (HCL) is to identify sections of the Network which have a High Collision Concentration and from this analysis to identify sections of the Network which have a Potential for Improvement.
- 2.4 Reference Populations (R.P.) are defined at the commencement of the process of identification of High Collision Locations.
- 2.5 The end product of the ranking of High Collision Locations will be the identification of sections of the Network with a Potential for Improvement.
- 2.6 All High Collision Locations identified as having an engineering remedial solution will be ranked according to the potential First year Rate of Return for the preferred option at each High Collision Location.

### **Safety Health and Welfare at Work Act**

- 2.7 It will be important to ensure that the Assessment Team complies with current legalisation and best practice in relation to safety and health while undertaking the assessment of High Collision Locations.

### **Review Periods**

- 2.8 The Authority is responsible for initiating the review of the Network and for ensuring that the review is repeated at the appropriate time interval.
- 2.9 The review of the Network to identify and rank High Collision Locations will be carried out on an annual basis.

### 3. IDENTIFICATION OF HIGH COLLISION LOCATIONS

3.1 The identification and ranking of High Collision Locations is a multi-stage process. It follows the steps listed below:-

- a) Initial Desktop Study
- b) Detailed Desktop Study
- c) Site Assessment
- d) Defining the Problem
- e) Measures to Resolve the Problem
- f) Prioritising the Schemes on the Network.

#### Initial Desktop Study

3.2 The initial desktop study is based on a robust spatial analysis of the collision data, traffic volume data and network road link data. It defines the Reference Populations (R.P.), and calculates the potential for improvement (P.I.) for individual locations.

3.3 Reference Populations (R.P.)

The following reference populations are defined:-

- a) Rural
  - i) Standard and Wide Motorways
  - ii) Type 1, 2 and 3 Dual Carriageways
  - iii) Type 1, 2 and 3 Single Carriageways
- b) Urban
  - i) Standard and Wide Motorways
  - ii) Type 1, 2 and 3 Dual Carriageways
  - iii) Type 1, 2, and 3 Single Carriageways

The initial review of the Reference Population is based on 1km section lengths.

3.4 Collision Frequency (C.F.) and Collision Rates (C.R.).

*Collision Frequency (C.F.)*

Eq 1. Average Collision Frequency for the Reference Population

$$f_{rp} = \frac{\sum f_j}{n}$$

Where:

$f_{rp}$  = Average Collision Frequency for the Reference Population

$f_j$  = collision frequency at site j of a Reference Population

$n$  = number of sites

*Collision Rate (C.R.) is a ratio between a number of collisions and an exposure to traffic volume.*

Eq 2. Collision Rate for individual site (j)

$$R_j = \frac{f_j \times 10^8}{365.25 \times PL_j Q_j}$$

Where:

$R_j$  = Collision rate of site j (collisions/100 Million vehicle km)

$f_j$  = Collision frequency at site j

$P$  = period of analysis (years)

$L_j$  = segment length of site j (km)

$Q_j$  = average annual daily traffic of site j (AADT)

Eq 3. Collision Rate for Reference Population

$$R_{rp} = \frac{\sum f_j \times 10^8}{365.25 \times P \times \sum L_j \times Q_w}$$

Where:

$R_{rp}$  = Average Collision Rate (collisions/100 Million vehicle km)

$f_j$  = Collision frequency at site j

$P$  = period of analysis (years)

$L_j$  = segment length of site j (km)

$Q_w$  = Weighted average annual daily traffic (AADT)

Eq 4. Weighted AADT

$$Q_w = \frac{\sum (Q_j \times L_j)}{\sum L_j}$$

Where:

$Q_w$  = Weighted average annual daily traffic (AADT)

$Q_j$  = AADT of site j

$L_j$  = segment length of site j (km)

- 3.5 This initial desktop study identifies High Collision Locations which are subject to a Detailed Desktop Study.

### **Detailed Desktop Study**

- 3.6 Each High Collision Location is assessed to ensure that all the data used in identifying the location during the initial desktop review is correct.
- 3.7 As the initial assessment is based on section lengths of approximately 1km, it is possible that the collisions occurred at a single site, at multiple sites or a site which extends along a length of the 1km section. Where this is the case then each site becomes the focus for the detailed review.
- 3.8 A detailed review of the collision data for the collisions at the High Collision Location is undertaken to identify the factors which can explain how the various road users failed to cope immediately prior to the collisions. The analysis should aim to highlight factors common to a number of the collisions at the site.

### **Site Visit**

- 3.9 Once the collision data and other relevant data for a particular location have been studied, it will be necessary to carry out a site visit. The site visit should only take place after the initial collision study has been completed. This should avoid the pre-judgement of collision problems that can happen if the site is visited prior to the collision data been examined.

The site visit should be used to try to understand the site from the point of view of those involved in the collision. It should note the various road features at the site.

### **Defining the problem**

- 3.10 Once the collision analysis and site visit has taken place, the collision problems for the site can be defined. The definition of the problem should be as precise as possible so that a specific counter measure or counter measures can be designed to resolve the problem.

### **Measures to Resolve the Problem**

- 3.11 Once the collision problems have been identified, possible treatments can be considered. An assessment of the different treatments is carried out to identify the most suitable treatment available.

### **Prioritising the schemes on the Network**

- 3.12 All sites which are identified as having an engineering remedial solution will be ranked against all other High Collision Locations on the Network, according to the potential First Year Rate of Return for the preferred option at each site.

## 4. REFERENCES

- 4.1 Department of Environment, [A Guide to Road Safety Engineering in Ireland](#), 1996
- 4.2 Road Safety Authority, [Road Collision Facts](#), 2011
- 4.3 PIARC, [Road Safety Manual](#), 2003

## 5. ENQUIRIES

- 5.1 All technical enquiries or comments on this document or any of the documents listed as forming part of the NRA DMRB should be sent by e-mail to [infoDMRB@nra.ie](mailto:infoDMRB@nra.ie), addressed to the following:

“Head of Network Management, Engineering Standards & Research  
National Roads Authority  
St Martin’s House  
Waterloo Road  
Dublin 4”



.....  
Pat Maher  
Head of Network Management,  
Engineering Standards & Research





Bonneagar Iompair Éireann  
Transport Infrastructure Ireland



Ionad Ghnó Gheata na  
Páirce,

Stráid Gheata na Páirce,  
Baile Átha Cliath 8, Éire



[www.tii.ie](http://www.tii.ie)



+353 (01) 646 3600



Parkgate Business Centre,  
Parkgate Street,  
Dublin 8, Ireland



[info@tii.ie](mailto:info@tii.ie)



+353 (01) 646 3601