



PRE-XVII CONGRESO ARGENTINO  
**de Vialidad y Tránsito**  
8º EXPOVIAL ARGENTINA



**3 AL 6 DE NOVIEMBRE 2014**

**HOTEL PANAMERICANO - Buenos Aires, Argentina**

# Planning and Management of Road Safety Improvements

Douglas W. Harwood

MRIGlobal

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X CONGRESO INTERNACIONAL ITS  
X SIMPOSIO DEL ASFALTO



II SEMINARIO INTERNACIONAL DE PAVIMENTOS DE HORMIGÓN

[www.congresodevialidad.org.ar](http://www.congresodevialidad.org.ar)

# How Can We Move Toward Zero Deaths and Serious Injuries on the Road System?

We already know the key improvement types  
to reduce severe crashes

# Shoulders

Wide paved or stabilized shoulder



Narrower turf shoulder



Safety difference of 10 to 25% in crashes for all severity levels

# Striping and Delineation



11% reduction in fatal-and-injury crashes with striping and delineation and rumble strip improvements

# Rumble Strips



Centerline Rumble Strip

6% reduction in fatal-and-injury crashes



Shoulder/Edgeline Rumble Strip

15% reduction in fatal-and-injury crashes

# Head-on crashes

- Combined mass and speeds of vehicles often leading to fatal and serious outcomes
- Contributing factors:
  - Driver fatigue
  - Driver impairment
  - Failure to judge curve
  - Skid or loss of control
  - Driver distraction
  - Passing maneuvers
- Effective countermeasures are available



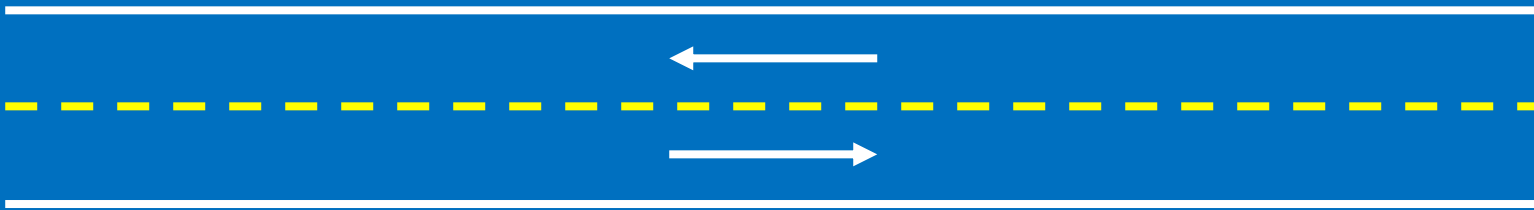
# Passing Lanes



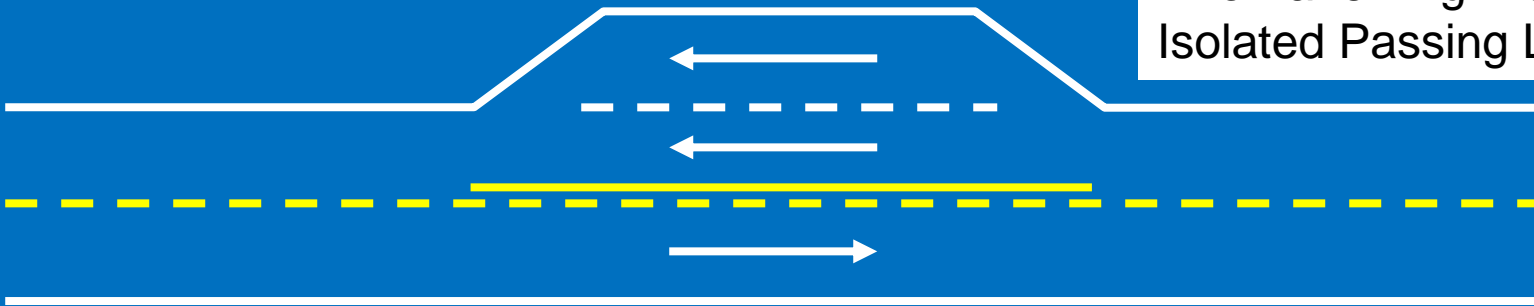
25% reduction in total and fatal-and-injury crashes with passing lane installation

# Passing Lanes

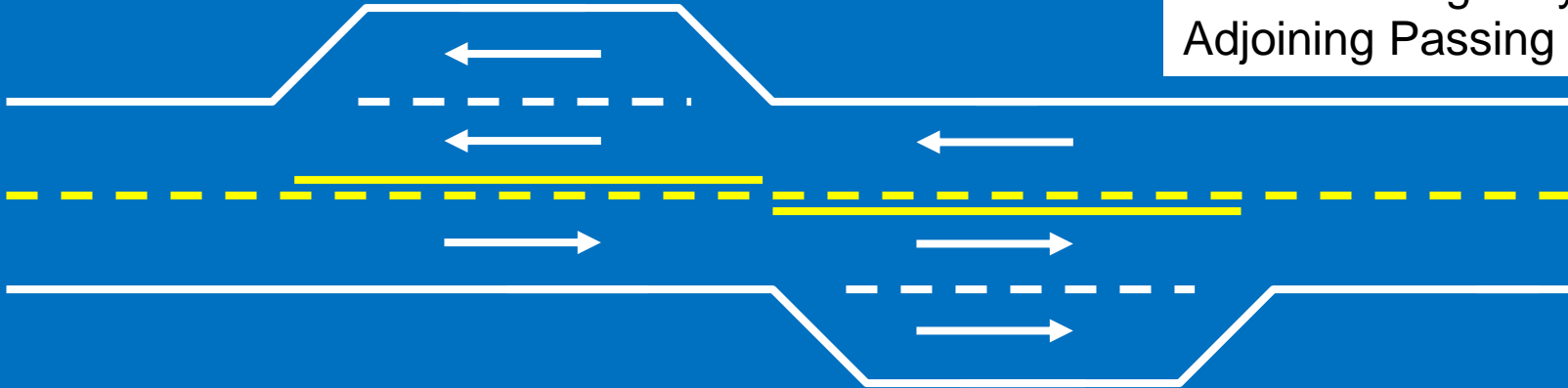
Conventional Two-Lane Highway



Two-Lane Highway with Isolated Passing Lane



Two-Lane Highway with Adjoining Passing Lanes





# Central hatching and flexi-posts

- Advantages: increases separation between flows
- Implementation issues: width requirements, may need regular maintenance
- Effectiveness: 10 to 25% in severe crashes



# Median Treatments

- traversable (grass) median
- barrier median
  - rigid (concrete barrier)
  - semi-rigid (steel w-beam barrier)
  - flexible (cable barrier)



# Intersection Turn Lanes



Left-turn lane: 10 to 55% reduction in fatal-and-injury crashes

Right-turn lane: 10 to 25% reduction in fatal-and-injury crashes

# Signalized intersections

- Reduces crash risk by restricting movement of vehicles through the intersection
- Must ensure adequate visibility of signal heads
- Consider incorporating pedestrian signals



A signalised intersection in Thailand. Photo courtesy of David Best.

# Grade Separation

- Reduces side impact crashes
- Fewer conflict points
- Improved traffic flow
- Costly and often requires land acquisition

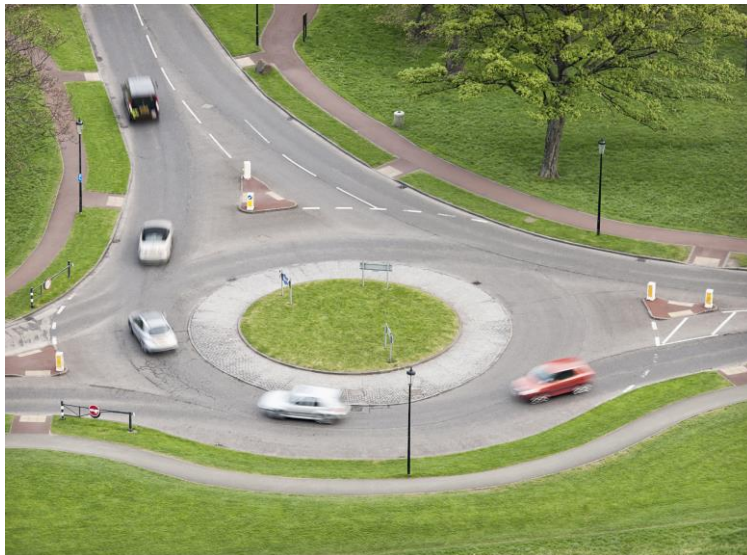


# Roundabouts

- Reduce crash frequency and severity
- Cause little delay in low and medium flows
- Require less maintenance than signals
- Geometric design is key to safe and efficient operations
- Deflection on approach to slow vehicles
- Need to consider pedestrians and bicyclists

RURAL LOCATIONS  
80 to 90% reduction in  
fatal-and-injury crashes

URBAN LOCATIONS  
60 to 80% reduction in  
fatal-and-injury crashes



# Roadside Design – Clear Roadsides Minimize Run-Off-Road Crashes



# Roadside Design – Clear Zone or Traffic Barrier?





# Guardrail – Needed at Steep Slopes or Roadside Objects; Guardrail End Must Be Properly Treated



# Consequences Where Guardrail End Is Not Properly Treated



# Guardrail End Treatments Are Essential



# Pedestrian Crossings



# Sidewalks



# Bicycle Facilities



# **How to Select Appropriate Countermeasures for Specific Roads?**

**iRAP provides an internationally recognized method**

# International Road Assessment Program (iRAP)

- iRAP is an international program with evaluation protocols and software tools that can be applied to rural and urban roads:
  - identify the highest risk roads
  - select crash countermeasures that make engineering sense and have demonstrated cost-effectiveness
- Pilot program for iRAP in Argentina in 2009
  - 1,540 km of National highways
  - 1,450 km of Provincial highways in Cordoba



# Risk Mapping

- Crash density (crashes per kilometer)
- Crash rate (crashes per vehicle-kilometer travelled)
- International benchmark
- Effective communication tool for identifying high-risk roads

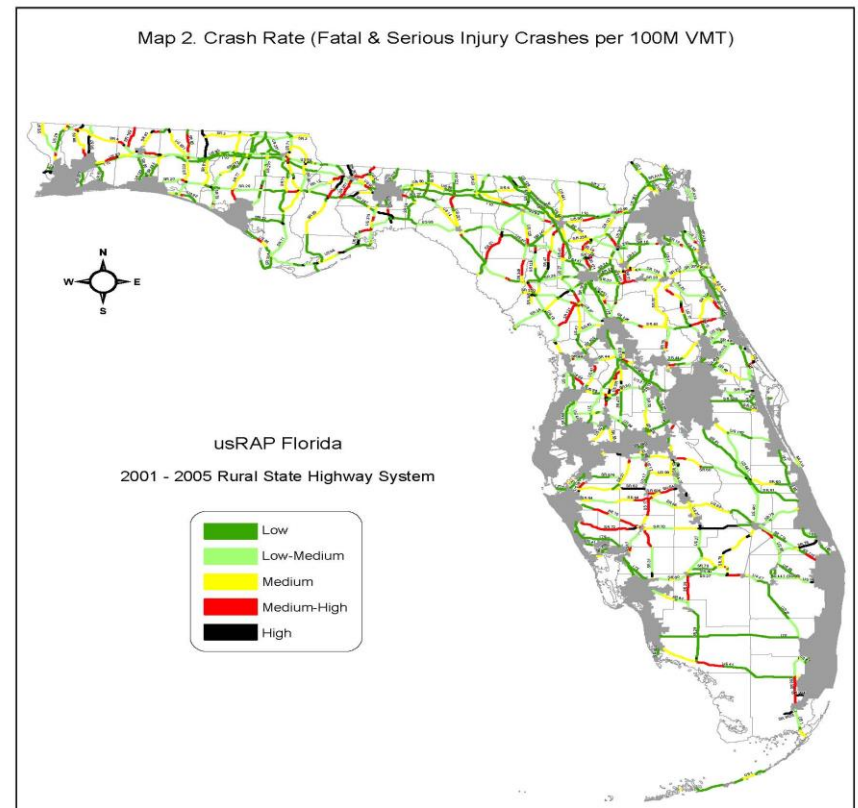


Figure 3. Average annual casualty crashes per km



# Star Ratings & Investment Plans



## Inspections

More than 40 features that influence serious casualty risk

## North Coast Corridor - Indonesia Map



## Star Ratings

For car occupants, pedestrians, bicyclists and motorcyclists



## Training

For local engineers in risk assessment and countermeasures



## Life-Saving Countermeasures

Recommendations for simple, affordable improvements

# Star Rating Model

- Developed by world-leading road safety research agencies
- Validation studies in many countries
- Governed by a Global Technical Committee
- Ongoing research and development is continuously improving the model
- Can be used as a first-cut assessment for safety-appropriate designs



# The Road Attributes

Shoulders  
Roadside Hazards  
Sidewalks

Area type  
Speed  
Vehicle flow

Crossing Facilities  
Pedestrian Flow

Alignment  
Grade

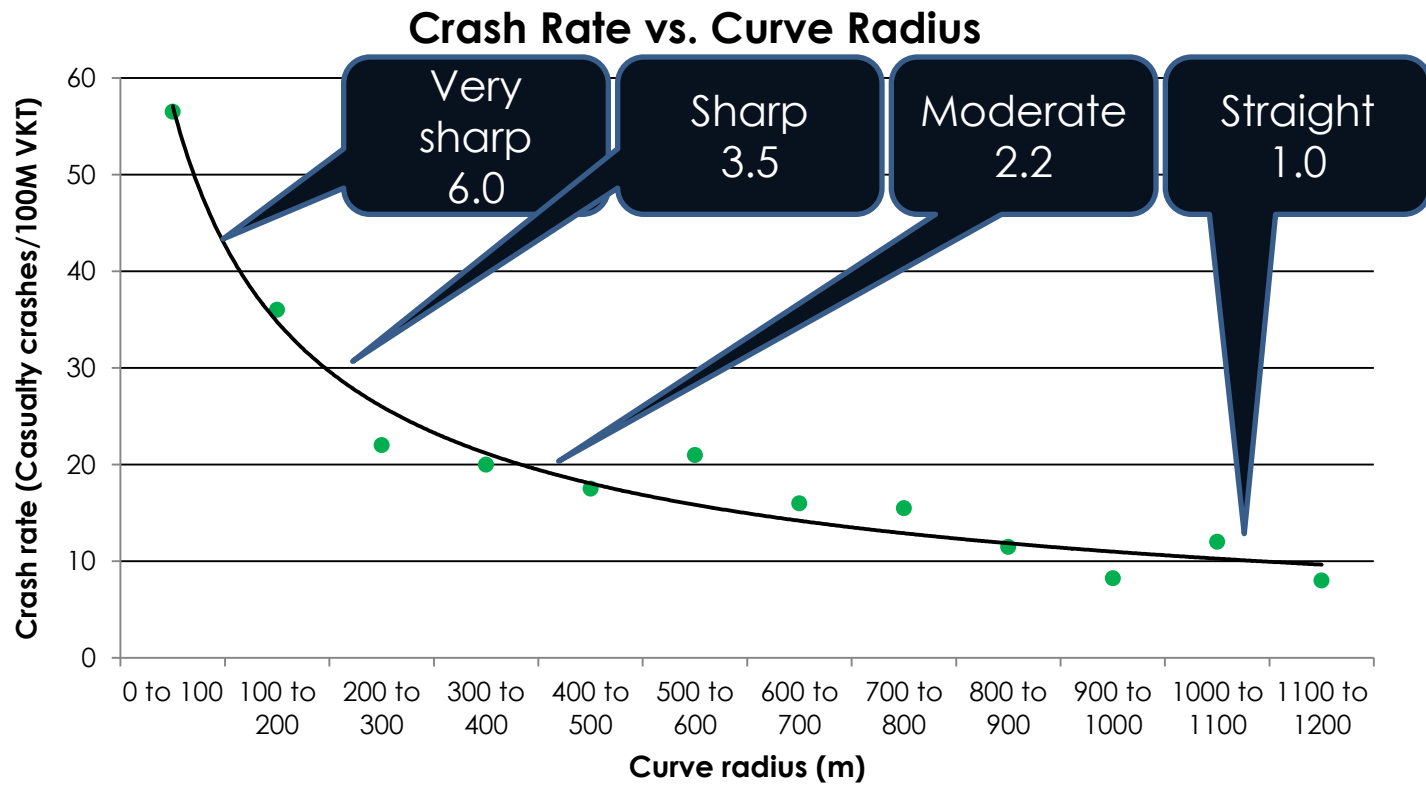
Road condition  
Skid Resistance

Intersection type  
Intersection quality  
Intersecting volume  
Channelization

Median / Centerline  
Rumble strips  
Sight distance  
Grade

Street Lighting  
Sight Distance  
Delineation

# Risk factor example



# The Business Case for Safer Roads

## 20 year economic analysis

Footpath provision driver side (>3m from road)

Footpath provision driver side (>3m from road) 1,646.30 km 44,263.63 4

Footpath provision passenger side (>3m from road)

Footpath provision passenger side (>3m from road)

Footpath provision passenger side (>3m from road)

### Location details

**Road** N2  
**Section** N2-5 - Bhulta (Int.with R203)-  
 Jehastala (Int.with Z2038)

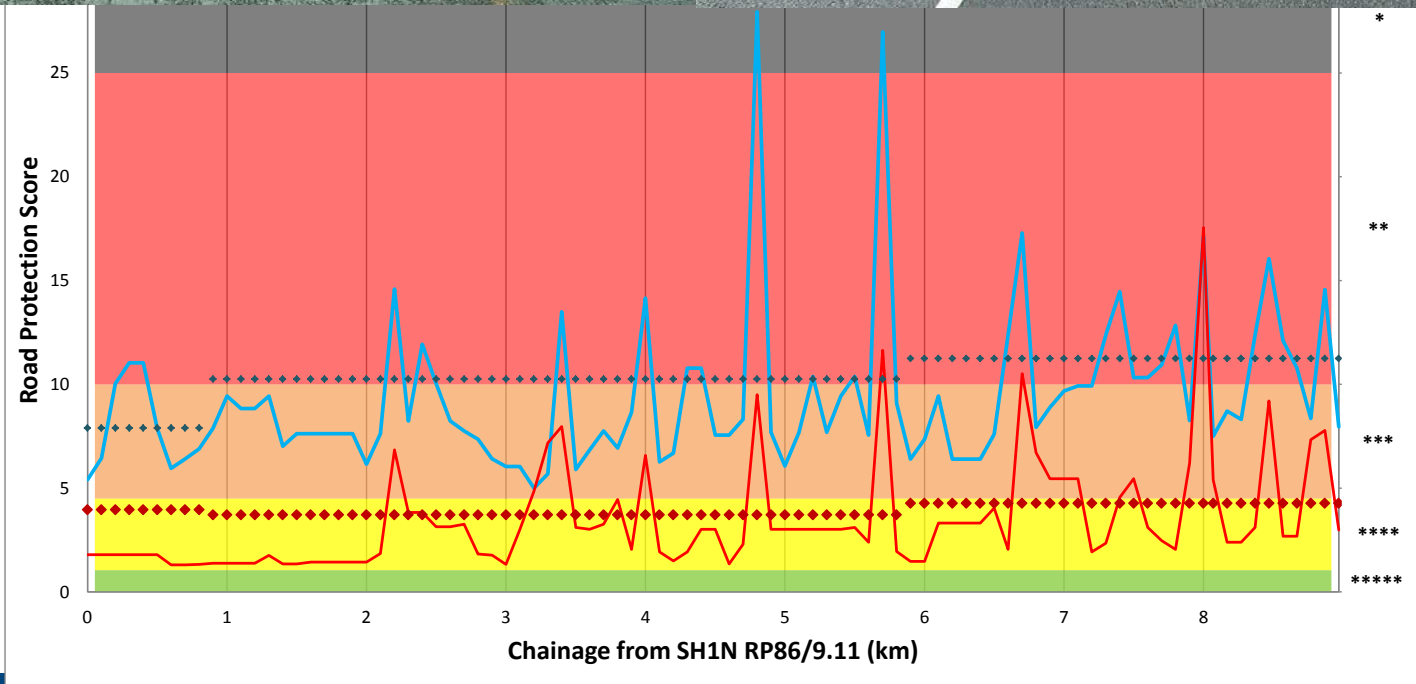
**Carriageway** 3  
**Distance** 18.138

### Estimated programme details

**Cost** \$313,899.16  
**KSlc saved** 2.110802



# Before & After Star Ratings



# Star Rating Designs



## 5 years prior

- 6 fatal head-on crashes
- 3 injury head-on crashes

## 4 years after

- No fatal head-on crashes
- No injury head-on crashes

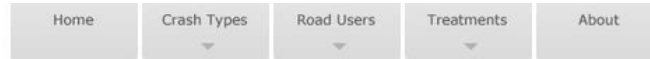




# Road Safety Toolkit

[toolkit.irap.org](http://toolkit.irap.org)

ROAD SAFETY  
TOOLKIT



Home

Search the iRAP Toolkit



The Road Safety Toolkit provides free information on the causes and prevention of serious road crashes.

Building on decades of road safety research, the Toolkit helps engineers, planners and policy makers develop safety plans for car occupants, motorcyclists, pedestrians, bicyclists, heavy vehicle occupants and public transport users.

The Road Safety Toolkit is the result of collaboration between the International Road Assessment Programme (iRAP), the Global Transport Knowledge Partnership (gTKP), the World Bank Global Road Safety Facility and ARRB Group.

## Quickfind

- Motorcyclist
- Cyclist
- Head on
- New Car Assessment Program (NCAP)
- Vehicle Features and Devices

## Stay informed

Get the latest news on road safety improvements from iRAP.



Sign up here ▶

## Did you know?



Head-on crashes often result from a steering wheel overcorrection...

## Latest Case Study



### Coming Soon

We're working on this site right now to bring you as much information as possible.

- Free access
- Share knowledge
- Typical treatments and crash reductions
- Implementation issues
- Link to key reference documents

**Questions?**