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Determination of crash barrier runout lengths for expressways in India based on crash data analysis

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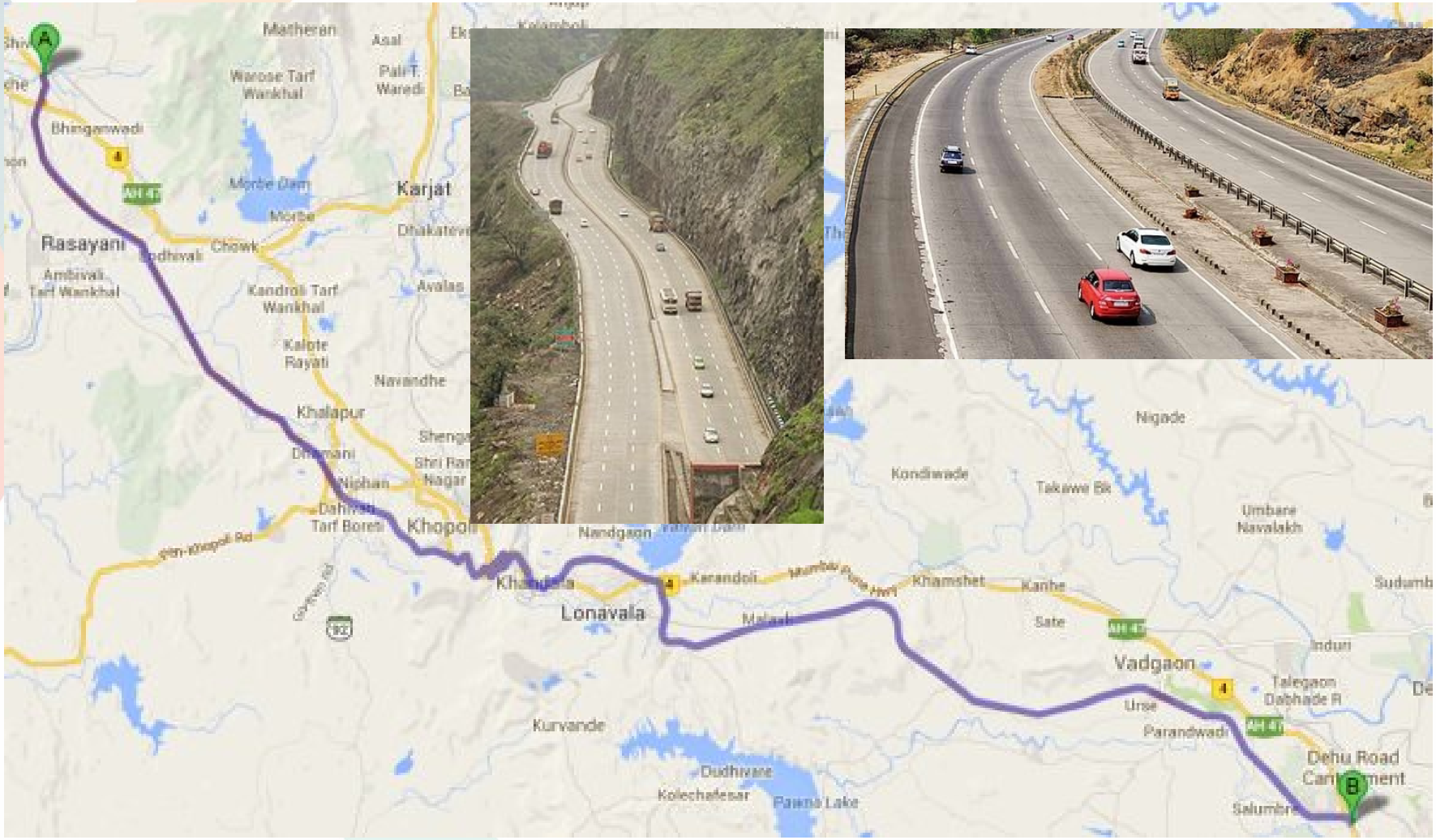
Mumbai Pune Expressway (94.6 km)



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Introduction

- Scientific crash investigations on the Mumbai-Pune Expressway since October 2012.

RASSI

FUELLED BY SCIENCE.DRIVEN BY DATA.

An in-depth crash database containing detailed crash data collected through on-site crash investigations with the cooperation of the police. The crash data, including reconstruction and injury information, is shared by a consortium of OEMs for scientific crash analysis.

Crash Investigation → Crash Reconstruction → Victim Interviews → Injury Data Collection

Founder & Coordinator

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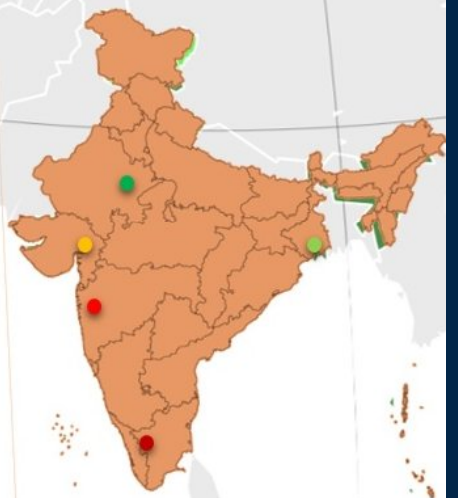
Sampling Locations

Coimbatore, Tamil Nadu
Pune, Maharashtra
Ahmedabad, Gujarat
Kolkata, West Bengal
Jaipur, Rajasthan



RASSI Consortium Members

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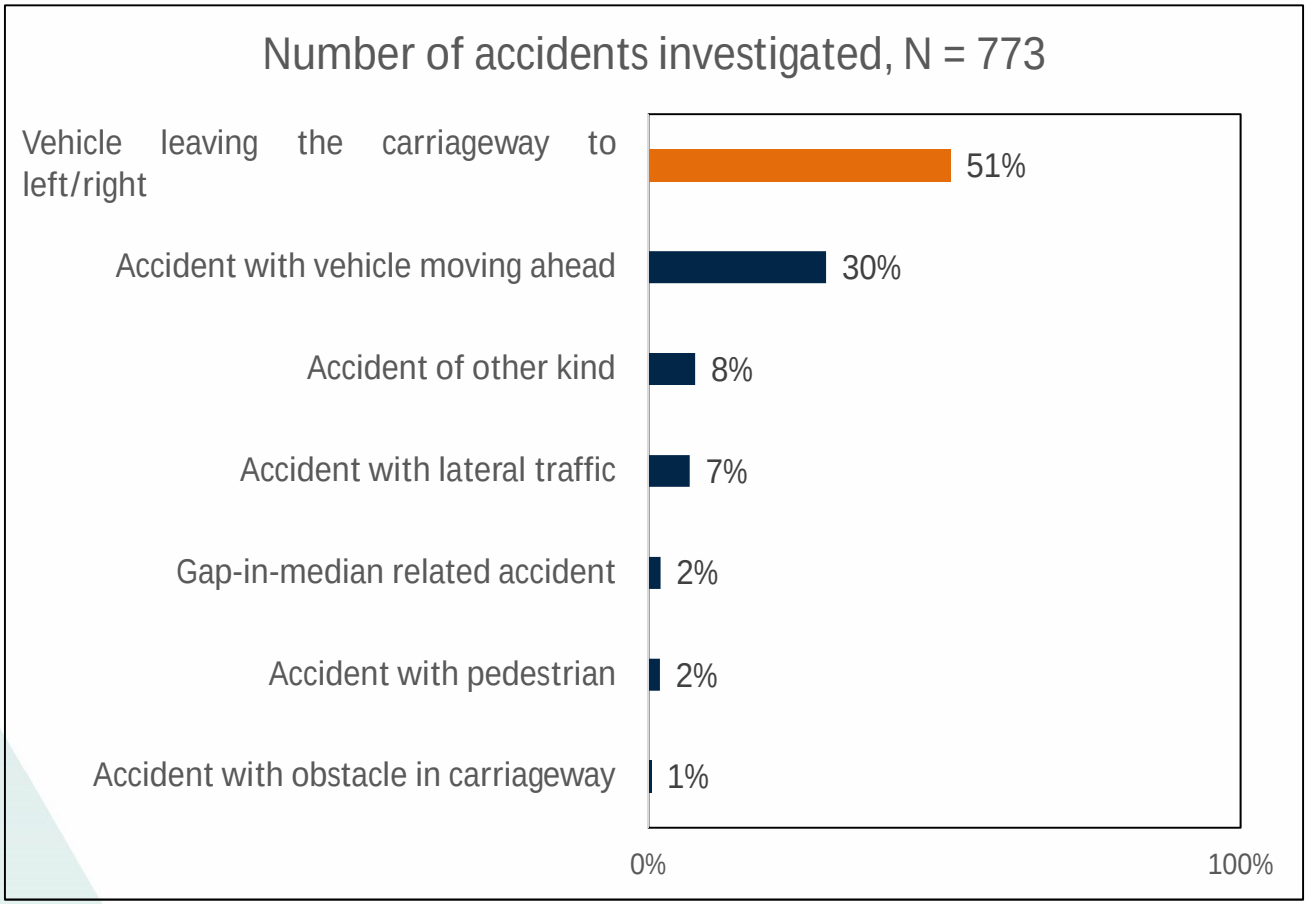
Crash Data

- 773 crashes investigated in 4 years.
- 500 fatalities and over 1500 seriously injured victims.

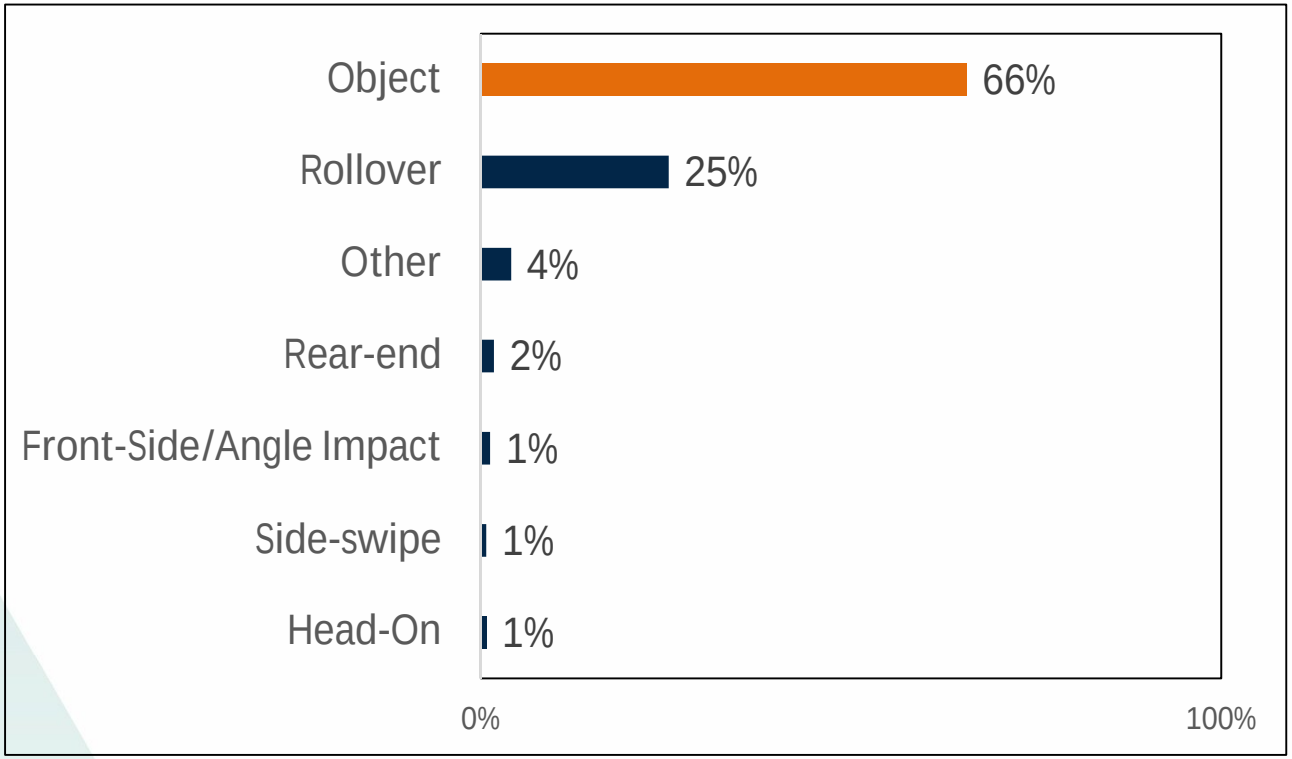
Percentage Distribution of "Kind of Accident"



Run-off road crashes (51%, 390 out of 773 crashes) are the major crashes occurring on MPEW.

Percentage Distribution of "First Crash Configuration"

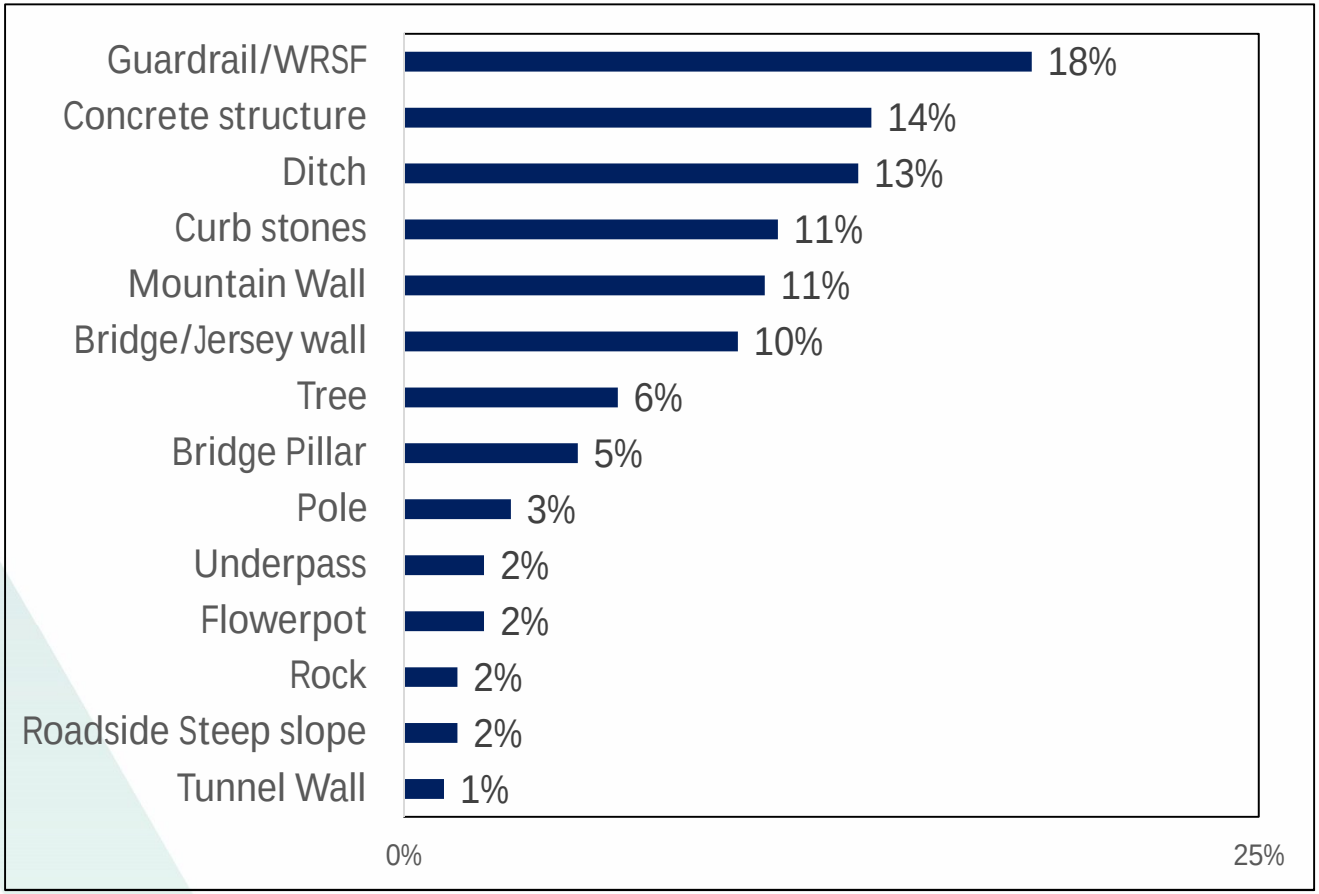
Distribution of the first crash configuration post the vehicle leaving the carriageway (390 accidents) is as follows:



First Impact after leaving the carriageway is with a roadside/median objects in 66% (256 out of 390) of the run-off from road crashes.

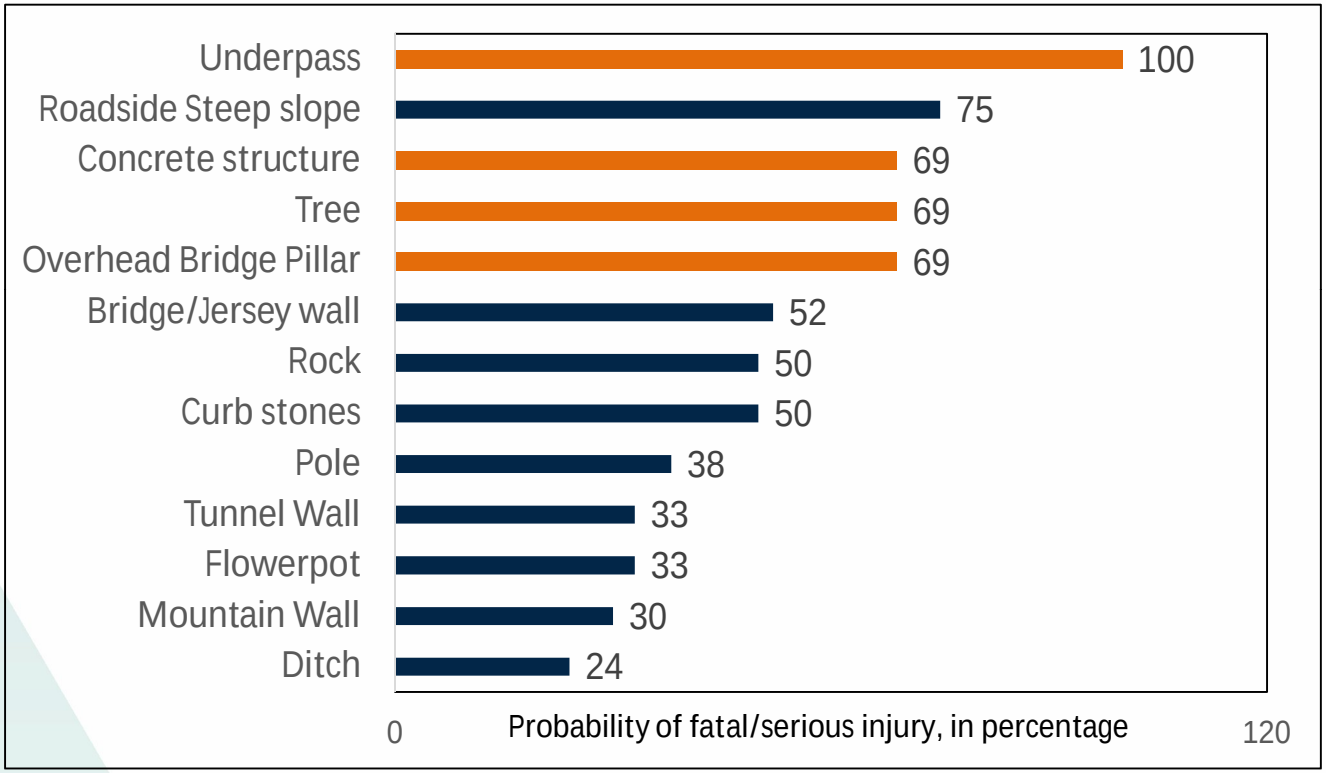
Distribution of "Roadside/Median Objects Impacted"

Distribution of the object type impacted (256 accidents) by the run-off road vehicle is as follows:



Distribution of injury severity rate

Distribution of the injury severity rate for the object types impacted by the run-off road vehicle is as follows:



70 crashes with object impacted type as Underpass, OHB Pillars, Trees and Concrete Structures were identified for further study.

Object types selected for this study

The following objects were selected based on the ease of implementation of counter-measures through installation of crash barriers.

Trees

Concrete Structures

OHB Pillars

Underpasses

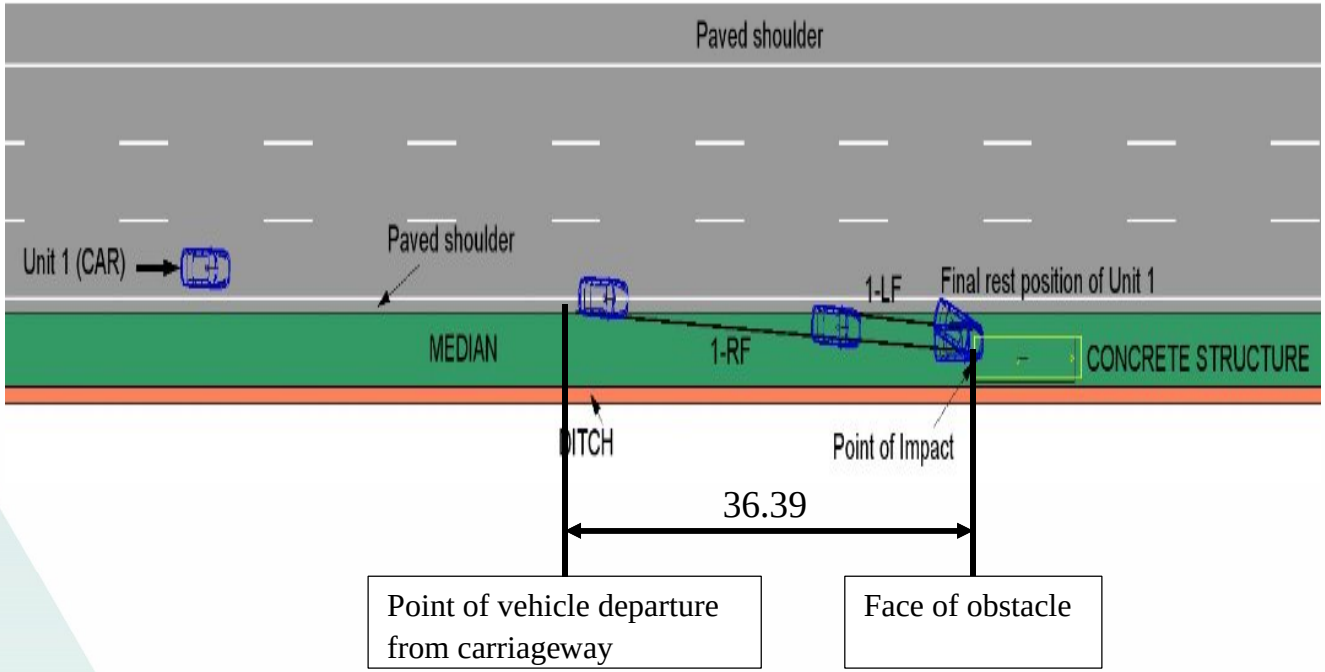
IRC guidelines for crash barrier installation on expressways

- As per IRC SP:99-2013 Section 10.7.7, the minimum guardrail runout length is 30 meters.
- Crash investigations indicate this runout length is inadequate.

Hence minimum guardrail runout lengths need to be recalculated using crash data.

Methodology – Measurement of distance

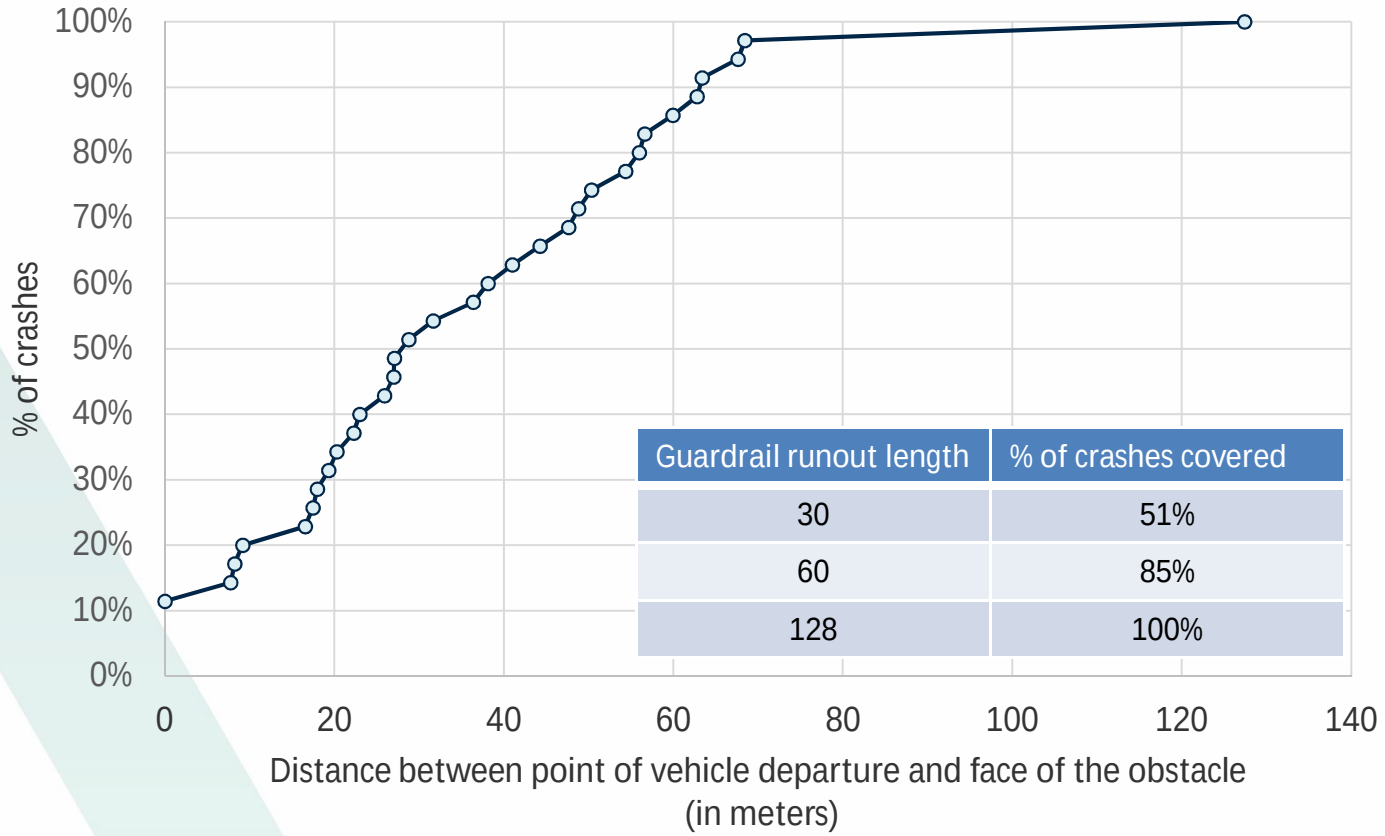
The distance between the point of vehicle departure from carriageway and the face of the obstacle was measured using to-scale 2D diagrams of the scene.



Using the same method, distance was calculated for all crashes involving impacts with objects selected for this study.

Results – Concrete Structures

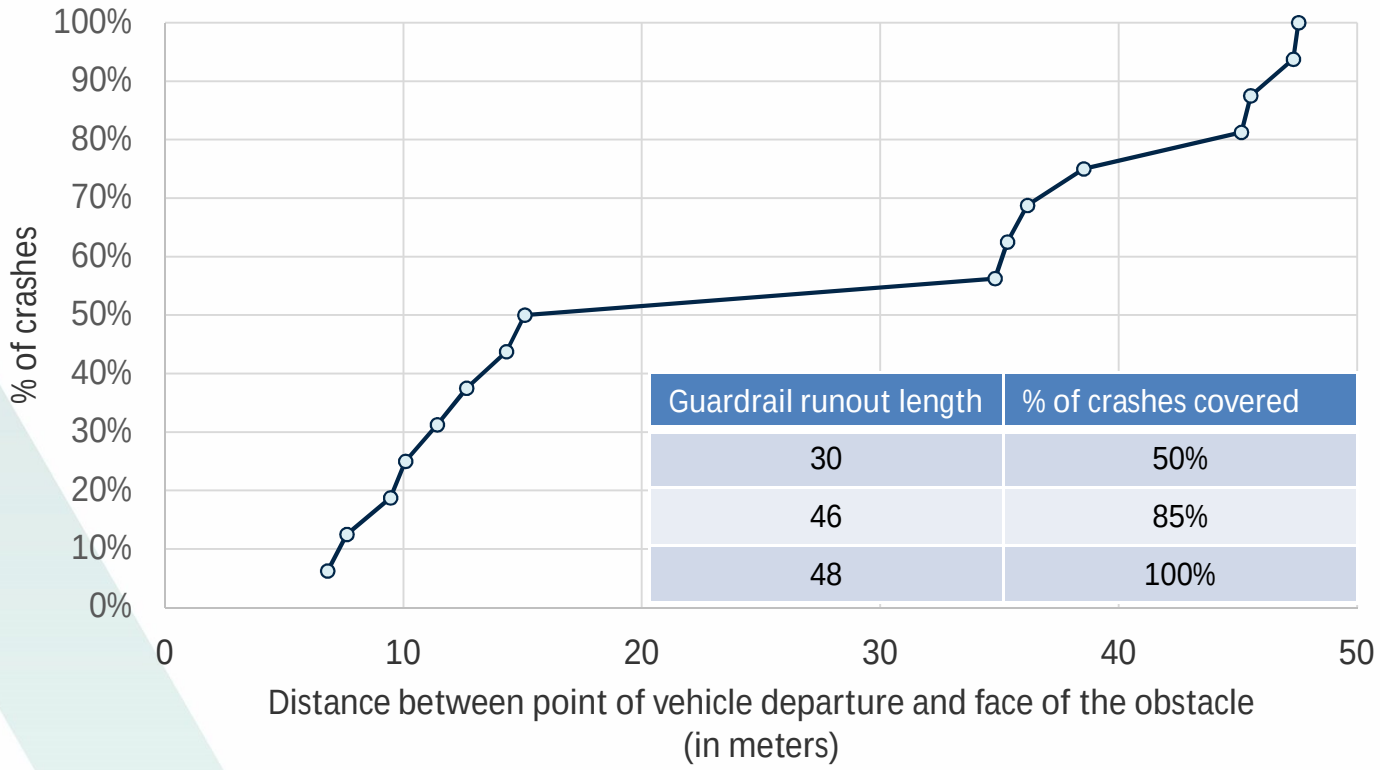
The cumulative frequency distribution of measured distances for run-off road vehicles impacting a concrete structure (N = 35) is:



Guardrail runout length	% of crashes covered
30	51%
60	85%
128	100%

Results – Trees

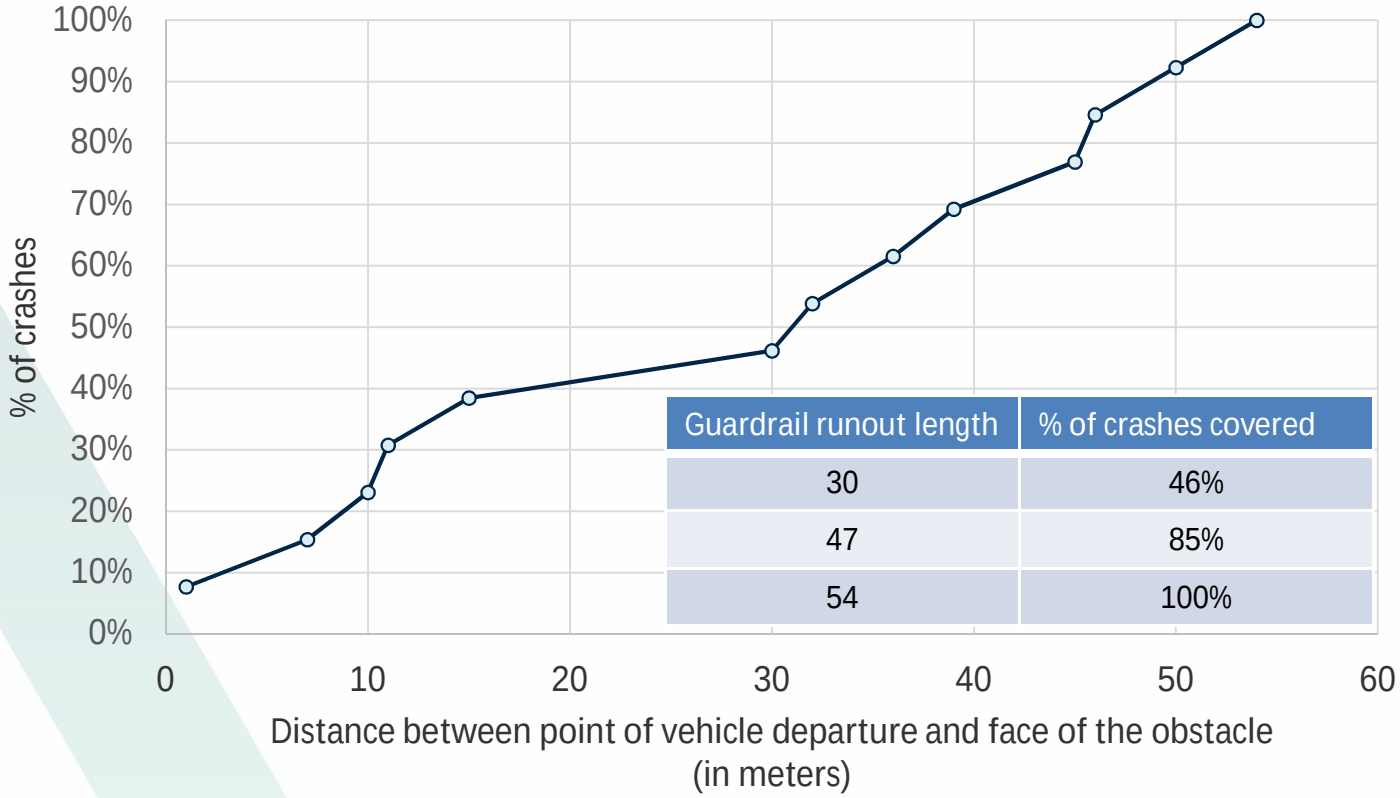
The cumulative frequency distribution of measured distances for run-off road vehicles impacting a trees (N = 16) is:



Guardrail runout length	% of crashes covered
30	50%
46	85%
48	100%

Results – OHB Pillars

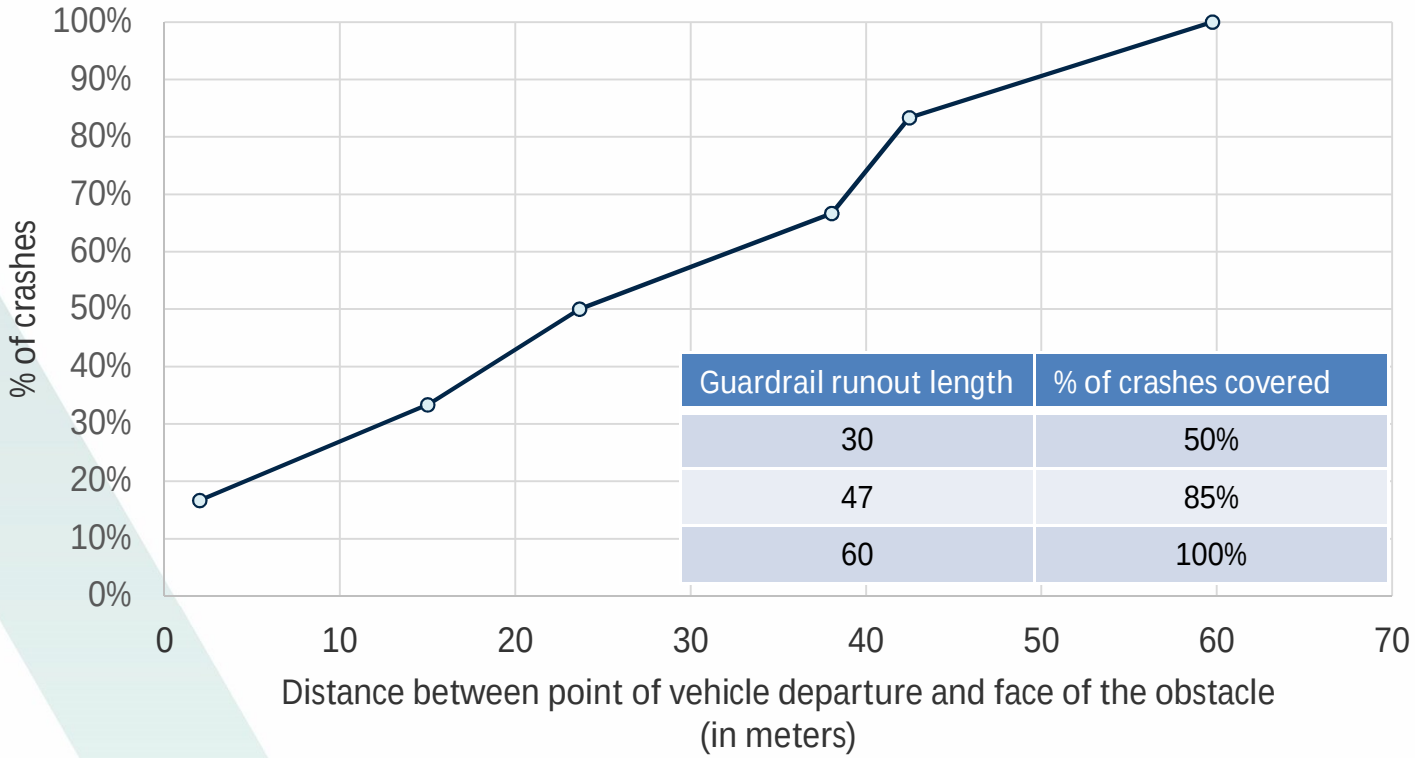
The cumulative frequency distribution of measured distances for run-off road vehicles impacting a OHB Pillars (N = 13) is:



Guardrail runout length	% of crashes covered
30	46%
47	85%
54	100%

Results – Underpass

The cumulative frequency distribution of measured distances for run-off road vehicles impacting an underpass (N = 6) is:



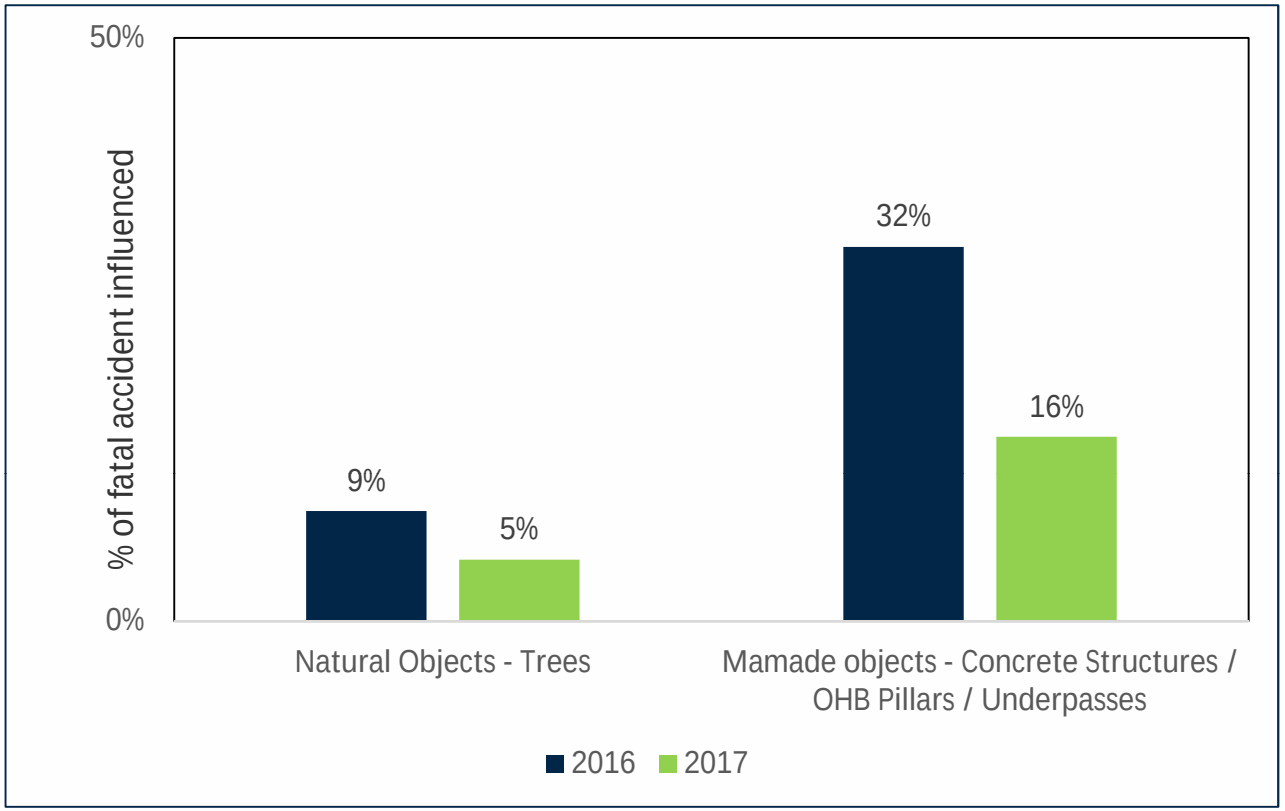
Guardrail runout length	% of crashes covered
30	50%
47	85%
60	100%

Conclusion

A runout length that covers 85% of the crashes is recommended as the minimum runout length of guardrail required.

Objects	Recommended minimum guardrail runout length (in meters)	Guardrail runout length implemented on MPEW (in meters)
Concrete Structures	60	75
Trees	46	54
OHB Pillars	47	64
Underpasses	47	68

Changes witnessed on MPEW



Almost 50% reduction observed in fatal/serious injury accidents due to objects impacts within 6 months of implementation.

Acknowledgements

- Road Accident Sampling System – India (RASSI)
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Thank You!

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