



Roadside Hardware Design Considerations for Motorcyclists

Nathan Schulz

The Problem

- Motorcyclists accounted for 40% of all fatalities resulting from a guardrail collision
- Car occupants accounted for 31% of all fatalities resulting from a guardrail collision

Roadside Hardware Design

- Standard vehicle impacts



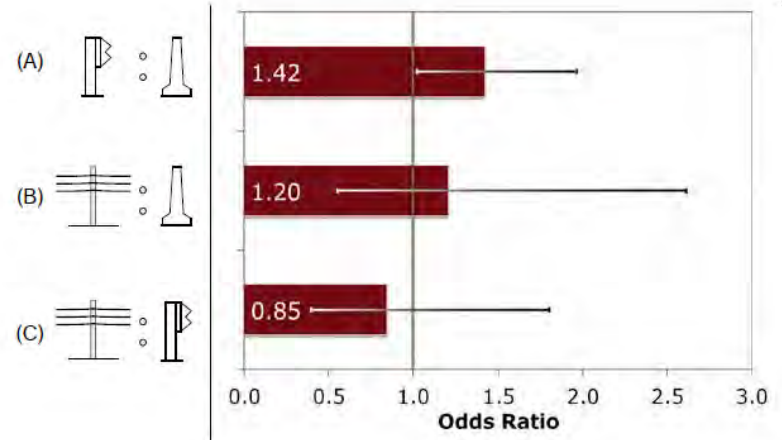
Roadside Hardware Design

- Cable Barrier
- Concrete Barrier
- Guardrail



Injury Risk

- Odds of serious injury 1.4 times greater in W-Beam guardrail crashes as compared to concrete barrier.
- Odds of serious injury 0.85 times greater in cable barrier crashes as compared to W-Beam guardrail crashes.

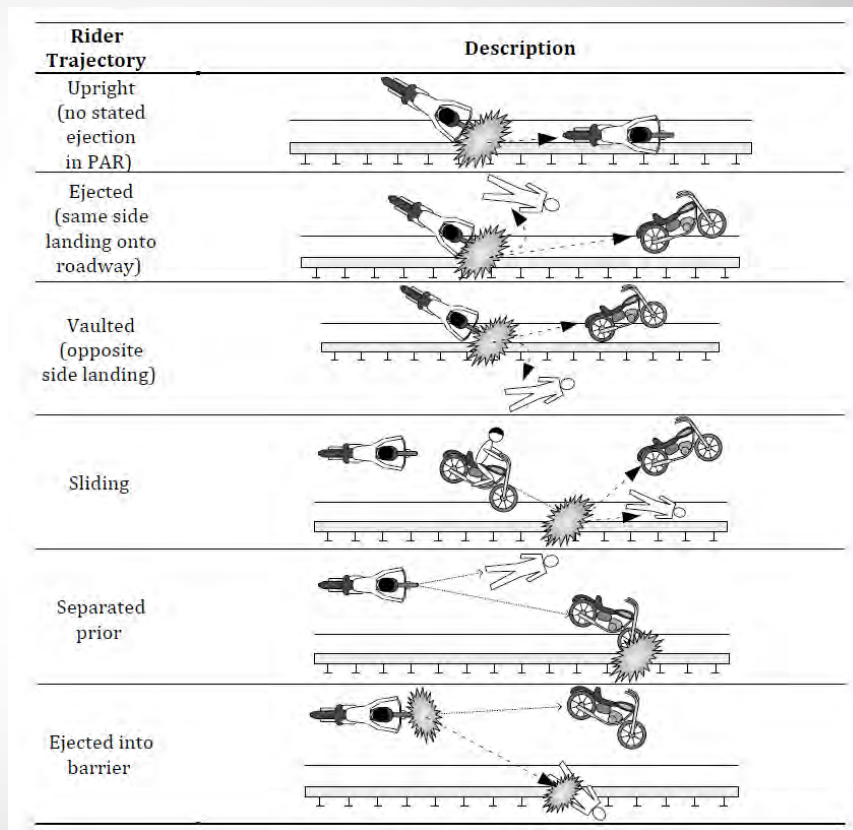


Source: Gabler, Hampton C., et al. *Motorcycle Crashes into Traffic Barriers: Factors Related to Serious and Fatal Injuries*. No. NCHRP Project 22-26. 2022.

Impact Configuration

- Majority of crashes found to occur with motorcyclist and rider upright prior to impact ~ 70%

Source: Gabler, Hampton C., et al. *Motorcycle Crashes into Traffic Barriers: Factors Related to Serious and Fatal Injuries*. No. NCHRP Project 22-26. 2022.



TxDOT Project

- Develop a retrofit design for a guardrail system to address motorcyclist impacts
- Upright and sliding impact scenarios
- Maintain safety for standard vehicles

Injury Mechanisms

- Rider entanglement with posts
- Lacerations from top of post
- Lacerations from top of W-Beam rail

Source: Gabler, Hampton C., et al. *Motorcycle Crashes into Traffic Barriers: Factors Related to Serious and Fatal Injuries*. No. NCHRP Project 22-26. 2022.

Focus Areas



Background

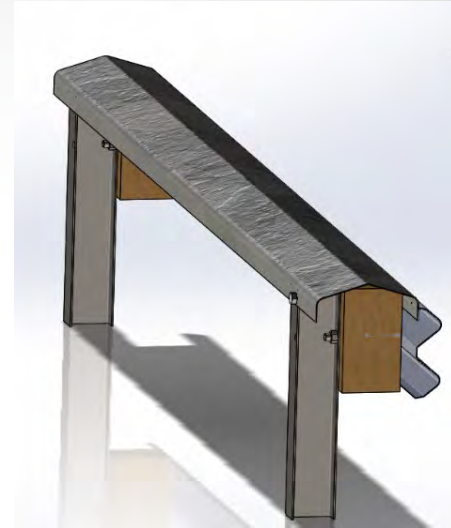
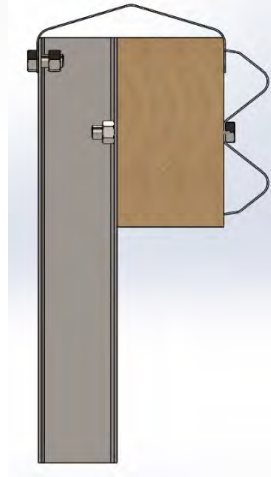
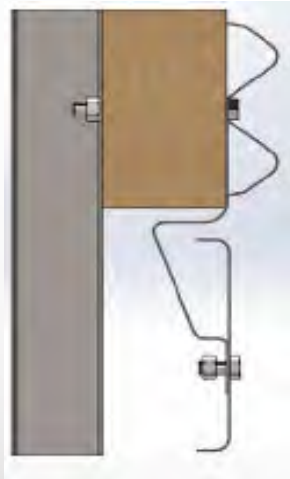
- No standard in U.S. for testing and evaluating roadside hardware for motorcyclist impacts
- European test standard for sliding motorcyclist impact

Approach

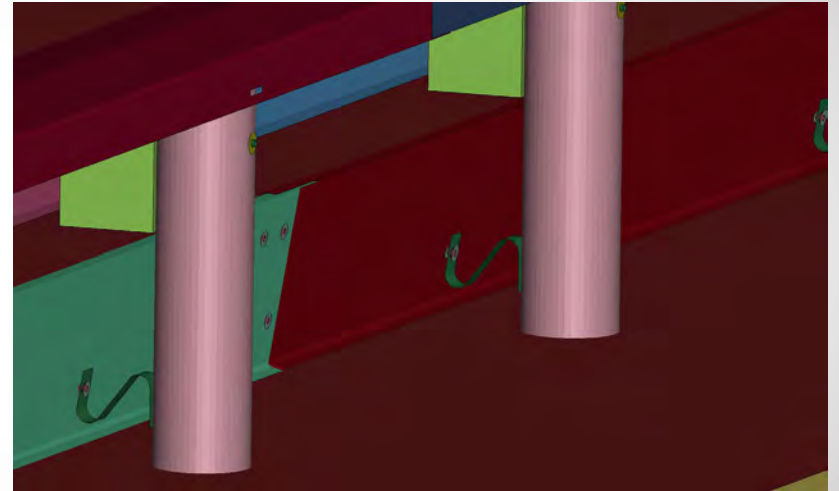
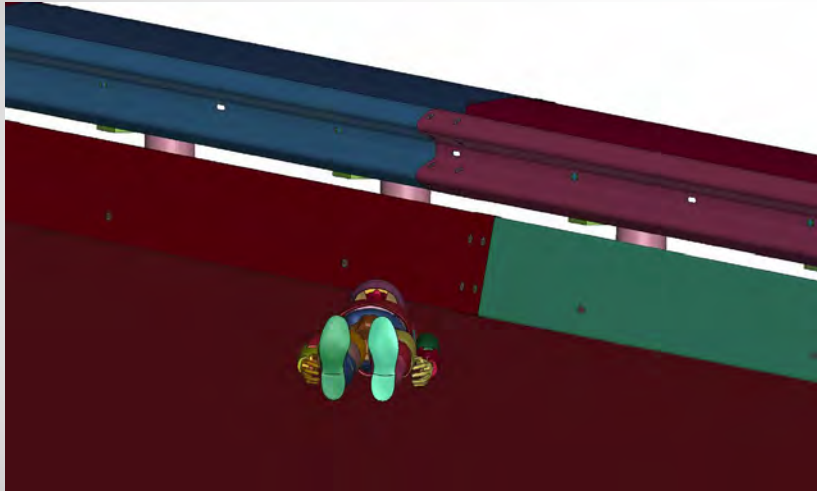
- Develop design concepts
- Conduct finite element computer simulations
- Conduct full-scale crash tests

Design Concept

- Top Rail
- Rubrail



Computer Simulations



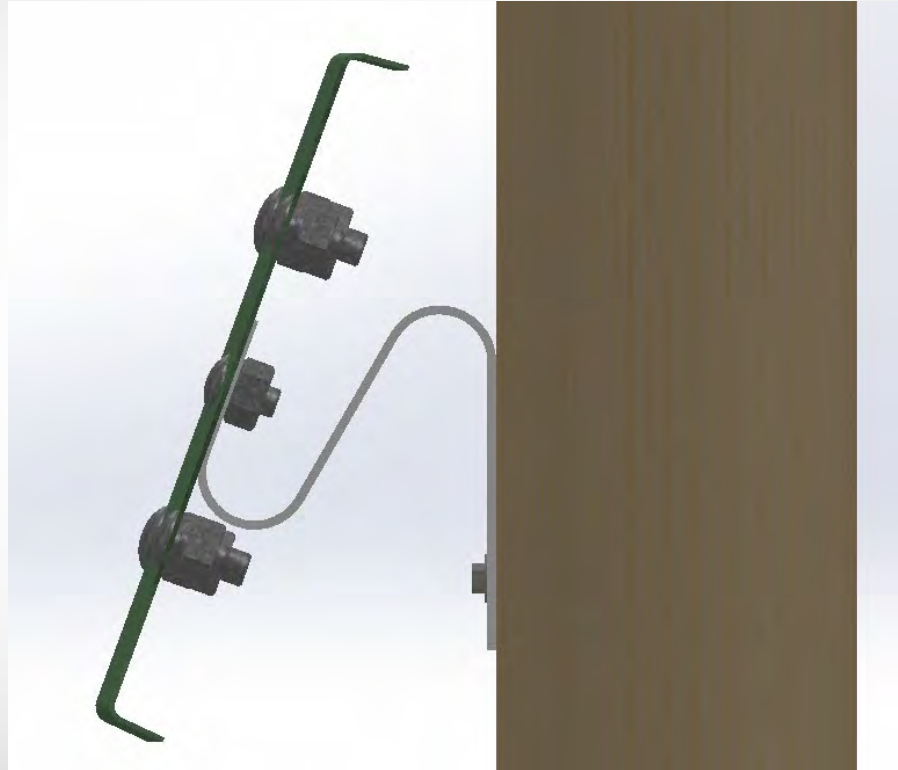
Retrofit Design – Top Rail



Retrofit Design – Rubrail



Retrofit Design – Rubrail



Upright Motorcyclist Impact



Upright Motorcyclist Impact



Sliding Motorcyclist Impact



Summary

- Retrofit guardrail design developed to accommodate motorcyclist impacts
- Upright and sliding motorcyclist impacts
- MASH Tests 3-10 and 3-11



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