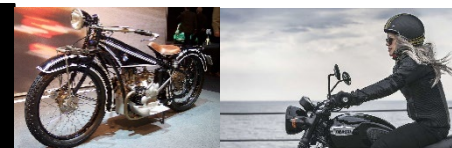

Barriers vs. Motorcycle

Chiara Silvestri Dobrovolny



Safety Barriers Types



Safety Barriers Purpose

Barriers are designed to:

- Contain and redirect a vehicle
- Maintain vehicle stability
- Minimize occupant risk
- Not pose a hazard to the impacting vehicles



Safety Barriers: How to Design and Evaluate?



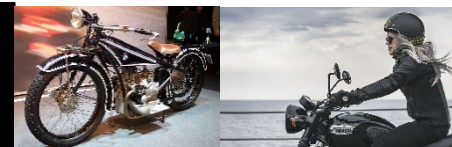
Upright Impact Concrete Barrier



Upright Impact Post-Beam System



Berg A. et al., Motorcycle Impacts to Roadside Barriers – Real World Accident Studies and Crash Tests Carried out in Germany and Australia, *Proc. 19th Int. Tech. Conf. on ESV*, Washington, USA, June 2005.



Sliding Impact Post-Beam System

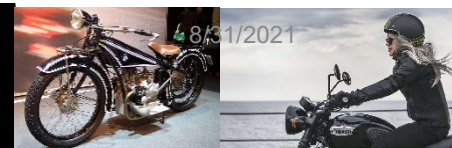


Sliding Test -Video and Crash
Testing done by Transport For
NSW: For bottom protection
system.



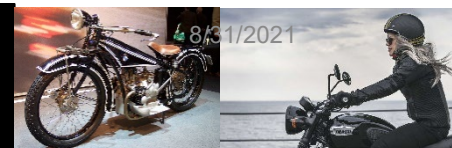
So... What about Motorcycles?

- Significant rise in use of motorcycles
- Increase in fatalities related to motorcycle impacts into roadside safety barriers
- Motorcyclists are more vulnerable than vehicle occupants
- Fully exposed to injury risk during crash



Our Community's Obligation

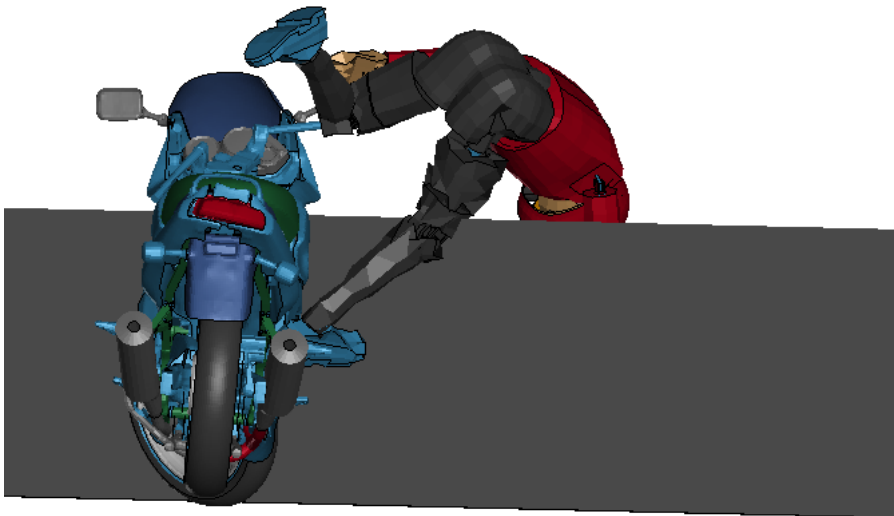
- Understand injuries/fatalities caused by barriers
- Identify problems and safety effects of barrier designs
- Provide recommendations on testing criteria, procedures, and standards for better designs



Injuries Associated with Motorcyclists Impacts

- Containment:

Severe injuries after rider impact due to ejection on the other side of the system.



Injuries Associated with Motorcyclists Impacts

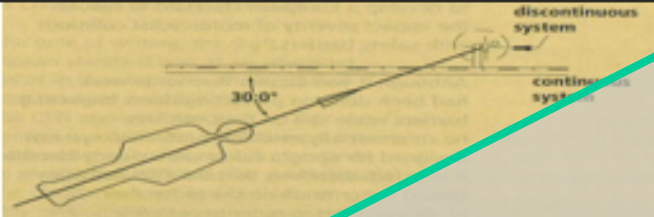
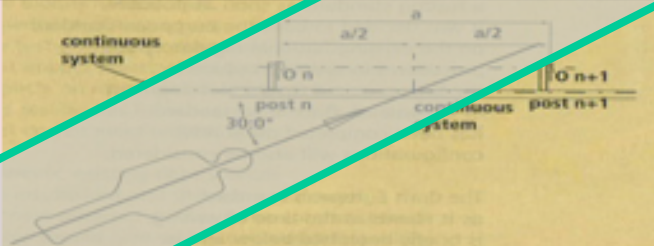
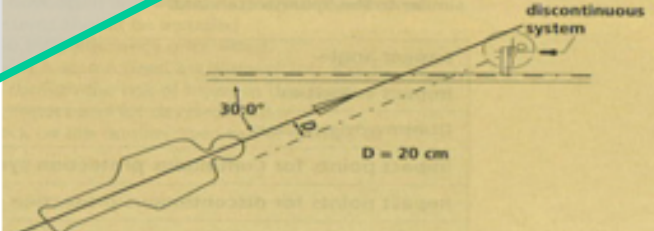
- Post-Beam Upright Sliding Impacts

Potentially severe head injuries /lacerations, sliding through guardrail top, impacting posts before resting on either system side.



"Less-sharp Guardrails Can Save Motorcyclists", VTI Testing in Linköping, Sweden,
<https://nordicroads.com/less-sharp-guardrails-can-save-motorcyclists/>

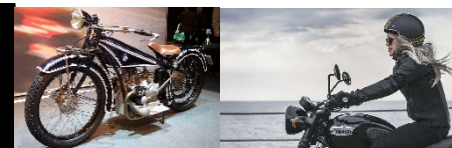
Motorcyclists Impacts -- Existing Protocols

Impact Configuration	
Test 1. Dummy aligned w/launch path - post centered	
Test 2. Dummy aligned w/ launch path - mid-span	
Test 3. Dummy aligned w/the launch path - post offset	

Impact speed	Test 1 and 3: 60 km/h (37.3 mi/h) or 70 km/h (43.5 mi/h)
Impact Angle	Test 1, 2 and 3: 30°
ATD	Modified Hybrid III 50 th percentile male
Dummy Helmet	Motorcycle Helmet (polycarbonate shell) satisfying Regulation 22 of ECE/TRANS/505 requirements.
Dummy Clothing	Complying EN 1621 – 1 requirements Motorcyclist Clothing
Approval Criteria	MPS: Any longitudinal element of the test item must not have complete rupture. ATD: the ATD shall not remain trapped in the test item. Parts of dummy shall not be completely detached (except the upper extremity which can be detached due to rupture of the frangible screws in the shoulder assembly).



Protocols for Upright Motorcycle-Barrier Impact



Post-Beam Upright Impacts – Developed Solutions



System Euskirchen Plus (Germany)



<https://nordicroads.com/less-sharp-guardrails-can-save-motorcyclists/> (VTI)

<https://youtu.be/IN8o7fheEXU>



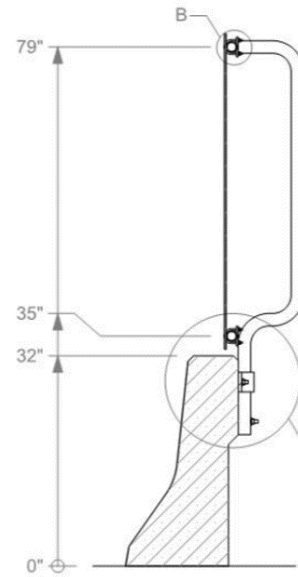
Upright Test - Video and Crash
Testing done by VTI: For upright
protection system.
<https://nordicroads.com/less-sharp-guardrails-can-save-motorcyclists/> (VTI)



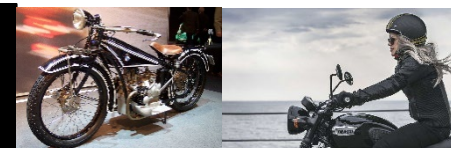
Containment Upright Impacts – Developed Solution

Containment barrier system with the capability of:

- Containing/redirecting errant upright motorcyclists.
- Reducing injury risk for the errant motorcycle rider



Containment TxDOT Retrofit System



Concrete Barrier Containment: TxDOT

Full Scale Crash Test: Video by TTI



"DEVELOPMENT AND EVALUATION OF CONCRETE BARRIER CONTAINMENT OPTIONS FOR ERRANT MOTORCYCLE RIDERS",
TxDOT Report 0-6968-R6 <https://static.tti.tamu.edu/tti.tamu.edu/documents/0-6968-R6.pdf>



Post-Beam Sliding Impacts – Developed Solutions



Sliding Test -Video and Crash
Testing done by Transport For NSW:
For bottom protection system.



Are All Questions Answered?

While we are at a great start,
Not Really...



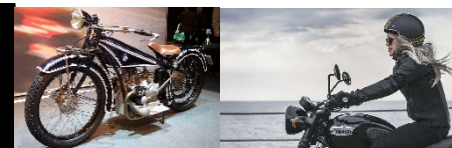
What About Vehicle Compliance?

- Investigation through vehicle impacts to verify adequate crashworthiness per standards requirements
- TxDOT Project 0-6994 to investigate guardrail retrofit for upright motorcycle impact, sliding dummy impacts, AND MASH vehicles.



What's Next?

- Need for a motorcycle standard addressing motorcycle testing and impact configurations in the U.S. (and worldwide for upright condition)
- What are the critical locations to implement the protection systems (e.g., black spots)?
- Can we share best practices for management approaches for motorcycle-friendly barriers installation?



THANK YOU

Barriers vs. Motorcycle

Chiara Silvestri Dobrovolny

