MASH Testing of a Guardrail System on 1H:1V Slope (T4541-ET)

- State Rep: Ted Whitmore, P.E.
- Research Need
  - In many mountainous areas or in locations with tight environmental controls, it is difficult to provide 2 ft offset from a slope break to the back edges of the post (AASHTO guideline)
  - Designers often make a trade-off between reduced shoulder width and a less than optimal guardrail placement
  - MASH Tests conducted on W-beam guardrail system on 1H:1V slope failed
- Objectives
  - Develop a guardrail on 1H:1V slope design to be evaluated under MASH TL-3 test criteria
- Workplan
  - Develop thrie-beam design options (with or without rubrail)
  - Conduct FE simulation to evaluate the new guardrail designs
  - Conduct full-scale tests

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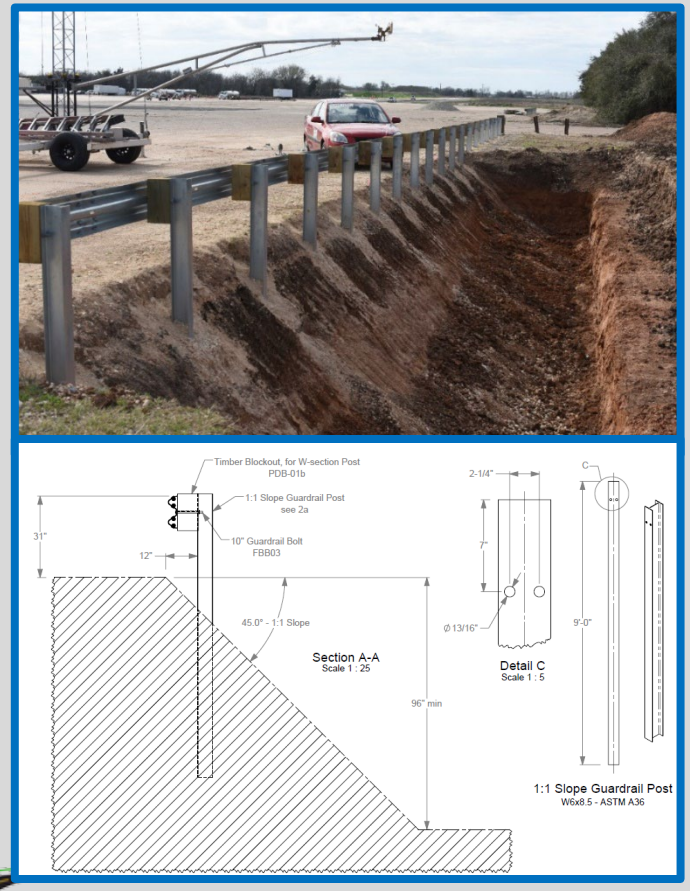
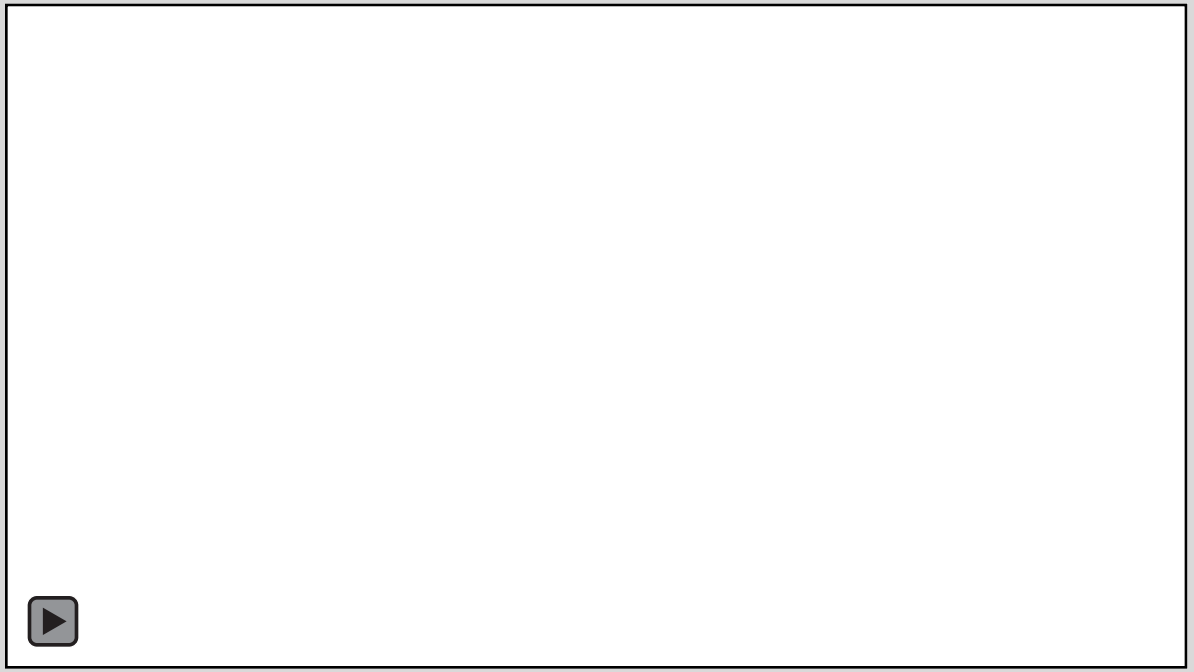
- Previous test with W-beam





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- 5 design options were proposed

	System	Thrie-beam height	Rubrail
1	31-inch Thrie-beam	31-inch from flat ground	No
2	34-inch Thrie-beam	34-inch from flat ground	No
3	34-inch Thrie-beam with channel rubrail at 12-in height	34-inch from flat ground	channel rubrail at 12-in height
4	34-inch Thrie-beam with plate rubrail at 12-in height	34-inch from flat ground	plate rubrail at 12-in height
5	34-inch Thrie-beam with plate rubrail at 8-in height	34-inch from flat ground	plate rubrail at 8-in height

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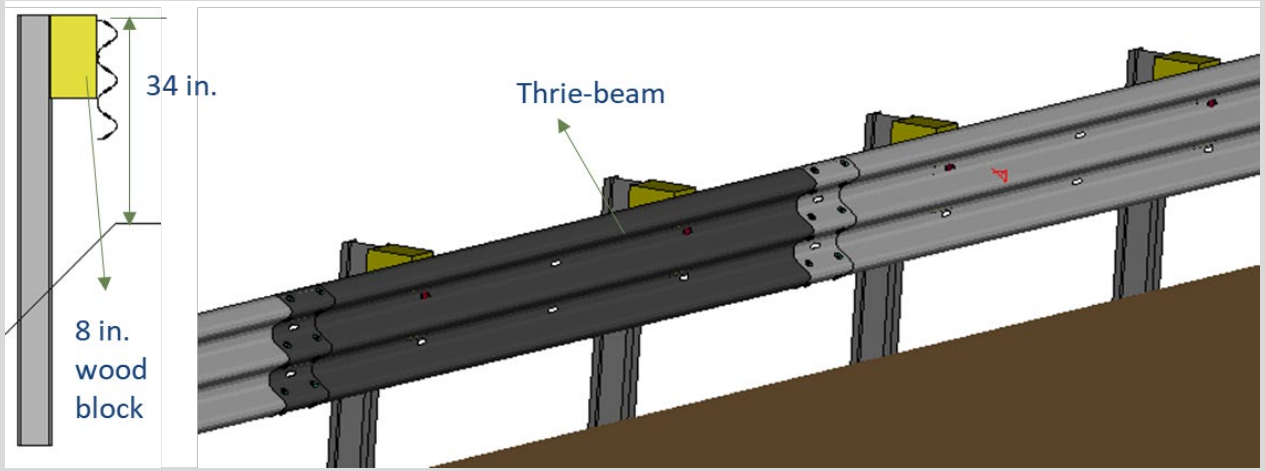
- Recommended System



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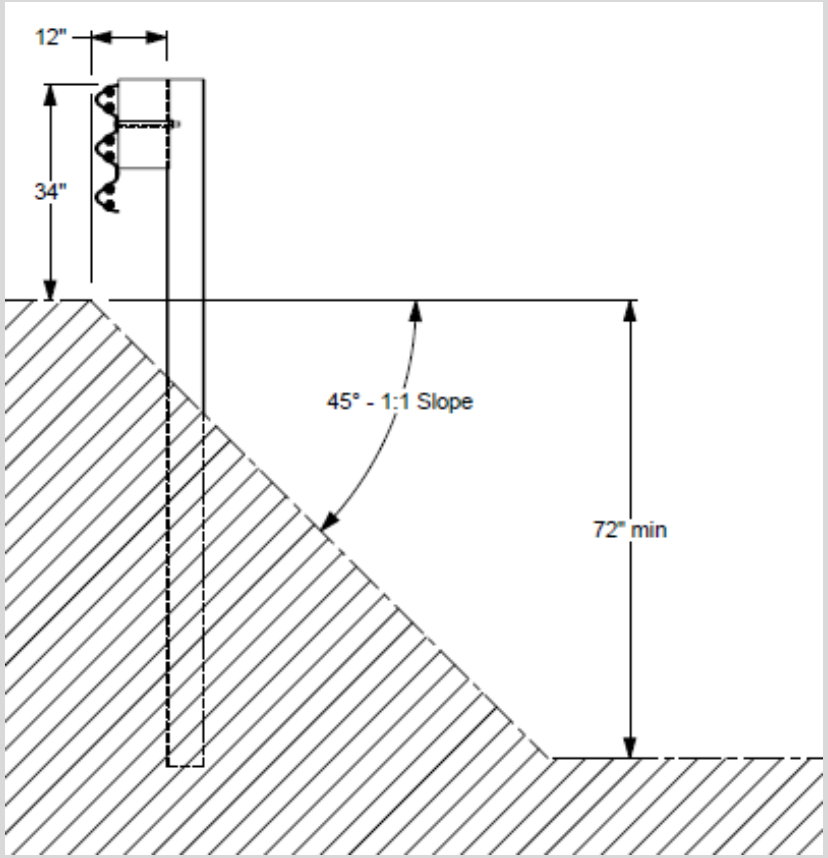
- Thrie-beam system without a rubrail was constructed on 1H:1V slope



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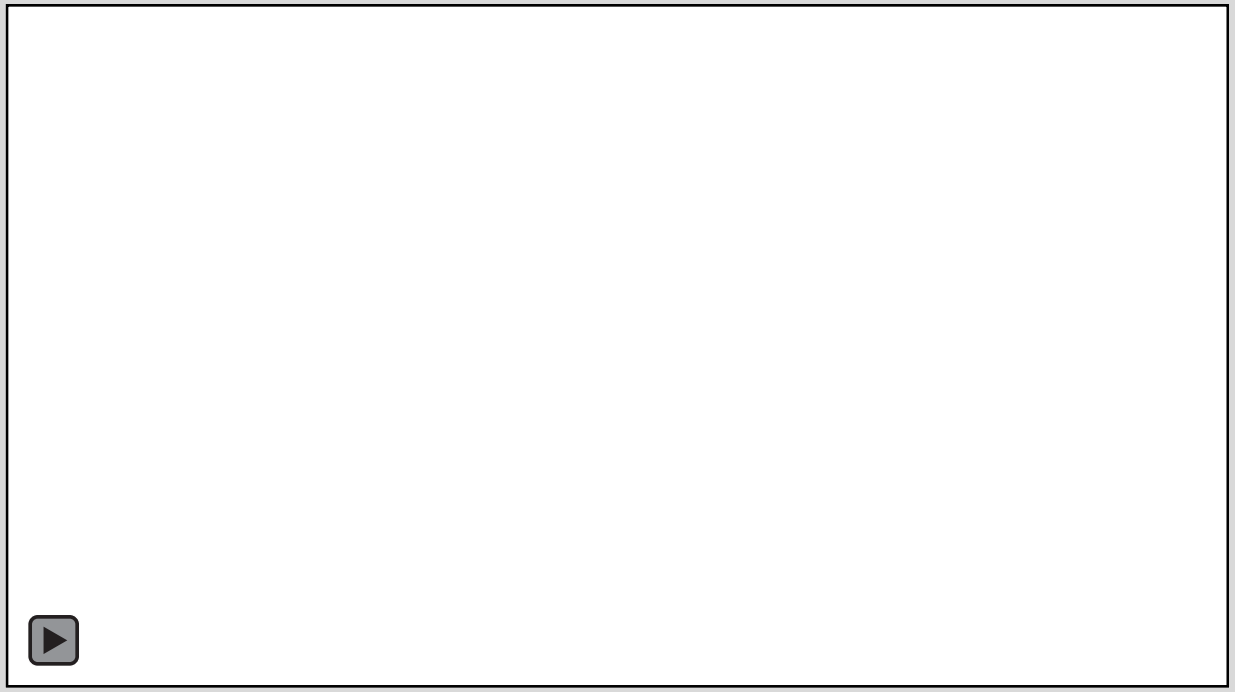

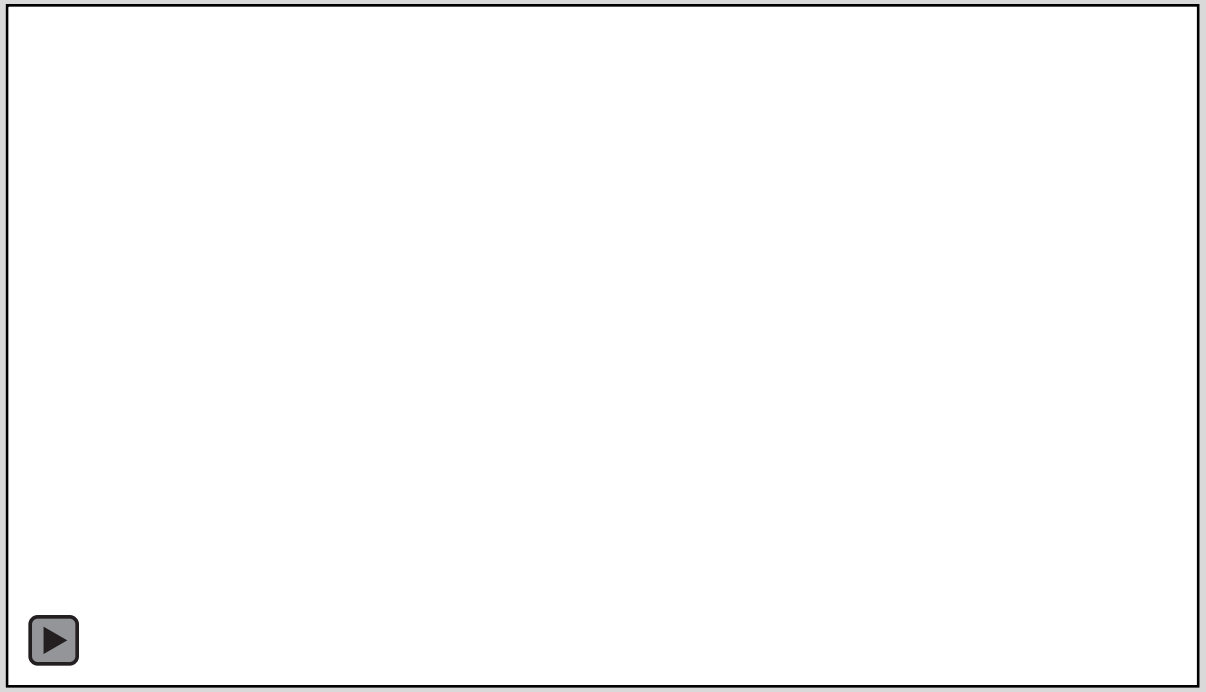

MASH Testing of a Guardrail System on 1H:1V Slope (T4541-ET)

MASH 3-10

MASH 3-11

MASH Testing of a Guardrail System on 1H:1V Slope (T4541-ET)

- Both MASH Tests 3-10 and 3-11 passed MASH evaluation criteria

Parameter	MASH	Measured (3-10)	Measured (3-11)
OIV, Longitudinal (ft/s)	≤40.0	13.0	12.2
OIV, Lateral (ft/s)	≤40.0	19.8	14.7
Ridedown, Longitudinal (g)	≤20.49	7.7	5.2
Ridedown, Lateral (g)	≤20.49	10.7	7.6
Roll (deg)	≤75	8.5	16.8
Pitch (deg)	≤75	5.8	3.4
Max Dynamic deflection	N/A	33.0 inches	79.4 inches

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- It is recommended to use the minimum length of installation to be 182-ft which is around the total installation length tested in this project
- It is recommended using a minimum of 54-ft length of flat terrain W-Beam length on either side of the sloped ditch to allow sufficient anchorage to develop
- The end terminal / anchor should be strong enough to withstand the impact conditions presented herewith for a MASH TL-3 conditions in addition of being a MASH crashworthy terminal

Any Question?

- Please slow down