OCCUPANT SAFETY RESEARCH PARTNERSHIP

USCAR

Ford CHRYSLER GM

OSRP Pedestrian Lower Leg Response Research test series

GTR09 PH2 Informal Working Group

17 Sept 2012

Background

- **USCAR: The United States Council for Automotive Research, LLC**
  An organization created by Chrysler, Ford and General Motors, to conduct cooperative, pre-competitive research.

- The **O**ccupant **S**afety **R**esearch **P**artnership (OSRP) is a Division of **USCAR** with the primary charter to conduct pre-competitive research, development, testing and evaluation of occupant surrogate devices, safety systems, and safety simulation software

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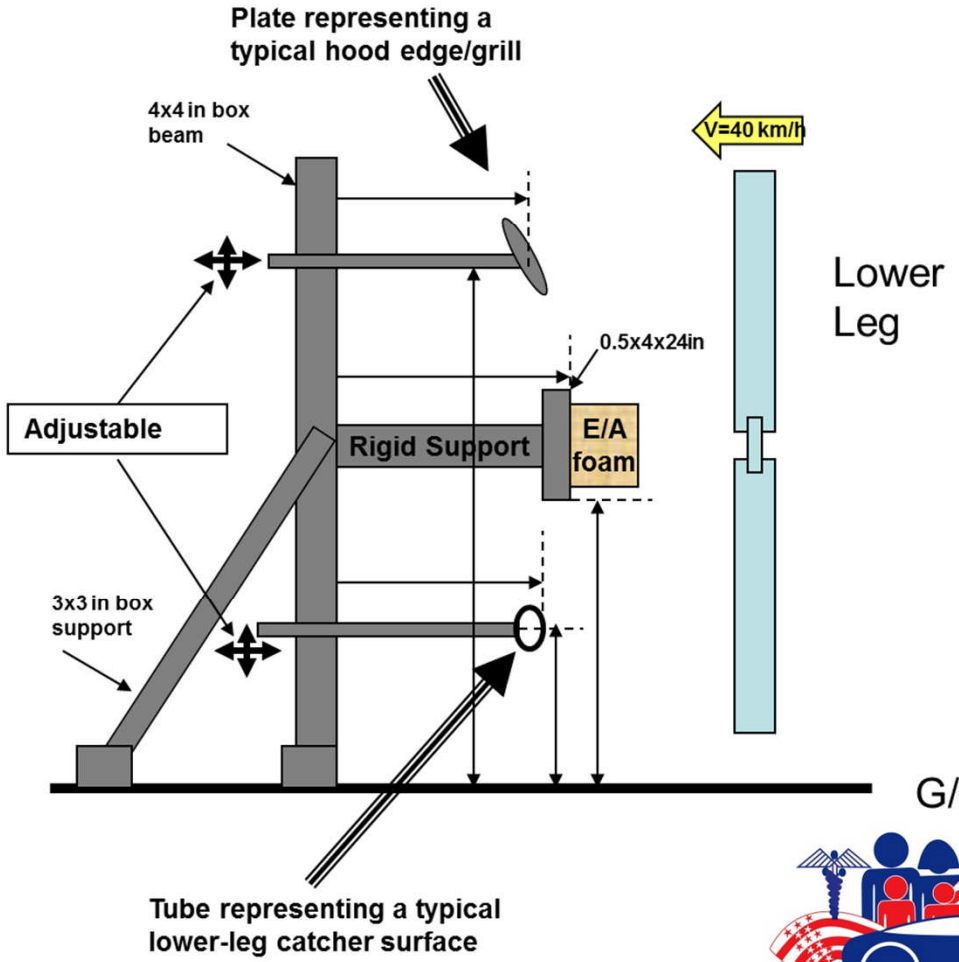
OSRP Test Fixture

Lower Leg impact test device concept

Notes:

1. The support structure is constructed from a 4x4 box beam.
2. The adjustable elements from 2x2 box beam
3. The E/A foam support plate 1/2x4x24 is welded to the end of the 3x3 box beam
4. Lower Leg catcher 2-dia 24 in long tube is welded to the 2x2 box beam
5. All tubing material wall thickness at least 1/8 in or 3 mm.
6. The vertical adjustment of the Lower leg catcher and the hood edge would be achieved by additional attachment points on the mounting surface



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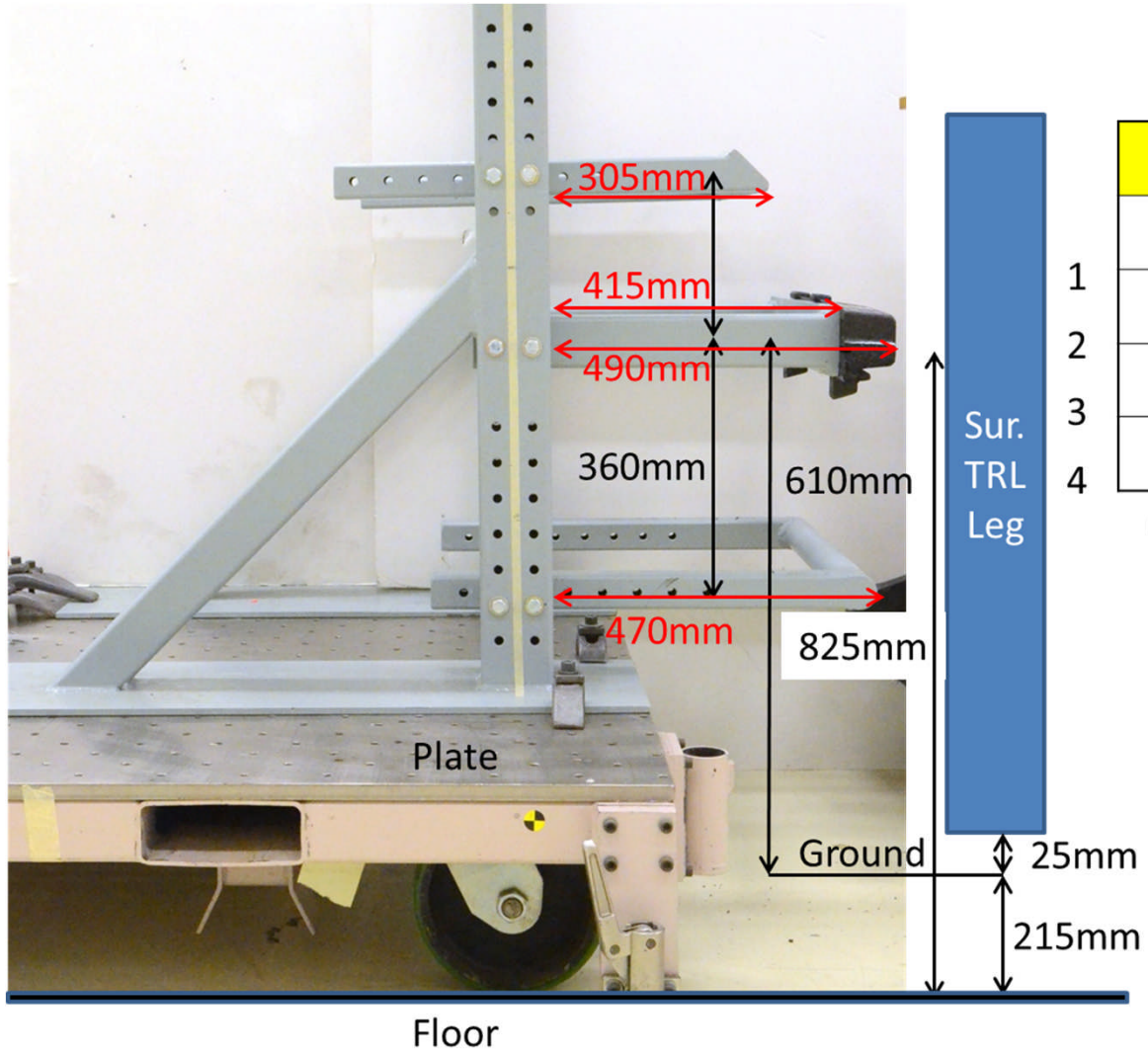
Fixture Qualification Test Plan



Test Matrix

	B/Beam	LL catcher	BLE
1	415mm	470mm	305mm
2	415mm	470mm	305mm
3	415mm	420mm	355mm
4	415mm	420mm	355mm

Dimensions are approximate values

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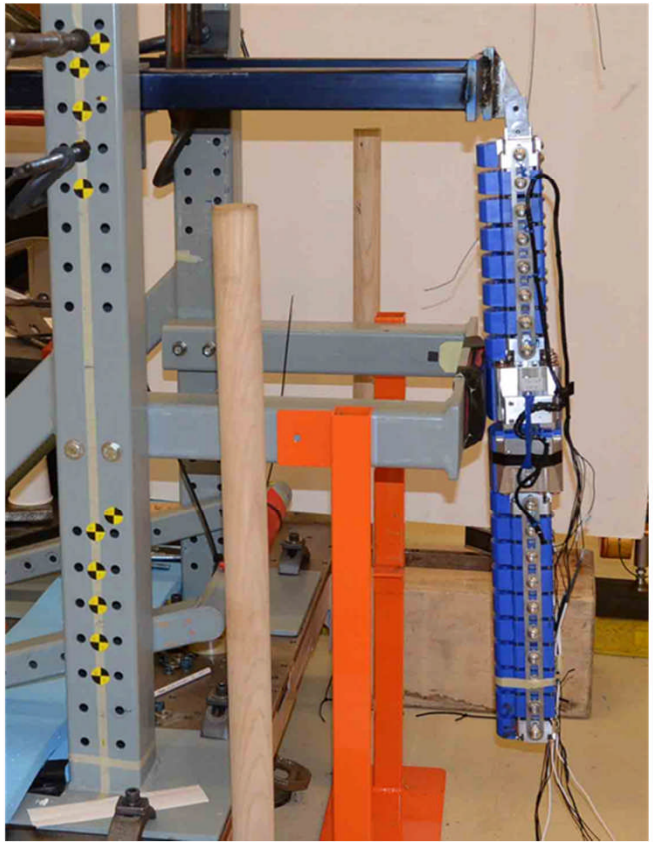
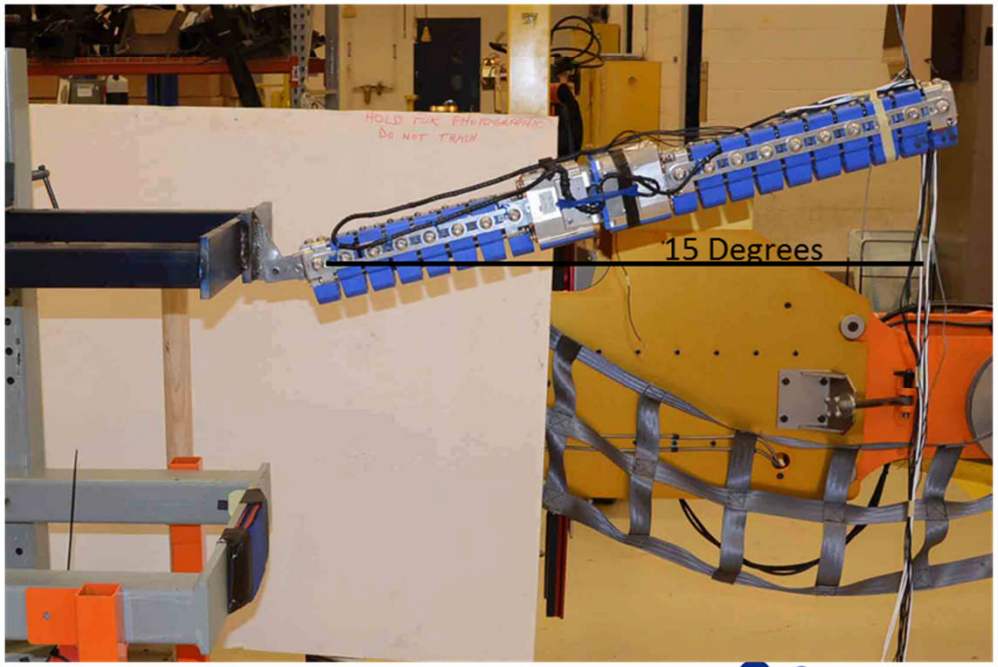
Flex PLI Calibration

Adapted ORSP Pedestrian Fixture to Conduct Calibration

A separate attachment was made for calibration. The dimensions were based on the calibration fixture drawing provided by JARI. Also a support for the bumper beam was made to keep it from rotating during the high speed impact tests.





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Experimental Setup

- Four vehicle factors were chosen to define the experimental setup
  - Bumper Section, Bumper Lower Edge from ground, Lower leg catcher offset and Lower leg catcher from ground
  - Taguchi L9-Orthogonal matrix layout was used

Control Factors			
	Level 1	**Level 2**	**Level 3**
Bumper Section (z)	100 mm		200 mm
Bumper lower edge from Ground	350 mm	400 mm	450 mm
Lower Leg Catcher Offset to bumper face	-50 mm	0 mm	+50 mm
Lower Leg Catcher from ground	180 mm	230 mm	280 mm

Taguchi Orthogonal layout of tests

Test Matrix	Bumper Section (z)	Bumper lower edge from Ground	Lower Leg Catcher Offset to bumper face	Lower Leg Catcher from ground
9 x 2 tests required for initial parameter evaluation	A	B	C	D
3 Repeat tests of the best conditions for confirmation of repeatability	1	1	1	1
3 Repeat tests of the worst conditions for confirmation of repeatability	1	2	2	2
2 Test for Optimum prediction confirmation	1	3	3	3
	1'	1	2	3
	1'	2	3	1
■ 1' is used to substitute for level #2 for the bumper section size	1'	3	1	2
■ Test speed will be nominally set at 32 KPH	3	1	3	2
Total number of tests ~ 22	3	2	1	3
	3	3	2	1

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Summary

- Fixture qualification
  - Four tests were used to evaluate the stability of the fixture.
- Flex-PLI Calibration was conducted using the pendulum test
- Flex-PLI test series
  - 20 tests
  - A new series is being planned
- TRL-Leg test series
  - A new series is being planned