

WorldSID Status Report

October 2011

Background

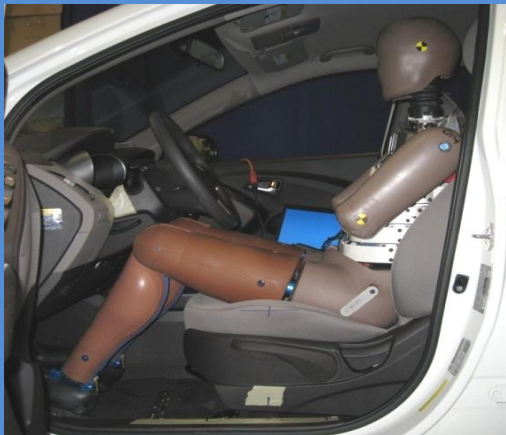
- 2009-2011: Seating Evaluation
 - FMVSS 214 (WS & ES2-re)
 - WS Version 5.1 - 5.4 (WS)
 - UMTRI (WS)
 - FMVSS 214 (-20mm midtrack) (WS)
- Differences between the WS seating procedures and FMVSS 214
 - Initial seat setup
 - WS 5.4: midtrack - 20mm
 - WS 5.4 lowers the seat to lowest, taking out pitch of seat in some cases
 - OSCAR tolerance
 - WS H-point: Add 20mm +/-5mm
 - ES2-re H-point: (+/-) 10 mm





Observations from Seating Evaluation

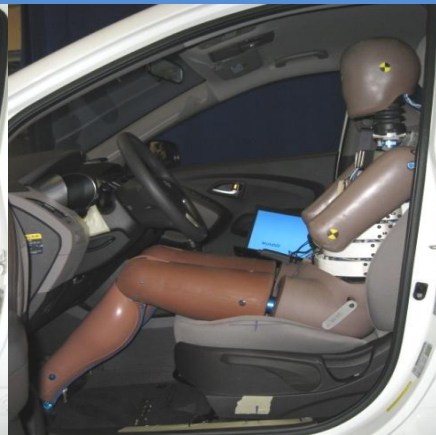
- Head CG differences
- Similar final target H-points
- [Issues with leg lengths at FMVSS 214 \(midtrack position\)](#)
- Recommendations for WS seating procedure
 - Use FMVSS 214 seat cushion setup (mid angle / lowest height) with seat track at midtrack-20mm
 - Use WS5.4 in setting the dummy (tilt sensors) + Oscar H-point tolerance



FMVSS 214



FMVSS 214(-20mm)



WS 5.4



ES2-RE 214

Fleet Testing

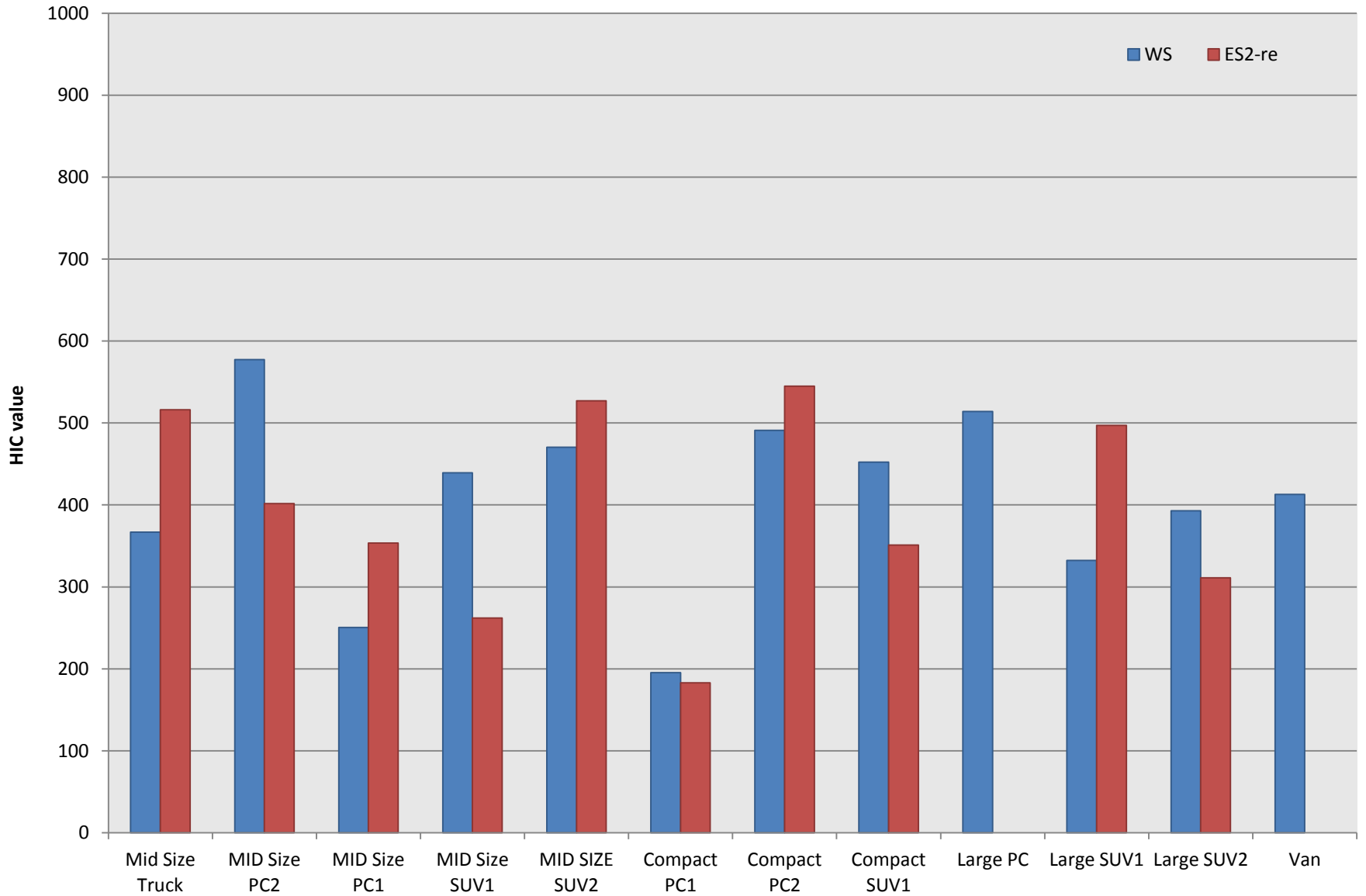
Injury Criteria

- Current regulation FMVSS 214
 - ES2-re injury limits based on AIS 3 with 50% risk of injury except for pelvic criterion
 - HIC36: 1000
 - Chest: 44mm
 - Abdominal Force: 2500 N
 - Pubic Force: 6000N
 - Lower Spine: 82 g's (monitored)
- WorldSID (not approved)
 - Using similar reasoning as the ES2-re (AIS 3 with 50% risk of injury except for pelvic and shoulder*)
 - HIC36: 1000
 - Thoracic Rib Def.: 57mm
 - Abdomen Def.: 57mm
 - Pubic Force: 2780 N
 - Lower Spine: 105 g's
 - Shoulder Def: 65mm
 - Shoulder Force: 2560N

*Injury Risk Curves from 2009 & 2010 Stapp Papers on Injury Criterion by Audrey Petijean

Vehicle	Dummy	HIC36	Shoulder Deflection (mm)	Max Thorax Rib Deflection (mm)	Max Abdomen Rib Deflection (mm)	Lower Spine (G's)	Pubic Force (N)	Pelvis Resultant Acceleration (G's)	Abdominal Force (N)
Injury Values	WS	1000	65	57	57	75	2780	105	n/a
(AIS3)	ES2-re	1000	n/a	44	n/a	82 (monitored)	6000N	n/a	2500
Compact	WS	195	25	35	42	53	1107	69	n/a
PC1	ES2-re	183	n/a	29	not instrumented		2265	not instrumented	1765
Compact	WS	491	55	25	34	46	1151	79	n/a
PC2	ES2-re	545	n/a	26	not instrumented		2570	not instrumented	1410
MID Size	WS	250	57	32	44	73	1433	72	n/a
PC1	ES2-re	354	n/a	24	not instrumented		2182	not instrumented	1305
MID Size	WS	577	54	43	26	61	1201	87	n/a
PC2	ES2-re	402	n/a	23	not instrumented		2752	not instrumented	1051
Large PC	WS	514	51	56	40	57	925	47	n/a
Compact	WS	452	55	35	42	57	936	54	n/a
SUV	ES2-re	351	n/a	34	not instrumented		2093	not instrumented	1523
Mid Size	WS	470	62	29	42	54	812	52	n/a
SUV1	ES2-re	527	n/a	38	not instrumented		1614	not instrumented	not calculated
MID Size	WS	439	66	46	36	54	1557	71	n/a
SUV2	ES2-re	262	n/a	37	not instrumented		2697	not instrumented	1248
Large	WS	332	51	30	23	36	1227	58	n/a
SUV1	ES2-re	497	n/a	32	not instrumented		1248	not instrumented	1545
Large	WS	393	60	43	39	81	912	81	n/a
SUV2	ES2-re	311	n/a	25	not instrumented		2969	not instrumented	818
Mid Size	WS	367	38	41	33	57	1110	44	n/a
Truck	ES2-re	516	n/a	31	not instrumented		2575	not instrumented	1349
Van	WS	413	51	40	41	49	1013	58	n/a

HIC 36



MID Size SUV

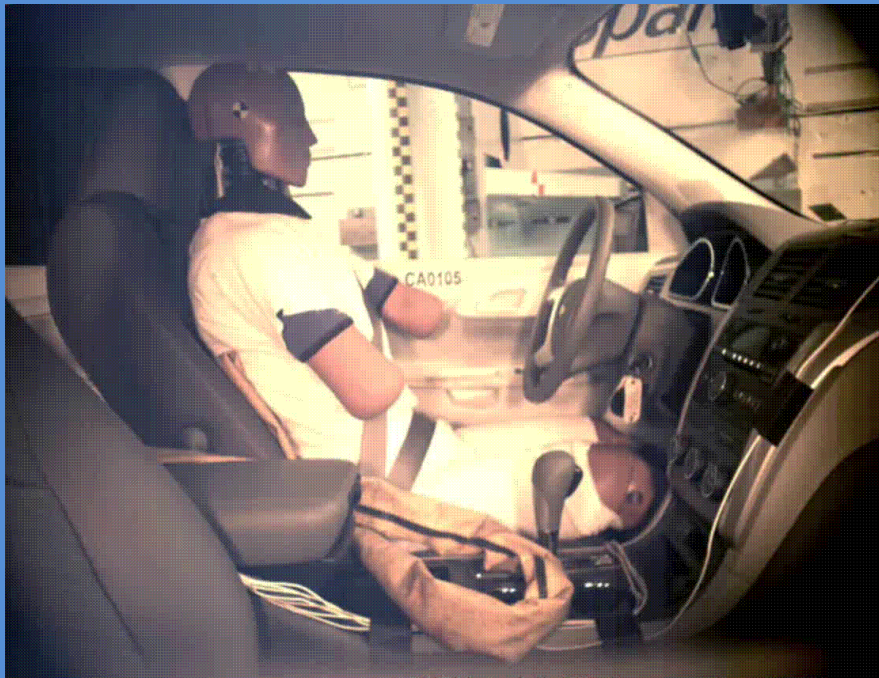
-20.0



500 fps • T0: 27 • Frame: 17 • -20,00 ms



-20.0



500 fps • T0: 26 • Frame: 16 • -20,00 ms



ES2-re

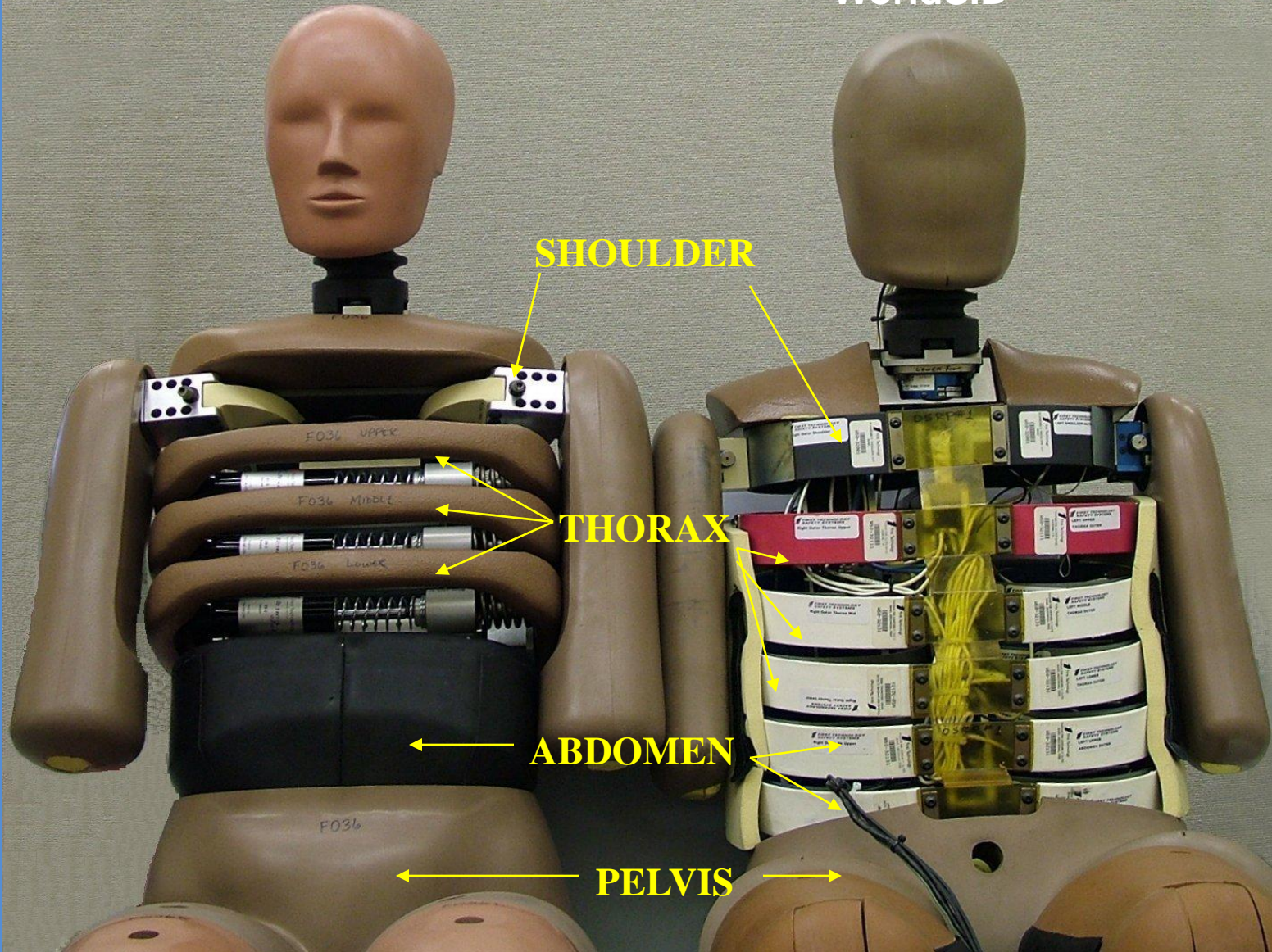
WorldSID

SHOULDER

THORAX

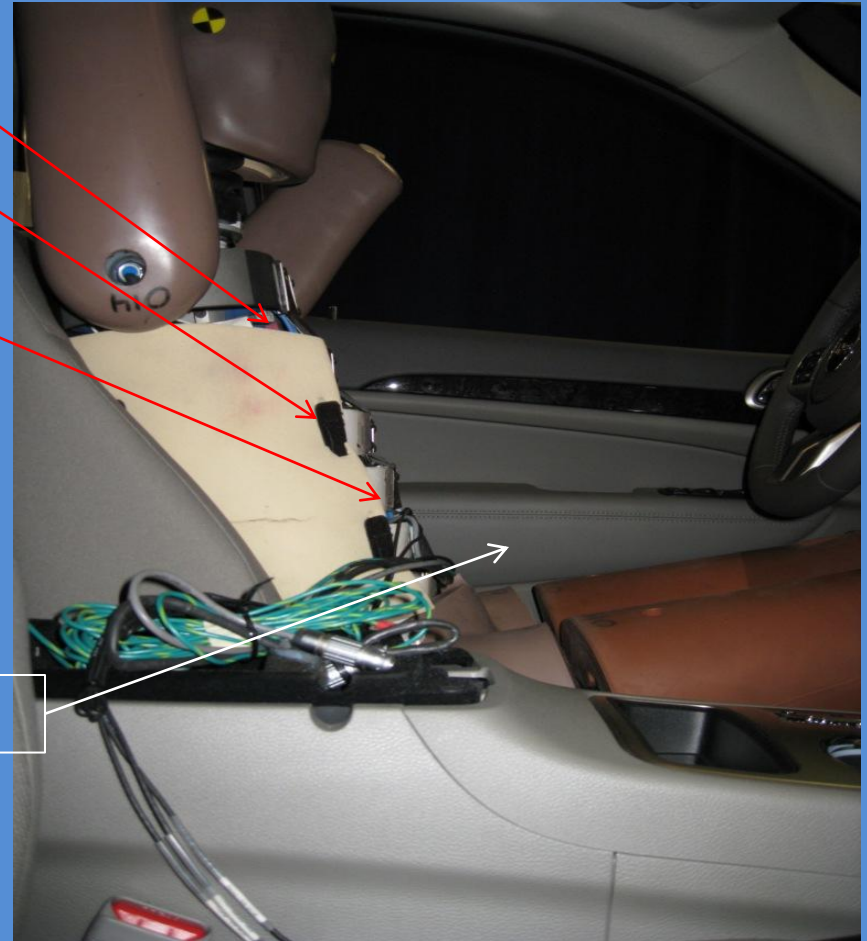
ABDOMEN

PELVIS



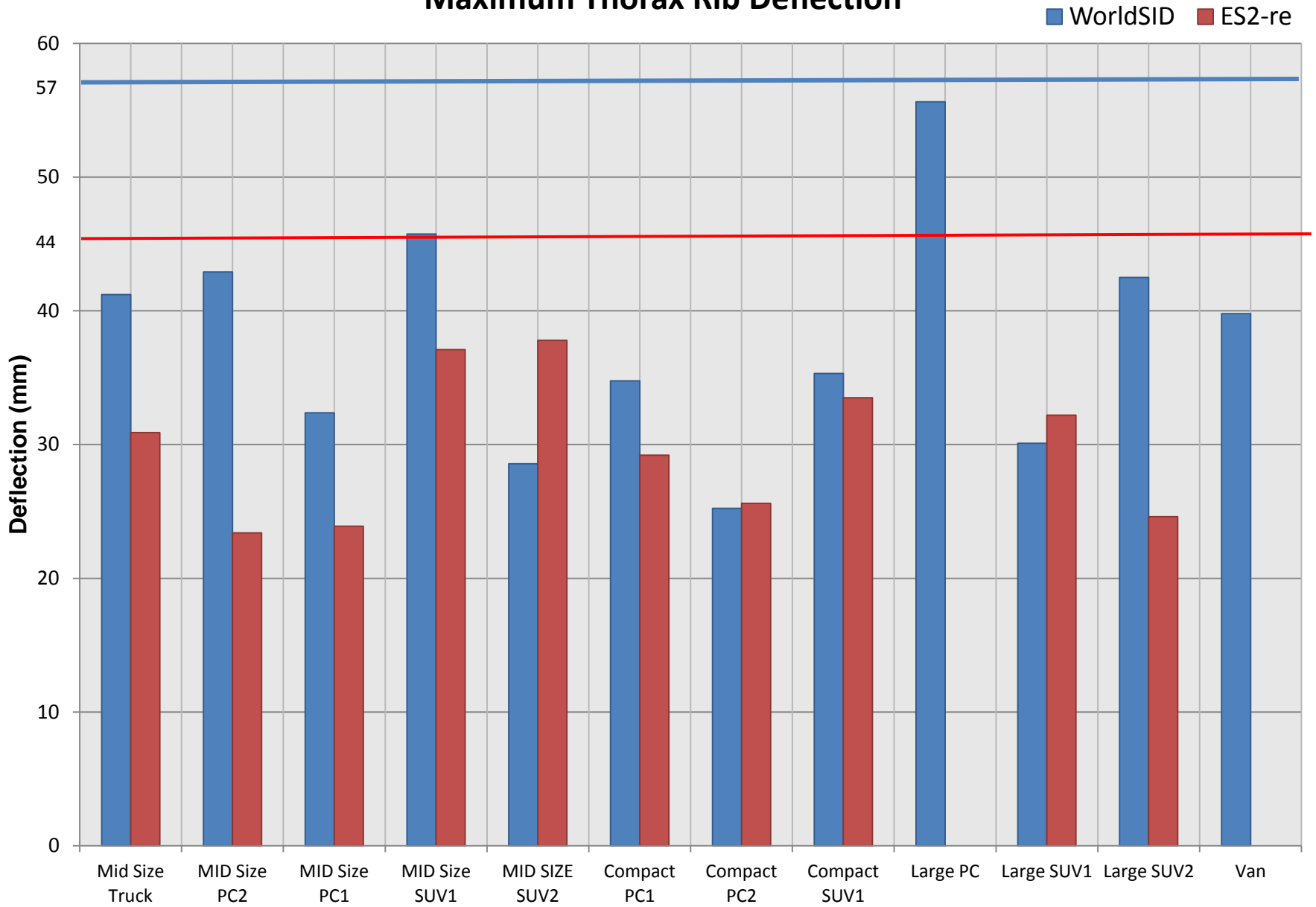


ES2-re without jacket

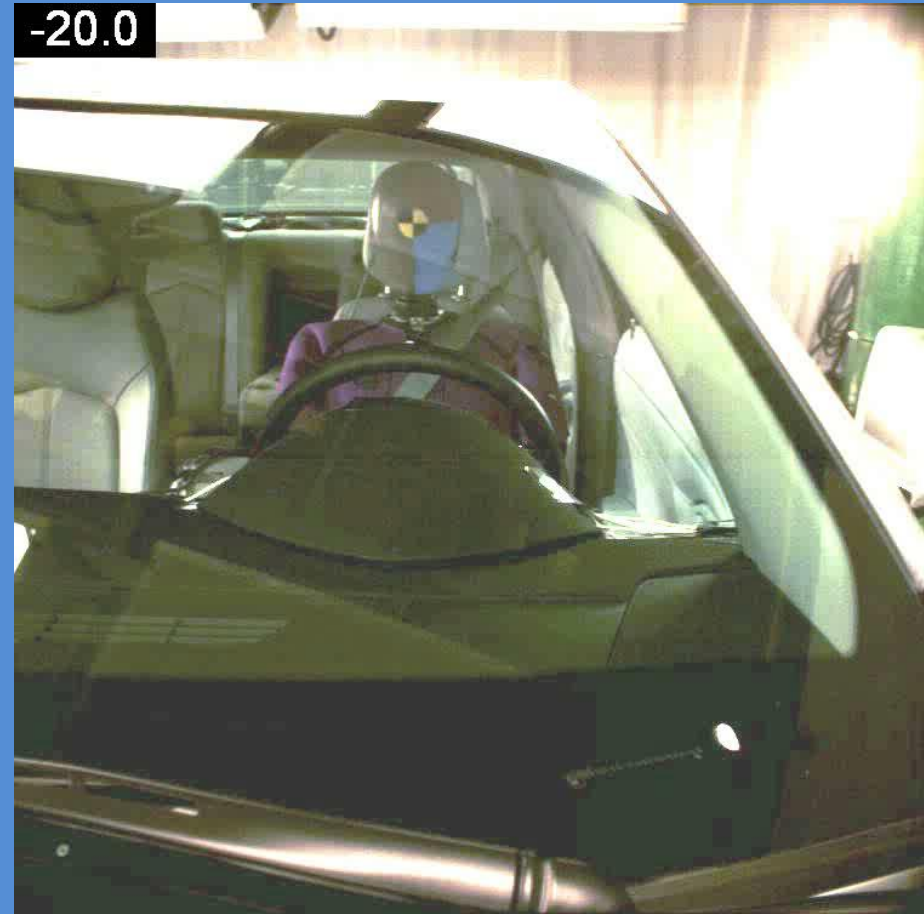
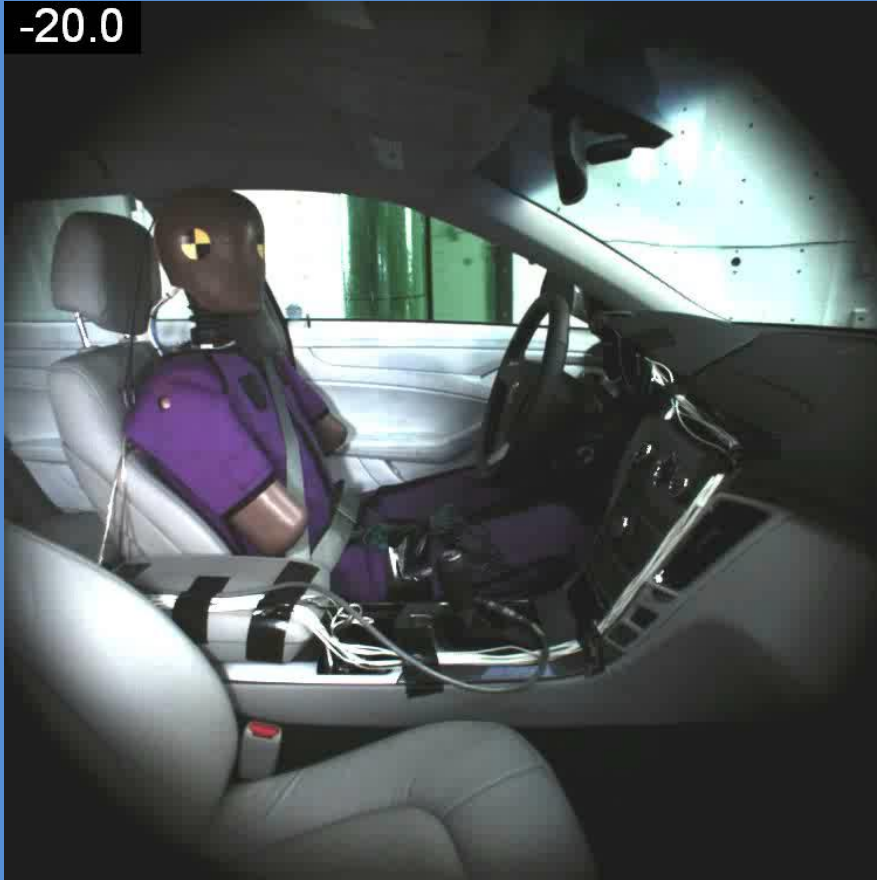


WorldSID without jacket

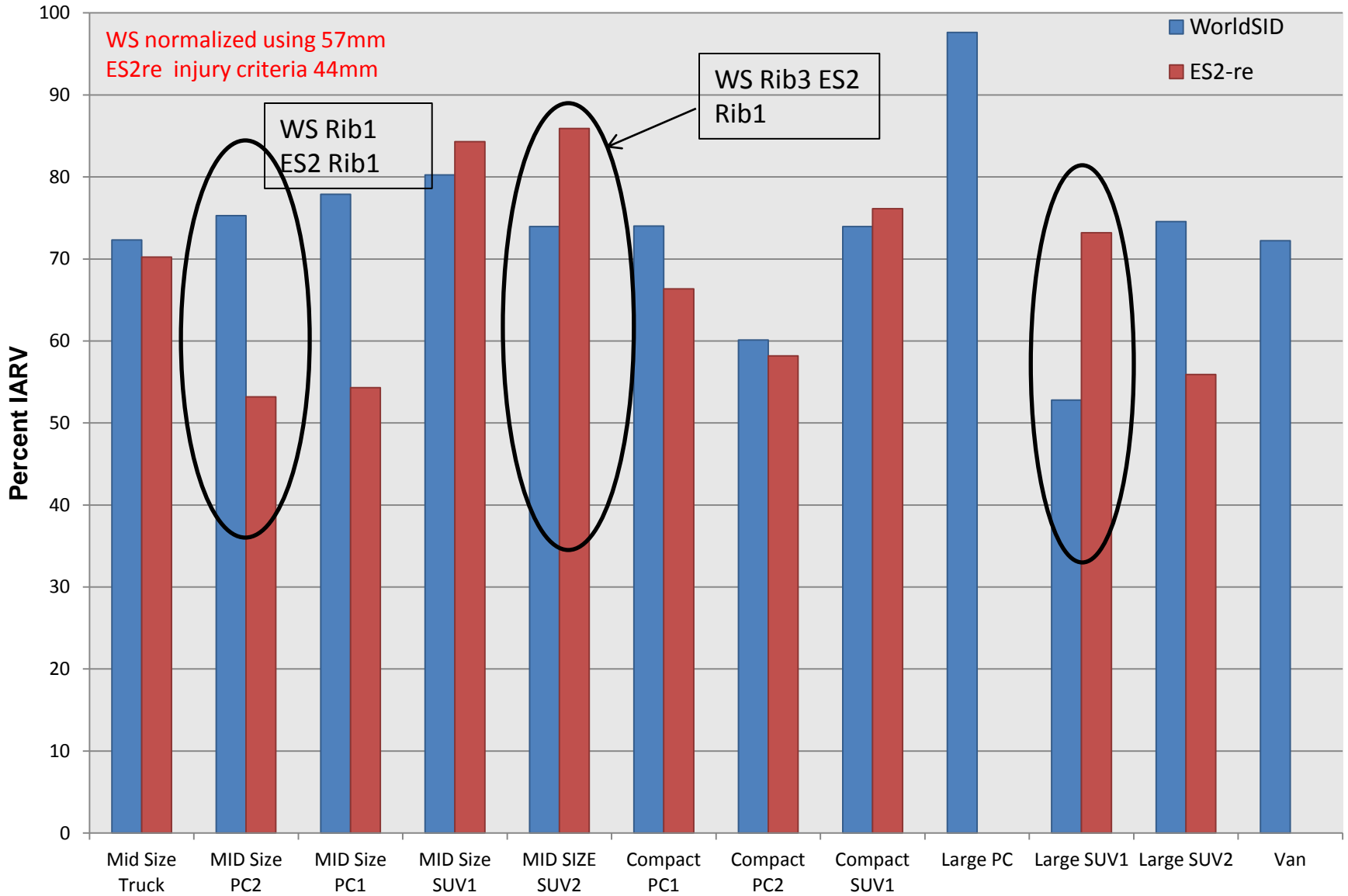
Maximum Thorax Rib Deflection



Large PC



Maximum Rib Deflection (Normalized)

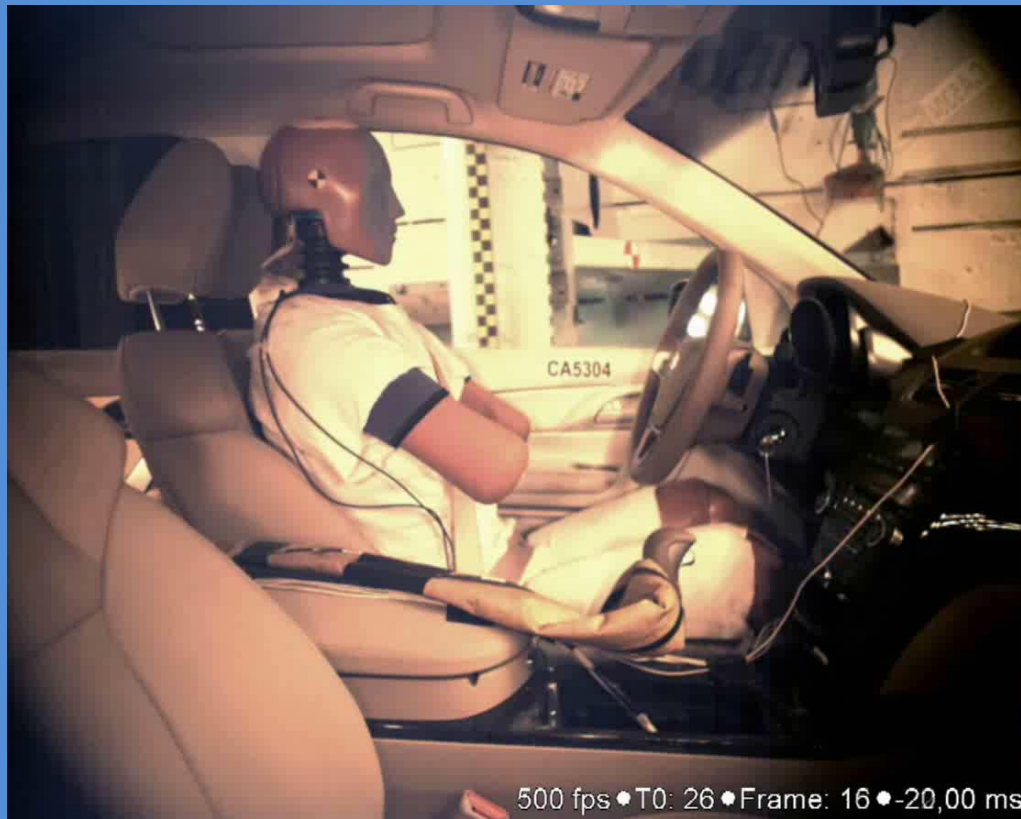




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MID Size SUV



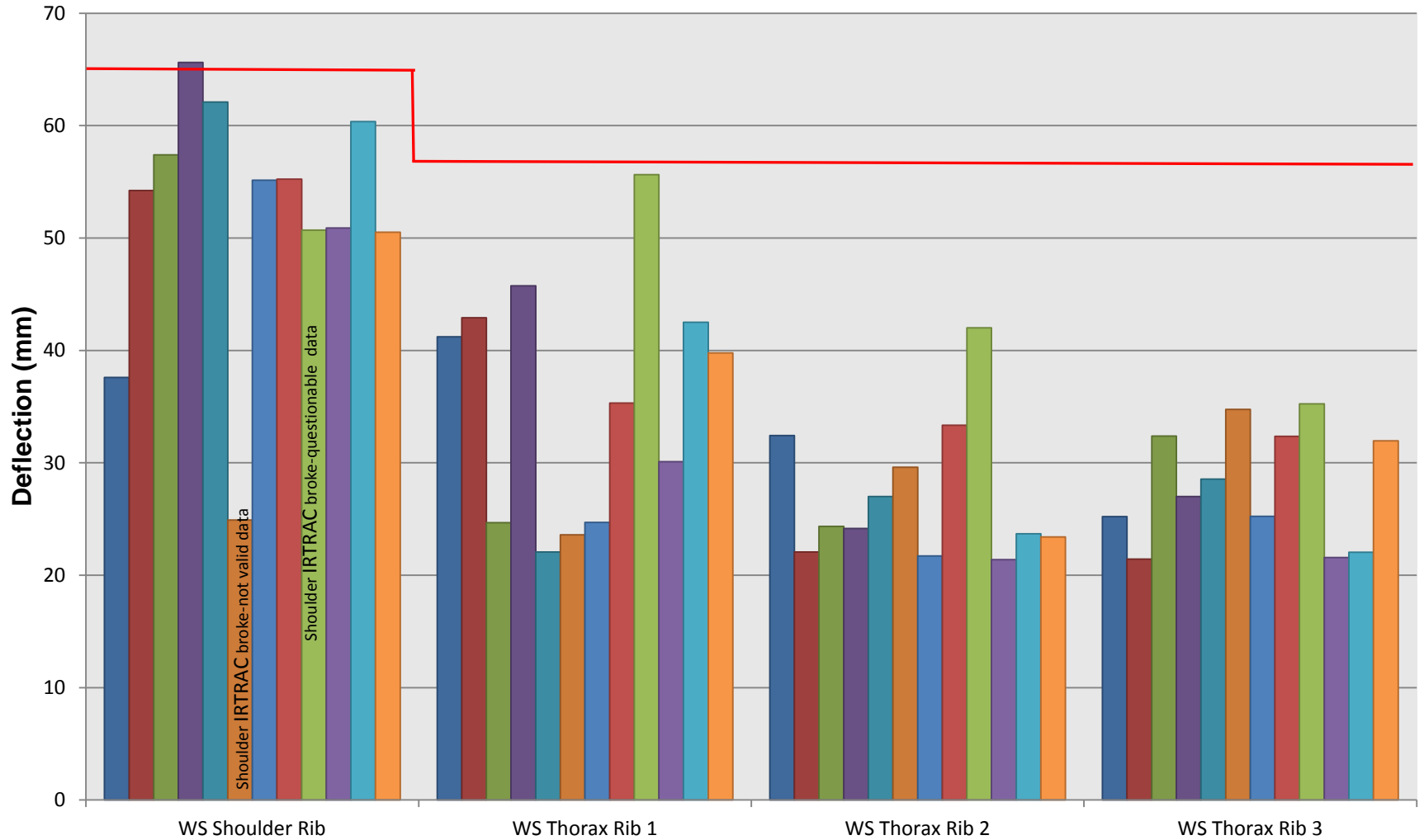
Max Rib Deflection
ES2re Rib 1



Max Rib Deflection
WS Rib 3

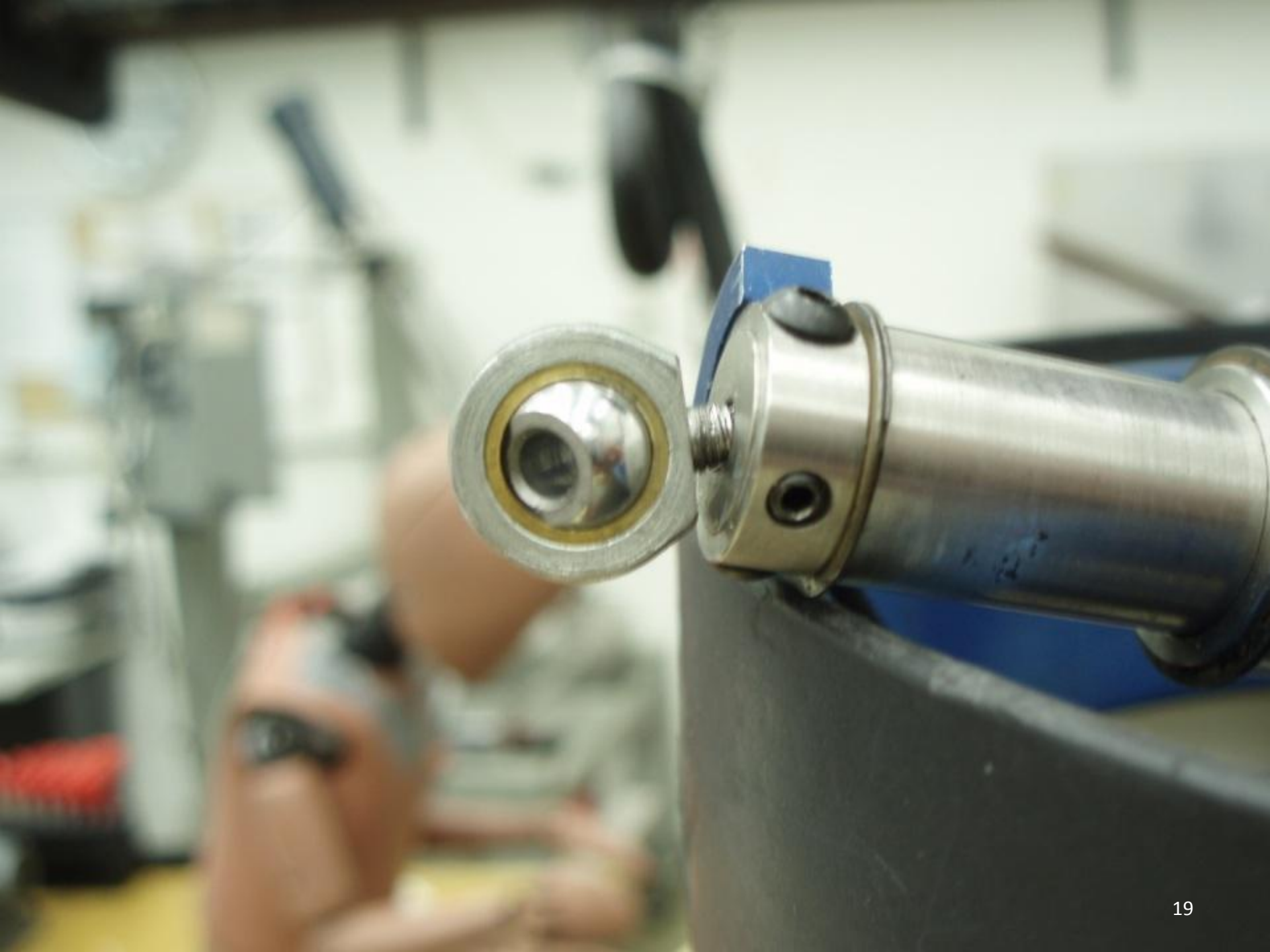
WorldSID Shoulder and Thorax Ribs

- Mid Size Truck
- MID Size PC2
- MID Size PC1
- MID Size SUV1
- MID SIZE SUV2
- Compact PC1
- Compact PC2
- Compact SUV1
- Large PC
- Large SUV1
- Large SUV2
- Van

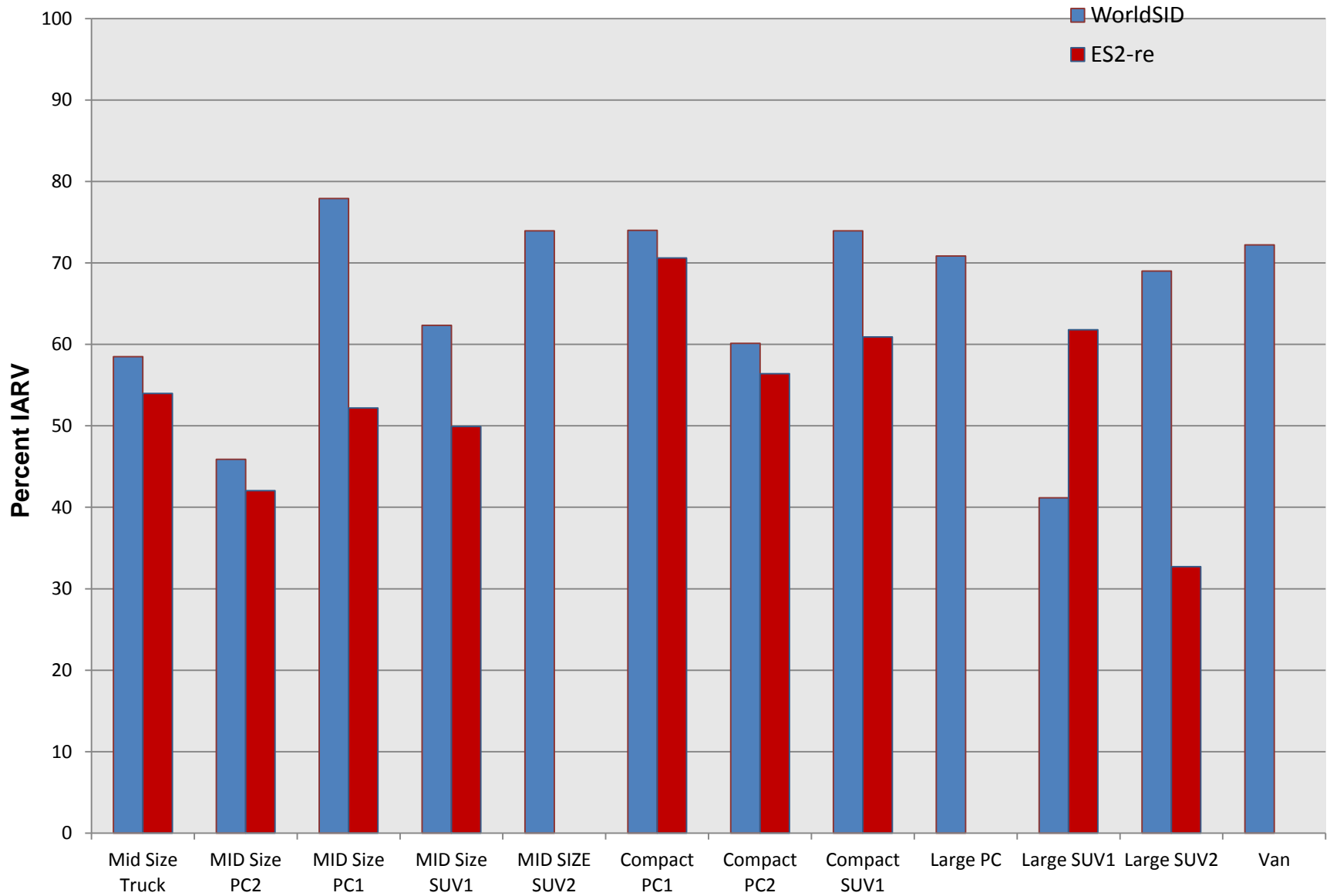


Shoulder IRTRAC broke-not valid data

Shoulder IRTRAC broke-questionable data



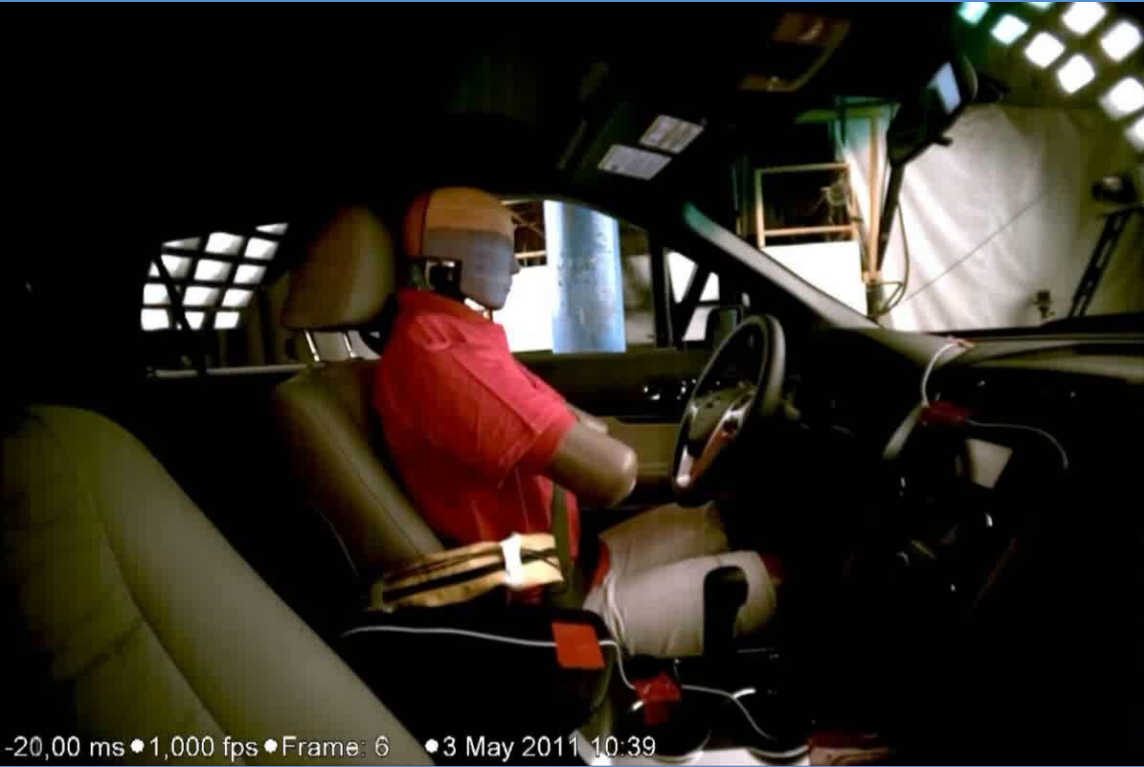
WS Abdominal Ribs vs ES2-re Abdominal Force (Normalized)



Large SUV

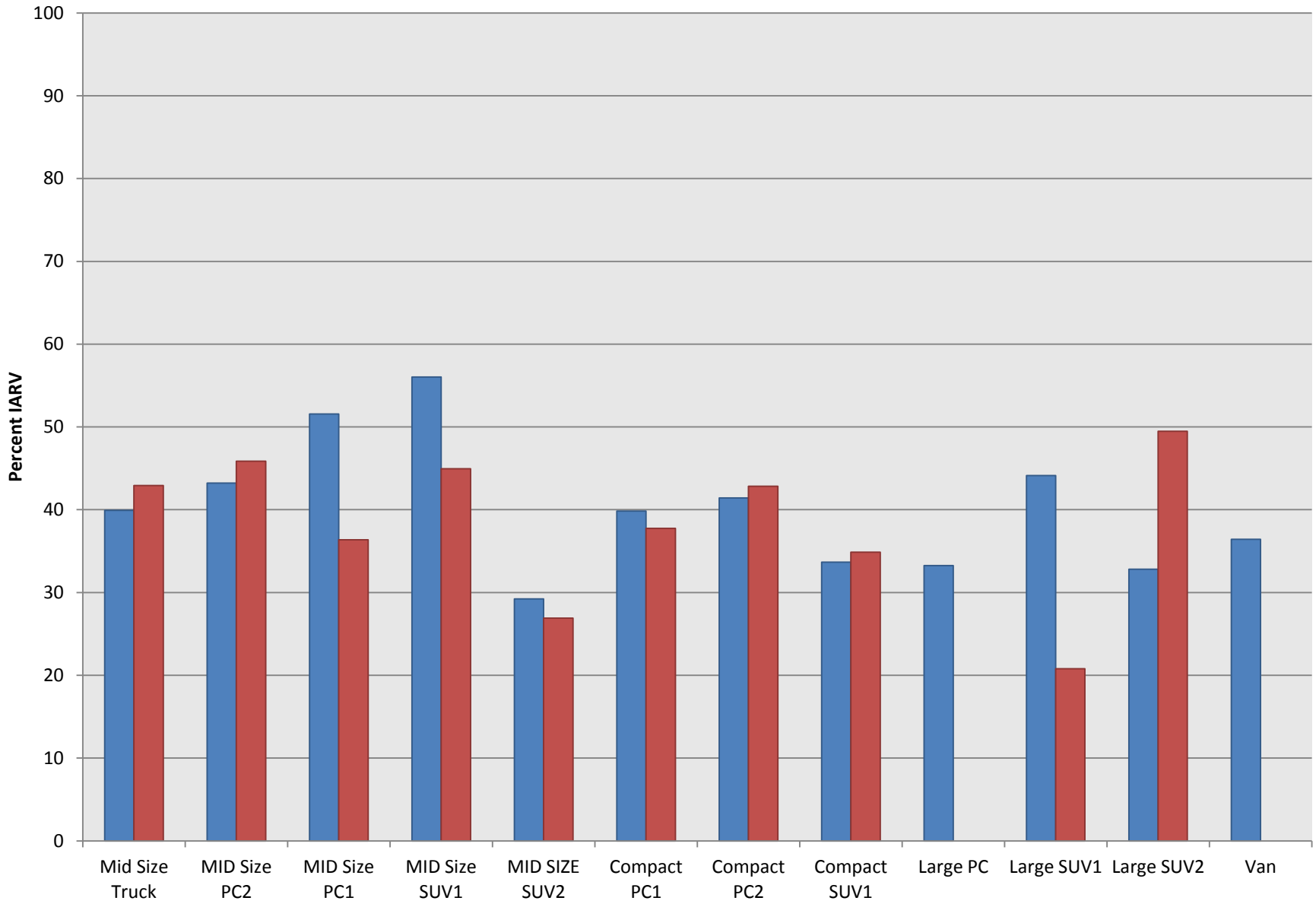
ES2-re

WorldSID



Normalized Pubic Force

■ WS ■ ES2-re



Observations

- WorldSID overall kinematics very similar to ES2-re
- All vehicles 'passed' certification with both dummies
 - Some rib responses were elevated (over 80% IARV) for each dummy
 - Abdominal loading was generally higher for the WS than for the ES2-re, although all were below 80% IARV
 - All HICs and pubic forces were below 60% IARV for both dummies
- Several shoulder deflections, lower spine accelerations, and pelvic accelerations were elevated in the WS
 - These were not measured in the ES2-re
- WorldSID dummy: very durable
 - Broke shoulder IRTRAC swivel in 2/12 vehicles