Performance as Test Procedures of the PDB and ODB Tests for a Mini-Car

JAPAN

December 9, 2008

3rd Meeting of the Informal Group on Frontal Impact

Objective

- **To examine effects on mini-cars when the test conditions prescribed in ECE R94 are replaced by PDB test.**

Test Matrix

Test Vehicles	Mini-Car A		Mini-Car B		
Test Conditions	60PDB	64ODB*	60PDB	64ODB*	56ODB (ECE R94)
Test Weight (kg)	1144		1120		
Dummies (DR&PA)	H3 50th%tile Male		H3 50th%tile Male		

* Conducted in JNCAP

- 60PDB: PDB barrier - 60km/h - 50% overlap - 150mm ground clearance
- 64ODB: EEVC barrier - 64km/h - 40% overlap - 200mm ground clearance
- 56ODB: EEVC barrier - 56km/h - 40% overlap - 200mm ground clearance

Test Vehicles

Mini-Car A

- Front rail and bumper cross beam

Mini-Car B

- Front rail and lower cross beam (w/o bumper cross beam)

Barrier Deformation

Mini-Car A

60PDB

- The front plate broke wide open.

64ODB (EEVC Barrier)

- The lower part of the honeycomb bottomed out completely.

Barrier Deformation

Mini-Car B

60PDB

- The front plate broke wide open.

64ODB (EEVC Barrier)

- The lower part of the honeycomb bottomed out completely.

56ODB (EEVC Barrier)

- The lower part of the honeycomb bottomed out .

Vehicle Deformation

Mini-Car A

60PDB

- The front rail was rarely deformed.
- The bumper cross beam was bent significantly.

64ODB (EEVC Barrier)

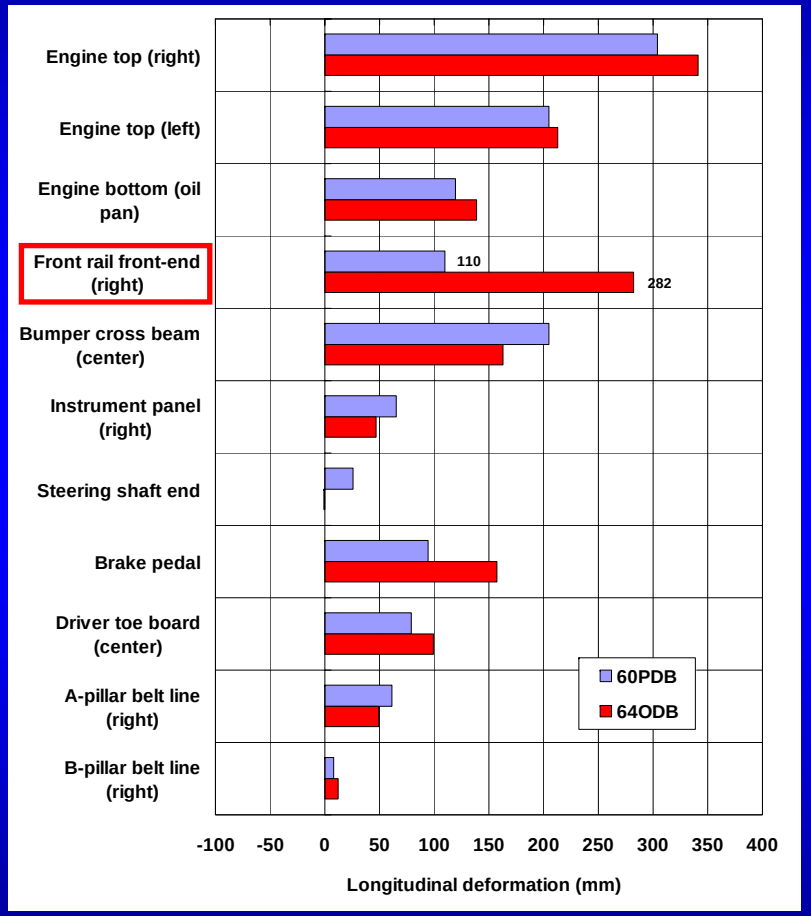
- The front rail was deformed.

Vehicle Deformation

Mini-Car A

60PDB

64ODB (EEVC Barrier)



- There were big differences in the deformation of the front rail. In 60PDB, the front rail was deformed very slightly.
- The intrusion into the upper part of the cabin (instrument panel, A-pillar, etc.) tended to be large in 60PDB, while that into the lower part of the cabin (toe board, etc.) tended to be large in 64ODB.

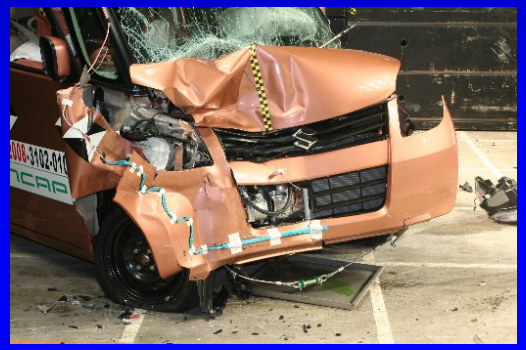
Vehicle Deformation

Mini-Car B

60PDB

➢ The front rail was rarely deformed.
➢ The lower cross beam was bent significantly.

64ODB (EEVC Barrier)



➢ The front rail was deformed.

56ODB (EEVC Barrier)

➢ The front rail was deformed.

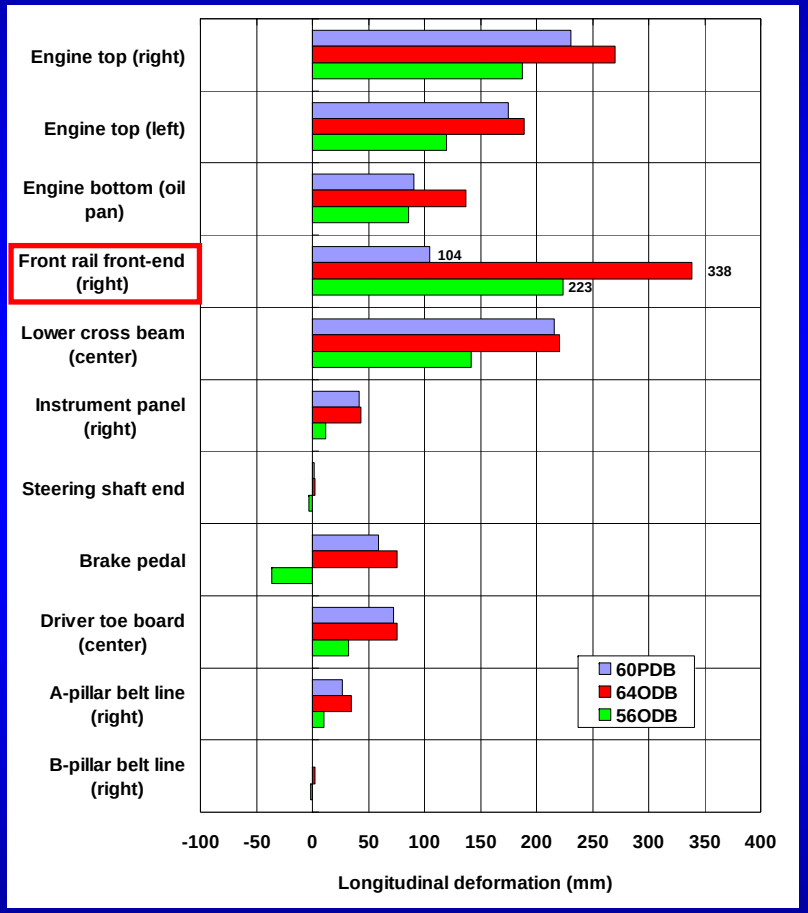
Vehicle Deformation

Mini-Car B

60PDB

64ODB (EEVC Barrier)

56ODB (EEVC Barrier)

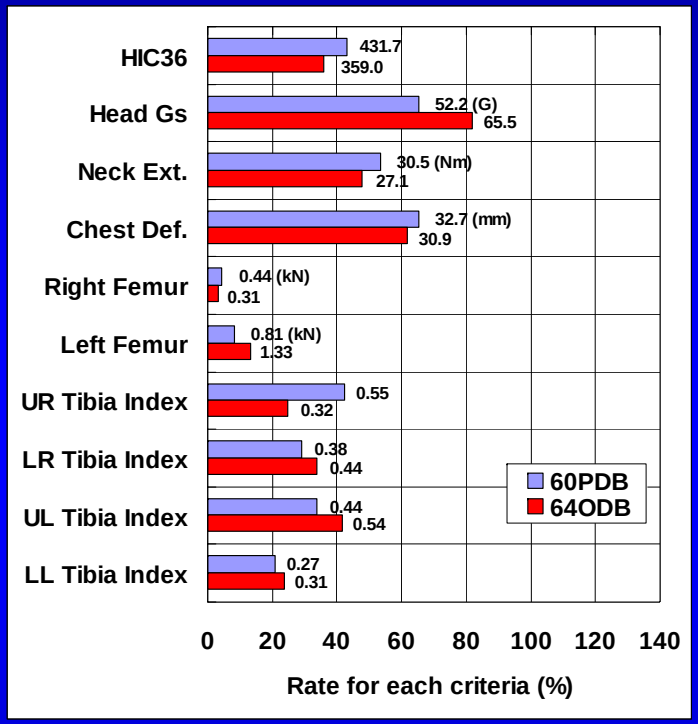


- Overall, vehicle deformation in 64ODB tended to be large.
- 60PDB showed the smallest deformation of the front rail.

Dummy Injury Criteria

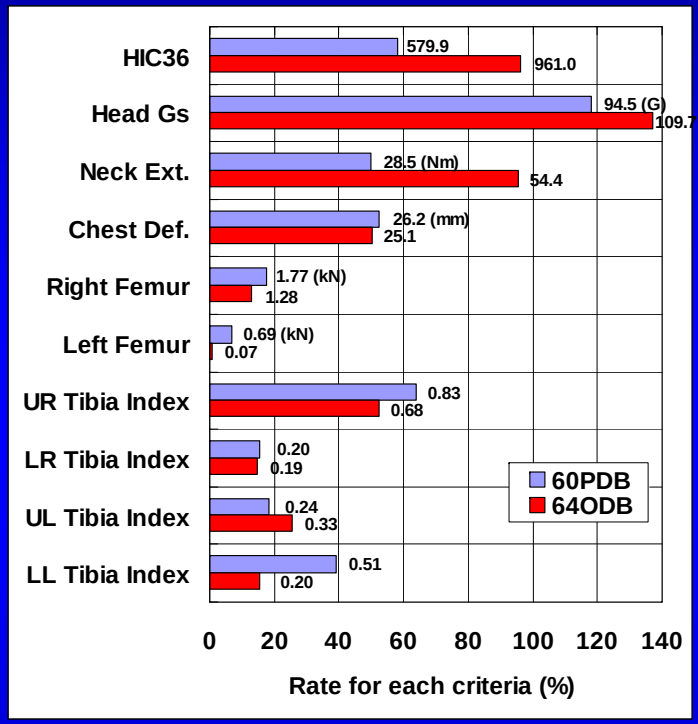
Mini-Car A

Driver



- 60PDB showed a slightly higher HIC, while 64ODB showed a slightly higher Head Gs.
- No significant difference was observed between the two tests for Neck, Chest, and Legs.

Passenger

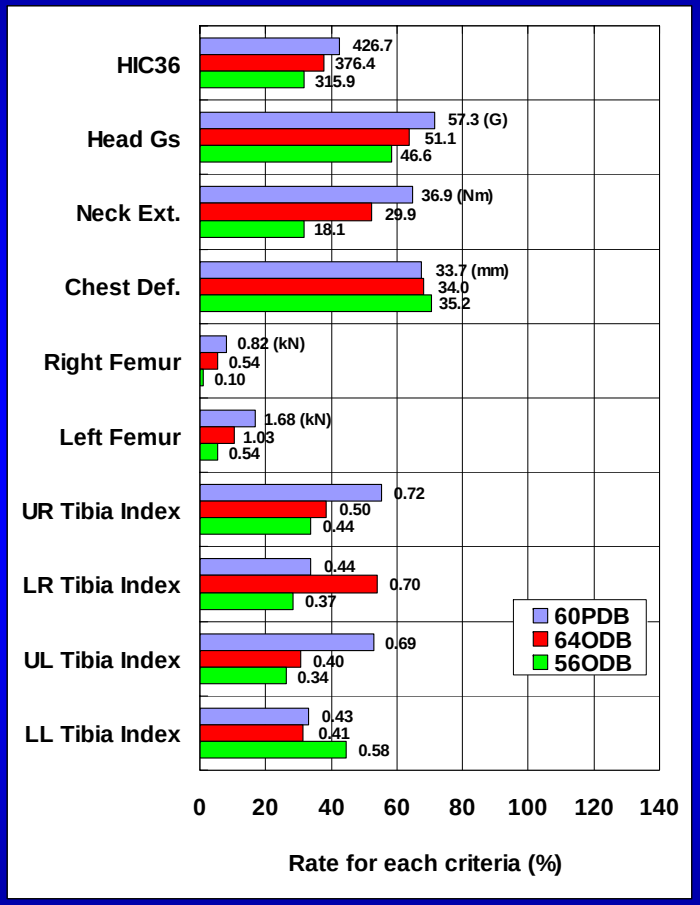


- 64ODB showed higher levels for Head and Neck.
- No significant difference was observed between the two tests for Chest and Legs.
- The Head Gs criterion was exceeded in both tests.

Dummy Injury Criteria

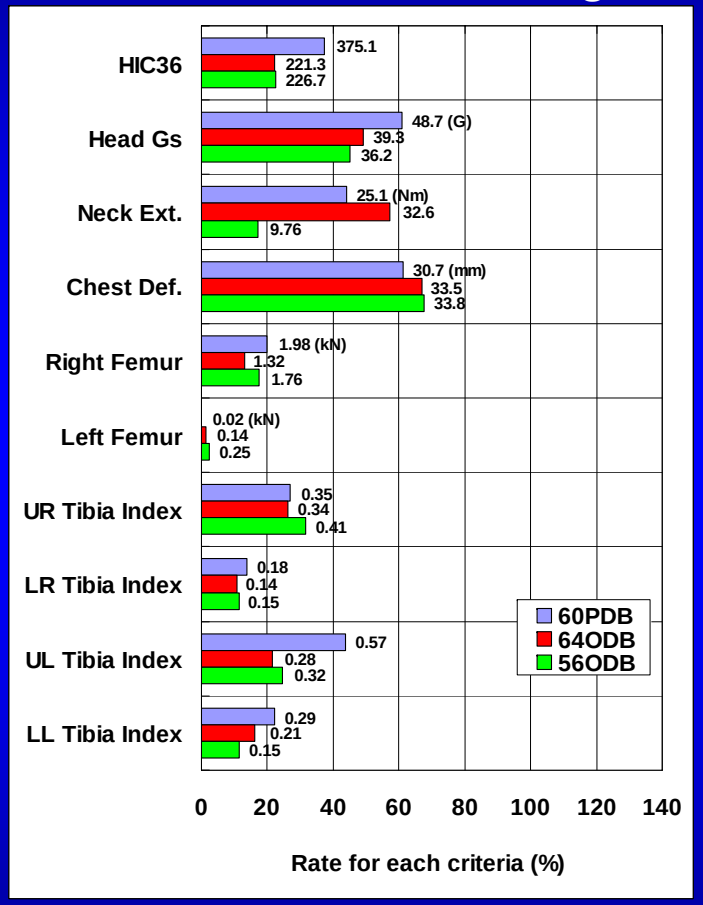
Mini-Car B

Driver



- The Head and Neck levels became lower in the order of 60PDB, 64ODB, and 56ODB.
- No significant difference was observed between 60PDB and 64ODB for Chest and Legs.

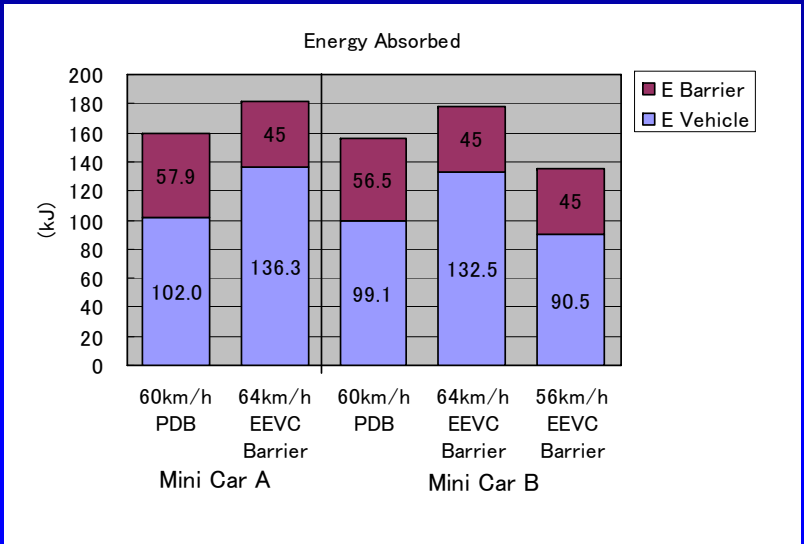
Passenger

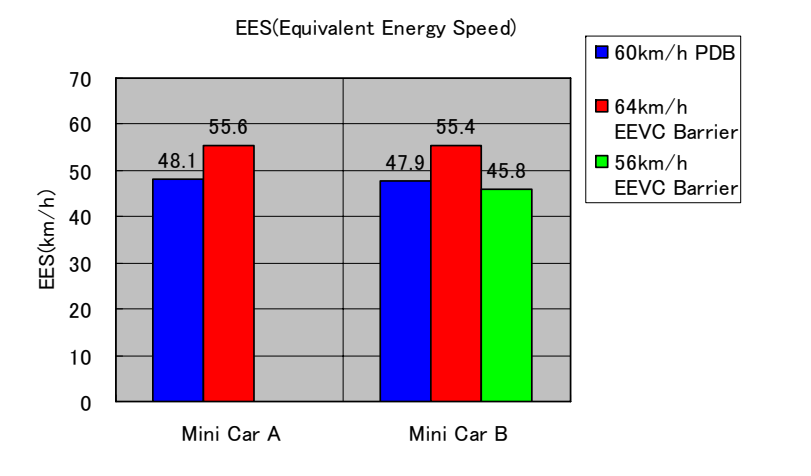


- 60PDB showed the highest level for Head.
- No significant difference was observed between the three tests for Chest and Legs.

Internal Energy (EES)

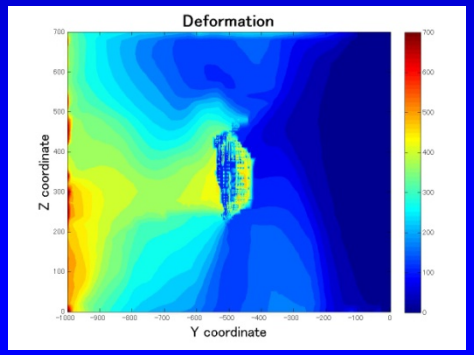
Suppose the deformation energy of EEVC Barrier is 45kJ (UTAC Proposal) :



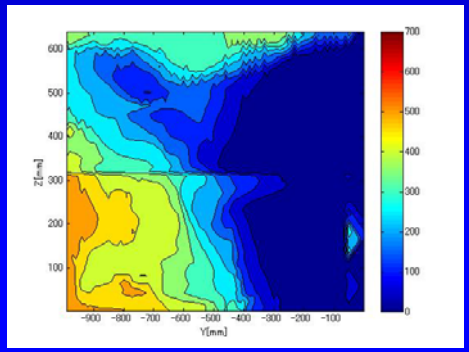


Mini Car A

60PDB

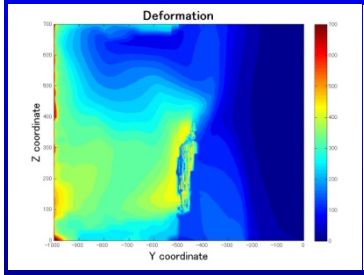


64ODB(EEVC)

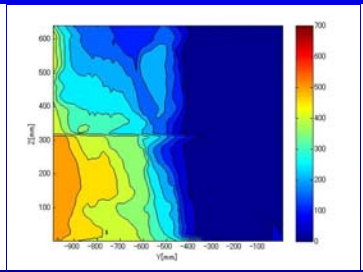


Mini Car B

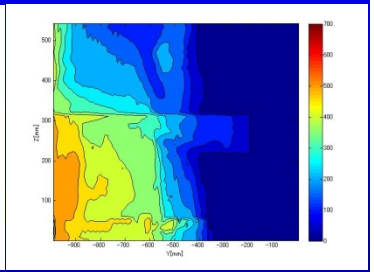
60PDB



64ODB(EEVC)



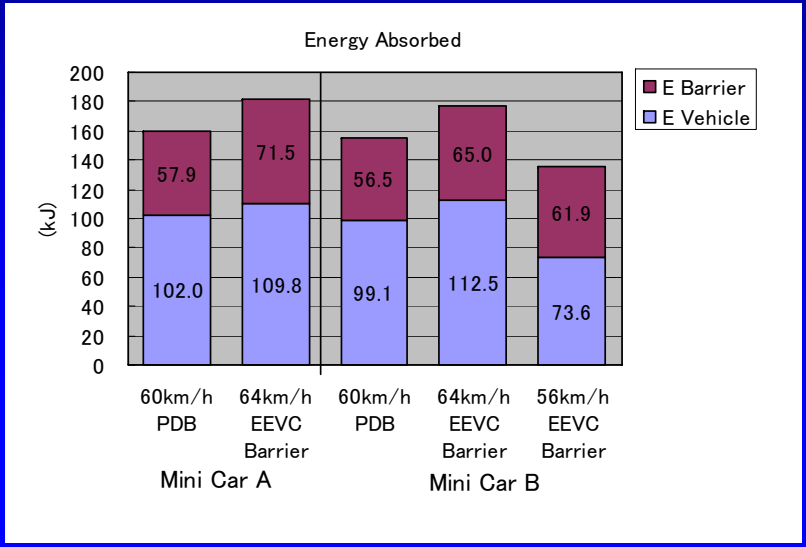
56ODB(EEVC)

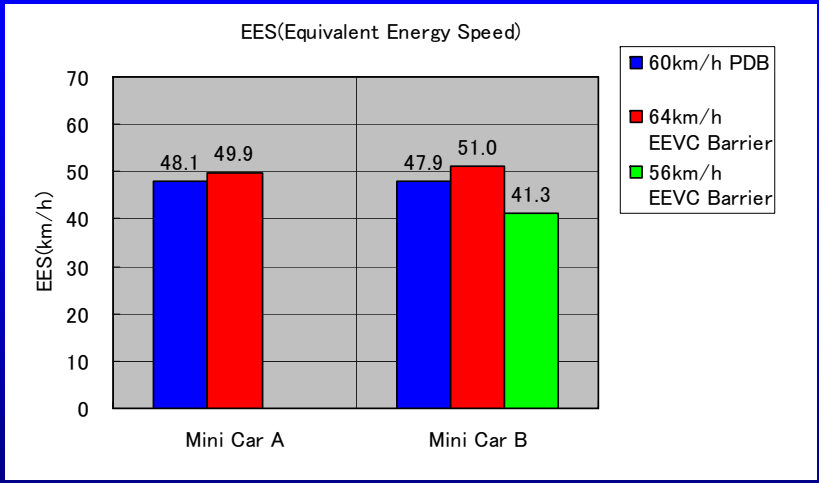


➢ 64ODB showed the highest EES, while 60PDB and 56ODB resulted in EES of the same level.

Internal Energy (EES)

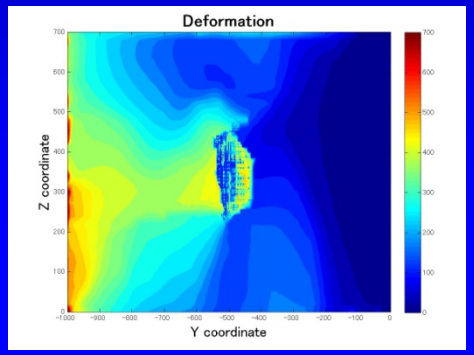
The deformation energy of EEVC Barrier was actually measured.



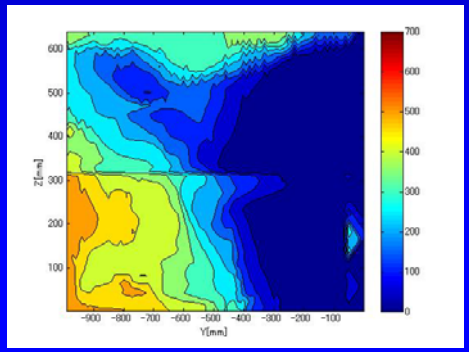


Mini Car A

60PDB

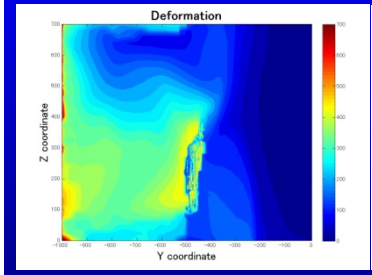


64ODB(EEVC)

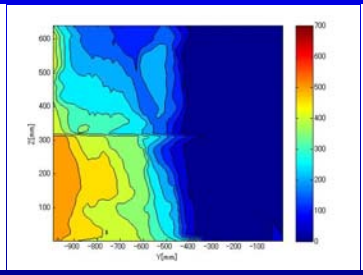


Mini Car B

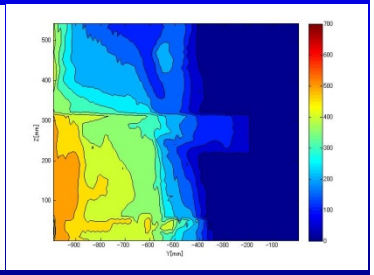
60PDB



64ODB(EEVC)



56ODB(EEVC)



➢ 56ODB showed the lowest EES, while 60PDB and 64ODB resulted in EES of the same level.

Summary

- The bottom-out of the EEVC barrier was observed with the mini-car even under the 56ODB conditions (the current ECE R94).
- The front rail penetrated into the PDB and deformed its front block significantly (the front plate broke wide open).
- Significant differences were seen in the deformation of the front rail between PDB and ODB. Deformation in 60PDB was extremely smaller than that in 56 and 64 ODB.
- No significant difference was seen in dummy injury criteria for Chest and Legs between 60PDB and 64ODB (for Mini-Car B, the head injury criterion tended to be higher in 60PDB than 64ODB (56ODB)).
- 64ODB showed the highest EES, while 60PDB and 56ODB resulted in EES of the same level. (The deformation energy of EEVC Barrier is 45kJ(UTAC proposal)
- 56ODB showed the lowest EES, while 60PDB and 64ODB resulted in EES of the same level. (The deformation energy of EEVC Barrier was actually measured.)

◆ If the test of heavy weight car is finished in Japan, we're going to report the details in 4th informal meeting.

Test Matrix

	PDB 60kph at 50% overlap (France proposal)	ODB 56kph at 40% overlap (Current ECE R94)	ODB 64kph at 40% overlap (JNCAP)
Minicar A (curb mass: 940kg)	**X** (JAMA)		**X** (JNCAP)
Minicar B (curb mass: 910kg)	**X** (MLIT)	**X** (MLIT)	**X** (JNCAP)
Minivan (Heavy) (curb mass: 1890kg)	**X** (JAMA)		**X** (JNCAP)

Test Schedule

	2008					2009		
	8	9	10	11	12	1	2	3
Minicar A	**X** (ODB 64kph)			**X** (PDB 60kph)				
Minicar B	**X** (ODB 64kph)			**X** (PDB 60kph & ODB 56kph)				
Minivan		**X** (ODB 64kph)			**X** (PDB 60kph)			
Meeting [1)]			**X** (2nd)		**X** (3rd)			**X** (4th)

1) Meeting of the Informal Group on Frontal Impact