CHILDRESTRAINTSYSTEMS
TESTING&EVALUATION

Child restraint systems have been the subject of research and testing at The University of Michigan since the late 1960s. Staff expertise covers both the engineering and human factors aspects of the design and use of effective child restraint systems.

Test facilities, instrumentation, and equipment offer flexibility in set-up and operation as well as immediate data processing and retrieval of results. Experienced laboratory staff can also provide special assistance as needed.

TEST CONFIGURATIONS

The test benches, impact directions, and belt systems currently available are listed below, and other combinations may be developed as needed.

- Frontal impact only
- Rigid seat back
- Center or semi-outboard lap belts
- Center LATCH anchors
- Outboard static (standard) or ELR lap/shoulder belts
- Center static (standard) or ELR lap/shoulder belts
- Center, semi-outboard, or outboard tether anchors

**ECE R-44.02 Test Seat**
- All impact directions
- Right or left static lap/shoulder belt

**CRABI (Airbag) Test Fixture**
- Frontal impact only
- Lap or lap/shoulder belt

**IMPACT SLED**
- The impact sled operates on a rebound principle, achieving the desired velocity change by reversing the direction of motion during the impact event.
- For child restraint testing as required by FMVSS 213, the standard bench seat is decelerated to approximate the required sled pulse corridor at a speed of 48 km/h (30 mph).

**TEST SETUP**

- Child restraints can be attached to the test buck using:
  - A lap belt made of standard automotive belt webbing
  - LATCH
  - A three-point lap/shoulder belt
  - An additional top tether strap.
- The lap belt or LATCH attachments are pre-tensioned between 53 - 66 N (12 - 15 lb), unless otherwise requested.
- Child restraints may be tested individually or two side-by-side on the test buck.
- Pre-test conditioning to simulate very cold environments can be provided if needed. Freezer capacity is available for overnight conditioning of several child restraints.
- FARO arm digitizing is available upon request for use in pre-test dummy positioning and recording.
- Realistic dummy positioning in a booster seat is available using the UMTRI seating procedure.

**ELECTRONIC DATA**

- Electronic signals are digitized live using a TDAS onboard data acquisition system.
- All test signals are filtered according to the requirements of SAE J-211.
- Results, such as impact speed, head injury criterion (HIC), neck forces, or belt loads, are available within minutes.
Several different anthropomorphic dummies are available for use in child restraint testing. Additional weight can be added to some dummies as requested. Several dummies are instrumented to measure head and chest accelerations. Standard dummies used in FMVSS 213 and CMVSS 213 crash testing are listed in bold below.

- Riley Low Birth Weight Infant (2.2 kg)
- Part 572:K CAMI Newborn (3.4 kg)
- Part 572:D CAMI 6-Month (7.9 kg)
- CRABI 6-Month (7.8 kg)
- Part 572:J TNO P-3/4, 9-Month (9.0 kg)
- Part 572:R CRABI 12-Month (10.0 kg)
- CRABI 18-Month (11.3 kg)
- Part 572:C Hybrid II 3-Year (15.1 kg)
- Part 572:P Hybrid III 3-Year (15.5 kg)
- Part 572:1 Hybrid II 6-Year (21.5 kg)
- Part 572:N Hybrid III 6-Year (23.4 kg)
- Part 572:S Hybrid III 6-Year (29.5 kg)
- Hybrid III 10-Year (35.3 kg)

PHOTOGRAPHY

- High-speed digital video (typically 1000 frames per second) from both side and overhead or forward directions is provided.
- Precise excursion measurements are provided, if needed.
- Copies of the test media are available on CD or to download at the UMTRI online database soon after testing.

REPORTS

A written report is prepared and submitted typically within two weeks of testing that includes details of the test setup, sled and dummy measures, and pre and post-test photographs of the impact event.

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