Transport Canada
Motor Vehicle Safety

Transports Canada
Sécurité des véhicules automobiles

TEST METHOD 213

Child Restraint Systems

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Table of Contents

1. Introduction **1**

2. Test Devices to be Used **1**

3. Pre-Test Buckle Release Force Measurement **3**

4. Dynamic Tests **5**

4.1 Test Description 5

4.2 Test Acceleration 6

4.3 Test Conditions 7

4.4 Positioning of the ATD and Installation of the Restraint System for a Dynamic Test Using a Type 1 or Type 2 Seat Belt Assembly 7

4.5 Positioning of the ATD and Installation of the Restraint System for a Dynamic Test Using a Lower Universal Anchorage System 10

4.6 Test Procedure 13

5. Buckle Release Test **13**

6. Energy Absorbing Material Test **14**

7. Inversion Test **15**

Table of Figures

Figure 1(a) — Buckle Pre-load Requirements **4**

Figure 1(b) — Release Force Application Position for Push-Button Mechanisms **4**

Figure 1(c) — Release Force Application Device **5**

Figure 2 — Test Platform Acceleration Graph **7**

Figure 3 — Webbing Tension Pull Device **13**

Figure 4 — Self-Adjusting Sling for the Buckle Release Test **14**

Figure 5 — Simulated Aircraft Passenger Seat **16**

List of Referenced Documents

SAE International Recommended Practice J211-1, *Instrumentation for Impact Test – Part 1 – Electronic Instrumentation* (July 2007)

Subparts R, P, N and S, part 572, chapter V, title 49 of the *Code of Federal Regulations* of the United States (revised as of October 1, 2011)

ASTM International:

Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber, Designation No. D1056-00

Standard Specification for Flexible Cellular Materials—Vinyl Chloride Polymers and Copolymers (Open-Cell Foam), Designation No. D1565-81 (Reapproved 1990)

Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams, Designation No. D3574-08

1. Introduction

Test Method 213 — Child Restraint Systems (May 2012) is referred to in Part 2 of the *Motor Vehicle Restraint Systems and Booster Seats Safety Regulations* (RSSR).

2. Test Devices to be Used

2.1 Seat Assemblies

2.1.1 ***Standard seat assembly:*** The standard seat assembly is mounted on a dynamic test platform, instrumented as set out in subsection 2.2, so that the seat orientation reference line (SORL) is parallel to the direction of travel of the test platform and any movement between the base of the assembly and the platform is prevented. The location of the seat belt anchorage points on the standard seat assembly is illustrated in Figures 3 and 5 of Schedule 7 to the RSSR while the location of the lower universal anchorage system is illustrated in Figures 4 and 6 of Schedule 7 to the RSSR.

2.1.2 ***Representative aircraft passenger seat*****:** In section 7, "representative aircraft passenger seat" means

a) a production aircraft passenger seat that has been approved by the U.S. Federal Aviation Administration or by Transport Canada's Director, Aircraft Certification, or

b) a simulated aircraft passenger seat that conforms to the requirements of Figure 5.

2.2 Test platform

The test platform shall be instrumented with an accelerometer that is linked to a data processing system, and the accelerometer-sensitive axis shall be parallel to the direction of travel of the test platform. The data shall be filtered with a Class 60 filter, as specified in the SAE International Recommended Practice J211-1, *Instrumentation for Impact Test – Part 1 – Electronic Instrumentation* (July 2007).

2.3 Type 1 seat belt assembly and Type 2 seat belt assembly

Type 1 and Type 2 seat belt assemblies that meet the requirements of section 209 of Schedule IV to the *Motor Vehicle Safety Regulations* and whose webbing is not more than 50 mm wide shall be attached, without the use of retractors or reels of any kind, to the seat belt anchorage points provided on the standard seat assembly.

2.4 Anthropomorphic test device

For the dynamic tests, select all anthropomorphic test devices (ATD) specified in paragraphs (a) to (c), as required, for testing a child restraint system for use by children whose mass and height are within the ranges indicated in the statement referred to in paragraph 218(1)(*d*) of the RSSR.

a) A restraint system that is designed to be used by children in a specified mass range that includes any children having a mass greater than 10 kg but not greater than 18 kg, or by children in a specified height range that includes any children whose height is greater than 850 mm but not greater than 1100 mm, shall be tested with

   i) the CRABI 12-month-old infant ATD conforming to subpart R, part 572, chapter V, title 49 of the *Code of Federal Regulations* of the United States (revised as of October 1, 2011); and

   ii) the Hybrid III 3-year-old child ATD conforming to subpart P, part 572, chapter V, title 49 of the *Code of Federal Regulations* of the United States (revised as of October 1, 2011).

b) A restraint system that is designed to be used by children in a specified mass range that includes any children having a mass greater than 18 kg but not greater than 22.7 kg, or by children in a specified height range that includes any children whose height is greater than 1100 mm but not greater than 1250 mm, shall be tested with the Hybrid III 6-year-old child ATD conforming to subpart N, part 572, chapter V, title 49 of the *Code of Federal Regulations* of the United States (revised as of October 1, 2011).

c) A restraint system that is *designed to be used by chil*dren in a specified mass range that includes any children having a mass greater than 22.7 kg but not greater than 30 kg, or by children in a specified height range that includes any children whose height is greater than 1100 mm but not greater than 1250 mm, shall be tested with

   i) the Hybrid III 6-year-old child ATD conforming to subpart N, part 572, chapter V, title 49 of the *Code of Federal Regulations* of the United States (revised as of October 1, 2011); and

   ii) the Hybrid III 6-year-old weighted child ATD conforming to subpart S, part 572, chapter V, title 49 of the *Code of Federal Regulations* of the United States (revised as of October 1, 2011).

2.4.1 The clothing of any ATD, other than the shoes, shall be machine washed in water that is at a temperature of at least 71°C but not more than 82°C and machine dried at a temperature of at least 49°C but not more than 60°C for 30 minutes.

2.4.2 The clothing of any ATD shall consist of,

a) for the CRABI 12-month-old infant ATD, subpart R, a cotton-polyester-based tight fitting sweatshirt with long sleeves and ankle-length pants whose combined mass is not more than 0.25 kg;

b) for the Hybrid III 3-year-old child ATD, subpart P, thermal knit, waffle-weave cotton-polyester underwear or equivalent, a size-4 long-sleeved shirt having a mass of 0.090 kg, a pair of size-4 long pants having a mass of 0.090 kg and cut off just far enough above the knee to allow the knee target point to be visible, and children's size 8 canvas oxford style sneakers weighing not more than 0.26 kg each;

c) for the Hybrid III 6-year-old child ATD, subpart N, and the Hybrid III 6-year-old weighted child ATD, subpart S, light-weight cotton stretch short-sleeved shirt and above-the-knee pants, and size 12½ M sneakers with rubber toe caps, uppers of Dacron and cotton, or nylon and a total mass of 0.453 kg.

2.4.3 For the purposes of the dynamic tests, any ATD used shall be conditioned at an ambient temperature of at least 20.6°C but not more than 22.2°C and at a relative humidity of at least 10 % but not more than 70 % for at least 4 hours immediately prior to the test.

3. Pre-Test Buckle Release Force Measurement

3.1 If the belts of the restraint system are equipped with buckles, the release force of each buckle is to be measured in accordance with subsections 3.2 to 3.6 before commencing the dynamic tests.

3.2 Place the buckle assembly to be tested on a hard, flat, horizontal surface.

3.3 Each belt end of the buckle shall be pre-loaded as shown in Figure 1(a) such that the anchor end of the buckle is loaded with a 9 N force in the direction away from the buckle in the following manner:

a) In the case of buckles designed to secure a single latch plate, the belt latch plate end of the buckle shall be pre-loaded with a 9 N force in the direction away from the buckle.

b) In the case of buckles designed to secure two or more latch plates, the belt latch plate ends of the buckle shall be loaded equally such that the total load is 9 N, in the direction away from the buckle.

3.4 For push-button-actuated buckles, the release force shall be applied to the buckle by a conical surface as shown in Figure 1(c) and,

a) for push-button-actuated mechanisms with a fixed edge (referred to in Figure 1(b) as "hinge button"), the release force shall be applied at the centreline of the button, 3 mm away from the movable edge directly opposite to the fixed edge, and in the direction that produces maximum releasing effect; and

b) for push-button-actuated mechanisms with no fixed edge (referred to in Figure 1(b) as "floating button"), the release force shall be applied at the centre of the release mechanism in the direction that produces the maximum releasing effect.

3.5 For all other buckle release mechanisms, the force shall be applied on the centreline of the buckle lever or finger tab in the direction that produces the maximum releasing effect.

3.6 Measure the force required to release the buckle.

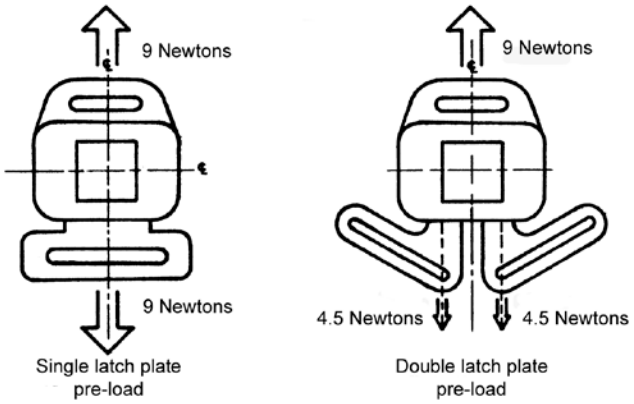


Figure 1(a) — Buckle Pre-load Requirements

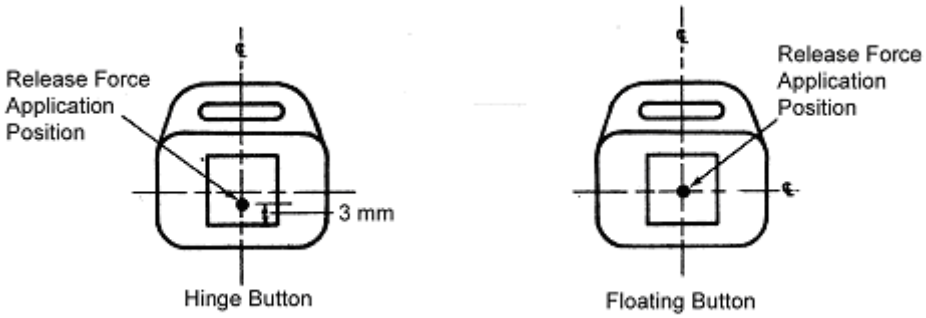


Figure 1(b) — Release Force Application Position for Push-Button Mechanisms

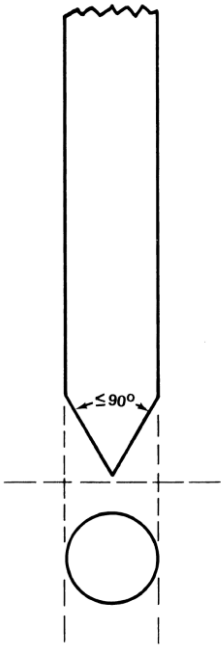


Figure 1(c) — Release Force Application Device

4. Dynamic Tests

4.1 Test Description

a) A first dynamic test is to be conducted in accordance with the procedure set out in subsections 4.4 and 4.6 using

   i) an ATD specified in subsection 2.4;

   ii) a standard seat assembly mounted as set out in subsection 2.1.1; and

   iii) a new child restraint system attached to the standard seat assembly by means of a Type 1 seat belt assembly, as set out in subsection 2.3, and,

      A) in the case of a forward-facing restraint system, with the tether strap that is provided with the restraint system; and

      B) in the case of a rear-facing restraint system, with the tether strap if the restraint system is equipped with a tether strap and the manufacturer recommends its use.

b) A second dynamic test is to be conducted in accordance with the procedure set out in subsections 4.5 and 4.6 using

i) an ATD specified in subsection 2.4;

ii) a standard seat assembly mounted as set out in subsection 2.1.1; and

iii) a new child restraint system attached to the standard seat assembly by means of the lower universal anchorage system and,

A) in the case of a forward-facing restraint system, with the tether strap that is provided with the restraint system; and

B) in the case of a rear-facing restraint system, with the tether strap if the restraint system is equipped with a tether strap and the manufacturer recommends its use.

c) A third dynamic test is to be conducted in accordance with the procedure set out in subsections 4.4 and 4.6 using

i) an ATD specified in subsection 2.4;

ii) a standard seat assembly mounted as set out in subsection 2.1.1; and

iii) a new child restraint system attached to the standard seat assembly by means of a Type 2 seat belt assembly, as set out in subsection 2.3, installed in either configuration of appropriate anchorage points and,

A) in the case of a forward-facing restraint system, with the tether strap that is provided with the restraint system; and

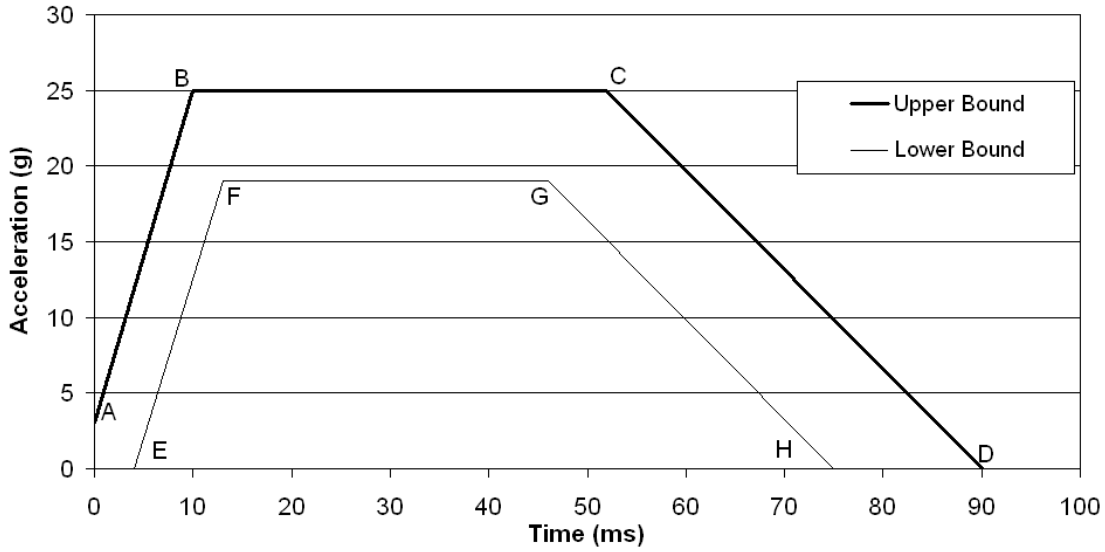
B) in the case of a rear-facing restraint system, with the tether strap if the restraint system is equipped with a tether strap and the manufacturer recommends is use.

4.2 Test Acceleration

The dynamic tests simulate a frontal barrier impact having an acceleration plot of the test platform following every curve that meets the two following requirements:

a) it is within the corridor shown in Figure 2; and

b) it represents a change of velocity of 48 km/h.



Upper Bound		
Point	Time	Acceleration
A	0	3
B	10	25
C	52	25
D	90	0
Lower Bound		
Point	Time	Acceleration
E	4	0
F	13	19
G	46	19
H	75	0

Figure 2 — Test Platform Acceleration Graph

4.3 Test Conditions

For the dynamic tests, the ambient temperature shall be at least 20.6°C but not more than 22.2°C with a relative humidity of at least 10 % but not more than 70 %.

4.4 Positioning of the ATD and Installation of the Restraint System for a Dynamic Test Using a Type 1 or Type 2 Seat Belt Assembly

4.4.1 In accordance with the manufacturer's instructions, place a new child restraint system at the centre seating position of the standard seat assembly. If the restraint system is installed by passing the seat belt assembly over the restraint system and under the seated ATD, attach the seat belt assembly to the restraint system, but do not tighten it. In the case of a forward-facing restraint system, attach the tether strap but do not tighten it. In the case of a rear-facing restraint system, attach the tether strap if the restraint system is equipped with a tether strap and the manufacturer recommends its use, but do not tighten it.

4.4.2 Any ATD placed in the child restraint system shall be positioned in accordance with the manufacturer's instructions while conforming to the following:

a) For the CRABI 12-month-old infant ATD, subpart R,

i) in the case of a rear-facing restraint system,

A) place the ATD in the restraint system so that the back of the ATD's torso contacts the seat back of the restraint system.

B) attach all appropriate belts and harnesses of the restraint system around the ATD and tighten them as specified in subsection 4.4.3.

C) in accordance with the manufacturer's instructions, secure the restraint system, if it is not already installed, to the standard seat assembly using the seat belt. Tighten the seat belt assembly in the following manner :

(I) In the case of a Type 1 seat belt assembly, tighten the seat belt assembly and tether strap, if the restraint system is equipped with a tether strap and the manufacturer recommends its use, to a tension, as measured by a force gauge used on the webbing, of not less than 53.5 N and not more than 67 N.

(II) In the case of a Type 2 seat belt assembly, tighten the pelvic restraint and tether strap, if the restraint system is equipped with a tether strap and the manufacturer its use, to a tension, as measured by a force gauge used on the webbing, of not less than 53.5 N and not more than 67 N and tighten the upper torso restraint to a tension, as measured by a force gauge used on the webbing, of not less than 9 N and not more than 18 N.

D) position each movable surface in accordance with the instructions referred to in section 220 of the RSSR. If the ATD's head does not remain in the proper position, tape it against the seat back head support surface of the restraint system by means of a single thickness of 6 mm-wide paper masking tape placed across the centre of the ATD's face.

E) extend the ATD's arms vertically upwards and then rotate each arm downward toward the ATD's lower body until the arm contacts a surface of the restraint system or a surface of the standard seat assembly. Ensure that no arm is restrained from movement, other than in the downward direction, by any part of the restraint system or the belts used to anchor the restraint system to the standard seat assembly.

ii) in the case of a forward-facing restraint system,

A) holding the torso upright until it contacts the seat back of the restraint system, seat the ATD in the restraint system so that the mid-sagittal plane of its head is coincident with the SORL.

B) lift the arms of the ATD as far as possible in the upward vertical direction.

C) extend the legs of the ATD as far as possible in the forward horizontal direction, with its feet perpendicular to the centreline of the lower legs.

D) using a flat square surface with an area of 2580 mm^2, apply a force of 178 N perpendicular to the plane of the seat back of the standard seat assembly, first against the crotch of the ATD and then in the mid-sagittal plane against its thorax.

E) attach all appropriate belts and harnesses on the restraint system around the ATD and tighten them as specified in subsection 4.4.3.

F) in accordance with the manufacturer's instructions, secure the restraint system, if it is not already installed, to the standard seat assembly using the seat belt. Tighten the seat belt assembly in the following manner:

(I) In the case of a Type 1 seat belt assembly, tighten the seat belt and tether strap, to a tension, as measured by a force gauge used on the webbing, of not less than 53.5 N and not more than 67 N.

(II) In the case of a Type 2 seat belt assembly, tighten the pelvic restraint and tether strap, to a tension, as measured by a force gauge used on the webbing, of not less than 53.5 N and not more than 67 N and tighten the upper torso restraint to a tension, as measured by a force gauge used on the webbing, of not less than 9 N and not more than 18 N.

G) position each movable surface in accordance with the instructions referred to in section 220 of the RSSR.

H) rotate each limb of the ATD downward in a plane parallel to its mid-sagittal plane until the limb contacts a surface of the restraint system or a surface of the standard seat assembly. Position the limbs so that they will not inhibit the movement of the torso or head during the test.

b) For the Hybrid III 3-year-old child ATD, subpart P, the Hybrid III 6-year-old child ATD, subpart N, and the Hybrid III 6-year-old weighted child ATD, subpart S,

i) holding the torso upright until it contacts the seat back of the restraint system, seat the ATD in the restraint system so that the mid-sagittal plane of its head is coincident with the SORL.

ii) lift the arms of the ATD as far as possible in the upward vertical direction.

iii) extend the legs of the ATD as far as possible in the forward horizontal direction, with its feet perpendicular to the centreline of the lower legs.

iv) using a flat square surface with an area of 2580 mm^2, apply a force of 178 N perpendicular to the plane of the seat back of the standard seat assembly, first against the crotch of the ATD and then in the mid-sagittal plane against its thorax.

v) attach all appropriate belts and harnesses on the restraint system around the ATD and tighten them as specified in subsection 4.4.3.

vi) in accordance with the manufacturer's instructions, secure the restraint system, if it is not already installed, to the standard seat assembly using the seat belt. Tighten the seat belt assembly in the following manner:

A) In the case of a Type 1 seat belt assembly, tighten the seat belt and tether strap, if the restraint system is equipped with a tether strap and the manufacturer recommends its use, to a tension, as measured by a force gauge used on the webbing, of not less than 53.5 N and not more than 67 N.

B) In the case of a Type 2 seat belt assembly, tighten the pelvic restraint and tether strap, if the restraint system is equipped with a tether strap and the manufacturer recommends its use, to a tension, as measured by a force gauge used on the webbing, of not less than 53.5 N and not more than 67 N and tighten the upper torso restraint to a tension, as measured by a force gauge used on the webbing, of not less than 9 N and not more than 18 N.

(vii) position each movable surface in accordance with the instructions referred to in section 220 of the RSSR.

(viii) rotate each limb of the ATD downward in a plane parallel to its mid-sagittal plane until the limb contacts a surface of the restraint system or a surface of the standard seat assembly. Position the limbs so that they will not inhibit the movement of the torso or head during the test and,

(A) in the case of a rear-facing restraint system for children whose mass is 16 kg or less, if the lower limbs of the ATD contact the seat back of the standard seat assembly, remove the lower limbs at the knees;

(B) in the case of a rear-facing restraint system for children whose mass is 30 kg or less, if the lower limbs of the ATD contact the seat back of the standard seat assembly, remove the lower limbs at the knees and secure each limb on either side of the upper legs of the ATD.

4.4.3 If the restraint system is equipped with belts to restrain the upper or lower torso of the ATD, they must be adjusted by tightening the belts until a 9 N force applied using a webbing tension pull device (as illustrated in Figure 3) to the webbing at the top of each shoulder and to the pelvic webbing 50 mm on either side of the mid-sagittal plane of the torso pulls the webbing a distance of 7 mm away from the ATD.

4.5 Positioning of the ATD and Installation of the Restraint System for a Dynamic Test Using a Lower Universal Anchorage System

4.5.1 In accordance with the manufacturer's instructions, place a new child restraint system at the centre seating position of the standard seat assembly. Attach and adjust the lower connectors of the child restraint system to the lower universal anchorage system in accordance with the manufacturer's instructions. In the case of a forward-facing restraint system, attach the tether strap but do not tighten it. In the case of a rear-facing restraint system, attach the tether strap if the restraint system is equipped with a tether strap and the manufacturer recommends its use, but do not tighten it.

4.5.2 Any ATD placed in the child restraint system shall be positioned in accordance with the manufacturer's instructions while conforming to the following:

a) For the CRABI 12-month-old infant ATD, subpart R,

i) in the case of a rear-facing restraint system,

A) place the ATD in the restraint system so that the back of the ATD's torso contacts the seat back of the restraint system.

B) attach all appropriate belts and harnesses of the restraint system around the ATD and tighten them as specified in subsection 4.5.3.

C) tighten the tether strap, if the restraint system is equipped with a tether strap and the manufacturer recommends its use, to a tension of not less than 53.5 N and not more than 67 N, as measured by a force gauge used on the webbing.

D) position each movable surface in accordance with the instructions referred to in section 220 of the RSSR. If the ATD's head does not remain in the proper position, tape it against the seat back head support surface of the restraint system by means of a single thickness of 6 mm-wide paper masking tape placed across the centre of the ATD's face.

E) extend the ATD's arms vertically upwards and then rotate each arm downward toward the ATD's lower body until the arm contacts a surface of the restraint system or a surface of the standard seat assembly. Ensure that no arm is restrained from movement, other than in the downward direction, by any part of the restraint system or the belts used to anchor the restraint system to the standard seat assembly.

ii) in the case of a forward-facing restraint system:

A) holding the torso upright until it contacts the seat back of the restraint system, seat the ATD in the restraint system so that the mid-sagittal plane of its head is coincident with the SORL.

B) lift the arms of the ATD as far as possible in the upward vertical direction.

C) extend the legs of the ATD as far as possible in the forward horizontal direction, with its feet perpendicular to the centreline of the lower legs.

D) using a flat square surface with an area of 2580 mm^2, apply a force of 178 N perpendicular to the plane of the seat back of the standard seat assembly, first against the crotch of the ATD and then in the mid-sagittal plane against its thorax.

E) attach all appropriate belts and harnesses on the restraint system and tighten them as specified in subsection 4.5.3.

F) tighten the tether strap, to a tension of not less than 53.5 N and not more than 67 N, as measured by a force gauge used on the webbing.

G) position each movable surface in accordance with the instructions referred to in section 220 of the RSSR.

H) rotate each limb of the ATD downward in a plane parallel to its mid-sagittal plane until the limb contacts a surface of the restraint system or a surface of the standard seat assembly. Position the limbs so that they will not inhibit the movement of the torso or head during the test.

b) For the Hybrid III 3-year-old child ATD, subpart P, the Hybrid III 6-year-old child ATD, subpart N, and the Hybrid III 6-year-old weighted child ATD, subpart S,

i) holding the torso upright until it contacts the seat back of the restraint system, seat the ATD in the restraint system so that the mid-sagittal plane of its head is coincident with the SORL.

ii) lift the arms of the ATD as far as possible in the upward vertical direction.

iii) extend the legs of the ATD as far as possible in the forward horizontal direction, with its feet perpendicular to the centreline of the lower legs.

iv) using a flat square surface with an area of 2580 mm^2, apply a force of 178 N perpendicular to the plane of the seat back of the standard seat assembly, first against the crotch of the ATD and then in the mid-sagittal plane against its thorax.

v) attach all appropriate belts and harnesses on the restraint system around the ATD and tighten them as specified in subsection 4.5.3.

vi) tighten the tether strap, if the restraint system is equipped with a tether strap and the manufacturer recommends its use, to a tension of not less than 53.5 N and not more than 67 N, as measured by a force gauge used on the webbing.

vii) position each movable surface in accordance with the instructions referred to in section 220 of the RSSR.

viii) rotate each limb of the ATD downward in a plane parallel to its mid-sagittal plane until the limb contacts a surface of the restraint system or a surface of the standard seat assembly. Position the limbs so that they will not inhibit the movement of the torso or head during the test and,

A) in the case of a rear-facing restraint system for children whose mass is 16 kg or less, if the lower limbs of the ATD contact the seat back of the standard seat assembly, remove the lower limbs at the knees;

B) in the case of a rear-facing restraint system for children whose mass is 30 kg or less, if the lower limbs of the ATD contact the seat back of the standard seat assembly, remove the lower limbs at the knees and secure each limb on either side of the upper legs of the ATD.

4.5.3 If the restraint system is equipped with belts to restrain the upper or lower torso of the ATD, they must be adjusted by tightening the belts until a 9 N force applied using a webbing tension pull device (as illustrated in Figure 3) to the webbing at the top of each shoulder and

to the pelvic webbing 50 mm on either side of the mid-sagittal plane of the torso pulls the webbing a distance of 7 mm away from the ATD.

4.6 Test Procedure

Accelerate the test platform in accordance with the requirements of subsection 4.2.

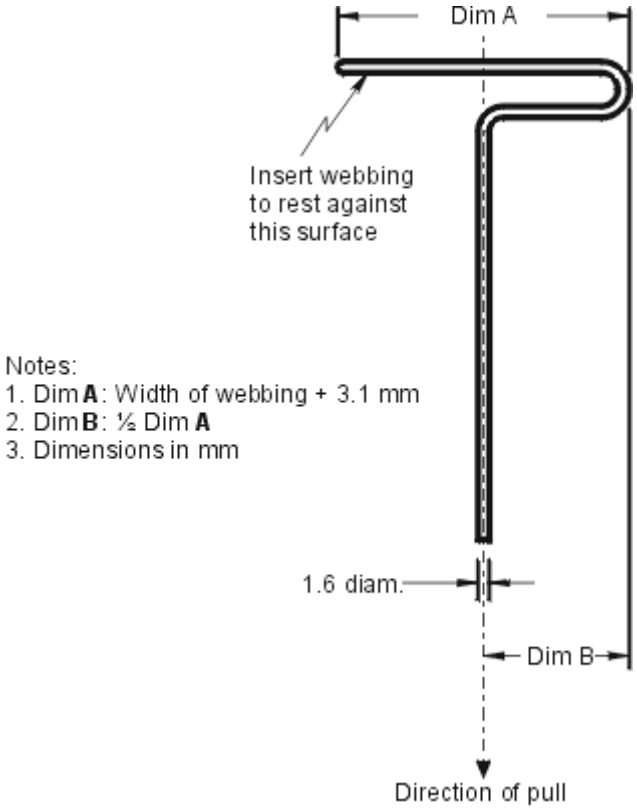


Figure 3 — Webbing Tension Pull Device

5. Buckle Release Test

5.1 The release force of each buckle is to be tested after each dynamic test conducted with the heaviest ATD specified in subsection 2.4 for use in testing that restraint. The ATD must be retained in the restraint system and both forward- and rear-facing restraint systems installed in a forward-facing direction.

5.2 The buckle release force is to be tested as follows:

a) Tie a self-adjusting sling to the wrists and ankles of the ATD, as illustrated in Figure 4.

b) While applying a pullout force of 9 N to the buckle assembly in a direction that will produce maximum releasing effect, pull the sling horizontally and parallel to the SORL with a force of 90 N for a restraint system tested with the CRABI 12-month-old infant ATD, subpart R; 200 N for a restraint system tested with the Hybrid III 3-year-old child ATD, subpart P; 270 N for a restraint system tested with the Hybrid III 6-year-old child ATD, subpart N; or 350 N for a restraint system tested with the Hybrid III 6-year-old weighted child ATD, subpart S.

Note: If the restraint system is equipped with a T-shield, a force equivalent to its mass shall be added to the pullout force. Any shield, if present, may be adjusted to facilitate application of the pullout force, provided that the harness tension is not significantly affected.

c) Apply a release force as per subsection 3.4 or 3.5, as applicable.

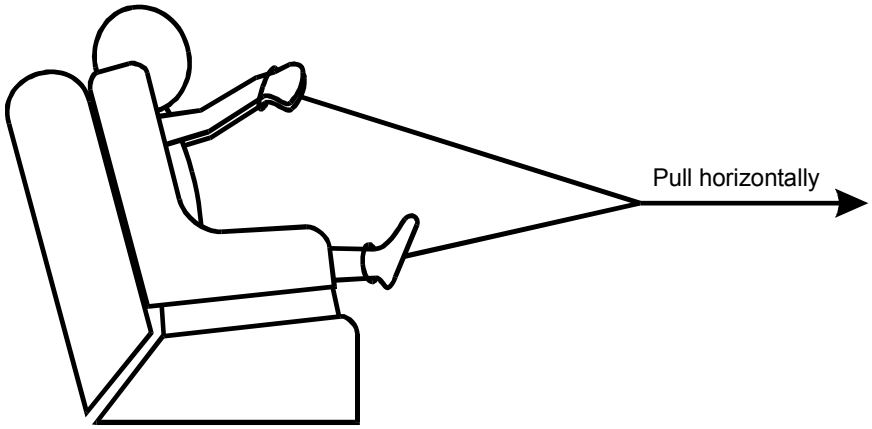


Figure 4 — Self-Adjusting Sling for the Buckle Release Test

6. Energy Absorbing Material Test

Prepare and test specimens of energy absorbing material in accordance with the applicable 25 % compression-deflection test described in one of the following ASTM International Standards:

a) *Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber*, Designation No. D1056-00;

b) *Standard Specification for Flexible Cellular Materials—Vinyl Chloride Polymers and Copolymers (Open-Cell Foam)*, Designation No. D1565-81 (Reapproved 1990); or

c) *Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams*, Designation No. D3574-08.

7. Inversion Test

7.1 Each child restraint system shall be tested in accordance with subsections 7.2 to 7.6 when adjusted in any seat back angle adjustment position and restraint belt routing position.

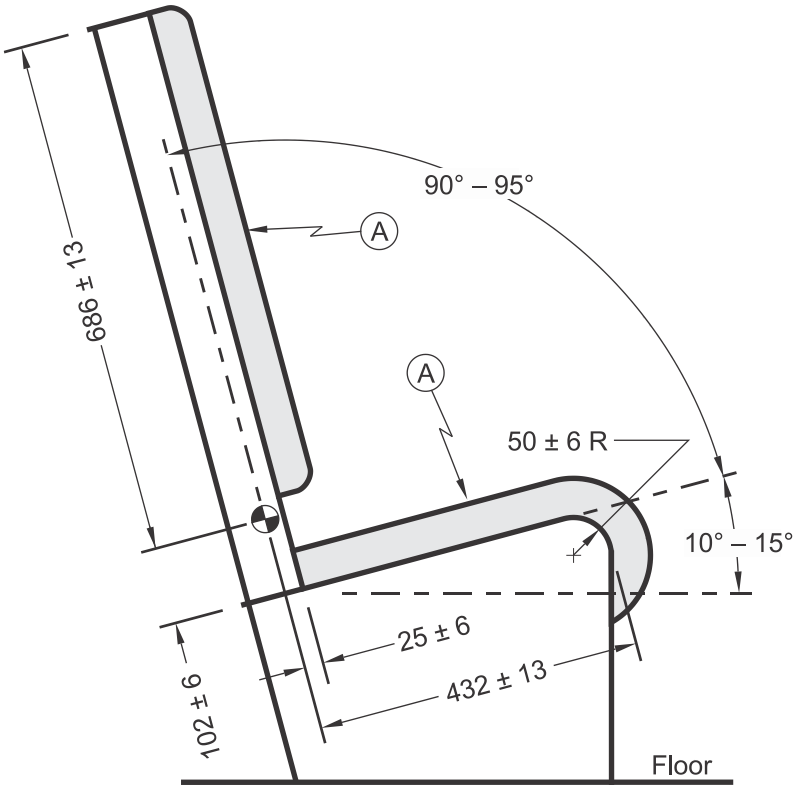
7.2 A representative aircraft passenger seat shall be positioned and adjusted so that its horizontal and vertical orientation and its seat back angle are as shown in Figure 5.

7.3 The child restraint system shall be attached in accordance with the manufacturer's instructions to the representative aircraft passenger seat using, at the manufacturer's option, any aircraft safety belt approved by the U.S. Federal Aviation Administration or by Transport Canada's Director, Aircraft Certification. No supplementary anchorage belts or tether straps may be attached; however, safety belt extensions approved by the U.S. Federal Aviation Administration or by Transport Canada's Director, Aircraft Certification, may be used.

7.4 In accordance with the requirements of subsection 4.4.2, place and restrain the ATD specified in subsection 2.4 in the child restraint system.

7.5 The combination of representative aircraft passenger seat, child restraint system, and ATD shall be rotated forward around a horizontal axis that is contained in the median transverse vertical plane of the seating surface portion of the aircraft seat and is located 25 mm below the bottom of the seat frame, at a speed of 35° to 45° per second, to an angle of 180°. The rotation shall be stopped when it reaches that angle, and the seat shall be held in this position for three seconds. The specified rate of rotation shall be attained in not less than one-half second and not more than one second, and the rotating combination shall be brought to a stop in not less than one-half second and not more than one second.

7.6 Repeat the procedure set out in subsections 7.2 to 7.4. The combination of the representative aircraft passenger seat, child restraint system, and ATD shall be rotated sideways around a horizontal axis that is contained in the median longitudinal vertical plane of the seating surface portion of the aircraft seat and is located 25 mm below the bottom of the seat frame, at a speed of 35° to 45° per second, to an angle of 180°. The rotation shall be stopped when it reaches that angle, and the seat shall be held in this position for three seconds. The specified rate of rotation shall be attained in not less than one-half second and not more than one second, and the rotating combination shall be brought to a stop in not less than one-half second and not more than one second.



Notes:

1. Dimensions in mm
2. Not to scale
3. A represents a 50-mm to 76-mm thick polyurethane foam pad with a density of 24 kg/m³ to 32 kg/m³, over a 0.50-mm thick aluminum pan and covered by marine canvas of 400 g/m² to 480 g/m².
4. The sheet aluminum pan is 508 mm wide and supported on each side by a rigid structure.
5. The seat back is a rectangular frame covered with an aluminum sheet whose mass is between 6.3 kg and 6.8 kg with a centre of mass 330 mm to 406 mm above the seat pivot axis.
6. The mass moment of inertia of the seat back about the pivot axis is between 1.38 kg-m² and 1.55 kg-m².
7. The seat back is free to fold forward about the pivot, but a stop prevents rearward motion.
8. The passenger safety belt anchor points are spaced from 533 mm to 559 mm apart and are located along the seat pivot axis.

Figure 5 — Simulated Aircraft Passenger Seat