



Compatibility with ISOFIX Child Restraints and "Universal" Gabarit

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. The purpose of this test is to determine the suitability of each passenger seating position for accommodation of child restraints representing the UN R16 Universal Child Restraint Gabarit Test Fixture and the UN R16 ISOFIX Child Restraint Test Fixtures.

1.2 Applicability. Applies to all non-driver seating positions. All vehicle trim combinations and seating options should be considered for evaluation, (i.e., 4-way manual and 8-way power seat tracks, rear fixed seat back and slide seating). In some cases, seating positions with symmetrically opposite designs may be judged using the assessment of the symmetrically opposite seat, however, the design and key parameters such as foam density or hardness shall be shown to be symmetric.

1.3 Remarks.

1.3.1 This assessment should be completed with acceptable results prior to Certification Witness review, where applicable.

1.3.2 It is advantageous to obtain data from each vehicle seating configuration from a vehicle program to demonstrate fitment of the Child Restraint Fixtures (CRF) and Universal Gabarit to that vehicle. It remains the responsibility of the Validation Engineer or other GM responsible engineer to select a suitable vehicle and reconcile the various test conditions and considerations to accomplish this objective.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

UN R14 UN R16 Annex 17

2.2 GM Standards/Specifications.

GMW14831 GMW14832 GMW16710

2.3 Additional References.

- CG190
- CG1804 Subsystem Technical Specification (SSTS) for Seat Subsystems
- Owner's Manual

2.3.1 Location of standards.

- ASEAN NCAP Protocol <http://www.aseancap.org/our-test/2017-2020-protocols/>
- Australian NCAP Protocol <http://www.ancap.com.au/technical-protocols-and-policies>
- Euro NCAP COP Protocol <http://www.euroncap.com/en/for-engineers/protocols/child-occupant-protection/>
- Latin NCAP Protocol <http://www.latinncap.com/en/our-tests>

3 Resources

3.1 Facilities. Can be any test facility having test equipment described in 3.2 appropriate for the test(s) being conducted.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Gabarit Fixture. A belted fixture made to the dimensions described in UN R16 Annex 17 Appendix 1 and specifications shown in Figure A1 of Appendix A, identified as Gabarit, with a weight of 23 kg, evenly distributed. Fixture to be approved by the Certification Witness.

3.2.2 Child Restraint Fixture ISO/L1. ISOFIX left lateral facing Child Restraint Fixture made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A2 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.3 Child Restraint Fixture ISO/L2. ISOFIX right lateral facing CRF made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A2 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.4 Child Restraint Fixture ISO/R1. ISOFIX rearward facing infant CRF made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A3 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.5 Child Restraint Fixture ISO/R2. ISOFIX reduced-size rearward facing toddler CRF made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A4 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.6 Child Restraint Fixture ISO/R3. ISOFIX full-size rearward facing toddler CRF made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A5 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.7 Child Restraint Fixture ISO/F2. ISOFIX reduced height forward facing CRF made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A6 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.8 Child Restraint Fixture ISO/F2X. ISOFIX reduced-height forward facing CRF made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A7 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.9 Child Restraint Fixture ISO/F3. ISOFIX full-height forward facing CRF made to the dimensions described in UN R16 Annex 17 Appendix 2 and specifications shown in Figure A8 of Appendix A. Fixtures to be approved by the Certification Witness.

3.2.10 Child Restraint Fixture ISO/B2. ISOFIX child booster seat reduced width 440 mm belted CRF made to the dimensions described in UN R16 Annex 17 Appendix 5 and specifications shown in Figure A9 of Appendix A. Fixtures to be approved by the Certification Witness. The fixture shall be constructed with a mass of (7 ± 0.2) kg.

3.2.11 Child Restraint Fixture ISO/B3. ISOFIX child booster seat full width 520 mm belted CRF made to the dimensions described in UN R16 Annex 17 Appendix 5 and specifications shown in Figure A10 of Appendix A. Fixtures to be approved by the Certification Witness. The fixture shall be constructed with a mass of (7 ± 0.2) kg.

3.2.12 Force Gauge. Force gauge shall be capable of 200 N.

3.2.13 Digital Inclinator.

3.3 Test Vehicle/Test Piece. A vehicle or vehicle buck with seats and safety belts representative of the design.

3.4 Test Time.

Calendar time: (1 to 2) days

Test time: 1 day

Coordination time: (8 to 12) h

3.5 Test Required Information. The nominal design riding position of the seat back will be required to conduct the tests outlined in this procedure.

3.6 Personnel/Skills. Following are the required personnel to perform the testing in this standard: Test Lab Technician, Test Lab Engineer, GM responsible Subsystem Validation Engineer, as applicable.

4 Procedure

4.1 Preparation.

4.1.1 Vehicle or seating buck to be at room temperature (ambient) prior to testing.

4.1.2 Responsible Design Engineer to approve vehicle content including seats and belts before testing.

4.1.3 Seat Setup.

4.1.3.1 Seat Being Assessed. Where applicable, adjust the seat to its rearmost longitudinal position, lowermost height adjuster position, design position of the seat back, head restraint to its lowermost and rearmost position, and all other adjustments for comfort to the off position or non-use position (i.e., lumbar, bolster support, cushion length adjuster). In the absence of any specification, an angle of 25 degrees from the vertical, or the nearest fixed position of the seat back should be used. Record the seat position on the appropriate Data Sheet (Data Sheet B1 or Data Sheet B2) of Appendix B.

4.1.3.2 Seat Immediately in Front of Seat Being Assessed (ISOFIX Child Restraint Fixture Assessment Only). If the assessment is performed on a rear seat in a vehicle, the seat located immediately in front of the position being assessed may be moved to mid longitudinal position, and, if applicable, lowermost position. Use the GMW16710 (H-Point Measurement) test procedure to set the seat back recline to the position that results in a torso angle of no < 15 degrees.

4.1.3.3 Simultaneous i-Size Position. If there is more than one i-Size position per row, the adjacent seating positions to the seat being evaluated shall be occupied by an ISOFIX fixture during the assessment (e.g., ISO/F2 or ISO/R2).

4.2 Conditions.

4.2.1 Environmental Conditions. Testing is to be done at ambient temperature.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc. Per the UN R16 Annex 17 Appendix 1 and 2. Additionally, for Appendix 1: GMW14831 paragraph 3.7.3.5.23 and GMW14832 paragraph 3.1.4.1.2.

4.3 Instructions. Appendix 1 UN R16 Gabarit Fixture Assessment.

4.3.1 Prepare Equipment. Use the fixture (Gabarit) from as described on 3.2.1.

4.3.2 Seat Adjustment. Confirm the seating positions are set according to 4.1.3.

4.3.3 Set the shoulder anchorage (Adjustable Guide Loop (AGL)) to the lowest position.

4.3.4 Place a (SAE approved) cotton cloth on the seat back and cushion if needed.

4.3.5 Place the fixture (as described in Figure A1 of Appendix A) on the vehicle seat.

4.3.6 If the seating position is intended to accommodate a forward facing or rearward facing universal restraint system, proceed according to 4.3.6.1, 4.3.7, 4.3.8, 4.3.9 and 4.3.10. If the seating position is intended to accommodate only a forward facing universal restraint system, proceed according to 4.3.6.2, 4.3.7, 4.3.8, 4.3.9, and 4.3.10.

4.3.6.1 Arrange the seat belt strap around the fixture in approximately the correct position as shown in Figure C1 and Figure C3 of Appendix C, then latch the buckle.

4.3.6.2 Arrange the seat belt lap strap approximately in the correct positions around the lower part of the fixture of 150 mm radius as shown in Figure C3 of Appendix C, then latch the buckle.

4.3.7 Ensure that the fixture is located with its centerline on the apparent centerline of the seating position ± 25.0 mm, with its centerline parallel with the centerline of the vehicle.

4.3.8 Ensure that all webbing slack is removed. Use sufficient force to remove the slack (45 N as a guideline), however, do not attempt to tension the webbing.

4.3.9 Push rearwards on the center of the front of the fixture with a force of (100 ± 10) N, applied parallel to the lower surface, and remove the force.

4.3.10 Push vertically downwards on the center of the upper surface of the fixture with a force of (100 ± 10) N, and remove the force.

4.3.11 The base of the fixture shall contact both the forward and rearward parts of the seat cushion surface. If such contact does not occur due to the belt access gap in the test fixture, this gap may be covered in-line with the bottom surface of the test fixture.

Note: The Gabarit fixture shall be placed flush on the seat bottom cushion surface. There shall be no interference between the Gabarit fixture and the rear of the cushion, seat back, or other resulting in a gap. An example of improper setting is shown in Figure C2 of Appendix C.

4.3.12 The lap portion of the belt shall touch the fixture on both sides at the rear of the lap belt path (see Figure C4 of Appendix C). The seat belt webbing shall always cover the points BP on the left and right ends of the curved edge; the exact position of point BP on the curved edge is indicated in detail W of Figure C5 of Appendix C. There shall be sufficient webbing below the curved edge per the engineering requirement. Confirm the requirement with the GM Seat Belt BFO. Record the length of webbing below the curved edge on the left side, length of the webbing below the curved edge on the right side, and the length of webbing below the BP line on Data Sheet B2 in Appendix B.

4.3.13 Should the requirements not be met after the procedure defined in 4.3.1 thru 4.3.12 with the adjustments indicated in 4.1.3, the seat, seat back and seat belt anchorages for the position being evaluated may be adjusted to an alternative position. This alternative position shall be communicated by the Design Release Engineer (DRE) and Subsystem Validation Engineer (SVE), which shall be intended for normal use. The installation procedure defined in 4.3.1 thru 4.3.12 shall be repeated at this alternative position and the requirements again verified and met. For rear row evaluations, the seat and seat back in front of the position being evaluated, may be adjusted to an alternative position communicated by the DRE and SVE at which the installation procedure defined in 4.3.1 thru 4.3.12 shall be repeated and the requirements again verified and met. These alternative positions shall be included as information in Appendix B, Table B1. Seat belt responsible engineer to update the vehicle Owner's Manual with instructions to position seat for child seat install.

4.3.14 If it is not possible to get the required amount of webbing around the fixture for a rear facing child seat this must be documented in Table B1 of Appendix B.

4.3.15 With the seat belt webbing routed around the front of the fixture, measure remaining Webbing On Spool (WOS). Mark webbing with chalk or cleanable marker at the opening of web guide or plastic trim. Pull all remaining webbing off spool and hold. Measure from opening of web guide or plastic trim to the chalk line. It may require measuring three (3) or more times to obtain an average webbing length on spool. Record remaining webbing (WOS) on Data Sheet B1 in Appendix B. Refer to most recent regional NCAP protocol.

4.3.16 Photograph documenting the belt routing. Take overall side view photo of each side of Gabarit including close up view of the webbing contact at the curved edge. Take additional photos if Gabarit makes contact with console, IP or other interior adjacent parts. Include photos in test report.

4.4 Instructions. Appendix 2 UN R16 ISOFIX Non-Belted CRF Assessments.

4.4.1 Prepare Equipment. Use the appropriate fixtures as described in 3.2.1 thru 3.2.9 that will be used for the assessment according to the Child Restraint Systems Installation Suitability Matrix.

4.4.2 Seat Adjustment. Confirm the seating positions are set according to 4.1.3. If so equipped, open the latch covers so that the lower latches are accessible.

4.4.3 Cotton Cloth. Place a (SAE approved) cotton cloth on the seat back and cushion if needed.

4.4.4 ISOFIX CRF Installation.

4.4.4.1 Place the CRF on the seat to be assessed located with its centerline ± 25.0 mm from the apparent centerline of the seating position and parallel with the centerline of the vehicle.

4.4.4.2 With the CRF ISOFIX attachment in its most extended position and locked, if equipped with a locking feature, push rearwards on the center of the front of the fixture with a force of (100 ± 10) N, applied parallel to the lower surface, and remove the force. Ensure the ISOFIX is secure to the lower latch.

4.4.4.3 Attach the CRF to the ISOFIX anchorage system and ensure that the ISOFIX extension legs, if equipped with a locking feature, are locked.

4.4.4.4 Push vertically downwards on the center of the upper surface of the fixture with a force of (100 ± 10) N, and remove the force.

4.4.4.5 Confirm the condition between the CRF and the rest of the vehicle interior. If there is no interference record this in Data Sheet B2 of Appendix B. If interference exists, the ISOFIX attachment legs may be adjusted to accommodate the CRF fixture. Either by manually adjusting, or unlocked, if equipped with a locking feature, repeat 4.4.4.2 thru 4.4.4.5. Record the amount of adjustment made to the attachment legs in Data Sheet B2 of Appendix B. If no adjustment is necessary, record a zero.

4.4.5 Measure and record the CRF pitch angle in Data Sheet B2 of Appendix B. Unless otherwise specified by the CG1804 seat Subsystem Technical Specification (SSTS) (The supplier shall work with the GM Design

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Responsible Engineer to comprehend this requirement), the CRF base shall have a pitch angle of (15 ± 10) degrees above the horizontal plane passing through the ISOFIX anchorage system.

4.4.6 Record if the tether anchorage remains accessible.

4.4.7 Repeat 4.4.4 thru 4.4.6 for each applicable unbelted CRF according to Data Sheet B2 of Appendix B.

4.4.8 Repeat 4.4.4 thru 4.4.7 with the i-Size support leg installed. If it is available, math data may be used to show compliance with this assessment.

4.4.9 Should the requirements not be met after the procedure defined in 4.4.1 thru 4.4.8 with the adjustments indicated in 4.4.2, the seat, seat back and seat belt anchorages for the position being evaluated may be adjusted to an alternative position. This alternative position shall be communicated by the Design Release Engineer (DRE) and Subsystem Validation Engineer (SVE), which shall be intended for normal use. The installation procedure defined in 4.4.1 thru 4.4.8 shall be repeated at this alternative position and the requirements again verified and met. For rear row evaluations, the seat and seat back in front of the position being evaluated, may be adjusted to an alternative position communicated by the DRE and SVE at which the installation procedure defined in 4.4.1 thru 4.4.8 shall be repeated and the requirements again verified and met. These alternative positions shall be included as information in Appendix B, Table B1. Seat responsible engineer to update the vehicle Owner's Manual with instructions to position seat for child seat install.

4.5 Instructions. Appendix 2 UN R16 ISOFIX Belted CRF Assessments (ISO/B2 and ISO/B3).

4.5.1 Prepare Equipment. Use the appropriate fixtures as described in 3.3.10 thru 3.3.11 that will be used for the assessment according to the Child Restraint Systems Installation Suitability Matrix. Remove the ISOFIX attachments from the CRF, or fully retract them. Set the CRF back to its 90 degree position.

4.5.2 Seat Adjustment. Confirm the seating positions are set according to 4.1.3.

4.5.3 Set the shoulder anchorage (Adjustable Guide Loop (AGL)) to the lowest position.

4.5.4 Cotton Cloth. Place a (SAE approved) cotton cloth on the seat back and cushion if needed.

4.5.4 ISOFIX CRF Installation.

4.5.4.1 Place the CRF on the seat to be assessed. The top of the fixture may touch the vehicle roof and compression of the seat cushion is allowed to move the fixture into position.

4.5.4.2 Arrange the seat belt through the CRF in approximately the correct position, and fasten the buckle.

4.5.4.3 Place the CRF on the seat to be assessed located with its centerline ± 25.0 mm from the apparent centerline of the seating position and parallel with the centerline of the vehicle.

4.5.4.4 Ensure that all webbing slack is removed. Use sufficient force to remove the slack (45 N as a guideline), do not attempt to tension the webbing.

4.5.4.5 Push rearwards on the center of the front of the fixture with a force of (100 ± 10) N, applied parallel to the lower surface, and remove the force.

4.5.4.6 Push vertically downwards on the center of the upper surface of the fixture with a force of (100 ± 10) N, and remove the force.

4.5.4.7 Record if it is possible to secure the fixture in the seating position using the 3-point seat belt and to buckle the seat belt in Data Sheet B3 of Appendix B. If it is not possible, the CRF back angle may be adjusted rearward to a maximum of 110 degrees. Adjust the back angle incrementally and repeat the procedure from 4.5.4.1 thru 4.5.4.7. Record the amount of adjustment necessary.

4.5.5 The base of the fixture shall contact the seat cushion and the back face of the CRF shall contact the seat back or head restraint as shown in Figure C6 of Appendix C. If it is not possible, the CRF back angle may be adjusted rearward to a maximum of 110 degrees. Adjust the back angle incrementally and repeat the procedure from 4.5.4.1 thru 4.5.4.7. Record the amount of adjustment necessary.

Note: Full contact of the CRF with the seat is not necessary. Gaps are permitted as shown in Figure C6 of Appendix C.

4.5.6 Measure and record the roll angle of the CRF in Data Sheet B3 of Appendix B. Unless otherwise specified in the CG1804 SSTs (The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement), the CRF base shall have a pitch angle of (0 ± 5) degrees above the horizontal plane.

4.5.7 Should the requirements not be met after the procedure defined in 4.5.1 thru 4.5.6 with the adjustments indicated in 4.5.2, the seat, seat back and seat belt anchorages for the position being evaluated may be adjusted to an alternative position. This alternative position shall be communicated by the DRE and SVE, which shall be

intended for normal use. The installation procedure defined in 4.5.1 thru 4.5.6 shall be repeated at this alternative position and the requirements again verified and met. For rear row evaluations, the seat and seat back in front of the position being evaluated, may be adjusted to an alternative position communicated by the DRE and SVE at which the installation procedure defined in 4.5.1 thru 4.5.6 shall be repeated and the requirements again verified and met. These alternative positions shall be included as information in Appendix B, Table B1. Seat responsible engineer to update the vehicle Owner's Manual with instructions to position seat for child seat install.

4.3.8 With the seat belt webbing routed around the front of the fixture, measure the amount of remaining Webbing on the Spool (WOS). Mark the webbing with chalk or cleanable marker at the opening of web guide or plastic trim. Pull all remaining webbing off the spool and hold. Measure from opening of web guide or plastic trim to the chalk line. It may require measuring three (3) or more times to obtain an average webbing length on spool. Record remaining webbing (WOS) on Data Sheet B3 in Appendix B.

4.3.9 Photograph documenting the belt routing. Take overall side view photo of each side of the CRF including close up view of the webbing contact. Take additional photos if the CRF makes contact with the console, IP or other interior adjacent parts. Include photos in the test report.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Assessing child seat attachment using seat belts.

5.2.1 If it is not possible to get more than (25.0 ± 2) mm of seat belt routing over the curved edge at the lap belt portion on the fixture a change to the seat belt buckle and/or seating surface must be considered. See Figure C4 of Appendix C.

5.2.2 If it is not possible to get a minimum of 10 mm of webbing below the curved edge on the fixture webbing opening a change to the seat belt buckle and/or seating surface must be considered. See Figure C3 of Appendix C.

5.3 Test Documentation.

Test Lab Technician, Test Lab Engineer, GM responsible Subsystem Validation Engineer to complete the appropriate data sheets in Appendix B and include results in GM Evaluation Report (form CG190) (The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement). Evaluation Report to include test result with photos to be loaded in the General Motors Global Document Management (GDM) System or similar GM document storage.

All non-compliant and unexpected results will require a PRTS to be written.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

7 Notes

7.1 Glossary.

i-Size Position: Position with two lower anchorages (latches), a top tether and sufficient volume for a support leg (installation volume as defined in UN R14), which allows the installation of the UN R16 fixtures F2X, R2, and B2, and is intended for installation of any i-Size (Integral Universal ISOFIX Child Restraint Systems) child restraint system.

ISOFIX: A system for the connection of child restraint systems to vehicles which has two vehicle rigid anchorages, two corresponding rigid attachments on the child restraint system, and a means to limit the pitch rotation of the child restraint system.

7.2 Acronyms, Abbreviations, and Symbols.

AGL	Adjustable Guide Loop
CRF	Child Restraint Fixture

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DRE	Design Release Engineer
GDM	Global Document Management
NOK	Not Okay
R	Radius
SSTS	Subsystem Technical Specification
SVE	Subsystem Validation Engineer
TYP	Typical
WOS	Webbing On Spool

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW17786

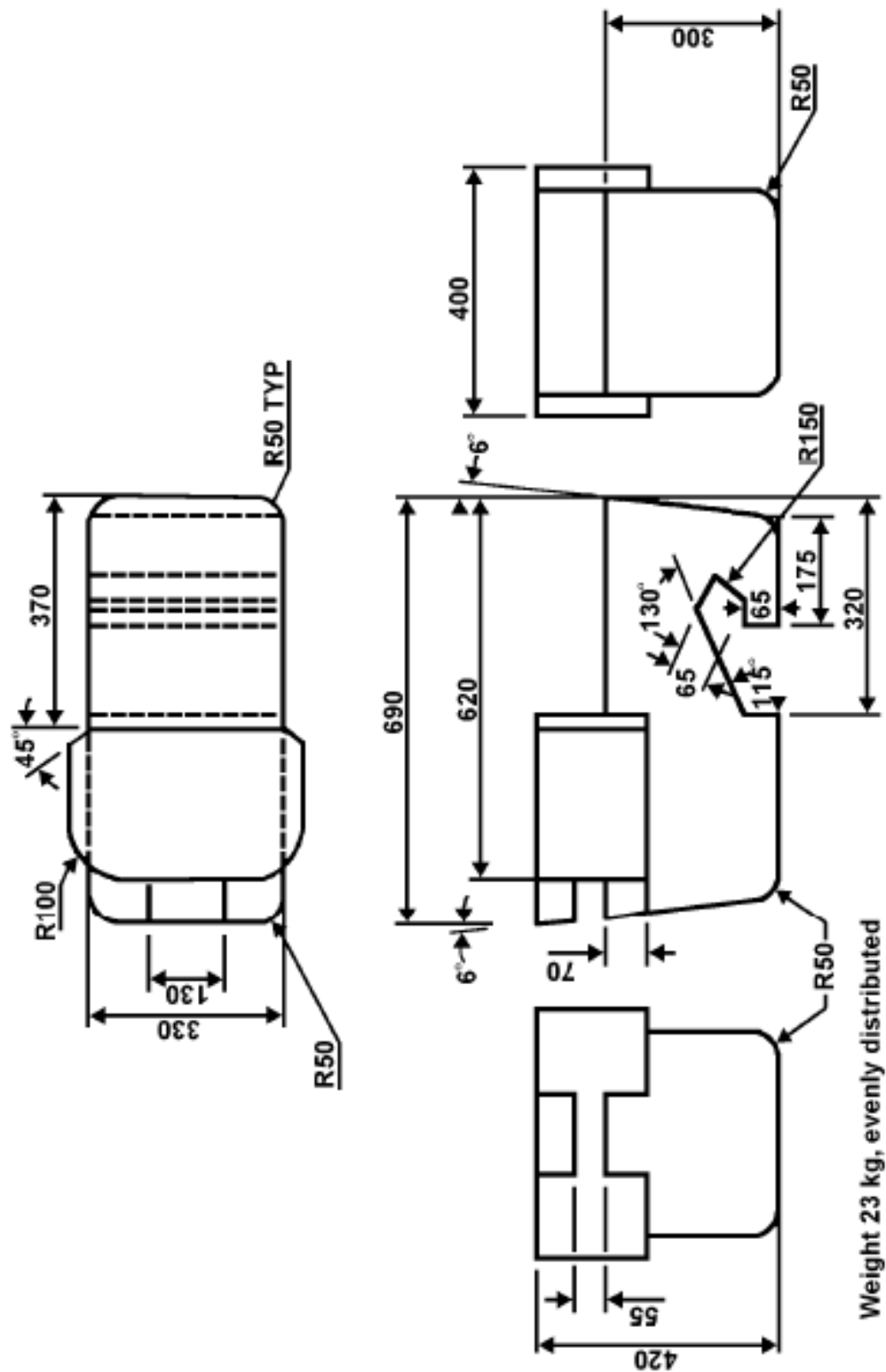
9 Release and Revisions

This standard was originated in February 2017. It was first approved by Interior - Seats in October 2017. It was first published in October 2017.

Issue	Publication Date	Description (Organization)
1	OCT 2017	Initial publication.

Appendix A: Child Restraint Fixture Specifications

Figure A1: Gabarit Fixture



R Radius; TYP Typical; Dimensions in mm

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Documents

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