



SURFACE VEHICLE INFORMATION REPORT

J3059™

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Superseding J3059 APR2017

Ambulance Patient Compartment Seated Occupant Excursion Zone Evaluation

RATIONALE

This SAE Information Report was developed by members of the SAE Truck Crashworthiness Committee in support of the ambulance industry's need to apply science to the design and testing of the occupant seating and occupant Restraint Systems for workers and civilians transported in the patient compartment of an ambulance. The Information Report was validated collaboratively by industry and government partners through extensive testing funded by the National Institute for Occupational Safety and Health, the Department of Homeland Security, and the Ambulance Manufacturers Division of the NTEA. Input loading was generated using the vehicle specific crash pulses described in SAE J2917 and SAE J2956, respectively. An independent analysis of the testing methodology and resulting data was performed by government and private members of the automotive testing community.

SAE J3059 has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

This SAE Information Report describes the testing and reporting procedures that may be used to evaluate and document the excursion of a worker or civilian when transported in a seated and restrained position in the patient compartment of a ground ambulance when exposed to a front, side, or rear impact. Its purpose is to provide seating and occupant restraint manufacturers, ambulance builders, and end-users with testing procedures and documentation methods needed to identify head travel paths in crash loading events. This is a component level test. The seating system is tested in free space to measure maximum head travel paths. The purpose is not to identify stay out zones. Rather, the goal is to provide ambulance manufacturers with the data needed to design safer and functionally sound workstations for Emergency Medical Service workers so that workers are better able to safely perform patient care tasks in a moving ambulance. Descriptions of the test set-up, test instrumentation, photographic/video coverage, text fixture, and reporting requirements are included.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-806-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J211-1	Instrumentation for Impact Test - Part 1 - Electronic Instrumentation
SAE J211-2	Instrumentation for Impact Test - Part 2: Photographic Instrumentation
SAE J2917	Occupant Restraint and Equipment Mounting Integrity - Frontal Impact Ambulance Patient Compartment

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SAE WEB ADDRESS:

Full document details: SAE J3059_202401

For more information on this standard, visit
https://www.sae.org/standards/content/J3059_202401/

Documents

Document Sharing Hub

- SAE J2956 Occupant Restraint and Equipment Mounting Integrity - Side Impact Ambulance Patient Compartment
- SAE J3026 Ambulance Patient Compartment Seating Integrity and Occupant Restraint
- SAE J3044 Occupant Restraint and Equipment Mounting Integrity - Rear Impact Ambulance Patient Compartment
- SAE Engineering Aid 23 "User's Manual for the 50th Percentile Hybrid III Test Dummy," June 1985

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

Ambulance Patient Compartment Human Factors Design Guidebook, released by the Department of Homeland Security, Science and Technology, First Responders Group, February 2015

Code of Federal Regulations, Title 49, Part 571.208

Code of Federal Regulations, Title 49, Part 571.213

Code of Federal Regulations, Title 49, Part 571.214

Code of Federal Regulations, Title 49, Part 572

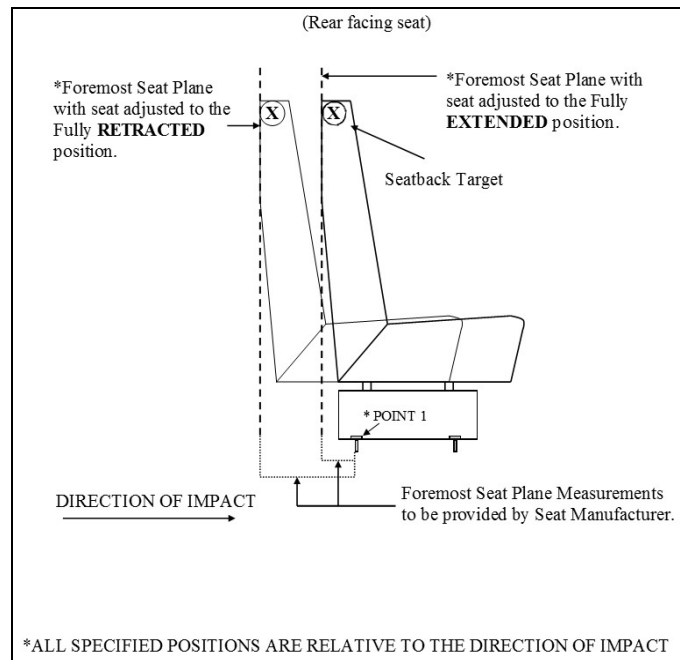
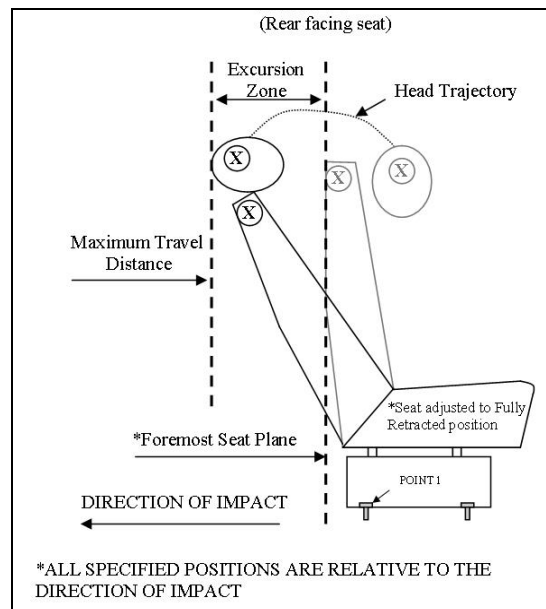
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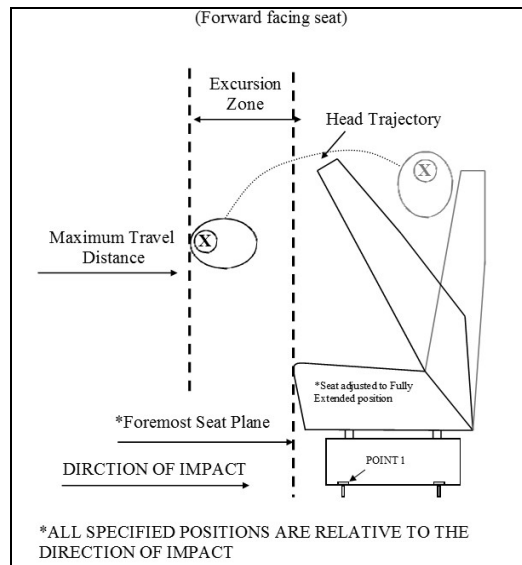
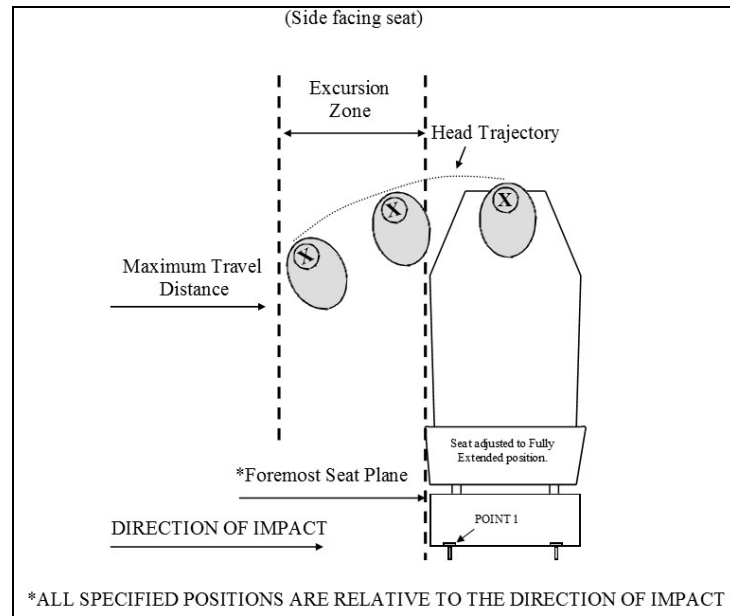
Code of Federal Regulations, Title 49, Part 571.207

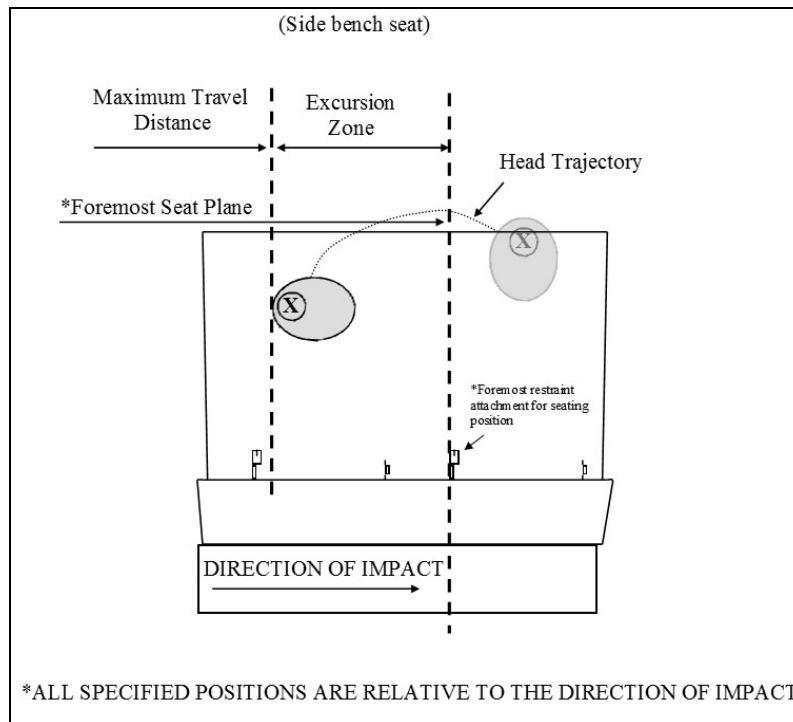
3. DEFINITIONS

- 3.1 "Designated Seating Position" as defined in 49 CFR 571.3 and 571.10, as applicable.
- 3.2 "Pedestal Seating System" means a Seating System that has Restraint Systems integrated into the seat's structure or attached to the seat's pedestal.
- 3.3 "Bench or Jump Seating System" means a Seating System that is built into, or integrated into, the patient compartment structure and may utilize portions of vehicle wall structure as the seat back. The Restraint Systems for these seats are attached to the vehicle wall or floor structure, seat base structure, or both, depending upon the Restraint System utilized.
- 3.4 "Anthropomorphic Test Device (ATD)" is a biofidelic test device which represents a variety of human forms and sizes including men, women, and children. For the purposes of this standard only 50th percentile male ATDs will be used, with a seated hip, to allow the ATD to be positioned properly on each Seating System. Specific details regarding these ATDs are provided in 49 CFR Part 572.
- 3.5 "Restraint System" means any strap, webbing, or similar device designed to secure a person in the patient compartment with the intention of mitigating the results of a collision, including all buckles and other fasteners and all hardware designed for installing the assembly in the ambulance patient compartment. The entirety of the Restraint System shall meet the definitions set forth as "Occupant Restraint System" in 49 CFR Part 571.209.
- 3.6 "Fracture" means to crack or tear.
- 3.7 "Seat Adjuster" as defined by Title 49 CFR Part 571.207 means the part of the seat that provides forward and rearward positioning of the seat bench and back, and/or rotation around a vertical axis, including any fixed portion, such as a seat track.
- 3.8 "Head Trajectory" means the path of travel which comprises respective positions of the head in time relative to a known starting point of a target placed on the ATD's head.

- 3.9 "Excursion Zone" means the volume of space created when measuring the Head Trajectory in the X, Y, and Z planes for a given Seating System in each orientation tested. Measured values are acquired as the head passes the "Foremost Seat Plane" and reaches the "Maximum Travel Distance" (see Figures 1 through 4). Sample Excursion Zone illustrations are provided in Appendix A.
- 3.10 "Installation Drawing" means documentation that sufficiently defines the Excursion Zones and other pertinent information for a given Seating System (see Appendix A for examples).
- 3.11 "Seatback Target" means a tracking target which is placed at the top of the seatback, on a vertical face of the seat, on the foremost portion of the seat with respect to the direction of impact (see Figure 1).
- 3.12 "Point 1" is the reference or datum location for all measurements that will define the Excursion Zone as noted in illustrations.
- 3.13 "Foremost Seat Plane" means the foremost adjustable plane, perpendicular to the direction of impact, regardless of the orientation of the Seating System (see Figures 1 through 4). If the Seating System has multiple Designated Seating Positions, such as a bench seat, then the Foremost Seat Plane will be based on the location of the foremost restraint attachment in the direction of impact for that Designated Seating Position being tested (see Figure 5). A measurement from the Foremost Seat Plane to Point 1 is to be provided by the manufacturer for each seating position and orientation.
- 3.14 "Maximum Travel Distance" means the furthest distance ANY point of the Seating System and/or ATD travels toward the direction of impact beyond the original Foremost Seat Plane (see Figures 2 through 5).
- 3.15 "Seating System" means any unique combination of a Bench, Jump, or Pedestal Seat, Restraint System, and Seat Adjuster which are used as a Designated Seating Position.
- 3.16 "Seat" means a structure that provides at least one Designated Seating Position comprising of a minimum of a seat bench and may also include a back.
- 3.17 A fully "Extended" seat means the seat has been adjusted as far as possible on the seat base in the direction that the seated occupant is facing.
- 3.18 A fully "Retracted" seat means the seat has been adjusted as far as possible on the seat base in the direction opposite that to which the seated occupant is facing.

**Figure 1****Figure 2**

**Figure 3****Figure 4**

**Figure 5**

4. REQUIREMENTS

Excursion zones shall be determined using the pulses specified in SAE J2917, SAE J2956, and SAE J3044.

- 4.1 An excursion zone calculation shall be developed for each seating system that includes all of the dimensions illustrated in accordance with the requirements described in Appendix A.
- 4.2 A head trajectory shall be determined for each Seating System based on measuring procedures outlined in SAE J211.
- 4.3 The maximum travel distance of the seatback target shall be calculated.

5. TEST CONDITIONS

The following conditions apply:

- 5.1 It is recommended that this test procedure be completed in conjunction with any other planned dynamic seat or occupant restraint testing.
- 5.2 The rigid sled test platform shall be in a horizontal plane.
- 5.3 Each seating system shall be tested in each of the following positions:
 - 5.3.1 A seating system facing the front of the vehicle shall be tested in the fully extended position using SAE J2917. This test generates the forward excursion zone data.
 - 5.3.2 A seating system facing the rear of the vehicle shall be tested in the fully retracted position using SAE J2917. This test generates the rear excursion zone data for the seat.