

	SURFACE VEHICLE RECOMMENDED PRACTICE		J972 OCT2009
		Issued 1966-11 Revised 2009-10	
		Superseding J972 MAY2000	
Moving Rigid Barrier Collision Tests			

RATIONALE

This document was revised to consider numerous changes in measurement technology and to reflect current industry practices.

FOREWORD

This SAE Recommended Practice is intended as a guide toward standard practice and is subject to change to keep pace with experience and technical advances such as video in place of movie film.

1. SCOPE

Collision tests are conducted on automotive vehicles to obtain information of value in evaluation of structural integrity and in reducing the risk of occupant injuries. The deformation resulting from a moving rigid barrier impact is more severe at a given speed than that produced by using an actual vehicle, but is more readily reproducible than that occurring during vehicle to vehicle impacts. The purpose of this SAE Recommended Practice is to establish sufficient standardization of such moving barriers and moving barrier collision methods so that results of tests conducted at different facilities may be compared.

2. REFERENCES

2.1 Applicable Publications

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

2.1.1 SAE Publication

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 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

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2.1.2 FMVSS Publication

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

FMVSS 301 Fuel System Integrity (49 CFR Part 571.301)

3. OBJECTIVES

The primary objective of this document is to define test procedures for impacts which will result in a simulation of forces and deformations experienced during a vehicle crash. Standardized procedures allow evaluation of vehicle structural loads and deflections, occupant loads and dynamics, photographic, video, and post-collision observations of pertinent areas or events which are useful in establishing design criteria.

4. CRASH TEST FACILITY

4.1 Test Site, General

The test site shall be of sufficient area to provide accommodations for the test vehicle, various photographic equipment, a protected observer area, and provisions for accelerating the moving barrier to the desired velocity.

4.1.1 The immediate crash site shall be level.

4.1.2 The approach road and the surface at the immediate crash site shall be paved or concrete.

4.1.3 Allowances for proper positioning of photographic equipment should be made.

4.1.4 Allowances should be made for post impact motion of both the test vehicle and the moving barrier.

4.1.5 Document guide rail and/or steering inputs and location and direction of application.

4.2 Approach

The type of approach required depends upon the technique employed to obtain the desired impact velocity of the moving barrier. A practical approach is level, straight, and of sufficient length to permit the moving barrier to be towed along a rail guidance system with the impacts occurring after the moving barrier is released from the tow force and released from guidance at the end of the rail.

4.3 Barrier

Two rigid impact faces are used: the flat face described in 4.3.2 for rear and side impact tests and the contoured face described in 4.3.3, generally used for school bus testing. These two faces are attachable to the front end of a common carriage as shown in Figure 1.

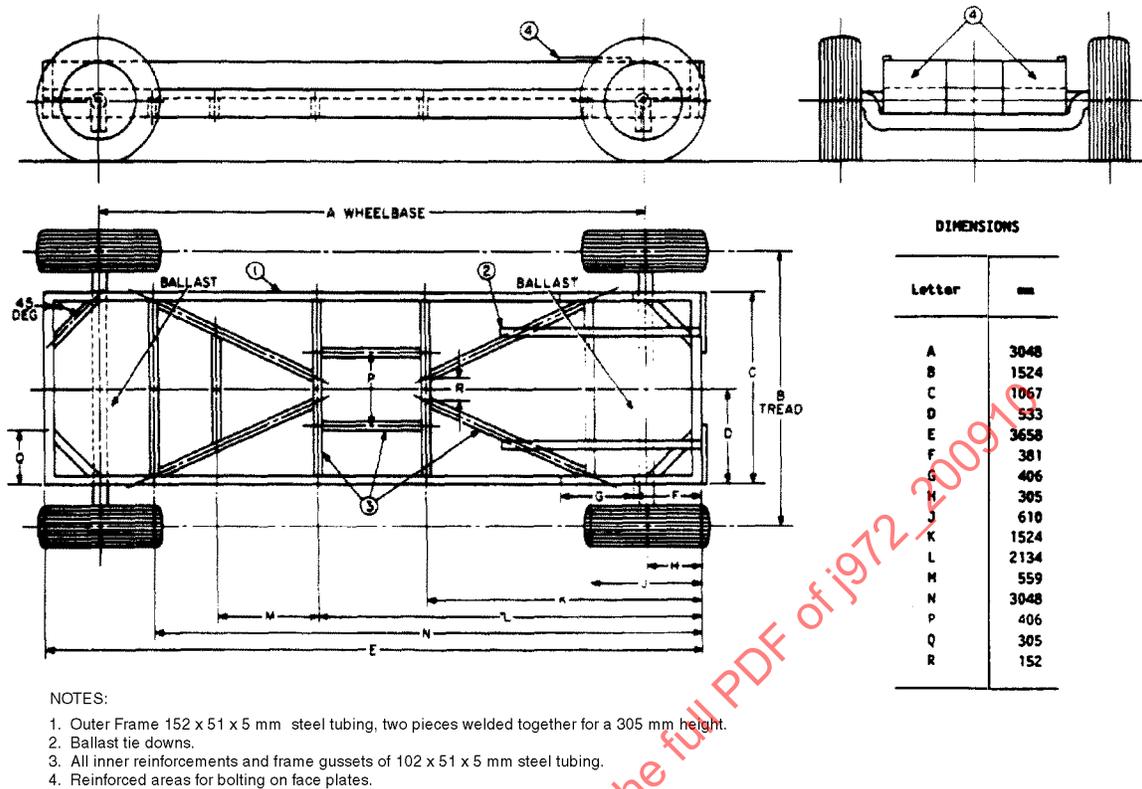


FIGURE 1 - COMMON CARRIAGE FOR RIGID MOVING BARRIERS

4.3.1 General

With either impact face attached to the common carriage, the moving barrier assembly shall have the following characteristics:

- 4.3.1.1 The moving barrier shall be of rigid construction, symmetrical about a longitudinal-vertical plane, with a solid nonsteerable front axle and fixed rear axle attached directly to the frame rails with no spring nor other type suspension system on any wheel.
- 4.3.1.2 The total mass shall be 1814 kg \pm 23 kg. The mass distribution shall be: front axle, 55% \pm 10%, and rear axle, 45% \pm 10% or 407 kg \pm 10 kg at each rear wheel and 500 kg \pm 10 kg at each front wheel.
- 4.3.1.3 It shall have a braking device capable of stopping it.
- 4.3.1.4 Track width of 1524 mm \pm 30 mm, front and rear axles.
- 4.3.1.5 Wheel base of 3048 mm \pm 50 mm.
- 4.3.1.6 Pneumatic tires on all wheels, P205-75 R15, or equivalent, inflated to 207 kPa.
- 4.3.1.7 The center of gravity shall be located at:

X = 1372 mm \pm 40 mm rearward of the front wheel axis
 Y = at the longitudinal-vertical plane of symmetry \pm 5 mm
 Z = 401 mm \pm 13 mm above ground

4.3.2 Rear and Side Impact Testing

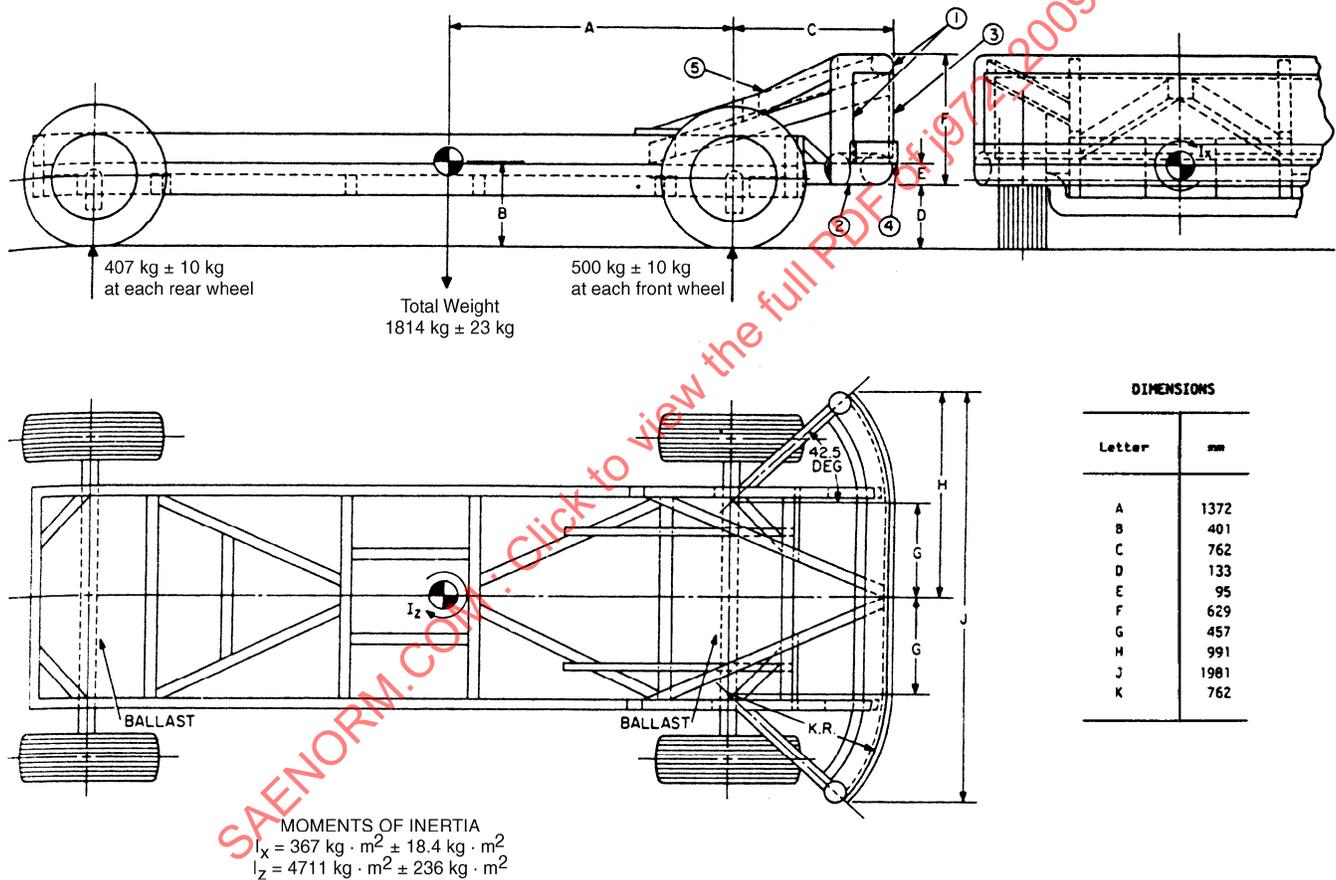
The impact face of the barrier is a vertical rigid flat rectangle 1524 mm high and 1981 mm wide with its lower edge horizontal and 127 mm \pm 13 mm from the ground. The impact face is covered with 19 mm thick plywood.

4.3.3 Contoured Moving Barrier Impact Testing

A contoured impact face 629 mm high and 1981 mm wide shall be attached to the carriage as shown in Figure 2. The impact face is not covered with plywood. Ground clearance to the lower edge of the impact surface shall be 133 mm \pm 13 mm. The contoured moving barrier assembly shall have a moment of inertia about the center of gravity as follows:

$$I_x = 367 \text{ kg} \cdot \text{m}^2 \pm 18.4 \text{ kg} \cdot \text{m}^2$$

$$I_z = 4711 \text{ kg} \cdot \text{m}^2 \pm 236 \text{ kg} \cdot \text{m}^2$$



NOTES:

1. Upper frame 102 mm Dia x 6 mm wall steel tubing (three sides).
2. Lower frame 152 mm Dia x 13 mm wall steel tubing.
3. Face Plate 19 mm thick cold rolled steel.
4. Leading edge 25 x 102 mm steel band, sharp edges broken.
5. All inner reinforcements 102 x 51 x 5 mm steel tubing.

FIGURE 2 - COMMON CARRIAGE WITH CONTOURED IMPACT SURFACE ATTACHED

5. METHODOLOGY

5.1 General

Even when simplified by using moving barriers, vehicle collisions are very complex and careful controls of impact parameters must be exercised. Paragraphs 5.1.1, 5.1.2, 5.1.3, 5.1.4, and 5.1.5 shall be followed for every moving barrier test, with the addition of those in 5.2 or 5.3 for the specific type of test under consideration.

- 5.1.1 The moving barrier shall impact the test vehicle while moving at essentially a constant velocity. The impact velocity chosen will depend upon the object of the test or the specific energy levels desired.
- 5.1.2 The moving barrier shall be braked within 5 ms following an initial separation from the impacted vehicle to preclude subsequent impacts.
- 5.1.3 The test vehicle shall be stationary with its parking brake off and the transmission in neutral.
- 5.1.4 All doors on the test vehicle shall be closed and locked.
- 5.1.5 Position of windows during test will be contingent on test objectives.

5.2 Rear Impact Tests

The flat impact face shall be used.

- 5.2.1 The longitudinal-vertical planes of the moving barrier shall be at a 0 degree \pm 3 degrees angle relative to the longitudinal-vertical planes of the test vehicle.
- 5.2.2 The longitudinal-vertical planes at the centerline of the test vehicle and the moving barrier shall be in line within \pm 75 mm at the time of initial impact.

5.3 Side Impact Test

Either the contoured or flat impact face may be used.

- 5.3.1 All standard side components and door system components which may affect the strength or rigidity of the vehicle shall be installed. Steering wheel and seats shall be installed and in mid-position if adjustable. After impacting one side of a vehicle, tests shall not be performed on the other side unless the frame, floor, and door opening remain essentially undistorted on that side.
- 5.3.2 The test shall be conducted with the moving barrier approaching from the left or right side of the stationary test vehicle. The longitudinal-vertical plane of the moving barrier shall be 90 degrees \pm 3 degrees relative to the longitudinal-vertical plane at the centerline of the test vehicle.
- 5.3.3 The longitudinal-vertical plane of the moving barrier and the impact point on the test vehicle shall be inline within \pm 30 mm at the time of impact.

6. INSTRUMENTATION AND EQUIPMENT

To obtain meaningful information from a moving barrier collision test, it is essential that adequate means be provided to observe and record the test results. Inasmuch as the objectives of any one impact test are limited, the instrumentation to be used will depend on the specific requirements of the test. The instrumentation systems should comply with SAE J211.

6.1 Vehicle Acceleration

Test vehicle accelerations may be measured by accelerometers located on the floor pan and/or the frame. Accelerometers may also be mounted on the moving barrier to record its acceleration during the test.