Technical Report Reprint

This report is scheduled to appear in the 1968 SAE Handbook.

Published November 1966

SOCIETY OF AUTOMOTIVE ENGINEERS, INC.,
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J972

MOVING BARRIER COLLISION TESTS - SAE J972

SAE Recommended Practice

Report of the Automotive Safety Committee approved November 1966.

1. SCOPE AND PURPOSE

Collision tests are conducted on automotive vehicles to obtain information of value in evaluating structural integrity and in reducing occupant injuries. Deceleration conditions during a moving barrier impact are more severe at a given speed than those produced by using a crushable vehicle but are more readily reproducible than those occurring during impacts of two vehicles. The purpose of this SAE Recommended Practice is to establish sufficient standardization of moving barriers and moving barrier collision methods so that results of tests conducted at different facilities may be compared.

2. OBJECTIVES

The primary objective of this recommended practice is to define test procedures for rear impact which will result in realistic simulation of forces experienced during a vehicle crash. Standardized procedure will allow proper evaluation of vehicle structural loads and deflections, occupant loads and dynamics, and photographic and post-collision observations of pertinent areas or events which may be useful in establishing design criteria.

3. CRASH TEST FACILITY

3.1 TEST SITE, GENERAL - The test site should encompass sufficient area to provide accommodations for the test vehicle, location of various photographic equipment, a protected observer area, and sufficient space for accelerating the moving barrier to a desired speed for impact.

3.1.1 The immediate crash site should be level.

3.1.2 The approach road and the surface at the impact site should be paved.

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

3.1.4 Allowances should be made for after-impact skidding of both the test vehicle and the moving barrier.

3.2 BARRIER APPROACH - The type approach required depends upon the technique employed to obtain desired impact velocity of the moving barrier into the test vehicle. Practical approaches include the following:

3.2.1 Suitable grade of sufficient slope and length for gravity to accelerate the moving barrier to the desired speed.

3.2.2 Level approach of sufficient length to permit the moving barrier to be driven or towed to impact speed under a remote or other guidance system.

3.3 BARRIER - A flat faced moving barrier suitable for impact testing should have the characteristics listed below and as illustrated in Fig. 1.

3.3.1 The barrier should be of very rigid construction.

3.3.2 Its total weight should be 4000 ± 50 lb.

3.3.3 The flat face of the barrier should be 2 ft 6 in. high, 8 ft wide, and have a 7 in. ground clearance ± 1 in. The face of the barrier should be covered with 3/4 in. plywood.

3.3.4 The chassis upon which the moving barrier is mounted shall have a remote or inertia controlled braking device capable of stopping it.

(Note: Moving barrier faces with shapes other than the wide flat surface are under investigation for use in simulating side impact and will be added as soon as they have been developed and evaluated.)

4. METHODOLOGY

4.1 Careful control of impact parameters must be exercised as vehicle collisions are very complex by nature, even with a simple moving barrier. As a standard evaluation procedure for rear impacts, an impact speed of 20 mph is recommended using the flat barrier. For rear impacts, the moving barrier should impact into the test vehicle so that their longitudinal axis are in line within ± 12 in.

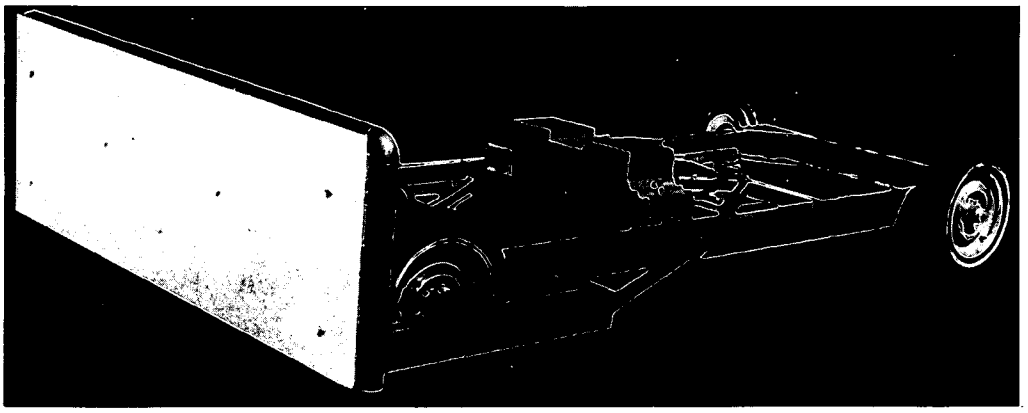
4.2 Requirements for acceptable photographic coverage include adequate lighting and a clear background, preferably of consistent texture and void of any moving objects.

4.3 The moving barrier should be braked following its first separation from the impacted vehicle.

4.4 Brakes on the test vehicle are normally set before the test.

5. INSTRUMENTATION AND EQUIPMENT

To obtain meaningful information from a barrier collision test, it is important that adequate means be provided to observe and record test results. Inasmuch as the objectives of any one impact are limited, the instrumentation to be used will need to be tailored to the specific requirements of the test. This section provides a guide to the type of instrumentation and equipment which can be employed to obtain desired data on the movements and loads experienced by the vehicle, its components, or occupants during a test impact.



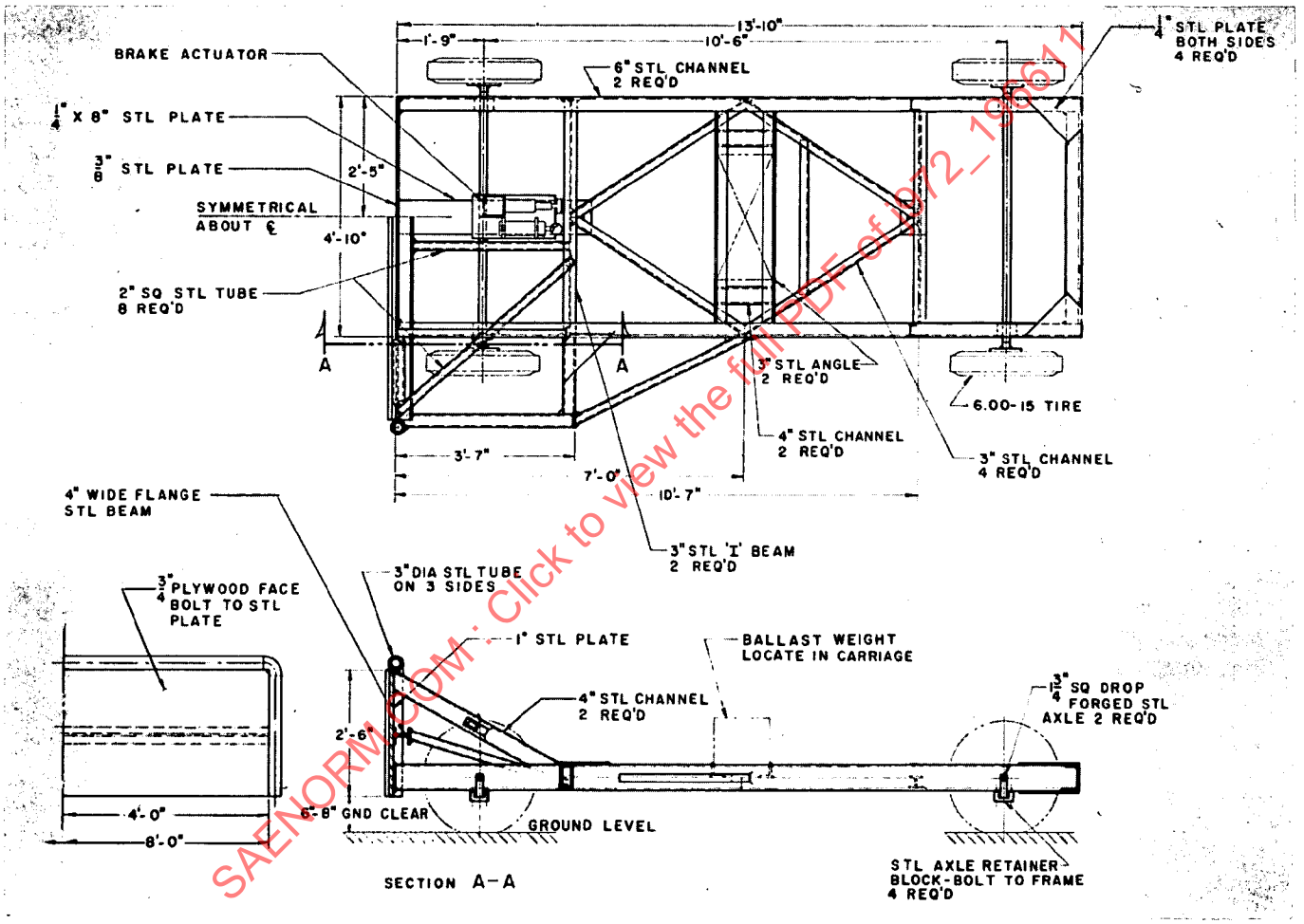


Fig. 1 - Flat faced moving barrier

5.1 VEHICLE ACCELERATIONS - Overall test vehicle accelerations may be measured by accelerometers located on the floor pan or frame.

5.2 PHOTOGRAPHIC INSTRUMENTATION - It is desirable to provide comprehensive photographic coverage of each barrier crash test. However, in cases where this is not possible, the following represent the recommended minimum coverage for meaningful information:

5.2.1 High Speed Cameras - A minimum of two high speed cameras (1000 frames/sec, are recommended.

5.2.1.1 At least one high speed camera should be located on the side of the crash site. Locating axis for precise positioning of photographic equipment should be provided. This camera shall be positioned so that the field of view is large enough to include both the test vehicle and the moving barrier in a path perpendicular to the moving barrier at the instant of barrier contact. The camera shall have provision for recording a timed pulse signal on the film and shall have a framing rate sufficient to facilitate accurate micromotion analysis of the film. Suitable calibration and position reference targets, both stationary and on the vehicle, should be provided. Information obtainable from this film through micromotion analysis includes total vehicle displacement, velocity, and deceleration.