



<b>SURFACE VEHICLE RECOMMENDED PRACTICE</b>	<b>J2420™</b>	<b>DEC2024</b>
	Issued	1998-01
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Superseding J2420 OCT2010		
COE Frontal Strength Evaluation - Dynamic Loading Heavy Trucks		

## RATIONALE

This revision adjusts the scope to include all heavy trucks with forward controls. Impact energy and test conditions are adjusted to more closely harmonize with ECE Regulation 29 test A.

### 1. SCOPE

This SAE Recommended Practice describes the test procedures for conducting dynamic frontal strength test for COE and other heavy trucks with forward controls. Its purpose is to establish recommended test procedures which will standardize the procedure for heavy trucks. Descriptions of the test setup, test instrumentation, photographic/video coverage, and the test fixtures 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: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://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 J1516 Accommodation Tool Reference Point for Class B Vehicles

##### 2.1.2 Code of Federal Regulations (CFR) Publications

Copies of these documents are available online at <https://www.ecfr.gov>.

49 CFR § 571.3 Definitions

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[https://www.sae.org/standards/content/J2420\\_202412/](https://www.sae.org/standards/content/J2420_202412/)

### 2.1.3 ECE Publications

Available from United Nations Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10, Switzerland, Tel: +41-0-22-917-12-34, [www.unece.org](http://www.unece.org).

ECE Regulation 29 Uniform Provisions Concerning the Approval of Vehicles with Regard to the Protection of the Occupants of the Cab of a Commercial Vehicle [2019/1850].

## 2.2 Related Publications

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

### 2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

SAE J826 Devices for Use in Defining and Measuring Vehicle Seating Accommodation

SAE CRP-009 Heavy Truck Crashworthiness (Statistical Analysis, Accident Reconstruction, Occupant Dynamics Simulation)

SAE CRP-013 Heavy Truck Crashworthiness - Phase III (Restraint System Test Procedure Development, Cab Interior Component Test Development, Cab Structural Test Procedure Development)

## 3. DEFINITIONS

### 3.1 PLATEN

A structurally stiff, flat plate.

### 3.2 CAB MOUNT

The component or components used to connect the cab to the chassis frame rails.

### 3.3 CAB OVER ENGINE (COE)

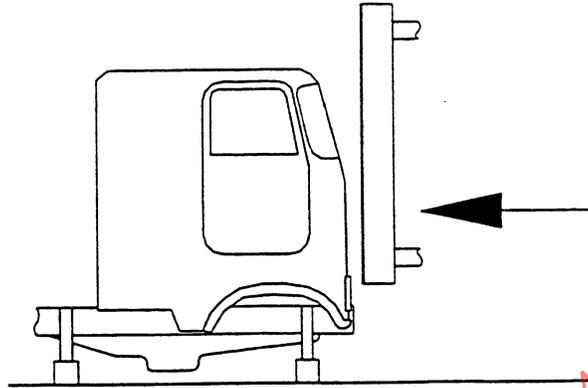
A vehicle where more than half of the engine length is rearward of the foremost point of the windshield base and the steering wheel hub is in the forward quarter of the vehicle length.

### 3.4 FORWARD CONTROL

A cab design where the driver's controls such as the steering column, accelerator pedal, and service brake pedal are positioned longitudinally forward of a vertical plane positioned through the centerline of the vehicle's front axle.

#### 4. TEST CONFIGURATION

The frontal strength test is designed to evaluate the resistance of a COE or other forward control heavy truck striking the rear of a heavy combination vehicle semi-trailer. The rear of the semi-trailer is simulated as a rigid surface. With the cab attached to the ground through its cab mounts, a platen is forced to longitudinally move into the cab with the inertia of the platen and the structure carrying it. This loading configuration is shown in Figure 1.



**Figure 1 - COE frontal strength test configuration**

##### 4.1 Cab Mounting

The cab shall be evaluated with its standard cab mounts. The cab mounts shall either be mounted to the vehicle's stock frame rails or to a simulated chassis that locates the cab mounts in their standard location and orientation. If testing is conducted using actual frame rails, the frame rails shall be rigidly attached to the ground. The forward attachment to the ground shall be not less than 15 cm (6 inches) rearward of any front bumper or cab mounting hardware. If a simulated chassis is used, it shall not deform during the test. Hardware used to attach the cab mounts to the simulated chassis shall be the same type and strength as the standard hardware used to attach the cab mounts to the standard chassis.

Cab mounts employing pneumatic ride control should be pressurized to produce the manufacturer's recommended ride height.

If the influence of the engine or other vehicle components are to be included in the evaluation, they must be attached to the frame rails or simulated chassis with the production intent mounting hardware. Space should be provided to allow for movement of large vehicle components without interference with the test fixture or simulated chassis.

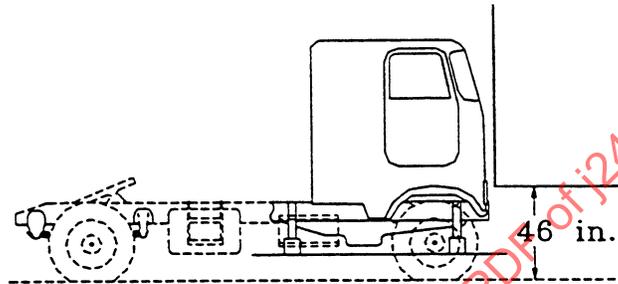
If the vehicle always includes a body or other structural member that will influence the cab's rearward longitudinal motion, the body or structure shall be included on the simulated chassis. If multiple bodies are used with the cab, the commonly used body section that provides the least longitudinal cab support should be used for testing. Care should be taken to ensure that only the structural members always on the vehicle provide the load path to ground. Test fixtures should not influence the motion of the vehicle's standard equipment.

Doors of the cab shall be fully closed but not locked prior to the test. The cab shall be equipped with the steering mechanism, steering wheel, and instrument panel as well as seats at front row designated seating positions, as defined in 49 CFR § 571.3. The steering wheel and each seating accommodation shall be adjusted to the mid position of their adjustment ranges. If any adjustment position does not exist at the mid position, use the closest adjustment position to the rear or below the midpoint.

## 4.2 Platen

A rigid platen simulates the rear of a heavy truck trailer. The height of the bottom of the platen is defined by the position on the cab that would first contact the lower structure of a trailer. For the vehicle at curb conditions, the position on the front of the cab 117 cm (46 inches) above the ground defines the height of the platen. This is shown in Figure 2. The platen should be tall and wide enough so that the entire front of the cab is engaged, up to a width of 259 cm (102 inches). The platen shall be made of steel, and its mass shall be evenly distributed. The face of the platen is to be covered with a 19-mm (3/4-inch) thick layer of plywood.

The combined weight of the platen and structure that carries it shall be 2268 to 6803.9 kg (5000 to 15000 pounds). Two recommended methods for supporting the platen are described in the following sections. The platen's center of gravity shall be in the vertical longitudinal plane of the vehicle's center of gravity. The platen shall strike the cab at the front, in the direction toward the rear of the cab. The direction of impact shall be horizontal and shall be parallel to the longitudinal axis of the vehicle.



**Figure 2 - Vertical position of platen contact**

## 4.3 Carriage Option

With this option, the platen is attached to the front of a carriage. The carriage is then towed to a target impact speed and released to roll into the cab. The platen shall be positioned far enough forward of the carriage structure so that there will be no interference between the over-ridden vehicle structure and the carriage. Ballast shall be added as necessary to the rear of the carriage to stabilize it and obtain the target mass.

## 4.4 Pendulum Option

With this option, the platen is attached to a pendulum. The pendulum is then pulled back to a height determined to obtain the target impact speed and released to swing into the cab. Ballast shall be added as necessary to the pendulum to reach the target mass. The pendulum should be positioned relative to the cab so that the platen is vertical at impact. The distance from the bottom of the platen to the pivot point should be at least 610 cm (20 feet) to ensure that there is relatively little vertical motion of the platen during the crush phase of the test. This will also ensure that the platen's orientation remains nearly vertical throughout the impact. A bifilar pendulum design may be used to constrain the platen in a vertical orientation.