

4.5.8 Procedure VII - Rail impact

4.5.8.1 Controls.

The Department of Defense (DoD) uses this test to determine the effect of normal railroad car impacts that occur during rail shipment, to verify the structural integrity of the materiel, and to evaluate the adequacy of the tiedown system and the tiedown process.

a. Test facility/equipment.

- (1) Buffer railcars. Empty cars are preferred for use as the buffer or struck cars. However, loaded cars may also be used with prior approval by the Director, Military Traffic Management Command Transportation Engineering Agency (MTMCTEA), ATTN: MTTE-DPE, 720 Thimble Shoals Blvd., Suite 130, Newport News, VA 23606-4537. (MTMCTEA is the designated DoD agent for land transportation (AR 70-44).) In either case, the total weight of the buffer cars is to be at least 113,400 kg (250,000 lbs). The first buffer car must be a standard draft gear car. The remaining buffer cars should have standard draft gear, if possible. The following are required to perform the rail impact test:
- (2) A test railcar, equipped with chain tiedowns and end-of-car cushioned draft gear, unless other railcar types are approved by MTMCTEA. Some materiel may require other types of railcars for testing to be representative of the intended shipping methods.

NOTE: Cushioned draft gear is a significant change from previous equipment requirements.

- (3) One locomotive.
 - (4) A minimum 61 m (200 ft) length of reasonably level, tangent track is required between the buffer cars and test car to allow acceleration of locomotive and test car to specified impact speeds.
 - (5) If the alternate procedure (see paragraph 4.5.8.3b) is used to conduct the test, use a tangent track with a slight grade in lieu of a locomotive.
- b. Preparation for test.

- (1) Load and secure the test item as would be done for actual rail transport. If safety or other reasons preclude the use of a test item representative of the actual materiel, use a substitute test item that is equal in weight and general character to the materiel. Obtain approval from MTMCTEA before a substitute test item is used.
- (2) The materiel developer is responsible for the development of transportation procedures and instructions and is responsible for coordinating these with, and obtaining approval from, MTMCTEA well in advance of rail impact testing. Mount the test item as would be done in actual service and in accordance with the standard loading methods shown in Section No. 6 of the Rules Governing the Loading of Department of Defense Materiel on Open Top Cars (procure copies from the Publications Department, Association of American Railroads, Transportation Technology Center, Inc., PO Box 79780, Baltimore MD 21279-0780, 877-999-8824 (toll free), email: pubs@aar.com). Do not use more than four tiedown provisions, typically two at each end of the test item. Apply the first tiedown from each provision as near as possible to, but without exceeding 45 degrees from, the horizontal (when viewed from the side). Apply additional tiedowns to the next available tiedown point on the flatcar. Apply chains to the railcar near side (do not cross chains across the flatcar). All tiedown procedures require approval by MTMCTEA prior to testing. Only

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use an arrangement of the test item and its tiedown to be tested that is identical to that proposed or approved by MTMCTEA.

- (3) Unless otherwise specified in the transportability requirements for the materiel, perform the test with the test item at its maximum gross weight (fully loaded) rating.

c. Test setup.

- (1) Buffer cars must have their air and hand brakes set. This provides a more conservative test. Cars must be bunched to compress all slack and cushioning in the couplings, if any. The struck end of first buffer car must have standard draft gear.
- (2) Locate the test car between the buffer cars and the locomotive.
- (3) Install one of the following timing devices (or equivalent) to obtain the impact speed of the test car.
 - (a) An electric timer capable of measuring within 0.16 km/h (± 0.1 mph): Place the switch contacts on the track in accordance with manufacturer's instructions.
 - (b) A stop watch and torpedoes: when used, measure the torpedo locations. Place the first torpedo beyond the face of the knuckle on the first buffer car and located one foot more than the distance between the leading axle and knuckle face on the test car. Place the second torpedo 6.7 m (22 ft) along the track from the first torpedo. The relationship of time lapse versus speed for travel of a distance of 6.7 m (22 ft) is shown in table 516.5-VIII.
 - (c) Radar: To obtain an accurate speed, position the operator of the radar in line with the direction of impact or as otherwise recommended by the radar manufacturer.
- (4) Photograph the test setup including any securement items. This may be a valuable tool if there is any subsequent failure of the items of securement.

4.5.8.2 Test tolerances.

Ensure test tolerances are in accordance with tolerances specified in paragraphs 4.5.8.1 and 4.5.8.3, and in the test plan.

4.5.8.3 Procedure VII.

a. General considerations for main procedure.

- (1) Brief the train crew on the procedure. Delegate one person to advise the appropriate member of the train crew when moves are to be made. Instruct all participants and observers to take precautions for their personal safety and observe safety practices of the carrier and/or company conducting the test. If desired, perform a test run without impacting the test item to establish accuracy of speed.
- (2) Subject the test item to four impacts, the first three of which are in the same direction and at speeds of 6.4, 9.7, and 13 km/h (4, 6, and 8 mph) respectively, with a tolerance of ± 0.8 km/h (± 0.5 mph) for the 6.4 and 9.7 km/h impacts, and $+0.8 - 0.0$ km/h ($+0.5 - 0$ mph) for the 13 km/h impacts.
- (3) Perform the fourth impact at 13 km/h ($+0.8 - 0.0$ km/h) and impact the opposite end of the test car from the first three impacts. If it is not possible to turn the test car because of track layout, this may be accomplished by running the test item car to the opposite end of the buffer cars and impacting as above.
- (4) If the lading or securement items loosen or fail during the test, photograph and document these items. If it appears necessary to adjust the lading or securement items to continue the test, correct the restraint and restart the test beginning with the 6.4 km/h (4 mph) impact.
- (5) Pull the rail car carrying the test item a sufficient distance from the buffer cars. Next, push the test load car toward the buffer cars until the desired speed is obtained, and release it so it rolls freely into the buffer cars having knuckles positioned for coupling.
- (6) If the materiel can be shipped in two orientations (such as lengthwise and crosswise on the rail car), repeat the four impacts for each orientation.

b. General considerations for alternate procedure.

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- (1) A section of track can be calibrated using a test car and either radar or another speed-measuring device. Release the test car from the designated starting point and allow it to roll freely down the inclined track. For radar, a crew member riding the test car is in radio contact with the radar operator who reads off the car speed to the rider. For other than radar, follow the same concept. The rider drops markers at track-side to indicate locations at which the desired speeds are obtained. After determining the 8 mph mark, stop the test car by use of the hand brake. Ensure no other cars are present on the test track during the calibration process. Repeat the process two times to ensure the accuracy of speed locations. If it is difficult for the rider to safely drop the markers and stop the car using the hand brake, use a free rolling locomotive for the initial calibration when markers are dropped with the locomotive's brakes applied after reaching 8 mph as indicated by radar. Then release the test car from the same starting point and make adjustments in markers if needed prior to impacting.
 - (2) After determining speed locations, perform impacts by locating the buffer cars at the proper location for desired impact speed and releasing the test car from the designated starting point. This requires moving the buffer cars every time a different speed is required.
 - (3) Use speeds and the direction of impacts as outlined in paragraph 4.5.8.3a.
 - (4) In lieu of positioning of the buffer cars at various positions on the track, release the test car from calibrated positions on the inclined track that correspond to the desired speeds.
 - (5) If the lading or securement items loosen or fail during the test, photograph and document these items. If it appears necessary to adjust the lading or securement items to continue the test, correct the restraint and restart the test beginning with the 6.4 km/h impact.
- c. Additional requirements.
- (1) Repeat any impacts that are below the required test speeds. If any readjustment of the lading or reconditioning of the bracing or items of securement is necessary, correct, photograph and document the problem(s), correct the restraint and restart the entire test beginning with the 6.4 km/h impact. Accept any impacts above the required test speed providing the test item satisfies the requirements of paragraph 4.5.8.4.
 - (2) If the tiedown chains or chock blocks become loose during the test, photograph and document the problem(s). The test director will notify MTMCTEA of the modifications required, and jointly decide if a retest will be required.

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TABLE 516.5-VIII. Impact test time speed (miles per hour - based on 22'0" rail).

TIME SPEED SECS. MPH	TIME SPEED SECS. MPH	TIME SPEED SECS. MPH	TIME SPEED SECS. MPH
1.0 - 15.0	4.0 - 3.8	7.0 - 2.1	10.0 - 1.5
1.1 - 13.6	4.1 - 3.7	7.1 - 2.1	10.1 - 1.5
1.2 - 12.5	4.2 - 3.6	7.2 - 2.1	10.2 - 1.5
1.3 - 11.5	4.3 - 3.5	7.3 - 2.0	10.3 - 1.5
1.4 - 10.7	4.4 - 3.4	7.4 - 2.0	10.4 - 1.4
1.5 - 10.0	4.5 - 3.3	7.5 - 2.0	10.5 - 1.4
1.6 - 9.4	4.6 - 3.3	7.6 - 2.0	10.6 - 1.4
1.7 - 8.8	4.7 - 3.2	7.7 - 1.9	10.7 - 1.4
1.8 - 8.3	4.8 - 3.1	7.8 - 1.9	10.8 - 1.4
1.9 - 7.9	4.9 - 3.1	7.9 - 1.9	10.9 - 1.4
2.0 - 7.5	5.0 - 3.0	8.0 - 1.9	11.0 - 1.4
2.1 - 7.1	5.1 - 2.9	8.1 - 1.9	11.1 - 1.4
2.2 - 6.8	5.2 - 2.9	8.2 - 1.8	11.2 - 1.3
2.3 - 6.5	5.3 - 2.8	8.3 - 1.8	11.3 - 1.3
2.4 - 6.3	5.4 - 2.8	8.4 - 1.8	11.4 - 1.3
2.5 - 6.0	5.5 - 2.7	8.5 - 1.8	11.5 - 1.3
2.6 - 5.8	5.6 - 2.7	8.6 - 1.7	11.6 - 1.3
2.7 - 5.6	5.7 - 2.6	8.7 - 1.7	11.7 - 1.3
2.8 - 5.4	5.8 - 2.6	8.8 - 1.7	11.8 - 1.3
2.9 - 5.2	5.9 - 2.5	8.9 - 1.7	11.9 - 1.3
3.0 - 5.0	6.0 - 2.5	9.0 - 1.7	12.0 - 1.3
3.1 - 4.8	6.1 - 2.5	9.1 - 1.6	12.1 - 1.2
3.2 - 4.7	6.2 - 2.4	9.2 - 1.6	12.2 - 1.2
3.3 - 4.5	6.3 - 2.4	9.3 - 1.6	12.3 - 1.2
3.4 - 4.4	6.4 - 2.3	9.4 - 1.6	12.4 - 1.2
3.5 - 4.3	6.5 - 2.3	9.5 - 1.6	12.5 - 1.2
3.6 - 4.2	6.6 - 2.3	9.6 - 1.6	12.6 - 1.2
3.7 - 4.0	6.7 - 2.2	9.7 - 1.5	12.7 - 1.2
3.8 - 3.9	6.8 - 2.2	9.8 - 1.5	12.8 - 1.2
3.9 - 3.8	6.9 - 2.2	9.9 - 1.5	12.9 - 1.2

NOTE: Cargo requiring extraordinary attention, e.g., nuclear, one-of-a-kind, high value, or key military materiel, may justify changes to the test procedure and criteria; the developer or Program Manager must identify these, and they must be approved by the Director, Military Traffic Management Command Transportation Engineering Agency (MTMCTEA), ATTN: MTTE-DPE, 720 Thimble Shoals Blvd., Suite 130, Newport News, VA 23606-4537 (or its European equivalent).

4.5.8.4 Analysis of results.

Refer to the guidance in Part One, paragraphs 5.14 and 5.17, to assist in the evaluation of the test results. The test item fails this test if the test item or any item that is attached to it, or that is included as an integral part of the test item, breaks free, loosens, or shows any sign of permanent deformation beyond specification tolerances. Likewise, the test item and its subassemblies must be operationally effective after the test. If tiedown securement items break or displace substantially, photograph and document the problem areas for evaluation of the procedures and materials used. The test director and MTMCTEA jointly decide if any failed securement items require reconfiguring and, if so, whether a complete retest is required. If the test item fails, the necessary required action will be determined jointly by the parties involved. For retests, use new tiedown material to eliminate additive effects and, if possible, a new test item.

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