

General Information Bulletin No. 2

Rules and Procedures for Testing of New Loading and Bracing Methods or Materials



Revised

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**Approved by
DAMAGE PREVENTION & FREIGHT CLAIM COMMITTEE**

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SECTION I INTRODUCTION

This publication contains rules and test procedures utilized by AAR Damage Prevention & Loading Services for evaluation of new closed car, container or trailer loading, blocking and bracing methods and materials.

The purpose of this publication is to provide necessary information for any proponent wishing to gain AAR approval of a loading and bracing concept. Approved loading and bracing concepts are published in appropriate AAR publications. The loading standards afford a means of providing uniform consent of member railroads for interchange of approved methods unless restricted by individual carrier rules.

In order to gain approval, evaluation of a new loading and bracing concept's performance in the railroad environment is necessary. This may be accomplished through impact testing, rail environment simulation testing, TTCI on-track testing, and/or field shipment testing. This testing will occur at the Transportation Technology Center Inc. (TTCI) test facility in Pueblo, CO or if feasible in the field environment for impact tests or field shipment testing. Generally, impact tests are conducted prior to simulation tests, on-track tests, or test shipments. See **Section III** for more information on impact tests. Simulation and on-track testing subjects a specimen load to controlled vertical and lateral vibration inputs creating the dynamic effects of the railroad environment. See **Section IV** for more information on simulation tests and on-track testing. Laboratory testing may also be required to document the performance of bracing system components.

Tests of new loading and bracing methods and materials are conducted for the benefit of shippers and the railroad industry. Results of testing are published and available to any interested party unless deemed proprietary by the proponent(s). The costs of this testing may be underwritten by the AAR members.

AAR costs for testing of new loading and bracing methods and/or materials may be covered by the AAR budget when successful testing will result in new approved methods published and available for use by all railroads, shippers and suppliers.

For tests funded by the AAR, TTCI will review the transportation needs to the test center and back to origin with the involved carriers and ensure equitable distribution of the cost by agreement of the carrier members of the Damage Prevention and Freight Claim Committee. Based on the testing scope, participation in the transportation costs may be requested of the proponent or other involved parties. If the proponent wishes to have the test car moved to another destination after testing, the proponent is responsible for arranging movement of the test car at the completion of testing.

Proponents may be charged for laboratory testing, impact testing (in the field or at TTCI), field shipment testing, TTCI on-track testing, and/or simulation testing (at TTCI) conducted by the AAR when the testing falls into one of the following categories:

- Testing solely for the purpose of approving one vendor's packaging, securement or dunnage product for use in rail shipments.
- Retesting of concepts which failed prior testing due to deficiencies in the original concept or load.
- Testing for the purpose of approving a loading, packaging or securement concept or a dunnage product of a specialized nature which will have application to a limited number of shippers and/or carriers.
- The testing is "proprietary" in nature (i.e. evaluation of a proprietary concept), the proponent is not seeking AAR approval and/or the results of the testing will be the property of the proponent.

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All test requests are reviewed by the AAR Damage Prevention and Loading Services staff. Determination of the funding status of test requests is on a case by case basis. If the AAR determines a test request falls into one of the categories requiring proponent funding, the Damage Prevention and Freight Claim Committee will be advised and asked to concur.

The success or failure of a proposed loading and bracing concept is determined by the AAR's Damage Prevention and Freight Claim Committee or the Damage Prevention & Loading Services staff acting on their behalf. The following general criteria must be met for a test to be successful.

1. The loading and securement system performs successfully.
2. There is no excessive load movement which could lead to the total breakdown of the load.
3. There is no damage to freight or rail equipment.
4. No condition develops which could lead to freight or equipment damage.
5. Nothing develops wherein the safety of the load is in question.

Other additional criteria which might be critical to a specific concept or commodity involved in testing may also be considered.

SECTION II defines the procedures to be followed in testing new loading and bracing methods or materials.

SECTION III contains the AAR Standard Procedures for Impact Tests. This test is intended only to evaluate whether or not proposed loading and bracing concepts can withstand longitudinal shocks of the type which might be experienced in rail transportation. This test, if required, is generally conducted before any other test procedures are begun.

SECTION IV contains the Procedures for Conducting Simulation Testing and TTCI On-Track Testing of new loading and bracing concepts. Simulation testing is the preferred method of evaluating new concepts whenever possible because of the advantages of this test process over the alternative field test.

Field test shipments conducted in accordance with Sections 6 through 11 of Rule of Order X (Damage Prevention and Freight Claim Rulebook) may be used as an alternate to simulation testing.

SECTION V contains a test request form which can be used for requesting testing of a new loading and bracing concept.

LABORATORY TESTING

The AAR also has the capabilities to perform laboratory testing on loading and bracing system components, shipping containers, and packaging materials at the TTCI facilities in Pueblo, Colorado. Both static and dynamic testing can be performed.

Product Performance Testing for Pneumatic Dunnage is conducted following procedures in General Information Bulletin No. 9, Product Performance Profile for Pneumatic Dunnage.

Testing on loading and bracing system components, such as strapping, is conducted using ASTM standards or other appropriate test procedures. These tests are generally considered proprietary in nature and, as such, their costs would be borne by the proponent.

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SECTION II PROCEDURE FOR EVALUATION OF NEW LOADING AND BRACING METHODS AND MATERIALS

The following procedures govern the evaluation and acceptance of new closed car loading and bracing methods or materials not currently recognized in AAR publications.

1. Requests for evaluation shall be in writing to the Damage Prevention and Freight Claim Committee Manager and may originate with a shipper or supplier, a railroad damage prevention representative, or the Damage Prevention and Freight Claim Committee.

2. The written request shall fully define the proposed loading or bracing method or material, including an illustration; a statement of purpose; the approximate freight weight of proposed test shipments; description of the type of commodity to be shipped; description of the type of rail equipment to be used; origin point; origin railroad; routes; and intermediate and destination carriers. Documentation on the performance of the subject method or material may be submitted for consideration with the written test request. Responding to the request, the Damage Prevention and Freight Claim Committee Manager shall make recommendations to all involved railroads regarding the required testing and arrangements to progress the test request.

If, at the request of one of the member railroads, there is a need for Damage Prevention and Freight Claim Committee consideration, before further progression of the request, the Damage Prevention and Freight Claim Committee Manager shall so advise the Damage Prevention and Freight Claim Committee in order to solicit input from Committee members.

3. The proponent will be advised of one of four likely possibilities: 1) the loading and bracing method is sufficiently similar to one already approved and/or the Committee already has sufficient information by which to make a decision; 2) the method will require impact testing and either simulation testing/TTCI on-track testing or field testing; 3) the method will require simulation testing/TTCI on-track testing or field testing only; or, 4) the request requires further information for committee consideration.

4. In the event of a positive recommendation for an impact test, the Damage Prevention and Freight Claim Committee Manager shall notify the proponent and the origin railroad to determine the most appropriate means to conduct the test.

5. In the event of a positive recommendation for simulation testing/TTCI On-track testing, the Damage Prevention and Freight Claim Committee Manager shall notify the proponent that it will be necessary for the proponent to arrange for a specimen load to be tested in accordance with the "AAR Procedures for Simulation Testing/TTCI On-Track Testing." as approved by the Damage Prevention and Freight Claim Committee.

6. As an alternative to simulation testing/TTCI on-track testing or in conjunction with simulation testing/TTCI on-track testing, the Director Damage Prevention and Loading Services or Damage Prevention and Freight Claim Committee Manager may request that field test shipments be initiated.

7. If field test shipments are requested, the Damage Prevention and Freight Claim Committee Manager shall notify the Damage Prevention and Freight Claim Committee member of the origin railroad and the intermediate and delivering railroads that are expected to be actively involved in the majority of routes and seek their consent for the test shipments.

8. Prior to commencing a field test, the Damage Prevention and Freight Claim Committee Manager will supply the proponent with inspection forms. The standard inspection forms are to be completed at origin and destination and will have instructions for both origin and destination inspectors.

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- 9.** Sufficient cars or trailers shall be shipped using the proposed method to ensure a minimum of twenty-five (25) origin and matching destination reports. The twenty-five (25) reports must be complete in detail to permit an accurate evaluation of performance. The proponent will be responsible for obtaining the origin and destination reports. If field test shipments are being progressed in conjunction with a simulation test/TTCI on-track testing, the Director Damage Prevention and Loading Services may reduce the number of reports required. The number of test shipments will be limited to those required to produce sufficient data to determine a valid conclusion.
- 10.** Test shipments shall be prepared as uniformly as possible and be made in types of equipment normally utilized by the shipper. The distance of each test shipment must be more than 500 miles (800 kilometers).
- 11.** The shipper is required to notify the AAR of test shipments, allowing enough lead time to permit the AAR to notify the origin carrier and delivering carriers so carrier inspections can be arranged when possible.
- 12.** The Director Damage Prevention and Loading Services shall arrange for a staff observation of test shipments at the destinations, when necessary, to provide a base for engineering analysis.
- 13.** When a test is concluded, the Damage Prevention and Freight Claim Committee Manager shall prepare a test report for the Damage Prevention and Freight Claim Committee, for consideration by that Committee. The Damage Prevention and Freight Claim Committee shall approve, by a two-thirds vote of its members, or disapprove the proposal. Vote will commence at the next available meeting of the Damage Prevention and Freight Claim Committee or by electronic ballot to the Committee members. Committee members will have 14 calendar days to respond to electronic ballot requests.
- 14.** Concurrently with the submission of the report to the Damage Prevention and Freight Claim Committee, a copy will be furnished to the proponent.
- 15.** If the Request for Approval is for hazardous materials securement methods, following successful completion of an impact test as defined in Section III, proposed loading methods are required to undergo simulation testing and a minimum of fifteen (15) non-hazardous field test shipments in order to be considered for approval.
- 16.** Hazardous material securement methods that successfully complete impact, simulation and field testing, are approved for hazardous shipments by the Damage Prevention and Freight Claim Committee.

SECTION III AAR IMPACT TEST PROCEDURES

1. SCOPE

This method is intended to evaluate whether or not proposed loading and bracing concepts can withstand longitudinal shocks of the type which might be experienced in rail transportation.

2. EQUIPMENT

- (a) Empty cars are preferred for use as the buffer or struck cars. Loaded cars may also be used with prior AAR approval. In either case, the total weight of the buffer cars is to be approximately 250,000 lbs. (minimum). The first buffer car must be a standard draft gear car. The remaining buffer cars should have standard draft gears, if possible.
- (b) One locomotive.
- (c) A minimum of 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.

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- (d) If alternate procedure (Section 6) is being used to conduct the test, a tangent track with a slight grade is required.
- (e) A means of determining the speed of the test car at the time of impact is required.

3. PREPARATION

The test load or loads must be prepared specimens' representative of the intended loading and bracing method. If safety or other reasons preclude the use of actual commodity, the specimen must be equal in weight and general character to the materials to be shipped.

4. ARRANGEMENT OF TEST EQUIPMENT

- (a) Buffer cars must have air brakes set on all cars and hand brakes set on the first and last cars of the anvil string. If cushioned cars are included in the buffer consist, cars must be bunched, by applying the hand brake to the last car and compressing the string of cars with a locomotive. The struck end of first buffer car must have standard draft gear.
- (b) Locate the test car between the buffer cars and the locomotive.
- (c) Electric timer, radar, or other means of measuring impact speed. Use in accordance with manufacturers instructions. Speed measuring device must have a current and verifiable calibration certificate.
- (d) Radar Equipment: Operator of radar must be positioned in line with the direction of impact in order to obtain an accurate speed. Follow the instructions of the equipment manufacturer and carrier or company conducting the test regarding location of radar operator. For safety, the radar operator should be positioned so as to aim at the test car moving away from their position.

5. PROCEDURE

- (a) 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, test runs can be made without impacting the test load to establish accuracy of speed.
- (b) There are four impacts of the test load. The first three impacts are in the same direction. On all closed COFC/TOFC loads, including those for hazardous materials, the first three impacts are conducted with the rear of the test trailers/containers facing the direction of impact.
 - (i) On boxcar load tests for non-hazardous materials and for closed COFC/TOFC load tests for non-hazardous materials or hazardous materials other than explosives the first three impacts are 4, 6 and 6 mph (+/- 0.5 mph).
 - (ii) On boxcar load tests for all hazardous material including explosives and for closed COFC/TOFC load tests for hazardous materials involving explosives the first three impacts are at 4, 6 and 8 mph (+/- 0.5 mph).
 - (iii) For test specifications for open top railcar and open top COFC/TOFC shipments reference Open Top Loading Rules – Section 1 General Rules for Loading all Commodities.
- (c) The fourth impact is at the opposite end of the test car from the first three impacts. If it is not possible to turn test car, place the test car at the opposite end of the buffer cars and conduct the fourth impact. In this instance, the last car at the opposite end of the buffer cars must also be a standard draft gear car.
 - (i) On boxcar load tests for non-hazardous materials and for closed COFC/TOFC load tests for non-hazardous materials or hazardous materials other than explosives the fourth impact is at 6 mph (+/- 0.5 mph).

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(ii) On boxcar load tests for all hazardous material including explosives and for closed COFC/TOFC load test for hazardous materials involving explosives the fourth impact is at 8 mph (+/- 0.5 mph).

(d) No readjustment of freight or reconditioning of bracing or items of securement will be permitted during the test.

(e) The specimen car carrying the test load is pulled a sufficient distance from the buffer cars to allow acceleration to the required impact speed. The test load car is then pushed toward the buffer cars until the required speed is attained. It is then released and allowed to roll freely into the buffer cars. Knuckles should be open and positioned for coupling. This process is repeated for each impact.

6. ALTERNATE PROCEDURE

(a) A section of inclined track can be calibrated using a test car and radar. The test car is released from the designated starting point and allowed to roll free down the inclined track. A crew member riding the test car is in radio contact with radar operator who reads off the car speed to the rider. The rider drops markers at track side to indicate locations at which the desired speeds are obtained. After the final speed mark is determined, the test car is stopped by use of the hand brake. No other cars are present on the test track during the calibration process. The process is repeated at least 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, a free rolling locomotive can be used for the initial calibration when markers are dropped with the locomotive's brakes applied after reaching final speed as indicated by radar. The test car can then be released from the same starting point and adjustments in markers made if needed prior to impacting.

(b) After determining speed locations, impacts are performed 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 or measuring back from the end of the anvil string to the appropriate release points.

(c) Speeds and the direction of impacts shall be the same as outlined in Sections 5(b) and 5(c) above.

(d) No readjustment of freight or reconditioning of bracing or items of securement will be permitted during the test.

7. RECORD OF TESTS

An accurate record of the tests is to be maintained, tabulating the number and speed of impacts and observations of blocking and freight after each impact.

SECTION IV AAR PROCEDURES FOR SIMULATION TESTING/ TTCI ON-TRACK TESTING

1. Simulation Testing

Simulation testing is conducted using the Vibration Test Unit (VTU) at the TTCI test facility in Pueblo, Colorado (subsidiary of the Association of American Railroads).

The VTU is an electro-hydraulic unit capable of subjecting a full-size loaded rail car to controlled vertical and lateral vibration inputs at the wheels, creating the dynamic effects of the track being simulated. Use of the VTU allows damage prevention testing in a controlled environment with known inputs. Observation of loads during testing and use of electronic instrumentation allows for study and analysis of freight and bracing, and bracing failure modes. The result is improved loading and bracing systems.

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The test procedures consist of two test cycles as shown below. Each cycle begins with two impacts performed to provide longitudinal shocks of the type a car may experience in transit. The impacts are followed by a series of runs on the VTU using track input data which simulates the effects of various types of track. Additional test cycles simulating specific rail input conditions can also be provided.

The actual testing requires two to three days; however, the test load would be at TTCI a minimum of two weeks to allow time for inspection of the loads and any preparation or load adjustment required. Every attempt is made to minimize the time loads are at TTCI.

Procedures for Simulation Testing of New Closed Car, Container, or Trailer Loading and Bracing Methods or Materials

Cycle 1

A) Two Impacts - One at each end of the test car at 5 mph (± 0.5 mph).

For containers/trailers the first impact is toward the doors of the unit; the second impact is towards the nose of the unit.

B) Track data on VTU;

Total Simulated Mileage – Cycle 1: 149.1

Cycle 2

A) Two Impacts - One at each end of the test car at 6 mph (± 0.5 mph).

For containers/trailers the first impact is toward the nose of the unit; the second impact is towards the door of the unit.

B) Track data on VTU;

Total Simulated Mileage – Cycle 2: 119.7

Total Simulated Mileage – Cycles 1 & 2: 268.8

2. TTCI On-Track Testing

TTCI on-track testing is conducted using the FAST (Facility for Accelerated Service Testing) track at the TTCI test facility in Pueblo, Colorado (subsidiary of the Association of American Railroads). This testing will be utilized at the discretion of the Damage Prevention & Freight Claim Committee and the Director Damage Prevention and Loading Services. Requested testing of multiple loading and bracing methods or materials or commodities, requiring multiple boxcars, containers, or trailers during the same timeframe will be integral to the use of the on-track testing.

The High Tonnage Loop (HTL) at the FAST track is a kidney shaped track maintained to class 4 track conditions. These conditions create comparable vertical and lateral vibration inputs as the VTU simulation testing. Each lap of the HTL track is 2.72 miles. Each shift of the FAST train will complete approximately 100 laps of the HTL track. The train consist that runs on FAST is typically a 100 plus car train and test cars utilizing this testing method will be placed at the rear of the train.

Observation of loads during testing and use of electronic instrumentation allows for study and analysis of freight and bracing, and bracing failure modes. The result is improved loading and bracing systems.

The test procedures consist of two test cycles as shown below. Each cycle begins with two impacts performed to provide longitudinal shocks of the type a car may experience in transit. The impacts are followed by a series of runs on the FAST track. Additional test cycles can be completed to increase on-track rail mileage.

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The test loads would be at TTCI a minimum of three weeks to allow time for testing, inspection of the loads, and any preparation or load adjustment required. Every attempt is made to minimize the time loads are at TTCI but additional time onsite may be required.

Procedures for On-Track Testing of New Closed Car, Container, or Trailer Loading and Bracing Methods or Materials

Cycle 1

A) Two Impacts - One at each end of the test car at 5 mph (± 0.5 mph).

For containers/trailers the first impact is toward the doors of the unit; the second impact is towards the nose of the unit.

B) Track data on FAST Track;

Day 1 (clockwise) – Minimum Mileage: 250

Day 2 (counter-clockwise) – Minimum Mileage: 250

Total Minimum Mileage – Cycle 1: 500

Cycle 2

A) Two Impacts - One at each end of the test car at 6 mph (± 0.5 mph).

For containers/trailers the first impact is toward the nose of the unit; the second impact is towards the door of the unit.

B) Track data on FAST Track;

Day 1 (clockwise) – Minimum Mileage: 250

Day 2 (counter-clockwise) – Minimum Mileage: 250

Total Minimum Mileage – Cycle 2: 500

Total On-Track Minimum Mileage – Cycles 1 & 2: 1000



Request for AAR Testing

AAR/TTCI Damage Prevention and Loading Services*

Name of Person Requesting Test: _____

Title: _____

Company: _____

Address: _____

Telephone No.: _____ E-mail: _____

Commodity: _____

Origin Location: _____

Individual in Charge of Origin Loading: _____

Title: _____

Telephone No.: _____ E-mail: _____

Origin Railroad: _____

Railroad Representative: _____

Telephone No.: _____ E-mail: _____

Proposed Destinations: _____

Intermediate and Destination Railroads: _____

Purpose of Test: _____

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Description of Loading and Bracing Method (Attach diagram, list of materials and specifications of proposed loading and bracing method.): _____

Identify Equipment Type and Size Below:

Boxcar:

Type: _____ **Size:** _____ **Type Draft Gear/Cushioning:** _____

Intermodal:

Trailer or Container: _____ **Size:** _____

Other (Describe): _____

Load Weight: _____

Proposed Starting Date: _____

*Note: AAR/TTCI Damage Prevention and Loading Services staff will review any test proposal and advise the proponent what type of testing will be required. DP&LS staff will also advise the AAR Damage Prevention and Freight Claim Committee of the test request and the testing recommended. Scheduling of testing is dependent on availability of AAR/TTCI staff and facilities required.

Submit the completed request form to:

Closed Car Loading Rules Manager
Association of American Railroads/TTCI
55500 DOT Road
Pueblo, CO 81001
DPLS@aar.com

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Closed Car Loading Guides

- 1** Minimum Loading Standards for Freight in General Purpose Boxcars (01/2014)
- 2** Best Practices for Loading Roll Paper in Railcars (12/2019)
- 3** Minimum Loading Standards for Plywood and Similar Building Products in Closed Cars (06/2014)
- 4** Minimum Loading Standards for Lumber in Closed Cars (03/2014)
- 5** Minimum Loading Standards for Building Brick in Closed Cars (06/2014)
- 6** Minimum Loading Standards for Prepared Food and Similarly Packaged Products in Closed Cars (03/2014)
- 7** Minimum Loading Standards for Intermediate Bulk Containers in Closed Cars (03/2014)
- 8** Minimum Loading Standards for Bagged and Baled commodities in Closed Cars (07/2014)
- 9** Minimum Loading Standards for Coiled Metal Products in Closed Cars (08/2014)
- 10** Minimum Loading Standards for Primary Metal Products in Closed Cars (10/2014)

See Also:

Intermodal Loading Guide (IMLG) for Products in Closed Trailers and Containers (01/2016)

General Rules Circulars

- 42-N** General Rules Covering Loading of Carload Shipments of Commodities in Closed Cars (10/2019)
43-G Rules Governing the Loading, Blocking and Bracing of Freight in Closed Trailers and Containers for TOFC/COFC Service (05/2017)

General Information Bulletins (G.I.B.)

- 1** Handling and Shipping Fresh Fruits and Vegetables by Rail (05/1976)
- 2** Rules and Procedures for Testing of New Loading and Bracing Methods of Materials (12/2020)
- 3** Instructions for Applying Polyethylene Sheets as Weather Protection in Boxcars (11/1991)
- 4** Weather Protection for Open Top Wallboard Shipments (05/1993)
- 5** Overloaded or Unbalanced Hopper Cars are Unsafe (08/1993)
- 6** Measurement Requirements for Remote Ride Quality Monitoring (11/1996)
- 7** Evaluating and Loading Auto Parts Racks in Railcars for Transportation via the North American Rail System (02/1999)
- 9** Product Performance Profile for Pneumatic Dunnage (02/2020)