

# **General Information Bulletin No. 2**

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



**Revised**

**October 2019**

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

**Published by  
Association of American Railroads/TTCI  
Damage Prevention and Loading Services  
55500 DOT Road  
Pueblo, CO 81001**

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**Rules and Procedures for  
Testing of New Loading and Bracing  
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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, trailer or container 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 and/or field shipment testing. Generally, impact tests are conducted prior to simulation tests or test shipments. See **Section III** for more information on impact tests. Simulation 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. 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.

Proponents may be charged for laboratory testing, impact testing (in the field or at TTC), field shipment testing and/or simulation testing (at TTC) 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.

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 lading or rail equipment.
4. No condition develops which could lead to lading 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.

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**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 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 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.

Testing on shipping containers and related packaging material is done in accordance with ASTM Standard D4169-Practice for Performance Testing of Shipping Containers or other applicable ASTM test standards.

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.

## **SECTION II EVALUATION OF NEW LOADING AND BRACING METHODS AND MATERIALS FOR CLOSED CARS, TRAILERS OR CONTAINERS**

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 lading 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 and either simulation testing or field testing; 3) the method will require simulation 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, 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 "Procedures for Simulation Testing of New Closed Car Loading and Bracing Methods or Materials" as approved by the Damage Prevention and Freight Claim Committee.

**6** - As an alternative to simulation testing or in conjunction with simulation 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.

**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, 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 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 - RECOMMENDED PROCEDURES FOR CONDUCTING IMPACT TESTS OF LOADED FREIGHT CARS, TRAILERS OR CONTAINERS**

#### **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.

(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 TOFC/COFC 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 TOFC/COFC 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 TOFC/COFC 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 TOFC/COFC 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 TOFC/COFC load tests for non-hazardous materials or hazardous materials other than explosives the fourth impact is at 6 mph (+/- 0.5 mph).

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

(d) No readjustment of lading 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 lading 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 lading after each impact.

## SECTION IV - PROCEDURES FOR SIMULATION TESTING OF NEW CLOSED CAR, TRAILER OR CONTAINER LOADING AND BRACING METHODS OR MATERIALS

Simulation testing is conducted using the Vibration Test Unit at the Transportation Technology Center (TTC), a test facility in Pueblo, Colorado operated by the Transportation Technology Center, Inc., a subsidiary of the Association of American Railroads.

The Vibration Test Unit (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 lading and bracing, and bracing failure modes. The result is improved loading and bracing systems.

There are two standard simulation test procedures, one for railcar loading methods and the second for trailer/container loading methods. 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 Vibration Test Unit 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 the TTC 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 the TTC if this would be a problem.

For tests funded by the AAR, the AAR arranges for free rail movement of the test load to the Transportation Technology Center and back to origin after testing is completed. 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.

### **Procedures for Simulation Testing of New Closed Car Loading and Bracing Methods or Materials**

#### **Cycle 1**

- A) 2 Impacts - One at each end of the test car at 5 mph ( $\pm 0.5$  mph).
- B) Track data on VTU;  
Total Simulated Mileage – Cycle 1: 149.1

#### **Cycle 2**

- A) 2 Impacts - One at each end of the test car at 6 mph ( $\pm 0.5$  mph).
- B) Track data on VTU;  
Total Simulated Mileage – Cycle 2: 119.7

**Total Simulated Mileage – Cycles 1 & 2: 268.8**

### **Procedures for Simulation Testing of New Intermodal (closed TOFC/COFC) Loading and Bracing Methods or Materials**

#### **Cycle 1**

- A) 2 Impacts - Both at 5 mph ( $\pm 0.5$  mph)  
The first impact is toward the nose of the trailer, the second impact towards the doors.
- B) Track data on VTU;  
Total Simulated Mileage – Cycle 1: 149.1

#### **Cycle 2**

- A) 2 Impacts - Both at 6 mph ( $\pm 0.5$  m.p.h.)  
The first impact is toward the doors of the trailer, the second impact towards the nose.
- B) Track data on VTU;  
Total Simulated Mileage – Cycle 2: 119.7

**Total Simulated Mileage – Cycles 1 & 2: 268.8**



# 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: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**Continued**

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

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**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](mailto: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 (08/2016)
- 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-M** General Rules Covering Loading of Carload Shipments of Commodities in Closed Cars (12/2017)
- 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 (10/2019)
- 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 (09/2019)