

ISRI Luggage Securement Presentation

CVSA Virtual Fall Conference

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What is a lugger & how does it work?

Currently there is no commodity regulation specific to lugger trucks as in comparison to roll-on/roll-off trucks. By their design, the hoist on luggers provides container securement. ***Lugger video:***



General Cargo Securement Regulations

- Under general cargo securement regs 3 or more tiedowns would be required for an empty or fully loaded 20-yard container, depending on weight and tiedown rating.
- The following slides provide alternative means of securement that have been tested to meet FMCSA cargo securement guidelines under 393.102
 - Utilizing existing components-hoist pins, container channels, container lift lugs, hoist chains and key plates, and/or alternative equivalent means such as straps, chains and binders

(c) *Equivalent means of securement.* The means of securing articles of cargo are considered to meet the performance requirements of this section if the cargo is:

(1) Immobilized, such so that it cannot shift or tip to the extent that the vehicle's stability or maneuverability is adversely affected

Participants (Test Performed on 07/29/20 and 08/18/20)

Onsite Test Performed in Fond du Lac, WI. Participants Included:

- Ace: Brother's Equipment, Inc.
- Institute of Scrap Recycling Industries, Inc. (ISRI)
 - ISRI Recycling Education & Research Foundation (RERF)
- Sadoff Iron and Metal Company
- Whealon Towing & Service Inc.
- Wisconsin State Patrol

Other Active Participants:

- BENLEE
- Convento Manufacturing Company
- E.L. Harvey & Sons, Inc.
- EMR Group
- National Waste & Recycling Association (NWRA)
 - ANS Z245.1 Accredited Standards Committee c/o NWRA
- Metro Group, Inc.
- Michael Brothers Hauling & Recycling
- Muller Welding
- OmniSource
- United Scrap Metal, Inc.

Types of Test Administered

Types of tests:

- Rearward securement at 0.5g (done with truck)
- Lateral securement at 0.5g (done with truck)
- Forward securement at 0.8g (done with lugger body to prevent damage to power unit)
 - Utilizing existing components-hoist pins, container channels, container lift lugs, hoist chains and key plates, and/or alternative equivalent means such as chains & binders
- To achieve the desired g forces required the truck/hoist to be placed at an angle sufficient to experience 0.5 or 0.8g respectively (g represents gravity).
- **Note: Container and commodity weight (43,060 lbs.) far exceeded federal bridge formula weights. Tare (empty) weight on unit used was 32,400 lbs.**

Measurement Device: Racelogic Video VBOX combined with an Inertial Measurement Unit (IMU)

We used a Racelogic Video VBOX combined with an Inertial Measurement Unit (IMU). The IMU is a triaxial accelerometer that is measuring the forces acting on it in the X, Y, and Z directions. By attaching it to the loaded frame and pitching (tipping) the frame about its Y axis, we are measuring the acceleration force acting on it in the longitudinal direction due to gravity. The Video VBOX receives data from the IMU, displays it in a video file, and saves it to a data file. Equipment owned and operated by WI State Patrol, and the test were conducted with the assistance of the WI State Patrol.



Rearward Securement Test

Rear acceleration 0.5g:

- The rear acceleration test was successful. The hydraulic dump pins and container dump hooks held the container with minimal movement of 3.5”.



Rear Acceleration Test Video



Lateral Securement Test

Lateral Acceleration 0.5g:

- The lateral acceleration test was also successful. The hydraulic dump pins and body structure held the container with minimal lateral movement of 0.75”



Lateral Acceleration Test Video



Two alternative methods to consider:

1. Hydraulic Dump Pins & Channels*
2. Direct securement to container Lifting Lug

* Refer to vehicle committee agenda engineering study conducted for ACE Brother's Equipment Inc.

Option 1: Pins & Channels

Forward Acceleration 0.8g Option 1-Pins & Added Channels:

* Refer to vehicle committee
agenda engineering study
conducted for ACE Brother's
Equipment Inc.



Option 1: Pins & Channels

Forward Acceleration 0.8g Option 1-Pins & channels:

- This forward acceleration test was successful. The hydraulic dump pins & container channel held the container with minimal forward movement of 2”.



Option 1: Pins & Channels Video. Note: Video on left shows container movement. Video on the right shows .80g



Option 2: Direct securement to container lugs

Option 2-direct securement to container lugs: (1/2" Grade 80 chain rated at 12,000 lbs., and a binder rated at 9,200 lbs.). Photo depicts preparation for Forward Acceleration 0.8g test.



Option 2: Direct securement to container lugs

**Forward Acceleration 0.8g
Option 2-direct
securement to container
lugs:**

- This forward acceleration test was also successful. The chains & binder used held the container with minimal forward movement of 3”.



Option 2: Direct Securement to Container Lugs Video. Note: Video on left shows container movement. Video on the right shows .80g



