

ISRI Lugger Securement Presentation CVSA Virtual Fall Conference September 21 - 25, 2020

SRI 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:*



SRI *Vice of the Recycling Industry* **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

SRI 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
- Converto 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 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.

SRI 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.





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".



SRI Vice of the Recycling Industr^{*} Rear Acceleration Test Video





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"



SRI Vice of the Recycling Industry² Lateral Acceleration Test Video





Two alternative methods to consider:

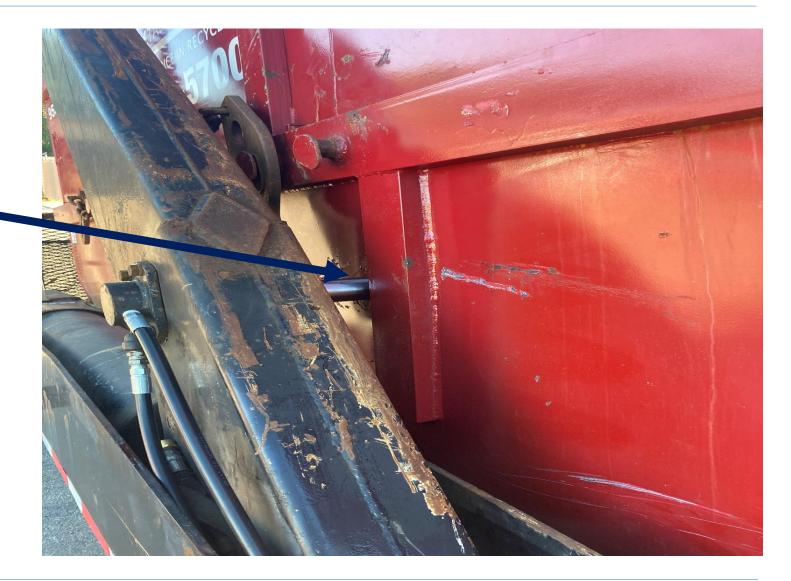
- 1. Hydraulic Dump Pins & Channels*
- 2. Direct securement to container Lifting Lug

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

SRI 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.





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".



Image: Strain of the Recycling IndustryOption 1: Pins & Channels Video. Note: Video on left showsVideo of the Recycling IndustryContainer 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.

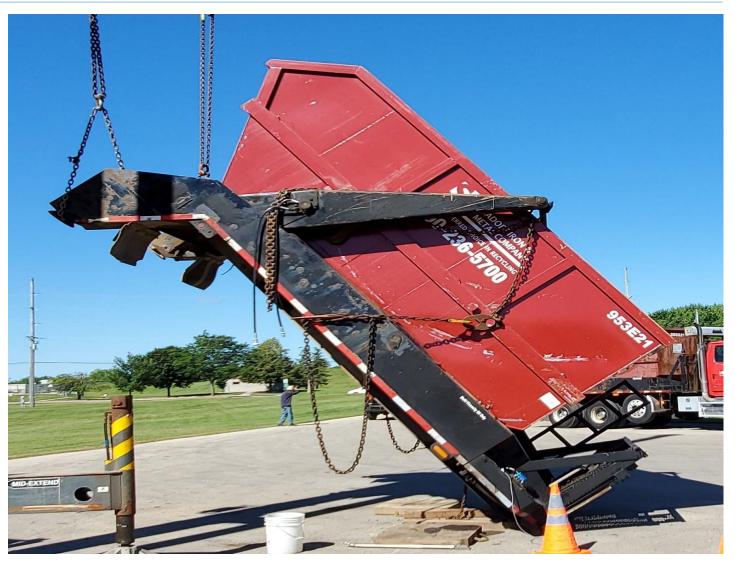


SRI Option 2: Direct securement to container lugs

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".



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





