ISRI Lugger Securement Presentation
CVSA Virtual Fall Conference
September 21 - 25, 2020
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:**
• 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
Onsite Test Performed in Fond du Lac, WI. Participants Included:

• Ace: Brother’s Equipment, Inc.
• Institute of Scrap Recycling Industries, Inc. (ISRI)
  o 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)
  o 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)
  o 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.
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”. 
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”
Lateral Acceleration Test Video

G Force 0.48
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.
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: (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
Questions & Answers