# Memorandum

U.S. Department
Of Transportation

Federal Motor Carrier
Safety Administration

JUL 07 2008

Subject: **ACTION**: Technical Review of Industry Cargo Securement Practices for Baled Hay and Straw, Revision 1

Date:

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To: Field Administrators
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## BACKGROUND

Baled hay and straw are not currently covered by a separate commodity-specific rule under the FMCSRs, and as such, have typically been required to be secured in accordance with the general cargo securement requirements outlined in 49 CFR 393.100-114.

In response to concerns raised by industry representatives, the Federal Motor Carrier Safety Administration (FMCSA) issued a "Technical Review of Industry Cargo Securement Practices for Square Bales of Hay and Straw" on September 28, 2007. Based on a review of testing performed to evaluate the adequacy of longstanding practices concerning the securement of baled hay and straw, the Agency concluded that while these industry practices do not meet the general cargo securement requirements specified in Sections 393.100-393.114, use of these securement methods – under specific conditions outlined in the Technical Review – meet the "equivalent means of securement" provisions of Section 393.102(c). The results of the testing demonstrated conclusively that these securement methods (1) meet or exceed the performance criteria established by the FMCSRs and (2) do not result in any degradation in the level of safety during transport.

However, after reviewing the September 2007 Technical Review, several jurisdictions requested that the Agency provide a more detailed description of the specific conditions under which a load of baled hay or straw is considered to meet the equivalent means of securement provision of Section 393.102(c). In an effort to respond to these requests, FMCSA contracted with DOT's

Volpe Center to perform a comprehensive series of full-scale load securement tests on loads of baled hay at the California Highway Patrol Academy in Sacramento, California.

This testing was conducted in November 2007, and the results directly parallel those of the previous testing that served as the basis for the September 2007 Technical Review. Specifically, FMCSA has confirmed that the combination of longitudinal tiedown assemblies that effectively unitizes the bales of hay and straw, along with the addition of one or two transverse (lateral) cargo securement devices depending on vehicle length, provides a cargo securement system that meets or exceeds the performance criteria established by the FMCSRs and does not result in any degradation in the level of safety during transport.

Based on the above, and to address the concerns of those jurisdictions that requested a greater level of detail regarding the conditions under which loads of baled hay and straw meet the "equivalent means of securement" provision of the FMCSRs, the attachment provides a revised "Technical Review of Industry Cargo Securement Practices for Baled Hay and Straw. This document supersedes the September 2007 Technical Review.

Importantly:

1) While the Technical Review outlines specific conditions under which the equivalent means of securement determination can be satisfied, this is not the *only* manner in which loads of baled hay and straw could satisfy the equivalency standard. It is, however, the only alternative FMCSA has evaluated; motor carriers that contend some other securement method also meets the equivalency test will have to demonstrate to the satisfaction of the Agency that this is indeed the case.

2) FMCSA will work with its Canadian counterparts to consider whether the language presented in the attachment should be used as the basis for a proposal to develop a new commodity-specific section for inclusion into the North American Cargo Securement Model Regulation. This issue will be presented at the next meeting of the North American Cargo Securement Harmonization Public Forum in September 2008 in Winnipeg, Manitoba.

## COMMUNICATION OF FMCSA TECHNICAL REVIEW WITH STATE AGENCIES

Division Administrators and State Directors are to contact the lead Motor Carrier Safety Assistance Program agency in their States and advise them of the Agency's Technical Review concerning the securement of loads of baled hay and straw. Please request that the States refrain from penalizing motor carriers that use the "equivalent means" of cargo securement which includes the use of longitudinal ropes or tiedown assemblies – as outlined in the following Technical Review – instead of applying 49 CFR 393.110 concerning the minimum number of tiedowns based on the length of the articles of cargo.

Reference: Volpe Study "Evaluation of Cargo Securement on the Transportation of Agricultural Commodities." (draft)

# TECHNICAL REVIEW

**Loads of baled hay and straw should be considered to meet the "equivalent means of securement" requirements in 49 CFR 393.102(c), provided that the following conditions are met:**

**(a) Applicability.**

(1) This Technical Review applies to the transportation of baled hay and straw on flatbed vehicles, trailers, and semi-trailers.

(i) Loads of bales that are secured according to the conditions of this Technical Review are exempt from the aggregate working load limit requirements of 393.106(d), *Aggregate Working Load Limit.*

(2) Loads of bales that are not unitized by longitudinal tiedowns must be transported in accordance with the general cargo securement rules of 393.100 through 393.114.

**(b) General Requirements.**

(1) Regular bales are defined as rectangular bales having one or more dimensions less than 2 ½ by 3 ½ by 6 feet. Jumbo bales are defined as rectangular bales with dimensions of 2 ½ by 3 ½ by 6 feet or greater. Unless otherwise provided, this Technical Review applies to both regular and jumbo bales.

(2) V-Bars (V-boards). When V-bars are used, they must be positioned at the top edge of the load beneath the tiedowns, and shall:

(i) Consist of two parallel pieces of lumber, metal, or other material not more than 12 feet in length, attached together near each end by flexible material.
V-bars more than 6 feet in length must also be attached at the approximate midpoint.

(ii) Be of sufficient length to restrain at least one-half of each bale to which they are applied. As far as is practicable, multiple tiedowns must be uniformly spaced over the entire length of a V-bar.

(iii) Be constructed using materials of strength not less than that of nominal size Douglas fir (1 inch by 3 inches).

(3) Longitudinal Tiedowns. Each longitudinal tiedown must have a working load limit of not less than 2,100 pounds, and shall be limited to the following types: chain, wire rope, manila rope, synthetic fiber rope, synthetic webbing.

(i) Each tiedown must be provided with a tightening device of a type designed for that tiedown. Binder-type tightening devices may also be used to secure longitudinal tiedowns over V-bars at the top of a load as provided in Figures 1 and 2.

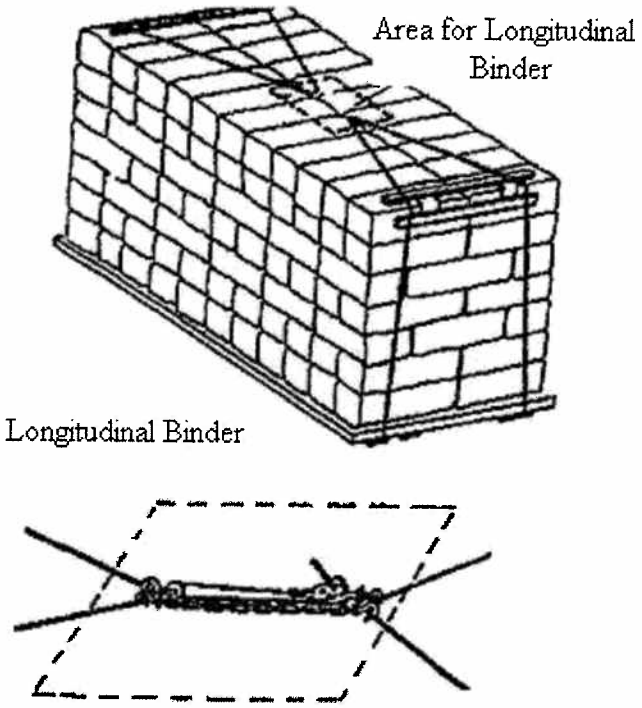


**Figure 1. Longitudinal Binder Illustration**

**Figure 2. Locking Tightener (Binder)**

(ii) If the tightening device does not meet the strength requirements for the tiedowns, additional chain or wire rope which meets such strength requirements must be used to secure the tiedowns together.

(4) Transverse (lateral) tiedowns. Each lateral tiedown used must have a minimum working load limit of 4,000 lbs. If a single tiedown does not have the required minimum working load limit, multiple tiedowns may be used, but they (a) must each have a minimum working load limit of 625 lbs, and (b) cumulatively must total the minimum lateral tiedown working load limit of 4,000 lbs. Chain, wire rope, manila rope, synthetic fiber rope, synthetic webbing may be used, and any tiedown less than 2 inches in width or diameter must be used in conjunction with V-bars to protect bale integrity.

(5) Stability of load. Loads must be well balanced and positioned on the vehicle so the load is stable without tiedowns. All loading and securement requirements must be met prior to a vehicle entering a highway and must be so maintained enroute by a periodic inspection of the load. If there is any evidence of load instability, the vehicle must be driven from the roadway and shall not again be moved on the roadway until corrective load or securement adjustments are made to conform to this Technical Review.

(6) Loss of Load.

(i) The incidental blow-off of individual stems of hay and straw shall not constitute loss of load as identified in 49 CFR 393.100(b), *Prevention against loss of load.*

(ii). The disintegration and/or loss of a complete bale, flake or cluster of hay or straw (see Figure 3 below) would constitute loss of load under 49 CFR 393.100(b), *Prevention against loss of load.*

(a) Flake - A thin piece of a rectangular bale of hay. Flakes are formed during the process of baling hay or straw into a rectangular shape.

(b) Cluster – two or more flakes of hay or straw.

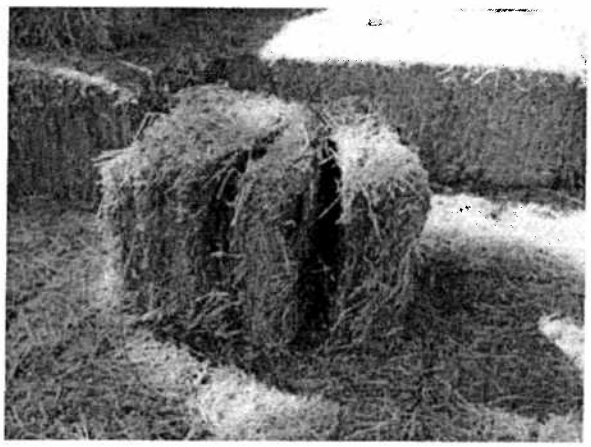

**Figure 3. Cluster of Flakes of Hay**

**(c) Construction of Loads.**

The following provisions must govern the construction of loads of baled hay and straw:

(1) Tier. Tier is defined as one layer of bales.

(2) Jumbo Bale Placement – sides of load. Loads of jumbo bales must be constructed so that the bales on the outside of the load must not be placed in the same direction in more than three successive tiers.

(3) Regular Bale Placement – sides of load. Loads of regular bales must be constructed so that the bales on the outside of the load must not be placed in the same direction in more than two successive tiers except as follows:

(i) One bale on each side of a tier may be exempt from the above requirements, up to a maximum of three tiers in succession. (See Figure 4)

(ii) To provide for machine handling, a single column of stacked bales, non-interlocked with adjacent bales, the width and height of the load may be used. The column must not be closer than 6 feet to either end of the load.
(See Figure 5).

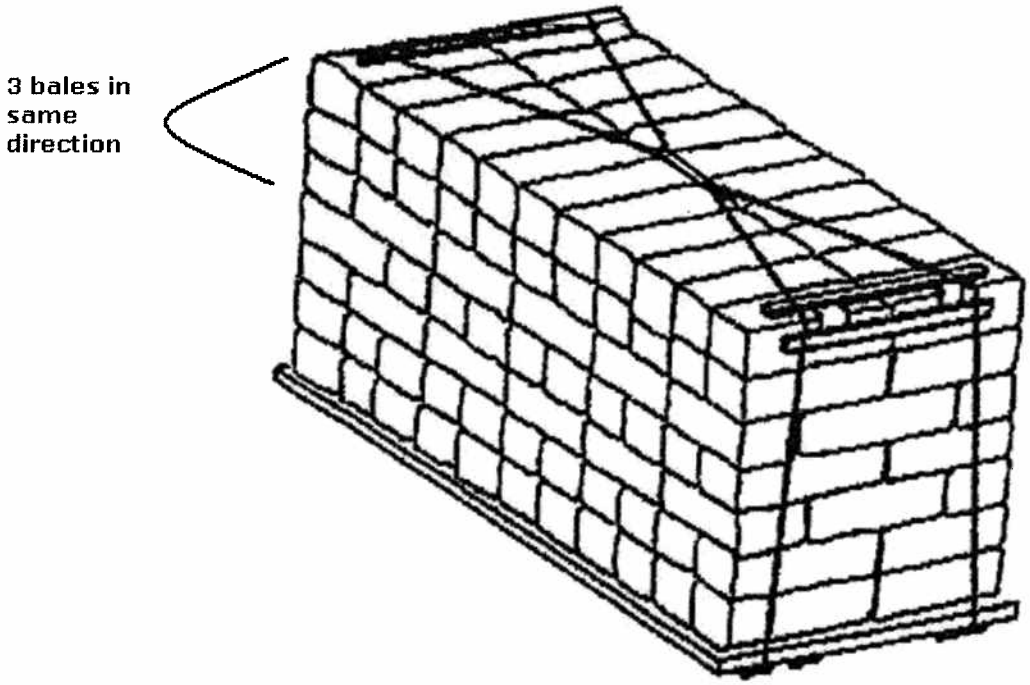


**Figure 4. Regular Bale Load**

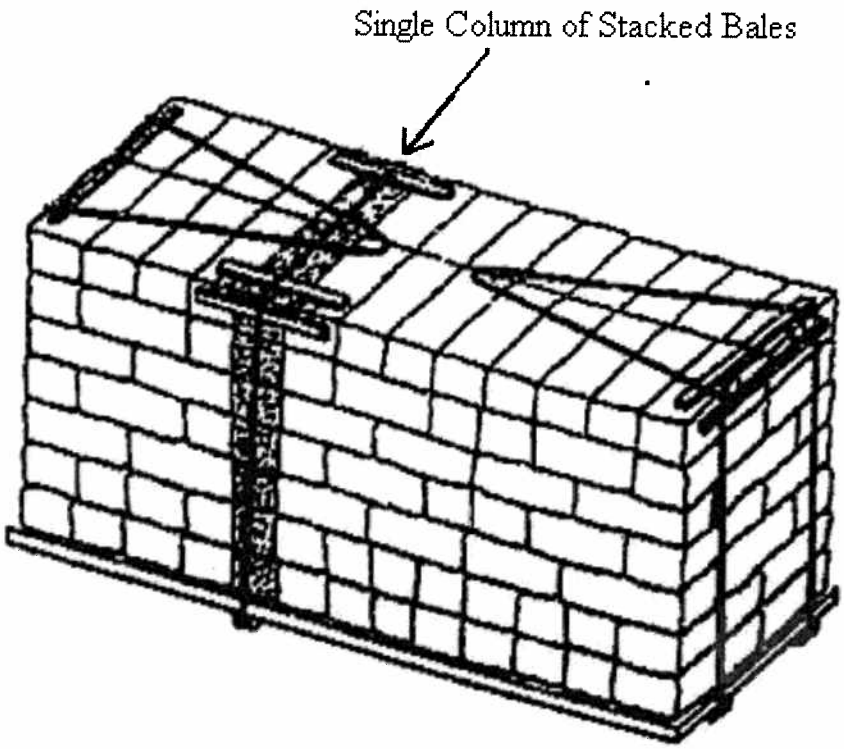


**Figure 5. Regular Bale Load with One Single Stacked Column for Machine Handling**

(3) Regular Bale Placement – Top of load. Bale lengths in the top tier of the load must be placed crosswise with respect to the vehicle's longitudinal centerline.

(4) Vertical placement of Regular Bales Prohibited. A regular bale must not be loaded vertically on its end.

(5) Load Projection – Front and Rear. Loads of regular and jumbo bales which project beyond the front and/or rear of the vehicle bed are subject to the following limitations:

(i) No portion of the load must extend beyond the vehicle bed into the area between a (a) truck and trailer, or (b) semitrailer and trailer.

(ii) Loads must not extend more than one-third bale length beyond the rear of the bed surface on (a) a single vehicle, or (b) the last vehicle in a combination of vehicles.

(iii) Loads may extend beyond the front end of the truck bed over the driver's compartment or sleeper berth if this portion of the load is (a) supported by permanent, substantial steel (or equivalent) construction and (b) tied into the remainder of the load by interlocking construction, and the load or supporting structure does not obstruct the view of the driver to the front or sides of the vehicle.

**(d) Securement of Loads.**

(1) Longitudinal Tiedowns. All loads must be secured by longitudinal tiedowns applied over V bars, using:

(i) At least two longitudinal tiedowns extending over the top of the load, attached from right front to left rear and left front to right rear so as to cross at the approximate top center of the load (Figure 6); or

(ii) One longitudinal tiedown extending over the front of the load with each end anchored on the front near the corners, and one tiedown extending over the rear of the load with each end anchored on the rear near the corners, and both tiedowns drawn together and tightened at the approximate top center of the load. (See Figures 1 and 2).

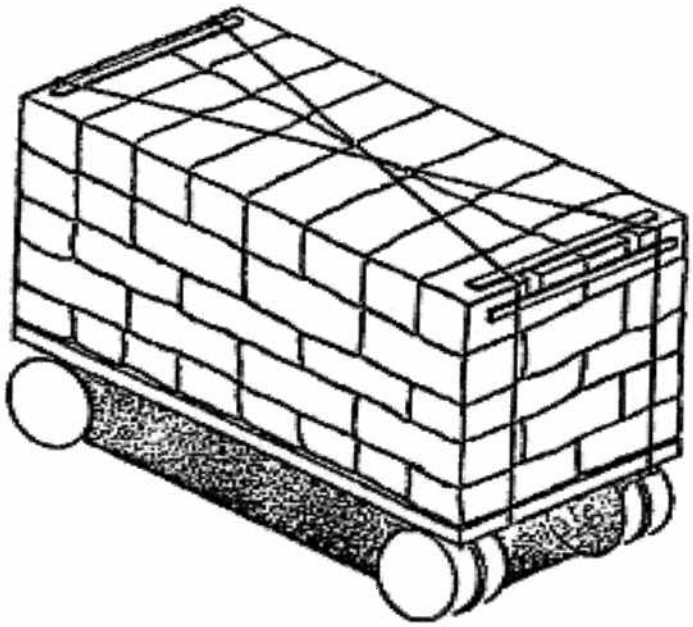

**Figure 6**

(2) Lateral tiedowns. For rectangular bales of hay or straw that are unitized using longitudinal ropes or tiedown assemblies:

(i) Trucks, trailers and semi-trailers 32 feet or less in length require the use of a minimum of one lateral tiedown placed in the approximate center of the length of the truck or trailer.

(ii) Trucks, trailers and semi-trailers greater than 32 feet in length require the use of a minimum of two lateral tiedowns which must be positioned at approximately one-third and two-thirds of the length of the truck or trailer.

(3) Additional Tiedowns. In addition to the other required tiedowns, one lateral tiedown shall be applied to a single row of regular bales stacked the width and height of the load with bale lengths crosswise to the vehicle bed. (See Figure 5)

**(e) Alternative Securement of Jumbo Bales.**

The alternate method of securement provided in this section shall apply only to bales with dimensions not less than 2 ½ by 3 ½ by 6 feet.

(1) Jumbo Bale Placement – Sides of Load. Loads of jumbo bales shall be constructed so that the outermost bales at the sides of the load must not be placed in the same direction in more than three successive tiers.

(2) Securement.

(i) V-bars are not required.

(ii) Two longitudinal tiedowns must be used to secure the load, as follows:

(iii) The ends of one tiedown shall be fastened to separate anchorages not less than 48 inches apart on the vehicle at the front of the load. The tiedown shall cross as it extends up the vertical end of the load and pass to the outside around the upper corners of the top bales, forming a loop on top of the load as shown in Figure 7.

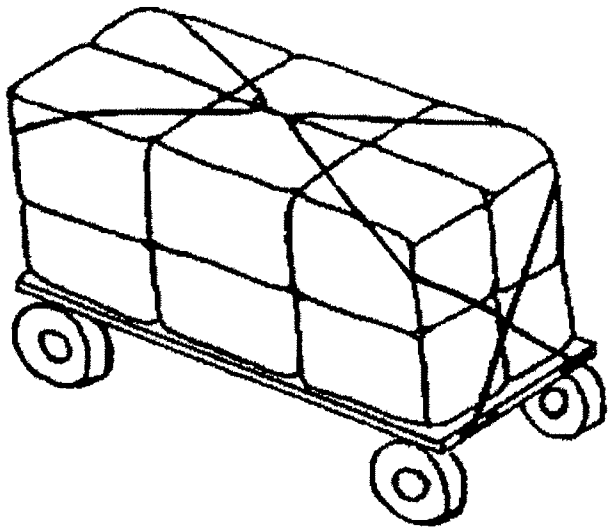

**Figure 7 Alternate Securement of Jumbo Bales**

(iv) A second tiedown must be similarly positioned over the rear of the load.

(v) The two tiedowns shall be connected near the top center of the load by a winch or ratchet-type tightening device. (Figure 2)

(vi) Lateral tiedowns.

(a) Trucks, trailers and semi-trailers 32 feet or less in length require the use of a minimum of one lateral tiedown placed in the approximate center of the length of the truck or trailer.

(b) Trucks, trailers and semi-trailers greater than 32 feet in length require the use of a minimum of two lateral tiedowns which must be positioned at approximately one-third and two-thirds of the length of the truck or trailer.