

SUMMARY

AFIA 

The Australian Fodder Industry Association

Assessment of Vehicles for the Transport of Hay and Straw



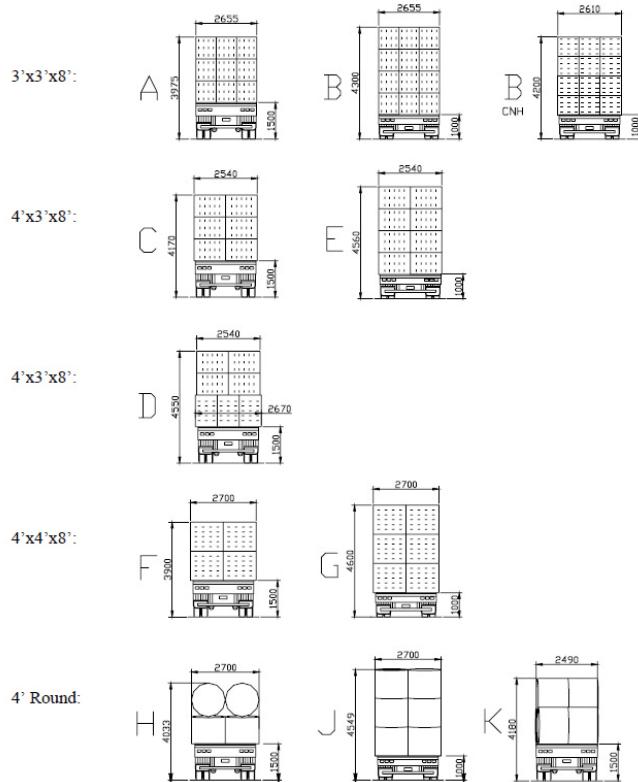
Loading configurations

ARRB Group undertook an assessment of the key safety aspects of proposed hay and straw transport methods. The assessment included the testing of various strapping methods. This document provides a summary of the key findings.

Each of the bale types was assessed in a number of loading configurations. Some of the configurations are suitable only for 'drop deck' trailers, where deck height is reduced for most of the trailer length.

Figure 1 shows the various loading configurations with key dimensions. The dashed lines indicate bale orientation by the direction of the strings.

Figure 1: Loading configurations – dimensions



Forward and aft load restraint testing

Methodology

The Load Restraint Guide (National Transport Commission and Roads and Traffic Authority, 2004) defines a set of body forces to which a load restraint system needs to be designed. Figure 2 shows the design forces for the load restraint system, with components in the lateral, longitudinal and vertical directions.

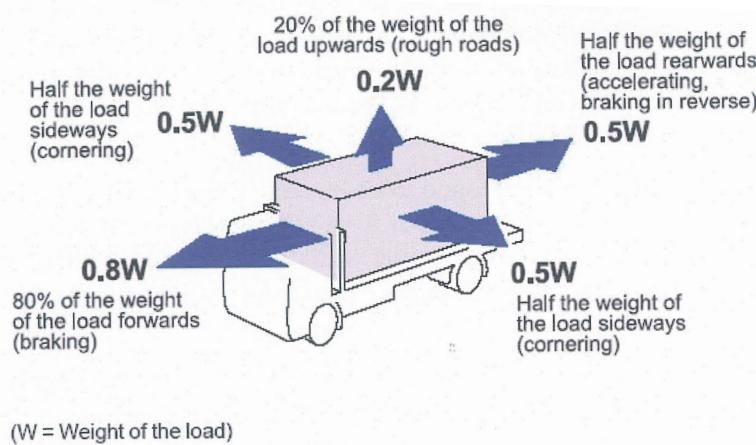


Figure 2: Design body forces for a load restraint system

Test results

The tables lists the observations of each test conducted.

Rectangular	3'x3'x8'	Four high
Strapping methods		
Double straps, belly strap		Double straps

Test Results

Rectangular	4'x3'x8'	Four high	
Strapping methods			
<i>Double straps, belly strap</i>	(	<i>Double straps</i>	(



Double straps, belly strap



Double straps

Rectangular	4'x4'x8'	Three high			
Strapping methods					
<i>Double straps, belly strap, diagonal bracing strap</i>	(	<i>Double straps, diagonal bracing strap</i>	(	<i>Single rear strap, diagonal bracing strap</i>	(



Double straps, belly strap, diagonal bracing strap

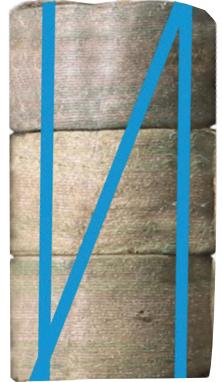


Double straps, diagonal bracing strap



Single rear strap, diagonal bracing strap

Round	5'x4'	Three high	
Strapping methods			
<i>Single strap, belly strap, diagonal bracing strap</i>	(	<i>Single strap, diagonal bracing strap</i>	(



Single strap, belly strap, diagonal bracing strap



Single strap, diagonal bracing strap

Conclusions

Lateral rigidity tests

It was found that the stability of hay trucks is not affected greatly by the load restraint method, provided the load restraint does not reduce beyond a certain minimum threshold level. That minimum threshold was found to be two straps in the case of large rectangular bales. The minimum threshold for round bales was found to be a single strap however it is recommended to restrain this strap by “double dogging” where possible.

Forward and aft load restraint

The tilt testing program demonstrated that, with appropriate restraint, compliance with the restraint requirements of the Load Restraint Guide is possible for all four of the tested bale types when stacked to not more than 4.6 metres overall height (actual overall height depends on bale type and stacking arrangement) on a drop deck trailer. This includes 4'x4'x8' rectangular bales at 2.7 metres wide and 5'x4' round bales at 3 metres wide.

In all cases, the level of load restraint was gradually reduced with each successive test. It was found that, for each bale type, compliance was demonstrated with a reduced level of restraint. Each bale type was tested with continually decreasing restraint until instability caused the test to be stopped.

Of particular importance was the finding that all loads could satisfy Load Restraint Guide requirements for rearward body load (0.5 g) without the use of rear gates. This is a major finding that implies considerable benefits for the hay and straw cartage industries.

It was found that the use of a diagonal bracing strap provided a considerable improvement to load stability. It is strongly recommended that diagonal bracing is considered for at least the front and rear groups of bales on a trailer, with the bracing pulling towards the centre of the trailer. Alternatively, diagonally bracing all groups of bales is acceptable. Figure 3 demonstrates examples of these recommendations.

PBS assessment

The performance of nine vehicles and five loading configurations was assessed. In general performance was good, but for a small number of vehicles and loading configurations the extra width of the payloads resulted in some standards being difficult to satisfy, on geometric grounds. Good performance of the vehicles in a stability sense is most strongly attributable to the low mass of most of the loading configurations.

The use of protective ‘angles’

The tests completed by ARRB used conventional strapping techniques without the use of protective ‘angles’. The testing confirmed that edge protectors are unnecessary to adequately restrain hay and are not a requirement.

Vehicle tilt test

A physical lateral tilt test of a load of hay (C/E) on a 45° drop-deck semi-trailer with air suspension was conducted. This demonstrated the validity of the SRT results determined by simulation, and also demonstrated the effectiveness of two straps in meeting the load restraint requirements.



Figure 3: Diagonal bracing recommendations

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