SECTION I

How to Certify a Load Restraint System

CONTENTS

This section contains general information on the selection of a competent person to design and/or certify a load restraint system, on the methods of testing and on the production of appropriate documentation. The purpose of certifying a load restraint system is to ensure that it meets the load restraint Performance Standards.

Documentation of loading and load restraint procedures will enable the consignor of goods, the person in charge of loading, the vehicle owner, the driver and enforcement personnel to verify whether a load complies with loading Regulations.

1 WHO SHOULD DO THE DESIGN AND CHECKING?

Only a person with appropriate skills and experience should assess and certify a load restraint system. Normally a mechanical engineer with full membership of the Institute of Engineers Australia should be chosen. The person should have an understanding of vehicle design and detailed knowledge of load restraint issues. A person with these qualifications and background should be accepted as an 'expert witness' to represent a client in Court.

2 SUGGESTED METHODS OF TESTING A LOAD RESTRAINT SYSTEM

Consider whether the type of vehicle(s) is appropriate to carry the load by consulting with the manufacturer if necessary.

Consider whether the lashing(s) used is appropriate for the load and the type of operating environment. For instance, will the elasticity of a lashing be an advantage or disadvantage?

Care should be taken in testing of load restraint systems because of the possibility of the sudden release of stored energy in the load, lashings or testing apparatus, if an unexpected failure occurs.

2.1 Tie-down System

Where tie-down is used and the system is meant for a range of vehicles or for use in a vehicle fleet, ensure that all vehicles will perform the same when loaded having regard to the friction coefficient over the load space and the restraint attachment points. For instance, steel, aluminum and timber decks might be fitted to different vehicles in a fleet.

Where there could be differences of friction coefficient or weight due to packaging variances or component specifications, ensure that the test load chosen is the worst case. Any report or procedure should accurately describe the product or the load type.

If the load type is in layers or stacked, the performance of the stacking method in the pack must be assessed as well as the performance of the load as a whole.

Friction testing should be performed on the unsecured load by either:

Tilting it until the load slips, or;

Pushing or pulling the load until the load slips.

All tie-down systems where lashings are tensioned by load shift (Section F.3.7 page 198), should be physically tested to evaluate the load restraint forces and the behaviour of the load.

The initial physical tests should be vehicle braking tests.

Where braking tests cannot replicate 0.8 'g' deceleration of the vehicle, the actual forces must be calculated using the results of the actual tests as a basis for the certification.

2.2 Direct Restraint System (Attachment, Blocking, Containment)

Direct load restraint systems can be assessed by calculation provided the calculations take into account the true operating conditions and methods of attachment.

The integrity of a pack which is strapped or wrapped, or uses tie-down to unitise the individual items, should be checked by restraining the base and tilting it to the equivalent angles of the Performance Standards (also see Section F.5 page 200).

All direct restraint systems, where movement is permitted (see Section F.1, page 186) Performance Standards, should be physically tested.

Where containment systems are used without any tie-down, the load(s) should be placed on rollers or similar for testing, to negate the effect of friction under and between parts of the load. In a containment system where there is no tie-down, it must be assumed friction is zero as the load can leave the deck over bumps.

As coaming rails are not high enough to guarantee horizontal restraint of a load that is not tied down, care must be taken to ensure they are not in contact with the load during testing.

The following are several basic methods of testing direct restraint systems:

Horizontal Force - Forces could be applied to the restraint system to test its capacity, by pushing against it with objects simulating the loads to be carried. The force can be applied through mechanical, hydraulic or pneumatic (cylinder or air-bag) methods.

Vertical Force - The vehicle or body could be tipped on its side and half (0.5 'g') the load placed on top of the side restraint system or tipped on end and 80% (0.8 'g') of the load placed on top of the front restraint system.

Tilting - The vehicle could be tilted sideways at 30° or endways at 53° and the load placed on rollers or vibrated to simulate road shocks and vibration.

The following are ways of testing each type of load for sideways restraint:

(i) Stable and Unstable Single Loads

Vehicle horizontal, load on rollers pushed against side restraint structure.

Vehicle tilted at 30°, load on rollers.

(ii) Stacked Loads

Vehicle horizontal, load stacked using slippery separators, load pushed evenly against side restraint structure, using appropriate force distribution system (hydraulics, pneumatics, air bladder etc).

Vehicle on side, half load stacked on side restraint structure, load vibrated.

Vehicle tilted at 30°, load stacked using slippery separators, load vibrated.

(iii) Loose Bulk Loads

Vehicle horizontal, load pushed evenly against side restraint structure, using appropriate force distribution system (rigid longitudinal panel, air bladder etc against load or side restraint structure).

Vehicle on side, half load stacked on side restraint structure, load vibrated.

Vehicle tilted at 30°, load vibrated.

Similar test methods can be used for forward and rearward restraint with appropriate 0.8 'g' and 0.5 'g' force simulation and 53° and 30° tilt angles.

The deflection of the restraint system will limit the capacity for restraining many loads. In the absence of any test data or guidelines on allowable load shift for the different types of load, the maximum sideways deflection of the restraint system including side curtains should be limited to 100 mm.

3 REPORTING

A report on a load restraint system should include:

(i) A description of the load type and any unitising system used.

(ii) A description of the restraint method used including the type of lashing, the size (e.g. 50 mm wide, 8 mm diameter etc.) and any identifying features.

(iii) Where the system uses tie-down, the type of friction surfaces or friction material the system has been designed to use and the design tension in the lashing(s).

(iv) The existence and specification of any interlayer packing.

(v) The method of stacking the load.

(vi) If the system is a direct method, the location of the attachment points should be accurately described and where appropriate, accurate dimensions given.

(vii) A drawing showing the load type and the restraint system should be prepared. This should be used by the vehicle driver to ensure that the load is restrained in the same manner as tested.

(viii) A statement describing any maintenance schedule, safety precautions, tensioning or retensioning procedures and other special requirements.

(ix) Relevant particulars of the person certifying the load restraint system.

4 RECORDS

Copies of all calculations, test results and equipment data should be retained for future reference by all relevant parties.

5 OTHER

The registration authorities in each State and Territory usually have a list of qualified persons who can carry out engineering work. Ensure that any person chosen is qualified and has the experience to do the work.

Persons designing a load restraint system should also contact the authorities in each State or Territory (Section J.4 page 253) to check if any special requirements apply which are not in this guide including dangerous goods and occupational health and safety.

6 LOADING AND LOAD RESTRAINT PROCEDURES

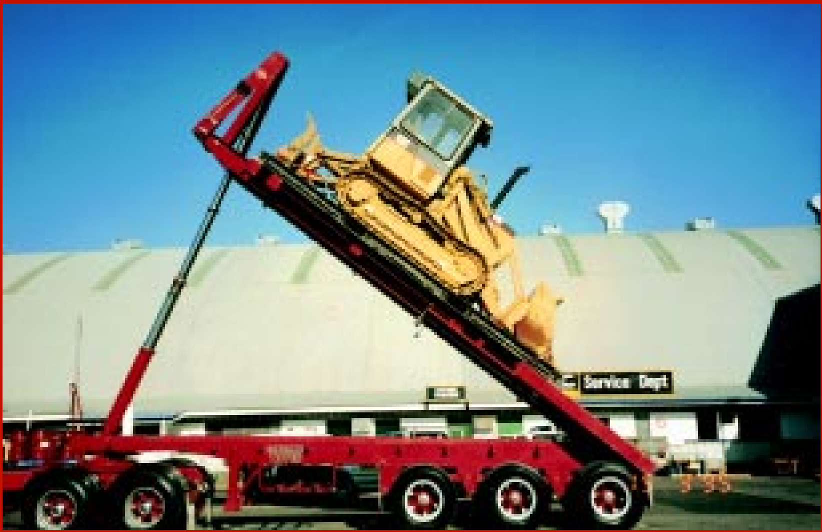
A loading and load restraint procedure document should be prepared for use by consignors, loading staff, vehicle owners, operators, drivers, enforcement personnel and unloading staff as appropriate.

The document should contain all information necessary to enable a vehicle to be loaded and the load restrained to meet the Regulation performance standards.

Tilt testing a cotton bale packing arrangement.

Testing the friction by tilting the load and measuring the angle at the point it just slides. The test is for both the friction between the bales and the bales and the deck.

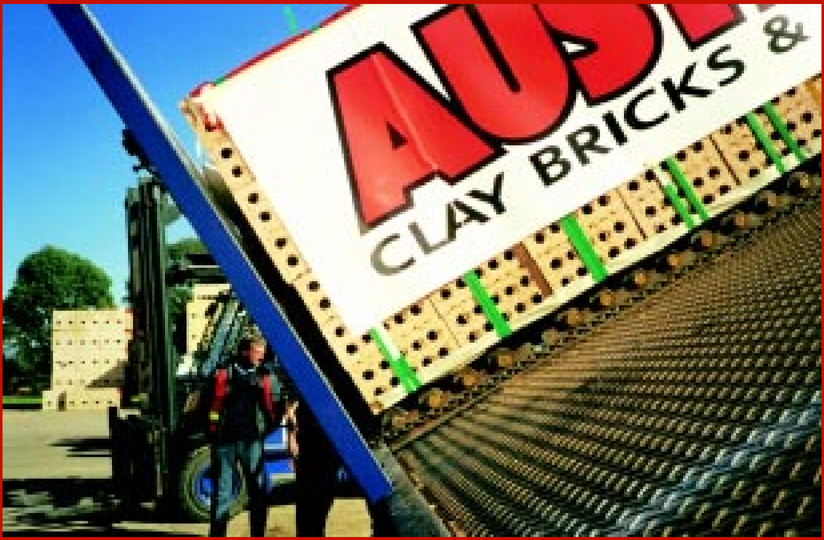
Another method for testing friction by first weighing the load and then measuring the force needed to just slide it on the deck of the truck. The forklift tractor provides the pulling force and a load cell fitted to a chain between the tractor and hay bale reads the pulling force.



Test of a restraint system for a tracked loader. *(Photo courtesy Loadsafe Australia).*

A good attempt, but these chains will not hold this 26 tonne roll of steel cable. A better system, which is also easier, would be to use a properly designed cradle (see Section G.7, page 214).

This photo is a view of the back of the driver's cabin of a prime mover. It was damaged by a tractor that was being carried on a low loader. When the prime mover braked, the tractor rolled forward, up and over the 'goose neck' onto the cabin.



If a load is not restrained in the vertical direction to 20% of its weight, it must be assumed that it can move. Friction cannot be taken into account. This photo shows a test of a gate as part of a containment system. The bricks are on rollers so their full force is applied to the gate. *(Photo courtesy Loadsafe Australia).*

This car hit a hay bale that fell off a truck. Note that the roof has been bent by the impact. *(Photo courtesy Border Mail).*