

Eagle Canvas Load Restraint Curtain Load Rating Certification

Keith Batten & Assoc, May 2010 Amended 17 August 2012 by K Batten

Certification

Eagle Load Restraint Curtains are designed for after-market applications and tested in accordance with the Load Restraint Guide 2004. However, because of the variations in truck body designs each application must be rated individually according to the guidelines set out in this document.

How load restraint is achieved

The Load Restraint Guide 2004, Section 5 - p 212, requires that the sideways deflection (bulge) of any part of the curtain be limited to maximum 100 mm when the physical load is forced into the curtain with a force equivalent to 50% of its weight.

A standard side curtain has limited load capacity due to stretch of the reinforcing webbing straps built into the curtains. The 100 mm maximum side deflection occurs before any useful load rating has been achieved.

The improved load rating of the Eagle Load Restraint Curtain has been achieved by the addition of stiff but flexible reinforcing loops in place of the previous webbing straps.

As described in the Load Restraint Guide 2004, Section 4.8- p 77, any bulging of the curtain causes the curtain to pull down on the roof and upwards on the coaming rails. The more flexible the roof beam and coaming rail the more the curtain will bulge under load – and the lower the load rating according to the standard test. Notes for body builders seeking to reduce flexibility in an efficient manner are included at attachment 1.

Test configuration

The Eagle Load Restraint Curtain was tested on a frame of similar design to that of a commercial truck body. The test load approximated a standard pallet configuration and was supported on rollers as required according to the Load Restraint Guide 2004. The frame was tilted to 30 degrees to generate a force of 0.5 g times the rated load into the side of the curtain. In all cases the load was positioned equally across two curtain reinforcements.

Several steel and aluminium section roof beams were tested. The coaming rail was a common construction incorporating a 75 mm tapered flange channel on its side with cross members at 600 centres.

Table 1 below gives the certified load rating for a range of roof beams and components.

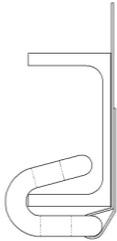
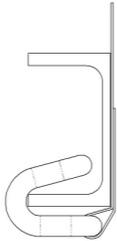
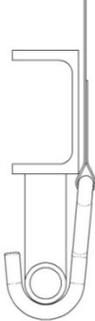
Components (minimum requirement)	1.2 Tonne load rating per pallet space – note 1	1.0 Tonne load rating per pallet space – note 1	0.75 Tonne load rating per pallet space – note 1
Roof rail	(1) 100x50x3 RHS Gr 350 standing upright (see dwg 1004) with 2.9 m maximum between vertical posts or, (2) 100x50x3.5 RHS Gr 350 (see dwg 1004) with 3.1 m max between vertical post supports. (3) Aluminium extrusion Type A or Type B (see Table 2) with 3.1 m maximum between vertical post supports	100x50x3 RHS Gr 350 standing upright (see dwg 1004) with 3.1 m maximum between vertical post supports.	Aluminium extrusion Type C (see table 2)
Buckle and webbing	Buckle and webbing – Eagle part 6132-20	Buckle and webbing – Eagle part 6105	Buckle and webbing – Eagle part 6105
Coaming rail/ tie rail connection	Strap and Hook (Coaming Rail) Eagle part 6117 	Strap and Hook (Coaming Rail) Eagle part 6117 	Strap and Hook (Tie rail) Eagle part 6116 
Coaming rail	75 tapered flange channel with cross members min 50x50x 3 SHS welded in at 600 centres	As for 1.2 T rating	As for 1.2 T rating

Table 1 – Minimum component requirements for certified load ratings.

Maintenance

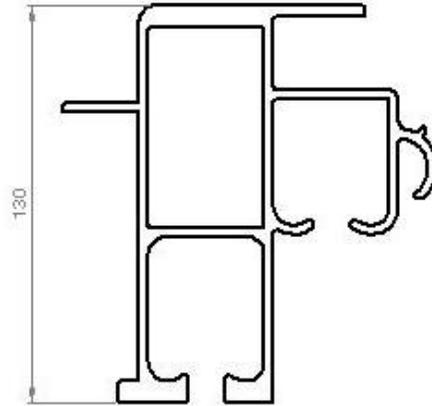
The load ratings above apply provided:

- The truck body is constructed using good work practices and its integrity is maintained.
- The curtain equipment is maintained in good order and worn components are replaced.

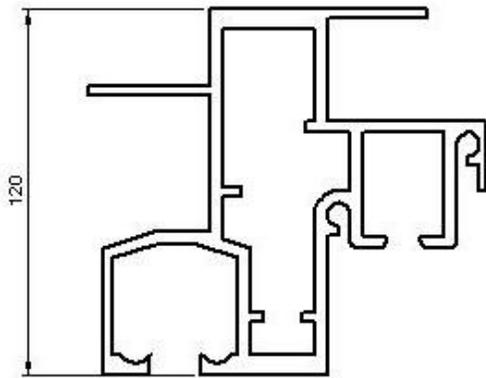
Roof beam identification



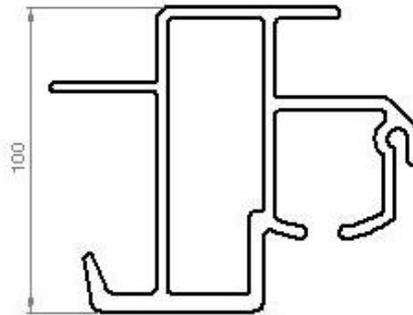
100 x 50 x 3 RHS (Steel)
 $I_{xx} = 1,090,000 \text{ mm}^4$
Multiply I_{xx} by 3 to compare with
stiffness of aluminium sections



Type A Aluminium Extrusion
 $I_{xx} = 3,700,000 \text{ mm}^4$



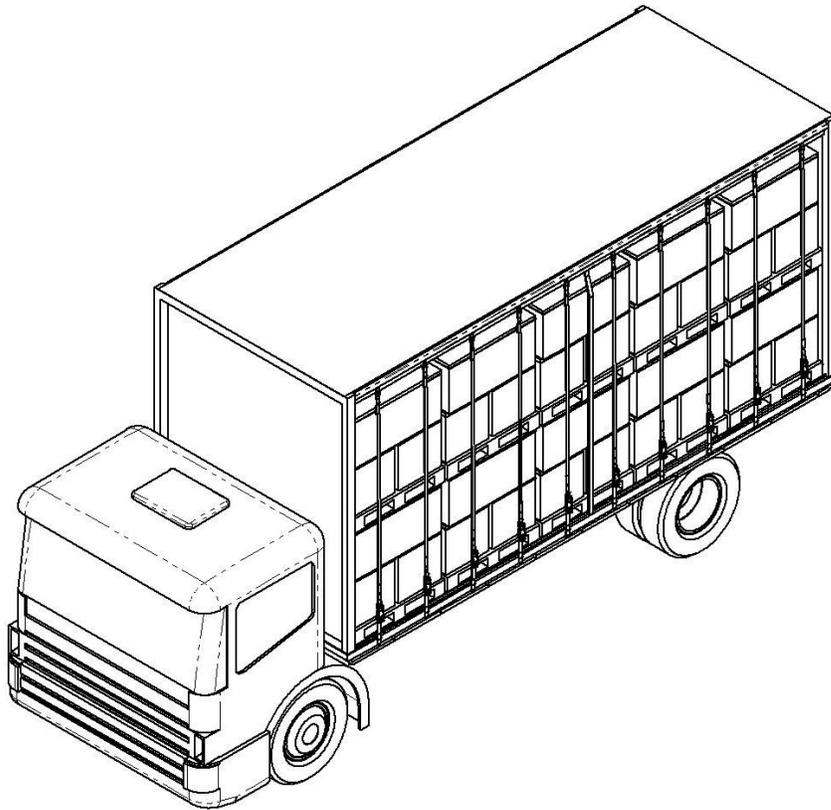
Type B Aluminium Extrusion
 $I_{xx} = 3,600,000 \text{ mm}^4$



Type C Aluminium Extrusion
 $I_{xx} = 2,300,000 \text{ mm}^4$

Table 2: Identification of Roof Beams

Note 1 – Pallet space and allowable load height



A pallet space is the floor area taken by a pallet whether loaded one or two pallets high. This truck is loaded with 20 pallets (10 each side). There are 10 pallet spaces (5 each side).

The load in each pallet space may be 1 or 2 pallets high with the lower pallet carrying at least 50% of the rated load.

Essential Requirements

The certification is valid only for the configurations and components shown in Table 1.

The Load Restraint Guide 2004 Section 7 – p140 notes that certified (load restraint) curtains can be used to contain a load that has been adequately unitized or secured to a pallet.

Certified curtain sides are designed primarily to contain pallet loads and unitized loads. For a body designed for carrying pallets, the curtain restraint members shall be fitted at 600 centres such that a standard pallet will be restrained evenly by two curtain restraint straps as shown on the figure of the loaded truck above. The first curtain restraint should be 300 from the front of the body (load board), and successive restraints at 900, 1500, 2100, 2700, 3300, 3900, 4500, 5100, 5700. The tolerance with

respect to positioning any restraint is 50 mm from the positions nominated above. This tolerance is absolute and must not accumulate from one restraint to the next.

If any other configuration is to be contemplated, each pallet must be constrained by two curtain restraint straps and the load must be constrained from moving forwards or rearwards by the use of load bars or similar devices.

Any unitized loads not on pallets must also be arranged such that the rated load is taken evenly by at least two curtain restraint members. Failure to do this could result in the load spearing out between the restraint members during transport. Where a unitized load cannot be restrained effectively by the load rated curtain the load must then be restrained by other means.

The Load Restraint Guide 2004 notes that contained loads should be tightly packed together within the curtains to prevent fore, aft, and side movement. Load separators such as empty pallets, tyres, shoring bars or dunnage can be used to restrain individual items.

The Guide also notes that consignors of unitized loads should ensure that the size of the packs and the unitizing method is appropriate to maintain the pack integrity. If the unitizing were to fail during transport the load could be dislodged from the vehicle. Where there is a possibility that items can dislodge from a pack, additional restraint including as blocking or containment must be used.

Where the load is to be stacked more than one pallet high the lighter pallet should be loaded on top. High friction material should be used between stacked pallets to prevent load movement.

Note that the requirements of the Load Restraint Guide 2004 prevail in the event there is inconsistency between the Guide and the information given in this document.



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Attachment 1

Truck body builder notes

The load rating of a truck side curtain is limited by the flexibility of the roof beam and coaming rail. Any application of load into the curtain will cause the roof beam to bend down and the coaming rail to bend up. In practice the flexibility of the roof beam and coaming rail is the significant factor that limits the achievable load rating.

The following notes are included for body builders seeking to increase the stiffness of the body (and load rating) without a significant weight penalty:

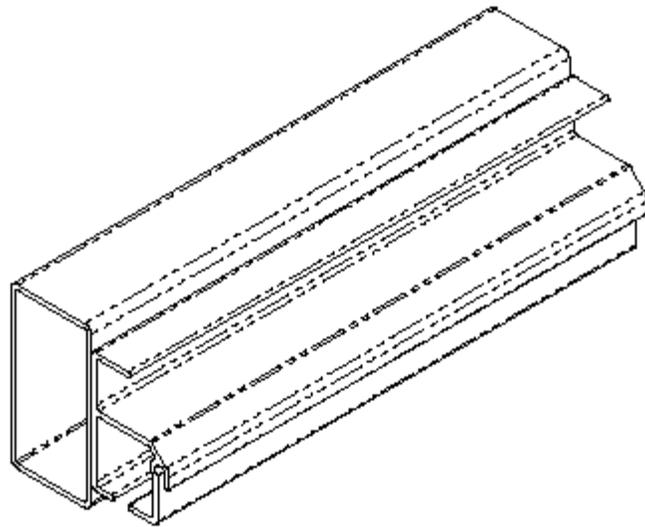
- Steel beams will not necessarily produce a weight disadvantage over aluminium. An aluminium beam weighs 1/3 that of an equal size steel beam but will deflect 3 times that of the steel beam under the same load independent of the tensile strength of either material. Steel beams of appropriate section for the task can be weight efficient.
- Adding additional roof support posts is an efficient approach to reducing the deflection of the roof beam and coaming rail and improving the curtain load rating. Deflection of a beam is proportional to its length cubed. Halving the effective length of a beam loaded at its centre will reduce deflection to 1/8.
- An efficient approach to improving the stiffness of steel roof beams is to weld in a reinforcing section under the existing beam. For example, welding in a stiffener beam of equal section to the existing beam (doubling the height of the existing beam) will increase the stiffness by 5 times.

In Table 1 of the certification, higher ratings have been assigned to the curtains where stiffer roof beams are used. The deflection of a beam is inversely proportional to the factor I_{xx} which is included in the table for the various beams considered. Because steel is a stiffer material than aluminium the factor for the steel beams should be multiplied by 3 for comparison with aluminium beams.

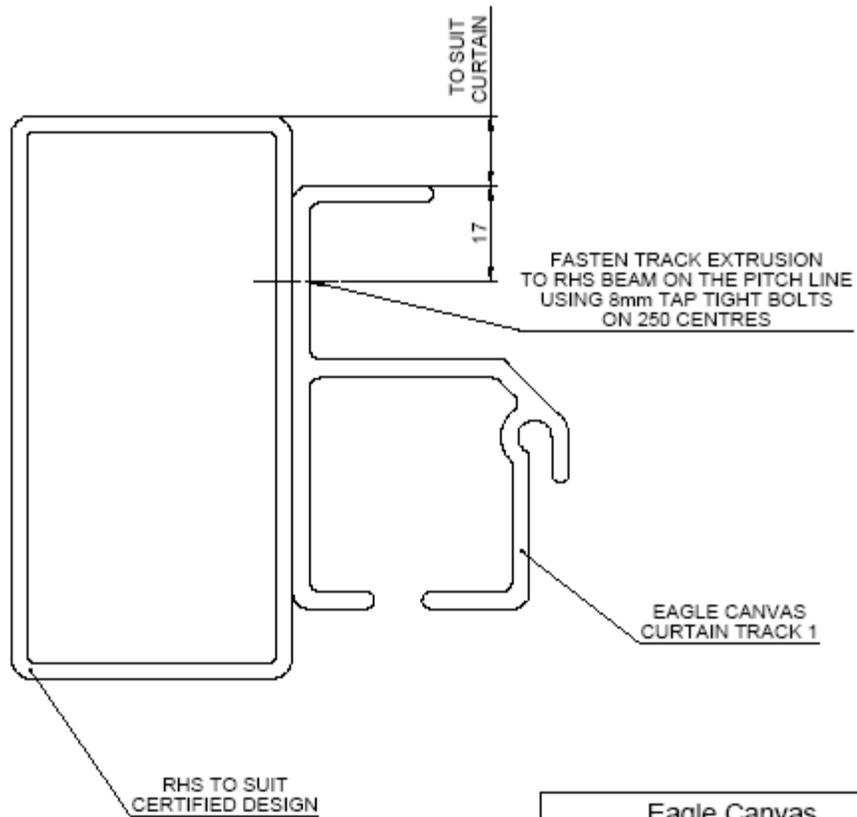
Be wary when comparing the advertised load ratings for competitor's load curtains. All curtains on the market are similar in that they replace the flexible webbing straps common to non-load curtains with a stiffer material (steel cable, Kevlar strap, chain, or fibre glass strips). The flexibility of the roof beam and coaming rail is the weak link and in practical terms will contribute significantly more deflection than that associated with the reinforced curtain. In practice, that the rating of all well-designed curtains should be roughly equal when applied to a common body construction.

The ratings assigned by the larger semi trailer manufacturers are considered reliable, about 1 tonne or more per pallet space with spaces between roof supports of 2.9 to 3.1 metres. These curtains have been tested using a whole body model so that the flexibility of the body is taken into account as required by the Load Restraint Guide 2004. Ratings of other curtains may be less reliable especially when the nominated spacing between roof supports exceeds 3.1 metres and when the detailed construction of the body has not been tested.

Keith Batten



PARTIAL ISOMETRIC VIEW



Eagle Canvas
Roof Beam &
Curtain Track
Drawing No. 1004
Drawn RAW - 27/04/10
Approved - KB 27/04/10

