

Report Reference: BTK16-10-10

# ENGINEERING TEST REPORT

*DOTARS TEST FACILITY NUMBER T02348*

## LOAD RESTRAINT OF COTTON BALES – COLLIER AND MILLER CRUSH APPLICATION TO 8 BALE SEMI AND 5 BALE A-TRAILER

Report Prepared For:

**Collier and Miller Pty Ltd  
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Oct 19<sup>th</sup>, 2016

Report Prepared By:

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Original testing carried out at  
Wagga Mobile Cranes, 7-9 Pearson St, Wagga Wagga NSW 2650  
19<sup>th</sup> Nov, 2014

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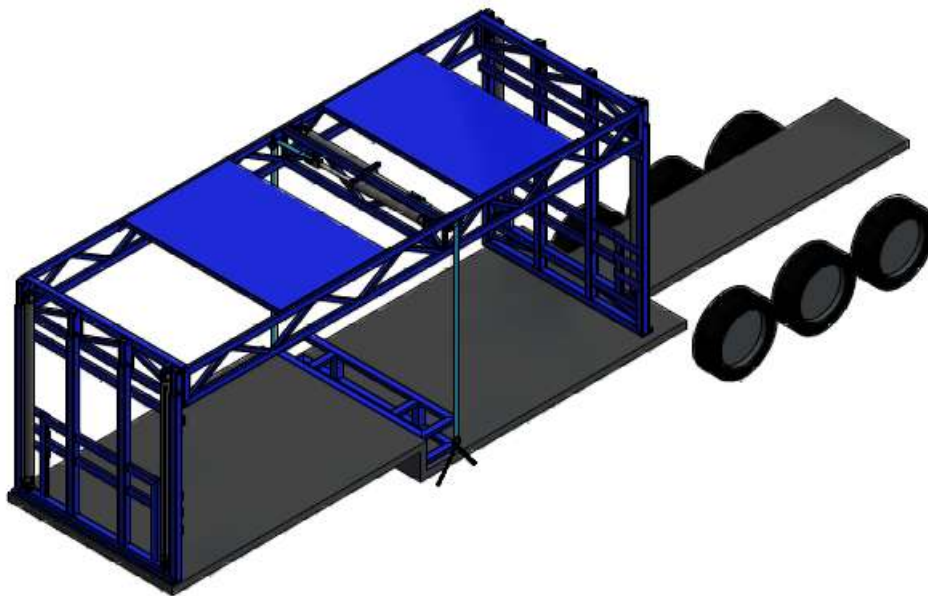
- 1. Summary
  - 2. Vehicle and Load Details – A trailer and Eight Bale combination
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**1. SUMMARY:**

- 1.1 This report is an extension of the previous examination and certification of a nine cotton bale semi trailer to include the design of a five bale A-trailer, and alternative eight bale B-trailer. Refer to Bisitecniks reports BTK14-12-01 “Cotton Bale Crush Restraint System” and BTK16-05-11 “FEA Report – Cotton Crush Roof Structure”.
- 1.2 Subject to the specified location of the removed bale, the nine cotton bale semi trailer design is certified to carry eight bales.
- 1.3 A modified Certificate of Compliance is issued as an appendix to accommodate all three combinations.
- 1.4 The design elements of the original nine bale trailer are retained in both the five bale A-trailer and eight bale B-trailer.

**2. VEHICLE and LOAD DETAILS:**

2.1 A-TRAILER.




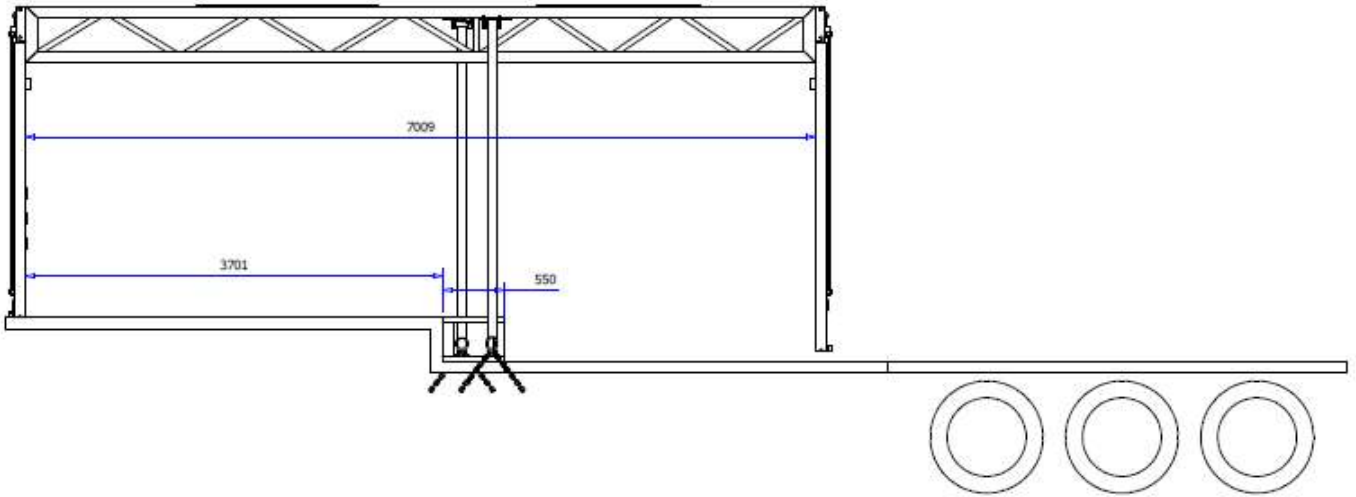
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 Collier & Miller Engineering			A Trailer Cotton Crush	
			Edition	Sheet 1 / 2

Diagram 1 – 3D view of A-trailer showing drop deck, front and rear rams, and central ram hold down.



*Diagram 2 – Profile of A-trailer, showing overall longitudinal load space dimension of crush is 7009 mm – i.e. approximately half the structure of the previously certified semi trailer.*

*Photograph 1 – Loaded A trailer with crush engaged, showing central horizontal rams and central tie down to same specification as tested semi trailer.*



*Photograph 2 – A trailer being loaded, showing end vertical rams and 45° check chains to same specification as tested semi trailer.*



**2.2. LOAD RESTRAINT DETAILS A-TRAILER:**

LOAD RESTRAINT MECHANISM	Superstructure with four vertical Norden NI rams with 3.5” bore and 2” rods (or equivalent), and two central horizontal Norden NA35A36 hydraulic rams (or equivalent) fitted with hydraulic lock valves.
SUPPORT CHAINS STRUCTURE	Chain restraints at approximately 45 degrees at head and tail boards. Lattice structure, component sections, bracing and reinforcement items remain same as the semi trailer crush previously tested.
DIMENSIONS	Only change is that the total longitudinal span is approximately half that of the crush previously tested thus the deflection of the beam will be 1/8 of the original at the same load .

- 2.2.1 The overhead frame has full width plates located where the bales in the upper row lie (see photograph 2) and is raised and lowered by a hydraulic ram at each corner of the trailer.
- 2.2.2 Two more rams are located laterally at the centre of the frame and crush the load by acting on the blue webbing straps and chain visible across the central bale in the bottom layer. (Photograph 1).
- 2.2.3 The head and tailboards are braced with a chain passed over two brackets on the outside.
- 2.2.4 Refer to Bisitecniks report BTK14-12-01 for detail of the rams and ancillary fittings.

**2.3 REDUCTION FROM NINE TO EIGHT BALES – SEMI TRAILER**

- 2.3.1 In the case of some trailers with the Collier and Miller design cotton bale crush it is desirable to reduce the overall loaded trailer weight by eliminating one bale from the load as tested.
- 2.3.2 The bale eliminated must be from the top row; either the bale immediately in front of or behind the central ram operated tie down as shown in photographs 3 and 4.
- 2.3.3 Such loading is required to maintain the clamping restraint on the bales in the bottom row as per the original test.



*Photograph 3 – Bale removed from behind the central tie down.*



*Photograph 4 – Bale removed from in front of the central tie down.*

### **3. TEST METHOD AND RESULTS:**

The load restraint of the original laden semi trailer was tested by tilting– see BTK14-12-01.

1. Test - tilt direction	2. Maximum tilt angle measured (degrees)	3. g force (Calculated from column 2)	4. Restraint of load
Lateral	31.3	0.520	Yes
Forward	55.5	0.824	Yes
Rearward	31.2	0.518	Yes
Upward	See note below:		Yes

Note:

In the FEA simulation of the structure of the crush and the full trailer width plates above the individual top layer bales, the assumed loading far exceeded the requirement of an upward restraint equivalent to 0.2g.

### **4. REFERENCES:**

1. NTC Australia, "Load restraint Guide" Second edition 2004.
2. Cotton Australia, "Cotton Australia Fact Sheet Transportation of Round Modules", 2013
3. BTK14-12-01 "Cotton Bale Crush restraint System".
4. BTK16-05-11 "FEA Report – Cotton Crush Roof Structure".

**CERTIFICATE of COMPLIANCE:**

This certificate is issued using the 0.8g forward, 0.5g lateral and rearward and 0.2g upward performance requirements "Load Restraint Guide", 2<sup>nd</sup> Edition, 2004 National Transport Commission, Australia, and VDI 2700 (Verein Deutscher Ingenieure – Association of German Engineers).

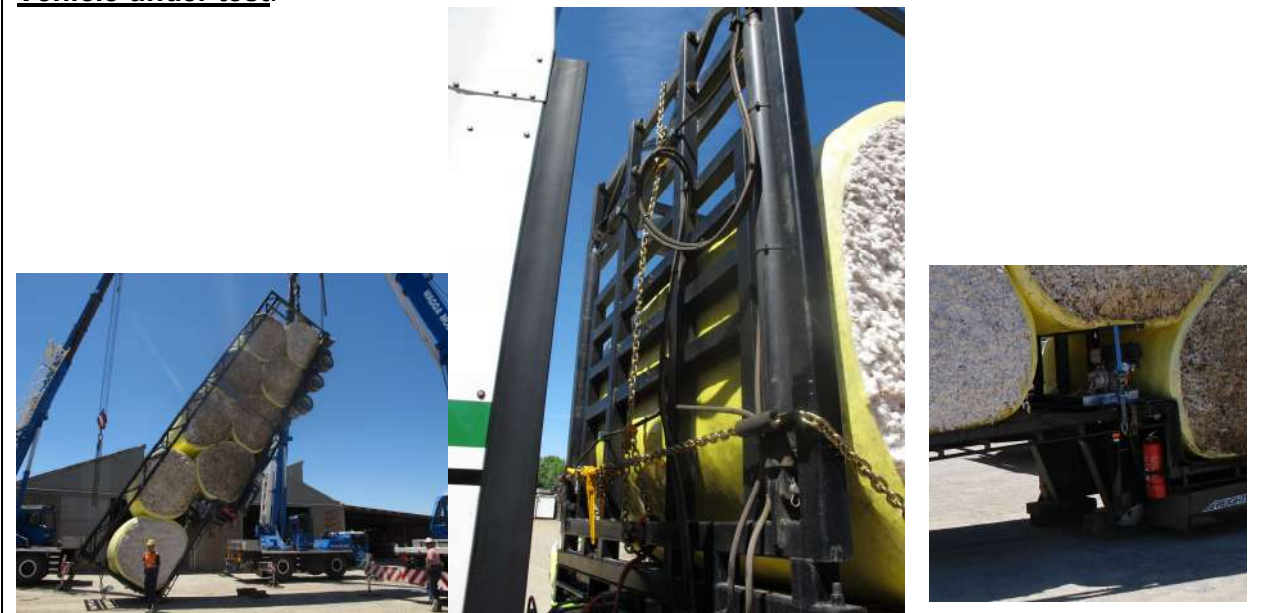
**Vehicle Details:**

Generic drop deck triaxle A and B trailers with specialised cotton bale crush restraint: Design by Collier and Miller Engineering

**Load & Restraint Details:**

Maximum loading and minimum loading. A trailer	The loading rate shall consist of five standard cotton bales or modules. The system will not accommodate fewer bales.
Maximum loading and minimum loading. B trailer	The loading rate shall consist of nine standard cotton bales or modules. One bale may be optionally removed from the central position top row adjacent to the central tie down. The system will not accommodate less than 8 bales.
Load binder chains	Head boards and Tailboards to be supplemented by 45 degree chains located as shown below (centre).
Second bale B trailer.	To be supported by stand rated at 3500kg, shown below. Note lip of stand must be engaged over raised deck rear edge to act as additional load restraint.

**Vehicle under test:**



The above load restraint system has been tested and assessed to meet the performance requirement for restraining the load as specified for a static forward force of 0.8g, a lateral force of 0.5g, a rearward force of 0.5g, and upward restraining force of 0.2g.

Certificate Approved By:

Keith Mackinlay - MIEAust, CPEng

Bisitecniks Pty. Ltd.

Certificate number:

Date: 19<sup>th</sup> October, 2016

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