




**Deton Engineering – Risk Assessment**

**Automatic Hopper Coupler**



# Deton Engineering - Risk Assessment

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## 1. Introduction to the Deton Group of Companies

Deton Engineering (Pty) Ltd., was established in 1973 by Hercules du Preez, the first product being the Hercules Jack for mining applications.

From this date, Deton Engineering has specialised in the production of products with safety and efficiency in mind, especially for applications in the Mining and Industrial industries. The Deton Group is continuously focussed on the monitoring and improvement of production, reduced downtime, improved safety, and the servicing and support of our products which has made Deton a leader in its field.

Within the Deton Group of Companies are the following companies whose processes are incorporated in our Quality Management System –

**Deton Engineering (Pty) Ltd.** – Deton Engineering manufactures Jacks, Rail Benders, Snatch Blocks, Pulleys, Hercules Jack and related products for the Mining and Industrial markets.

**Wearresist SA (Pty) Ltd.** – Wearresist manufactures, sells and applies a range of wear-resistant coatings, based upon a resin matrix with a 90% alumina content, targeted at the Mining and Industrial markets.

**Ceramic Linings (Pty) Ltd.** – Ceramic Linings manufacture and market alumina ceramic tiles for high abrasion, high impact and high temperature applications. The products compliment the Wearresist products and can be used in conjunction in such environments.

**Cutlass Products (Pty) Ltd.** – Cutlass manufacture and market a range of corrosion and abrasion resistant products, aimed at the general Industrial market.

**Densit S.A. (Pty) Ltd.** – Densit supplies and applies a range of branded wear-resistant products to the general industrial markets, under license from Densit Norway.



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## 2. Details of Deton Engineering

This Risk Assessment refers to our Alberton based Head Office and Workshops, the details of which are –

6 Barium Street  
Alrode Ext. 7  
Alberton

P.O. Box 123920  
Alrode  
1450

Telephone: (011) 908-1922  
E-mail: info@deton.co.za

Facsimile: (011) 864-5386  
Website: www.deton.co.za

## 3. Scope of Quality Management System (SABS ISO 9001:2008)

The manufacture and repair of Hercules Jacks, Snatch Blocks, explosive boxes, mining equipment, rail benders, pipe splitters, railway rolling stock and re-railing equipment for mining, agriculture, postal and transport industries, the manufacture of corrosion-coating resins and wear-resistant linings, including the Cutlass range of epoxy products.

## 4. Risk Assessment Team


As a result of Deton Engineering's commitment to our customers, this Risk Assessment was conducted in order to ensure that all potential health, safety and related hazards are identified, the risks evaluated and controls implemented to ensure that the products are safe and without risk to our customers, as far as is reasonably practicable.

This Risk Assessment was compiled by the following team -

HP du Preez	Chairman
A du Preez	Managing Director
W Germishuizen	Sales & Marketing
I Gasa	Production Foreman
J Downward	Production & Operations
S Barley	Quality & Risk



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## 5. Excerpt from Mine Safety Act (Act 29 of 1996)

Section 21 of the Mine Safety Act states the following -

21.(1) Any person who -

- (a) *designs, manufactures, repairs, imports or supplies any article for use at a mine must ensure, as far as reasonably practicable -*
  - (i) *that the article is safe and without risk to health and safety when used properly and*
  - (ii) *that it complies with all requirements in terms of this Act;*


21.(2) *Any person who bears a duty in terms of sub-section (1) is relieved of that duty to the extent that is reasonable in the circumstances, if -*

- (a) *that person designs, manufactures, repairs, imports or supplies an article for or to another person; and*
- (b) *that person provides a written undertaking to take specified steps sufficient to ensure, as far as reasonably practicable, that the article will be safe and without risk to health and safety when used properly and that it complies with all prescribed requirements*





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## 6. Scope of Risk Assessment

The scope of this Risk Assessment is limited to the Deton Engineering Automatic Hopper Couplers and their application in a mining environment.

The objective of this Risk Assessment is to, as far as is reasonably practicable -

- identify all potential health, safety and related risks that the Automatic Hopper Coupler could pose to the end-user
- measure the level of risk of the identified risks
- to recommend controls to alleviate or minimise the risks

The aim of this Risk Assessment is to provide end-users with detailed information that will permit them to use the Automatic Hopper Coupler in a manner that is safe and provide optimal utilisation.





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## 7. Format of Risk Assessment

The Risk Assessments are reflected in tabular format, with the specific aspects listed under the following main headings -

**Potential Hazard** - what could go wrong?

**Consequences & Impact** - what could happen if the instance occurred?

**Recommendations & Controls** - what measures are in place or should be taken?

The aspects are then rated in terms of -

**Likelihood** (What are the chances of the incident occurring, probability?)

LIKELIHOOD	Index Value	Result
Most likely	5	<input type="text"/>
Highly likely	4	
Likely	3	
Unlikely	2	
Highly unlikely	1	

**Risk** (What level of risk/element of danger would this incident expose you to?)

RISK	Index Value	Result
Very high risk	5	<input type="text"/>
High risk	4	
Medium risk	3	
Low risk	2	
Very low risk	1	

**Severity** (What could the severity of this incident be in terms of injuries, damage)?

SEVERITY	Index Value	Result
Extremely severe	5	<input type="text"/>
Quite severe	4	
Severe	3	
Not too severe	2	
Negligible	1	

From the above results, the "Risk Result" is tabulated as follows -

$$\text{RISK RESULT} = \text{LIKELIHOOD} \times \text{RISK} \times \text{SEVERITY}$$



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## 7. Format of Risk Assessment (cont.)

The figure obtained (the Risk Result) is then classified as follows -

- 61 + High risk requiring immediate corrective action
- 39 - 60 High risk requiring corrective action (identified in RED)
- 21 - 40 Substantial risk with corrective action needed
- 6 - 20 Possible risk, must be brought to people's attention
- 5 Risk tolerable

This is reflected as "RR" on the accompanying Risk Assessment Charts.

## 8. Procedure for the Safe, Correct Use of the Automatic Hopper Couplers

### 8.1 Coupling

Step	Action	Photograph
1	Check hopper is secured – sprag wheel	
2	Check coupling link has been inserted and is secure	
3	Operator to check that Driver is visible, and can see any signals given by Operator	
3	DO NOT LIFT LINK WITH KEY	
4	Signal Driver to couple	

### 8.2 Uncoupling

Step	Action	Photograph
1	Secure hopper that is to be uncoupled by spragging wheel	
2	Operator to check that Driver is visible, and can see any signals given by Operator	
3	Insert key	
4	Turn key anti-clockwise to release latch	
5	Signal Driver to uncouple	





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## 9. Inspection & Maintenance of Automatic Hopper Couplers by Customer

Due to the working environment, the load factors placed upon the products and the safety critical nature of the product, Deton Engineering recommends that all Automatic Hopper Couplers are subject to regular inspection.

Inspection should consist of weekly maintenance/inspection and pre-trip/pre-shift inspection by the Driver. The nature of the inspection, what needs to be checked and the frequency is detailed below –

### 9.1 Daily Inspection for Loco Operators

- (a) check coupling link at both ends for any sign of “mushrooming” – scrap if evident
- (b) check that the latch can operate freely and returns to the locked position
- (c) check opening (“mouth”) to ensure that no obstructions are present

### 9.2 Weekly Inspection by Maintenance Staff

- (a) wash inside of coupler thoroughly with high pressure water
- (b) uncouple hoppers, ensuring that they are properly spragged
- (c) check through pin for visible wear
- (d) check latch for visible wear (deformation on face)
- (e) check buffer head for deformation – buffer head must not be flattened across face
- (f) check bolts and nuts securing buffer are secured (4 off 8,8 bolts, nuts & washers)

In order to ensure that the product's integrity is maintained, Deton Engineering recommend that use is made of Deton Engineering approved components only and that all repairs are performed by Deton Engineering.

## 10. Repair of Automatic Hopper Couplers


The Automatic Hopper Couplers consists of the following components -

- (a) Through Pin
- (b) Latch
- (c) Spring Box
- (d) 2 off Stainless Steel springs
- (e) M20 Washer
- (f) M10 Bolts & Nuts (4 off)

The repair/replacement of these components is addressed below -



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## (a) Through Pin

- Remove split pin
- Pull Latch Pin out of body
- Remove bolt & nut
- Remove 2 springs and discard
- Remove Latch
- Line up the Through Pin keyway and insert latch
- Replace M20 washers
- Replace 2 springs and secure with 2 off M10 bolts and nuts
- Tack weld nut to ensure that it is secure

## (b) Latch Pin

Follow same procedure as Through Pin if Latch Pin requires replacement

## (c) Spring Box

- To remove spring box, cut away small weld on top of buffer
- Remove plate
- Cut away spring box (tack welded)
- Dress area with grinder
- Ensure spring box is correctly oriented – i.e. not upside down (check that markings that appear on top of box are visible)
- Ensure back of spring box fits flush to inside of back plate
- Secure box by tack welding back and side
- Perform full weld

## (d) Stainless Steel Springs

- Cut bolt off and remove
- Replace 2 off stainless steel springs
- Secure with 2 off M10 bolts & nut
- Tack weld nut
- Springs must be replaced in all instances – exposure to heat degrades spring quality

## (e) Washer

- Replace washer if visibly worn
- Remove split pin
- Remove washer
- Replace with new washer and new split pin





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## 11.1 Risk Assessment – Effective Operation of Automatic Hopper Coupler by Customer

ITEM	POTENTIAL HAZARD	CONSEQUENCES & IMPACT	RATINGS				RECOMMENDATIONS and CONTROLS
			L	R	S	RR	
1	Operator is positioned incorrectly when coupling	<ul style="list-style-type: none"> <li>Operator caught between couplers/mine cars</li> </ul>	1	4	4	16	<ul style="list-style-type: none"> <li>Design of coupler allows Operator to stand clear during coupling, in sight of Driver yet able to observe coupling operation</li> <li>Ensure Operators are trained in the correct, safe use of the coupler</li> </ul>
2	Centre-line height of couplers varies	<ul style="list-style-type: none"> <li>Failure to couple</li> <li>Damage to coupling link</li> <li>Derailment</li> </ul>	2	2	3	12	<ul style="list-style-type: none"> <li>Coupler heights must be standardised</li> <li>Standardisation must also extend to Hopper types, wheel &amp; axle sets as well as the 2 step link from loco to first hopper</li> <li>Correct maintenance of suspension components</li> <li>Ensure hoppers are chocked during coupling or uncoupling operations</li> <li>Ensure Operators are trained in the correct, safe use of the coupler</li> </ul>



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ITEM	POTENTIAL HAZARD	CONSEQUENCES & IMPACT	RATINGS				RECOMMENDATIONS and CONTROLS
			L	R	S	RR	
3	Incorrect coupling link used	<ul style="list-style-type: none"> <li>Failure to couple</li> <li>Damage to centralising rubbers</li> <li>Damage to coupler</li> </ul>	1	2	2	4	<ul style="list-style-type: none"> <li>Ensure that the correct link is used and is present</li> <li>Ensure that only Deton Engineering spares are retained, both on surface and underground</li> <li>Ensure hoppers are chocked during coupling and uncoupling operations</li> <li>Ensure Operators are trained in the correct, safe use of the coupler</li> </ul>
4	Damaged Couplers	<ul style="list-style-type: none"> <li>Failure to couple</li> <li>Progressive damage to coupler and link</li> </ul>	1	2	2	4	<ul style="list-style-type: none"> <li>Conduct Weekly inspection of coupling link and coupler assembly</li> <li>Ensure correct maintenance and inspection procedures are followed</li> <li>Ensure hoppers are chocked during coupling or uncoupling operation</li> <li>Ensure Operators are trained in the correct, safe use of the coupler</li> </ul>
5	Excessive speed during coupling operation	<ul style="list-style-type: none"> <li>Damage to coupler and link</li> <li>Derailment</li> </ul>	2	2	3	12	<ul style="list-style-type: none"> <li>Ensure correct signals are used by Operators</li> <li>Ensure locomotives and related systems are in working order</li> <li>Ensure Operators and Drivers are trained in the correct, safe use of the coupler</li> <li>Enforce Disciplinary Procedures for operating outside Mine Procedures</li> </ul>



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ITEM	POTENTIAL HAZARD	CONSEQUENCES & IMPACT	RATINGS				RECOMMENDATIONS and CONTROLS
			L	R	S	RR	
6	Excessive play between link and latch	<ul style="list-style-type: none"> <li>Reduced safe working load</li> </ul>	1	1	1	1	<ul style="list-style-type: none"> <li>Inspect wear on coupling link as per maintenance and inspection procedures</li> <li>Inspect wear on coupling latch as per maintenance and inspection procedures</li> <li>Ensure staff are trained in the correct, safe use, inspection and maintenance of the coupler</li> </ul>
7	Coupling latch fails to locate correctly	<ul style="list-style-type: none"> <li>Possible runaway hoppers</li> </ul>	1	2	3	6	<ul style="list-style-type: none"> <li>Ensure couplings are inspected on weekly basis, with particular attention to latch springs and regular cleaning using high pressure water</li> <li>Driver to check coupling as part of pre-start Inspection List</li> </ul>
8	Derailment or Tip Over of Loco & Hoppers	<ul style="list-style-type: none"> <li>Damage to loco &amp; hoppers</li> <li>Injury, loss of life</li> </ul>					<ul style="list-style-type: none"> <li>Enforce Disciplinary Procedures to ensure correct control and operation of loco's</li> <li>Ensure staff are trained in the correct, safe operation of underground loco's</li> <li>Once secured (chocked), following removal of latch pin split pin, followed by latch pin, loco and hoppers can safely be uncoupled</li> </ul>