



DEPARTMENT OF MINERAL RESOURCES AND ENERGY

11 September 2020

TMMs Yard Sticks Presentation

MHSC TMMs Workshop



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INTRODUCTION

PURPOSE

Learnings from the Mining Industry incidents in terms of Trackless Mobile Equipment led to the identifying of the mentioned Yard Sticks to be implemented as Best Practices to ensure safer machinery equipment.

OBJECTIVE

To reduce mining-related deaths, injuries and ill health through the application of systems that monitor, audit and enforce compliance in the Mining Sector.



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PRESENTATION OUTLINE

Yardstick Dashboard

- Fatigue management
- Pre-use checklists of trackless mobile machines
- Roll-over protection systems(ROPS)
- Falling objects protection systems(FOPS)
- Procurement
- Checklist of all trackless mobile machines
- Pedestrian detection system
- Anti-collision device
- Brake interlocking on trackless mobile machine doors
- Contractor packs



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Yardstick Dashboard Continued

- Brake test ramps
- Fitness to perform work(medical)
- Fire suppressions & Fire extinguishers
- Emergency preparedness
- Illumination
- Equipment noise monitoring
- Airborne pollutants
- Training



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FATIGUE MANAGEMENT

1. Electronic monitoring System
2. Short and long distance warning Radars
3. Cameras for blind spot visibility i.e. Haul Trucks
4. Fatigue Management Plans
5. Scheduled Fatigue Breaks
6. Shift rosters



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Pre-Use Checklists

1. Pre-Use Checklists for all Mobile Equipment
2. Checklists must meet the need as required
3. Must identify the real hazards
4. Easy enough for all to understand
5. Proper management of Checklists at operational level

AngloAmerican MODJALENGWA PLATINUM MINE
PRE-SHIFT INSPECTION CHECKLIST:
 RC DRILL RIG / RANGER 600 / DML40 /
 351 PPT VIPER / DMSO / TEREX R20T / D25KB
 MS-MIN-ENG-PCOB-0075a

SHIFT: D A N

OPERATOR'S NAME & SURNAME: _____ COMPANY NUMBER: _____

MACHINE NUMBER: _____ HOUR METER READING: _____ DATE: _____

DID YOU HAVE ENOUGH REST? YES NO IF NO, REPORT IMMEDIATELY

ARE YOU ON ANY MEDICATION? YES NO IF YES, REPORT IMMEDIATELY

ITEMS	PERFECT TYPE	OK / OK	ITEMS	DEFECT TYPE	OK / OK
SAFETY					
Sturdy grounds	A		OPERATOR'S CABIN	B	
Fire extinguisher	B		Windows	B	
Fire suppression system	A		Cab protection (EM 95 / ZIBKOB)	A	
HYDRAULICS / PNEUMATICS LEAKS / LEVELS					
Check for leaks all around the machine	B		Missing Top	B	
Hydraulic Oil Level	B		DIAGNOSTIC OPERATION EXP:		
Compressor Oil Level	B		Fuel pressure gauge	A	
CHASSIS					
Speed rotation gears	B		Other gauges	B	
Handbrake / Steps	A		Emergency stop buttons	A	
WORKING DECK					
Rock det oil	B		Radio & Speaker	B	
Oil M & rod	B		Control levers	A	
Deck brush	B		Tread & ladders	A	
C Operator	B		Hoist / Tensioning hoist	B	
Excavator fluid	B		Wipers	B	
Chassis	B		Outside lights	B	
Breath-hold test (Marshall)	B		Thinning and Drilling lights	A	
Wind-into nose (where applicable)	B		All warning lights	B	
Hominging (gears, brakes and pin)	B		Airline system / Depth control (where applicable)	B	
Dust board / Collector / Water tank	B		Drum / Handrail	A	
Front lower chains / Cables	A		Leveling jacks	A	
Stability chains on all bores	A		UNFOLDING UNIT: RC RIG		
Slide & Retainer chains (where applicable)	A		Unfolding hose retractor	A	
Inter lock pin	A		Swapping area inspection	A	
			Cable in case	B	
			Dust hose secured	B	

Code: A = No Go Report immediately
 B = Go - Report to Supervisor
 - In Order
 - Not in order

Report any damage to the machine: _____

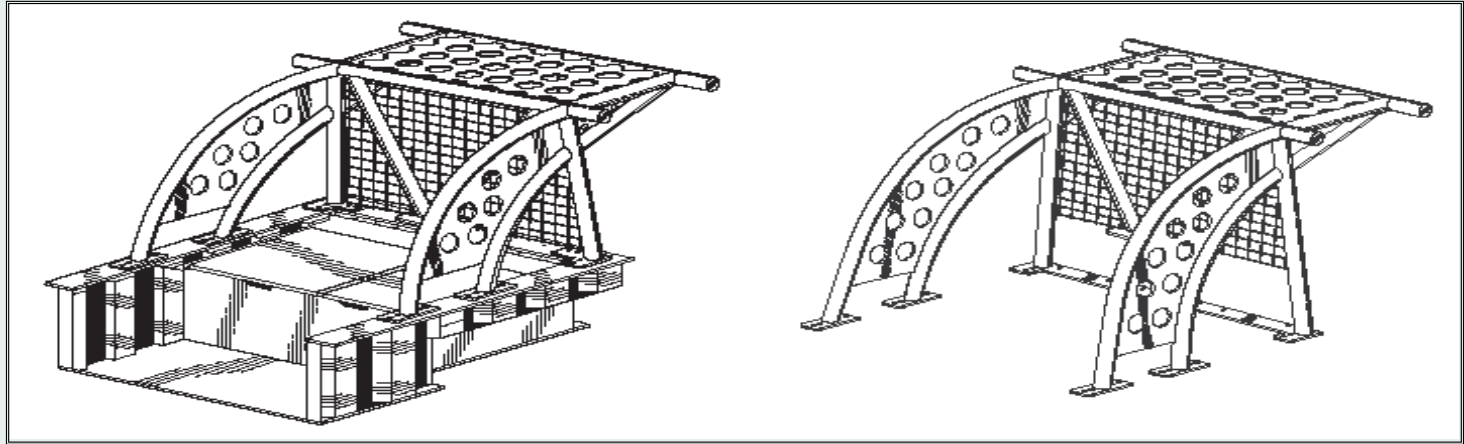
Signature: _____ Operator: _____

Foreman / Artisan comments: _____
 (if applicable)

Signature: _____ Foreman / Artisan: _____

Only Standard 2002/2014 Rev 1 PRINT NUMBER 00 910-001 000000000

Roll-Over Protection Systems (ROPS)



1. Roll Over Protection in all LDVs
2. Roll Over Protection in all Mini - buses
3. Roll Over Protection for Busses (how feasible is it?)
4. Standardisation of ROPS
5. Must understand the function of ROPS
6. It must not significantly alter the COG



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Falling Objects Protection Systems (FOPS)

1. We need to understand our risks
2. FOPS should be designed to eliminate the risk
3. FOPS should be practical
4. Should not create new risks



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Procurement

1. Procurement Systems should incorporate Safety from the onset
2. Safety should be a non negotiable on all contracts
3. Safety professionals should be involved in all tenders
4. Quality inspections in the manufacturing, repair and compliance to SANS and international safety standards
5. Equipment procurement and selection must be risk based



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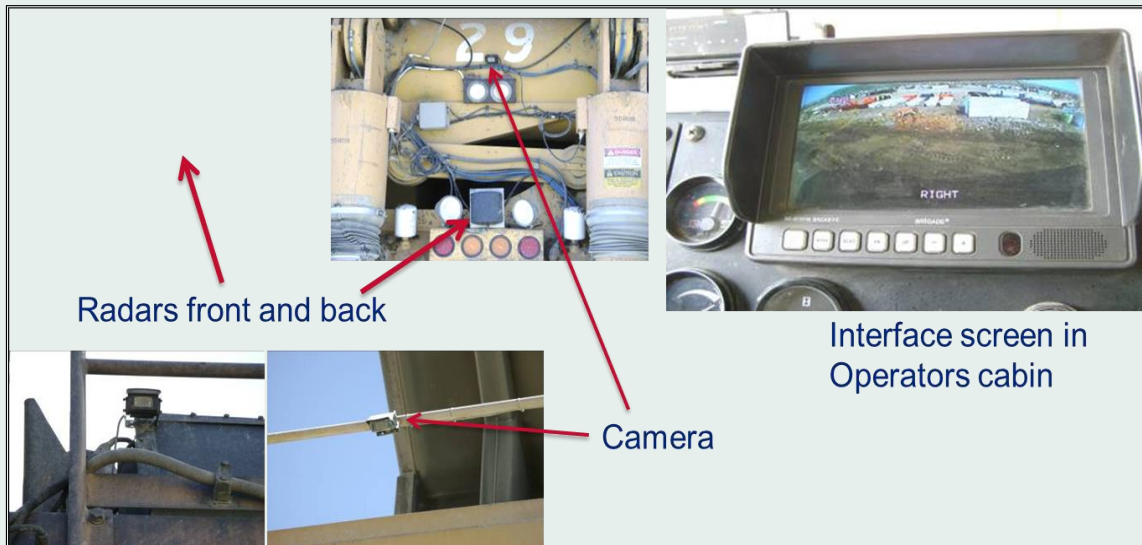


Pedestrian Detection (PD) System

1. Radars and Cameras act as PD System

2. PD Systems for LDVs (number of operations already have or are busy investigating)

3. Interaction between people and machines remain a high risk on open pit operations



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Anti Collision Devices

1. Radars in Haul Trucks
2. Cameras on Haul Trucks
3. System which de-rates power in Haul Trucks when in close proximity to other TMMs – been investigated
4. Systems should not irritate operators
5. Systems should be tamper proof
6. Different systems should talk to each other
7. System overload?



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Brake Interlocking (Doors)

- Not applicable Underground



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Contractor's Pack

1. Contractor management remains a high risk area for all open pit mines
2. Contractor's packs must be in place for all contractors
3. No contractor's pack = no work
4. Contractor's packs audited on regular basis
5. There should be no difference between contractors and own employees in terms of:
 - Safety training
 - Safety Requirements
 - Procedures



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Maintenance System

1. Planned Maintenance for all equipment should be scheduled on a user-friendly system
2. OEM requirements should be understood
3. Qualification of artisans very important
4. Mines should have an Emergency break downs management system al contractor equipment should be in the Mine's maintenance system



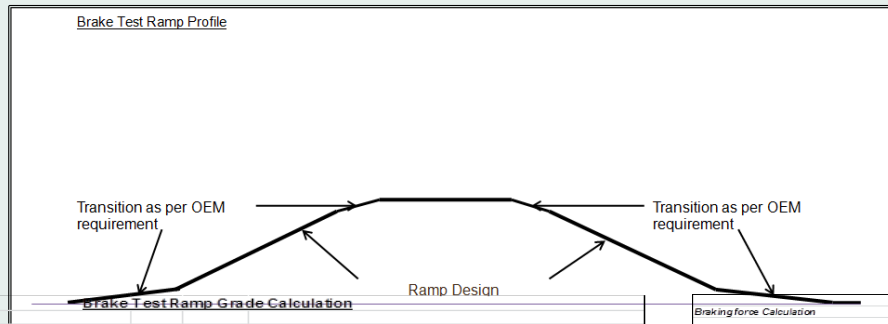
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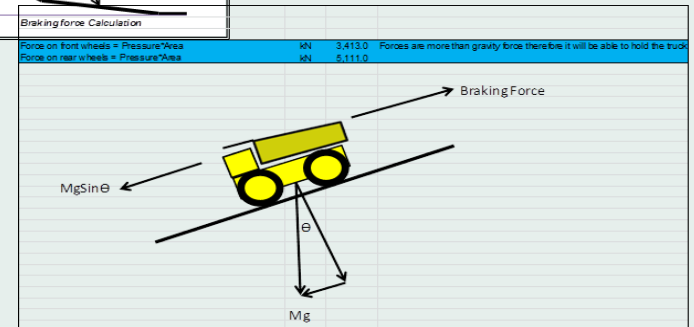


Brake Test Ramp

1. Brake test ramp standard on DMR Website
2. Brake testing with a SIMRET brake tester shall be done after every service, every time when maintenance or repairs on brakes are performed as well as every time when any brake related problems have been reported.
3. Use the supplier's instruction sheet as a procedure for the dynamic testing of brakes.



Inputs	Unit	Quantity	Comments
Mtotal	kg	240,000.0	Average
Mtruck	kg	106,686.0	793D Gross mass operational from p31 793D mining truck document
Mtotal = Mtruck+payload	kg	406,686.0	793D Gross mass operational from 793D mining truck document
Grade	%	10.0	Maximum according to Mine design and VM TMM COP p.60
Brake surface front (89817cm ²)	square m	8.9817	
Brake surface rear (134500cm ²)	square m	13.45	
Operating pressure (415+-35)	kPa	380	Assume minimum pressure to release will be what the springs are applying
Force Calculation (Truck Loaded)			
$\theta = \text{Tan}(\text{Grade}/100)$	Degrees	5.7	
$\text{Force} = \text{Mtotal} * \text{G} * \text{Sin}\theta$	N	387,154.7	
Grade Calculation (Truck unloaded)			
Mtotal = Mtruck	kg	106,686.0	
$\theta = \text{arcSin}(\text{Force} / \text{Mtotal} * \text{G} * \text{Sin}\theta)$	Degrees	14.0	
Grade	%	25.0	Brake test ramp required for empty loaded truck to simulate full load truck brake holding force.



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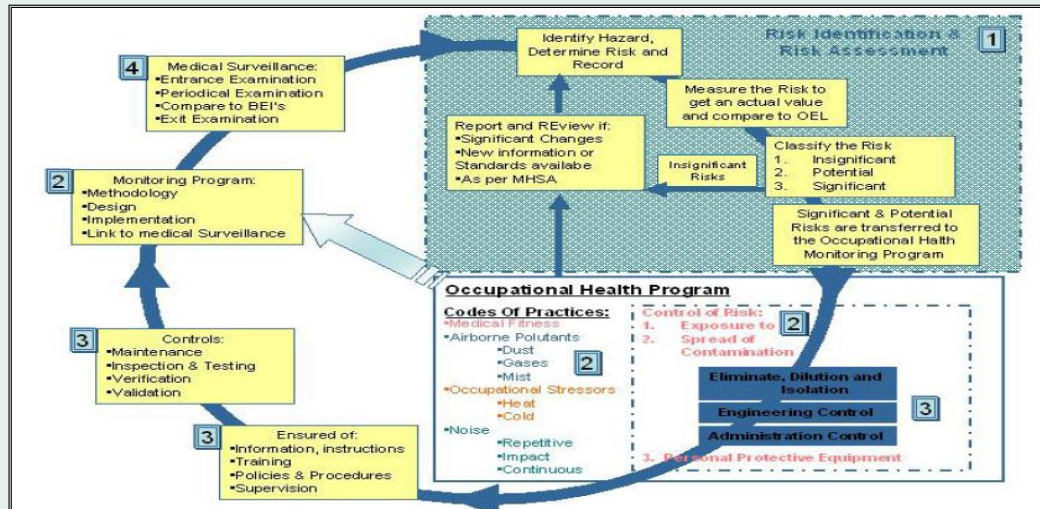
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Fitness to Perform Work (Medical)

1. Requirement of the MSHA act, due to the nature of tasks associated with operating TMMs.

2. It requires certain medical check points: Diabetes (insulin dependent), hypertension, depth perception, vision testing, color test= due to the amount of color used on instrument panels and warning systems. Hearing fitness (Audiometry).



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Fire Extinguishers

1. Ensure adequate risk assessments are in place for the type of fire fighting equipment to be used.
2. Ensure fire fighting equipment is suited to the need
3. Ensure that all operators are adequately trained to use the specific fire fighting equipment
4. Maintenance schedule is important



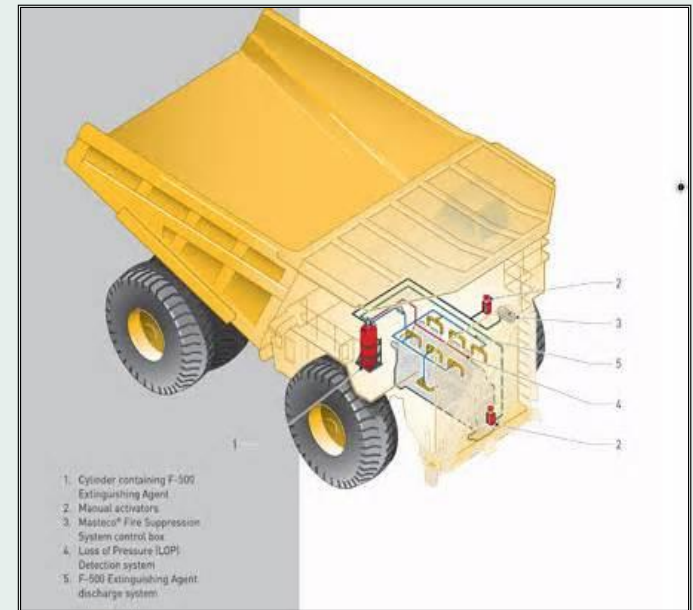
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Fire Suppression systems

1. Automated suppression systems can be installed to minimize reliance on administrative control delivered through training to the operator.
2. Should reduce risk
3. Training is important



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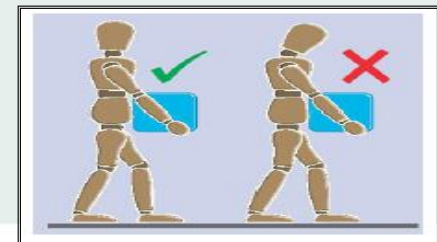
Ergonomics Assessment

1. We need to consider the physical aspect of man machine interface.

2. Section 21 of the MHS Act requires an ergonomic Assessment to be done.

3. We need to understand the effect of warning devices in the cab on the operator

4. Environmental conditions in the cab, especially in the summer months and cold nights.



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Illumination

Illumination is not only the head lights on a Machine or vehicle, the main purpose of illumination is to provide contrast, to increase risk identification ability of the operator.

Visibility should be seen in the whole context especially where you have light and heavy machinery/vehicle interaction.

ILLUMINATION SURVEY FOR MOBILE EQUIPMENT			
Date of assessment:		Time:	
Activity area/workplace description			
Vehicle Information		Vehicle illumination sources	
Machine number		Front	
Make		Back	
Model		Spot lights	
Other		Other	
Front position			
Distance from vehicle	Recorded illumination at measurement position		
	A	B	C
	20m (Dim)		
20m (Bright)			
Lux meter information			
Instrument used		Calibration date	
Serial number		Certificate number	
<div style="text-align: center;"> <p>Front</p> </div>			
Remarks and Recommendations			



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CONCLUSION

IT IS IMPORTANT THAT ALL THE STAKEHOLDERS SHOULD LIVE THE THEME OF
STRIVING FOR ZERO HARM

ENSURING EVERY MINE WORKER RETURNS FROM WORK UNHARMED EVERY DAY.



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