Static Stability Tilt Test

Millbrook Proving Ground Ltd.	
Project	VG348-001-01
Datapack	MBK16/0229
Test Date	26th February 2016
Issue Date	29th February 2016

Test Vehicle Details

Vehicle Make:	Scarab
Vehicle Model:	MCS 2500
Vehicle Identification No.:	258010357
Total Permissible Mass (kg):	8 040
Permissible Front Axle Load (kg):	4 000
Permissible Rear Axle Load (kg):	5 000
Tyre Make and Model:	Continental Contract AC70G
Tyre Size:	425/55 R17 MPT
Tyre Pressures (psi):	40
Camera Boom Arm:	Alpha Grip SuperTechno 50
Vehicle Test Load:	75 kg Driver, 75 kg Passenger
Vehicle Test Setup:	Neutral, Park Brake OFF

Figure 1 - Test Vehicle

Figure 2 - VIN Plate

Result Overview

Configuration	Configuration Description	Result
1	Crane column straight, 896 kg weight on crane	20.5°
2	Crane column leant over, 896 kg weight on crane	29.2°
3	Crane column straight, no weights on crane	30.7°
4	Crane column leant over, no weights on crane	36.1°
5	Crane column straight, 896 kg weight in stowage	34.7°
6	Crane column leant over, 896 kg weight in stowage	38.2°

Instrumentation

Instrumentation	Serial No.	Calibration Due
Inclinometer, Platform	21-MPG164	May-16
Inclinometer, Body Front	21-0005-16	Jan-17
Inclinometer, Body Rear	21-2508-16	Mar-16
Tyre Pressure Gauge	34-033-119	Aug-16
Millbrook Weather Station	03-1363-40	Jan-17

Weather Conditions

Average Wind Speed (m/s):	2.0
Average Wind Direction (°):	122
Tilt Axis (°):	240° / 60°

Contact Details

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Tilt Test Results

Configuration 1	Crane column straight vertically. 28x 16 kg weights located on each side of crane.

RH Tilt Test	Rear Wheel Lift (°)
Platform	20.5
Body Front	21.1
Body Rear	22.5

Figure 3 - Config. 1, Front View, 20.5° Platform

Figure 4 - Config. 1, Rear View, 20.5° Platform

Configuration 2	Crane column leant away from tilt, at maximum. 28x 16 kg weights located on each side of crane.

RH Tilt Test	Rear Wheel Lift (°)
Platform	29.2
Body Front	29.9
Body Rear	31.7

Figure 5 - Config. 2, Front View, 29.2° Platform

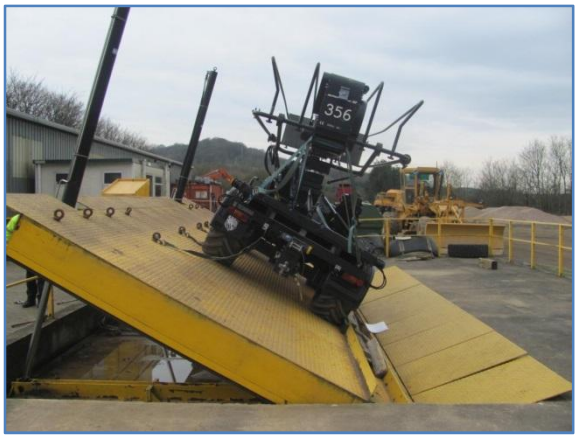

Figure 6 - Config. 2, Rear View, 29.2° Platform

Tilt Test Results

Configuration 3	Crane column straight vertically. No weights on crane.

RH Tilt Test	Rear Wheel Lift (°)
Platform	30.7
Body Front	31.7
Body Rear	32.6

Figure 7 - Config. 3, Front View, 30.7° Platform

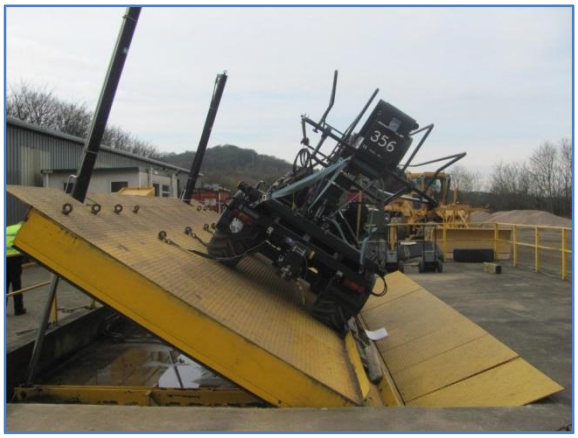

Figure 8 - Config. 3, Rear View, 30.7° Platform

Configuration 4	Crane column leant away from tilt, at maximum. No weights on crane.

RH Tilt Test	Rear Wheel Lift (°)
Platform	36.1
Body Front	37.1
Body Rear	37.6

Figure 9 - Config. 4, Front View, 36.1° Platform

Figure 10 - Config. 4, Rear View, 36.1° Platform

Tilt Test Results

Configuration 5	Crane column straight vertically. All weights (896 kg) in stowage above rear axle.

RH Tilt Test	Rear Wheel Lift (°)
Platform	34.7
Body Front	35.7
Body Rear	36.5

Figure 11 - Config. 5, Front View, 34.7° Platform

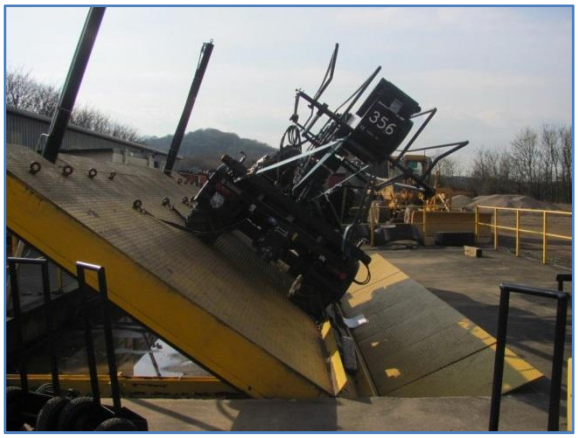

Figure 12 - Config. 5, Rear View, 34.7° Platform

Configuration 6	Crane column leant away from tilt, at maximum. All weights (896 kg) in stowage above rear axle.

RH Tilt Test	Rear Wheel Lift (°)
Platform	38.2
Body Front	39.1
Body Rear	39.8

Figure 13 - Config. 6, Front View, 38.2° Platform

Figure 14 - Config. 6, Rear View, 38.2° Platform

Conclusions

Tilting the crane column away from the direction of tilt resulted in an increase in rear wheel lift angle of 8.7 degrees with the weights attached to the crane, and by 5.4 degrees without the weights.

Removing the weights attached to the crane resulted in an increase in rear wheel lift angle of 10.2 degrees with the crane column straight, and by 6.2 degrees with the crane column leant over at its maximum away from the direction of tilt.

Moving all weight from the crane into stowage boxes above the rear axle resulting in an increase in rear wheel lift angle of 14.2 degrees with the crane column straight, and by 9.0 degrees with the crane column leant over at its maximum away from the direction of tilt.

An overall increase in rear wheel lift angle of 17.7 degrees was achieved as a result of moving weight from the crane into the rear stowage lockers, and tilting the crane column away from the angle of tilt.

During all tests, the rear wheel was the only one to lift. The vehicle was articulated between the front and rear axles, and as a result when the rear axle lifted, it was not held down by the front wheels, so all platform angles referred to as "rear wheel lift" should also be considered as the vehicle's roll over angle.

Recommendation

Millbrook would recommend that the weights are removed from the crane and placed within the rear stowage lockers, and that the crane is tilted away from the angle of tilt, whenever the vehicle is traversing a side slope.

It is not possible for Millbrook to recommend safe operating conditions for the vehicle, as all tests have been conducted statically. However, a suitable safety factor should be incorporated when determining the safe operating conditions of the vehicle.