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## 1.0 Scope

To provide guidance to users of PJB Minecruisers for the 'In-Service' Testing of the braking systems on PJB Minecruisers (Mk4.5).

Recommended minimum frequency of testing

Maintenance Examination	Test	Frequency
Code A	Daily test	8 engine hours or daily
Code B	Intermediate system check	40 engine hours or fortnightly
Code C	Full system test	120 engine hours or monthly
Code D	Park brake v/v change out	2000 engine hours or two yearly

It is recommended that a “Full system test” be undertaken immediately after any repairs or maintenance to any part of the braking system and before the vehicle is returned to service.

*Note The Daily test does not comply with any standards or guidelines but, gives a guide as to the possible deterioration of the brake systems between the Intermediate check and Full system tests.*

*The intention of the intermediate system checks is to provide a simple method of checking the brake system in the underground mine zones where non flameproof brake meters are not permitted.*

*This procedure or an edited version of this procedure should be incorporated into the Maintenance Management System of any underground coal mine using PJB Minecruisers.*

*The frequency of in-service testing may be based on historical records of performance, repairs and maintenance and reduced or extended.*

### WARNING

Braking systems and components are subject to wear and failure through misuse and damage in the mining environment. Regular in-service testing reduces the probability of a sudden and unexpected system or component failure. A number of undetected failures may result in an incident causing injury to a person or persons.

## 2.0 Definitions

The definitions used throughout this procedure are identical to those used in Handbook for the Approval Assessment of Transport Braking Systems on Free-Steered Vehicles in Underground Coal Mines MDG39 Feb 2001.

## 3.0 General Safety

The following tests either requires the vehicle to be driven at speed on a nominated test track or full transmission stall against the brakes. Measures must be taken to ensure the safety of the person undertaking the testing and any other persons or plant and equipment that may be in the vicinity of testing. Clear all-round visibility is essential.



The test area should be of sufficient length to ensure that the vehicle may be brought safely to rest in the event of a brake failure of any kind during testing.

It may be necessary to install barriers or tapes in accordance with the mine's general safety rules, in the test area.

## **4.0 Test Course and Conditions**

### **4.1 For Daily Tests**

The daily test is a static test and must have adequate clear room around the vehicle to allow the vehicle to be brought back to rest in the case of brake failure. The test area shall meet the requirements of MDG39 Appendix B.

*Note The test area where the vehicle located during the test shall meet the requirements of MDG 39. Dips, bumps, slopes and other surface condition shall affect the results and cannot be compensated for by comparisons or other means.*

### **4.2 For Intermediate system check and Full system test**

#### **4.2.a) For deceleration tests**

The test course on which braking tests are carried out shall have sufficient length to enable them to be carried out safely and shall meet the requirements of MDG39 Appendix B.

*Note Where a test course is not available, meeting the above requirements, then operators should select a test course for in-service testing which will be maintained and consistent for long periods. The results from the same test course may then be used to indicate performance trends that may then be employed within the maintenance management system to predict service/repair requirements. Testing should always be done in the same direction of travel on the test course.*

#### **4.2.c) For holding tests**

A ramp having a 25% grade and surface meeting the requirements of 3.1 above.

or,

A deceleration test where the Park & Emergency Brake is combined may be satisfactory for In-Service Tests.

## **5.0 Test Instruments**

Any brake testing instrument employed for in-service testing should be calibrated and comply with the requirements of MDG39 Appendix G.

## **6.0 Daily Test**

During each 8 engine hour or daily period that a vehicle is operated at the mine, the brake system shall be tested to confirm the safe operation of the brakes.

### **6.1 Service brake test (static test)**

- Place foot on service brake pedal.
- Select second gear.\*\* For Vehicles fitted with Perkins 1104C-44 Engines use 3<sup>rd</sup> third gear.
- Select forward direction.
- Release park brake (button out).
- Slowly accelerate engine to maximum RPM for approximately 1 second
- The vehicle should remain stationary.

In the event the brakes do not hold the vehicle stationary, apply the park brake, turn off the engine, place an out of service tag and follow the mine's Defect Safety Management Plan.



6.2 Secondary brake test (static test)

- Apply park brake (button down).
- Check Park/Emergency indicator gauge shows zero pressure.
- Select forward direction.
- Slowly accelerate engine to maximum RPM for approximately 1 second.
- The vehicle should remain stationary.

In the event the brakes do not hold the vehicle stationary or the Park/Emergency indicator does not show zero pressure with the park brake applied, turn off the engine, place an out of service tag and follow the mines Defect Safety Management Plan.

6.3 Automatic brake test (static test)

- Place foot on service brake pedal.
- Release park brake (button out).
- Open operator door
- The park brake should apply within 1 second.

If the park brake does not apply within 1 second or pressure is incorrect, apply the park brake, turn off the engine, place an out of service tag and follow the mines Defect Safety Management Plan.

## **7.0 Intermediate system Check**

During each 40 engine hours or fortnightly period that a vehicle is operated at the mine, the brake system shall be tested to confirm the safe operation of the brakes.

7.1 Visual Inspection of Brake Components

- Inspect foot brake pedals are free from debris or damage that may affect it's operation.
- Check axle hubs for damage or oil leaks.
- Check secondary brake housing for damage or leaks.
- Check park brake control for debris or damage that may affect it's operation.

7.3 Pressure Checks

- With the engine running release the park brake.
- Check the brake pressure gauge is indicating the correct pressure (8200 kPa).
- Apply the park brake
- Stop the engine and pump the service brake pedal 5 times.
- Brake pressure gauge must indicate a pressure above (3100 kPa).
- Check Park/Emergency indicator gauge shows zero pressure when the park brake is applied.

In the event that the gauges do not show the correct pressures as above, turn off the engine, place an out of service tag and follow the mines Defect Safety Management Plan.



**7.4 Automatic brake**

- Place foot on service brake pedal.
- Release park brake (button out).
- Open operator door.
- The park brake should apply within 1 second.
- Close operator door.
- With the service brake still applied, release park brake (button out).
- Turn the engine off.
- The park brake should apply within 1 second.

If the park brake does not apply within 1 second or pressure is incorrect, apply the park brake, turn off the engine, place an out of service tag and follow the mines Defect Safety Management Plan.

**7.5 Service Brake**

- Check safety precautions such as clear area of personnel
- Accelerate vehicle to maximum speed in second gear (or first depending on conditions).
- At a predetermined set point on the roadway apply the service brake.
- Vehicle should stop normally and smoothly within the stopping distance specified below.

If the vehicle does not stop within the specified distance normally and smoothly, apply the park brake, turn off the engine, place an out of service tag and follow the mines Defect Safety Management Plan.

**7.6 Secondary Brake**

- Check safety precautions such as clear area of personnel
- Accelerate vehicle to maximum speed in second gear (or first depending on conditions).
- At a predetermined set point on the roadway apply the secondary brake.
- Vehicle should stop normally and smoothly within the stopping distance specified below.

If the vehicle does not stop within the specified distance normally and smoothly, apply the park brake, turn off the engine, place an out of service tag and follow the mines Defect Safety Management Plan.

<b>Mine Cruiser Stopping Distance</b>																			
<b>Speed (kph)</b>	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<b>Stop Distance Service (m)</b>	0.3	0.5	0.6	0.8	1.0	1.3	1.6	1.8	2.2	2.5	2.9	3.3	3.7	4.2	4.6	5.1	5.6	6.2	6.8
<b>Stop Distance Secondary (m)</b>	0.6	0.9	1.2	1.5	1.9	2.4	2.9	3.5	4.1	4.7	5.4	6.2	7.0	7.8	8.7	9.6	11	12	13

Maximum vehicle speeds when driven unladen on smooth level compacted ground.

	<b>Naturally Aspirated Maximum Speed (kph)</b>	<b>Super Charged Maximum Speed (kph)</b>
<b>1<sup>st</sup> Gear</b>	7	8
<b>2<sup>nd</sup> Gear</b>	16	18
<b>3<sup>rd</sup> Gear</b>	30	34



## 8.0 Full System Test

### 8.1 Visual Inspection of Brake Components

- Inspect foot brake pedals are free from debris, corrosion or damage that may affect it's operation.
- Check axle hubs for damage or oil leaks.
- Check secondary brake housing for damage or leaks.
- Check park brake control for debris or damage that may affect it's operation.
- Check Park/Emergency indicator gauge shows zero pressure when the park brake is applied.
- Check propeller shafts condition.

If a defect is found, apply the park brake, turn off the engine, place an out of service tag and follow the mines Defect Safety Management Plan.

### 8.2 Information to be recorded

For each test, measure and record;

- (i) The speed immediately prior to the application of the brakes (km/hr)
- (ii) The mean deceleration rate ( $m/s^2$ )
- (iii) The peak deceleration rate ( $m/s^2$ )
- (iv) The response time between the application of the brakes and the beginning of retardation. The beginning of retardation is considered to be 0.1 g.
- (v) The operating force applied to the pedal/button/lever by the operator. (N)

*Note The peak deceleration rate is an indicator of the ability of brakes to hold on a grade. A rate of less than  $2.8 m/s^2$  indicates that the brakes may not hold on a 25% grade.*

### 8.3 Service brakes

a) Service brakes shall be tested while the vehicle is unladen, at tare mass (MDG39 1.3.6), and travelling on a surface and grades as close as practicable to the requirements of 3.0 (above) at the recommended testing speed for the vehicle, subject to a maximum of 30 km/h.

The Service Brake Performance shall not be less than :-

Application	Parameter	Min acceptable performance	Test Result	Complies
3rd Gear Fwd	Speed (km/hr)	> 15 km/hr		
	Mean deceleration rate ( $m/s^2$ )	> $3.0 m/s^2$		
	Peak deceleration rate ( $m/s^2$ )	> $4.0 m/s^2$		
	Response time (sec)	< 0.7 sec		
	Operating force (N)	< 700 N		

*Note Decreases in the mean deceleration rate for subsequent in-service tests will indicate a reduction of service brake performance and a requirement for maintenance, service, adjustment or repair.*



**8.3 Park/Emergency/Automatic brakes**

Parking brakes shall be capable of holding the vehicle stationary in a fully loaded condition on the steepest grade that may be encountered in the mine, in both the forward and the reverse directions, subject to a minimum incline of 25%.

or

If the above test is impractical, then Park/Emergency Brakes shall be tested while the vehicle is unladen, at tare mass, and travelling on a surface and grades as close as practicable to the requirements of 3.0 (above) at the recommended testing speed for the vehicle, subject to a maximum of 30 km/h.

The Park/Emergency Brake Performance shall not be less than :-

<b>Application</b>	<b>Parameter</b>	<b>Min acceptable performance</b>	<b>Test Result</b>	<b>Complies</b>
3rd Gear Fwd	Speed (km/hr)	> 15 km/hr		
	Mean deceleration rate (m/s <sup>2</sup> )	> 1.6 m/s <sup>2</sup>		
	Peak deceleration rate (m/s <sup>2</sup> )	> 2.8 m/s <sup>2</sup>		
	Response time (sec)	< 1.0 sec		
	Operating force (N)	< 300 N		

*Note Decreases in the mean deceleration rate for subsequent in-service tests will indicate a reduction of service brake performance and a requirement for maintenance, service, adjustment or repair.*

**8.5 Accumulator Testing**

Accumulators are fitted to provide stored pressure, enabling brake operation after an engine stoppage or major component failure.

To test,

- a) Start engine and run until hydraulic (inc Brake pressure) gauge(s) reaches system pressure. (8300 kPa, ± 280 kPa, or 1200 Psi ± 40 Psi).
- b) Stop engine.
- c) Apply the service brake (on/off pedal) 5 times.

After 5 applications, the gauge(s) must indicate a pressure in the range or above, 3100/4500 kPa (450/650 psi).

*Notes In the event that gauge(s) read nil after test - replace accumulator(s). Do not return the vehicle to service.*

*In the event that the gauge(s) read less than 3100/4500 kPa (450/650 psi), re-charge accumulators (inert gas) or replace.. Do not return the vehicle to service.*



#### 8.6 Park/Emergency/Automatic Brake, Sequence Testing

- a) Manual operation testing  
The manual operation of the Park/Emergency/Automatic Brake has been tested in 6.2 (above).
- b) Engine stop test  
Start engine.  
Release brake. (Pull button up)  
Stop engine.  
Button must automatically set to the down/applied position.
- c) Door interlock test  
Start engine.  
Release brake. (Pull button up)  
Open drivers door.  
Button must automatically set to the down/applied position  
While watching the park brake button, close operator door. **Note - If the knob moves at all during or immediately after door closure, the park brake valve is faulty and should be replaced.**
- d) Rear Compartment test  
Start engine  
Release brake (Pull button up)  
Press button in rear (passenger) compartment  
Button (drivers compartment) must automatically set to the down/applied position.

## 9.0 **PARK BRAKE VALVE CHANGE OUT**

### 9.1 Replacement of pilot valve (P/No HY00331) and park brake valve (P/No AR00722)

It is recommended that as a minimum, both valves be replaced at the code D interval with at least fully reconditioned and tested valve assemblies.

Both hydraulic and pneumatic secondary/automatic/park brake system hoses and fittings are recommended to be checked for blockages, kinks and leaks at the code D interval.