

Approval No: MDA DES 055119

File:

Date: 8 February 2006

COAL MINES REGULATION ACT, 1982

Notice of Type Approval (Diesel Engine System)

It is hereby notified that the Approved System listed herein has been assessed for compliance with the Coal Mines Regulation Act and appropriate standards or requirements and is hereby APPROVED in accordance with the requirements of the COAL MINES REGULATION ACT 1982. This approval is issued pursuant to the provisions of Clause 70 Part 8 of Approval of Items of the Coal Mines (General) Regulation 1999.

This APPROVAL is issued to : PJ Berriman & Co Pty Ltd, ABN 80 001 530 981

Address of Approval Holder : 1 Campbell Road, TOMAGO NSW 2322

Description of Item : Type approval for the Diesel Engine System (DES) on a PJ Berriman & Co. Pty Ltd, Perkins 1104C-44 DINA engine rated at 58.0 kW with wet exhaust system as specified by the listed documents

CMRA Approval Clause : 13 of the Coal Mines (Underground) Regulation 1999

Specific Approval Category : DES (Diesel Engine System)

This Approval is issued subject to compliance with the requirements of the Occupational Health and Safety Act 2000.

The Authority issuing the Approval has, for the purposes of the Occupational Health and Safety Act, 2000, appended a list of conditions, (including drawings, documents, etc.) that are applicable to this approved system, as identified during test and/or assessment, to assist the Approval Holder and User to comply with the obligations of the Occupational Health and Safety Act, 2000. The onus is on the Supplier and/or User to ensure the Approved System, and any deviation from the list of conditions, in reference to that system is not inferior in any way to the item tested and/or assessed, this includes the supply, installation and continuing use of the Approved System.

The Approval Number shall appear in a conspicuous place and in a legible manner on each approved system, unless specifically excluded.

A copy of the Approval Documentation shall be supplied to each user of the Approved System and shall comprise the number of pages listed in the footer block together with supplementary documentation as listed in the Schedule and in respect to drawings, all drawings as listed in the schedule and those drawings specifically nominated for the purposes of repair and maintenance.

Any maintenance, repair or overhaul of approved systems shall be carried out in accordance with the requirements of the Coal Mines Regulations Act 1982.

G. D. JERVIS,
Senior Inspector of Mechanical Engineering
Under the delegated authority of the Chief Inspector of Coal Mines

TYPE APPROVAL SCHEDULE**1.0 Detailed Description of Approved Item (s) and Variation (s):**

Type approval for the Diesel Engine System (DES) on a PJ Berriman & Co. Pty Ltd, Perkins 1104C-44 DINA engine rated at 58.0 kW with wet exhaust system as specified by the listed documents.

1.1 Assessment Criteria

This diesel engine system was assessed against the following documents:

- (a) AS/NZS 3584.2:2003
Diesel engine systems for underground coal mines
Part 2: Explosion protected.
- (b) Technical reference for the approval of diesel engine systems (DES) for use in underground coal mines in NSW
– July 2003

1.2 Engine Specifications

Description of Diesel Engine System including its major components:

Perkins 1104C-44 Direct Injection naturally aspirated (DINA) overhead valve, 4 cylinder, 4 cycle, engine with PJ Berriman & Co Pty Ltd flameproof components and wet exhaust system comprising; exhaust catalytic converter, water based exhaust conditioner, particulate filter assembly and pneumatic shutdown system as follows:

Combustion System		Direct injection, naturally aspirated
Piston Displacement	L	4.4
Cylinder bore and stroke	mm	Diameter 105.0 x stroke 127.0
Firing order		1, 3, 4, 2
Compression Ratio		19.3:1
Testing Dynamometer		
Power Rating / speed	kW / rpm	58.0 kW @ 2500 rpm (with exhaust filter)
Rated Torque / speed	Nm/rpm	279.8 Nm @ 1600 rpm (with exhaust filter)
Fuel setting	mm	8.2
Fuel timing		Injection pump plunger 1.55mm @ TDC
In service		
Torque stall power / speed	kW / rpm	54.3 kW @ 2100 rpm (with exhaust filter)
High idle	rpm	3100
Idle speed	rpm	750
Minimum ventilation requirements	m ³ /sec	3.5

1.3 Typical Test Results at Approved Power Rating

Speed	(rpm)	2500
Torque	(Nm)	221.8 (with exhaust filter)
Power	(kW)	58.0 (with exhaust filter)
Inlet Vacuum	mm Hg	-3.2
Exhaust Pressure	kPa	12.9 (with exhaust filter)
Fuel Consumption	kg/hr	17.51 (with exhaust filter)
Maximum surface temperature / location	°C	134
Conditioner water consumption over 1 hour	L	80.3
Carbon Dioxide CO ₂ (before/after treatment)	%	10.4 / 11.1
Carbon Monoxide CO (before/after treatment)	ppm	280 / 20
Oxides of Nitrogen NO _x (before/after treatment)	ppm	468 / 496
Nitrogen Oxide NO (before/after treatment)	ppm	463 / 486
Nitrogen Dioxide NO ₂ (before/after treatment)	ppm	5 / 10
Smoke – Single point(before/after treatment)	Bosch	2.35 / 1.9

2.0 Documents Submitted for Approval

2.1 Approval Drawings

The drawings listed must be supplied and kept with each Diesel Engine System approval package.

DRAWING NO:	ISSUE	DATE	TITLE
GT19700 sheet 14	01	23/3/2005	PERKINS 1104C-44, APPROVAL DRAWING, ENGINE SYSTEM MDA DES 055119
GT19700 sheet 15	01	23/3/2005	PERKINS 1104C-44, APPROVAL DRAWING, ENGINE SYSTEM MDA DES 055119
GT19700 sheet 16	01	23/3/2005	PERKINS 1104C-44, APPROVAL DRAWING, ENGINE SYSTEM MDA DES 055119

2.2 Drawings Submitted for Reference

These drawings are listed for reference only and need not be supplied with each Diesel Engine System approval package.

DRAWING NO:	ISSUE	DATE	TITLE
GT19700 sheet 21	01	13/11/2005	NIPPER & MK4.5, 1104C PERKINS, EXHAUST ASSEMBLY
GT19700 sheet 2	01	18/2/2005	PERKINS 1104C-44, SINGLE PIPE CATALYTIC CONVERTER
GT19700 sheet 29	01	19/10/2005	PERKINS 1104C-44, NIPPER & MK4.5, FUEL SYSTEM
GT19700 sheet 28	01	18/10/2005	PERKINS 1104C-44, NIPPER & MK4.5, COOLING SYSTEM FITTINGS
GT19700 sheet 19	01	17/10/2005	PARTS/SERVICE/OPERATORS, 1104C-44 PERKINS ENGINE, INTAKE AND ENGINE MODIFICATIONS
MC45700 sheet 6	01	12/11/2005	MINE CRUISER MK4.5 - 1104C-44, EMERGENCY STOP VALVE, PARTS/OPERATION & MAINTENANCE
MC45700 sheet3	01	17/11/2005	MINE CRUISER MK4.5 – CAT/PERK 1104C-44, CONDITIONER WATER SUPPLY CIRCUIT

2.3 Approval Documents:

The document listed must be supplied and kept with each Diesel Engine System approval package.

DOCUMENT NO:	ISSUE	DATE	TITLE
RE0157	01	22/11/2005	Compliance Statement by designer G Bailey of PJ Berriman & Co Pty Ltd
RE0158	02	27/1/2005	Design verification statement by T O'Donnell of PJ Berriman & Co Pty Ltd

2.4 Documents Submitted for Reference

These documents are listed for reference only and need not be supplied with each Diesel Engine System approval package.

DOCUMENT NO:	ISSUE	DATE	TITLE
RE0140	01	30/09/2005	Form C – Design verification compliance assessment
RE0141	01	5/10/2005	Diesel Engine System - FMEA Risk Assessment by PJ Berriman & Co Pty Ltd
RE0142	01	25/11/2005	Perkins 1104C-44 DES Type approval fitted with an emergency stop valve by PJ Berriman & Co Pty Ltd
26533A	01	26/10/2005	Type Testing Perkins Diesel Engine Reference 1104-4C by Testsafe Australia
DEV0772	Original	23/11/2005	Diesel Engine Exhaust Gas Analysis by PJB Research Pty Ltd
-	-	-	3M Brand Substrate Blown Microfiber Filter Media – Exhaust particulate filter element
76001	-	6/8/1997	Ignition temperature tests by Testing & Certification Australia
43175.1	-	2/8/2002	Glow wire tests by Testing & Certification Australia
FORM-181-00			Mechanical Code A Inspection by PJ Berriman and Co Pty Ltd
FORM-182-00			Mechanical Code B Inspection by PJ Berriman and Co Pty Ltd
FORM-183-00			Mechanical Code C Inspection by PJ Berriman and Co Pty Ltd
FORM-178-00			Mechanical Code D Inspection by PJ Berriman and Co Pty Ltd

3.0 Conditions for Supply and Use

3.1 General Conditions

1. The user of the Approved System shall conduct a site specific Operational Risk Assessment and implement all barriers to risk identified in the Risk Assessment prior to the introduction of the system into a Coal Mine in New South Wales. This Operational Risk Assessment shall be reviewed when operating conditions vary and at periods not exceeding five (5) years.
2. The Chief Inspector of Coal Mines has the right to vary or revoke this approval at any time.
3. The manufacture is to certify in writing that the particular system supplied is in accordance with the requirements of this approval insofar as those matters assessed for the approval are concerned.
4. There shall be no variation in the materials, design or construction of the equipment associated with this approval without prior consent of the Chief Inspector. Unauthorised alteration or substitution of approved equipment shall render this approval void.
5. The Owner of this System shall ensure that adequate information is retained at the mine to enable the system to be operated, tested and maintained in the approved condition. This information shall also be made available wherever the system is overhauled or repaired.
6. This approval ceases to be valid if the system is not designed, modified, examined, tested, maintained, overhauled and repaired in accordance with the approval conditions, Occupational Health and Safety Act, 2000 Coal Mines Regulation Act, 1982 and Associated Regulations.
7. The Mine Managers Defect Management System required by Clause 42 Part 2 Division of the Coal Mines (General) Regulation 1999 should include providing details of any defects to the approval holder.
8. The Manager of the mine shall ensure the recommendations of the Approval Holder are complied with as far as they relate to the system, unless an appropriate documented risk assessment process is used to identify alternative means of providing at least equivalent levels of safety and these alternatives are implemented.
9. In accordance with the Occupational Health and Safety Act, 2000 it is a requirement that the Mine Management, Equipment Manufacturers, Equipment Owners, Hire / Lease Organisations, Approval Holders and the Designer of the equipment all take considerable responsibility for the safety related aspects of the system. Compliance with safety related recommendations of the Approval Holder should be viewed as an integral part of the responsibility of all concerned.
10. A safety audit of the Approved System shall be carried out at intervals not exceeding five (5) years. This safety audit shall be documented and shall include:
 - (a) an assessment for compliance against these approval conditions, and
 - (b) an assessment for compliance against the current community standards, applicable to the Approved System at the time of the audit, and implementation of interim control measures to reduce risk to an acceptable level, and
 - (c) an assessment of the safety defects identified since the previous audit and a review of the improvements required to minimise these defects.

3.2 Specific Conditions

1. Type Approval No. MDA DES 055119, the Suppliers name or mark and the required minimum ventilation quantity of 3.5m³/sec shall be inscribed on a durable plate fixed in a prominent position on the equipment. In addition, the approval number shall be stamped on each of the following components:
 - (a) Inlet flame trap and manifold assembly.
 - (b) Exhaust manifold & pipe assembly.
 - (c) Exhaust gas catalytic purifier.
 - (d) Exhaust particulate filter assembly.
 - (e) Exhaust conditioner.
2. An individual DE number shall be allocated for each diesel engine by the Department of Mineral Resources Mine Safety unit. This number shall be stamped on the engine block in an accessible location.
3. MDG32 or any relevant Australian Standard should be considered in the development of the mine's standards of engineering practice for the maintenance of the Diesel Engine System and for the mines 103 scheme.
4. Each installation of this engine type shall be checked to ensure compliance with Australian Standard AS 3584.2-2003. These checks shall include but are not limited to:
 - (a) Protection of exposed Aluminium or light metal alloys.
 - (b) Operation of the engine shutdown system.
5. The diesel fuel used in this engine system shall comply with that specified under Clause 69 of the Coal Mines Regulation (Underground) 1999 and with any additional criteria nominated by the Engine System Manufacturer.
6. The exhaust gas emissions shall comply with that specified under Clause 14 (2) of the Coal Mines (Underground) Regulation 1999.

7. Routine testing of exhaust gas emissions shall not exceed those results obtained during type testing, as listed above, by more than 10% for CO, NO & NO₂ or by more than 5% for CO₂ as specified in AS 3584.2-2003
8. All emergency activations of the emergency shutdown system and failures of the normal fuel shutdown system shall be documented and reported to the Department Inspectorate.
9. Consideration should be given to the safety of the operation of the diesel engine system when used in an emergency.
10. After activation of the emergency shutdown system there shall be a risk assessment to determine the issues of resetting and the continued safe operation of the diesel engine system.

G. D. JERVIS,
Senior Inspector of Mechanical Engineering,
Under the delegated authority of the Chief Inspector of Coal Mines