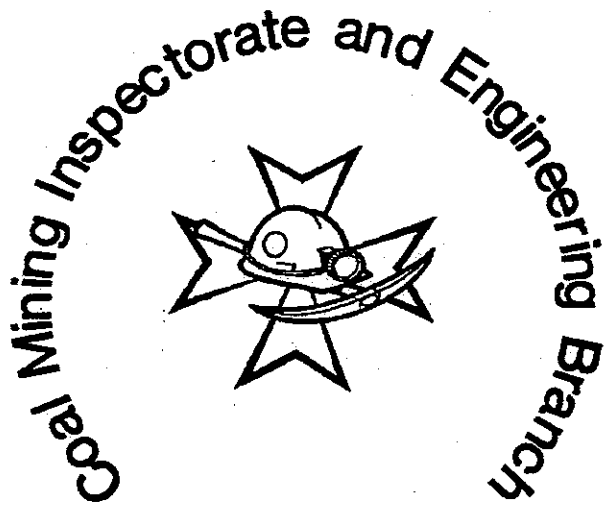
MINERAL RESOURCES

Department of Mineral Resources
New South Wales



Design Guidelines for the Construction of Locomotives

No MDG 2

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DESIGN GUIDELINES FOR THE CONSTRUCTION OF LOCOMOTIVES
No MDG2

FILE REFERENCE: C82/3465

1. SCOPE

1.1 Clause 9(a) of the Coal Mines Regulation (Transport - Underground Mines) Regulation 1984, requires that all locomotives operated in an underground coal mine shall be approved by the Chief Inspector.

A "locomotive" means a vehicle running on rails whether propelled by electrical or mechanical means.

NOTE A locomotive thus includes man cars which are self powered and run on rails.

1.2 The following guidelines are intended to help designers by indicating those parameters which will be considered in an approval assessment of locomotives.

The guidelines do not generally give quantitive information as it is not intended to restrict innovative design. Where specific values or test procedures are required, advice should be sought from Inspectors of Mechanical Engineering, Coal Mining Inspectorate and Engineering Branch of the Department of Minerals Resources.

NOTE "shall" and "should"

(a) "shall" means that the requirement is mandatory if it is applicable to the type of locomotive under consideration.

(b) "should" means recommended.

1.3 Unless otherwise specified, the appropriate Australian Standards shall apply.

1.4 These guidelines do not in any way negate the requirements of the Coal Mines Regulation Act 67/1982 nor the Occupational Health and Safety Act, 1983, No 20.

1.5 Approval procedure for Diesel Engined Locomotives

1.5.1 Diesel Engine Locomotive (DEL) Type approval applications should be supported by the following:-

(A) All information as requested in Appendix A1 (Application Guide) for DEL applications.

(B) A brief statement of compliance, variation or reason for non compliance with each item mentioned in these guidelines. A marked up and signed copy of these guidelines may be used.

1.5.2 Diesel Engine System (DES) Type approval applications should be supported by the following:-

(A) Results of tests and a statement of compliance with all requirements in accordance with Australian Standard AS 3584.

(B) All information as requested in Appendix A2 (approval for diesel engine system DES).

(C) A brief statement of compliance, variation or reason for non compliance with specific DES items contained in these guidelines.

1.6 Approval procedure for Electric Powered Locomotives.

1.6.1 Electric powered locomotives Type approval application should be supported by the following:-

(A) All information is requested in appendix A3 (application guide for Electric Powered Loco applications.

(B) A brief statement of compliance, variation or reason for non-compliance with each item mentioned in these guidelines etc.

1.6.2 Documentation covering electrical aspects as required by the Department of Mineral Resources Applicants Guide to obtaining an approval from the Chief Inspector of Coal Mines or an Accredited Assessing Authority.

All electric apparatus shall comply with the requirements of the Coal Mines Regulation Act 67/1982, subsequent Regulations and relevant Australian Standards.

1.7 Limit of Application:-

1.7.1 Use of locomotives on Grades

The maximum operating grade for diesel and electric powered locomotives is limited by the requirements of clause 13 of "Coal Mines Regulation (Transport - Underground Mines) Regulation 1984".

1.7.2 Use of Diesel Engines on Grades

The maximum slope of any diesel engine system is limited to:-

In the line of the diesel system axis - 1 in 4
Across the travel direction - 1 in 8

Use of diesel engined systems on steeper grades requires the application of special approval conditions to ensure that the engine system remains flameproof.

1.7.3 Transport of locomotives by Drift Haulage Winders.

Provisions shall be made for the safe transport of locomotives by drift haulage winders at slopes up to and including 1 in 3. The system shall not require the loco to be occupied. Any safety devices which need to be overruled for transport on a drift should be such that normal operation can only be achieved when all safety devices are operational.

NOTE Some of the safety devices are referred to in section 6.2

1.8 Date of Application

The majority of the requirements in these guidelines are already in effect. The additional requirements shall be in effect for all new locomotives delivered after 1st May, 1992.

2. CONTROL FUNCTIONS

2.1 The operating controls shall be clearly marked to show their function and mode of operation. Direction of movement is specified below:

FUNCTION	DIRECTION
EMERGENCY STOP	Push a large red button.
ON	Down, right, forward, clockwise, pull (push/pull type switch).
OFF	Up, left, backward, anti-clockwise, push.
RIGHT	Clockwise, right.
LEFT	Anti-clockwise, left.
FORWARD	Forward, down.
REVERSE	Backward, up.
RAISE	Up, back.
LOWER	Down, forward.
RETRACT	Up, backward, pull.
EXTEND	Down, forward, push.
INCREASE	Forward, away, right, clockwise.
DECREASE	Backward, toward, left, anti-clockwise
OPEN VALVE	Anti-clockwise.
CLOSE VALVE	Clockwise.

NOTE The details of all controls shall comply with the minimum ergonomic requirements as detailed in (appendix A4). The requirements contained in this guideline shall take precedence over appendix A4.

2.2 PERSONNEL PROTECTION

Ergonomics

All relevant ergonomic aspects of the locomotive shall be addressed by the manufacturer in the design and manufacture of the locomotive. A suitable person shall review the ergonomic aspects of the locomotive to ensure compliance with good practice.

2.2.1(a) The control cabin and all passenger compartments shall have sufficient structural integrity to protect personnel being transported in the locomotive. This includes but is not limited to collisions, derailments and falling roof cross supports an enclosed cabin complete with a solid roof is recommended.

(b) The structural integrity of the driver and passenger compartment shall pass the test requirements as stipulated in (Appendix A5).

(c) The distance from the underside of a protective device or cabin roof in the vicinity of a persons head to the top of the horizontal section of the persons seat should be 1 metre when the protective device or cabin roof is in its lowest position.

(d) Alternatively "F.O.P.S." to Australian Standard AS2294 or SAE J1040 or ISO 3449 may be provided to protect locomotive drivers and passengers.

2.2.2 The driver should be seated in the direction of travel. A control cabin shall be provided at each end of all locomotives.

2.2.3 Protection shall be available to minimise the possible ingress of substantial materials from the surrounds of the locomotives into any driver or passenger compartments.

2.2.4 The entrance to and driver and passenger compartments shall be designed to prevent personnel being thrown out of the locomotive. The design shall be such that it comfortably contains the driver and passengers within the compartment.

2.2.5 There shall be no sharp edges in any compartment. Against which a driver or passenger could be thrown in the event of a collision or derailment.

2.2.6 Ergonomically designed seating shall be provided for the driver and all personnel to be transported.

2.2.7(a) Seat belts should be provided for the driver and passengers on all vehicles, particularly those capable of speeds in excess of 20 Kph.

(c) All seat belts and anchorages shall comply with Australian Standard AS2664 or SAE J386 or ISO 6683.

2.2.8 The driver's seat shall be ergonomically designed and positioned so the seated driver has all controls within comfortable reach and can clearly see in the direction of travel.

2.2.9 Engineered suspension systems should be used to ensure adequate comfort for the driver and passengers for all operating conditions.

2.2.10 Provision shall be made for the transport of a stretcher patient on all locomotives designed to carry two or more people, including the driver.

2.2.11(a) Hand grips shall be provided on all locomotives to assist both passengers and drivers with access.

(c) All hand grips shall be so positioned that a persons hand will not be vulnerable to danger from items external to the vehicle.

2.2.12 Steps should be provided on all locomotives to assist both passengers and drivers with access. Safe ingress and egress shall be designed such that injury to personnel is minimised.

2.3 MAIN CONTROLS

2.3.1 Regenerative or hydrostatic braking shall be incorporated within the speed control device operated by the drivers right hand. Service braking shall be operated by the left hand.

2.3.2 Means shall be provided for giving adequate audible warning and to allow the application of the emergency brakes from the driver's compartment and by at least one person in each of any separate passenger compartments. Sound pressure from the horn shall not exceed 100 dB(A) at the ear of any person within the loco.

2.3.3 All locomotives capable of travelling on a level grade at a speed in excess of 10 km/h shall be provided with an illuminated speed indicator visible to the driver. If a cable drive is used then proof of the long term reliability shall be confirmed.

2.3.4(a) Two separate headlights shall be provided on each end of each locomotive. The headlights shall give adequate illumination for at least 100 metres or the maximum stopping distance plus 30% whichever is the greater requirement. The headlights shall operate at least in the direction of travel. The end of a locomotive opposite to the direction of travel shall be fitted with red lights which are readily visible from a distance of at least 40 metres.

NOTE Appendix A4 provides more details on light intensities.

(b) The headlights should be positioned near the maximum height and width of the locomotive.

(c) Grouping of the red and white light in the same enclosure may be used, subject to electrical approval requirements.

(d) The height of the lights should suit undulating terrain. Additional lighting should be provided if considered necessary.

(e) For mancars the automatic changeover of headlight/taillight switching in conjunction with control station selection should be provided.

2.3.5 To avoid convoy accidents brake lights should indicate when any brakes are applied. Flashing of the lights should be considered.

2.3.6 Locos normally used as mancars shall not be capable of being driven in reverse i.e. the driver must move to the other cab to drive in the other direction.

2.3.7 For tandem operation hoses and cables shall not be capable of being installed incorrectly.

2.3.8 On battery powered locomotives the earth leakage indication shall be visible to the driver in his normally seated position.

2.3.9 Drive control stations shall be so interlocked that it is only possible to drive from one control station at a time.

2.3.10 Means shall be provided for applying sand to the rails for both directions of travel of the locomotive in front of each leading wheel.

2.3.11 Means shall be provided for easy cleaning of sand boxes and discharge pipes.

2.3.12 Means should be provided for emergency flushing of sand discharge pipes with high pressure air.

2.3.13 Means should be provided for voice communication between compartments on a locomotive and between locomotives designed to be operated in tandem.

2.3.14 If locomotives are to be used in tandem then the train shall be controlled from one drivers cab.

2.3.15 Failure of the control connections between locomotives in tandem shall result in automatic removal of tractive effort and automatic application of the brakes. This should be achieved by fail to safety means.

2.3.16 Consideration should be given to providing a means of assessing load mass and grade to assist drivers in limiting the loads hauled.

3. TRACTION BRAKING REQUIREMENTS

At least three (3) braking systems shall be available for use on any locomotive. These systems are classified as:-

3.1 Service brakes - to be used as the primary braking system.

3.2 Emergency brakes - to be used in the event of a failure of the service brakes; and

3.3 Parking brakes.

3.4 Brakes General

3.4.1 A 'dead-man' control shall be fitted. This control shall be designed to minimise the possibility of being defeated. When activated the 'dead-man' control shall either cut or reset automatically to zero the traction power and apply either the spring applied section of the service brakes where applicable or the emergency brake at a controlled rate. (refer section 3.8)

Brake systems may use common components, but any one failure in the common components shall not reduce the capability of the emergency brakes to stop the locomotive safely.

At least one of the braking systems must be operated by direct mechanical action by the driver. Brakes applied by springs on the release of fluid pressure satisfy this requirement.

All braking systems should be designed to eliminate, or minimise so far as practicable, locking of the wheels.

No power assisted mechanical or fluid braking systems shall be rendered ineffective by non-rotation of the engine.

Where the operation of a braking system depends on accumulated hydraulic or pneumatic power, the system must include a reservoir capable of sustaining at least five consecutive applications of the brakes with the power source inoperative. Devices shall be provided to prevent the locomotive or vehicle being moved under its own power unless the braking system is in operating condition.

3.4.5 Hydraulic or pneumatic braking systems shall include a pressure gauge clearly marked to indicate the minimum safe brake operating pressure. The gauge shall be easily visible from the drivers seat. A warning light should also be used to indicate the state of the brake pressure systems.

3.4.6 Hydraulic braking systems shall use approved fire resistant oil or fluid except where hydrostatic service braking is used or oil immersed brakes are used.

3.4.7 The emergency and park brake once applied should require the control to be reset before the brakes may be released.

3.4.8 An effective interlock should be provided to protect against the locomotive being driven with the brakes applied.

3.4.9 All mechanical brakes other than dump shoes or shoes applied directly to the wheels or rail track shall be oil immersed and fully enclosed and shall include a means of limiting maximum surface temperature to less than 150 degrees Celsius.

3.4.10 A clearly identifiable means of externally monitoring brake wear and the required adjustment range shall be displayed.

3.4.11 Any braking system relying on adhesion between wheel and track shall have that braking system acting on all wheels.

3.4.13 Service and emergency braking systems shall be so constructed that the response time between initiation and commencement of braking does not exceed 0.7 second. (excludes human response time)

(This may be increased to 1.0 seconds whilst locomotives are operated and controlled in tandem).

3.4.14 The mechanical brake installations shall be designed so that the same braking effort can be delivered in both driving directions.

3.4.15 (A) For operational service the loads and speed shall be limited so that an adhesive coefficient of 0.17 during braking will bring the locomotive and its load safely to rest in a safe distance. As a guide a distance not exceeding 60 metres may be used (assuming steel wheels on steel track.)

(B) The theoretical maximum possible braking force shall be less than the theoretical maximum possible adhesive force but by no more than 5%.

3.4.16 Electrical regenerative or hydrostatic braking should be capable of a maximum effective brake force as per section 3.4.15.

3.4.17 All mechanical braking systems except service brakes shall fail to safety.

3.4.18 All locomotives utilizing pneumatic operated braking systems shall have a compressor and receiver capacity adequate for immediate or future train braking. (This requirement does not apply to mancars which are not designed to haul other wheeled loads).

3.4.19 Compressed air operated brake cylinders and systems shall be designed to ensure an adequate service life by including:-

(a) suitable protective coating of the cylinder walls to prevent corrosion.

(b) Effective and adequate draining of the water from the air system.

3.4.20 Consideration should be given to providing air or hydraulic energy storage for service brake application independently from the requirements of other consuming systems.

3.4.21 Braking systems must be designed to eliminate or minimise so far as practicable, the generation, in any part of the system, of temperatures capable of igniting combustible material likely to be present in the vicinity of that part. Brake blocks and/or brake linings must be of a type designed to minimise incendive sparking by frictional contact and shall not contain asbestos.

3.4.22 Locos which normally rely on rail to wheel adhesion but do not have shoe brakes applied directly to the wheels shall be provided with a means of removing any build up of solid materials which may effect the adhesion between rail and wheels.

3.4.23 All braking performance requirements shall be verified both by calculation and testing. (see Appendix A6)

3.4.24 If brake performance varies with wear then consideration should be given to design of an automatic adjusting system which maintains braking performance.

3.4.25 Consideration should be given to the installation of a grade and load sensitive speed limiter.

3.5 Service Brakes

3.5.1 The service brake systems shall consist of either

(a) a full mechanical system or

(b) a electric regenerative system in addition to a mechanical system or

(c) a hydrostatic system in addition to a mechanical system.

3.5.2 Mechanical Service Brakes

It is preferred that the mechanical service brake system be a dual circuit such that the failure of one circuit will not prevent the other circuit from acting to apply braking effort. This applies particularly to locomotives with only 1 means of service braking. This provision is not necessary if the dead man brake system automatically applies when pressure to the service brakes fails.

At least one brake actuator shall be provided for each axle.

For locomotives designed for use with captive rail traction systems the mechanical service braking system must be capable of providing effort at least equal to the maximum tractive effort which the locomotive is capable of developing.

3.5.3 Electric Regenerative Braking

Is permitted provided that it can readily be replaced or supplemented by mechanical service braking during normal driving.

Automatic application of the regenerative braking during overspeed should be considered, particularly for man cars.

In addition automatic braking should be considered for locomotives hauling loads where the control system includes a means of compensating for variations in grade.

Before the automatic braking system speed is reached a warning light should indicate to the driver that he is approaching that speed at which the brakes apply automatically.

A means of detecting wheel slip and correcting automatically should be considered.

3.5.4 Hydrostatic Service Brakes

Is permitted provided it can be replaced or supplemented by mechanical service braking during normal driving.

Hydrostatic service braking should be provided with dual circuits such that the failure of one circuit will not prevent the other circuit from acting to apply the respective brake.

Hydrostatic service braking shall include adequate factors of safety in the design of the system and components.

Automatic application of the Hydrostatic brakes when the locomotive exceeds its safe speed should be considered, particularly for man cars.

In addition automatic brake application should be considered for locomotive hauling loads where the control system includes a means of compensating for variations in grade.

3.6 Emergency Brakes

Emergency braking shall operate independently of the adhesion between the wheels and track

3.6.1 Emergency braking shall meet deceleration criteria as per results of clause 3.4.15.

3.6.2 A satisfactory means of emergency braking includes track dump braking.

3.6.3 The emergency brake shall remain capable of being applied from any compartment regardless of which drive station has been selected.

3.6.4 Clearance between dump pod and rail shall be such that contact does not normally occur when negotiating undulating track.

Operation of the emergency brake should be by a large red button readily accessible to the seated driver and to passengers in any other compartment.

3.7 Parking Brake

(a) A fail to safety park brake shall be provided. The park brake shall keep the locomotive and its maximum permissible load at standstill on the maximum operable gradient that the loco is design for.

(b) It must be possible for the park brake to be activated whilst the locomotive is moving.

(c) The parking brake may use components of the dead man brake but the means of application must be by a seperate control of the operating device.

3.8 Deadman Brake

3.8.1 The deadman brake shall be fail to safety and not require stored fluid pressure energy for its application. (spring applied brakes may be used)

3.8.2 The deadman brake shall be capable of safely bringing to rest the maximum load on the maximum grade that the loco is designed for.

3.8.3 The dead man valve shall be sufficiently clear of the floor to prevent a build up of dirt preventing its operation.

3.8.4 The rate of application of the dead man brake shall be such that it doesn't tend to cause the locomotive to skid on unsanded track.

3.8.5 A dead man control shall be provided at each drivers position and shall only be capable of releasing the brakes from the cabin selected for drive control.

4. NOISE.

Noise should not exceed a level which would expose the driver or any passenger to 85dB(A) or more in an underground coal mine environment under any conditions of locomotive use. In any case this noise level shall not exceed 90 dB(A).

5. FLUID POWER SYSTEMS.

5.1 Flexible hoses shall be compatible with hydraulic fluid used and the maximum system pressure and temperature.

5.2 The hose factor of safety shall be a minimum of 4 to 1 based on hose burst pressure to maximum working pressure.

5.3 Hydraulic hose shall comply with the provisions of AS 3791-1991 Hydraulic Hose and the requirements for flame resistance shall be in accordance with testing to AS1180-10B and acceptance to AS2660 or alternately satisfy Schedule 2G of the U.S. Bureau of Mines or comply with type 1 or 3 hose specifications as listed in ISO 6805.

5.4 Where a hydraulic system incorporates an accumulator the attachment to the accumulator shall be by means of a minimal length adaptor and flexible hose. Fittings shall be located or otherwise guarded to provide mechanical protection. A manual bleed valve shall be fitted to allow pressure relief for maintenance. Fluid should return to tank.

5.5. Accumulators shall be securely installed.

5.6 The use of nylon or PVC piping for pneumatic control systems will be acceptable only in cases where loss of pressure within these systems cause the system to fail to safety. All such piping shall be adequately protected and shielded from contact with hot and/or sharp surfaces.

5.7 Air and water hoses shall be in accordance with AS2660-1983 unless otherwise specified.

5.8 Elastomeric (rubber type) hose shall not be used between an air compressor and air receiver. Teflon with steel braid is satisfactory.

5.9 Air compressors should be of the liquid cooled type in accordance with AS 3584.

5.10 Pressure vessels shall comply with at least one of the following standards.

(a) AS2971 - Serially produced pressure vessels (maximum capacity limited to 150 litres)

(b) AS1210 - Unfired pressure vessels, where capacity exceeds 30 litres.

(c) SAE-J10 - Automotive and off-highway air brake reservoir performance and identification requirements.

6.0 DRAWBAR ATTACHMENTS

6.1 The drawgear for locomotives shall comply with Australian Standard AS3751 unless otherwise stated. The complete drawgear assembly including the coupling shall have the following minimum breaking strength:-

(i) Not less than 2.5 times the weight of the locomotive.

OR (ii) Ten times the maximum drawbar pull.

whichever is the greater.

For locos in tandem add the relevant additional weight and drawbar pull and apply the above criterion.

Hooks for safety chains shall be provided and shall be fitted with self closing attachments and comply with Australian Standard AS3751.

NOTE Allen and Garcia, Alliance and Willison type couplings are permitted although not specifically detailed in AS3751 provided they basically comply with the standard including such items as factor of safety, locking methods to retain the coupling in the closed position, a shroud to prevent vertical disengagement and material that is resistant to impact failure.

6.1.1 The maximum towable weight (gross load) shall be as per the towing locomotive manufacturer's recommendation which will cover:-

(a) towed loads not fitted with train brakes.

(b) towed loads fitted with train brakes.

(c) Reference made to grades for the towable weight recommended.

6.1.2 All braking systems used when a locomotive tows a load fitted with train brakes should comply with section "3" of these guidelines.

6.2 Towing of a locomotive which is inoperable.

A means of towing shall be recommended by the Manufacturer and provisions to be made shall include the following:-

6.2.1 A suitable towing point shall be provided on the locomotive.

6.2.2 A means of releasing deadman brakes on the towed locomotive.

6.2.3 A means of defeating the emergency brake system.

6.3 Personnel carrying skips or carriages towed by locomotives shall be required to comply with these guidelines. This includes but is not limited to the inclusion of train brakes.

7. ENGINE SYSTEMS

7.1 Diesel Engine systems should comply with Australian Standard AS3584 Diesel Engine Systems for underground coal mines.

7.2(a) Fuel filling points shall be fitted with spring closed caps which effectively prevent the spillage of fuel under any condition of operation of the vehicle.

(b) Fuel tank capacity shall not exceed a maximum of 6 hours engine running at the maximum rated engine power. A rule of thumb is maximum fuel tank size (in litres) = maximum approved power rating in Kw X 2.

7.3(a) To minimise the ingress of foreign material which could cause safety devices to malfunction header tanks should be made from a corrosion resistant material and a strainer should be utilised in the header tank discharge line.

(b) Hoses from the header tank to the conditioner should be arranged so that a sediment trap is not formed and they are not vulnerable to damage.

7.4 Consideration should be given to providing sufficient water in the conditioner header tank if fitted, to permit a full shifts operation of the vehicle under normal operating conditions.

7.5 The Normal Manual Engine Shut Down System shall automatically remain in the shut down position until manually reset for starting.

7.6 All locomotives should be fitted with a meter to measure the hours the engine has run.

7.7 Routine testing of engine system components shall conform to the requirements of section 3.3 AS3584.

7.8 Items now detailed in Australian Standard AS3584 which are highlighted for convenience:-

7.8.1 Transmission belts shall be fire resistant and anti static to AS2784 (section 2.2.2 b2 AS3584).

7.8.2 Cooling fans from non metallic materials shall have an electrical resistance not exceeding 1 G ohm (section 2.5f AS3584).

7.8.3 A safe radiator pressure release system shall be provided e.g. by special radiator caps fitted with pressure relief devices. (section 2.5d AS3584)

7.8.4 The automatic safety shutdown system shall be designed to be fail safe. e.g. if low water shut down float fails or becomes disconnected then engine should shut down (section 2.11.1 AS3584).

7.8.5 Following an operation of the automatic safety shutdown system, the engine shall not be able to be restarted until the malfunction is rectified or unless the shutdown was caused by low oil pressure or loss of engine cooling water pressure. e.g. can no longer override low water in conditioner or engine over temperature etc. (section 2.11.4 AS3584)

7.8.6 A means should be provided for readily identifying the reason for automatic shutdown of an engine automatic safety shutdown system.

7.8.7 For the purpose of periodic engine testing of the undiluted exhaust gases as required under C.M.R.A. the manufacturer shall recommend a suitable method of loading the engine.

7.8.8 There should be no readily accessible means other than the nominated device of defeating the engine automatic safety shutdown system.

7.8.9 A temperature monitor shall be positioned in the exhaust from the exhaust conditioner to shut down the engine if an over temperature condition occurs. This acts as a back up for the low water shut down system.

8. General

8.1 Interlocking of start controls on diesel powered locomotives

(a) Neutral interlock shall be provided on all locomotives. Such provision is to prohibit locomotives from being started with the transmission engaged. The neutral interlock system shall also prevent an operator engaging the transmission drive position whilst ever the engine safety shutdown system override is engaged.

(b) Interlocking should be provided so that the park brake needs to be applied before a locomotive diesel engine can be started.

8.2 Reflective medium shall be provided at each end and side of the locomotive in a position where it can be easily seen.

8.3 All electric apparatus shall comply with the requirements of the Coal Mines Regulation Act 67/1982, subsequent Regulations and relevant Australian Standards. These standards include but are not limited to:-

- AS2595 Part 1 — Electrical Equipment for Coal Mines - Electrical requirements for underground mining machines and accessories. Equipment for use in explosive atmospheres.

- AS2380 Part 1 — Electrical Equipment for explosive atmospheres - Explosion protection techniques. General requirements.

8.4 At least one approved portable fire extinguisher shall be installed in close proximity to each drivers compartment. The extinguishers shall have a minimum SAA rating of 80BE.

8.5 Exposed aluminium or light metal alloys shall not be permitted in the construction of locomotives. For specific guidelines (refer appendix A7) and section 2.2.1 of the Australian Standard AS3584.

8.6 No external surface temperature shall exceed 150 degrees C under any conditions of locomotives usage. Such includes brake devices, compressors and all other heat sources.

8.7 Locomotives shall, so far as practicable, be constructed of non-flammable material.

8.8 The addition of power operated winches mounted on a locomotive shall require appropriate safety protection considerations. Requirements can be provided by the Senior Inspector of Mechanical Engineering upon request.

8.9 Axle boxes fitted with labyrinth seals should be fitted with back up seals which prevent contamination of bearing surfaces by dirt and water.

8.10 Anti friction bearings should be fitted with metallic cages (poly-amide caged bearings shall not be used on any drive train components nor in axle boxes).

8.9(a) An adequate operating manual and maintenance manual shall be provided. Such manuals shall relate where required to matters prescribed under the CMRA 67/1982 section 101 Transport Rules and Section 103 Schemes for the testing of electrical or mechanical apparatus.

(b) Sufficient information must be supplied by the manufacturer to ensure that the requirements of the Occupational Health and Safety Act, 1983. No 20 are complied with, this includes but is not limited to section 18.

8.10 Exhaust Outlet for diesel engines.

The exhaust outlet from the conditioner should be designed to:-

(a) effectively channel exhaust gases away from the driver and passengers.

(b) to avoid recirculation of the exhaust gas.

(c) minimise disturbance of roadway dust.

(d) include a system of dilution of the exhaust gases where this can be achieved without any increased exposure to the driver or passengers.

8.11 Auxiliary transmission belts and fans not part of the engine system shall comply with sections 7.8.1 and 7.8.2.

8.12 The extremities of the loco shall be designed to prevent dumping the loco on a persons toes. Only the coupling area may be exempted from this requirement.

LABELLING.

The labels required shall include the following where applicable:-

9.1 The electrical approval number or the DEL and DES numbers.

9.2 The date of manufacture.

9.3 The tare and gross weight of the locomotive.

9.4 The maximum number of personnel for which seating is provided in each compartment.

9.5 For Diesel Engine powered locomotives the ventilating air quantity required at maximum power output. This shall be based on a minimum of 0.06 cubic meters per second for each kilowatt with a minimum of 3.5 cubic meters per second (Coal Mines Regulations 1984.)

9.6 Maximum operating grade and load limit for that grade.

9.7 Towing instructions
(a) for towing the locomotive if inoperable
(b) for towing a load
(c) maximum load to be towed.

9.8 A warning sign adjacent to all rotating fans.

9.9 A warning at all accumulators that pressure must be safely released before work commences. (sect. 5.4)

9.10 A warning on any spring applied brake chamber that it contains a spring under compression.

9.11 An operator check list is to be provided within the control compartment denoting the minimum operator checks prior to operating the machine. The check list will be constructed of engraved "Traffolyte" or similar. (See appendix A8).

9.12 A warning that "hearing protection must be worn" if noise level exceeds 85 dB(A) for each loco compartment.

9.13 Minimum safe operating pressure shall be marked on the pressure gauges of hydraulic and/or pneumatic braking systems.

9.14(a) For any diesel engine the exhaust conditioner "test point".

(b) The exhaust conditioner "drain point".

(c) The radiator pressure relief point.

9.15 Danger signs shall be placed in appropriate positions of the locomotive if it is possible to dump any part of it onto a persons feet.

9.16 A warning that the park brake should be applied before leaving the vehicle.

9.17 Identification of all controls including direction of movement where applicable.

9.18 Brake wear indication and identification.

9.19 Identification of tandem connection hoses and cables.

9.20 Emergency stops.

9.21 All controls.

10. REVIEW OF GUIDELINES

To keep abreast of progress in industry, Guidelines are subject to periodic review and are kept up-to-date by the issue of amendments or new editions as necessary. It is important therefore that users ensure that they are in possession of the latest edition, and any amendments.

Suggestions for improvements of Design Guidelines, addressed to the Senior Inspector of Mechanical Engineering are welcomed. Notification of any inaccuracy or ambiguity in any Guidelines should be made without delay in order that the matter may be investigated and appropriate action taken.

Proposed Review date: 1st June 1992.

Appendices

I Approval for diesel engine powered vehicle (DEL).

II Approval for diesel engine powered system (DES).

III Approval for electric powered vehicle (EL).

IV Minimum Ergonomic Requirements for Underground vehicles.
(1) Minimum Lighting Requirements.

V Test Data Sheet - Protective devices for free steered vehicles.

VI Brake Performance Verification.

VII Industry Guidelines for the Use of Aluminium Underground.

VIII Operator Check List.

IX Design Guideline Listing.

X Purchasing Form For Design Guidelines.

New South Wales
Department of Mineral Resources

Appendix A1

APPROVAL FOR DIESEL ENGINE POWERED LOCOMOTIVE (DEL) FOR USE IN UNDERGROUND COAL MINES

In conjunction with the submission of an Approval Application Form seeking a DEL Approval the following information is required:

(a) A general arrangement drawing showing the overall dimensions of the loco showing, location of:

1 diesel engine
2 intake system
3 exhaust system including water conditioner; and water supply
4 exhaust gas dilution system
5 operator's compartment
6 fuel tank
7 headlights and taillights

detail of equipment specifications including:-

1 speed
2 weight
3 model number, type
4 liquid capacities of tanks
5 brake details
6 maximum tractive effort
7 performance specifications,

list of individual items of components or equipment which are approved together with approval number, and a list of the drawings covering systems and circuits such as braking, hydraulic, fuel, safety shutdown, cooling, electrical schematic, ergonomic compliance, noise etc.

(b) A copy of the approval issued for the Diesel Engine System (DES) and a notice in writing from the system supplier certifying that the particular system supplied is in accordance with the system provided for Approval in so far as those features which relate to the matters assessed for the purposes of Approval.

(c) Specifications and assembly drawing for the exhaust dilution system.

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i) Braking system drawings and specifications:

1 an assembly drawing of the equipment that shows the arrangement of the braking system components
2 a schematic drawing showing the arrangement of the components
3 brake system characteristics including identification of friction materials and system operating pressures
4 a detailed narrative description of the operation of the braking systems, including warning devices; failure of service brake system; and system check procedures
5 details of provisions for train braking

e) Instrument and control layout. (This may be included on the general arrangement drawing.)

f) Fuel tank drawing and specifications including shut-off valves and fuel cap.

g) Fuel system schematic

h) Hydraulic system schematic

i) Air system schematic

j) Electrical system schematic and specifications

k) Fire extinguisher

l) Operator's compartment drawing including relevant ergonomic dimensions

(m) Personnel carrier compartment drawing including relevant ergonomic dimensions

(n) Signalling methods

(o) ergonomic survey

(p) noise survey

NOTE:

For general guidance reference to Appendix A - Approval of Machines as contained in AS 2595, Part 1 - 193 is recommended.

Date of issue: 3 January 1992
Prepared by: W J Koppe

New South Wales
Department of Mineral Resources

APPROVAL FOR DIESEL ENGINE POWERED SYSTEM (DES) FOR USE IN UNDERGROUND COAL MINES

In conjunction with the submission of an Approval Application Form seeking a DES Approval the following information is required:-

(a) A general arrangement drawing showing the overall dimensions of the diesel engine and safety components showing location and identification by drawing number of all pertinent parts including all flame arresters, the exhaust gas conditioner and its water supply tank, the intake system, the exhaust system, safety components, and any other components that are essential to the performance of the diesel power system.

(b) Diesel engine specifications shall include:-

(1) A copy or the Certificate of Examination that has been issued for the diesel engine and a notice in writing from the engine supplier certifying that the particular engine supplied is in accordance with the engine provided for Certificate of Examination in so far as those features which relate to the matters assessed for the purpose of Certification.

NOTE: It may be convenient to conduct testing for engine certification and system approval simultaneously.

(2) the model and serial number of the diesel engine
(3) rated speed, maximum brake horsepower at rated speed, peak torque speed, maximum rated torque, full throttle no load speed
(4) fuel consumption at maximum rated horsepower and at maximum rate torque
(5) specifications of the complete cooling system

(c) All drawings, specifications, descriptions and related material necessary to evaluate, and determine that the Design Requirements for Flameproof Diesel Engines have been met.

As a minimum, this shall include detailed drawings of the following:-

(1) air intake system including piping, flame arrester, flanges and gaskets, air shut-off device
(2) exhaust system including water-cooled manifolds, exhaust gas conditioner and its water supply, low water shut-down system, flanges and gaskets

(3) a drawing showing the path of the exhaust gas through the exhaust system
(4) a complete description of the safety shut-down system including a schematic drawing of the system and specifications of component parts
(5) detailed drawings of all safety components including flame arresters, water-cooled manifolds and exhaust conditioners, and
(6) information that should be included with exhaust conditioner:

(a) quantity of water under normal operating conditions
(b) level of water at normal operation
(c) level of water at low water shut-down

NOTE: It is preferred that only the information required to determine compliance with the Design Requirements is provided, ie. it is not necessary or preferred to have detail manufacturing drawings supplied.

(d) A DES Approval can only be obtained when:-

(1) a diesel engine system has been dynamometer load tested for exhaust gas emissions, surface temperatures, etc, either by the Londonderry Industrial Safety Centre or a workshop approved for this purpose and witnessed by a person authorised by the Department.

(2) hydrostatic pressure testing of components has been carried out as per (1).

(3) explosion testing for flame arresters by the Londonderry Industrial Safety Centre.

To assist with dynamometer load testing at Londonderry a diesel engine system shall be supplied as follows:-

(1) The engine shall be provided with an adapter to fit the dynamometer coupling. Drawings of the Centre's dynamometer coupling are available upon request.

(2) power transmission drives such as clutches, torque converters, and hydrostatic drives should not be supplied.

(3) the engine shall be supplied with an electric starter.

(4) a copy of the operating and maintenance manual shall be supplied with the engine together with any other data which may be necessary to assist with resting.

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Prepared by: L J Roberts

New South Wales
Department of Mineral Resources

Appendix A3

APPROVAL FOR ELECTRIC POWERED BATTERY LOCOMOTIVE (EL) FOR USE IN UNDERGROUND COAL MINES

In conjunction with the submission of an Approval Application Form seeking a EL Approval the following information is required:

(a) A general arrangement drawing showing the overall dimensions of the loco showing, location of:

1 Electric motors
2 Operator's compartment and control
3 Battery
4 Headlights taillights

details of equipment specifications including:-

1 speed and speed control system
2 weight
3 model number, type
4 capacities of batteries
5 brake details
6 maximum tractive effort
7 performance specifications,

list of individual items of components or equipment which are approved together with approval number, and a list of the drawings covering systems and circuits such as braking, hydraulic, safety shutdown, electrical schematic, ergonomic compliance, noise etc.

(b) Braking system drawings and specifications:

1 an assembly drawing of the equipment that shows the arrangement of the braking system components
2 a schematic drawing showing the arrangement of the components
3 brake system characteristics including identification of friction materials and system operating pressures
4 a detailed narrative description of the operation of the braking systems, including warning devices; failure of service brake system; and system check procedures
5 details of provision for train braking

(c) Instrument and control layout. (This may be included on the general arrangement drawing.)

(d) Battery box drawing and specifications including location of isolation devices

(e) Hydraulic system schematic

(f) Air system schematic

(g) Electrical system schematic and specifications

(h) Fire extinguisher

(i) Operator's compartment drawing including relevant ergonomic dimensions

(j) Personnel carrier compartment drawing including relevant ergonomic dimensions

(k) Signalling methods

(l) ergonomic survey

(m) noise survey

NOTE:
For general guidance reference to Appendix A – Approval of Machines as contained in AS 2595, part 1 – 1983 is recommended.

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Prepared by: W J Koppe

Appendix A4

MINIMUM ERGONOMIC REQUIREMENTS FOR UNDERGROUND LOCOMOTIVES

S Mason

The following safety requirements have been extracted from an ergonomics design handbook which was specifically produced for underground locomotive cabs. This handbook is entitled, 'Ergonomic Principles for the Design of Underground Locomotives', Mason S, Simpson GC, TSRE Report Number SSL/90/174. 1990. It provides information on cab design which can be used both to satisfy the minimum safety requirements outlined below, and further improve the ergonomics of loco cabs.

Where differences occur between these minimum safety requirements and the guidelines in the handbook, the following requirements should be adopted.

NOTE

1. In addition to the above further editing has been done to suit Australian Operations.

2. Requirements continued in MDG2 take precidence over this appendix.

3. Access to the above report SSL/90/174 can be obtained by contacting the Senior Inspector of Mechanical Engineering.

Minimum Ergonomic Requirements

Controls

1. Controls should be located as follows:

   Right Hand: Power control, Direction Selector

   Left Hand: Service Brake (unless combined with power control), Gear Selector, Hand Brake *

   Left and Right Hand: Horn, Engine Stop

   Right Foot: Sanders

   Left Foot: Deadman Pedal (if needed)

   * (For locos which don't use a single level drive and service brake control, the handbrake could be positioned to be operated by the right hand if engineering reasons dictated.)

2. All controls should be labelled for both their function and mode of operation.

3. The controls should operate in a direction which is compatible with the loco drivers' natural expectations:

   Power control: Push forwards to increase speed

   Service Brake: Push forwards to apply brakes – unless combined with power control (*)

   Direction: In direction of loco movement

   * (An anti-clockwise or left to right movement of the Westinghouse brake is also acceptable.)

4. The controls outlined in '1' above, should all be located in the maximum control envelopes given in the loco handbook.

5. Consideration should be given to the automatic application of the parking brake after a predetermined time after the loco has become stationary.

Displays

6. Important gauges (especially the speedometer and service brake pressures) should be self illuminated and located close to the normal viewing sightline. This is essential on locos fitted with windscreens.

7. The service brake gauges should have their minimum pressures or normal working zones colour coded.

8. The speedometer gauges should have maximum scale readings compatible with the loco's maximum speed ie. full scale readings far in excess of the real maximum speed should be avoided. The gauges should show the loco speed only in km.p.h.

Workspace

9. The cab workspaces should fulfil the minimum cab height v's length combinations outlined in the loco handbook. Sufficient workspace should be provided to cater for the driver and passenger in each cab - excluding pony locos and other locos specifically intended for single man operation. The location of fittings and other equipment should not restrict the drivers' freedom of movement, access/egress, or sightlines.

10. The minimum access dimensions given in the loco handbook should be provided for safe entry into the cab. A second means of egress shall be provided. The size of the aperture may be reduced around the seat sides to give additional sideways driver protection. NOTE this should be varied to suit N.S.W. requirements for stretcher access.

11. Seats should broadly meet the dimensions given in the loco handbook, be padded and have back-rests which cater for the wearing of batteries and self-rescuers.

12. With the exception of low speed pony type locos, all driving positions should be forwards facing.

13. If doors are provided, they should be sliding, not unduly restrict vision, and be capable of being locked in both limit positions (eg. when using them as hand holds when climbing into the cab.) The front edge should not constitute a safety hazard.

Visibility

14. A tall driver (95th percentile) should be able to see the roof of a roadway (taken as 500mm above the cab) to a point not more than 5 metres in front of the loco. A small driver (5th percentile) should be able to see the track/roadway floor to a point not more than 5 metres in front of the loco. Both the tall and small drivers should be able to see the sides of a roadway (taken as 600m each side of the loco. NOTE N.S.W. CMRA transport regulations require at least 200 m.m. clearance above the loco and 600 m.m. clearance at each side.

15. A windscreen wash/wipe facility should be available for all locos equipped with windscreens.

16. Locos should be provided with at least two headlights for use in each direction, slow 'pony' type locos need only have one mounted in the high position for each direction.

17. A driver should be able to easily look backwards down the train from his driving position. NOTE this may not be practical in some applications.

Warnings

18. The horn should be proven to be effective in both directions at a distance equal to the maximum stopping distance plus 30% or 100 metres which ever is the greater.

19. Consideration should be given to the provision of a warning device to indicate to the driver that one or more wheels have locked up – ie the loco is in a skid.

20. Consideration should be given to the provision of a mechanism whereby a driver can reliably detect a fire on the loco. When hauling materials and travelling against the air movement the driver would be unlikely to detect any smoke or fire.

Appendix A4–1

Minimum Lighting Requirements For Underground Locomotives

The following requirements have been translated from:-

TECHNICAL REQUIREMENTS

of the Superior Board of Mines of Northrhine-Westphalia (Germany)

for Mining Locomotives

in Underground Works and Hard Coal Mines

(Technical Requirements for Mining Locomotives - TAG)

dated 20.05.1987

with

GENERAL DECREE

of the Superior Board of Mines of Northrhine-Westphalia

dated 20.05.1987 / Reference 16.3-1-17

It provides comparable light intensity to that specified by U.K. authorities in Appendix A4–1

3.6.3.1 Headlamps have to be placed in a way that the track line will be illuminated sufficiently when used with driving beam light and that blinding will be prevented when used with traffic beam light.

3.6.3.2 Illumination intensities

Installations for illumination have to be designed in a way that following illumination intensities – measured vertically to the rail – will be achieved:

- driving beam light
  At least 5 Lux at a distance of 100 m from the locomotive inside of the light space profile 1) at the point of max. illumination intensity at height of headlamp center,

  at least 4 Lux at a distance of 80 m from the locomotive in the whole inner light space profile,

  at least 1 Lux at a distance of 80 m from the locomotive in the whole of the outer light space profile 2),

  at least 3 Lux at a distance of 30 m from the locomotive at height of rail shoulder.

- Traffic beam light

  max. 1 Lux at a distance of 30 m from the locomotive at a height of 1.5 m and more, above rail shoulder,

  at least 1 Lux for the area between 5 and 30 m distance from the locomotive between rails at a height of rail shoulder,

  at least 2 Lux at a distance of 30 m from the locomotive at a horizontal line of a width of 4 m symmetrical to the middle of rail track approx. 0.5 m above rail shoulder.

1) Inner light space profile: Width: 2.0 m symmetrical to middle of rail track
   Height: 2.2 m

2) Outer light space profile: Width: 5.0 m symmetrical to middle of rail track
   Height: 2.75 m

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File Ref.
Approval No.:

Appendix A5

TEST DATA SHEET
PROTECTIVE DEVICES FOR FREE STEERED VEHICLES AND LOCOMOTIVES

Mine or Company .....

Mine or Company Address .....

Test Carried out at .....

Protective Device for vehicle(loco) type .....

..... model number .....

Drawing Number .....

Manufacturer's stated strength (based on U.T.S.)
in vertical direction .....

in lateral horizontal direction .....

in longitudinal horizontal direction .....

Note 1. A protective device will only be accepted if it can elasticall resist a minimum test load of 1.0 tonnes applied vertically and minimum test load of 0.5 tonnes applied horizontally in bot longitudinal and transverse directions independently. Vertica test loads may be shared between 2 separate protective devices but other test loads must be applied to each protective devic individually.

2. Larger test loads should be considered by the applicant wher considered appropriate for conditions where the protective devic is to be used. The test document should record the maximum loa for which tests are successful.

Test method

With the protective device fully extended where applicable the followin tests shall be conducted:-

1. Apply vertical test load distributed over a width of 300 m.m. at th centre of the maximum span.

(a) apply preload of between 10-100 Kg to remove slack from joints set dial indicator to zero then apply test load. Recor deflection "A" under the test load and the residual deflectio "B" on removal of the test load.

"B" divided by "A" must be less than 10% for the protectiv device to be satisfactory.

NOTE (1) It may be necessary to repeat this test or othe tests in order to further eliminate any initia movement in pinned or bolted connections.

(2) If protective device consists of 2 separate bars the vertical load may be shared between the 2 bars.

2. With protective device at its maximum height apply a horizontal tes load along the middle one third of the protective device edg directing the load away from the centreline of the vehicle(loco).

Preload and deflection measurements are as in 1(a) above.

3. Repeat test 2 but with the load applied towards the centreline of th vehicle(loco). This test is only necessary if there is a significan difference in the strength of the protective device supports betwee the 2 directions.

4. Apply horizontal test load along the middle one third of th protective device edge directing the load from the rear to the fron of the vehicle (loco).

5. Repeat test 4 but with the load applied directed from the front, t the back of the vehicle(loco). This test is only necessary if ther is a significant difference in the strength of the protective devic supports between the 2 directions.

Test Results

	Test	Remarks
1. Vertical test - test load (KN)		
initial deflection "A" (mm)		
residual deflection "B" (mm)		
B x 100 (%)		
A		
2. Horizontal test away from vehicle (loco) centreline		
test load - (KN)		
initial deflection "A" (mm)		
residual deflection "B" (mm)		
B x 100 (%)		
A		
3. Horizontal test towards vehicle (loco) centreline		
test load (KN)		
initial deflection "A" (mm)		
residual deflection "B" (mm)		
B x 100 (%)		
A		

4. Horizontal test towards front of vehicle(loco) test load (KN) initial deflection "A" m.m. residual deflection "B" m.m. B x 100 (%) A			
5. Horizontal test towards rear of vehicle(loco) test load (KN) initial deflection "A" m.m. residual deflection "B" m.m. B x 100 (%) A			
6. Distance from underside of protective device in the vicinity of the drivers head to the top of the horizontal section of the drivers seat with the canopy in its lowest position (m.m.)			

comment.

NOTE pass or fail must be nominated in remarks column for each test wh applicable.

Tests may be carried out by a NATA Registered Testing Laboratory alternatively witnessed by an Inspector of Mechanical Engineering from Coal Mining Inspectorate and Engineering Branch.

Name and Number of NATA registered testing laboratory
Signed: Authorised NATA signatory
OR

Signed:

Inspector if Mechanical Engineering

Date:

---

acceptance recommended: YES/NO

Signed:

Inspector of mechanical Engineering

Date:

revised 8th October, 1990
Guideline reference No M86/349

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Appendix A6

Brake Performance Verification

The performance of all brake systems shall be verified by both calculations and by practical tests as follows:-

Calculations should include those leading to -

1. available braking force assuming an adhesion coefficient of 0.17
2. maximum possible adhesive braking force - best conditions
3. maximum possible braking force that the brakes can apply.

Practical Tests

These tests require use of a suitable automatic device to monitor brake response time and to coordinate this with actual loco retardation relative to the track. This requires the use of a separate non braked wheel applied to the track but supported by the loco to ensure that any skidding is catered for.

Test results will include:-

1. Brake system response time from each drivers compartment and also for tandem operation.
2. Average deceleration.
3. Maximum deceleration.
4. Operation of the interlock which prevents a loco being driven with the brakes applied.
5. Operation of the automatic brake systems where fitted.
6. Maximum surface temperature of brakes (for oil immersed type brakes only) NOTE this may require a non braked load to be applied to increase the load on the braking system.
7. Number of effective brake operations that can be achieved from any stored energy system, where fitted.
8. Ability of brake system to defeat the maximum tractive effort of the loco (requires temporary defeat of interlock).
9. All brake tests are to be conducted with and without the sanders operating.

New South Wales
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APPENDIX A7
of Mechanical Design Guidelines For
The Construction of Continuous Miners.

INDUSTRY GUIDELINES FOR THE USE OF ALUMINIUM UNDERGROUND

COAL MINES REGULATION ACT, 1982

Issue Date:. 26th May, 1989
File Reference:. M84/5001

The prohibition on use of aluminium and light metal alloys in underground coal mines is covered under Clause 39 of "Coal Mines Regulation (Mechanical-Underground Mines) Regulation, 1984."

This clause is as follows:

" (1) The Manager of a mine shall ensure that no aluminium or light metal alloy as specified shall be used on the external parts of any machinery, equipment or other item underground at the mine.

(2) Notwithstanding subclause (1), aluminium or light metal alloys may be used where it is determined by the Chief Inspector that there is no reasonable alternative to such use and such use has been approved."

A copy of the Notice of Specification No, 845001 covering Aluminium and Light Metal Alloys as published in the Government Gazette No. 86 of 1st June 1984 is attached.

In relation to Clause 39(2) the following guidelines shall be applied for the use of aluminium and light metal alloys in underground coal mines.

1. Aluminium or light metal alloy is not permitted where a reasonable alternative can be found. An applicant to use aluminium or light metal alloy must first demonstrate "no reasonable alternative".

2. Where no reasonable alternative exists:-

   (a) for apparatus of a portable nature, normally kept in possession of a person, then this apparatus may be approved to be taken and used underground subject to being protected or enclosed other than during actual use, so as to prevent contact with other metal

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10. Level track is preferred but results can be corrected if necessary to allow for some grade.

11. Tests should be conducted with both the loco loaded and unloaded.

12. Check to ensure that operation of the service brake doesn't interfere with the operation of the dump brake.

13. Brake tests should be conducted in both directions and repeated. The suggested number of operations is at least 3 service, 3 dump brake tests and 1 deadman brake test in each direction.

14. Variations to this test procedure are permitted subject to the concurrence of the Senior Inspector of Mechanical Engineering.

OPERATOR CHECKS - EXAMPLE ONLY

OPERATORS CHECK LIST

MACHINE TYPE (M.P.V. ETC.

- OPERATION OF FOOT BRAKE
- PARK BRAKE
- LIGHTS WORKING
- HORN
- FIRE EXTINGUISHER
- COVER & GUARDS IN OPERATORS CABIN
- WHEEL NUTS LOOK VISUALLY TIGHT
- WATER IN EXHAUST CONDITIONER
- REVERSE ALARM OPERATION

OPERATOR TO REPORT ANY DEFECT TO A MINING OFFICIAL

(b) for other apparatus, approval may be given provided that the aluminium or light metal alloy is covered by an approved metal spray coating and is protected by a substantial guard, so arranged e.g. by the use of limit switches that the guard must be in place for the equipment to carry out its function

(c) and (a) or (b) cannot be applied e.g. diesel engine fuel pump, then approval may be given for installations in which the component is well protected, by reason of its location in the apparatus.

R.W. Scott
Acting Chief Inspector of Coal Mines

Department of Industrial Relations
Sydney, 3rd May, 1984

COAL MINES REGULATION ACT, 1982-
NOTICE OF SPECIFICATION

Specification: 845001
File No:. 84-5001

ALUMINIUM AND LIGHT METAL ALLOYS

IT is hereby notified that the Chief Inspector of Coal Mines, for the purposes of the Regulation cited as the "Coal Mines Regulation (Mechanical-Underground Mines) Regulation 1984" under the Coal Mines Regulation Act, 1982, has specified that the material described below is aluminium or light metal alloy for the purposes of clause 39 of the Regulation.

Any metal or alloy which includes aluminium and/or magnesium and/or titanium in which the total content of these three constituents exceed 15 per cent by weight but in any case in which the content of magnesium and titanium together exceeds 6 per cent by weight.

M.J. MUIR, Chief Inspector of Coal Mines