



Australian Government

Department of Education, Employment and Workplace Relations

RIIDES303 Inspect, test and maintain cooling systems on diesel engine systems

Release: 1

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Modification History

Not applicable.

Unit Descriptor

This unit covers the inspection, testing and maintenance of cooling systems of diesel engine systems for underground coal mines to provide the means of confirming their effectiveness. It includes: preparing for and carrying out cooling systems inspection, testing and maintenance tasks; and the completion of post-work requirements

Application of the Unit

This unit is appropriate for those undertaking the inspection, testing and maintenance of diesel engine systems for underground coal mines.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Metal, mechanical, electrical or automotive trades or mechanical or electrical engineering

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

1. Plan for inspection, testing and/or maintenance tasks	1.1 Access, interpret and apply <i>compliance and other documentation</i> relevant to the <i>inspection, testing and maintenance of cooling systems on diesel engine systems</i> 1.2 Obtain, interpret and clarify <i>work requirements</i> for the satisfactory completion of tasks 1.3 Resolve coordination requirements with <i>others</i> at the site prior to commencing and during work activities
2. Prepare for inspection, testing and/or maintenance tasks	2.1 <i>Inspect and prepare work area in coordination with others</i> 2.2 Identify and obtain <i>items</i> and <i>tools</i> required for the safe, effective and efficient conduct of the tasks 2.3 Identify and arrange <i>support</i> required for the safe, effective and efficient completion of the tasks 2.4 Select and use <i>personal protection equipment</i> appropriate to the task 2.5 Carry out required equipment <i>pre-start and inspection procedures</i> 2.6 Carry out isolation and lock-out of all equipment necessary for the safe execution of tasks 2.7 Recognise and respond to <i>hazardous and emergency situations</i>
3. Carry out inspection of cooling systems	3.1 Inspect cooling systems on diesel engine systems 3.2 <i>Diagnose</i> and record existing or identified faults 3.3 Report outcomes of inspection to appropriate person
4. Carry out testing of cooling systems	4.1 Select and operate testing equipment and methods 4.2 Carry out testing and fault finding of cooling systems 4.3 Diagnose and record existing identified faults 4.4 Recognise and respond to <i>hazardous and emergency situations</i> 4.5 Report outcomes of testing to appropriate person
5. Carry out maintenance of cooling systems	5.1 Select and use maintenance items, tools and equipment 5.2 Rectify diagnosed and identified faults 5.3 Carry out maintenance of cooling systems on diesel engine systems in accordance with the work requirements

	5.4 Recognise and respond to hazardous and emergency situations
6. Complete post-work activity requirements	6.1 Tidy up the work area 6.2 Dispose of used oil, lubricant and other waste 6.3 Return and secure all tools and re-usable items 6.4 Complete and maintain inspection, testing and maintenance records

Required Skills and Knowledge

Required skills

Specific skills are required to achieve the performance criteria in this unit, particularly for the application in the various circumstances in which this unit may be applied.

This includes the ability to carry out the following as required to inspect, test and maintain cooling systems on diesel engine systems:

- apply legislative, organisation and site requirements and procedures
- apply site risk, statutory compliance, health, safety, environmental, quality and communication requirements and procedures
- apply site and manufacturer's requirements and procedures
- apply surface and underground worksite hazard identification and risk management requirements and procedures
- apply task hazard identification and risk management requirements and procedures
- apply technical literacy
- interpret and apply technical and scientific/industry terminology
- communicate with those providing support
- apply work area and equipment inspection procedures
- apply work area safeguarding options and requirements
- apply isolation and lock-out requirements and procedures
- apply hazard and emergency procedures
- apply site service and maintenance reporting requirements and procedures
- work wearing appropriate personal protective equipment
- use tools for inspection, testing and maintenance
- use calibrated/verified instruments

Required knowledge

Specific knowledge is required to achieve the Performance Criteria of this unit, particularly its application in a variety of circumstances in which the unit may be used.

This includes knowledge of the following, as required to inspect, test and maintain cooling systems on diesel engine systems:

- site risk, statutory compliance, health, safety, environmental, quality and communication requirements and procedures

- limitations on allowable maintenance including work in hazardous environments
- limitations on allowable modifications and the required controls and procedures
- provisions of AS/NZS3584.1, 2 and 3 relating to fasteners and joints
- recognise the requirements and performance of various types of fasteners, including bolts, studs, threads and washers
- site and manufacturer's requirements and procedures
- items required to be used in performance of inspection, testing and maintenance tasks
- tools required for the performance of inspection, testing and maintenance tasks
- site inspection, testing and maintenance support requirements and availability
- site work area inspection requirements
- site work area safeguarding options and requirements
- site isolation and lock-out requirements and procedures
- site hazard and emergency procedures
- critical temperatures and explosion limits for gasses, dusts and hydro-carbon liquids that may be encountered by a diesel engine system in an underground coal mines, including;
 - coal dust
 - methane
 - diesel fuel
- margins of safety provided by all relevant Legislation, Regulation, Standards and Guidelines are applied to surface and exhaust gas temperatures
- methods to limit temperatures including; maintenance, testing and monitoring for;
 - exhaust manifold design & fitment
 - adaptor pipe
 - exhaust flametrap and/or cooler
 - turbochargers
 - air compressors
- possible failure modes maintenance procedures and practices required to provide controls
- causes of temperature rise as a gas is compressed, including:
 - intake system to air compressors and failure modes resulting in excessive temperatures
 - output side of air compressors and failure modes resulting in excessive temperatures
 - risks and consequences of carbon build-up in the air stream (fittings, valves and hoses) types of heat exchange including;
 - shell and tube
 - plate
 - plate and fin
 - causes of the degradation of heat exchanger performance, caused by;
 - build up of the products of combustion on the 'gas' side of heat exchangers
 - build up of salts, chlorides and other materials on the 'coolant' side of heat exchangers
- temperature controls applied to prevent the exhaust gas stream from exceeding nominate maximum temperatures
- materials including elastomeric hoses, metallic and synthetic fittings employed in critical components subject to temperature rise under the designed conditions of operation
- automatic shutdown controls, which may include;

- the design of the system and the ‘safety margin’ provided in the design for some deterioration in performance
- coolant flow monitoring devices
- coolant temperature monitoring devices
- coolant loss monitoring devices
- direct exhaust gas temperature monitoring devices
- water-bath level monitoring devices
- site inspection, testing and maintenance reporting requirements and procedures
- site inspection, testing and maintenance record procedures
- site requirements and procedures for working in isolation
- site requirements for the use of personal protective equipment

Evidence Guide

Critical aspects for assessment and evidence required to demonstrate competency in this unit	The evidence required to demonstrate competency in this unit must be relevant to worksite operations and satisfy all of the requirements of the performance criteria, required skills and knowledge and the range statement of this unit and include evidence of the following: • Knowledge of the requirements, procedures and instructions for the inspection, testing and maintenance of cooling systems on diesel engine systems. • Implementation of requirements, procedures and techniques for the safe, effective and efficient completion of the inspection, testing and maintenance of cooling systems on diesel engine systems • Working with others to undertake and complete the inspection, testing and maintenance of cooling systems on diesel engine systems that meets all of the required outcomes. • Consistent timely completion of the inspection, testing and maintenance of cooling systems on diesel engine systems that safely, effectively and efficiently meets the required outcomes.
Context of and specific resources for assessment	• This unit must be assessed in the context of the work environment. Where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills. • The assessment environment should not disadvantage the participant. For example, language, literacy and numeracy demands of assessment should not be greater than those required on the job. • Customisation of assessment and delivery environment to sensitively accommodate cultural diversity. • Aboriginal people and other people from a non English speaking background may have second language issues. • Assessment of this competency requires typical resources normally used in a resources and infrastructure sector environment. Selection and use of resources for particular worksites may differ due to the site circumstances.

	• Where applicable, physical resources should include equipment modified for people with disabilities. • Access must be provided to appropriate learning and/or assessment support when required.
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Method of assessment	This unit may be assessed in a holistic way with other units of competency. The assessment strategy for this unit must verify required knowledge and skill and practical application using more than one of the following assessment methods: • written and/or oral assessment of the candidate's required knowledge • observed, documented and/or first hand testimonial evidence of the candidate's: • implementation of appropriate requirement, procedures and techniques for the safe, effective and efficient achievement of required outcomes • consistently achieving the required outcomes • first hand testimonial evidence of the candidate: • working with others to undertake and complete the inspection, testing and maintenance of cooling systems on diesel engine systems
Guidance information for assessment	• Consult the SkillsDMC User Guide for further information on assessment including access and equity issues.

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Range Statement

Compliance and other documentation may include:	• certification documentation, or • approval documentation • legislative, organisation and site requirements and procedures • manufacturer's specifications and guidelines • Australian Standards, including: AS/NZS3584 and AS 4291 • codes of practice • Employment and Workplace Relations legislation • Equal Employment Opportunity and Disability Discrimination legislation
Inspection is to include:	• checking for coolant leaks in radiator (core and tanks) and radiator hoses • visually check that the coolant level is correct • checking for coolant leaks in water pumps, thermostats (housing) or from hoses associated with the jacket water cooling of air compressors, manifolds, manifold/conditioner adaptor pipes, etc • checking that the hoses are in a good condition, correctly fitted, clamped and restrained

	• checking that the radiator core is clean
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Testing may include:	- checking the proper operation and function of the coolant loss detection sensor, and record the time taken to cause the engine to shut down - Checking the proper operation and function of the coolant over-temperature sensor, and record the coolant temperature at which the engine shut down. NOTE Testing this sensor by defeating other sensors and overheating the diesel engine system may be hazardous or cause damage to the diesel engine system. It is recommended that the sensor be removed from the engine and tested in heated water while remaining connected to the engine shutdown system.
Maintenance is:	the combination of actions carried out to retain a diesel engine system in, or to restore it to, conditions in which it is able to meet the requirements of the relevant specification and perform its required function
Maintenance is to include:	- service - adjust - replace
Maintenance may include:	- repair - overhaul - modify - draining and replacing the engine coolant and ensuring that the correct coolant formulation is used
Cooling systems may include:	- exhaust manifolds - compressors or turbo chargers - pipings - joints - exhaust flame traps - exhaust filters
Diesel engine systems are:	diesel engines for underground coal mines and their: - inlet systems - exhaust systems - cooling systems - starting systems - shut-down and protection systems - electrical or electronic devices
Work requirements may come from briefings, handovers, and work orders and may include:	- service and maintenance schedules - production requirements - nature and scope of tasks

	• achievement targets • operational conditions • operational requirements • site layout and out of bounds areas • worksite inspection requirements • plant or equipment defects • hazards and potential hazards • coordination requirements or issues
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Others may include:	• yard persons • processing plant operators • mobile plant operators • other maintenance personnel
Inspect and prepare work area may include:	• determining if the proposed work area is a designated safe area • identification of hazards, including: • workshop work area hazard • underground work area hazards, and • work activity hazards • selection and implementation of control measures for the hazards identified • safeguarding site and non-site personnel by: • erection of barricades and posting of signs • selection of appropriate equipment to ensure personnel safety and protection
Items may include:	• replacement parts • fasteners • packing materials
Tools may include:	• hand tools • power tools • special tools • testing equipment
Support may include:	• other site personnel • contractors • cranes • other lifting equipment
Personal protection equipment may include:	• hard hats • eye protection • hearing protection • breathing apparatus • gas/fume masks • prescribed footwear
Pre-start and inspection procedures include:	• checking: • cleanliness, particularly coal dust • diesel and other flammable liquid leaks • coolant leaks in radiator or radiator hoses • coolant level • that guards are in place and secure • engine oil level is correct • conduct Exhaust Conditioner/Flametrapp, low-water,

	shutdown tests
Hazardous and emergency situations may include:	• working alone • personal injury • fire • explosions • electrical • noise • dust • environmental • chemical
Diagnose faults may include:	• Root cause analysis • Troubleshooting techniques
Records may include:	• inspection and test results • defect identified • defect rectification carried out • item consumed • hazard/risk management reports

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Unit Sector(s)

Coal Mining (Diesel Engine Systems Maintenance)

Custom Content Section

Not applicable.