



Australian Government

Department of Education, Employment and Workplace Relations

RIIDES305 Inspect, test and maintain exhaust 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 exhaust systems of diesel engine systems for underground coal mines to provide a means of confirming the effectiveness of their explosion and fire protection and emission control. It includes: planning and preparing for and carrying out of exhaust system inspection, testing, routine maintenance and overhaul 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</i> and <i>maintenance</i> of <i>exhaust systems</i> on <i>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</i> in <i>coordination with others</i> 2.2 Identify and obtain <i>items and tools</i> required for the safe, effective and efficient conduct of the tasks. 2.3 Identify and arrange <i>support</i> required for completion of tasks 2.4 Select and use <i>personal protection equipment</i> appropriate to the task 2.5 Carry out required equipment <i>pre-start procedures</i> 2.6 Carry out required 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 exhaust systems	3.1 Carry out inspection of exhaust systems on diesel engine systems 3.2 Carry out inspection and fault finding of exhaust system flame traps for effectiveness of explosion protection 3.3 Carry out inspection and fault finding of exhaust gas cooling systems 3.4 Carry out inspection and fault finding of exhaust system joints 3.5 <i>Diagnose</i> and record existing or identified faults
4. Carry out testing of exhaust systems	4.1 Select and operate testing equipment and methods in an appropriate, safe, effective and efficient manner 4.2 Carry out <i>testing</i> and fault finding of exhaust systems on diesel engine systems 4.3 Carry out testing of exhaust system flametraps for effectiveness of explosion and fire protection 4.4 Carry out leak testing of exhaust system joints for

	effectiveness of explosion and fire protection 4.5 Test and report on the performance of exhaust emission treatment devices 4.6 Identify and record existing or potential faults, including blockages and constrictions
5. Carry out routine maintenance of exhaust systems	5.1 Select and use maintenance items, tools and equipment 5.2 Rectify diagnosed and identified faults 5.3 Carry out <i>routine maintenance</i> of exhaust systems on diesel engine systems in accordance with the work requirements 5.4 Carry out routine maintenance of exhaust system flametraps for effectiveness of explosion protection 5.5 Carry out routine maintenance of exhaust system joints for effectiveness of explosion and fire protection
6. Carry out the overhaul of exhaust systems	6.1 Select and use overhaul items, tools and equipment 6.2 Carry out <i>overhaul</i> of exhaust systems in accordance with the work requirements and Australian Standards
7. Complete post-work activity requirements	7.1 Tidy up the work area 7.2 Dispose of used oil, lubricant and other waste 7.3 Return and secure all tools and re-usable items 7.4 Report outcomes of inspection, testing, maintenance and overhaul tasks to appropriate person 7.5 Complete and maintain inspection, testing and maintenance <i>records</i>

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 to safely, effectively and efficiently inspect, test and maintain exhaust systems on diesel engine systems:

- apply legislative 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 hazard and emergency procedures
- apply technical literacy
- interpret and apply technical and scientific/industry terminology
- identify health effects of emissions and nominate controls to minimise potential health effects
- apply site health and safety requirements and procedures
- apply site environmental requirements and procedures
- apply site quality requirements and procedures
- apply site communication requirements and procedures
- apply manufacturer's requirements and procedures
- 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 site service and maintenance reporting requirements and procedures
- apply inspection requirements and procedures
- apply testing requirements and procedures
- apply fault finding techniques
- apply maintenance 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 to safely, effectively and efficiently inspect, test and maintain exhaust systems on diesel engine systems:

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

- provisions of AS/NZS3584.1,2 and 3 relating to exhaust systems, fasteners, joints and flametraps
- potential hazards in the use of diesel engine systems in underground coal mines, including:
 - explosions
 - fire, and
 - emissions
- limitations on allowable maintenance, including:
 - service
 - adjust
 - replace
 - repair
 - overhaul
- work in hazardous environments
- limitations on allowable modifications and their required controls and procedures
- methods to limit surface temperatures for;
 - exhaust manifold design and fitment
 - adaptor pipe
- possible failure modes in maintenance procedures and practices required to provide controls (including, flametraps, cooling systems, treatment systems, filtration)
- the heat energy generating characteristics of forced induction systems and the control measures provided to manage surface temperatures, including; maintenance, testing and monitoring
- causes of the degradation of heat exchanger performance;
- function and performance criteria and protection employed in exhaust, including;
 - cooling
 - flametrap
 - spark arrestor
- emissions reduction
- fire-protection
- explosion protection
- types of flametraps permitted by the relevant Standard, including;
 - water-based flametraps
 - positive flametraps
- properties and functional characteristics of exhaust flametraps, including;
 - positive flametraps
 - water-based flametraps
- failure modes and inherent risks and hazards for each type of exhaust flametrap
- operational and installation requirements for heat exchangers when installed in conjunction with positive flametraps
- maintenance processes and procedures required to ensure ongoing safe operation
- importance of the application of appropriate components and fasteners, including the selection of appropriate bolts, studs, threads and washers to specific applications within a diesel engine system including the provisions of AS/NZS3584.3 relating to fasteners

- the types of joints that may be integral to the design and maintenance of a diesel engine system, including;
- fixed connection
- open joints
- the factors that determine the selection of joint types
- the requirements for interposed gaskets and seals in joints, including;
- materials
- dimensions
- form and shape
- items required to be used in performance of inspection, testing and maintenance tasks
- tools required for the performance of inspection, testing and maintenance tasks
- 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 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
- 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 exhaust 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 exhaust systems on diesel engine systems • working with others to undertake and complete the inspection, testing and maintenance of exhaust systems on diesel engine systems that meets all of the required outcomes • consistent timely completion of the inspection, testing and maintenance of exhaust 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.
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 exhaust systems on diesel engine systems
Guidance information for assessment	• Consult the SkillsDMC User Guide for further information on assessment including access and equity issues.

Range Statement

Compliance and other documentation may include:	• certification documentation • 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 may include:	• checking the marking of parts/components • determine that there is no evidence of carbon build-up on or heating of joints that may suggest a leakage of exhaust gas • check that the positive exhaust flametrap and exhaust gas cooling system is clean • check that the floats used for the low water shutdown in the exhaust system conditioner/flame trap/spark arrester are free, clean, unobstructed and correctly installed • check that the static water level on any water-based exhaust system conditioner/flame trap/spark arrester is at or above the level indicated • checking materials and gaskets/seals • the conformity of threads and fasteners to registration and/or certification drawings
Testing may include:	• conduct exhaust conditioner/ flametrap, low-water, shutdown tests (i.e. both low water test systems are tested separately) • check that the engine system shuts down at or higher than the minimum shutdown water level and record the water levels after shut-down. • conduct gas tightness tests for all joints within the exhaust system <i>Note: A soapy water test may meet this requirement</i> • measurement of joints for dimensional compliance, surface finish, flatness
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 may include authorised:	• service • adjusting • replacing • repair • overhaul • modification
Exhaust systems may include:	• exhaust manifolds • turbo-chargers or superchargers • pipe work • hoses • joints • fastenings • exhaust flametraps, which may include: • positive flametraps, (with temperature sensors) • water-based flametraps, (with water level sensors and test valves) • spark arrestor • exhaust cooling system, which may include: • water bath • air dilution • heat exchanger • water Injection • monitoring or shutdown devices • surface temperature control systems • catalytic converters, including DOCs and SCRs • fume diluters and forced-air systems • particulate filters • replacement element-type filters • exhaust gas recirculation
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:	• nature and scope of tasks • procedures to be applied • quality standards to be applied • available resources • achievement targets

	• operational conditions • site layout • out-of-bounds areas • designated safe areas • explosion-risk zones • hazardous areas • other hazards and potential hazards • obtaining permits required • worksite inspection requirements • lighting conditions • plant or equipment defects • coordination requirements or issues
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Others may include:	• other maintenance personnel • support providers • contractors • underground production personnel • mobile or fixed plant operators
Inspect and prepare work area may include:	• determining if the proposed work area is a designated safe area • identification of explosion-risk zones • identification of hazardous areas • identification of hazards, including: • workshop work area hazard • underground work area hazards • work activity hazards • fire • explosion • emissions • 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:	• authorised replacement parts • fasteners as specified in manufacturer's drawings, which may include: • tensile strength • head and nut configuration • thread form and engagement • corrosion resistance (materials) • coatings (materials and application) • tolerances for fits and threads • tolerances for mating surfaces • dimensions of clearance holes • fixing torques • lubricants and anti-seize compounds used • packing materials
Tools may include:	• hand tools • power tools • special tools • testing equipment
Support may include:	• other site personnel • contractors

	• cranes • other lifting equipment
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Personal protection equipment may include:	• hard hats • eye protection • hearing protection • breathing apparatus • gas/fume masks • prescribed footwear
Pre-start 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 • emissions • electrical • noise • dust • noxious gases • environmental • chemical
Diagnose faults may include:	• root cause analysis • troubleshooting techniques
Routine maintenance is to include:	• servicing, including: • cleaning, including the gas path of any exhaust system • conditioner • flametrapp and/or • spark arrestor • checking and filling lubricants, fuel and water • adjusting • replacing
Overhaul may include:	• removal • dismantling • cleaning • inspecting

	• replacing, eg: • gaskets • fasteners • testing, including: • flatness • measuring dimensions • hydrostatic • reassembly • reinstallation, (e.g. cleaned or new exhaust positive flametrap assembly)
Records may include:	• inspection and test results • defect identified • defect rectification carried out • item consumed • hazard/risk management reports

Unit Sector(s)

Coal Mining (Diesel Engine Systems Maintenance)

Custom Content Section

Not applicable.