

Diesel Engine System (18): Safe Working

Document no.	Work description This SWI describes safe work practices related to the maintenance of components within the Diesel Engine System		
SMS-06-SW-1261	Scope This SWI describes the hazards and controls for work by RSD staff on Rolling Stock's Diesel Fleet Engines This document does not replace technical "how to" documents such as Engineering Instructions, Manufacturers' instructions etc		
Review date 30/04/11	References <ul style="list-style-type: none"> • OHS Act 2000 • OHS Regulations 2001 • Rail Safety Act 2008 • SMS-06-PR-0104 Workplace Risk Management. • SMS-12-OI-0886 Red Flagging Trains in stabling yards, depots and Maintenance Centres • SMS-06-SW-1151 Overhead Gantry Crane - Safe Operation • SMS-06-PR-0173 Plant and Equipment Lock-out Tag-out • SMS-06-SW-0400 Forklift Trucks • SMS-06-GD-0001 Guide to Manual Handling • SMS-06-SW-0812 Working in the Pit • SMS-06-SW-0487 Entering Trains from Ballast • SMS-06-SW-0488 Climbing out of Trains onto Ballast • SMS-06-SW-0809 Pneumatic Tools • SMS-06-SW-0194 Storage and Handling of Diesel • SMS-06-SW-1130 Electrical Isolation Diesel Fleet • SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms 		
Responsible supervisor	PPE and precautions	Competencies or qualifications	Licences or permits required
Line Manager	<ul style="list-style-type: none"> • High visibility vest or clothing • Safety Footwear • Protective gloves, as required • Safety Eyewear, as required • Safety Goggles when working on fuel systems • Fuel resistant Gloves when working on fuel systems • Respiratory protection, as required • Hearing Protection as required • Bump Hats as required 	<ul style="list-style-type: none"> • Rail Industry Safety Induction (RISI) • Site specific induction • Electrical Safety Awareness • Competent in this SWI • Competent in the use of relevant technical documents (eg. Els) • Competent in diesel engine work • Manual Handling Training • Crane competency, as required (refer SWI) 	<ul style="list-style-type: none"> • Forklift Certificate of Competency, as required
Tools and equipment required			
<ul style="list-style-type: none"> • Red Flag • Personal Locks, Multi-locks (Hasps) and/or Danger tags, as required • Powered tools, as required • Hand tools 			
IF CONTROL MEASURES ARE NOT SUITABLE AND MAJOR CHANGES ARE NEEDED, CONDUCT A RISK ASSESSMENT AND DEVELOP NEW CONTROLS ACCORDING TO SMS-06-PR-0104 WORKPLACE RISK MANAGEMENT.			

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	<p>Note</p> <p>Pre work brief and task risk assessment Ensure a pre-work brief and detailed task risk assessment is undertaken with all team members involved in the work activity. If any new/additional team members arrive any time later they must be briefed before they commence work.</p>
	<p>Warning <i>The following warning applies throughout this SWI:</i></p> <ul style="list-style-type: none"> • Direct exposure to pressurised systems will cause injury, release the energy and or cool the system/s and coolant as appropriate before commencing work • Contact with diesel, grease, oil and coolant is a health hazard. Oil from the system may also be hot • Where possible make use of equipment such as grease guns, bowsers and pouring containers to apply these chemicals • Additionally, wear chemical resistant gloves and protective goggles or glasses with side shields to carry out tasks that may result in contact with or splashes from these chemicals • Ensure you are aware of the closest eye wash station • After any hand contact, thoroughly wash hands as soon as possible and definitely before eating, drinking or smoking • If you require further information on hazards and controls, refer to local dangerous goods & hazardous substance risk assessments and/or contact your Line Manager • Ensure protection from hot surfaces that may cause burns or scalding
Competency	<p>Staff are to be trained and supervised to ensure they:</p> <ul style="list-style-type: none"> • Transport required parts, tools and equipment to and from the work area using manual aids (such as trolleys) so as to minimise the risk of manual handling injuries • Carry out the tasks in accordance with Engineering and Operational Instructions • Implement necessary controls, in accordance with this document • Work with Line Manager to identify any additional hazards and implement controls in accordance with relevant SWIs and other SMS components
Place Red Flag	<p>To notify persons that work on the train is being carried out, place a Red Flag in accordance with SMS-12-OI-0886 Red Flagging Trains in stabling yards, depots and Maintenance Centres</p>
Investigate Work Required	<ul style="list-style-type: none"> • Once the red flag is in place, inspect the relevant component to determine the work required • Identify the relevant tools, equipment and parts that will be required • Identify any other relevant SWIs (eg. SWIs for relevant tools) that will document hazards and their controls • Collect identified items from the store and transport to the location using manual handling aids (eg. trolleys) • Where possible, climb in and out of the train from platforms. If using steps or stairs provided always use 3 points of contact when climbing in or out of trains. If it is necessary to access from ballast always do so in accordance with SMS-06-SW-0487 Entering Trains from Ballast and SMS-06-SW-0488 Climbing out of Trains onto Ballast
Electrical Isolation	<p>To protect from electrical energy within the Diesel Engine System always:</p> <ul style="list-style-type: none"> • Isolate in accordance with SMS-06-SW-1130 Electrical Isolation Diesel Fleet
Isolation – Train Movement	<p>To protect from the movement of Trains always:</p> <ul style="list-style-type: none"> • Ensure engine is shut down and apply the park brake fully • Apply local road isolation (e.g. lock the boom gate, position the stop board and position chocks). Work is to be carried out in accordance with SMS-06-PR-0173 Plant and Equipment Lock-out Tag-out

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Carry Out Diesel Engine System Work	Once isolation and other relevant controls have been put in place, carry out the diesel engine work
	<p>Warning</p> <p>In addition to the warning above "contact with diesel, grease, oil and coolant etc", Diesel Engine work has a number of general hazards including:</p> <ul style="list-style-type: none"> Hazards associated with working in a pit. Always work in accordance with SMS-06-SW-0812 Working in the Pit Manual handling injury from handling large and/or heavy components. Additionally some components are located in difficult to reach work positions. To prevent injury use manual handling aids whenever possible and seek assistance, as required. Whenever manual handling always work in accordance with your training (refer to SMS-06-GD-0001 Guide to Manual Handling for further details) Head strikes when working in restricted work spaces. Wear bump hats, as required Crane related hazards when lifting components. Refer to SMS-06-SW-1151 Overhead Gantry Crane - Safe Operation for all hazard and control information Tool related hazards, including Pneumatic Tools. Where possible use non-powered or battery operated tools. If power tools are required, always work in accordance with the relevant SWI (including SMS-06-SW-0809 Pneumatic Tools) or manufacturers instructions, if no SWI is available Slip and falls as a result of spills, particularly oils and grease. Ensure any spills are immediately cleaned up, using an approved absorption media, and dispose of in appropriate waste bins Slips, Trips & Falls or strike injuries due to poor lighting. If you identify areas of insufficient lighting ensure Line Management is advised so this can be rectified. If particular tasks require additional lighting, then make use of portable lighting. Where possible use battery powered light as this is less hazardous than using mains powered lighting Exposure to hot working environments. Hot environments increase rates of dehydration and fatigue. Additionally, humid environments make sweating a less effective way of cooling down. During strenuous work in hot environments take regular breaks in a cooler location and re-hydrate by drinking cool water (not soft drink, coffee or tea). Remain alert to signs of dehydration and/or fatigue in yourself and others, however do not wait until you are dehydrated to act Contact with hot components. Where possible, allow hot components to sufficiently cool before interacting with them. Where components may still be too warm to safely handle, wear gloves Contact with sharp edges. If working in areas with sharp edges for extended periods, cover them with padding. Wear protective gloves when handling components with sharp edges Inhalation of fumes. Where possible ensure natural ventilation, such as opening roof hatches and leaving doors open. Where this is insufficient to remove fumes, make use of mechanical ventilation Eye injury when working with fuel, oil & coolant. Always wear safety goggles when working with fluids
	<p>Warning</p> <p>In addition to the general hazards, some Diesel Engine System work has additional unique hazards. These include:</p> <ul style="list-style-type: none"> Crane related hazards when lifting the engine. Refer to SMS-06-SW-1151 Overhead Gantry Crane - Safe Operation for all hazard and control information Pit related hazards when disconnecting/removing the engine from the car. To prevent injury always work in accordance with SMS-06-SW-0812 Working in the Pit Crush injury when removing the engine from the car. Always work in accordance with SMS-06-SW-1151 Overhead Gantry Crane - Safe Operation and ensure all persons are clear of the engine when it is being moved Slip and falls as a result of spilt oil and coolant. Drain all fluids before removal. Ensure any spills are immediately cleaned up, using an approved absorption media, and dispose of in appropriate waste bins
<u>Air Filters Removal & Replacement</u>	<ul style="list-style-type: none"> Fall from heights. To prevent falls ensure an approved mobile platform is used, in accordance with SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms, to access filters at height Inhalation of dust or dust blown or falling into eyes. Wear respiratory protection and eye protection
<u>Engine Oil & Fuel Filter Removal & Replacement</u>	<ul style="list-style-type: none"> Slip and falls as a result of spilt oil. Drain oil from filter housing before removal. Ensure any spills are immediately cleaned up, using an approved absorption media, and dispose of in appropriate waste bins Health hazards from contact with oil & fuel (refer to the warnings on page 2, second paragraph)

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<u>Engine Cylinder Head Removal , Replacement</u> <u>&</u> <u>Engine Power Assembly Components Removal & Replacement</u>	<ul style="list-style-type: none"> Squirt with diesel from pressurised fuel when removing the fuel rail. Isolate and drain fuel before disconnecting. Ensure protective goggles or glasses with side shields are worn during this task Fall from heights. To prevent falls ensure an approved and appropriate height stepladder is used, in accordance with SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms, to access roof hatch Manual handling injury when using the torque multiplier and removing the head. Ensure these steps are undertaken by two people, working in accordance with their manual handling training Crane related hazards when lifting components. Refer to SMS-06-SW-1151 Overhead Gantry Crane – Safe Operation for all hazard and control information Injury from pinch/crush points and sharp edges on components, always wear protective gloves Health hazards from contact with oil & fuel (refer to the warnings on page 2, second paragraph). Always work in accordance with SMS-06-SW-0194 Storage and Handling of Diesel
<u>Engine Fuel Injector Removal & Replacement</u>	<ul style="list-style-type: none"> Squirt with diesel from a pressurised fuel leak. Ensure protective goggles are worn during this task. Always work in accordance with SMS-06-SW-0194 Storage and Handling of Diesel Always wash hands thoroughly before eating, drink or smoking
<u>Engine Oil Priming Pump Removal & Replacement</u>	<ul style="list-style-type: none"> Fall from heights. To prevent falls ensure an approved and appropriate height stepladder is used, in accordance with SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms, to access roof hatch Slip and falls as a result of spilt oil. Drain oil before removal. Ensure any spills are immediately cleaned up, using an approved absorption media, and dispose of in appropriate waste bins
<u>Engine Pre-lube and Deflection</u>	<ul style="list-style-type: none"> Manual handling injury during manual rotation of engine, replacing engine covers and starter motor (if fitted). These steps are to be undertaken by two people, working in accordance with their manual handling training
<u>Turbo Charger Removal & Replacement</u>	<ul style="list-style-type: none"> Entanglement/Draw in hazards from moving turbo components. Even after isolation, the turbo can continue to spin. Ensure turbo has completely stopped before interacting with its components Contact with pressurised air from lines. Ensure lines are isolated and pressure safely vented before removing lines. Wear protective glasses Injury from pinch/crush points and sharp edges, always wear protective gloves
<u>Fuel Transfer Pump Removal & Replacement</u>	<ul style="list-style-type: none"> Contact with diesel fuel. Isolate and drain fuel before connecting lines (refer to the warnings on page 1). Always work in accordance with SMS-06-SW-0194 Storage and Handling of Diesel Forklift related hazards, including crush injuries. Ensure the operator has a clear path to travel and work at all times. Hydraulics can creep so never allow anyone to work beneath lifted equipment. Only trained and competent forklift operators are to drive or otherwise use forklifts. All forklift operation is to be conducted in accordance with SMS-06-SW-0400 Forklift Trucks Manual handling injury from handling the pump. When not being handled by the forklift the pump is to be moved by trolley, pushed by two person, work in accordance with their manual handling training
<u>Starter Motor Removal & Replacement</u>	<ul style="list-style-type: none"> Struck by dust or other foreign bodies during cleaning of engine access panel. Wear protective eyewear during this step and respiratory protection, as required Electric arc hazard if the battery is not isolated in accordance with SMS-06-SW-1130 Electrical Isolation Diesel Fleet Manual handling injury from handling the starter motor. Always use a two man lift and use manual handling aids such as a starter motor stands, trolleys and an overhead crane. Work in accordance your manual handling training Injury from pinch/crush points and sharp edges, always wear protective gloves
<u>Fire Control Bottle Removal & Replacement</u>	<ul style="list-style-type: none"> Blast injury from compressed gas/powder if the bottle discharges unexpectedly. Ensure the Fire Control System is isolated and contact with the bottle firing pin is avoided. Always wear a face shield, respiratory protection and protective gloves when interacting with fire bottles Cold burn injury from discharging gas contact with body. Seek medical attention as soon as practicable Asphyxiation from a discharge of gas/powder. Should a discharge occur, immediately vacate the engine area. Allow the discharge process to completely finish and additional time for the extinguishing gas to dissipate, before re-entering the engine area. Also prevent other persons from entering the engine area until the area is safe

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<u>Radiator Core & Fan Change & Radiator Core Clean</u>	<ul style="list-style-type: none"> Squirts of hot water/steam from radiator/piping system-ensure system has cooled down and or de-pressurised Fall from heights. To prevent falls ensure an approved and appropriate height stepladder is used, in accordance with SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms, to access roof hatch Slip and falls as a result of spilt coolant. Drain all fluid before removal. Ensure any spills are immediately cleaned up, using an approved absorption media, and dispose of in appropriate waste bins Fall from heights. To prevent falls ensure an approved mobile platform is used, in accordance with SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms, to access filters at height Electric arc hazard, ensure the battery is isolated in accordance with SMS-06-SW-1130 Electrical Isolation Diesel Fleet Injury from pinch/crush points and sharp edges on components. Always wear protective gloves
<u>Cooling Group Removal & Replacement</u>	<ul style="list-style-type: none"> Fall from heights. To prevent falls ensure only the approved safety stepladder is used, in accordance with SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms, to access the roof crane attach points Hazards relating to the use of an overhead crane, ensure all persons are clear of the cooling group and operate the crane in accordance with SMS-06-SW-1151 Overhead Gantry Crane - Safe Operation Manual handling injury when overreaching to attach lifting gear, due to the awkward position of the attach points. Never manually lift any of the lifting gear when attaching it to the lift points Slips from spilt coolant. Ensure all coolant is drained where possible and all openings are plugged to prevent leakage.
<u>Carden Shaft Removal & Replacement</u>	<ul style="list-style-type: none"> Exposure to mechanical energy. Always isolate before disconnecting mechanical components Hazards relating to the use of an overhead crane, ensure all persons are clear of the carriage and operate the crane in accordance with SMS-06-SW-1151 Overhead Gantry Crane - Safe Operation
	<p>Note</p> <p>For ease of access and to prevent strain injuries, when storing a removed cooling group unit, ensure it is placed to enable optimal access to the lift points with the safety stepladder</p>
	<p>Note</p> <ul style="list-style-type: none"> Always carry out work in accordance with relevant Engineering and Operational Instructions
Clean Up	<ul style="list-style-type: none"> Clean up any spills Remove old components and tools from the train Dispose of waste in the designated bin
<u>Reinstate the electrical circuit</u>	<ul style="list-style-type: none"> Before reinstating power always check for Red Flag(s) and that equipment is safe to reinstate Look for and inform other personnel that may be affected by reinstating the circuit
	<p>Warning</p> <ul style="list-style-type: none"> Only remove your own isolation. The removal of another persons lock and / or tag may result in their injury or death. Offenders will be subject to strict disciplinary action and may be subject to prosecution by the regulator
Function Test	Ensure correct installation of replaced components by function testing
	<p>Warning</p> <p>The engine is noisy. If testing requires standing in close proximity to the engine, particularly in an enclosed space, hearing protection is required to protect from hearing damage</p>
Red Flag	<p>Remove Red Flag, in accordance with SMS-12-OI-0886 Red Flagging Trains in stabling yards, depots and Maintenance Centres</p> <p>Notify the Line Manager (supervisor or foreman) of completion, as required</p>
Additional controls	
<ul style="list-style-type: none"> Other controls may be necessary, depending upon the work being carried out. Refer to relevant SWIs <p>If you identify additional hazards and / or controls relevant to this SWI, notify your Safety Facilitator or Line Manager as soon as practicable, so they can be noted and used to continuously improve this document</p>	