




Safe Work Instruction	Issue date: 02/02/10
Train Main Power Supply System (11): Safe Working	Review date: 30/03/11





Document no. SMS-06-SW-1286	Work description This SWI describes safe work practices related to the maintenance of components within the Train Main Power Supply System
	Scope This SWI describes the hazards and controls for work by RSD Electrical Maintenance Centre staff on Rollingstock train main power supply systems This document does not replace technical 'how to' documents such as Engineering Instructions, Manufacturers' instructions etc In addition to the inclusions of this document, all work is to be carried out in accordance with <u>SMS-06-GD-0268 Working Around Electrical Equipment</u>
Review date 30/03/11	References <ul style="list-style-type: none"> • OHS Act 2000 • OHS Regulations 2001 • Rail Safety Act 2008 • SMS-12-OI-0886 Red Flagging Trains in stabling yards, depots and Maintenance Centres • SMS-06-SW-0836 Isolating 1500V DC OH using an Annett Key • SMS-06-SW-0838 Pantograph Raising and Lowering • SMS-06-SW-1260 Pneumatics (other than Braking) System (06) - Safe Working • SMS-06-SW-1133 Guard's Emergency Cock Lock-Out • SMS-06-EN-0553 Electrical Hazards Warnings • SMS-06-GD-0268 Working Around Electrical Equipment • SMS-06-SW-0538 PPE for Electrical Work • SMS-06-SW-0269 Electric Shock Protocol • SMS-06-PR-0173 Plant and Equipment Lock-out Tag-out • SMS-06-SW-1151 Overhead Travelling Crane - Safe Operation • SMS-06-GD-0240 Working At Heights • SMS-06-SW-0812 Working in the Pit • SMS-06-PR-0104 Workplace Risk Management • SMS-06-GD-0001 Guide to Manual Handling • SMS-06-SW-1160 Working on High Roads • SMS-06-SW-0487 Entering Trains from Ballast • SMS-06-SW-0488 Climbing out of Trains onto Ballast • SMS-06-GD-1306 Radio Frequency Electromagnetic Energy at Fixed Sites • SMS-06-GD-0323 Personal Protective Equipment



Responsible supervisor	PPE and precautions	Competencies or qualifications	Licences or permits required
Line Manager	<ul style="list-style-type: none"> • Non-conductive, high visibility vest • Long sleeve, cotton drill work shirt • Lace-up Safety Footwear • Safety Eyewear, as required • Respiratory protection, as required • Riggers Gloves when handling sharp edges • All PPE to comply with 	<ul style="list-style-type: none"> • Rail Industry Safety Induction (RISI) • Site specific induction • Electrical Safety Awareness • Electrical Trade Certificate or higher, as required • Manual Handling Training 	

Tools and equipment required <ul style="list-style-type: none"> • Red Flag • Personal Locks, Multi-locks (Hasps) and/or Danger tags, as required • Power tools, as required • Hand tools • Electrical test Equipment e.g. Multimeter •
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>General Warning Fire Safety</p> <ul style="list-style-type: none"> Don't create a situation where a fire can start by short circuit or fusion If a fire occurs raise the alarm Assess risk whilst using fire extinguishers in restricted and confined areas Prevent blow back by correct use of fire extinguisher, short sharp bursts
	<p>Note</p> <p>Pre work brief and task risk assessment</p> <p>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</p> <p>The following warnings apply throughout this SWI:</p> <ul style="list-style-type: none"> Isolation of relevant circuit, including the placement of a lock and/or tag in accordance with <u>SMS-06-PR-0173 Plant and Equipment Lock-out Tag-out</u>, is required before any work on electrical components commences. Failure to correctly isolate electrical equipment before interacting with it could result in injury or death. Always verify isolation has been achieved before proceeding with work. Also refer to <u>SMS-06-GD-0268 Working Around Electrical Equipment</u> Ensure clothing complies with <u>SMS-06-SW-0538 PPE for Electrical Work</u> to minimise the risk of shock or flash burns. Wearing unacceptable clothing (including short sleeves or shorts) could fail to protect from, or even contribute, to serious injury. Also read in conjunction with <u>SMS-06-GD-0323 Personal Protective Equipment</u> Always remove all metal wrist, hand and neck jewellery and chains to prevent them becoming conductors should they come in contact with a live piece of equipment which could result in serious injury or death Consider all hazards relating to working with electricity, refer to <u>SMS-06-EN-0553 Electrical Hazards Warnings</u> Failure to comply with safe working practices may result in electric shock, refer to <u>SMS-06-SW-0269 Electric Shock Protocol</u>
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, refer to <u>SMS-06-GD-0001 Guide to Manual Handling</u> 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 and take a pro-active approach to risk assessment, refer to <u>SMS-06-PR-0104 Workplace Risk Management</u>
Place Red Flag	<p>To notify persons that work on the main power supply system is being carried out on the train, place your Red Flag in accordance with <u>SMS-12-OI-0886 Red Flagging Trains in stabling yards, depots and Maintenance Centres</u>.</p>
Investigate Work Required	<ul style="list-style-type: none"> Once your 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), refer to <u>SMS-06-GD-0001 Guide to Manual Handling</u> 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 <u>SMS-06-SW-0487 Entering Trains from Ballast</u> and <u>SMS-06-SW-0488 Climbing out of Trains onto Ballast</u>

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Isolation – Electrical Energy	<p>Before commencing any work on the main power supply system, isolation is required to protect from injury or death, refer to <u>SMS-06-PR-0173 Plant and Equipment Lock-out Tag-out</u>, <u>SMS-06-SW-0538 PPE for Electrical Work</u> and <u>SMS-06-GD-0268 Working Around Electrical Equipment</u>.</p> <p>The isolation required may vary, depending upon the work, and should be determined in conjunction with relevant technical documents and, if in doubt, in conjunction with the Line Manager.</p> <p>However, to protect from electrical energy within the main power supply system refer to the following:</p> <ul style="list-style-type: none"> Lower the pantograph(s), in accordance with <u>SMS-06-SW-0838 Pantograph Raising and Lowering</u>, and Isolate the road, in accordance with <u>SMS-06-SW-0836 Isolating 1500V DC OH Using an Annett Key</u> 	
	<p>Warning</p> <p><i>Failure to correctly isolate all energy sources could result in serious injury or death. Always verify that isolation has been achieved and, if in doubt, seek assistance from your Line Manager.</i></p>	
Check	Visually inspect that the pantograph(s) has been lowered from the overhead power supply.	
	<p>Warning</p> <p><i>Ensure all pantographs are lowered in accordance with <u>SMS-06-SW-0838 Pantograph Raising and Lowering</u>. Visually check that the pantographs are lowered. Do not simply rely on the pantograph air pressure gauge, this will not guarantee that the pantographs are lowered. Failure to confirm that pantographs are lowered correctly may lead to serious INJURY or DEATH.</i></p>	
Isolation – Train Movement	<p>To protect from the movement of Electric Trains, the following additional isolation may also be required:</p> <ul style="list-style-type: none"> Isolate the guard's emergency cock, in accordance with <u>SMS-06-SW-1133 Guard's Emergency Cock Lock-Out</u> Stay alert at all times – always practice safe work practices 	
Carry Out Main Power Supply System Work	<p>Once isolation and other relevant controls have been put in place, carry out the main power supply work. Consider the risks associated with the work being carried out, continually undertake a pro-active risk assessment, refer to <u>SMS-06-PR-0104 Workplace Risk Management</u></p>	
	<p>Warning</p> <p><i>Main Power Supply work has a number of general hazards. These include:</i></p>	
	<ul style="list-style-type: none"> <i>Electric shock from failure to carry out the isolation of the Over Head Power and of relevant roof equipment circuits, including the placement of a lock and/or tag in accordance with <u>SMS-06-PR-0173 Plant and Equipment Lock-out Tag-out</u>, before any work on electrical components commences also refer to <u>SMS-06-EN-0553 Electrical Hazards Warnings</u>, <u>SMS-06-SW-0538 PPE for Electrical Work</u>, <u>SMS-06-GD-0268 Working Around Electrical Equipment</u> and <u>in case of electric shock refer to SMS-06-SW-0269 Electric Shock Protocol</u></i> <i>Failure to correctly isolate electrical equipment before interacting with these activities could result in injury or death, refer to relevant task SWI. Always verify isolation has been achieved before proceeding with work (see Isolation Electrical-Energy on page 2 of 4)</i> <i>Injury from high tension components that are electrically controlled but pneumatically operated e.g. line Switches. Ensure pneumatic isolations have been carried out in accordance with <u>SMS-06-SW-1260 Pneumatics (other than Braking) System (06) - Safe Working</u></i> <i>Power Supply system components can be heavy and / or awkward to manipulate. Where possible use manual handling aids and/or seek assistance. Whenever manually handling, work in accordance with your training</i> 	
	<p>Warning</p> <p><i>In addition to the above, some main power supply work has additional unique hazards. These include:</i></p>	

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Pantograph Removal & Replacement	<ul style="list-style-type: none">Various hazards associated with working from high roads. Always work in accordance with <u>SMS-06-SW-1160 Working on High Roads</u>Overhead crane hazards. Work on pantographs may involve the use of an overhead Crane to lift equipment. Always work in accordance with <u>SMS-06-SW-1151 Travelling Crane - Safe Operation and relevant task SWI's</u>. NOTE this type of activity or task will vary depending upon the interaction from the environment, people, plant, materials and equipment. Therefore continuously re-access the risk throughout the activity refer to <u>SMS-06-PR-0104 Workplace Risk Management</u>Air blast injury. Always isolate the air supply in accordance with <u>SMS-06-SW-1260 Pneumatics (other than Braking) System (06) - Safe Working</u> and apply a personal lock and/or tag, in accordance with <u>SMS-06-PR-0173 Plant and Equipment Lock-out Tag-out</u>. Then, bleed all downstream air before disconnecting hoses. To further protection, wear eye protection refer to <u>SMS-16-GD-0323 Personal Protective Equipment</u>Injury from falling items e.g. tools, parts etc. Ensure all persons are clear of the potential drop zone and that items are positioned and secured to prevent falls from height	
Earthing System Maintenance	<ul style="list-style-type: none">Hazards around working in the pit including, slips trips & falls, head strikes and potential exposure to train radio radiation refer to, <u>SMS-06-GD-1306 Radio Frequency Electromagnetic Energy at Fixed Sites</u> and electric shock refer to <u>SMS-06-SW-0269 Electric Shock Protocol</u>Always conduct work in the pit, in accordance with <u>SMS-06-SW-0812 Working in the Pit</u>Hand injuries from protrusions and sharp edges on components. Always wear protective gloves refer to <u>SMS-16-GD-0323 Personal Protective Equipment</u>Exposure to dust. When examining or working on earthing components, wear eye and respiratory protection, refer to <u>SMS-16-GD-0323 Personal Protective Equipment</u>Electric shock from conductive parts and cables under and between cars. Particularly if both earth returns on axles are broken or disconnected as these will potentially be at 1500V. Always ensure that any overhead power is isolated and/or all pantographs lowered, Refer to relevant task SWI for isolation and <u>SMS-06-SW-0838 Pantograph Raising and Lowering</u>	
	Note Always carry out work in accordance with relevant Engineering and Operational Instructions.	
Reinstate the electrical circuit	<ul style="list-style-type: none">Before reinstating power always check for Red Flag/s, refer to <u>SMS-12-OI-0886 Red Flagging Trains in stabling yards, depots and Maintenance Centres</u> and that equipment is safe to reinstateLook for and inform other personnel that may be affected by reinstating the circuitWork in accordance with the previously referenced SWI(s)	
	Warning 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, as required.	
Clean and Exit	<ul style="list-style-type: none">Ensure old components and waste are removed from the trainDispose of waste so as they can not cause injury to others, such as in a designated bin	
Red Flag	Remove Red Flag, in accordance with <u>SMS-12-OI-0886 Red Flagging Trains in stabling yards, depots and Maintenance Centres</u> . Notify the Line Manager (supervisor or foreman) of completion, as required.	
Additional controls		
<ul style="list-style-type: none">Other controls may be necessary, depending upon the work being carried out. Refer to relevant SWIsIf 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 documentIn conjunction with SWI- always undertake a pro-active risk assessment of work activities, especially when the environment changes, or the activity or task is altered, for example by interaction of other related or parallel activities and tasks.		