GE-55

Health and Safety

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Cummins Power Generation

General Information

Generator Set

English – Original Instructions 11-2009 0908-0110-00 (Issue 5)

FOREWORD

The purpose of this manual is to provide the users with sound, general information. It is for guidance and assistance with recommendations for correct and safe procedures. Cummins Power Generation Limited cannot accept any liability whatsoever for problems arising as a result of following recommendations in this manual.

The information contained within the manual is based on information available at the time of going to print. In line with Cummins Power Generation Limited policy of continuous development and improvement, information may change at any time without notice. The users should therefore ensure that before commencing any work, they have the latest information available.

Users are respectfully advised that it is their responsibility to employ competent persons to carry out any installation work in the interests of good practice and safety. Consult your Authorised Distributor for further installation information. It is essential that the utmost care is taken with the application, installation and operation of any diesel engine due to their potentially hazardous nature. Careful reference should also be made to other Cummins Power Generation Limited literature, in particular the Controller, and the Engine Operation and Maintenance Manuals.

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SECTION 1 – INTRODUCTION

1. Introduction

1.1 General Information

Personnel engaged in the installation, commissioning, operation and maintenance of generator sets must be competent and experienced in these fields. They must also comply with all relevant and current statutory requirements and regulations, including the provisions of the Health and Safety at Work Act (1974), and any modification and amendment that may subsequently become a legal requirement, together with any local requirements/regulations.

Before operating the generator set, read this manual and become familiar with the equipment and its operation (including all controls, manually operated valves and shutdown devices). Correct operation and maintenance is essential for safe and efficient operation of this set.

Read and become familiar with the Safety Precautions listed in this manual and within any other manuals related to the equipment. Many accidents result from a failure to observe fundamental safety rules and precautions.

There are many potential hazards that can occur during the operation of a generator set, which cannot always be anticipated. Therefore a warning cannot be included in the manual for every possible circumstance that might involve a potential hazard.

Should a procedure be used that has not been specifically recommended, then the personnel involved must be satisfied that it is safe and will not damage the generator set.

1.2 Safety Precautions

Copy and post these suggestions in potentially hazardous areas.

1.2.1 Engine Warning

WARNING: DO NOT OPERATE AN ENGINE WHERE THERE ARE, OR CAN BE, COMBUSTIBLE VAPOURS.

THESE VAPOURS CAN BE SUCKED THROUGH THE AIR INTAKE SYSTEM AND CAUSE ENGINE ACCELERATION AND OVER-SPEEDING, WHICH CAN RESULT IN A FIRE, OR AN EXPLOSION.

WHERE AN ENGINE, DUE TO ITS APPLICATION, MIGHT OPERATE IN A COMBUSTIBLE ENVIRONMENT, SUITABLE OVERSPEED SHUTDOWN DEVICES MUST BE FITTED.

THE EQUIPMENT OWNER AND OPERATOR ARE RESPONSIBLE FOR SAFE OPERATION IN A HOSTILE ENVIRONMENT.

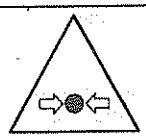
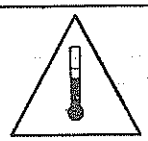
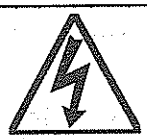
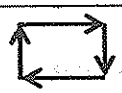
CONSULT YOUR AUTHORISED DEALER FOR FURTHER INFORMATION.

1.3 Generator Plant Safety Code

Before operating the generator set, read *the Operation and Maintenance* manuals and become familiar with them and the equipment. Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

1.3.1 Generator Set Warning Labels

Warning signs are provided on the generator set at the point of risk. To avoid injury, always take the necessary precautions - as indicated on the sample signs shown below:

	**Caution / Warning.** Indicates a risk of personal injury.
	**Caution / Warning of Pressure Hazard.** Indicates a risk of personal injury from pressurised fluids.
	**Caution / Warning of Temperature Hazard.** Indicates a risk of personal injury from high temperature.
	**Caution / Warning of Radio Frequency Hazard.** Indicates a risk of operating radio frequency communications equipment in the vicinity of the generator set.
	**Caution / Warning of High Voltage Hazard.** Indicates a risk of personal injury from electric shock.
	**Caution / Warning of High Voltage Hazard.** Indicates that earth leads only must be connected at this point.
	**Caution.** Indicates a risk of personal injury from equipment that may be subject to Automatic Starting.

SECTION 2 – WARNING NOTES

2. Warning Notes

2.1 Warning, Caution and Note Styles Used In This Manual

The following safety styles found throughout this manual indicate potentially hazardous conditions to the operator, service personnel or the equipment.

WARNING; **WARNS OF A HAZARD THAT MAY RESULT IN SEVERE PERSONAL INJURY OR DEATH.**

Caution: *Warns of a hazard or an unsafe practice that can result in product or property damage.*

Note: *A short piece of text giving information that augments the current text.*

2.2 Warnings

WARNING: **IT IS IMPORTANT TO READ AND UNDERSTAND ALL SAFETY NOTICES PROVIDED IN THIS MANUAL. IMPROPER OPERATION OR MAINTENANCE COULD RESULT IN A SERIOUS ACCIDENT OR DAMAGE TO THE EQUIPMENT CAUSING INJURY OR DEATH.**

2.2.1 Electricity

WARNING: **ELECTRICITY CAN KILL! LETHAL VOLTAGES MAY BE PRESENT IN MUCH OF THE EQUIPMENT REFERRED TO IN THIS MANUAL.**

2.2.2 High Pressures

WARNING: **LIQUIDS OR GASES THAT ARE HIGHLY PRESSURISED CAN PASS THROUGH THE SKIN AND INTO THE BODY. THEY CAN ALSO CAUSE DAMAGE TO EQUIPMENT.**

2.2.3 Maintenance

WARNING: **ONLY AUTHORISED AND COMPETENT PERSONNEL WHO ARE FAMILIAR WITH THE EQUIPMENT AND ITS OPERATION SHOULD CARRY OUT MAINTENANCE.**

WARNING: **DEPENDENT UPON THE CONTROL SYSTEM FITTED, THIS UNIT MAY OPERATE AUTOMATICALLY AND COULD START WITHOUT WARNING.**

Caution: *If using a fork-lift truck, during installation or re-siting of the generator set, ensure the forks are correctly aligned at right angles to the bedframe before inserting into the fork-lift pockets.*

WARNING: **MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. USE EXTREME CAUTION AROUND HOT MANIFOLDS, MOVING PARTS, ETC..**

TO PREVENT SERIOUS BURNS, AVOID CONTACT WITH HOT METAL PARTS SUCH AS RADIATOR, TURBOCHARGER AND EXHAUST SYSTEM.

WARNING: **TO COMPLETE MAINTENANCE TASKS AT HEIGHT, SUITABLE EQUIPMENT FOR PERFORMING THESE TASKS MUST BE USED IN ACCORDANCE WITH THE LOCAL GUIDELINES AND LEGISLATION. FAILURE TO FOLLOW THESE GUIDELINES AND LEGISLATION CAN RESULT IN SEVERE PERSONAL INJURY OR DEATH.**

2.2.4 Supply Isolation

Caution: *If the engine has been running recently, or if the optional battery charger has been switch on, explosive gases (given off during battery charging) may be present in the vicinity of the batteries. Ensure the area is well ventilated before disconnecting batteries.*

Caution: *Remove AC power to the cooling system heaters before disconnecting battery leads. Heaters will run continuously without DC power and can overheat and damage heater.*

WARNING: **BEFORE CARRYING OUT ANY MAINTENANCE, ISOLATE ALL SUPPLIES TO THE GENERATOR SET AND ANY CONTROL PANELS. RENDER THE SET INOPERATIVE BY DISCONNECTING THE PLANT BATTERY.**

Note: *Shut down the generator set as described in the Operation and Maintenance Manual supplied with the set.*

1. Turn the Mode switch on the control panel to Off (O).
2. Remove the key from the Mode switch (if applicable), and account for all other keys for safekeeping.
3. As an additional precaution, thoroughly ventilate the plant room before disconnecting any leads.
4. Isolate and lock off the heater control box, where fitted.
5. Isolate and lock off the supply to the battery charger, where fitted.
6. Isolate the fuel supply to the engine
7. Disconnect the starting batteries and control system batteries, (if separate). Disconnect the negative (-) cable first.
8. Fit Warning notices at each of the above points to indicate Maintenance in Progress – Plant Immobilised for Safe Working.

2.2.5 Reinstatement of Supply

Reinstate all protective devices removed or disconnected during Maintenance or Overhaul, before putting the set back into Service.

The procedure for reinstatement is the reverse of the procedure for isolation.

SECTION 3 – STANDARDS

3. Standards

3.1 Radio Frequency

The apparatus has been tested according to EN 61000-6-2:1999 (IEC 61000-6-2:1999) and BS EN 61000-6-4:2007, specifying the limits of radio frequency immunity and emissions to meet the essential requirements of the EMC directive 2004/108/EC.

From these tests the manufacturer has established that as a precaution against undue effects, no radio frequency communications equipment should be operated at a distance of less than three metres from any part of the apparatus when the generator set could, or is relied upon to, provide power.

The effective separation distance should be increased if the radio frequency communications equipment is found to interfere with the apparatus, the onus lies with the customer to effectively test for adverse effects on the apparatus before usage of the equipment.

NO RADIO FREQUENCY COMMUNICATIONS EQUIPMENT

MAY BE OPERATED IN THE VICINITY OF THIS APPARATUS

Figure 3-1 Radio Frequency Warning

3.2 Standards, Codes & Regulations

The generator set and its control system are manufactured under a registered quality control system approved to BS EN ISO 9001 (2000). The following regulations are observed where applicable:

- The Health & Safety at work Act 1974
- The Control of Substances Hazardous to Health Regulations 2002, (SI 2002 No. 2677)
- IEE Wiring Regulations for Electrical Installations (16th Edition)
- The Electricity at Work Regulations 1989
- The Environmental Protection Act 1990
- The Health & Safety at Work Regulations 1992
- The EMC Directive 2004/108/EC
- The LV Directive 73/23/EEC as amended by Directive 93/68/EEC
- The Machinery Directive 98/37/EC
- The Noise Directive 2000/14/EC as amended
- The Gas Act 1986 (Natural Gas Generator Sets)

3.3 Build Standards

The generator set and its control system have been designed, constructed and tested generally in accordance with the following Standards where applicable:

BS 4999 (IEC 60034[1])	General requirements for rotating electrical machines
BS 5000-3:2006 (IEC 60034[1])	Rotating electrical machines of particular types or for particular applications
BS ISO 3046-3:2006[2]	Reciprocating internal combustion engines: performance
BS 7671:2001	Requirements for electrical installations IEE Wiring Regulations (16th Edition)
BS ISO 8528[2]	Reciprocating internal combustion engine driven alternating current generating sets
BS EN 61000-6-2:1999 (IEC61000-6-2:1999[2])	Electromagnetic compatibility. Generic emission standard
BS EN 61000-6-4:2007	Electromagnetic compatibility. Generic immunity standard
BS EN 60439 (IEC 60439[2]) (EN 60439[2])	Specification for low-voltage switchgear and control gear assemblies
BS EN 60947-1:2007 (IEC 947[1]) (EN 60947[2])	Specification for low voltage switchgear and control gear
BS EN 60204-1:2006	Safety of Machinery – Electrical Equipment of Machines
UL 508A	Specification for Control Panels

1. A related, but not equivalent, standard: A BSI publication, the content of which to any extent at all, short of complete identity or technical equivalence, covers subject matters similar to that covered by a corresponding international standard.
2. An identical standard: A BSI publication identical in every detail with a corresponding international standard.

SECTION 4 – SAFETY PRECAUTIONS

4. Safety Precautions

4.1 General

WARNING: RISK OF INJURY

On generator sets that can be started automatically or from a remote location, a warning plate should be displayed prominently indicating, pictorially, to personnel that the set may start automatically without warning.

Appropriate personal protective equipment should be worn when working on the generator set or on any associated equipment.

Information on first aid procedures and facilities should be displayed near the set.

The area around the generator set should be clear of obstructions and dangerous objects. In addition, the floor should be kept clean, dry and clear of oil deposits.

Maintenance work, particularly in confined areas, should be carried out by a minimum of two operators working together.

Never lift the generator set using the engine or alternator lifting lugs. Refer to the lifting recommendation drawings and/or Installation Manual for further details.

Caution: *If fork-lift pockets have been provided to re-position the generator set, ensure that the forks of the fork-lift truck are at right angles to the bedframe before inserting them into the pockets provided.*

Only lifting devices of suitable capacity should be used.

WARNING: TO COMPLETE MAINTENANCE TASKS AT HEIGHT REFER TO LOCAL LEGISLATIVE REQUIREMENTS. SUITABLE EQUIPMENT FOR PERFORMING THESE TASKS MUST BE USED IN ACCORDANCE WITH THE LOCAL GUIDELINES AND LEGISLATION. FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN SEVERE PERSONAL INJURY OR DEATH.

WARNING: LIFTING AND REPOSITIONING ON THE GENERATOR SET MUST ONLY BE CARRIED OUT USING SUITABLE LIFTING EQUIPMENT, SHACKLES AND SPREADER BARS IN ACCORDANCE WITH LOCAL GUIDELINES AND LEGISLATION BY SUITABLY TRAINED AND EXPERIENCED PERSONNEL. INCORRECT LIFTING CAN RESULT IN SEVERE PERSONAL INJURY, DEATH AND/OR EQUIPMENT DAMAGE. FOR MORE INFORMATION CONTACT YOUR AUTHORISED DISTRIBUTOR.

4.2 Electrical Hazards

WARNING: RISK FROM ELECTRIC SHOCK

Before carrying out any maintenance, isolate all supplies to the generator set and any control panels. Render the set inoperative by disconnecting the plant battery – refer to Section 2.2.4 - Supply Isolation. See also the Operation and Maintenance Manuals supplied with the set.

Only suitably trained and qualified engineers, who are authorised to do so, should connect the generator set load, operate or perform maintenance on the set. Connection must also be in compliance with relevant codes and standards.

The generator set should only be connected to loads compatible with its electrical characteristics and rated output.

Medium or high voltage acts differently than low voltage. Special equipment and training is required to work on, or around, medium or high voltage equipment. Do not work on energized equipment. Due to the nature of medium or high voltage electrical equipment, induced or residual voltage remains even after the equipment is disconnected from the power source.

The metalwork of the generating set, bed frame and other exposed parts must be bonded to an effective earth point.

Do not touch any electrically energised part of the generator set or cables/conductors with any part of the body or with any non-electrically insulated object.

Do not operate the generator set with any terminal box cover open.

Ensure that all connections are insulated.

Ensure that all electrical equipment and connections are kept clean and dry.

Replace any defective terminal covers and wiring immediately and ensure that all terminations are secure.

Reinstate all protective devices removed or disconnected during maintenance or overhaul, before putting the generator set back into service.

The appropriate neutral earthing requirements must be complied with, or adequate means incorporated to ensure that an isolated neutral system is adequately protected against voltage rises and undetected earth faults. In the situation where the generator set is operated in parallel with a network supply, the user must be satisfied that the neutral earthing switch gear (where fitted), is operational and that the associated protection devices are fully functional. Permission must have been obtained from the local electricity supply utility, before parallel operation is considered.

Do not connect generator set directly to any building electrical system. Hazardous voltages can flow from the set into the utility line. This creates a potential for electrocution, or property damage. Connect only through an approved isolation switch or an approved paralleling device.

To prevent irreparable damage to the battery charging system:

- Never disconnect the battery whilst the set is running
- Never disconnect the charging leads whilst the set is running
- Disconnect the battery and charge alternator before electric arc welding on the set

Note: The charge alternator output lead is live at all times.

Follow all applicable electrical safety codes.

Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

4.3 Engine Waste

WARNING; INCORRECT DISPOSAL OF ENGINE WASTE IS ENVIRONMENTALLY HARMFUL AND PRESENTS A HEALTH RISK.
SOME ENGINE WASTE IS COMBUSTIBLE AND IS THEREFORE A FIRE RISK.

Dispose of unwanted or absorbed substances through an authorised contractor who will transport and correctly dispose of the waste to a licensed site.
For further information refer to Section 5 - Substances Hazardous to Health.

4.4 Exhaust Gas Hazards

WARNING: RISK FROM TOXIC FUMES

Exhaust fumes are toxic and all necessary measures must be taken to ensure that they do not escape into, or re-circulate within, the plant room or associated buildings. Exhaust gases contain carbon monoxide, an odourless and colourless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms include: dizziness; nausea; headache; sleepiness; inability to think coherently. Persons affected should seek fresh air immediately and be kept active. If symptoms persist, seek medical attention. Shut down the generator set and do not operate until it has been inspected and repaired.

Visually and audibly inspect the exhaust system. Ensure that all exhaust components are secured and true (not warped).

Do not use exhaust gases to heat a compartment.

Ensure that the generator set is kept well ventilated. Thoroughly ventilate the plant room to remove all fumes and explosive vapours **before** disconnecting or connecting battery cables thus reducing the possibility of accidental sparks causing an explosion.

Ensure that the exhaust outlet is kept free from obstruction.

Should repeated attempts to start the engine fail, unburnt fuel gas may build up in the exhaust system creating a potentially dangerous situation. Allow these gases to disperse before carrying out further attempts to start.

4.5 Natural Gas

WARNING: RISK OF ASPHYXIATION AND EXPLOSION

Natural gas is dangerous if leakage occurs. Relatively low levels of gas leakage in confined areas can cause explosions if ignited.

Inhalation of large volumes of natural gas can cause asphyxiation and death. If leakage occurs isolate the gas supply, do not operate any equipment (electrical or otherwise) that may cause a spark or may be a source of ignition, evacuate the building and fully ventilate the area. Only suitably qualified personnel who are fully trained to handle natural gas emergencies are to be allowed near the plant room or generator set(s) in such emergencies.

Ensure that gas pipes and gas trains are installed in compliance with relevant codes, standards and local requirements.

Welding equipment, blowlamps and any other source of ignition that may cause natural gas to ignite should **not** be used in the Plant Room unless all gas pipes have been purged.

Incomplete or unsealed gasways should never be left unattended without all reasonable precautions being taken to inform others of the disconnection and potential danger i.e. Warning Signs etc. Metal pipes should **always** be sealed with metal pipe fittings.

Electrical earth bonding on all gas pipes and gas components should be regularly checked for security and good electrical contact.

If a gas leak is suspected:

- Do not operate any electrical equipment or switches in the plant room, these can cause sparks.
- Immediately evacuate all personnel from the plant room and then ventilate the building.
- Shutdown the generator set(s) by fully shutting the gas train shut-off valve(s).
- Fully shut all external gas supply valves to the generator set(s).
- Alert the emergency services and local gas supplier.

4.6 Fire Hazards

WARNING: RISK OF FIRE

With the use of fuel, lubricating oils and batteries there is a fire hazard. Naked flames or sparks should not be allowed near the generator set, fuel tank, gas train and batteries. Explosive fuel and oil vapours are always present in the vicinity of a generator set, while a battery on charge can produce inflammable hydrogen gas.

Leakage of Natural Gas, at relatively low levels and in confined areas, can cause explosions and fires if ignited.

An area in the vicinity of the generator set should be designated a NO SMOKING area and one that is prohibited to unauthorised persons.

Ensure that adequate ventilation is maintained within the plant room at all times. Thoroughly ventilate the plant room to remove all fumes and explosive vapours **before** disconnecting or connecting battery cables thus reducing the possibility of accidental sparks causing an explosion.

Providing suitable bunding to contain any spillage or leakage from the generator set is the responsibility of others. The volumes of fluids involved can be established from the data supplied with the set.

No loose items of equipment or combustible material should be left on or near any part of the generator set. Remove all unnecessary oil and grease from the unit and clean up fuel and oil spills immediately.

In the event of a fuel or oil leak, the spillage should be absorbed using a proprietary material (e.g. Fuller's Earth granules, or similar). Sawdust should not be used, as this will create a fire hazard. Appropriate fire fighting equipment should be readily available - (class A, B and C [dry powder] type fire extinguishers are recommended).

Inspect the fuel system before each operation and periodically while running.

Do not refill the fuel tank while the generator set is running, unless the tanks are outside the engine compartment. Fuel contact with a hot engine or exhaust is a potential fire hazard.

Keep a fire extinguisher available in or near the plant room and in other areas throughout the site. Use the correct extinguisher for the area.

4.7 Fluids

WARNING: RISK OF TOXIC CHEMICALS

There is a health risk associated with exposure to fuel, lubricating oils, coolant additives and battery electrolyte. Avoid contact with these fluids and always wear the appropriate personal protective equipment. Reference should be made to Section 5 for general information and to the Material Safety Data Sheets (MSDS) obtainable from the relevant suppliers/manufacturers.

Benzene and lead, found in some diesel oils, have been identified as causing cancer or reproductive toxicity. When checking, draining or adding diesel, take care not to ingest, breathe the fumes, or contact the diesel.

Used engine oils have been identified as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes or contact used oil.

Avoid fluid spillage and discard clothing contaminated by fuel oil, coolant, lubricants or battery electrolyte.

Ensure that remote fuel storage systems are installed in compliance with relevant codes, standards and local requirements.

Fuel lines must be adequately secured and free of leaks. Fuel connection to the engine should be made with an approved flexible line. Do not use zinc coated or copper fuel lines with diesel fuel.

Ensure all fuel supplies have a positive shut-off valve.

The user should also contact their supplier of fluids used in the generator set for Manufacturers' recommendations on Health and Safety.

4.8 High Temperature Hazards

WARNING: RISK OF BURNING AND SCALDING

While the generator set is running, and for a period following shutdown, avoid contact with exhaust, radiator and other components that are likely to become hot. At all times, avoid contact with hot oil, hot coolant and hot exhaust gases.

Hot coolant is under pressure. DO NOT attempt to remove a radiator or heat exchanger pressure cap while the generator set is running. Always allow the set to cool completely before doing so.

DO NOT drain coolant or lubricating oil until the generator set has cooled completely.

4.9 Moving Part Hazards

WARNING: RISK OF INJURY

Safety guards and covers must be securely fitted and all cubicle doors, cover-plates, etc, should be firmly in place while the generator set is in operation.

Keep hands and loose clothing away from moving parts. Do not wear jewellery while servicing any part of the generator set.

Never step on the generator set. It can stress and break unit components, possibly resulting in dangerous operating conditions – from leaking fuel, leaking exhaust fumes, etc.

Before performing any maintenance on the generator set, disconnect its batteries to prevent accidental starting. Thoroughly ventilate the plant room to remove all fumes and explosive vapours **before** disconnecting or connecting battery cables thus reducing the possibility of accidental sparks causing an explosion.

Avoid contact with any moving part.

4.10 Noise

WARNING: RISK OF DAMAGE TO HEARING

Generator sets emit noise. Ensure that the doors of any enclosure, or room that contains a generator set, display a suitable pictogram warning that hearing protection must be worn. It is the responsibility of personnel exposed to noise to ensure that they are provided with suitable ear protection, e.g. ear defenders.

Whilst there is a correlation between the emission and exposure levels, this cannot be used reliably to determine whether or not further precautions are required. Factors that influence the actual level of exposure of work-force include the characteristics of the work room, the other sources of noise, etc. i.e. the number of machines and other adjacent processes, and the length of time for which an operator is exposed to the noise. Also the permissible exposure level can vary from country to country.

Information on noise emissions can be found in the Engine Operator Manual supplied with your generator set. The figures quoted are emission levels and are not necessarily safe working levels.

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SECTION 5 - SUBSTANCES HAZARDOUS TO HEALTH

5. Substances Hazardous to Health

The generator set(s) covered by this manual contains several substances that require special consideration when handling to avoid becoming hazardous to health and safety.

Operators of generating plant and machinery must obtain the relevant suppliers' Material Safety Data Sheets, and information/instructions therein should take precedent over the information provided within this document. In the absence of the suppliers' information, the following information may be used on a temporary basis only. In addition to preventing hazards to personal health, these instructions are designed to minimise environmental damage and pollution.

The information contained herein is based on the data available to us. It is the responsibility of the user to comply with any relevant laws and regulations that may exist.

5.1 Antifreeze (Fleetguard – ES compleat/EG premix)

This antifreeze is also known as an ethylene glycol based coolant; summer coolant; coolant additive. It is a purple coloured, viscous liquid, with a mild chemical odour, is soluble in water and harmful. It contains ethylene glycol, and diethylene glycol. Ethylene glycol is a potentially hazardous constituent.

The substance has a boiling point of 107°C, and a flash point of 121°C.

It is used as an engine coolant additive, and can be found in engine cooling systems, and heat exchangers. Installers, operators and maintainers are likely to encounter this substance.

5.1.1 Hazardous Reactions

Ethylene glycol is combustible when exposed to heat or flame and can react vigorously with oxidants. Moderate explosive hazard in form of vapour when exposed to heat or flame. Hazardous products resulting from combustion or decomposition include carbon monoxide, carbon dioxide and acrid smoke. Self-contained breathing apparatus must be worn in the event of fume build up.

Avoid strong oxidising agents – incompatible with sulphuric acid, nitric acid, caustics and aliphatic amines.

It may cause neurological signs and symptoms, and kidney damage. It is also a skin and eye irritant.

Very toxic in particulate form upon inhalation. Harmful if swallowed, lethal dose for humans reported to be 100ml.

5.1.2 Protective Measures

Refrain from eating, drinking or smoking when using the product. Adopt a high standard of personal hygiene. In case of skin contact, wash immediately with soap and water.

Ensure good ventilation and avoid heat sources. Avoid breathing mist, if there is a risk of vapour, or particulate, use a suitable organic vapour mask.

Eye protection, gloves, overalls, impervious apron should be used. Avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly.

5.1.3 Storage / Transport

Store and transport only in correctly marked containers. Keep containers closed when not in use. Keep cool, out of sunlight, away from naked flames and strong acids, do not freeze. Store well away from food-stuffs and drinking water. Take special care to avoid discharge into drains, sewers and water-courses.

Contain leak/spill with sand, earth or non-combustible, absorbent material to prevent entry of substance into drainage/sewerage system, water-courses and land. Eliminate all ignition sources, use plastic shovel to transfer to suitable container and dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

5.1.4 Emergency Action

- Fire

  Extinguishing media: CO_2, alcohol resistant foam, dry powder, or water spray.

  Fire fighters to use self contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterways, drains and drinking water supplies.

- Ingestion

  Toxic by ingestion. If swallowed induce vomiting **only** under the advice of a Doctor or poison control centre.

  Delayed treatment may result in fatality.

- Inhalation (of vapour)

  Remove from further exposure. In case of irritation to lungs or throat, seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Flush copiously with water or preferably eye-wash solution for at least five minutes. Seek medical advice.

- Skin

  Wash thoroughly with soap and water, and seek medical attention if irritation develops. Change clothing if necessary and wash before re-use.

- Spillage

  Soak-up using an absorbent material and dispose of this as directed under Storage/Transport (Section 5.1.3).

5.2 Antifreeze (Valvoline coolant premix)

This antifreeze is a green, viscous liquid, which is practically odourless, and soluble in water. It contains ethylene glycol, and diethylene glycol. Ethylene glycol is a potentially hazardous constituent.

The substance has a boiling point between 171-203°C, with a flash point of 118°C, and a vapour pressure of 0.4mm Hg at 20°C.

It is used as an engine coolant additive, and can be found in engine cooling systems, and heat exchangers. Installers, operators and maintainers are likely to encounter this substance.

5.2.1 Hazardous Reactions

This product is considered stable but must be kept away from oxidising agents.

In the event of a fire, or excessive heat, there is a risk of the containing drum bursting.

At elevated temperatures vapour, or particulate, may irritate respiratory tract and continued exposure is reported to induce unconsciousness. Harmful, or fatal, if swallowed. Contact may cause skin sensitisation.

5.2.2 Protective Measures

Refrain from eating, drinking or smoking when using the product. Adopt a high standard of personal hygiene. In case of skin contact, wash with soap and clean water.

Ensure good ventilation and avoid heat sources. If there is a risk of vapour, or particulate, use a suitable organic vapour mask.

Use eye protection, rubber or PVC gloves, overalls, impervious apron. Avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly.

5.2.3 Storage / Transport

Store and transport only in correctly marked containers. Keep containers closed when not in use. Keep cool, out of sunlight and away from naked flames. Store well away from food-stuffs and drinking water. Take special care to avoid discharge into drains, sewers and water-courses.

Contain leak/spill with sand or earth, and prevent entry of substance into drainage/sewerage system, water-courses and land. Dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

5.2.4 Emergency Action

- Fire

  Extinguishing media:
  Large fires - alcohol resistant foam, or water fog.
  Small fires - CO_2, alcohol resistant foam, dry chemical, sand, earth or water fog.

  Fire-fighters to use self contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterways, drains and drinking water supplies.

- Ingestion

  Harmful or fatal if swallowed. Rinse mouth with water. If conscious, give water to drink and obtain medical advice.

- Inhalation (of vapour)

  Remove from further exposure. In case of irritation to lungs or throat, seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Flush copiously with water or preferably eye-wash solution for at least fifteen minutes. If irritation persists seek medical advice.

- Skin

  Wash thoroughly with soap and water, and seek medical attention if irritation develops. Change clothing if necessary and wash before re-use.

- Spillage

  Soak-up using an absorbent material and dispose of this as directed under Storage/Transport (Section 5.2.3).

5.3 Antifreeze (Valvoline – MPG Coolant 50/50)

This antifreeze is also known as a propylene glycol based coolant. It is a colourless liquid with a mild odour, and although soluble in water should be used undiluted. It contains 2-propane diol, ethylhexanoic acid (sodium salt), and aliphatic acid. 2-propane diol, and ethylhexanoic acid are considered to be potentially hazardous constituents.

The substance has a flash point of 112°C min.

It is used as an engine coolant, suitable for open and closed cooling systems, and can be found in the engine cooling system. Installers, operators and maintainers are likely to encounter this substance.

5.3.1 Hazardous Reactions

This product is considered stable but must be kept away from strong oxidizing agents, acids, and sources of ignition. Oxides of carbon, aldehydes and ketones are products of decomposition.

Prolonged contact, as with clothing wetted with the substance, may cause more severe irritation and discomfort, seen as local redness and swelling.

If more than several mouthfuls are swallowed, abdominal discomfort, nausea and diarrhoea may occur.

5.3.2 Protective Measures

Refrain from eating, drinking or smoking when using this product. Adopt a high standard of personal hygiene. In the case of skin contact, wash with soap and water. Cold water may be used.

Ensure good ventilation and avoid heat sources. Wear appropriate respirator when ventilation is inadequate.

Use a lab coat, impervious gloves and eye protection. Avoid contamination inside the gloves and if clothes become contaminated, discontinue use and clean thoroughly.

5.3.3 Storage / Transport

Store and transport only in correctly marked, tightly closed, containers. Keep cool, out of sunlight and away from naked flames. Keep away from incompatibles such as oxidizing agents, and acids. Water contamination should be avoided.

Absorb any leak/spill with an inert material and put the spilled material in an appropriate waste disposal container. Dispose of unwanted or absorbed substance through an authorized contractor to a licensed site. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

5.3.4 Emergency Action

- Fire

  Extinguishing media: Use water fog, dry powder, foam or carbon dioxide. Water or foam may cause frothing. If a leak or spill has not ignited, use water fog to disperse the vapours. Do not use a water jet.

  Fire-fighters to use self contained breathing apparatus. Keep fire-exposed containers cool. Prevent large quantities from entering waterways, drains and drinking water supplies.

- Ingestion

  If patient is conscious and can swallow, give two glasses of water (500ml). Induce vomiting as directed by medical personnel.

- Inhalation (of vapour)

  If irritation, headache, nausea or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult, or symptoms persist.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Flush eyes with plenty of water for several minutes. Get medical attention if eye irritation persists.

- Skin

  Wash thoroughly with soap and water for several minutes. Get medical attention if skin irritation develops or persists.

- Spillage

  Contain spill if possible, and dispose of as directed under Storage/Transport (Section 5.3.3).

5.4 Antifreeze (Valvoline – MPG Coolant 67/33)

This antifreeze is also known as a propylene glycol based coolant. It is a colourless liquid with a slight characteristic odour, easily soluble in cold water. It contains 2-propane diol, ethylhexanoic acid (sodium salt), and aliphatic acid. 2-propane diol, and ethylhexanoic acid are considered to be potentially hazardous constituents.

It has a boiling point greater than 120°C (248°F) and a flash point Closed Cup greater than 115°C (239°F).

It is used as an engine coolant, suitable for open and closed cooling systems, and can be found in the engine cooling systems. Installers, operators and maintainers are likely to encounter this substance.

5.4.1 Hazardous Reactions

This product is considered stable but must be kept away from strong oxidizing agents, acids and sources of ignition. Carbon oxides (CO, CO2) and water, and some metallic oxides are products of decomposition.

Prolonged contact, as with clothing wetted with the substance, may cause more severe irritation and discomfort, seen as local redness and swelling.

If more than several mouthfuls are swallowed, abdominal discomfort, nausea and diarrhoea may occur.

Contains material which may cause birth defects based on animal data.

5.4.2 Protective Measures

Refrain from eating, drinking or smoking when using this product. Adopt a high standard of personal hygiene. In the case of skin contact, wash with soap and water. Cold water may be used.

Ensure good ventilation and avoid heat sources.

Wear appropriate respirator when ventilation is inadequate. Use a lab coat, impervious gloves and eye protection. Avoid contamination inside the gloves and if clothes become contaminated, discontinue use and clean thoroughly.

5.4.3 Storage / Transport

Store and transport only in correctly marked, tightly closed, containers. Keep cool, out of sunlight and away from sources of ignition. Keep away from incompatibles such as oxidizing agents, and acids. Water contamination should be avoided.

Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Dispose of unwanted or absorbed substance through an authorized contractor to a licensed site. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

5.4.4 Emergency Action

- Fire

  Extinguishing media:
  Small Fire - Use dry chemical powder, or CO2.
  Large Fire – Use water spray, fog or foam. Do not use a water jet.

  Fire-fighters to use self contained breathing apparatus and full turnout gear. Keep fire-exposed containers cool. Prevent large quantities from entering waterways, drains and drinking water supplies.

- Ingestion

  Do not induce vomiting unless directed to do so by medical personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

- Inhalation (of vapour)

  If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Obtain medical attention.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Flush eyes with plenty of water for minimum of fifteen minutes. Cold water may be used. Obtain medical attention.

- Skin

  Wash thoroughly with soap and water for several minutes. Get medical attention if skin irritation develops. Cold water may be used.

- Spillage

  Contain spill if possible, and dispose of as directed under Storage/Transport (Section 5.4.3).

5.5 Coolant Treatment – Water Filter

Fleetguard DCA-4/powder/paste/pellet is also known as a coolant additive, or engine coolant treatment. It is a white solid (powder or pellet) or blue paste inside a filter container, having a mild chemical odour, and soluble in water. It contains dipotassium phosphate, potassium nitrate, sodium molybdate, sodium nitrite, mercaptobenzo thiazole, sodium silicate. Potentially hazardous constituents are alkaline salts, nitrates, nitrites, etc.

For industrial use only it is used as an engine coolant additive and as such it is used in engine cooling systems, heat exchangers, and radiators. Installers, operators and maintainers are likely to encounter these substances.

5.5.1 Hazardous Reactions

Incompatible with strong acids and oxidising materials. In contact with strong acids may form nitrous oxide gas.

Contact of sodium nitrate with combustible materials and organic matter may cause fire. Sodium nitrite intensifies fires of other materials. When heated to decomposition, No_x and K_2O emitted.

Dust may irritate nasal passages. Prolonged or repeated contact with the skin will cause irritation. Will irritate eyes on contact. Harmful if swallowed.

5.5.2 Protective Measures

Adopt a high standard of personal hygiene. In case of skin contact wash immediately with soap and water.

Ensure good ventilation and avoid heat sources.

Use eye protection, dust mask, PVC gloves, overalls and plastic aprons. Avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly. Use a respirator to avoid inhalation of dust.

5.5.3 Storage / Transport

Store and transport only in correctly marked containers. Keep cool, out of sunlight and away from naked flames. Keep product dry and container closed when not in use. Store well away from food-stuffs and drinking water. Take special care to avoid discharge into drains, sewers and water-courses.

Sweep up and return to container for use if not contaminated. Prevent entry of substance into drainage/sewerage system, water-courses and land. Dispose of unwanted substance through a licensed chemical disposal service.

5.5.4 Emergency Action

- Fire

  Extinguishing media: CO_2, dry powder, water.

  Fire-fighters to use self contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterways, drains and drinking water supplies.

- Ingestion

  Toxic by ingestion. Seek medical advice immediately.

- Inhalation (of vapour)

  Remove from further exposure. In case of irritation to lungs or throat, seek medical advice.

- Eyes

  Flush copiously with water for at least fifteen minutes. Seek medical advice immediately.

- Skin

  Wash immediately with soap and water. Seek medical advice if irritation develops or persists. Change clothing if necessary and wash before re-use.

- Spillage

  Sweep up and return to container if not contaminated. Discard contaminated product as directed under Storage/Transport (Section 5.5.3).

5.6 Coolant Treatment - Liquid Additive

Fleetguard DCA-4 Liquid is also known as a coolant additive, or liquid cooling conditioner. It is a pale blue liquid with a mild chemical odour. It contains potassium phosphate, potassium nitrate, sodium molybdate, sodium nitrite, adipic acid. The potentially hazardous constituents being alkaline salts, nitrates, nitrites, etc.

This substance has a boiling point of 100°C; vapour pressure of 760mm Hg at 100°C, and is soluble in water.

It is used as an engine coolant additive, and can be found in engine cooling systems, heat exchangers, and radiators. Installers, operators and maintainers are likely to encounter this product.

5.6.1 Hazardous Reactions

Sodium nitrite/potassium nitrate are strong oxidisers. Avoid organic matter (including wood), cyanides, strong acids, salts and urea. This product may ignite with heat or friction. When heated to decomposition, No_x, K_2O, sodium monoxide, carbon monoxide and carbon dioxide are emitted.

Contact will cause irritation to both skin and eyes. Inhalation may cause nasal passage and upper respiratory tract irritation. Ingestion can cause severe vomiting, shock and death. Ingestion of sodium nitrite can result in motor activity changes, coma, and decreased blood pressure.

5.6.2 Protective Measures

Adopt a high standard of personal hygiene. In case of skin contact irrigate with copious quantities of clean water.

Ensure good ventilation and avoid heat sources. Avoid breathing mist. Observance of good housekeeping rules will ensure general safety.

Use eye protection goggles, PVC gloves, overalls, impervious apron. Avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly. No special respiratory precautions are necessary in normal use.

5.6.3 Storage / Transport

Store and transport only in correctly marked containers. Keep cool (but do not freeze), out of sunlight and away from naked flames and strong acids. Keep product container closed when not in use. Store well away from food-stuffs and drinking water. Take special care to avoid discharge into drains, sewers and water-courses.

Prevent entry of liquid into drainage/sewerage system, water-courses and land. Use industrial absorbent and place in suitable container. Dispose of unwanted liquid through an authorised contractor to a licensed chemical disposal service.

5.6.4 Emergency Action

- Fire

  Extinguishing media: Water, carbon dioxide, dry powder.

  Fire fighters should wear self-contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterways, drains and drinking water supplies.

- Ingestion

  Toxic by ingestion. Ingestion can cause severe vomiting, shock and death. Ingestion of sodium nitrite can result in motor activity changes, coma, and decreased blood pressure.

  Seek medical advice immediately.

- Inhalation (of vapour)

  Remove to fresh air. If symptoms persist seek medical advice.

- Eyes

  Flush copiously with water for at least fifteen minutes. Seek medical advice immediately.

- Skin

  Wash immediately with soap and water. If irritation develops or persists seek medical advice. Change clothing if necessary and wash before re-use.

- Spillage

  Contain leak/spill and prevent entry of liquid into drainage/sewerage system, water-courses and land. Use industrial absorbent and dispose of as directed under Storage/Transport (Section 5.6.3).

5.7 Gas Oil

This product is also known as Red Diesel, Fuel Oil, and type A1 or A2. It can be pale red or a clear liquid with a characteristic mild odour. It contains catalytically cracked oil, petroleum distillates, quinizarin, and gas oil marker dye red. The catalytically cracked oil and petroleum distillates are potentially hazardous constituents.

The substance has an initial boiling point of 180°C, a flash point greater than 56°C, and a vapour pressure less than 0.7mm Hg at 20°C and has negligible solubility in water.

It is used as a fuel for off-road diesel powered vehicles and stationary engines, and can be found in fuel tanks, pipes and injection systems. The substance should not be used for any other purpose without contacting the manufacturer or supplier. Installers, operators and maintainers are likely to encounter this substance.

5.7.1 Hazardous Reactions

This liquid is flammable. Avoid smoking, heat sources, such as welding and naked flames, sparks and static electricity build-up. Thermal decomposition products are hazardous, containing CO_x, NO_x and SO_x compounds.

The vapour is explosive. High vapour concentrations can cause respiratory irritation, dizziness, nausea, and loss of consciousness. Excessive and prolonged exposure to the mist can cause chronic inflammatory reaction of the lungs and a form of pulmonary fibrosis.

Avoid strong oxidising agents, e.g. chlorates which may be use in agriculture.

Gas oil is slightly irritating to the skin and has a de-fatting action. Toxicity following single exposure to high level of gas oil is of low order. Prolonged, repeated skin contact may de-fat the skin resulting in possible skin irritation and dermatitis. In some cases warty, cancerous growths have occurred.

5.7.2 Protective Measures

Ensure good ventilation and avoid heat sources. Observance of good housekeeping rules will ensure general safety. Do not smoke. Avoid breathing mist.

When working on, or testing, injection equipment, special care is required to avoid perforation of skin by high pressure fuel. Use eye protection in the event of a suspected high pressure leak.

Adopt a high standard of personal hygiene. In the case of skin contact, wash well with soap and water.

Use gloves and overalls, and eye protection goggles if there is risk of splashing. Use oil impervious gloves and avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly. Contaminated clothing should be removed, soaked with water, and laundered before re-use.

No special respiratory precautions are necessary in normal use.

DO NOT use as a solvent for removing dirt/grease etc, from skin.

5.7.3 Storage / Transport

Store and transport only in correctly marked containers. Keep containers closed when not in use. Keep cool, out of sunlight and away from naked flames. Electrical continuity is required between the transport and storage vessels during product transfer.

Contain leak/spill with sand, earth or other suitable material, and prevent entry of substance into drainage/sewerage system, water-courses and land. Dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

Inform local and fire authorities should the product reach waterways, drains etc.

5.7.4 Emergency Action

- Fire

  Extinguishing media:

  Large fire – Foam/water fog. Never use water jet.
  Small fire - foam/dry powder, AAAF, CO_2, sand, earth.

  Avoid making sparks. Fire fighters to use self-contained breathing apparatus. Keep fire exposed containers cool, using water fog/spray. Prevent run-off from entering waterway, drains and drinking water supplies.

- Ingestion

  Do not induce vomiting. Wash the mouth out with water, and send to hospital immediately.

- Inhalation (of vapour)

  Remove from further exposure. Obtain medical assistance immediately.

- Aspiration (inhalation of liquid)

  If, following ingestion of gas oil, vomiting occurs, there is danger of aspiration into the lungs. This would cause intense local irritation and chemical pneumonitis that can be fatal. Obtain immediate medical assistance.

- Eyes

  Irrigate copiously with water or preferably eye-wash solution for at least five minutes. If irritation persists seek medical advice.

- Skin

  Wash thoroughly with soap and water. Change clothing if necessary.

  If high pressure injection has occurred prompt surgical attention is required.

- Spillage

  Absorb using sand, earth or other suitable material. Dispose of unwanted or absorbed flammable material as directed under Storage/Transport (Section 5.7.3).

5.8 Grease – Chevron SRI No. 2

This is formulated with ISOSYN® base stocks, a synthetic polyurea ashless organic thickener, and high performance rust and oxidation inhibitors. Its texture is smooth and buttery and its colour is dark green. All the components of this material are in compliance with the EU Seventh Amendment Directive 92/32/EEC.

The substance has a boiling point >371.1°C (700°F) and is insoluble in water but soluble in hydrocarbons. The substance has a flash point (Cleveland Open Cup) 260°C (500°F) (Min).

It is a high temperature ball and roller bearing grease and is used in generators, alternators, starters, air-conditioning units and unsealed electric motor bearings operating under moist conditions. Installers, operators and maintainers are likely to encounter this product.

5.8.1 Hazardous Reactions

This product is considered to be stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. May react with strong oxidizing agents such as chlorates, nitrates, peroxides etc. There are no known results of decomposition and none are expected.

This material will burn although it is not easily ignited. Dependent on combustion conditions a complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved. Combustion may form oxides of Nitrogen, Zinc, and Magnesium.

Note: Do not use pressure to empty drum or explosion may result.

Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have a potential of generating an accumulation of electrostatic charge.

5.8.2 Protective Measures

Ensure good ventilation and avoid heat sources. Prevent small spills and leakages to avoid the hazard of slipping.

Adopt a high standard of personal hygiene. In the case of skin contact, apply a waterless hand cleaner, mineral oil or petroleum jelly then wash thoroughly with soap and water.

No special respiratory precautions are necessary in normal use and with adequate ventilation. If prolonged or repeated skin contact is likely, oil impervious gloves MUST be worn, and eye protection should be used.

High pressure injection under the skin may occur due to the rupture of pressurised lines.

5.8.3 Storage/Transport

Store and transport only in correctly marked containers. Keep containers closed when not in use. Store away from heat, sparks, flame or strong oxidants and combustible materials.

Contain leak/spill and prevent entry of substance into drainage/sewerage system, water-courses and land. Dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

5.8.4 Emergency Action

- Fire

  Extinguishing media: CO_2, foam, dry powder, and water fog.

  In enclosed areas fire-fighters MUST use self-contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterway, drains and drinking water supplies.

- Unusual Fire/Explosion Hazard

  Do not use pressure to empty drum or explosion may result.

- Ingestion

  If swallowed, give water or milk to drink. Do not induce vomiting. Seek medical advice.

- Inhalation (of vapour)

  Remove from further exposure. If respiratory discomfort or coughing occurs, seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Irrigate copiously with water or preferably eye-wash solution for at least fifteen minutes. If irritation persists seek medical advice.

- Skin

  To remove the material from skin, apply a waterless hand cleaner, mineral oil or petroleum jelly then wash thoroughly with soap and water. Remove and clean oil soaked clothing daily and wash affected area.

  In an accident involving high-pressure equipment, this product may be injected under the skin. Such an accident may result in a small, sometimes bloodless, puncture wound. However, because of its driving force, material injected into a fingertip can be deposited into the palm of the hand. Within 24 hours there is usually a great deal of swelling, discolouration, and intense throbbing pain. Immediate treatment at a surgical emergency centre is recommended.

- Spillage

  Eliminate all sources of ignition in vicinity of spilled material. Contain spilled liquid with sand or other suitable absorbent. Dispose of used material as directed under Storage/Transport (Section 5.8.3).

5.9 Grease – Exxon Polyrex® EM

This polyurea grease is formulated with Base oil and additives including Amines, C12-14-ALKYL, 1-5 ISOOCTYL Phosphates. It is blue coloured grease with a mild odour.

The substance has a boiling point of 330°C (626°F) and a flash point of 204°C (400°F) (Estimated for oil, ASTM D-92 [COC]). It is insoluble in water.

It is high temperature ball and roller bearing grease and is used for long-life and corrosion resistance, even in salt water. Installers, operators and maintainers are likely to encounter this product.

5.9.1 Hazardous Reactions

Under normal conditions of use, this product is not considered hazardous. This product is considered to be stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Keep containers closed when not in use. Store away from heat, strong oxidizing agents and combustible material. Product does not decompose at ambient temperatures, however carbon monoxide, sulphur oxides, aldehydes and other decomposition products may be found in the case of incomplete combustion.

Note: *Empty containers retain residue and may explode causing injury or death. Do not pressurise, or expose to any source of ignition.*

5.9.2 Protective Measures

Ensure good ventilation and avoid heat sources. Prevent small spills and leakages to avoid the hazard of slipping.

Adopt a high standard of personal hygiene. In the case of skin contact, wash thoroughly with soap and water.

No special respiratory precautions are necessary in normal use and with adequate ventilation. If prolonged or repeated skin contact is likely, oil impervious gloves MUST be worn, and eye protection should be used.

High pressure injection under the skin may occur due to the rupture of pressurised lines.

5.9.3 Storage/Transport

Store and transport only in correctly marked containers. Keep containers closed when not in use. Store away from heat, sparks, flame or strong oxidants and combustible materials.

Contain leak/spill and prevent entry of substance into drainage/sewerage system, water-courses and land. Dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

Do not attempt to refill or clean container. Empty drums should be completely drained, properly closed/sealed and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with all applicable regulations.

5.9.4 Emergency Action

- Fire

  Extinguishing media: CO_2, foam, dry powder, and water fog. Water or foam may cause frothing.

  In enclosed areas fire-fighters MUST use self-contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterway, drains and drinking water supplies.

- Unusual Fire/Explosion Hazard

  Do not use pressure to empty drum or an explosion may result.

- Ingestion

  Do not induce vomiting. Seek medical advice.

- Inhalation (of vapour)

  Remove from further exposure. If respiratory discomfort or coughing occurs, seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Irrigate copiously with water. If irritation persists seek medical advice.

- Skin

  To remove the material from skin, wash thoroughly with soap and water. Remove and clean oil soaked clothing daily and wash affected area.

  In an accident involving high-pressure equipment, this product may be injected under the skin. Regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of the injury.

- Spillage

  Eliminate all sources of ignition in vicinity of spilled material. Contain spilled liquid with sand or other suitable absorbent. Dispose of used material as directed under Storage/Transport (Section 5.9.3).

5.10 Grease – Klüber Asonic GHY72

This is Ester oil based grease with polyurea thickener. It is a beige coloured paste having a characteristic odour.

Using the DIN ISO 2176 (BASE OIL) flàsh method, the substance has a flash point >200°C (392°F).

It is used to lubricate bearings where good resistance to water washout and corrosion are required. Installers, operators and maintainers are likely to encounter this product.

5.10.1 Hazardous Reactions

This product is considered to be stable. However it is incompatible with strong oxidizing agents. In case of fire, carbon monoxide and hydrocarbons can be released.

Prolonged skin contact may cause skin irritation and/or dermatitis.

5.10.2 Protective Measures

Ensure good ventilation and avoid heat sources. Prevent small spills and leakages to avoid the hazard of slipping.

Adopt a high standard of personal hygiene. In the case of skin contact, clean skin thoroughly with soap and water, and apply skin cream.

No special respiratory precautions are necessary in normal use and with adequate ventilation. If prolonged or repeated skin contact is likely, oil impervious gloves MUST be worn, and eye protection should be used.

High pressure injection under the skin may occur due to the rupture of pressurised lines.

5.10.3 Storage/Transport

Store and transport only in correctly marked containers. Keep containers closed when not in use. Store away from heat, sparks, flame or strong oxidants and combustible materials.

Contain leak/spill and prevent entry of substance into drainage/sewerage system, water-courses and land.

The code of waste has to correspond to the Council Directive 75/442/EEC and be specific as far as the related sector and process are concerned. Can be incinerated when in compliance with local, state and federal regulations.

Dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

Offer rinsed packaging material to local recycling facilities.

5.10.4 Emergency Action

- Fire

  Extinguishing media: CO_2, foam, dry powder, and water fog. High volume water jet is unsuitable as an extinguishing medium.

  In enclosed areas fire-fighters MUST use self-contained breathing apparatus. In case of fire carbon monoxide and hydrocarbons can be released.

  Keep fire exposed containers cool. Prevent run-off from entering waterway, drains and drinking water supplies.

- Ingestion

  Do not induce vomiting. Seek medical advice.

- Inhalation (of vapour)

  Remove from further exposure. If respiratory discomfort or coughing occurs, seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Irrigate copiously with water or preferably eye-wash solution for at least fifteen minutes. If irritation persists seek medical advice.

- Skin

  To remove the material from skin wash thoroughly with soap and water, apply skin cream. Remove and clean oil soaked clothing daily and wash affected area.

- Spillage

  Eliminate all sources of ignition in vicinity of spilled material. Contain spilled liquid with sand or other suitable absorbent. Dispose of used material as directed under Storage/Transport (Section 5.10.3).

5.11 Grease – Mobilgrease XTC

This grease is also known as NLGI No. 1 lithium soap-based product. It is highly viscous, dark brown in colour, and with a mild odour. It contains bitumen or vacuum residue, zinc alkyl and long-chain alkyl dithiophosphates. Based on available information this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the MSDS are followed.

The substance has a boiling point greater than 316°C and has negligible solubility in water. The substance has a flash point greater than 204°C and a vapour pressure of less than 0.1mm Hg at 20°C.

It is for industrial use only and is used in high speed flexible gearing and couplings in industrial situations for high speed and high temperature coupling applications. The use of hand-operated grease guns at low ambient temperatures, without auxiliary heat, is discouraged. Installers, operators and maintainers are likely to encounter this substance.

5.11.1 Hazardous Reactions

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines, although excessive exposure may result in eye, skin or respiratory irritation.

5.11.2 Protective Measures

Ensure good ventilation and avoid heat sources. Prevent small spills and leakages to avoid the hazard of slipping.

Adopt a high standard of personal hygiene. In the case of skin contact, wash with soap and water.

No special respiratory precautions are necessary in normal use and with adequate ventilation. If prolonged or repeated skin contact is likely, oil impervious gloves MUST be worn, and eye protection should be used.

High pressure injection under the skin may occur due to the rupture of pressurised lines.

5.11.3 Storage/Transport

Store and transport only in correctly marked containers. Keep containers closed when not in use. Store away from heat, sparks, flame or strong oxidants and combustible materials.

Contain leak/spill and prevent entry of substance into drainage/sewerage system, water-courses and land. Dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

5.11.4 Emergency Action

- Fire

  Extinguishing media: CO_2, foam, dry powder, and water fog.

  In enclosed areas fire-fighters MUST use self-contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterway, drains and drinking water supplies.

- Ingestion

  Do not induce vomiting. Seek medical advice if discomfort occurs.

- Inhalation (of vapour)

  Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Irrigate copiously with water or preferably eye-wash solution for at least five minutes. If irritation persists seek medical advice.

- Skin

  Wash thoroughly with soap and water. Remove and clean oil soaked clothing daily and wash affected area.

- Spillage

  Contain spilled liquid with sand or other suitable absorbent. Dispose of used material as directed under Storage/Transport (Section 5.11.3).

5.12 Grease –Val-Lith EP 2

This is a lithium based grease having a liquid (paste) consistency, is light brown in colour, and has a slight characteristic sulphurous odour. The preparation is not classified as dangerous according to Directive 1999/45/EC and its amendments. This product is not classified according to the EU regulations.

The substance has a boiling point of 371°C and is insoluble in water. The substance has a flash point - closed cup greater than 221°C.

It is used in automotive and industrial equipment for the lubrication of bearings and shaft joints to reduce ingress of moisture over a wide temperature range. Installers, operators and maintainers are likely to encounter this product.

5.12.1 Hazardous Reactions

The product is considered to be stable. However do not expose containers to heat or sources of ignition. It is reactive with oxidising agents. Results of decomposition are carbon oxides (CO, CO_2), water, and some metallic oxides.

Repeated or prolonged exposure is not known to aggravate medical conditions.

5.12.2 Protective Measures

Ensure good ventilation and avoid heat sources. Prevent small spills and leakages to avoid the hazard of slipping.

Adopt a high standard of personal hygiene. In the case of skin contact, wash with soap and water.

No special respiratory precautions are necessary in normal use and with adequate ventilation. Wear a lab coat and wash hands after handling.

5.12.3 Storage/Transport

Store and transport only in correctly marked containers. Keep containers tightly sealed when not in use. Store in a well ventilated area, away from heat, and combustible materials.

Wear boots and gloves and use a tool to scoop up solid or absorbed material. Dispose of unwanted or absorbed substance through an authorised contractor to a licensed site.

5.12.4 Emergency Action

- Fire

  Extinguishing media:
  Small fires - CO_2, dry chemical powder.
  Larger fires - water spray, fog or foam. For safety reasons do not use a full water jet.

  Fire-fighters should wear self-contained breathing apparatus, and full turnout gear. Keep fire exposed containers cool.

- Ingestion

  Do not induce vomiting. Seek medical advice if discomfort occurs.

- Inhalation (of vapour)

  Remove from further exposure. Seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Irrigate copiously with water or preferably eye-wash solution for at least fifteen minutes. If irritation persists seek medical advice.

- Skin

  Wash thoroughly with soap and water. Remove oil soaked clothing daily and wash before reuse. Clean shoes thoroughly before reuse. Obtain medical attention.

- Spillage

  Use a tool to scoop up solid or absorbed material and dispose of used material as directed under Storage/Transport (Section 5.12.3).

5.13 Lubrication Oil – Premium Blue E 15W40

Also known as oil, lube oil, sump oil, new oil is a dark, viscous liquid with a slight, characteristic odour. The base oil contains; distillates (petroleum), solvent-dewaxed heavy paraffinic. It is not classified as dangerous according to Directive 1999/45/EC and its amendments, and is not classified according to the EU regulations.

It has a boiling point greater than 150°C, a flash point Open Cup of 220°C (Cleveland), and is insoluble in cold water.

It is used in engine lubrication oil systems, sump pan and filters, make-up tanks and piping systems as a lubrication oil for use in wide range of diesel engines operating under severe conditions. Installers, operators and maintainers are likely to encounter this product.

5.13.1 Hazardous Reactions

This product is stable although slightly re-active with oxidising agents. Results of decomposition are carbon oxides (CO, CO_2) and water.

Although harmful if swallowed or aspirated (breathed in), repeated or prolonged exposure is not known to aggravate medical conditions.

Used oil may contain harmful combustion by-products and unburnt fuel that will cause skin reactions as detailed for fuel. Particular care must be taken if oil from a severely overheated engine is handled - use impervious gloves, lab coat and safety glasses.

Do not breathe vapour/spray.

5.13.2 Protective Measures

Ensure good ventilation and avoid heat sources.

Adopt a high standard of personal hygiene. In case of skin contact, wash thoroughly with soap and water.

Use safety glasses, impervious gloves and lab coat. Avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly.

No special respiratory precautions are necessary in normal use. Do not breathe vapour/spray when handling hot materials.

5.13.3 Storage / Transport

Store and transport only in correctly marked containers. Keep containers tightly sealed when not in use. Keep in a cool, well ventilated area, out of sunlight and away from naked flames. Store well away from food-stuffs and drinking water.

Wear splash goggles, full suit, boots and gloves. Absorb leak/spill with an inert material and dispose of unwanted or absorbed substance through an authorised contractor to a licensed site. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

5.13.4 Emergency Action

- Fire

  Extinguishing media:
  Large fire – Use water spray, fog or foam. Do not use water jet.
  Small fire – Use dry chemical powder or CO_2.

  Fire-fighters to use self contained breathing apparatus and full turnout gear. Keep fire exposed containers cool.

- Ingestion

  Do not induce vomiting. Obtain medical advice immediately.

- Inhalation (of vapour)

  Remove from further exposure. Obtain medical attention.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Flush copiously with water or preferably eye-wash solution for at least fifteen minutes. Obtain medical advice.

- Skin

  Wash thoroughly with soap and water. Obtain medical advice if irritation develops. Change clothing if necessary and wash before re-use.

- Spillage

  Absorb with an inert material and dispose of this as directed under Storage/Transport (Section 5.13.3).

5.14 Sulphuric Acid Battery Quality 1140 – 1400 SG (15-50%)

Also known as battery acid, battery electrolyte, electrolyte, this is a colourless to dark brown liquid, with a characteristic acrid, acidic odour. It is readily soluble in water forming a dilute, corrosive solution. Sulphuric acid battery quality 1140 – 1400sg (15-50%) contains aqueous solutions of sulphuric acid including all grades between 1140(10%) – 1400(50%). Sulphuric acid is a potentially hazardous product.

It has a boiling point between 104°C – 124°C, and a vapour pressure of 6.2mm Hg at 20°C.

In solution it is used as an electrolyte for lead acid batteries. These batteries are used in the starting and control systems on generating sets. Installers, operators and maintainers are likely to encounter this product.

5.14.1 Hazardous Reactions

The product is considered to be stable. However it may give rise to hazardous fumes in a fire. Violent reaction with water generates heat and may cause an explosion. Attacks many metals liberating hydrogen gas. Combustion will generate oxides of sulphur.

Avoid contact with body tissue. Causes destruction of body tissue, severe burns.

Inhalation of the spray mist may produce severe irritation of the respiratory tract. May be fatal if swallowed, causing burns to mouth, throat and stomach. Corrosive to eyes. Repeated or prolonged exposure to spray mist may produce chronic eye irritation, severe skin irritation, and respiratory irritation leading to frequent attacks of bronchial infection.

5.14.2 Protective Measures

Ensure good ventilation and avoid heat sources. Fumes must be positively removed from confined spaces by fume extraction.

Adopt a high standard of personal hygiene. Use total eye protection goggles, acid-resistant gloves (e.g. PVC), overalls, acid resistant apron and rubber boots. Note that handling contaminated clothing may result in acid burns.

No special respiratory precautions are necessary in normal use, however respiratory protection should be used if there is a risk of uncontrolled exposure to vapour. Avoid contact with acid mist if large quantities of batteries are being charged or if working close to charging batteries.

5.14.3 Storage / Transport

Store and transport only in correctly marked containers and keep tightly sealed when not in use. Stock tanks should be bunded separately, away from organic substances such as wood, paper, straw, and other reactive chemicals. Prevent water or steam from entering container at all times. Suitable storage materials are PTFE, and glass. Store in rubber-lined tanks for acid concentrations less than 70%. Do not store in metal drums, nylon, or plasticised PVC.

Keep cool, out of sunlight and away from naked flames. Store well away from food-stuffs and drinking water. Take special care to avoid discharge into drains, sewers and water-courses.

In case of spillage, contain using earth, sand or other inert material and transfer to suitable containers. Arrange disposal in accordance with local regulations. Advise the Emergency Services if the substance has entered a watercourse or sewer, or has contaminated soil or vegetation.

5.14.4 Emergency Action

- Fire

  Keep containers and surroundings cool with water spray. Water must not enter tanks or containers. Select extinguishing media appropriate to other materials involved.

  It may give rise to hazardous fumes in a fire. Violent reaction with water generates heat and may cause an explosion. Prevent run-off from entering waterways, drains and drinking water supplies.

  Fire-fighters to wear full protective clothing and use self contained breathing apparatus.

- Ingestion

  Do not induce vomiting. Wash out mouth with water. Give sips of cold water or milk to soothe the affected parts. Ingested acid must be diluted by approximately x 100, to render harmless to tissues. Obtain medical advice immediately.

- Inhalation (of vapour)

  Remove from further exposure. If breathing stops or shows signs of failing, give artificial respiration. Do not use mouth to mouth ventilation. If there is difficulty in breathing, give oxygen. Keep warm and at rest. Obtain medical attention urgently.

- Aspiration (inhalation of liquid)

  Obtain immediate medical assistance.

- Eyes

  Irrigate copiously with water or preferably eye-wash solution for at least fifteen minutes. Seek medical advice.

- Skin contact

  Flush area with copious quantities of water, preferably under a shower. Remove contaminated clothing, which should be washed or dry-cleaned before re-use.

  Obtain medical attention if blistering or redness persists.

- Spillage

  Wear appropriate protective clothing. Ventilate the area to dispel possible toxic, decomposition fumes. Contain and absorb using earth, sand or other inert material. Transfer to suitable container for disposal in accordance with local regulations as directed under Storage/Transport (Section 5.14.3).

5.14.5 Special Note: Identification of Usage

WARNING: CARE MUST BE TAKEN TO IDENTIFY THAT THE SULPHURIC ACID 'BATTERY ELECTROLYTE' OR 'ELECTROLYTE' IS THE CORRECT SUBSTANCE FOR USE IN A BATTERY. A VIOLENT CHEMICAL REACTION WILL OCCUR IF SULPHURIC ACID IS ACCIDENTALLY MIXED WITH ALKALINE BATTERY ELECTROLYTE.

5.14.6 Special Note: Concentrated Sulphuric Acid

WARNING: DO NOT ADD WATER TO ACID - A VIOLENT REACTION WILL OCCUR.

In some cases, sulphuric acid may be purchased in concentrated form. This is a clear viscous liquid. Do not attempt to add this type of acid to batteries. Dilution should only be attempted by experienced personnel. If spillage of concentrated acid occurs contact emergency services immediately and quote hazard code 1830.

5.14.7 Special Note: Lead Acid Batteries

Lead acid batteries contain significant quantities of metallic lead, which is harmful. Provided that the battery is not dismantled in any way, there is no risk of heavy metal poisoning from batteries. Use gloves when connecting and adopt a high standard of personal hygiene. Batteries can be recycled, and used batteries should be disposed of in accordance with local authority environmental health regulations.

5.15 Potassium Hydroxide – Solid

This is also known as caustic potash – solid. It is white, odourless, and may be granules, flakes, pellets, powder, lumps, solid blocks or sticks. Potassium hydroxide is potentially a hazardous product.

When added to distilled water it is used as battery electrolyte (NiCad batteries only). These batteries are used in the starting and control systems of generating sets. Installers, operators and maintainers are likely to encounter this product.

5.15.1 Hazardous Reactions

Highly corrosive, this product reacts with water to produce a caustic solution and heat. (N.B. sufficient heat can be generated with moisture to ignite combustible materials).

Reacts violently with acids. Attacks aluminium, lead, tin, zinc and their alloys, releasing flammable hydrogen gas. Reacts with ammonium salts giving ammonia.

Non flammable and non combustible in bulk form but when in battery may be associated with explosive gases.

Note: *Heating will cause pressure rise with risk of bursting - keep drums cool.*

Avoid contact with body tissue. The highly corrosive nature of this product causes severe burns to eyes and skin.

5.15.2 Protective Measures

Ensure good ventilation and avoid heat sources.

Adopt a high standard of personal hygiene.

Use total eye protection goggles, plastic or rubber gloves (e.g. PVC), overalls, apron and rubber boots. Note that handling contaminated clothing may result in damage to the skin. It is advised to have an eyewash bottle with clean water in the vicinity.

No special respiratory precautions are necessary in normal use.

5.15.3 Storage / Transport

Store and transport only in correctly marked containers and keep tightly sealed when not in use. Keep cool, out of sunlight and away from naked flames. Store well away from food-stuffs and drinking water. Take special care to avoid discharge into drains, sewers and water-courses.

Wearing total personal protection, cover a spillage with earth or sand and transfer to another container. Arrange disposal in accordance with local regulations. If the substance has entered a water course or sewer, or has contaminated soil or vegetation, please advise the Emergency Services.

5.15.4 Emergency Action

- Fire

  Non-combustible. Keep drums cool to reduce risk of bursting.

- Ingestion

  Do not induce vomiting. Drink copious quantities of milk. In all cases obtain immediate medical attention.

- Inhalation (of vapour)

  Remove from further exposure. In cases of irritation to lungs or throat seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical attention.

- Eyes

  Irrigate copiously with water. In all cases obtain immediate medical attention.

- Skin

  Remove contaminated clothing and flush affected skin with copious quantities of water. Cover with dry gauze. Change clothing if necessary and wash before re-use.

- Spillage

  Wearing protective clothing, cover spillage with earth or sand. Transfer to another container in accordance with local regulations as directed under Storage/Transport (Section 5.15.3).

5.16 Potassium Hydroxide – Solution

Also known as NiCad battery electrolyte, or electrolyte, this is a clear colourless liquid, readily soluble in water forming a diluted corrosive solution and considered to be a potentially hazardous product. Non flammable and non combustible in bulk form but when in battery may be associated with explosive gases. These NiCad batteries are used in the starting and control systems of generating sets. Installers, operators and maintainers are likely to encounter this product.

5.16.1 Hazardous Reactions

Highly corrosive this product reacts violently with acids. Attacks aluminium, lead, tin, zinc and their alloys, releasing flammable hydrogen gas. Reacts with ammonium salts to produce ammonia. When in battery it may be associated with explosive gases.

Avoid contact with body tissue. The highly corrosive nature of this product causes severe burns to eyes and skin.

5.16.2 Protective Measures

Ensure good ventilation and avoid heat sources. The fumes given off when batteries are charging is an explosive mixture of hydrogen and oxygen. Fumes must be positively removed from confined spaces by fume extraction. Use insulated tools when fitting batteries or making connections. Avoid sparks or naked flames in vicinity of battery, especially when charging.

Adopt a high standard of personal hygiene.

Use total eye protection goggles, plastic or rubber gloves (e.g. PVC), overalls, apron and rubber boots. Note that handling contaminated clothing may result in damage to the skin.

No special respiratory precautions are necessary in normal use. Avoid contact with electrolyte mist if large quantities of batteries are being charged or if working close to charging batteries.

5.16.3 Storage / Transport

Store and transport only in correctly marked containers, and keep tightly sealed when not in use. Keep cool, out of sunlight and away from naked flames. Store well away from food-stuffs and drinking water. Take special care to avoid discharge into drains, sewers and water-courses.

Cover a spillage with earth or sand and transfer to another container. Arrange disposal in accordance with local regulations. If the substance has entered a water course or sewer, or has contaminated soil or vegetation, please advise the Emergency Services.

5.16.4 Emergency Action

- Fire

  Extinguishing media: CO_2, dry powder, or Halon. DO NOT use water or water based foam.

  Fire fighters to use self contained breathing apparatus. Keep fire exposed containers cool. Prevent run-off from entering waterways drains and drinking water supplies.

- Ingestion

  Do not induce vomiting. Drink copious quantities of milk. In all cases obtain immediate medical attention.

- Inhalation (of vapour)

  Remove from further exposure. In cases of irritation to lungs or throat seek medical advice.

- Aspiration (inhalation of liquid)

  Obtain immediate medical attention.

- Eyes

  Irrigate copiously with water. In all cases obtain immediate medical attention.

- Skin

  Remove contaminated clothing and flush affected skin with copious quantities of water. Cover with dry gauze. Change clothing if necessary and wash before re-use.

- Spillage

  Wearing protective clothing, cover spillage with earth or sand. Transfer to another container in accordance with local regulations as directed under Storage/Transport (Section 5.16.3).

5.16.5 Special Note: Identification of Usage

WARNING: CARE MUST BE TAKEN TO IDENTIFY THAT THE ALKALINE BATTERY ELECTROLYTE IS THE CORRECT SUBSTANCE FOR USE IN A BATTERY. A VIOLENT CHEMICAL REACTION WILL OCCUR IF ALKALINE BATTERY ELECTROLYTE IS ACCIDENTALLY MIXED WITH SULPHURIC ACID 'BATTERY ELECTROLYTE' OR 'ELECTROLYTE' IN A LEAD-ACID BATTERY.

5.16.6 Special Note: Disposal

The simple electrochemistry of a NiCad battery brings alkaline electrolyte into contact with nickel-cadmium plates. No structural degradation can occur.

Provided that the battery is not dismantled in any way, there is minimal risk to personnel provided the above precautions are met. Do not dispose of the battery in land fill, and do not incinerate. Batteries can be recycled and should be returned to the manufacturer for recycling at the end of there life.

5.17 Natural Gas

Also known as Methane, this gas is not visible. A strong smell may be detectable if the gas has been treated with a smell additive for leakage detection. Natural Gas is piped to the generator set and would be found in the gas pipeline, gas train or generator set carburetor system. It is soluble in water, alcohol, ether and most organic Solvents. Installers, operators and maintainers are likely to encounter this product.

5.17.1 Hazardous Reactions

Extremely flammable/explosive at **low** levels in Air Atmosphere (4% to 15% Gas in Air). Relatively low levels of gas leakage in confined areas can cause explosions and fires if a spark occurs to ignite it. Inhalation of large volumes of natural gas can cause asphyxiation and death.

Effects of over exposure include headaches, dizziness, drowsiness, nausea or vomiting. Gas under pressure can penetrate skin; high concentrations can damage eyesight or cause blindness.

5.17.2 Protective Measures

Ensure good ventilation and avoid heat sources. Ensure all pipelines, gas train and fittings are gas tight and free from leaks. If leakage occurs isolate the gas supply, do not operate any electrical equipment which may cause a spark or become a source of ignition. Fully ventilate the area, and evacuate the building. Contact suitably qualified personnel who are fully trained to handle natural gas emergencies

No special respiratory precautions are necessary in normal use.

In the event of a gas leakage, eye protection goggles, rubber gloves (e.g. PVC) and breathing apparatus may be required.

5.17.3 Storage / Transport

Gas pipeline – not applicable.

5.17.4 Emergency Action

- Fire

  Extinguishing media: CO_2, dry powder, or Halon, Sand, Waterspray Fog, Mist or Water Based Foam. In the event of fire, attempt to shut off the gas supply and immediately inform the local fire authority and gas supplier. Natural gas is extremely flammable and may re-ignite after fire is extinguished. Carbon Dioxide (CO_2) and Carbon Monoxide (CO) gas is released when burning.

- Ingestion

  Not expected to be a Health Risk via this route.

- Inhalation (of vapour)

  Remove from further exposure. Inhalation can cause headaches, dizziness, nausea or vomiting. High vapour concentrations can lead to general narcotic effect or unconciousness. High volumes of gas or vapour displaces oxygen content available for breathing and can cause asphyxiation and death.

- Aspiration (inhalation of liquid)

  Not applicable.

- Eyes

  Gas under pressure can penetrate skin; high concentrations can damage eyesight or cause blindness.

- Skin

  In the event of a gas leakage, eye protection goggles, rubber gloves (e.g. PVC) and breathing apparatus may be required.

- Spillage

  In the event of Gas leakage, isolate the gas supply, ventilate the area and inform the local supplier. Do **not** operate electrical switches, mobile phones, torches etc, or any other equipment that may cause a spark to ignite gas – these should be removed or rendered inoperable. In circumstances of excessive leakage, evacuate the building and call the emergency services and the local gas supplier.

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