MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

HAZARDOUS MATERIALS MANAGEMENT PLAN

AUGUST 2007

PREFACE

General Information

The Hazardous Materials Management Plan (HMMP) will be executed within the scope of normal operations. The Meadowbank Gold Project is in the design and engineering Phase, and as such, some specific information and procedures required for the operation of the mine site are at this time unconfirmed. Meadowbank Mining Corp., formerly known as Cumberland Resources Ltd., is committed to providing specific information prior to the operation of the mine site, and updating this HMMP accordingly.

MMC is also committed to producing an Environmental Management System (EMS) to systematically control, manage and update all environmental and health and safety requirements and procedures for the Project, including this HMMP. The EMS will provide a mechanism for continual improvement in environmental and health and safety performance.

Annual Review

The HMMP will be reviewed and updated at least annually. Completion of the annual review of the HMMP will be documented through signatures of the personnel responsible for reviewing, updating and approving the HMMP.

Record of Changes

A record will document all significant changes that have been incorporated in the HMMP subsequent to the latest annual review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Distribution List

MMC will maintain a distribution list for the HMMP providing information about all parties that receive the plan including mine personnel, departments, and outside agencies.

Plan Reviewed by:_____ Date:

Plan Approved by:_____ Date:

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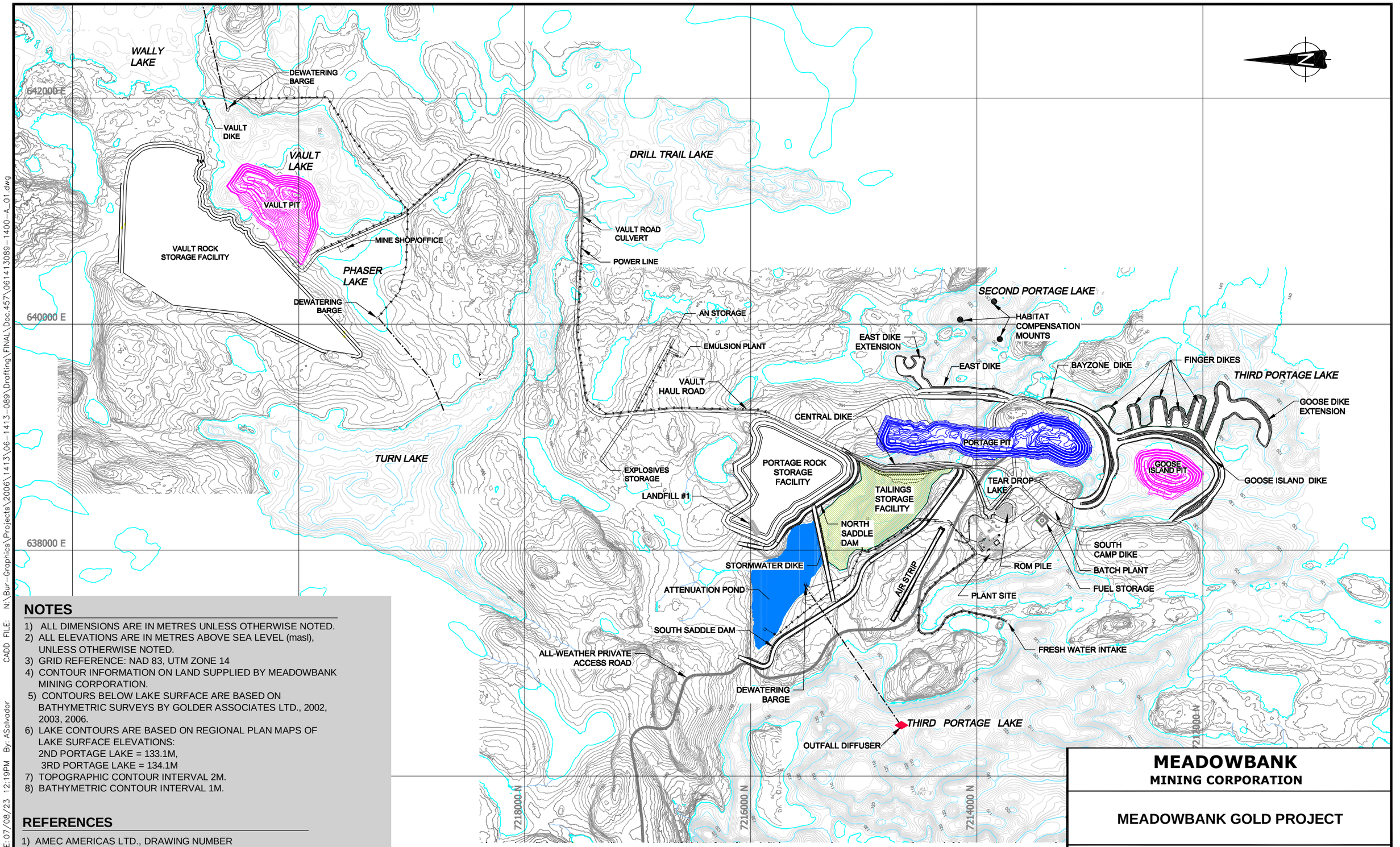
PROJECT LOCATION MAP



NOTES

1) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2) ALL ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (masl), UNLESS OTHERWISE NOTED.
3) GRID REFERENCE: NAD 83, UTM ZONE 14
4) CONTOUR INFORMATION ON LAND SUPPLIED BY MEADOWBANK MINING CORPORATION.
5) CONTOURS BELOW LAKE SURFACE ARE BASED ON BATHYMETRIC SURVEYS BY GOLDER ASSOCIATES LTD., 2002, 2003, 2006.
6) LAKE CONTOURS ARE BASED ON REGIONAL PLAN MAPS OF LAKE SURFACE ELEVATIONS:
   2ND PORTAGE LAKE = 133.1M,
   3RD PORTAGE LAKE = 134.1M
7) TOPOGRAPHIC CONTOUR INTERVAL 2M.
8) BATHYMETRIC CONTOUR INTERVAL 1M.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

NOT FOR CONSTRUCTION

MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

GENERAL SITE PLAN

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AMMONIUM NITRATE STORAGE AREA

TOWN ACCESS ROAD

EXPLOSIVES STORAGE AREA

GATE

DISPENSING STATION

FUEL TANKS WITHIN BERMED FUEL STORAGE AREA (BY OTHERS)

OFFICES

WORKSHOP

DISCHARGE TO BAKER LAKE

HIGH WATER MARK

WEST CONTACT WATER MONITORING STORAGE POND

DRY FREIGHT STORAGE AREA

FORESHORE FLATS

EAST CONTACT WATER MONITORING STORAGE POND

DISCHARGE TO BAKER LAKE

LAYDOWN ACCESS ROAD

PUSH TUG BARGE LANDING

7135000 N

7134500 N

647000 E

647500 E

0 40 80 120 160 200

Scale in Meters

LEGEND

- CONTACT WATER DIVERSION CHANNELS
- NON-CONTACT WATER DIVERSION CHANNELS
- CONTACT WATER CULVERTS
- NON-CONTACT WATER CULVERTS
- ROAD

NOTES

1. NORTHING AND EASTING ARE IN METRES REFERENCED TO UTM ZONE 14, NAD83.
2. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES REFERENCED TO GEODETIC DATUM UNLESS OTHERWISE NOTED.

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MEADOWBANK GOLD PROJECT

BAKER LAKE STORAGE AND MARSHALLING AREA

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SECTION 1 • INTRODUCTION

1.1 PURPOSE & SCOPE OF THE PLAN

The purpose of this plan is to provide a consolidated source of information on the safe and environmentally sound transportation, storage, and handling of the major hazardous products to be used at the Meadowbank Gold Project. A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a hazard to human health or the environment when it is improperly handled, used, stored, disposed of, or otherwise managed. In combination with Meadowbank Mining Corp.'s Emergency Response Plan (ERP) and Spill Contingency Plan (SCP), this Hazardous Materials Management Plan (HMMP) provides instruction on the prevention, detection, containment, response, and mitigation of accidents that could result from handling hazardous materials.

This HMMP will form a component of the Environmental Management System (EMS) for the Project. As such, it is a working document that will be reviewed and updated on a regular basis as mine development, construction and operations proceed.

The plan is based on the following principles of best practice management for hazardous materials:

- identify and prepare materials and waste inventories
- characterize potential environmental hazards posed by those materials
- allocate clear responsibility for managing hazardous materials
- describe methods for transport, storage, handling, and use
- identify means of long-term storage and disposal
- prepare contingency and emergency response plans
- ensure training for management, workers, and contractors whose responsibilities include handling hazardous materials
- maintain and review records of hazardous material consumption and incidents in order to anticipate and avoid impacts on personal health and the environment.

Meadowbank Mining Corp. (MMC), formerly known as Cumberland Resources Ltd. (Cumberland), recognizes that incorporating proper hazardous material management into other environmental management plans and systems leads to risk reduction, improved process control, and cost savings.

All hazardous materials to be used at the Meadowbank operation will be manufactured, delivered, stored, and handled in compliance with all applicable federal and territorial regulations, as well as ISO 14001 environmental management standards. MMC is committed to preventing, to the greatest extent possible, both inadvertent release of these substances to the environment and accidents resulting from mishandling or mishap. MMC will institute programs for employee training, facility inspection, periodic drills to test systems, and procedural review to address deficiencies, accountability, and continuous improvement objectives.

MMC will actively work towards minimizing the generation of hazardous wastes by investigating alternatives to the use of hazardous materials, by recycling products and containers wherever feasible, and by treating wastes using state-of-the-art technologies before any release to the environment.

As with all other aspects of health and safety policy at the Meadowbank mine, all employees will be expected to comply with all applicable precautions and handling procedures with regard to hazardous materials. Employees are also expected to report any concerns to their supervisors, the Occupational Health & Safety Committee (HSC), or senior site management. All staff is encouraged to bring forward suggestions for improvements that can be incorporated into procedure revisions as appropriate.

1.2 ENVIRONMENTAL POLICY

MMC is committed to achieving a high standard of environmental care in conducting its mineral exploration activities. MMC's Environmental Policy includes:

- Compliance with all applicable legislation including laws, regulations, and standards. Where laws do not exist, appropriate standards will be applied to minimize environmental impacts resulting from exploration activities.
- Open communication with government, the community, and employees on environmental issues.
- Development and adherence to management systems that adequately identify, monitor, and control environmental risks associated with MMC's exploration activities.
- Assurance that the employees are aware of their responsibilities and comply with MMC's Environmental Policy and field guide.

It is the policy of MMC to protect the environment, public health and safety, and natural resources by conducting operations in an environmentally sound manner while pursuing continuous improvement of our environmental performance.

MMC also subscribes to the principle of sustainable development in mining. While mining cannot occur without an impact on the surrounding natural environment and communities, MMC will make it our responsibility to limit negative environmental and social impacts and to enhance positive impacts.

To achieve these goals MMC is committed to:

- Assess the potential environmental impacts of any new undertaking with an objective to minimise them;
- Design and operate MMC facilities to ensure that effective controls are in place to minimise risks to health, safety and the environment;
- Implement an emergency response plan to minimise the impacts of unforeseen events;
- Provide a professional environmental staff to plan and direct environmental compliance programs and to assist in training and education activities;
- Provide training and resources to develop environmentally responsible employees;

- Ensure that environmental factors are included in the purchase of equipment and materials;
- Ensure that contractors operate according to MMC environmental policy and procedures;
- Comply with all applicable environmental laws and regulations;
- Communicate with employees, the public, government agencies and other stakeholders on activities involving health, safety and the environment;
- Regularly verify environmental performance and implement any required corrective action;
- Minimise the generation of hazardous and non-hazardous waste and ensure proper disposal of all wastes;
- Implement measures to conserve natural resources such as energy and water; and
- Rehabilitate sites in accordance with regulatory criteria and within the established time-frame.

1.3 CORPORATE STRUCTURE

Pursuant to a take-over bid, Agnico-Eagle Mines Limited (AEM) acquired approximately 92% of the shares of Cumberland. AEM invoked the compulsory acquisition provisions of the British Columbia Companies Act and in early July 2007 Cumberland became 100% wholly-owned subsidiary of AEM. Through a series of steps, AEM amalgamated with Cumberland and MMC (a wholly-owned subsidiary of Cumberland) on August 1, 2007. As a result of this amalgamation, all of the rights, title, interests, liabilities and obligations of Cumberland and MMC are automatically, by law, transferred to and assumed by AEM. Therefore in all Type-A Water License documents, the terms 'Cumberland', 'Meadowbank', 'MMC' and 'AEM' are to mean the same entity: 'Agnico-Eagle Mines Limited'.

1.4 APPLICABLE LEGISLATION

Both federal and territorial legislation regulate the management of hazardous materials in Nunavut. Nunavut has adopted many of its acts and regulations concerning hazardous materials from the Northwest Territories. Copies of relevant legal documents will be kept on file at the mine site. MMC will regularly update the HMMP with respect to applicable legislation, and ensure that current legislation documents are available at the mine site.

Management and safety personnel will provide an overview of the applicable regulations to all employees as part of their initiation and ongoing training. The acts, regulations, and guidelines pertinent to the hazardous products that will be used at the Meadowbank Gold Project are listed in Appendix A.

The *Transportation of Dangerous Goods Act* classifies hazardous materials into nine main classes according to an internationally recognized system, as follows:

- Class 1 – Explosives;
- Class 2 – Gases;
- Class 3 – Flammable liquids;
- Class 4 – Flammable solids;

- Class 5 – Oxidizing substances and organic products;
- Class 6 – Poisonous (toxic) and infectious substances;
- Class 8 – Corrosives; and
- Class 9 – Miscellaneous products or substances.

The materials addressed in this document are identified by class in the product description tables in specific sections.

SECTION 2 • ROLES AND RESPONSIBILITIES

This section is intended to identify the roles and responsibilities of mine site personnel involved in the management of hazardous materials and hazardous wastes on site. Generic mine site positions are listed below with a general description of their defined role and responsibilities. Additional roles and responsibilities are also provided in the OHSP, ERP and SCP.

At the time of writing this HMMP, MMC had not defined specific roles and responsibilities for mine personnel as they relate to the management of hazardous materials/wastes. MMC is committed to defining appropriate roles and responsibilities for generic classes of mine personnel prior to the operation of the mine site, and updating this HMMP accordingly.

Specific roles and responsibilities of each generic personnel class will be described and will consider:

- support, review, development, update and approval of the HMMP for their areas of influence
- review, development, and updating environmental procedures related to hazardous materials management
- employee training
- internal communications, record keeping and reporting
- external communications, reporting, and notification of regulatory agencies
- other roles/responsibilities relevant to hazardous materials management.

2.1 ALL EMPLOYEES

All employees are responsible for:

- ensuring site and personnel safety
- knowing the location of first aid stations and supplies, emergency and safety equipment (e.g., fire water pumps, fire extinguishers, monitors, self-contained breathing apparatus), Materials Safety Data Sheets (MSDS), emergency exits, and muster stations
- wearing appropriate personal protective equipment (PPE) for the task at hand
- reporting all emergencies and spills involving hazardous materials and wastes to their Supervisor and the On-Scene Coordinator.

2.2 SUPERVISOR

Supervisors are responsible for:

- ensuring personnel under their supervision are provided with and are wearing appropriate PPE for the task at hand

- notifying the On-Scene Coordinator in the case of an emergency or spill involving hazardous materials or wastes.

2.3 ON-SCENE COORDINATOR

The On-Scene Coordinator is responsible for:

- ensuring the safety of all personnel and the site
- activating any required contingency plans in the case of an emergency or spills involving hazardous materials or wastes (see OHSP, HMMP, ERP and SCP)
- assisting in developing and implementing emergency response training programs and exercises
- involvement in annual reviews of the HMMP with the HSC.

2.4 EMERGENCY RESPONSE TEAM

The site will have an Emergency Response Team (ERT) that will be trained and responsible for fire fighting, controlling spills, and assisting with medical and other emergencies that may occur at the Meadowbank site. These team members will attend regular training sessions.

2.5 GENERAL MINE MANAGER

The General Mine Manager is responsible for implementing and maintaining the HMMP. In addition, the General Mine Manager's responsibilities are to:

- act as a spokesperson on behalf of MMC with the public, media, and government agencies, as required
- prepare and submit any formal reports (within the required time frame) to regulators and MMC management regarding the management of hazardous materials and
- ensure that the On-Scene Coordinator has the means (financial and otherwise) to ensure that all required resources are made available, or provided from off-site if required
- ensure that the Human Resources Representative has the means (financial and otherwise) to ensure that all employees' training requirements are current
- work with the Human Resources Representative to evaluate what training is required by all staff, ensure that all staff are given appropriate training, and ensure that all staff are retrained as needed
- organize inspections of site hazardous material/waste management practices
- ensure that the results of the regular inspections are used to improve management and emergency response practices, and improve relevant plans accordingly
- complete an annual detailed review of the HMMP with the HSC, with particular emphasis on the objectives and methods of the plan, and the job descriptions of all positions named within
- ensure that this HMMP remains up-to-date, and that updated versions are distributed to the personnel on site, and external agencies and organizations

- keep a formal record of distribution and amendments to the HMMP
- complete annual internal audits of the environmental management system, including the HMMP, and arranging for external audits of the system every three years by independent specialists.

2.6 ENVIRONMENTAL ADVISOR

The following are the responsibilities of the Environmental Advisor:

- provide technical advice on hazardous material/waste management practices and appropriate spill response procedures
- be involved in emergency response training exercises
- contribute to the annual review of the HMMP with the HSC
- assist in implementing a routine site inspection of hazardous material/waste management practices. This program will address all applicable issues in relevant legislation pertaining to hazardous material/waste handling, storage, labelling, use, reporting, and health and safety requirements.

2.7 SAFETY SUPERINTENDENT

The General Mine Manager will ensure that a Safety Superintendent is identified. The Safety Superintendent will be responsible for:

- ensuring that all new site personnel are properly oriented
- maintaining up-to-date copies of all site procedures and making them available to new personnel
- assisting in conducting emergency response exercises
- implementing a routine site inspection of hazardous material/waste management practices. This program will address all applicable issues in relevant legislation pertaining to hazardous material/waste handling, storage, labelling, use, reporting, and health and safety requirements.
- ensuring proper and timely documentation/reporting of inspections, investigations, and meetings
- sending inspection reports and minutes to the Worker's Compensation Board (WCB) Prevention Services Mines Inspection Group

2.8 HUMAN RESOURCES REPRESENTATIVE

The following are the responsibilities of the Human Resources (HR) Representative:

- maintain emergency and health and safety records
- assist in conducting emergency response exercises
- track all emergency and health and safety training that on-site staff have received, and when retraining will be required
- notify the On-Scene Coordinator when retraining is required

- ensure that employees are retrained in appropriate emergency response skills, Workplace Hazardous Materials Information System (WHMIS) training, Hazard Communication (HAZCOM), Occupational Health and Safety Administration (OHSA) training, first aid, and respirator fit-testing prior to expiry of existing training certification
- consult with appropriate organizations regarding retraining requirements and schedules.

2.9 HEALTH PROFESSIONAL (SITE FIRST AID)

Health Professionals are responsible for the following:

- providing on-site first aid and other medical support
- providing additional training for ERT members
- ensuring that the first aid room is properly organized and equipped with advanced first aid equipment
- ensuring that the first aid room is maintained at all times.

2.10 PROJECT CONSTRUCTION MANAGER

The Project Construction Manager is required to inform the General Mine Manager and construction team members of additional hazardous material/waste management requirements during the construction phase.

2.11 OTHER PERSONNEL

Other personnel that may have specific roles and responsibilities with respect to the management of hazardous material/waste on site include:

- Assistant General Mine Manager
- Division Superintendents
- Process Operators
- Camp Maintenance Personnel
- Shipping and Receiving
- Meadowbank Manger of Environmental and Social Affairs
- Other Meadowbank Mining Corp. Management Representatives
- Third Party Contractors (Delivery, Materials/Waste Removal, On-Site Maintenance/Support).

MMC is committed to defining appropriate roles and responsibilities for any additional classes of mine personnel involved in the management of hazardous material/waste on site prior to the operation of the mine site, and to updating this HMMP accordingly.

SECTION 3 • OVERVIEW OF HAZARDOUS MATERIALS

3.1 HAZARDOUS MATERIALS AND FUEL STORAGE LOCATIONS

The primary storage locations for hazardous materials, hazardous wastes and fuel are shown on Figures 1 to 3 in Appendix B. Figure 1 identifies storage areas at the mine site. Figure 2 provides a close-up view of the process plant and associated storage areas. Figure 3 identifies storage locations at the Baker Lake Marshalling Area. General information on currently identified storage areas is provided in Table 3.1 below. Storage areas are identified on the figures according to nature of material stored as follows:

FS = Fuel Storage Area

HM = Hazardous Materials Storage Area

HW = Hazardous Waste Storage Area

Fuel storage areas (FS) include storage areas at which bulk diesel or aviation fuels are stored. Hazardous materials storage areas (HM) include storage areas containing hazardous materials used to support primary and ancillary mine operations and associated activities, other than bulk fuels storage. Hazardous waste storage areas (HW) include locations and facilities at which spent or unwanted hazardous materials are stored pending recycling, treatment or disposal.

Chemical storage locations within the Process and Water Treatment plants will be identified on Figures 1 and 2 following the completion of detailed plant design. Process Plant and Water Treatment chemicals and reagents are discussed in Section 8 of this HMMP.

The primary fuel storage, hazardous material and hazardous waste storage areas at the mine site and Baker Lake Marshalling Area are listed in Table 3.1

As the mine site is still in the design and engineering phase, the specifics of the storage locations including location, materials stored and quantities may change from what will be used for mine construction and operations. MMC is committed to providing this information prior to the operation of the mine site, and to updating this HMMP accordingly.

Table 3.1: Fuel, Hazardous Material and Hazardous Waste Storage Facilities

Storage Area	General Description	Location
FS-1	Mine Site diesel fuel tank farm. One 5.6 ML tank within bermed secondary containment.	See Figure 1
FS-2	Air Strip aviation fuel storage. One 5,000 L EnviroTank.	See Figure 1
FS/HM-3	Mechanical Shop fuel and hazardous materials storage. Diesel in a 1,000 L tank; motor oil, hydraulic fluid, varsol, automotive grease and ethylene glycol stored mainly in 205 L drums.	See Figures 1 and 2
FS/HM-4	Powerhouse fuel and hazardous materials storage. Diesel fuel in a 5,000 L tank; motor oil and hydraulic fluid in 205 L drums.	See Figures 1 and 2
FS/HM-5	Exploration Camp fuel and hazardous materials storage. Diesel and motor oil in 205 L drums.	See Figures 1 and 2
HM-6	Mine Site ammonium nitrate storage.	See Figure 1
HM-7	Mine Site explosive/detonator storage.	See Figure 1
HM-8	Emulsion Plant – ammonium nitrate and fuel oil mixing. Diesel and used oil storage – type and quantity of storage (tank or drum) to be determined. Temporary storage of ammonium nitrate for explosive mixing purposes only.	See Figure 1
FS-9	Baker Lake diesel fuel tank farm. Up to four 10 ML tanks within bermed secondary containment. Storage is temporary pending overland transportation to mine site.	See Figure 3
HM-10	Baker Lake explosive/detonator storage area. Storage is temporary pending overland transportation to mine site.	See Figure 3
HM-11	Baker Lake ammonium nitrate storage area. Storage is temporary pending overland transportation to mine site.	See Figure 3
HW	None currently designated	

Note: L = litre; ML = Mega-litre ($1x10^6$ litres).

3.2 TYPES OF HAZARDOUS MATERIALS

The Meadowbank Gold Project will require the use of the following types of classified hazardous materials:

- *Fuel and Lubricants* – diesel fuel, oils, greases, anti-freeze, and solvents used for equipment operation and maintenance
- *Process Plant Consumables* – sodium cyanide, sulphur, sodium metabisulphite, hydrochloric acid, lime, flocculants, and anti-scalants used in mineral extraction
- *Water Treatment Consumables*[1] – Lime or hydrated lime and/or hydrogen peroxide; polymer; ferric sulphate; carbon dioxide gas or sulphuric acid

[1] The list of consumables represents products that would be used on an as-needed basis and my not be required or used at all during or after mine life.

- *Explosives* – ammonium nitrate and high explosives used for blasting in the mine
- *Laboratory Wastes* – various by-products classified as hazardous waste and chemicals used in the assay laboratory.

Sections 6, 7, and 8 contain detailed lists of product quantities and safe handling procedures for the first three categories above. Laboratory wastes are generally very limited in quantity and will be handled only by specialist lab technicians. These wastes will be pumped to the grinding circuit in the process plant for recycle and eventually become part of the tailings disposal stream. As such, they are not addressed separately in this document.

3.3 GENERAL HAZARDOUS MATERIAL STORAGE GUIDELINES

MMC is committed to the safe and appropriate storage of fuels, hazardous materials and hazardous wastes. The following sections outline MMC's general guidelines for storing fuels, hazardous materials and hazardous wastes.

3.3.1 General Guidelines for Storage Drums/Containers

Hazardous materials/waste shall be stored in drums/containers according to the following guidelines:

- In the original containers, where possible, or in containers compatible with the material being stored to prevent corrosion or chemical interaction that could lead to leaks or fires.
- Storage containers shall be in good condition, sealable and not damaged or leaking.
- Drums containing hazardous materials/wastes expected to be in storage for more than six months shall be placed on pallets or on a well-drained storage area to prevent rusting.
- Each container shall be clearly labelled to identify the substance being stored according to the requirements of the *Work Site Hazardous Materials Information System* (WHMIS) of the *Safety Act* or the relevant Transport Authority, if transport is planned.
- Containers shall be kept closed except when adding or removing product.
- Containers with product shall be kept in the upright position; empty drums can be placed horizontally.
- Containers shall be arranged to prevent damage from falling or dislodging.
- Containers shall be arranged to allow for easy access and inspections.

3.3.2 General Guidelines for Storage Areas

To assist in the safe and secure storage of fuels, hazardous materials and hazardous wastes, the following general guidelines for storage areas/facilities will be considered:

- Design of storage areas shall be in compliance with the *National Fire Code*, where appropriate.
- Drainage into and from storage areas shall be controlled in order to prevent leaks or spills from migrating off-site and to avoid run-off from entering the storage areas.

- Storage areas shall have controlled access. Only authorized and trained personnel shall have access to storage areas.
- Storage areas shall be adequately signed indicating that hazardous materials/wastes are stored therein.
- Storage locations shall be clearly defined and marked to prevent damage of storage drums and containers in the event they are covered by snow.
- Incompatible materials shall be segregated by chemical compatibility within the storage area to prevent contact between materials in the event of a release.
- Storage areas shall be located at least 30 metres from surface water and on a low-permeability area, where possible.
- Storage areas shall be readily accessible for fire fighting and other emergency procedures.
- Storage areas shall be adequately ventilated to prevent the build up of noxious or toxic vapours.
- Secondary containment or an adequate spill collection system shall be installed to allow for the containment of at least 110% of the largest container or tank volume within the contained area, plus 10% of the aggregate capacity of all other containers or tanks.
- Storage areas and associated secondary containment shall be protected from the elements, where possible. In case this is not feasible, the secondary containment's volume shall be large enough to allow for any precipitation (rain, snow, and storm water run-on) that may enter containment systems located outdoors, in addition to the required containment volume for stored materials. In addition, sufficient capacity to handle sprinkler water and other water from fire protection efforts will be provided.
- Storage areas shall be constructed, or provided with barriers, to protect containers from physical damage.
- Adequate spill and emergency response equipment shall be installed at each storage area (i.e. spill control, fire protection, etc.). A list of spill control equipment is provided in the SCP.

SECTION 4 • HAZARDOUS MATERIALS LIFE CYCLE MANAGEMENT

4.1 LIFE CYCLE MANAGEMENT

"Life cycle management" implies the assessment of a particular product over its entire life — from the time a material need is identified to the time the product is fully consumed or disposed of as waste. It covers product supply, transportation, storage, handling, recycling, and waste disposal. MMC is committed to ensuring proper life cycle management of all products used at the Meadowbank site, including hazardous materials. MMC and its contractors will deal only with reputable, certified suppliers, transporters, and expediters.

4.1.1 Delivery

All hazardous materials will be delivered to site by commercial carriers in accordance with the requirements of the *Canadian Transportation of Dangerous Goods Act* (TDGA). Carriers will be licensed and inspected as required by the Department of Transportation. All required permits, licences, and certificates of compliance will be the responsibility of the carrier. All shipments must be properly identified and labelled. Shipping papers must be accessible and include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, fire-fighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

Each transportation company will be required to develop a spill prevention, control, and countermeasures plan to address the materials they are importing. In the event of a release during transport, the commercial transportation company is responsible for first response and cleanup. MMC intends to periodically verify the qualifications of transport companies, their personnel and the existence of their spill prevention, control and countermeasures plan.

4.1.2 On-Site Handling

Once dangerous goods are received at the workplace, additional regulations apply. The federal *Workplace Hazardous Materials Information System* (WHMIS) calls for the proper labelling of products, the availability of product information in the form of MSDS, and employee education on how to identify and handle hazardous products. MMC will establish procedures for obtaining MSDS with new product deliveries; maintaining MSDS current (i.e. no older than three years), and maintaining a system of hardcopy or electronic MSDS that are readily accessible by all employees. A chemical tracking system will be established.

All hazardous materials will be stored in secured areas to prevent access by unauthorized personnel or any tampering. All tanks used for the storage of hazardous materials will be installed in secondary containment areas sized to hold at least 110% of the volume of the largest tank, plus 10% of the aggregate capacity of all other containers or tanks. Tanks and vessels in the process plant will be installed on concrete surfaces sloping to interior sumps that will route spilled solutions to lined collection areas. Additional guidelines for the storage of hazardous materials are provided in Section 3.3.

In support of pollution prevention, Meadowbank Mining Corp will establish procedures for the regular inspection of storage containers and facilities. If deficient conditions are identified, appropriate corrective actions will be taken and documented. Additional details for inspection of storage areas are provided in Section 9.1.2.

Emergency response procedures for spilled chemical substances are provided in the SCP (see also the ERP). These procedures outline the response to accidental spills or releases of hazardous materials to minimize health risks and environmental effects. Included are procedures for evacuating personnel, maintaining safety, cleanup and neutralization activities, emergency contacts, internal and external notifications to regulatory authorities, and incident documentation.

4.1.3 Wastes

On becoming wastes, materials will be stored and/or disposed of in accordance with specific government regulations and guidelines. Overall, hazardous waste treatment, recycling, and disposal facilities are lacking in Nunavut. MMC will therefore store most waste materials on site in secure facilities until they can be transported to other provincial or territorial jurisdictions for recycling or disposal.

Backhauling of hazardous wastes for off-site recycling, treatment or disposal from the Baker Lake Marshalling Area and the mine site is seasonal - limited to July to October. As a consequence, it is expected that some hazardous wastes will remain on-site for more than 180 days. Therefore, MMC will register as a Hazardous Waste Storage Facility in accordance with the *Guideline for the General Management of Hazardous Waste*, if quantities stored may exceed those stipulated in Schedule 1 of the Guideline.

Process plant tailings will pass through a treatment plant for cyanide destruction using the standard Inco SO_2/air process before being disposed of in the tailings pond. The cyanide content of the tailings material will be reduced to 10 ppm (parts per million), which will dissipate naturally on exposure to air in the Tailings Storage Facility. The current regulatory requirement for cyanide content in liquids released to the environment is 30 ppm.

As a waste generator, MMC is ultimately responsible for ensuring hazardous waste will be properly managed from the time they are generated to final disposal. Waste must be properly stored, transported, treated and disposed. In cases where hazardous wastes are to be transported off-site for treatment or disposal, MMC will only use waste facilities approved with the appropriate provincial or territorial authorities having jurisdiction. Prior to selecting and engaging such companies, MMC will verify their “approved” status as a waste facility with the appropriate provincial or territorial authorities having jurisdiction. A review of their “approved” status will be conducted at least annually.

The Department of Environment, Environment Protection Service (EPS) monitors the movement of hazardous waste, from the generator to final disposal, through use of a tracking document known as a Waste Manifest. Accordingly, a completed Waste Manifest will accompany all movements of hazardous waste for the Meadowbank Project. MMC will register with the EPS as a waste generator, and will employ only registered waste carriers to transport waste to registered/approved waste receivers. A copy of the completed manifest will be maintained for a period of two years after the hazardous waste is received by the authorized waste disposal facility.

4.1.4 Empty Product Containers

Many empty chemical containers are not safe to dispose of directly and require handling precautions identical to those for full containers. Chemical users must be familiar with safe waste handling and storage procedures supplied by manufacturers in MSDS. The containers will be backhauled to the Baker Lake Marshalling Area for ultimate return to the original suppliers.

SECTION 5 • MATERIALS OF SPECIAL INTEREST

5.1 MATERIALS OF SPECIAL INTEREST

Three particular products — sodium cyanide, ammonium nitrate, and diesel fuel — will be used in relatively large quantities throughout the life of the mine. Detailed procedures have been developed to ensure that these materials are handled and used with no adverse effect on people or the environment. Product characteristics and use are briefly described below. Representative MSDS for sodium cyanide are provided in Appendix C. For information on ammonium nitrate, see Appendix D.

5.1.1 Sodium Cyanide

5.1.1.1 Physical Properties

Cyanide solutions have been used in the mining industry to aid in the recovery of precious metals since the late 18th century. Its use permits effective processing of lower grade ores and those not amenable to treatment through simple physical processes such as crushing and gravity separation. Although the mining industry has spent many millions of dollars over many years pursuing alternatives to cyanide, at present there is no substitute that is more effective, safer, easier to use, and less costly. Mining uses about 20% of total cyanide production worldwide.

Fear of cyanide arises from several historical sources and incidents. If used improperly, cyanide is toxic to humans and the environment. Humans can be exposed to cyanide by inhalation, ingestion, or absorption through the skin. However, this is also true for many other chemicals such as gasoline and common household cleaning products like bleach, which contains chlorine, a chemical as toxic as cyanide. It should be noted that the number of recorded mishaps related to cyanide use in mining is very low compared to environmental disasters caused by nature, other chemicals, and other industries.

Cyanide is a naturally occurring molecule of carbon and nitrogen. Low concentrations of cyanide are present in many insects and plants, including a wide range of vegetables, fruits, and nuts, where it provides protection against predators. It is also present in the everyday environment to which many people are exposed, for example, in road salt and automobile exhaust — not to mention tobacco smoke. The most toxic form of cyanide is HCN (hydrogen cyanide) gas.

Cyanide is one of only a few chemical reagents that will dissolve in water. Gold mining operations use very dilute solutions of sodium cyanide, typically in the range of 0.01% to 0.05% cyanide (100 to 500 ppm). Unlike many synthetic chemicals, cyanide oxidizes and decomposes when exposed to air or other oxidants, and does not persist in the environment. As such, it does not give rise to chronic health or environmental problems when present in low concentrations.

For more information on the properties of cyanide, see Appendix C.

5.1.1.2 Cyanide Production

Cyanide production and handling are highly regulated, and its risk management is well documented. Both the manufacturer and MMC will employ stringent risk management systems to prevent injury or damage from the use of cyanide.

Sodium cyanide for the Meadowbank project will be produced in granular form, and packaged in water-resistant bags inside an intermediate bulk container (IBC). The IBC will hold 1,000 kg of cyanide, and will have the following approximate dimensions: 44" x 44" x 44". For shipment, there are normally 20 IBCs in a container.

5.1.1.3 Cyanide Transport

Cyanide producers audit purchasers and transportation systems. They design special packaging for the transport of cyanide and inventory all shipments against delivery records to ensure proper surveillance at all times. All shipments are accompanied by MSDS that provide the chemistry and toxicity of sodium cyanide, instructions in case of accidents, and emergency telephone numbers for assistance.

Truck, rail, and barge transporters screen their employees, carefully inventory packages, and establish and maintain systems for loading and unloading cyanide products. Product handling and transportation are in accordance with protocols set by the industries and in compliance with national and international regulations.

For the Meadowbank Project, the IBCs will be properly stacked in sea containers and transported by ship from Montreal to Chesterfield Inlet, whereupon the container will be downloaded to a barge for transport to Baker Lake. At Baker Lake, the containers will be transferred from barge to truck for transport to the Meadowbank mine site. At no point during transport will the sea container or IBCs be opened. From the point of cyanide packaging and onwards, the bags will only be opened on site, when use of the cyanide is required.

This method of cyanide transport will provide three levels of containment. The cyanide will be contained within plastic bags. In the event one of the bags ruptures, the cyanide will be contained within the IBC. In the event the IBC container breaks, the cyanide will be contained within the sea container, which provides a tertiary precautionary measure for minimizing the impact of the spilled material.

5.1.1.4 On-Site Storage & Handling

The cyanide will be stored on site in a dark, cool, dry, ventilated impoundment. As the project is still in the design and engineering Phase, the exact location of the cyanide impoundment is not yet determined. An impoundment will be required at Baker Lake within the Marshalling Area for temporary storage, pending transportation overland by truck to the mine site. The cyanide storage impoundment at the mine site will be located close to the processing plant. The impoundment facility will be secure and monitored — only authorized personnel will have access.

When cyanide is required at the mine, only the quantity required for immediate use will be removed from storage. The cyanide bag will be lifted by its straps (the straps are provided by the manufacturer as part of packaging; see Appendix C for an illustration) using a forklift, and then positioned and lowered onto a specially designed knife slitter that cuts the bag. The contents of the bag will drop into a dissolving tank. At no time does the cyanide need to be physically handled by Meadowbank personnel.

The IBC materials will be properly decontaminated and disposed of according to all applicable regulations to prevent environmental impact. Before disposal, the bags will be visually inspected to ensure they are empty, and flushed and drained several times to dissolve any residual cyanide left in the bag. Rinse water from the flushing process will be used in the gold recovery plant or processed through the tailings treatment system before discharge under controlled and permitted conditions.

All personnel potentially exposed to cyanide, including contractors and visitors, will receive appropriate training (see Section 10).

5.1.1.5 Spills

In the event a spill occurs, the cyanide will be promptly cleaned up to minimize its exposure to humans and the environment. A dry spill will be swept up and disposed of in a drum or other suitable container. In the event of a wet spill, then spill procedures will be carried out to prevent environmental contamination and the appropriate authorities will be contacted. For more information on spills handling and containment, see the SCP and ERP.

After cleaning up as much cyanide as possible, the area will be decontaminated using a small amount of caustic solution (i.e., 1 oz/5 gal hypochlorite solution). This will help keep the pH in the 10 to 11 range and suppress the formation lethal HCN gas.

5.1.1.6 International Cyanide Management Code

MMC is committed to becoming a signatory to the International Cyanide Management Code (the Code) for the manufacture, transport and use of cyanide in the production of gold. The Code is administered by a non-profit institute consisting of participants from the gold mining industry, governments, non-governmental organizations, labour, cyanide producers, and other interested parties.

The Code represents a voluntary commitment on the part of all signatories to identify and follow basic principles and guidelines for safe cyanide use at gold mining operations. This is the first such generic international code in the history of the mining industry. Under the Code, gold mines are required to manage their cyanide from source to site, thus assuming “cradle to grave” responsibility for all cyanide used at their operation.

A copy of the Code is provided in Appendix C.

5.1.2 Ammonium Nitrate

5.1.2.1 Background

Ammonium nitrate (AN) (NH_4NO_3) is essentially a fertilizer product manufactured and used for agricultural purposes in many parts of the world. It is also used in the manufacture of commercial blasting explosives. Though inert and difficult to explode on its own, public concerns about the storage of large quantities of AN have increased in recent years because of its reputation as a constituent in illegal bombs. Given the high economic importance of AN-based fertilizers and explosives, it is essential that risks to society resulting from the manufacture and use of AN be kept as low as possible.

AN has been used in the production of industrial explosives since 1934. In addition to ANFO — a combination of ammonium nitrate and fuel oil — AN is a major raw material in the manufacture of nitro-glycerine, water gels/slurries, and other types of blasting emulsions. Trials with modern ANFO blasting agents were conducted through the 1950s and 1960s, leading to its current status as the most widely used commercial explosive in the world, representing about 70% of total usage. AN-based explosives are a vital part of every construction project and are indispensable in the mining industry.

Millions of tonnes of AN are produced annually throughout the world and handled without incident. Despite its benign characteristics under proper storage conditions, large-scale, accidental explosions involving bulk AN have occurred at manufacturing plants and on cargo ships in the past. These events were analyzed in detail and led to international improvements in AN handling and storage procedures. It must be emphasized that ***NO*** accidents of this type, involving explosions or fires related to AN, have ever been recorded in the Canadian mining industry.

5.1.2.2 Physical Properties

AN is a stable, inorganic, solid compound. It is completely soluble in water and must be kept dry to remain effective for its intended purpose. AN products vary in composition, blend, and surface treatment. For instance, granular fertilizer products are coated with various materials to seal the particles from moisture contamination, whereas AN prills (pellets) produced for use in ANFO explosives are intentionally porous to permit the oil to be absorbed. The prills are generally white or off-white, and shelf life in a tightly closed container is unlimited.

AN itself is not an explosive, but it is an oxidizer and can explode or decompose under specific conditions, such as: high temperature (between 160°C and 200°C); bulk storage in a confined space; contamination with organic substances such as oil or waxes; contamination with inorganic materials such as chlorides and metals (chromium, copper, cobalt, nickel); and exposure to strong shock waves from other explosions. Similarly, AN is not combustible in itself, but as an oxidizing agent it increases fire hazard when in contact with other combustible materials, even in the absence of air. AN must be stored in a dry, well-ventilated area away from all possible sources of heat, fire, or explosion.

AN is odourless under normal conditions but releases toxic nitrous and ammonia fumes on explosion, decomposition, or involvement in a fire. Direct, unprotected contact with dry AN can cause discomfort and inflammation of eyes, skin, and respiratory membranes. Its oral toxicity is slight to moderate, although swallowing large amounts can have serious, if not fatal, effects from the ammonia and

nitrate salts. It has no known chronic effects, however, and repeated or prolonged exposure is not known to aggravate pre-existing medical conditions.

AN is of low toxicity to aquatic life but may promote eutrophication in waterways (water becomes rich in dissolved nutrients).

For more information on ammonium nitrate, see the MSDS in Appendix D.

5.1.2.3 Handling & Storage

Although AN is classified as a hazardous product, its storage and handling is not considered to be a significant risk activity. Nevertheless, AN should not be stored near combustible materials or fuels. AN will be delivered to site in heavy-duty, one-tonne tote-bags via MMC's marshalling and expediting system.

AN will be temporarily stored at the Baker Lake Marshalling Area (see Figure 3) pending overland transportation to the mine site. The mine site AN storage area will be located north of the processing plant (see Figure 1).

The Baker Lake AN storage facility will have a capacity for 8,000 tonnes of AN annually. The mine site storage area will hold approximately 1,500 tonnes of AN, or a two month supply. At these two storage areas, the AN bags will be stored in a safe area away from water bodies and from the explosives storage magazines. The bags will be handled individually when needed for the preparation of batches of explosive.

Mixing of AN and diesel fuel will take place at the Emulsion Plant (see Figure 1) located at the mine site. The current plan is to transport AN from the mine site storage facility to this location on an as-needed basis for making ANFO. Some quantity of diesel and used oil may be stored in tanks or drums at this location for ANFO mixing purposes. However, the decision to store diesel fuel and used oil at the Emulsion Plant is not yet final.

Construction details for the AN storage areas will be as per the temporary storage area.

Any spills will be swept up and placed in suitable containers for use or disposal. Empty bags are not considered to be hazardous waste, and will likely be burned in the site incinerator.

All personnel exposed to AN will wear suitable PPE.

5.1.2.4 Regulatory Setting

In Canada, the production, storage, and use of AN are subject to strict precautionary measures under the *Explosives Act* and Regulations, and the *Canada Transportation Act*, Ammonium Nitrate Storage Facilities Regulations. The *Explosives Act* is administered by the Explosives Regulatory Division (ERD) of Natural Resources Canada.

Traditionally, the principal aim of the *Explosives Act* has been public and worker health and safety. After the terrorist attack of 11 September 2001, the ERD proposed certain amendments to the Act to protect Canada's domestic explosives supply from criminal and terrorist interests. The amendments became part of Bill C-17, the *Public Safety Act*, passed in 2002. The amendments provide for the implementation of more stringent controls and tracking systems for the acquisition, transport, and storage of explosives and precursor materials such as AN.

5.1.3 Diesel Fuel

Products such as combustible diesel fuels, toxic anti-freeze, compressed gases, lubricants, and cutting oils are widely used in the North. These products meet vital needs for power generation, heating, and vehicle operation. Diesel fuel is by far the largest volume of petroleum product shipped annually to communities in Nunavut. Supplies of diesel are brought in variously by barge, winter roads, and aircraft, usually in 45 gallon drums. The potential environmental dangers of transporting and burning diesel fuels are well understood.

The transportation, storage, and handling of diesel products are strictly regulated by both federal and territorial legislation. MMC will ensure that all such requirements are met. Standard procedures are discussed in Section 3 of this document. MMC will emphasize the need for regular inspection of all storage and distribution facilities on site to assure mechanical soundness and to prevent leaks or any other uncontained release of diesel fuel.

It is of note that over the next three or four years, the Canadian government will be implementing a series of regulations requiring suppliers and end-users to convert to diesel fuel containing lower levels of sulphur. The sulphur released from burning diesel fuel is a major contributor to air pollution.

For more information on diesel fuel, see the MSDS in Appendix D.

SECTION 6 • FUELS & LUBRICANTS

6.1 PRODUCT DESCRIPTION

Material categories, site handling and storage requirements, and PPE recommended by manufacturers in MSDS are summarized in Tables 6.1 to 6.4 (see also the SCP). As the mine site is still in the design and engineering Phase, the specifics of the storage locations including location, materials stored and quantities may change from what will be used for mine construction and operations. MMC is committed to providing this information prior to the operation of the mine site, and to updating this HMMP accordingly.

Table 6.1: Fuel Products – Hazard Classes & Potential Impacts

Material	TDGA Class[a]	Potential Environmental Impact
Diesel	3	Water & soil contamination
Motor oil	Not regulated	Water & soil contamination
Aviation fuel	3	Water & soil contamination
Hydraulic fluid	Not regulated	Low risk to water & soil with proper handling
Varsol	3	Water & Soil contamination
Automotive grease	Not regulated	Low risk to water & soil with proper handling
Ethylene glycol	Not regulated	Toxic by ingestion, could potentially be consumed by wildlife.

Table 6.2: Fuel Products – Storage Locations

Product	Total Quantity On-Site	Storage Location	Container
Diesel	45 ML (potentially 90 ML including Baker Lake)	Fuel farm Powerhouse Construction (waste storage) Exploration camp Airstrip Mechanical shop Explosives truckshop	bulk of 45 ML in bermed area 5,000 L silled tank 1,000 L bermed tank at crusher 1,000 L in barrels 250 L silled tank 1,000 L silled tank 1,000 L silled tank
		Baker Lake	bulk total of 40 ML in bermed area
Motor oil	1,000 L or less	Mechanical shop Powerhouse Exploration camp	500 L in barrels 205 L in barrels 205 L in barrels
Aviation fuel	5,000 L or less	Airstrip	5,000 L EnviroTank
Hydraulic fluid	1,000 L or less	Mechanical shop Powerhouse Plant	500 L in barrels 205 L in barrels 205 L in barrels
Varsol	205 L or less	Mechanical shop	205 L in barrels and solvent recycler
Automotive grease	1,000 L or less	Mechanical shop	fifty 20 L pails
Ethylene glycol	205 L or less	Mechanical shop	205 L in barrels

Note: L = litre; ML = Mega-litre ($1X10^6$ litres).

Table 6.3: Fuel Products – Safe Handling Procedures

Product	Handling Procedures
Diesel	Do not get in eyes, on skin, or on clothing. Avoid breathing vapours, mist, fume, or dust. Do not swallow. May be aspirated into lungs. Wear PPE and/or garments if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use with adequate ventilation. Keep away from heat, sparks, and flames. Store in a well-ventilated area. Store in a closed container. Bond and ground during transfer.
Motor oil	Wear protective clothing and impervious gloves when working with used motor oils. To be handled generally consistent with other petroleum hydrocarbons.
Aviation fuel	See diesel procedures above.
Hydraulic fluid	Keep container closed until ready for use.
Varsol	Avoid eye contact. Use with adequate ventilation. Wash thoroughly after handling. Empty container retains residue and may be hazardous. Follow label instructions. Avoid repeated skin contact. Store in cool, ventilated area, away from ignition sources and incompatibles. Keep container tightly closed.
Automotive grease	Minimize breathing vapour, mist, or fumes. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean before re-use; discard if oil-soaked. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water. To prevent fire or explosion risk from static accumulation and discharge, effectively ground product transfer system in accordance with the National Fire Code. Keep containers closed when not in use. Do not store near heat, sparks, flame, or strong oxidants.
Ethylene glycol	Ensure adequate ventilation. Wear protective gloves and chemical safety goggles. Keep in tightly closed container, stored in a cool, dry, ventilated area. Separate from acids and oxidizing materials. Empty containers of this product retain product residues and may be hazardous.

Table 6.4: Fuel Products – Personal Protective Equipment

Product	Personal Protective Equipment		
	Eyes	Skin	Respiration
Diesel	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Motor oil	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Aviation fuel	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation
Hydraulic fluid	Chemical goggles	None usually required	None usually required
Varsol	Chemical goggles	Rubber gloves	None usually required; ensure adequate ventilation
Automotive grease	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation
Ethylene glycol	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation

6.2 DELIVERY TO SITE

With the exception of diesel fuel, most petroleum fuel and lubricant products will be delivered to site and stored in the original packing container from the manufacturer. These types of containers include a variety of sealed drums, pails, cans, and tubes.

Diesel fuel will be transferred between transport and storage facilities at a number of points along the delivery route to Meadowbank. During summer, diesel will be shipped from the east coast of Canada (Halifax) to Hudson's Bay and up Chesterfield Inlet to Schooner Harbour in ocean-going tanker vessels. Fuel will then be transferred from the tankers to barges for passage up the remaining length of the inlet to Baker Lake. The barges will anchor at the push tug barge landing and connect to the fuel tanks' feed line from which point fuel will be pumped to the storage tanks.

The storage tanks at both Baker Lake and the mine site will be sized to hold a total of approximately 45 ML of diesel fuel. Up to four 10 ML tanks are currently foreseen at Baker Lake and one 45ML tank at the mine site. The tanks will be single-walled, constructed of welded steel. The fuel unloading facilities in each area will include a concrete pad enclosed by a gravel berm and equipped with a spill containment sump. A continuous 60 mm high-density, polyethylene liner sheet will be installed under the tanks and the internal sides of the berm. The containment area will be sized to hold 110% of the volume of the largest tank, plus 10% of the aggregate capacity of the other tanks. A manual drain connection from the sump will extend outside the berm.

All fuel transfer and storage facilities will be designed in accordance with the Canadian Council of Ministers for the Environment (CCME, 1994) *Environmental Code of Practice for Above Ground Storage Tank Systems Containing Petroleum Products*, and the *National Fire Code*.

Appropriate measures will be in place to minimize impacts to surface water, groundwater and soils from potential vehicle accidents when transporting hazardous materials to the Site. Details of spill responses are presented in the SCP. The following general precautions will be taken:

- A maximum speed on the All-Weather Private Access Road for loaded and empty vehicles will be established based on the road design.
- Trucks will carry at least 10 m^2 of polyethylene material, a spark-proof shovel and oil absorbent blankets or squares.
- Trucks will be equipped with a reliable radio and/or satellite phone.
- Trucks will be equipped with sufficient response equipment for the safe removal of fuel from an over turned tanker.
- MMC commits to being prepared to respond to spills resulting from vehicle accidents in a timely and efficient manner.

6.3 FUEL TRUCK TRANSFER PROCEDURES

A contract supplier will fill the storage tanks in the main tank farms. General procedures to be followed are listed below. Similar procedures would be followed for fuelling remote station tanks.

Before fuel transfer, verify that:

- All fuel transfer hoses have been connected properly and couplings are tight.
- Transfer hoses are not obviously damaged.
- Fuel transfer personnel are familiar with procedures.
- Personnel are located at both the fuel delivery truck and fuel transfer tank(s) and can manually shut off the flow of fuel.
- If a high liquid level shutoff device is installed at the delivery tank, verify that the shutoff is operating correctly each time it is used.
- Fuel transfer will then proceed per the established procedures of the contract supplier.

Any accidents or spills must be reported immediately to the On-Scene Coordinator or General Mine Manager and in writing to regulators and MMC management. Notification and response procedures are detailed in the SCP.

6.4 CONTAMINATED SOILS AND SPILLS

Contaminated soils resulting from the storage and handling of fuels and lubricants will be salvaged at the time such impacts are identified, and transferred to a landfarm facility on site, or alternatively put into drums, labelled and eventually shipped off-site to an approved disposal facility. The feasibility of an on-site landfarm facility will be evaluated during the mine design and engineering phase of the Meadowbank Gold Project.

A suitable absorbent will be used to cleanup spillage on impermeable floor surfaces, and will be handled similarly to contaminated soil as described above. Internal and external notification requirements, record keeping and response procedures are detailed in the SCP. If required, the assessment and remediation of contaminated soil will be carried out in accordance with The *Environmental Guideline for Contaminated Site Remediation*.

6.5 USED PETROLEUM PRODUCTS

Used oil that is no longer suitable for its intended use is classified as a hazardous waste. The discharge of used oil into the environment, including but not limited to landfills, sewers and water bodies, is prohibited. Used oil will not be used for dust suppression at the mine site.

MMC intends to apply for a permit to incinerate used oil in the camp incinerator as per Schedule B of the *Used Oil and Waste Fuel Management Regulations*; or use the oil in the production of ANFO. All used oil products will be collected in tanks or drums marked “Waste Oil” and disposed of under the direction of the process Plant Manager. Empty petroleum containers will be stored on site in a designated area and returned to the supplier on backhauls. Oil filters will be punctured and/or crushed and drained of their contents for 24 hours prior to disposal.

In support of the permit to incinerate accumulations of used oil, a representative sample of one month’s feedstock will be analysed once a year to ensure that it does not contain unacceptable levels of impurities, including cadmium, chromium, lead, total organic halogens (such as chlorine

compounds), polychlorinated biphenyls (PCB) and ash content. Samples will be sent to an accredited laboratory for analysis. Impurity concentrations will be compared to the levels set out in Schedule A of the *Used Oil and Waste Fuel Management Regulations*. Alternate arrangements will be made for the off-site disposal, treatment or recycling of used oil that contains levels of impurities above those that are set out in Schedule A of the regulations.

The following information will be recorded in association with the incineration of used oil:

- the volume of used oil generated at the facility
- the volume of used oil incinerated
- the name and address of the person in charge, management or control of the used oil, and the place where the used oil was produced
- the analysis of any representative sample of used oil
- a summary of maintenance performed on the incinerator or processing equipment
- the volume and nature of the products produced from the used oil
- the destination of the used oil products shipped from the facility

6.6 MINE CLOSURE

On closure of the mine and facilities, some storage capacity will be left in place at site for diesel fuel for the use of personnel involved in close-out and reclamation activities. Small amounts of other petroleum products will also continue to be available. More details are provided in the "Reclamation and Closure Plan."

SECTION 7 • EXPLOSIVES

7.1 PRODUCT DESCRIPTION

Explosives are required for blasting waste rock and ore in the mine. Transportation, storage, use, and handling of blasting materials are strictly regulated by the Federal *Explosives Act* and *Transportation of Dangerous Goods Act* (Class 1 – Explosives), as well as the following territorial Acts:

- *Explosives Use Act* and Regulations
- *Mine Health and Safety Act* and Regulations

Material categories, site handling and storage requirements, and PPE recommended by manufacturers in MSDS are summarized in the Tables 7.1 to 7.3.

Table 7.1: Explosives – Hazard Classes & Potential Environmental Impacts

Material	Class	Potential Impact
Ammonium nitrate	5.1	Water contamination
High explosive detonators	1	Negligible with proper handling
Blasting caps	1	Negligible with proper handling

Table 7.2: Explosives – Safe Handling Procedures

Product	Handling Procedure
Ammonium nitrate	Do not get in eyes or on skin. Avoid breathing dust. Do not swallow. Separate from all organic materials or other possible contaminants that are not compatible. Store in well-ventilated location, away from all sources of heat, fire, or explosion.
High explosive detonators	Store under dry conditions in a well-ventilated magazine. Keep away from heat, sparks, and flames. Keep containers closed.
Blasting caps	Store in cool, well-ventilated area in an approved magazine.

Table 7.3: Explosives – Personal Protective Equipment

Product	Personal Protective Equipment		
	Eyes	Skin	Respiration
Ammonium nitrate	Safety glasses or goggles	Non-absorbent rubber or equivalent gloves	NIOSH/MSHA approved respirator, if required
High explosive detonators	Safety glasses or goggles	Rubber gloves and protective clothing made from cotton	NIOSH/MSHA approved respirator, if required
Blasting caps	Safety glasses or goggles	Rubber gloves and protective clothing made from cotton	NIOSH/MSHA approved respirator, if required

7.2 EXPLOSIVES STORAGE

The estimated annual explosives requirement for the Meadowbank mine will vary between 9,000 to 11,000 tonnes per year. However, only a small amount of explosive material will be shipped to site in the form of blasting caps. The bulk of the explosives used at site will be ANFO, which is a mixture of 70% AN (fertilizer) to 30% diesel fuel. ANFO will be mixed in an on-site plant (Emulsion Plant shown on Figure 1 in Appendix B) by the supplier.

AN and explosives may be temporarily stored in separate facilities at the Baker Lake Marshalling Area (Figure 3 in Appendix B) prior to transport to site on the All-Weather Private Access Road by the supplier. The actual amount of explosive material stored at the Baker Marshalling Area or on site at any one time will be minimal.

AN will be stored outdoors in 1 tonne tote bags, commonly stacked about 3 bags high. The AN storage areas will be constructed by creating a pad prepared by levelling the area, placing a geotextile underlay, and then covering the liner with approximately 7 cm of gravel. The area around the storage pad will be sloped to prevent storm water accumulation and inflow into the storage area. Note: ammonium nitrate is not an explosive until mixed with diesel fuel.

The high explosive detonators and blasting caps will be stored in an enclosed magazine. It is estimated that three magazines will be required on site, and one at Baker Lake Marshalling Area for explosives storage, each being approximately 4 m x 14 m (i.e., not much bigger than a shipping container).

The explosive mixing plant, AN storage, and magazine will be safely located away from vulnerable facilities (see Figure 1 in Appendix B for locations), as stipulated by the federal and territorial *Explosives Use Act* and Regulations. The mixing plant will also be used for the washing and minor repair of trucks and equipment used to handle the explosives.

7.3 USE OF EXPLOSIVES

The primary blasthole drills will be diesel-powered rigs capable of drilling 152.4 mm diameter holes. Drilling requirements were calculated for ore and waste. A pre-shear and buffer blasting followed by mechanical wall cleanup is used for the final wall. Blasting operations will be affected by several factors, including wall control and weather. A number of modified operating procedures will be implemented during the winter season. These may include minimizing the sleep time for loaded holes; ensuring that cuttings are mounded around the hole collars after loading to prevent snow drifting into the holes, and utilizing blasthole covers.

The responsibility for blasting will be split between appropriately trained mine personnel and the explosives supplier. The supplier will be responsible for supplying and delivering blasting agents to the site, manufacturing the blasting product on site, delivering blasting agents to the blastholes and filling the holes. Mine personnel will be responsible for charging the holes, placing the detonators and boosters, and tying-in the patterns. The AN and emulsion components will be loaded on barges and transported to the Baker Lake Marshalling Area for temporary storage, if necessary, prior to transport to site. The supplier will provide mixing and delivery trucks. MMC will provide fuel oil and accommodations.

Blasting will be approximately daily and will average, in size, the daily production requirement of 50-90,000 tonnes per blast. Blasting will likely be by electric initiation and will feature current technology with down-the-hole delays to minimize the energy per delay to single hole loads. This will minimize backbreak, fly rock, vibration levels and will optimize fragmentation and minimize digging problems.

Blasting will be carried out by certified blasters following blasting regulations and safe practices. All pit activities are under the supervision of certified mine supervisors, knowledgeable in mine operating regulations and best practices.

The manufacture and distribution of explosives is carried out by suppliers under Federal license to conduct such work. They provide and operate the explosives manufacturing plant under such license and authority.

Details on explosives inventory and inspection are provided in Section 9.2. Information on Explosives Handlers is available in Section 10.3.

SECTION 8 • PROCESS PLANT & WATER TREATMENT REAGENTS & CONSUMABLES

8.1 PRODUCT DESCRIPTION

The Process Plant will use a number of chemicals and reagents to treat the ore, recover entrained gold. The Water Treatment Plant, if required, would also use a number of chemicals and reagents to treat water. Water Treatment chemicals would be used over a 3 to 4 month period during frost-free months only. The range in annual quantities used would reflect the different dosages that may be used during different mining stages (early operations, late operations, closure treatment of tailings water and polishing of pit lake water quality on a contingency basis). Material categories, site handling and storage requirements, and PPE recommended by manufacturers in MSDS (Appendix E) are summarized in Tables 8.1 to 8.4.

Table 8.1: Process Plant & Water Treatment Reagents – Use, Consumption & Storage

Reagent	Use	Approximate Consumption		Phase	Normal Delivery Format	On-Site Storage
		Daily	Annual			
Acetylene	Welding	1	365	gas	gas cylinders	secured upright
Activated carbon (granular)	Gold recovery	200 kg	75 t	solid	500 kg bags	Pallet
Anti-scalant	Water treatment	0.05 m^3	18.5 m^3	liquid	650 kg tote tank	Pallet drums
Borax	Refinery	60 kg	22 t	solid	40 kg bags	Pallet
Silica	Refinery	30 kg	11 t	solid	4 kg bags	Pallet
Calcium hydroxide (hydrated lime) ($Ca(OH)_2$)	Potential use: Water treatment	1.3 t	120-125 t	solid	1 t supersacs	Pallet
Calcium oxide (Quicklime) (CaO)	pH control	20 t	7,300 t	solid	1 t supersacs	Pallet
Calcium peroxide (alternative to hydrogen peroxide)	Potential use: Water treatment	minimal*	minimal*	solid	45 kg drum	Pallet drums
Carbon dioxide (CO_2)	Potential use: Water treatment	minimal*	minimal*	gas	gas cylinders	secured upright
Cement	Construction	13.6 t	4 961 t	solid	1 t bag	Pallet
Copper sulphate ($CuSO_4$)	Cyanide destruction	120 kg	40 t	solid	25 kg bags	Pallet
Ferric iron product (ferric sulphate ($Fe(SO_4)_3$); or ferric chloride ($FeCl_3$))	Potential use: Water treatment	300-450 kg	30-40 t	solid	25 kg drum w/bag	Pallet drums
Flocculant (Magnafloc 338 or Magnafloc 10)	Settling aid	180 kg	65 t	solid	25 kg bags	Pallet
Hydrochloric acid (HCl)	Refining/stripping	200 kg	75 t	liquid	20 gal drums	Pallet drums
Hydrofluoric acid	Laboratory	5 gallons	1 825 gallons	liquid	20 gal drums	Pallet drums
Hydrogen peroxide (alternative to calcium hydroxide)	Potential use: Water treatment	minimal*	minimal*	liquid	1 m^3 HDPE tote	Pallet
Lead acid batteries	Vehicles	-	24	liquid	-	pallet
Nitric acid	Stripping	50 kg	18 t	liquid	34 kg bottle	Pallet
Paints	Maintenance	-	100 gallons	liquid	gallon	Pallet
Sodium cyanide (NaCN)	Leaching	2 780 kg	1 014 t	solid	1 t box bags	Pallet
Sodium hydroxide (caustic soda) (NaOH)	Refining/stripping	300 kg	110 t	solid	25 kg bags	Pallet
Sodium metabisulphite ($Na_2S_2O_5$)	Cyanide destruction	3,500 kg	1,500 t	solid	1 t supersacs	Pallet
Sodium nitrate	Refinery	40 kg	15 t	solid	50 kg bags	Pallet s
Sulphur	Cyanide destruction	55 kg	2 010 t	solid	1 t bags	Pallet
Sulphuric acid	Future use: Water treatment	minimal*	minimal*	liquid	1 m^3 HDPE tote	Pallet

Note: kg = kilogram; t = tonne; gal = gallon; m^3 = cubic metre.

*not expected to be required but minimal amounts may be used on a contingency basis to be determined during operations.

Table 8.2: Process Plant & Water Treatment Reagents – Hazard Classes & Potential Environmental Impacts

Material	Class	Potential Impact
Acetylene	2.1	Generally not hazardous for water.
Activated carbon	4.2	No information available.
Anti-scalant	Not regulated	Negligible with proper handling
Borax	Not regulated	Presents no health hazards.
Calcium hydroxide	Not regulated	Toxic by ingestion, could potentially be consumed by wildlife.
Calcium oxide	Not regulated	No information available.
Calcium peroxide	5.1	Releases oxygen into environment when dissolved in water.
Carbon dioxide	2	Generally not hazardous for water.
Cement	Not regulated	No information available.
Copper sulphate	9	Harmful to aquatic life.
Ferric chloride	8	No information available.
Ferric sulphate	Not regulated	No information available.
Flocculant	Not regulated	Acute fish, invertebrate, algae and bacteria toxicity.
Hydrochloric acid	8	Extremely toxic to aquatic life by lowering the pH below 5.5. When released into the soil, this material may leach into groundwater.
Hydrofluoric acid	8.6.1	No information available.
Hydrogen peroxide	5.1	Aquatic Toxicity 96-hour LC50.
Lead acid batteries	8	No information available.
Nitric acid	8	No information available.
Paints	Not regulated	No information available.
Silica	Not regulated	Generally not hazardous for water.
Sodium cyanide	6.1	Expected to be very toxic to aquatic life and to terrestrial life.
Sodium hydroxide	8	No information available.
Sodium metabisulphite	Not regulated	No information available.
Sodium nitrate	5.1	Possibly hazardous short-term degradation products are not likely. However, long term degradation products may arise. The products of degradation are less toxic than the product itself.
Sulphur	9	No information available (insoluble in water).
Sulphuric acid	8	Harmful to aquatic life in very low concentrations. It may be dangerous if it enters water intakes.

Table 8.3: Process Plant & Water Treatment Reagents – Safe Handling Procedures

Product	Handling Procedure
Acetylene	Do not mix with air or oxygen above atmospheric pressure. Store away from oxidizing agents. Open and handle cylinder with care. Keep ignition sources away - Do not smoke. Protect from heat. Protect against electrostatic charges. Pressurized container: protect from sunlight, store in a cool location and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Prevent impact and friction. Store in accordance with local fire code and/or building code or any pertaining regulations.
Activated carbon	Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Activated Carbon, especially when wet, can deplete oxygen from air in enclosed spaces, and dangerously low levels of oxygen may result. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.
Anti-scalant	Used in extremely small quantities. Can cause mild to moderate irritation of eyes, skin, and upper respiratory tract. Wash thoroughly after handling. Use sensible industrial hygiene and housekeeping products. Not flammable. Keep containers tightly closed
Borax	No special steps required.
Calcium hydroxide	Wash thoroughly after handling. Store in a cool, DRY, well-ventilated place. Keep container tightly closed and away from incompatible materials.
Calcium oxide	Store in closed containers in a controlled drainage area under cover. Use in a well-ventilated area. Empty containers retain product residues and may be hazardous.
Calcium peroxide	Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure. Store in a cool, dry, well-ventilated place. Keep container tightly closed and away from incompatible materials and sources of heat.
Carbon dioxide	Keep ignition sources away - Do not smoke. Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Keep cylinder valve tightly closed. Store cylinder in a well ventilated area. Store in accordance with local fire code and/or building code or any pertaining regulations.
Cement	Store dry and away from water.

Product	Handling Procedure
Copper sulphate	Avoid contact with skin and eyes. DO NOT breathe dust. Always wash hands thoroughly after contact. Store and use only in dry, well-ventilated areas. Keep container tightly closed.
Ferric chloride	Hygroscopic. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C.
Ferric sulphate	Store in a tightly closed container. Protect against physical damage, direct sunlight, and freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.
Flocculant	Dust generated in handling of this product can be explosive if sufficient quantities are mixed in air, in which case ignition sources should be avoided. Employ grounding, venting and explosion relief provisions in accord with accepted engineering practices in process operations capable of generating dust/or static electricity. Handle in accordance with good industrial practice, handle with care and avoid unnecessary personal contact. Avoid contact with eyes and prolonged or repeated skin contact. Avoid continuous or repetitive breathing of dust. Use only with adequate ventilation. Remove contaminated clothing; launder or dry-clean before reuse. Wash thoroughly with soap and water after using. For industrial use only. Slip hazard when wet. Material is slippery when wet. Store in the original container, securely closed, in a cool and dry location. Avoid extremes of temperature and ignition sources.
Hydrochloric acid	Do not get in eyes, on skin, or on clothing. Wear protective clothing. Avoid breathing vapours or fumes. Store in cool, dry, ventilated area with acid-resistant floors. Keep container closed, out of direct sunlight, and away from heat, water, and incompatible materials. When diluting, add acid slowly to water and in small amounts. Never use hot water and never add water to acid. When opening metal drum, use non-sparking tools because hydrogen gas may be present. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.
Hydrofluoric acid	Wash thoroughly after handling. Remove contaminated clothing and wash before re-use. Use with adequate ventilation. Do not get on skin, in eyes or on clothing. Do not ingest or inhale. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in metal or glass containers. Do not store in direct sunlight. Keep tightly closed. Empty container may contain hazardous residue. Do not add any other material to the container. Do not wash down the drain. Do not allow smoking or food consumption while handling. Store in approved containers only. Do not add water to acids.
Hydrogen peroxide	Use extreme care when attempting any reactions because of fire and explosion potential (immediate or delayed). Conduct all initial experiments on a small scale and protect personnel with adequate shielding as the reactions are unpredictable, and may be delayed, and may be affected by impurities, contaminants, temperature, etc. Do not

Product	Handling Procedure
	get in eyes. Avoid contact with skin and clothing. Wash thoroughly after handling. Avoid contact with flammable or combustible materials. Avoid contamination from any source including metals, dust, and organic materials. In the event of an accident where large volumes of hydrogen peroxide might come into contact with external fires or with incompatible chemicals, a one-half mile area from the incident should be evacuated. Store in a properly vented container or in approved bulk storage facilities. Do not block vent. Do not store on wooden pallets. Do not store where contact with incompatible materials could occur, even with a spill (see "Hazardous Reactivity" on MSDS). Have water source available for diluting. Do not add any other product to container. Never return used or unused peroxide to container, instead dilute with plenty of water and discard. Rinse empty containers thoroughly with clean water before discarding. (See "Waste Disposal" on MSDS).
Lead Acid Batteries	Store batteries in a well ventilated cool area. Handle carefully to avoid damaging or turning batteries over.
Nitric acid	Class 8 products are not to be loaded with class 1, 4.3, 5, 6, 7 or foodstuffs or foodstuff empties. Store in a well ventilated area and out of direct sunlight. Keep containers closed at all times. Store away from oxidisable, caustic and combustible materials. Vapours heavier than air, prevent concentration in sumps and hollows. DO NOT enter confined spaces where vapour may have collected. Strong oxidising agent, can lead to fire or explosion with organic and/or combustible materials.
Paints	No special steps required.
Silica	Prevent formation of dust. This product is not flammable. When pouring into a container of flammable liquid, ground both containers electrically to prevent static electric spark. Keep containers tightly sealed.
Sodium cyanide	Highly toxic, corrosive to eyes, skin, and respiratory tract. Can be fatal if swallowed, inhaled, or absorbed through skin. Keep cyanide antidote kit available in any cyanide work area. Wear personal protective clothing at all times. Keep in tightly closed container in cool, dry, ventilated area. Protect against physical damage to containers. Do not store under sprinkler systems. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.
Sodium hydroxide (caustic soda)	Can cause severe injury to eyes, skin, and respiratory tract. Use PPE at all times and DO NOT contact product directly. Wash thoroughly after handling. Store in dry, well-ventilated area. Keep in original container, tightly closed. Empty containers retain product residues and may be hazardous.
Sodium metabisulphite	May cause irritation to eyes, skin, and respiratory tract with prolonged exposure. Sulphite-sensitive individuals may experience severe allergic reaction to dust. Releases sulphur dioxide gas when mixed with water. Wear PPE and wash thoroughly after handling. Store in dry, well-ventilated area away from heat, acids, and oxidizers.

Product	Handling Procedure
	Keep container tightly closed. Use vacuum to clean up dust.
Sodium nitrate	Keep away from heat. Keep away from sources of ignition. Keep away from combustible materials. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, acids.
	Keep container dry. Keep in a cool place. Keep container tightly closed. Keep in a cool and well-ventilated area. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.
Sulphur	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. May form flammable dust-air mixtures. Avoid contact with skin, eyes and clothing. Empty containers contain product residue, (liquid and/of vapour), and can be dangerous. Keep containers tightly closed. Avoid contact with heat, sparks, and flame. Use with adequate ventilation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat spark, or open flames.
	Store away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances (oxidizing agents).
Sulphuric acid	Store in well ventilated area. Store in a cool, dry place. Keep dry - reacts with water; may lead to drum rupture.
	Keep containers securely sealed and protected against physical damage. Store away from strong bases. Not to be loaded with Class 1, 4.3, 5.1, 5.2, 6*,7, Foodstuff and foodstuff empties. (* where the Class 6 substance is a cyanide and the Class 8 substance is an acid).
	Corrosive to most metals in the presence of moisture, liberating hydrogen gas, (potential explosion). Reacts violently or explosively with a wide range of organic and inorganic chemicals, including water, alcohol, carbides, chlorates, picrates, nitrates, metals and other combustibles.

Table 8.4: Process Plant & Water Treatment Reagents – Personal Protective Equipment

Product	Personal Eyes	Protective Skin	Equipment Respiration
Acetylene	Tightly sealed goggles	Protective gloves	Use atmosphere-supplying respirators (e.g. supplied-air: demand, pressure-demand, or continuous-flow or self-contained breathing apparatus: demand or pressure-demand or combination supplied-air with auxiliary self-contained air supply atmosphere-supplying respirator in case of insufficient ventilation).
Activated carbon	None required	None required	None required
Anti-scalant	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Not normally needed
Borax	Avoid eye contact	None required	None required
Calcium hydroxide	Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.	Impervious gloves, body suits, aprons, coveralls and impervious boots of chemically resistant material should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.	Respiratory protection is not normally required. If use creates dust formations, then a NIOSH-approved respirator with a dust cartridge is recommended.
Calcium oxide	For splash protection use chemical goggles or full face shield	Rubber, neoprene, or nitrile gloves; impervious apron or coveralls and boots.	NIOSH/MSHA approved respirator, if required
Calcium peroxide	Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.	Impervious gloves of chemically resistant material (rubber or neoprene) should be worn at all times. Wash contaminated gloves and dry thoroughly before reuse. Body suits, aprons, and/or coveralls of chemical resistant	NIOSH-approved respirator for dust should be worn if needed.

Product	Personal Eyes	Protective Skin	Equipment Respiration
		material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse. Impervious boots of chemically resistant material should be worn.	
Carbon dioxide	Safety glasses	The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.	Use atmosphere-supplying respirators (e.g. supplied-air: demand, pressure-demand, or continuous-flow or self-contained breathing apparatus: demand or pressure-demand or combination supplied-air with auxiliary self-contained air supply atmosphere-supplying respirator) in case of insufficient ventilation.
Cement	Wear glasses or safety goggles to prevent contact with eyes. Wearing contact lenses when using this product under dusty conditions is not recommended.	Wear impervious gloves, shoes and protective clothing to prevent skin contact.	Under ordinary conditions no respiratory protection is required. Wear a NIOSH approved respirator when exposed to dust above exposure limits.
Copper sulphate	Chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask; NIOSH/MSHA approved respirator, if required
Ferric chloride	Use OSHA approved chemical safety goggles or face shield. Contact lenses should not be worn. Maintain eye wash fountain and quick-drench facilities in work area.	Wear impervious gloves and synthetic apron	Vapor and dust respirator. Use and approved/certified OSHA respirator or equivalent
Ferric sulphate	Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.	Wear protective gloves and clean body-covering clothing.	If the exposure limit is exceeded and engineering controls are not feasible, a half face piece particulate respirator (NIOSH type N95 or better filters)

Product	Personal Eyes	Protective Skin	Equipment Respiration
			may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator.
Flocculant	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask
Hydrochloric acid	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Hydrofluoric acid	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133. Wear face shield.	Wear appropriate protective neoprene gloves to prevent skin exposure. Wear acid-resistant jacket, trousers and boots sufficient to protect skin.	Wear appropriate OSHA/MSHA approved chemical cartridge respirator regulations found in 29CFR 1910.134. If more than TLV, do not breathe vapour. Wear self-contained breathing apparatus. Always use an NIOSH-approved respirator when necessary.

Product	Personal Eyes	Protective Skin	Equipment Respiration
Hydrogen peroxide	Wear coverall chemical splash goggles. In addition, where the possibility exists for eye or face contact due to splashing or spraying of material, wear chemical splash goggles/full-length face shield combination.	Where there is potential for skin contact, have available and wear as appropriate: impervious gloves, apron, pants, jacket, hood, and boots; or totally encapsulating chemical suit with breathing air supply. Permeation data supplied by vendors indicate that impervious materials such as natural rubber, natural rubber plus neoprene, nitrile, or polyvinylchloride afford adequate protection. Do not wear leather gloves or leather shoes (uppers or soles) because they can ignite following contact with peroxide. Cotton clothing can also ignite. This effect may be within minutes, or delayed. Clothing fires and skin damage occur less quickly with 50% or lower hydrogen peroxide than with 70% material, but adequate personal protection is essential for all industrial concentrations. Protective skin creams offer no protection from hydrogen peroxide and should not be used.	Where there is potential for airborne exposure in excess of applicable limits, wear NIOSH approved respiratory protection.
Lead Acid Batteries	Safety glasses must be worn when moving, connecting, disconnecting or maintaining batteries, or cleaning up acid spills; as well as, when brushing battery posts or handling solids from inside a battery.	When moving, connecting, disconnecting or maintaining batteries, or cleaning up acid spills acid resistant gloves and full coverage acid resistant clothing must be worn. When brushing battery posts or handling solids from inside a battery gloves and apron must be worn.	When brushing battery posts or handling solids from inside a battery, dust masks must be worn.

Product	Personal Eyes	Protective Skin	Equipment Respiration
Nitric acid	Chemical safety goggles. A face shield may also be necessary.	Impervious gloves, coveralls, boots, and/or other resistant protective clothing. An impervious full-body encapsulating suit and respiratory protection may be required in some operations.	NIOSH/MSHA approved respirator, if required
Paints	None required.	None required.	None required.
Silica	Safety goggles	Wear impervious gloves, shoes and protective clothing to prevent skin contact.	NIOSH/MSHA approved respirator, if required
Sodium cyanide	For dust and splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious lab coat, apron, or coveralls and boots	NIOSH/MSHA approved respirator, if required
Sodium hydroxide (caustic soda)	Tight-fitting goggles if dust is generated. For splash protection use chemical goggles or full face shield	Gauntlet type rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Sodium metabisulphite	Chemical safety goggles	Cotton gloves adequate for handling dry product. For solutions, use rubber or neoprene gloves; impervious apron or overalls and boots	NIOSH/MSHA approved respirator
Sodium nitrate	Contact lenses should not be worn; they may contribute to severe eye injury.	Impervious gloves of chemically resistant material (rubber or PVC), body suits, aprons, and/or coveralls of chemical resistant material and impervious boots of chemically resistant material should be worn at all times	For dusty or misty conditions, wear NIOSH-approved dust or mist respirator. In case of spill or leak resulting in unknown concentration, use NIOSH approved supplied air respirator.
Sulphur	Chemical safety goggles	Wear impervious gloves, shoes and protective clothing to prevent skin	NIOSH/MSHA approved respirator, if required

Product	Personal Eyes	Protective Skin	Equipment Respiration
		contact.	
Sulphuric acid	Safety glasses, goggles or faceshield as appropriate.	Overalls or similar protective apparel. Rubber boots. Elbow-length PVC gloves. Splash apron.	

SECTION 9 • INVENTORY, INSPECTION & RECORDS

A contract expediting company will arrange all deliveries from the Baker Lake Marshalling Area to the Meadowbank site. This will include the hazardous materials discussed in this plan. The General Mine Manager and Plant Manager have ultimate responsibility for supervising the receipt, inspection, and recording of all material inventories at site. The division managers will reconcile total amounts received against amounts ordered.

9.1 FUELS & LUBRICANTS

9.1.1 Inventory Management

Diesel fuel use will be metered automatically when it is pumped from the bulk tanks. The metered volumes will be summarized weekly and reconciled against tank levels determined manually with a dipstick from the top of the tanks. Diesel fuel consumption for the power generators will be recorded weekly.

Aviation fuel will be dispensed from an EnviroTank as required under the supervision of aircraft personnel. Consumption and on-site volumes will be reconciled monthly.

Lubricants and other petroleum products will be inventoried monthly.

9.1.2 Inspection

The Plant Manager will coordinate with the General Mine Manager for inspection of all fuel and lubricant storage areas. The inspection schedule and procedure to be followed are summarized in Table 9.1. All inspections will be logged with the date and time of inspection, facility inspected, and name of the person making the inspection.

The condition of hazardous materials storage areas, containers, tanks, connectors and associated plumbing will be checked on a regular basis. Observations on their condition will be logged, dated and kept near the corresponding storage area. Drums/containers will be inspected for the presence and legibility of symbols, words or other marks identifying the contents, signs of deterioration or damage such as corrosion, rust, leaks at seams or signs that the drum/container is under pressure such as bulging and swelling, spillage or discoloration on the top or sides of the drum/container. If leaks or deterioration is encountered it will be noted and addressed in a timely manner.

The hazardous materials area's secondary containment will be inspected and the condition of the secondary containment will be noted. Arrangements will be made for repairs if necessary. If precipitation (water or snow) is present within the secondary containment, it will be removed from the secondary containment area in a timely manner to prevent overflow or damage to the containment system due to large ponding.

Table 9.1: Inspection of Petroleum Storage Sites

Fuel Tanks	*Schedule* – Quarterly by Plant Manager, annually by MMC's Environmental Advisor. *Procedure* – Repair leaks and report promptly. Inspections will be reported annually and filed with the General Mine Manager or Plant Manager and Environmental Advisor.
Diesel Generating Plant	*Schedule* – Monthly by Plant Manager as part of internal environmental audit. *Procedure* – Inspections will be reported annually and filed as above.
Other Fuelling Stations	*Schedule* – Weekly by Plant Manager or designate as part of internal environmental audit. *Procedure* – Inspections will be reported annually and filed as above.
Spill Kits	*Schedule* – Quarterly by Plant Manager or designate, annually by Environmental Advisor. *Procedure* – Inspections will be reported annually and filed as above.
Other Hazardous Material Storage	*Schedule* – Monthly by Plant Manager when materials are on site. *Procedure* – Inspections will be reported annually and filed as above.

Any accidental damage to containment structures will be inspected immediately and appropriate repairs undertaken. The extent of damage will be reported in writing to the General Mine Manager and Plant Manager, or alternate. The report will note any remedial repairs that may be made, the date of any repairs, and the need for any follow-up inspection.

9.1.3 Records

Records pertaining to storage, use, and loss of fuels and lubricants are required by CCME and the Fire Marshal (under the *National Fire Code).* The following records will be prepared under the supervision of the Plant Manager, in consultation with the General Mine Manager:

- reconciliation of bulk inventory from resupply logs
- weekly use summaries
- weekly reconciliation for each storage tank
- overfill alarm tests
- pressure tests (if applicable)
- inspections and maintenance checks of the storage tank, piping, and delivery systems
- any alteration to the systems
- reports of leaks or losses
- reports of spill responses
- records of training.

9.2 EXPLOSIVES

9.2.1 Inventory Management

Explosives personnel will record daily use of ammonium nitrate and high explosives. The General Mine Manager will check the records weekly and complete a monthly reconciliation.

9.2.2 Inspection

Access to and use of explosives will be under the exclusive control of MMC. MMC will be responsible for inspection of all explosives equipment and facilities, including the ammonium nitrate storage areas, the magazines for high explosive detonators and blasting caps, and the explosives manufacturing plant.

9.2.3 Records

The *Federal Explosives Act* requires that the following records be kept with regard to explosives products:

- annual quantity of each explosive issued to the mine site from the factory, including the dates of shipments
- annual quantity of each explosive present at the site.

The MMC explosives expert will provide weekly reports to the General Mine Manager that will include:

- staffing
- safety concerns or incidents
- total explosives consumption
- the amount of ammonium nitrate remaining on site or at the Baker Lake Marshalling Area
- inventory of other explosives and accessories to be audited for fiscal month-end balances.

9.3 PROCESS PLANT CONSUMABLES

9.3.1 Inventory Management

Process plant consumables will be reconciled against orders on receipt. The Plant Manager is responsible for reconciling the resupply inventory.

9.3.2 Inspection

On each shift, the process plant operators will be responsible for daily inspection and operation of consumables storage facilities in the plant. Any problems will be noted and reported to the Plant Manager. The Plant Manager will be responsible for weekly or monthly inspections of plant consumables and storage areas.

9.3.3 Records

The plant operators will keep daily records of consumables use. Weekly and monthly summaries will be provided to the Plant Manager for records keeping.

SECTION 10 • TRAINING

10.1 GENERAL

As outlined in MMC's Occupational Health & Safety Plan (OHSP), all staff and contractors at the Meadowbank Gold project will receive the following training:

- WHMIS
- emergency and spill response (see also the SCP and ERP)
- operations overview.

Mine employees will receive additional training in mine safety as specified by the *Mine Health and Safety Act* and regulations. If mining is carried out as a contract operation, this will be the responsibility of the mine contractor. MMC will ensure compliance with the training requirements specified in the Act and regulations.

Plant employees will receive additional training specific to their area of work and duties, including safe operating practices, safe handling and storage of chemicals, and use of PPE. This training will be the responsibility of MMC

Periodically, Meadowbank staff will carry out fire drills. The drills will test emergency response procedures and will be scheduled so as not to disrupt work. The results of the drills will be recorded and forwarded to the mine and Plant Managers and the HSC. The results may indicate that additional, or refresher, training is required. Safety Committee recommendations will be enacted expeditiously.

Medical and mine rescue staff, and others responsible for first response to emergencies, will conduct periodic drills to test their emergency response procedures (see also ERP and SCP). Reports on the drills will be provided to the Mine and Plant Managers for action as required.

A record of training received will be maintained for each employee.

10.2 FUEL & LUBRICANTS HANDLERS

Personnel who handle fuel and lubricants will be expected to be conversant with relevant MSDS information. As well, these personnel will be given training in the following:

- transportation of dangerous goods (TDG)
- MMC's fuel handling procedures (outlined in Section 6)
- spill response and cleanup procedures for petroleum (see the SCP)
- emergency response, especially firefighting procedures (see the ERP).

10.3 EXPLOSIVES HANDLERS

Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. The General Mine Manager will check the adequacy of training. Training requirements will include (but not necessarily be limited to):

- specific fire procedures as per the *Federal Explosives Act*
- first aid
- transportation of dangerous goods (TDG)
- pump and hydraulics training.

10.4 PLANT EMPLOYEES

Plant operators may receive TDG training, if appropriate. All plant employees will be trained in spill and emergency response procedures. Emergency response procedures for spilled chemical substances are provided in the SCP.

For more information on employee training and safety guidelines, see MMC's OHSP, SCP and ERP included under separate covers.

10.5 THIRD PARTY CONTRACTORS

It is expected that third party contractors receive adequate and comprehensive training to conduct their work tasks from their employer. MMC intends to review the general qualifications of third party contractors prior to having them work at the site. In addition, the contractor companies may also be requested to confirm the qualifications of specific individuals that they may have working at the site.

Third party contractors working on the site will be expected to participate in, and complete a site specific health and safety training session. The training session is envisioned to be valid for a period of one year, after which time the contractor may be required to complete the training again, or attend a refresher. The training session will outline site specific hazardous and response procedures that they should be aware of in the course of conducting their work on site. The training session will cover hazardous materials management.

SECTION 11 • PLAN EVALUATION, AUDIT & IMPROVEMENT

MMC's goal is to audit all aspects of the HMMP for effectiveness in accordance with ISO 140001 protocols. Environmental management procedures will be modified and updated to address changes in policy, regulations and technology advances. The primary purpose will be continued compliance with regulations governing the project. The HMMP will be reviewed and audited regularly to identify any components that need to be corrected, adjusted, upgraded, or otherwise modified. Audits will be both internal on an annual basis by MMC or contractor personnel, and every three years by external, independent specialists. Aspects of the plan that affect the safety of employees at the facility and of the general public will be most important.

Formal evaluations of the plan will be documented, deficiencies will be noted, and progress in addressing deficiencies will be tracked in writing. Individual responsibilities and accountabilities will be assigned, and deadlines will be set for addressing the required changes. The Meadowbank Plant Manager will assume overall responsibility for the process.

As part of MMC's commitment to attain certification under the International Cyanide Management Code, it will sponsor regular (every three years) audits by Institute-approved, third-party professionals to verify its compliance with the Code's principles and standards of practice with regard to cyanide handling.

In line with MMC's goal of continuous improvement in all health and safety matters, all employees will be encouraged to offer suggestions for more efficient and safer materials handling procedures.

SECTION 12 • LIST OF ACRONYMS

AN	Ammonium Nitrate
ANSI	American National Standards Institute
ANFO	Ammonium Nitrate Fuel Oil
CCME	Canadian Council of Ministers of the Environment
EPS	Environmental Protection Service
ERD	Explosives Regulatory Division, Natural Resources Canada
ERP	Emergency Response Plan
ERT	Emergency Response Team
FS	Fuel Storage Area
HAZCOM	Hazard Communication
HCN	Hydrogen Cyanide
HM	Hazardous Materials Storage Area
HMMP	Hazardous Materials Management Plan
HR	Human Resources
HSC	Occupational Health & Safety Committee
HW	Hazardous Waste Storage Area
IBC	Intermediate Bulk Container
ISO	International Organization for Standardization
MMC	Meadowbank Mining Corporation (Cumberland, Agnico-Eagle)
MSDS	Materials Safety Data Sheets
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health

OHSA	Occupational Health and Safety Administration
OHSP	Occupational Health & Safety Plan
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
SCP	Spill Contingency Plan
TDG	Transportation of Dangerous Goods
TDGA	Transportation of Dangerous Goods Act
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

APPENDIX A

List of Applicable Legislation

Federal Legislation and Guidelines, Federal Codes and Other Guidance Documents

And Territorial Legislation and Guidelines

Appendix A

List of Applicable Legislation

APPENDIX A - APPLICABLE LEGISLATION

The following is a list of federal and territorial legislation and guidelines that regulate the management of hazardous materials in Nunavut, and which are considered potentially applicable to the Meadow Gold Mine. As part of Meadowbank Mining Corp's overall environmental management system for the mine site, this list is updated at least annually to ensure it represents current and relevant information.

Federal Legislation

- *CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999 S.C. 1999, c. 33*
    - *Code of Practice for the Reduction of Chlorofluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*
    - *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*
    - *Environmental Code of Practice on Halons Code of Practice EPS 1/RA/3E.*
    - *Environmental Emergency Regulations SOR/2003-307.*
    - *Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks, CCME-EPC-87-E, as amended.*
    - *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations SOR/2005-149.*
    - *Federal Halocarbon Regulations, 2003 SOR/2003-289.*
    - *Interprovincial Movement of Hazardous Waste Regulations SOR/2002-301.*
    - *Ozone-Depleting Substances Regulations, 1998 SOR/99-7.*
- *EXPLOSIVES ACT R.S.C 1985, c. E-17*
    - *Ammonium Nitrate and Fuel Oil Order C.R.C. 1978, c. 598.*
    - *Explosives Regulations C.R.C. 1978, c. 599.*
- *TRANSPORTATION OF DANGEROUS GOODS ACT, 1992 S.C. 1992, c. 34*
    - *Transportation of Dangerous Goods Regulations SOR/2001-286.*
    - *Transportation of Dangerous Goods Regulations - Schedules SOR/2001-286.*

Federal Codes and Other Guidance Documents

- National Fire Code.
- Indian and Northern Affairs Canada. 2005. DEW Line Cleanup Barrel Protocol.
- Canadian Council of Ministers for the Environment (CCME) - Environmental Code of Practice for Above-Ground and Underground Storage Tanks Systems containing Petroleum Products and Allied Petroleum Products (2003).
- CCME - Canadian Wide Standards for Petroleum Hydrocarbons in Soil.
- CCME - Canadian Environmental Quality Guidelines.
- Environment Canada (Tilden & Westerman). 1990. Guidelines for the Preparation of Hazardous Material Spill Contingency Plans.
- Department of Fisheries and Oceans. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Water.

Territorial Legislation

- *ENVIRONMENTAL PROTECTION ACT R.S.N.W.T. 1988, c. E-7*
    - *A Guide to the Spill Contingency Planning and Reporting Regulations January 2002.*
    - *Environmental Guideline for Contaminated Site Remediation November 2003.*
    - *Environmental Guideline for Waste Lead and Lead Paint.*
    - *Guideline for Ozone Depleting Substances.*
    - *Guideline for the General Management of Hazardous Waste in the NWT.*
    - *Guideline for the Management of Waste Antifreeze.*
    - *Guideline for the Management of Waste Batteries.*
    - *Guideline for the Management of Waste Paint.*
    - *Guideline for the Management of Waste Solvents.*
    - *Guideline for Dust Suppression, February 1998.*
    - *Spill Contingency Planning and Reporting Regulations R-068-93.*
    - *Used Oil and Waste Fuel Management Regulations R-064-2003.*
    - *Plain Language Guide to the Used Oil and Waste Fuel Management Regulations.*
- *TRANSPORTATION OF DANGEROUS GOODS ACT, 1990 S.N.W.T. 1990, c. 36*
    - *Transportation of Dangerous Goods Regulations R-049-2002.*
- *EXPLOSIVES USE ACT R.S.N.W.T. 1988, c. E-10*
    - *Explosives Regulations R.R.N.W.T. 1990, c. E-27.*

- *FIRE PREVENTION ACT R.S.N.W.T. 1988, c. F-6*
    - *Fire Prevention Regulations R.R.N.W.T. 1990, c. F-12.*
    - *Propane Cylinder Storage Regulations R-094-91.*
- *MINE HEALTH AND SAFETY ACT (NUNAVUT) S.N.W.T, 1994, c. 25*
    - Mine Health and Safety Regulations R-125-95.
- *SAFETY ACT R.S.N.W.T. 1988, c. S-1*
    - *General Safety Regulations R.R.N.W.T. 1990, c. S-1.*
    - *Work Site Hazardous Materials Information System Regulations R.R.N.W.T. 1990, c. S-2.*

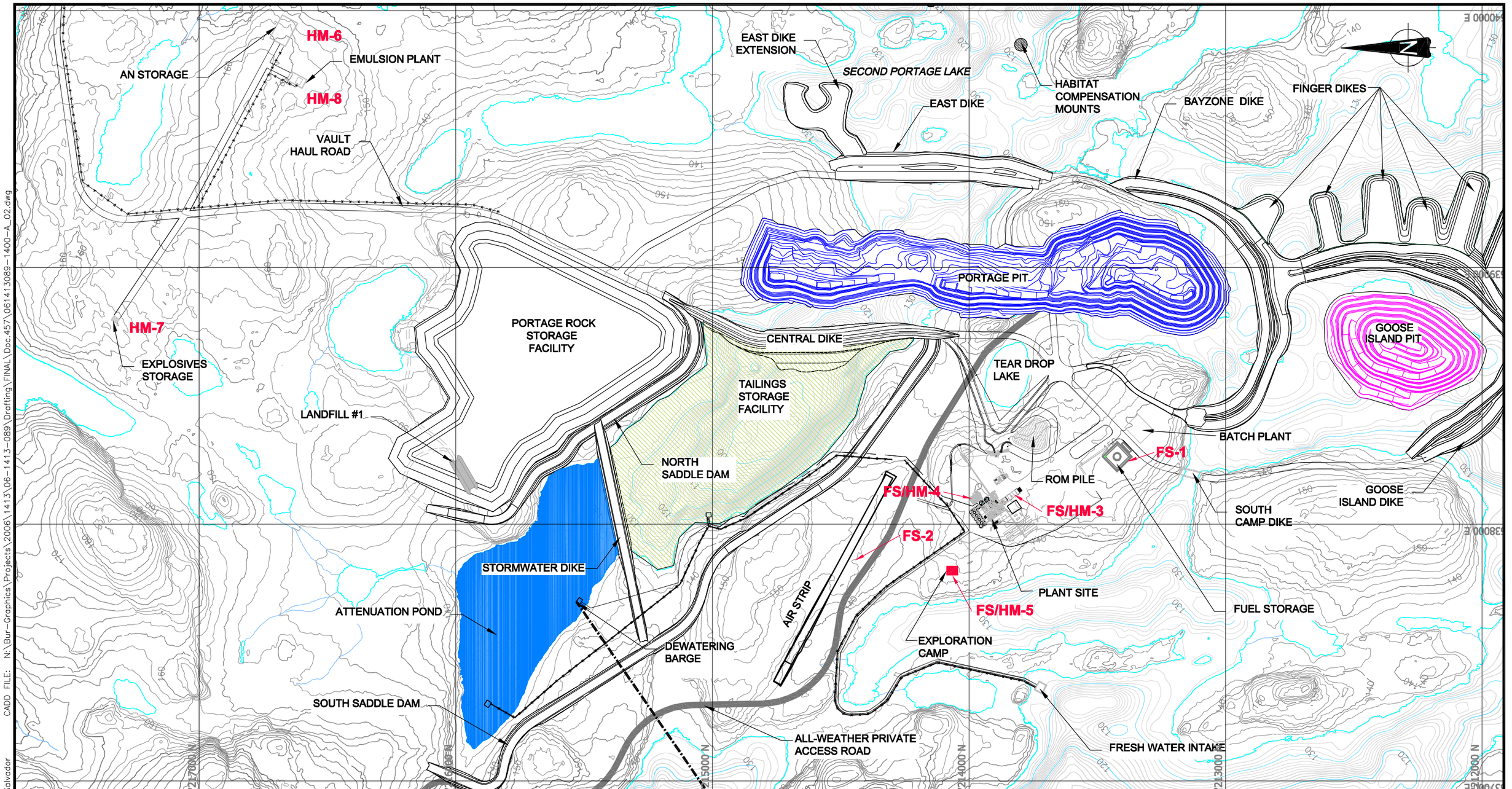
APPENDIX B

Figures: Location of Fuel, Hazardous Materials and Hazardous Waste Storage Areas

Figure 1: Meadowbank Mine Site, General Arrangement Plan, Hazardous Materials Storage Areas

Figure 2: Meadowbank Mine Site, Plant Site, Hazardous Materials Storage Areas

Figure 3: Baker Lake Marshalling Area Layout, Hazardous Materials Storage Areas



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LEGEND

FS	FUEL STORAGE AREA
HM	HAZARDOUS MATERIAL STORAGE AREA
HW	HAZARDOUS WASTE STORAGE AREA (NONE CURRENTLY DESIGNATED)

NOTES

1) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2) ALL ELEVATIONS ARE IN METERS ABOVE SEA LEVEL (MASL), UNLESS OTHERWISE NOTED.
3) GRID REFERENCE: NAD 83, UTM ZONE 14.
4) CONTOUR INFORMATION ON LAND SUPPLIED BY CUMBERLAND RESOURCES LTD.
5) CONTOUR BELOW LAKE SURFACE ARE BASED ON BATHYMETRIC SURVEYS BY GOLDER ASSOCIATES LTD., 2006. CONTOURS INTERVAL= 2m.
6) BATHYMETRY CONTOUR DATA SUBJECT TO FUTURE UPDATE.
7) LAKE CONTOURS ARE BASED ON SURVEYED LAKE SURFACE ELEVATIONS: 2nd PORTAGE LAKE= 133.1m, 3rd PORTAGE LAKE= 134.1m.
8) LOCATION OF FUEL STORAGE (FS) AND HAZARDOUS MATERIALS STORAGE (HM) ARE APPROXIMATE AND MAY CHANGE DURING FINAL DESIGN.
9) LOCATIONS AND NUMBER OF HAZARDOUS WASTE STORAGE AREAS (HW) TO BE DEFINED DURING FINAL DESIGN OF PLANT SITE.

0 100 200 300 400 500
Scale in Meters

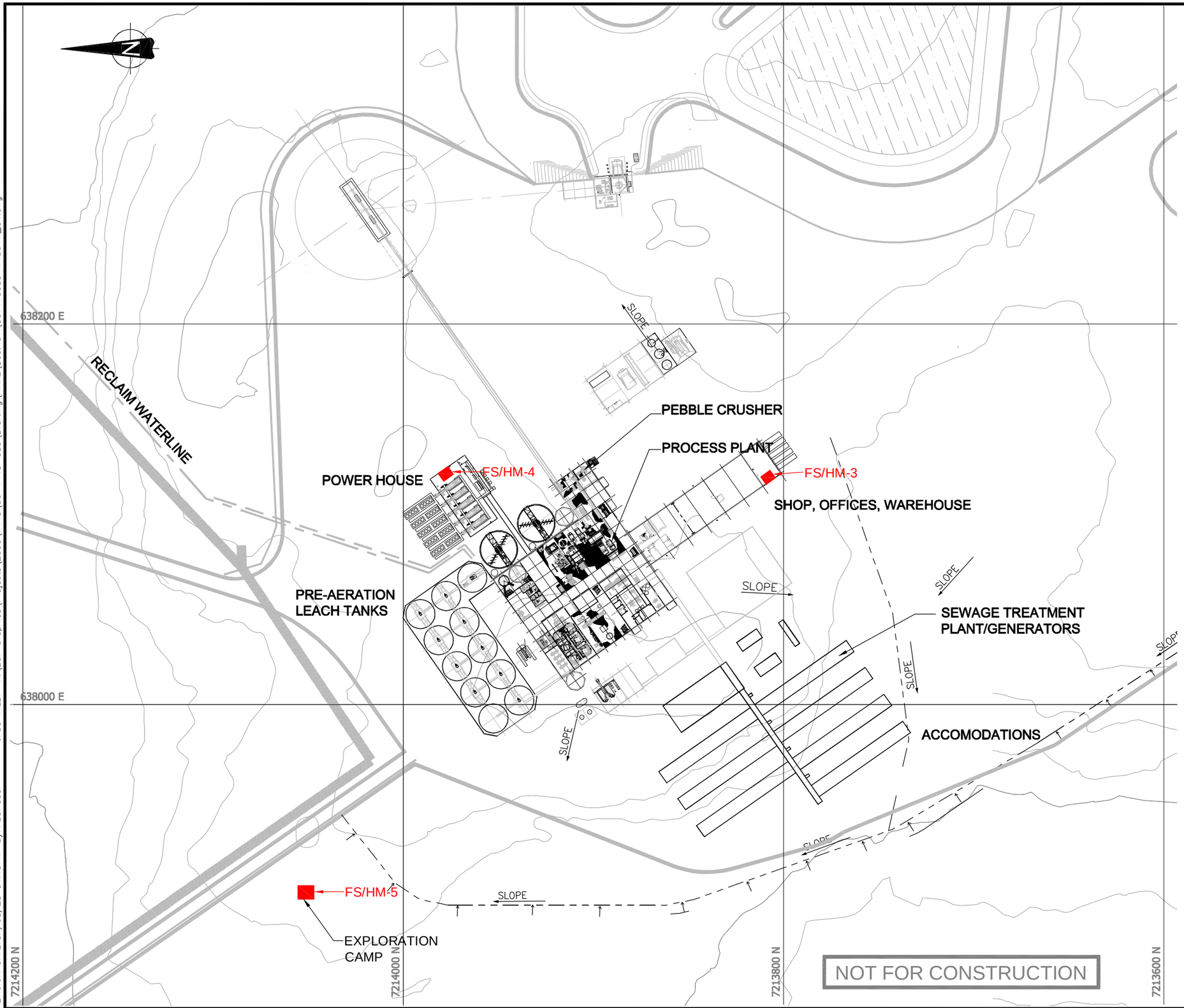
NOT FOR CONSTRUCTION

MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

GENERAL ARRANGEMENT PLAN HAZARDOUS MATERIALS STORAGE AREAS

FIGURE 1



NOT FOR CONSTRUCTION

LEGEND

FS	FUEL STORAGE AREA
HM	HAZARDOUS MATERIAL STORAGE AREA
HW	HAZARDOUS WASTE STORAGE AREA (NONE CURRENTLY DESIGNATED)

NOTES

1) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2) ALL ELEVATIONS ARE IN METERS ABOVE SEA LEVEL (masl), UNLESS OTHERWISE NOTED.
3) GRID REFERENCE: NAD 83, UTM ZONE 14.
4) CONTOUR INFORMATION ON LAND SUPPLIED BY CUMBERLAND RESOURCES LTD.
5) PLANT SITE PLAN SUPPLIED BY MEADOWBANK MINING CORPORATION.
6) LOCATION OF FUEL STORAGE (FS) AND HAZARDOUS MATERIALS STORAGE (HM) ARE APPROXIMATE AND MAY CHANGE DURING FINAL DESIGN.
7) LOCATIONS AND NUMBER OF HAZARDOUS WASTE STORAGE AREAS (HW) TO BE DEFINED DURING FINAL DESIGN OF PLANT SITE.

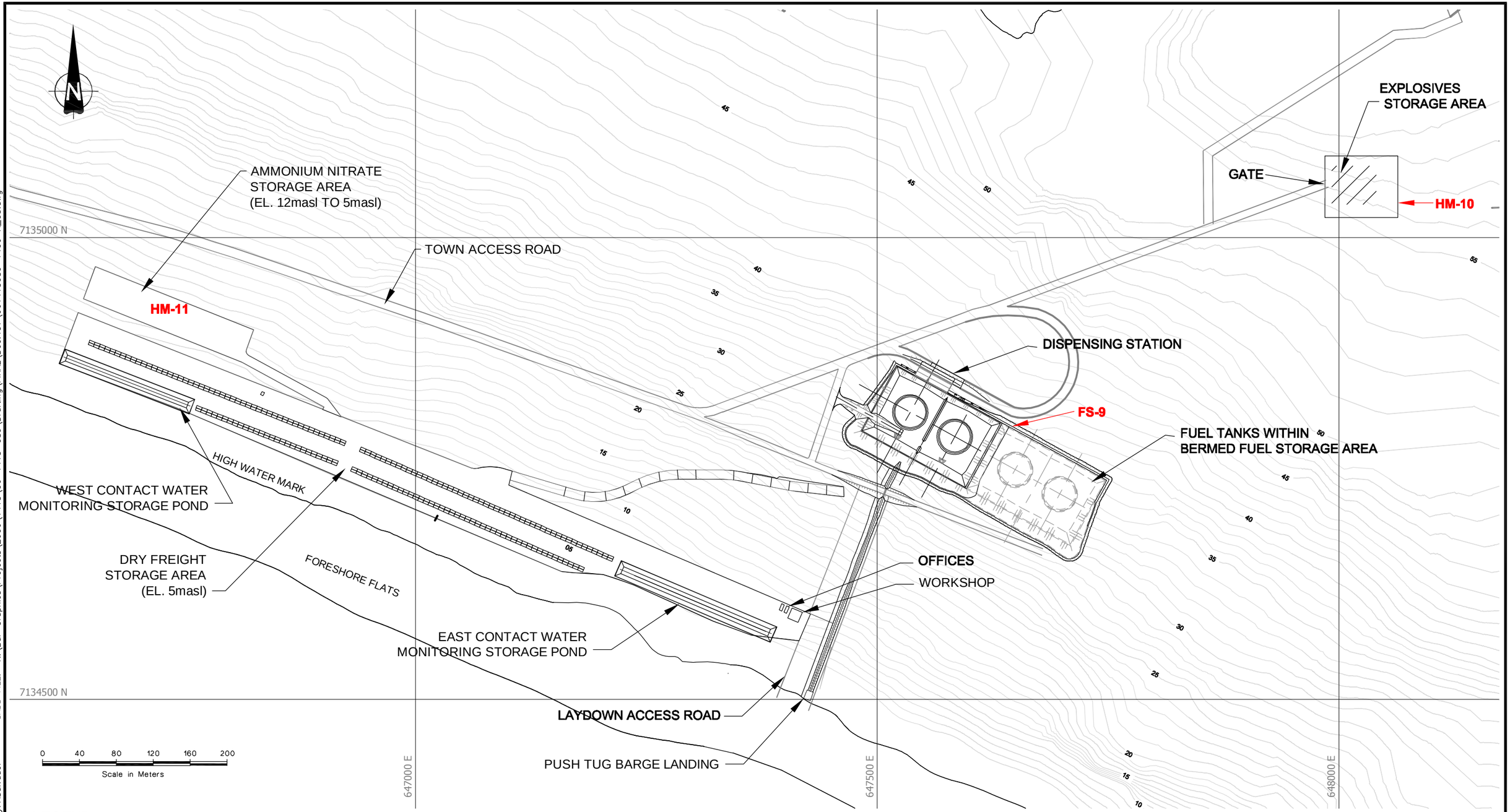
0 20 40 60 80 100
Scale in Metres

MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

MEADOWBANK MINE SITE
PLANT SITE
HAZARDOUS MATERIAL STORAGE AREAS

FIGURE 2



LEGEND

FS	FUEL STORAGE AREA
HM	HAZARDOUS MATERIAL STORAGE AREA
HW	HAZARDOUS WASTE STORAGE AREA (NONE CURRENTLY DESIGNATED)

NOTES

1) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2) ALL ELEVATIONS ARE IN METERS ABOVE SEA LEVEL (MASL), UNLESS OTHERWISE NOTED.
3) GRID REFERENCE: NAD 83, UTM ZONE 14.
4) CONTOUR INFORMATION SUPPLIED BY MEADOWBANK MINING CORPORATION (MMC).
5) DESIGN OF FUEL TANK STORAGE AREA BY OTHERS.
6) FUEL TANK STORAGE AREA FROM SNC-LAVALIN DWG.1000-46D1-1001 DATED APRIL 19, 2006.
7) LOCATION OF FUEL STORAGE (FS) AND HAZARDOUS MATERIALS STORAGE (HM) ARE APPROXIMATE AND MAY CHANGE DURING FINAL DESIGN.
8) LOCATIONS AND NUMBER OF HAZARDOUS WASTE STORAGE AREAS (HW), IF ANY, TO BE DEFINED DURING FINAL DESIGN OF MARSHALLING AREA.

NOT FOR CONSTRUCTION

MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

BAKER LAKE MARSHALLING AREA LAYOUT HAZARDOUS MATERIALS STORAGE AREAS

FIGURE 3

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APPENDIX C

Cyanide

Appendix C.1

International Cyanide Management Code

INTERNATIONAL CYANIDE MANAGEMENT INSTITUTE

The International Cyanide Management Code

www.cyanidecode.org

July 2005

The International Cyanide Management Code (hereinafter "the Code") and other documents or information sources referenced at *www.cyanidecode.org* are believed to be reliable and were prepared in good faith from information reasonably available to the drafters. However, no guarantee is made as to the accuracy or completeness of any of these other documents or information sources. No guarantee is made in connection with the application of the Code, the additional documents available or the referenced materials to prevent hazards, accidents, incidents, or injury to employees and/or members of the public at any specific site where gold is extracted from ore by the cyanidation process. Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein. Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.

SCOPE

The Code is a voluntary initiative for the gold mining industry and the producers and transporters of the cyanide used in gold mining. It is intended to complement an operation's existing regulatory requirements. Compliance with the rules, regulations and laws of the applicable political jurisdiction is necessary; this Code is not intended to contravene such laws.

The Code focuses exclusively on the safe management of cyanide that is produced, transported and used for the recovery of gold, and on cyanidation mill tailings and leach solutions. The Code originally was developed for gold mining operations, and addresses production, transport, storage, and use of cyanide and the decommissioning of cyanide facilities. It also includes requirements related to financial assurance, accident prevention, emergency response, training, public reporting, stakeholder involvement and verification procedures. Cyanide producers and transporters are subject to the applicable portions of the Code identified in their respective Verification Protocols.

It does not address all safety or environmental activities that may be present at gold mining operations such as the design and construction of tailings impoundments or long-term closure and rehabilitation of mining operations.

The term "cyanide" used throughout the Code generically refers to the cyanide ion, hydrogen cyanide, as well as salts and complexes of cyanide with a variety of metals in solids and solutions. It must be noted that the risks posed by the various forms of cyanide are dependent on the specific species and concentration. Information regarding the different chemical forms of cyanide is found at *www.cyanidecode.org/library/cyanide facts/cyanide chemistry*.

CODE IMPLEMENTATION

As it applies to gold mining operations, the Code is comprised of two major elements. The Principles broadly state commitments that signatories make to manage cyanide in a responsible manner. Standards of Practice follow each Principle, identifying the performance goals and objectives that must be met to comply with the Principle. The Principles and Practices applicable to cyanide production and transportation operations are included in their respective Verification Protocols. Operations are certified as being in compliance with the Code upon an independent third-party audit verifying that they meet the Standards of Practice, Production Practice or Transport Practice.

For implementation guidance, visit *http://www.cyanidecode.org/library/impl_resources.html*.

The programs and procedures identified by the Code's Principles and Standards of Practice and in the Cyanide Production and Transportation Verification Protocols for the management of cyanide can be developed separately from other programs, or they can be integrated into a site's overall safety, health and environmental management programs. Since operations typically do not have direct control over all phases of cyanide production, transport or handling, gold mines that are undergoing Verification Audits for certification under the Code will need to require that other entities involved in these activities and that are not themselves Code signatories commit to

and demonstrate that they adhere to the Code's Principles and meet its Standards of Practice for these activities.

This Code, the implementation guidance, mine operators guide, and other documents or information sources referenced at *www.cyanidecode.org* are believed to be reliable and were prepared in good faith from information reasonably available to the drafters. However, no guarantee is made as to the accuracy or completeness of any of these other documents or information sources. The implementation guidance, mine operators guide, and the additional documents and references are not intended to be part of the Code. No guarantee is made in connection with the application of the Code, the additional documents available or the referenced materials to prevent hazards, accidents, incidents, or injury to employees and/or members of the public at any specific site where gold is extracted from ore by the cyanidation process. Compliance with this Code is not intended to and does not replace, contravene or otherwise alter the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other requirements regarding the matters included herein. Compliance with this Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties.

PRINCIPLES AND STANDARDS OF PRACTICE

1. PRODUCTION **Encourage responsible cyanide manufacturing by purchasing from manufacturers who operate in a safe and environmentally protective manner.**

Standard of Practice

1.1 Purchase cyanide from manufacturers employing appropriate practices and procedures to limit exposure of their workforce to cyanide and to prevent releases of cyanide to the environment.

2. TRANSPORTATION **Protect communities and the environment during cyanide transport.**

Standards of Practice

2.1 Establish clear lines of responsibility for safety, security, release prevention, training and emergency response in written agreements with producers, distributors and transporters.

2.2 Require that cyanide transporters implement appropriate emergency response plans and capabilities, and employ adequate measures for cyanide management.

3. HANDLING AND STORAGE **Protect workers and the environment during cyanide handling and storage.**

Standards of Practice

3.1 Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures.

3.2 Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

4. OPERATIONS Manage cyanide process solutions and waste streams to protect human health and the environment.

Standards of Practice

4.1 Implement management and operating systems designed to protect human health and the environment including contingency planning and inspection and preventive maintenance procedures.

4.2 Introduce management and operating systems to minimize cyanide use, thereby limiting concentrations of cyanide in mill tailings.

4.3 Implement a comprehensive water management program to protect against unintentional releases.

4.4 Implement measures to protect birds, other wildlife and livestock from adverse effects of cyanide process solutions.

4.5 Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water.

4.6 Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.

4.7 Provide spill prevention or containment measures for process tanks and pipelines.

4.8 Implement quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

4.9 Implement monitoring programs to evaluate the effects of cyanide use on wildlife, surface and ground water quality.

5. DECOMMISSIONING **Protect communities and the environment from cyanide through development and implementation of decommissioning plans for cyanide facilities.**

Standards of Practice

5.1 Plan and implement procedures for effective decommissioning of cyanide facilities to protect human health, wildlife and livestock.

5.2 Establish an assurance mechanism capable of fully funding cyanide-related decommissioning activities.

6. WORKER SAFETY **Protect workers' health and safety from exposure to cyanide.**

Standards of Practice

6.1 Identify potential cyanide exposure scenarios and take measures as necessary to eliminate, reduce and control them.

6.2 Operate and monitor cyanide facilities to protect worker health and safety and periodically evaluate the effectiveness of health and safety measures.

6.3 Develop and implement emergency response plans and procedures to respond to worker exposure to cyanide.

7. EMERGENCY RESPONSE **Protect communities and the environment through the development of emergency response strategies and capabilities.**

Standards of Practice

7.1 Prepare detailed emergency response plans for potential cyanide releases.

7.2 Involve site personnel and stakeholders in the planning process.

7.3 Designate appropriate personnel and commit necessary equipment and resources for emergency response.

7.4 Develop procedures for internal and external emergency notification and reporting.

7.5 Incorporate into response plans monitoring elements and remediation measures that account for the additional hazards of using cyanide treatment chemicals.

7.6 Periodically evaluate response procedures and capabilities and revise them as needed.

8. TRAINING **Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.**

Standards of Practice

8.1 Train workers to understand the hazards associated with cyanide use.

8.2 Train appropriate personnel to operate the facility according to systems and procedures that protect human health, the community and the environment.

8.3 Train appropriate workers and personnel to respond to worker exposures and environmental releases of cyanide.

9. DIALOGUE **Engage in public consultation and disclosure.**

Standards of Practice

9.1 Provide stakeholders the opportunity to communicate issues of concern.

9.2 Initiate dialogue describing cyanide management procedures and responsively address identified concerns.

9.3 Make appropriate operational and environmental information regarding cyanide available to stakeholders.

CODE MANAGEMENT

Administration

The International Cyanide Management Institute ("The Institute") is a non-profit corporation established to administer the Code through a multi- stakeholder Board of Directors consisting of representatives of the gold mining industry and participants from other stakeholder groups. For additional information on the Institute, see: www.cyanidecode.org/theinstitute.

The Institute's primary responsibilities are to:

- Promote adoption of and compliance with the Code, and to monitor its effectiveness and implementation within the world gold mining industry.
- Develop funding sources and support for Institute activities.
- Work with governments, NGOs, financial interests and others to foster widespread adoption and support of the Code.
- Identify technical or administrative problems or deficiencies that may exist with Code implementation, and
- Determine when and how the Code should be revised and updated.

Code Signatories

Gold mining companies with either single or multiple operations, and the producers and transporters of cyanide used in gold mining can become signatories to the Code; the signature of an owner or corporate officer of the operating company is required. By becoming a signatory, a company commits to follow the Code's Principles and implement its Standards of Practice, or in the case of producers and transporters, the Principles and Practices identified in their respective Verification Protocols. Code signatories' operations will be audited to verify their operation's compliance with the Code.

When becoming a signatory, a gold mining company must specify which of its operations it intends on having certified. Only those cyanide production and transportation facilities that are related to the use of cyanide in gold mining are subject to certification. A company that does not have these operations audited within 3 years of signing the Code will lose its signatory status. See: www.cyanidecode.org/signatories&certifiedoperations.

Code Verification and Certification

Audits are conducted every three years by independent, third-party professionals who meet the Institute's criteria for auditors. Auditors evaluate an operation to determine if its management of cyanide achieves the Code's Principles and Standards of Practice, or the Production or Transport Practices for these types of operations. The Code's Verification Protocols contains the criteria for all audits. Operations must make all relevant data available to the auditors, including the complete findings of their most recent independent Code Verification Audit, in order to be considered for certification.

During an initial verification audit, an operation's compliance at the time of the audit will be evaluated. Subsequent re-verification audits will also evaluate compliance during the period between the preceding and current audits.

Upon completion of the audit, the auditor must review the findings with the operation to ensure that the audit is factually accurate and make any necessary changes. The auditor must submit a detailed "Audit Findings Report" addressing the criteria in the Verification Protocol and a "Summary Audit Report" that includes the conclusion regarding the operation's compliance with the Code to the signatory, the operation and to the Institute. The operation is certified as complying with the Code if the auditor concludes that it is in full compliance with the Code's Principles and Standards of Practice or its Principles and Practices for cyanide production or transportation. The detailed "Audit Findings Report" is the confidential property of the operation and shall not be released by the Institute in any fashion without the express written consent of the signatory and audited operation. The "Summary Audit Report" of certified operations will be made available to the public on the Code website. The operation may submit its comments regarding the Summary Audit Report to the Institute, which will be posted along with the Summary Audit Report on the Institute's website.

Operations that are in substantial compliance with the Code are conditionally certified, subject to the successful implementation of an Action Plan. Substantial compliance means that the operation has made a good-faith effort to comply with the Code and that the deficiencies identified by the auditor can be readily corrected and do not present an immediate or substantial risk to employee or community health or the environment. Operations that are in substantial compliance with a Standard of Practice, Production Practice or Transport Practice must develop and implement an Action Plan to correct the deficiencies identified by the verification audit. The operation may request that the auditor review the Action Plan or assist in its development so that there is agreement that its implementation will bring the operation into full compliance. The Action Plan must include a time period mutually agreed to with the auditor, but in no case longer than one year, to bring the operation into full compliance with the Code. The Auditor must submit the Action Plan to the Institute along with the Audit Findings Report and Summary Audit Report.

The operation must provide evidence to the auditor demonstrating that it has implemented the Action Plan as specified and in the agreed-upon time frame. In some cases, it may be necessary for the auditor to re-evaluate the operation to confirm that the Action Plan has been implemented. Upon receipt of the documentation that the Action Plan has been fully implemented, the auditor must provide a copy of the documentation to the Institute along with a statement verifying that the operation is in full compliance with the Code.

All operations certified as in compliance with the Code will be identified on the Code website, *www.cyanidecode.org/signatories&certifiedoperations*. Each certified operation's Summary Audit Report will be posted and operations with conditional certification will have their Summary Audit Report and their Action Plan posted.

An operation cannot be certified if the auditor concludes that it is neither in full compliance nor in substantial compliance with any one of the Standards of Practice (or Production or Transport Practice). An operation that is not certified based on its initial verification audit can be verified and certified once it has brought its management programs and procedures into compliance with the Code. Its signatory parent company remains a signatory during this process.

A gold mining operation that is not yet active but that is sufficiently advanced in its planning and design phases can request *pre-operational conditional certification* based on an auditor's review of its site plans and proposed operating procedures. An on-site audit is required within one year of the operation's first receipt of cyanide at the site to confirm that the operation has been constructed and is being operated in compliance with the Code.

A gold mining operation or an individual cyanide facility at an operation is no longer subject to certification after decommissioning of the cyanide facilities. A producer or transporter is no longer subject to certification after it no longer produces or transports cyanide for use in the gold mining industry.

Certification Maintenance

In order to maintain certification, an operation must meet all of the following conditions:

- The auditor has concluded that it is either in full compliance or substantial compliance with the Code.
- An operation in substantial compliance has submitted an Action Plan to correct its deficiencies and has demonstrated that it has fully implemented the Action Plan in the agreed-upon time.
- There is no verified evidence that the operation is not in compliance with the Code.
- An operation has had a verification audit within three years.
- An operation has had a verification audit within two years of a change in ownership, defined as a change of the controlling interest of the operating company.

Auditor Criteria and Review Process

The Institute has developed specific criteria for Code Verification auditors and will implement procedures for review of auditor credentials. Auditor criteria includes requisite levels of experience with cyanidation operations (or chemical production facilities or hazardous materials transport, as appropriate) and in conducting environmental, health or safety audits, membership in a self-regulating professional auditing association and lack of conflicts of interest with operation(s) to be audited.

Dispute Resolution

The Institute has developed and implemented fair and equitable procedures for resolution of disputes regarding auditor credentials and certification and/or de-certification of operations. The procedures provide due process to all parties that may be affected by these decisions.

Information Availability

The Code and related information and code management documentation are available via the Internet at www.cyanidecode.org. The website is intended to promote an understanding of the issues involved in cyanide management and to provide a forum for enhanced communication within and between the various stakeholder groups with interest in these issues. The website is the repository for Code certification and verification information.

ACKNOWLEDGEMENTS

This project was underwritten by a group of gold companies and cyanide producers from around the world. The Gold Institute was instrumental in organizing this financial and technical support and provided the administrative and logistical support necessary to successfully complete the project. This effort represents the first time that an industry has worked with other stakeholders to develop an international voluntary industry Code of Practice.

The individuals listed below participated in the process. Participation by these individuals does not necessarily represent an endorsement of the Code by their respective organizations.

Steering Committee

Harold Barnes (Chairman)[1]	Homestake Mining Company, United States
Stephen Bailey	International Finance Corporation, United States
Julio Bonelli	Government of Peru
Gordon Drake, Ph.D[2]	WMC Resources, Ltd., Australia
John den Dryver[3]	Normandy Mining Limited, Australia
Bill Faust	Eldorado Gold Company, Canada
Fred Fox[4]	Kennecott Minerals Company, United States
John Gammon, Ph.D.	Government of Ontario, Canada
Steven Hunt[5]	United Steelworkers of America, Canada
Juergen Loroesch, Ph.D.	Degussa, Germany
Basie Maree	Anglogold Company, South Africa
Glenn Miller, Ph.D.	University of Nevada, Reno, United States
Anthony O'Neill	WMC Resources, Ltd., Australia
Michael Rae	World Wide Fund For Nature, Australia
Stan Szymanski	International Council of Chemical Associations, United States
Stephan Theben[6]	European Commission, Spain
Federico Villasenor[5]	Minas Luismin, Mexico
Juergen Wettig	European Commission, Belgium

[1] Elected Chairman by the Steering Committee
[2] Substituted for Anthony O'Neill at Washington and Vancouver Meetings
[3] Substituted for Anthony O'Neill at Santiago Meeting
[4] Replaced Bill Faust on Committee after Napa Meeting
[5] Added to Steering Committee at Vancouver Meeting
[6] Substituted for Juergen Wettig at Washington, Vancouver and Santiago Meetings

Code Manager

Norman Greenwald	Norm Greenwald Associates, United States

Secretariat

Wanda Hoskin	United Nations Environment Programme, France
Tom Hynes, Ph.D.	International Council on Metals and the Environment, Canada
Kathryn Tayles	United Nations Environment Programme, France

Gold Institute

Paul Bateman	The Gold Institute, United States

Industry Advisory Group

Anglogold, South Africa	Homestake Mining Company, United States
Ashanti Goldfields Company, Ghana	Kinross Gold Corp., Canada
Australian Gold Council, Australia	Lihir Management Corp., Paupa New Guinea
Australian Gold Reagents, Australia	Mining Project Investors, Australia
Barrick Gold Corp., Canada	Newmont Gold Company, United States
Degussa, Germany	Normandy Mining, Australia

Dupont, United States
Glamis Gold, Ltd., United States
Gold Fields Limited, South Africa
The Gold Institute, United States
Placer Dome, Inc., Canada
South African Chamber of Mines, South Africa
Rio Tinto, United Kingdom
WMC, Australia

Appendix C.2

Cyanide – Properties, Uses, Storage & Handling (Dupont)

Sodium Cyanide

PROPERTIES, USES, STORAGE, AND HANDLING

DUPONT CHEMICAL SOLUTIONS ENTERPRISE

DUPONT

The miracles of science™

Notice:

Sodium cyanide may be fatal if swallowed, inhaled, or with prolonged skin contact. Contact with acids, water, or weak alkalies liberates poisonous gas. Causes eye burns and may irritate skin. See "Personal Safety and First Aid." See DuPont's Sodium Cyanide Material Safety Data Sheet (MSDS) for more detailed safety and health information.

For Emergency Assistance, Call DuPont at

(901) 357-1546

(This is a transportation emergency Cyanide Hotline to our Memphis, TN plant.
Do not use for routine technical or commercial information.)

For Transportation Emergencies,

Call DuPont at (901) 357-1546, Then Call

CHEMTREC at (800) 424-9300

(See "Transportation Emergencies")

For commercial or technical information, call your DuPont marketing representative or a sales office listed on the back cover.

Sodium Cyanide: UN 1689

DO NOT USE AS A PESTICIDE.

See DuPont's MSDS for detailed instructions for treatment of cyanide poisoning.

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Product Information

Introduction

DuPont sodium cyanide (NaCN) is a white crystalline solid, available in a briquette or granular form. The briquettes are uniform in size, average 18 g (about ⅔ oz) in weight, and have overall dimensions of approximately 3.5 × 3.5 × 1.3 cm (1⅜ × 1⅜ × ½ in). They are resistant to breakage and dusting, easy to scoop up, and readily soluble in water. The granules are irregularly shaped particles, typically sized to generate a minimum of dust, and pass 90–100% through a ⅜-in screen and 3% maximum through a USS Sieve No. 50. Cyanobrik® and Cyanogran® are DuPont trade names (see **Figures 1** and **2**).

The Chemical Abstract Service Registry Number for NaCN is 143-33-9.

Table 1. Physical Properties of Sodium Cyanide

Formula Weight	49.007
Melting Point, °C (°F)	564 (1047)
Boiling Point, °C (°F)	1496 (2725)
Specific Gravity, Solid, 25°C (77°F)	1.60
Apparent Bulk Density, Solid, kg/m^3 (lb/ft^3)	880–960 (55–60)
Specific Gravity, Liquid, 850°C (1560°F)	1.19
Heat of Formation, $\Delta H°_f$	
25°C, cal/g	–438
25°C, kJ/kg	–1833
77°F, Btu/lb	–788
Specific Heat, 26–73°C (78–163°F)	
Btu/lb·°F or cal/g·°C	0.335
kJ/kg·K	1.402
Heat of Fusion, mp, Btu/lb	77
cal/g	43
kJ/kg	179
Heat of Vaporization, bp, Btu/lb	1309
cal/g	727
kJ/kg	3041
Vapor Pressure, mmHg	
800°C (1470°F)	0.76
1200°C (2190°F)	89.8
1360°C (2480°F)	314.0
Solubility in Water, g NaCN/100 g water	
(see **Figure 3**), –20°C (–4°F)	35.4
20°C (68°F)	58.3

Table 2. Specifications and Typical Analysis

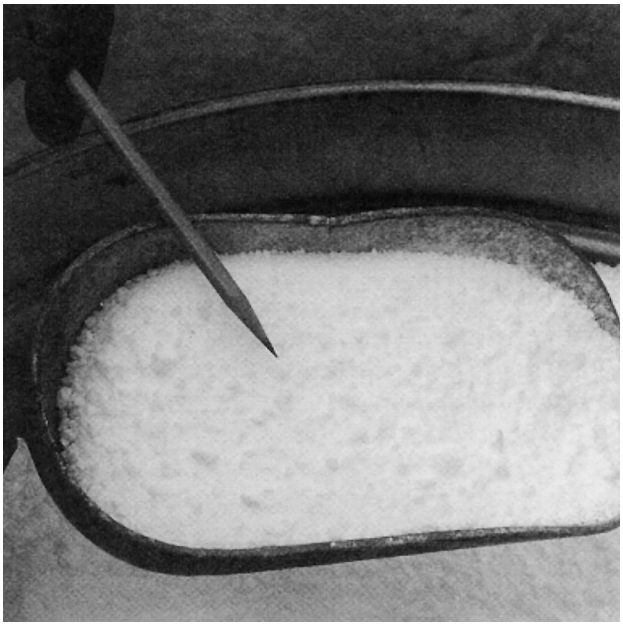
	Cyanobrik®/Cyanogran® and Bulk Solution Specifications	Typical Analysis*
Product Code 1220 (Cyanobrik®)		
Product Code 1222 (Cyanogran®)		
Sodium Cyanide, %	98.0 minimum	99
Sodium Hydroxide, %	0.5 maximum 0.06 minimum	0.3**
Product Code 1254 (Mining Grade)		
Sodium Cyanide, %	96.0 minimum	98
Sodium Hydroxide, %	0.5 maximum 0.06 minimum	0.3**
Product Code 1249 (30% Solution)		
Sodium Cyanide, %	28 minimum	30
Sodium Hydroxide, %	0.5 minimum	1

* Typical analyses based on historical production performance. DuPont does not make any express or implied warranty that future production will demonstrate or continue to possess these analyses.

** **CAUTION:** Sodium hydroxide (NaOH) content can be below 0.1% versus 0.3%, typical. NaOH should be added as outlined on page 3 to suppress hydrogen cyanide formation when making a water solution.

Figure 1. Cyanobrik®

Figure 2. Cyanogran®



Uses and Applications

The mining, metal, and chemical industries are the principal consumers of sodium cyanide. Typical uses include:

Ore Extraction and Ore Flotation

The cyanide process for extracting gold and silver from low-grade ores uses aqueous solutions of sodium cyanide with oxygen (air) to convert the noble metal (M) to soluble $NaM(CN)_2$, from which M can be recovered either by precipitation with zinc dust or aluminum powder, carbon absorption, or electrowinning.

In the flotation of galena (lead sulfide) to separate it from mixed ores containing sphalerite (zinc sulfide) and pyrite (iron sulfide), sodium cyanide acts as a depressor; that is, it reduces the tendency of gangue materials to travel along on the froth and so impair the separation. Sodium cyanide finds similar use in the separation of pentlandite from pyrrhotite and molybdenite from copper concentrates by flotation. It is also used to purify the molybdenite by extraction of copper impurities.

Electroplating

Cyanide brass, cadmium, copper, gold, silver, and zinc baths deposit decorative and/or functional metal coatings on a variety of substrates. The good throwing power of the electrolyte causes relatively uniform deposition of the metal on intricately shaped parts. Small amounts of special additives in the baths give bright metal deposits, even on recessed surfaces of the work. Cyanide electroplating baths are versatile and capable of high production rates, whether plating large or small parts.

Case Hardening Steel

Molten salt baths containing 10–30% sodium cyanide find extensive use for case hardening steels at temperatures below 870°C (1600°F). The molten bath process is fast, easy to operate, and yields mixed carbon-nitrogen cases that have excellent wear resistance and uniformity. The addition of activators or accelerators to the bath results in deeper cases than those obtained with plain cyanide baths, but nitrogen pickup is usually less.

The life of keen-edged tools improves when the high-speed steel is cyanide-nitrided in molten cyanide baths at about 565°C (1050°F).

Metal Cleaning

Aqueous solutions of sodium cyanide are effective metal cleaners, especially for smut removal after acid pickling.

Chemical Manufacture

Sodium cyanide is used to make other chemicals that lead to such diverse products as pharmaceuticals, vitamins, animal food supplements, dyes and pigments, insecticides, sequestrants, polymers, and catalysts (see "Chemical Reactions" section).

In any synthesis or formulation involving sodium cyanide, no cyanide compound should survive in the final product as an impurity. This is especially important with regard to consumer products.

Chemical Reactions

The most hazardous reaction of sodium cyanide is with acids to form lethal hydrogen cyanide (HCN) gas, which is invisible and has a very weak odor. Smaller amounts of HCN gas can develop from contact with water and weak alkalies. When working with sodium cyanide, special provisions are needed to address HCN and cyanide toxicity.

Sodium cyanide deliquesces in moist air. Crystals of the dihydrate, $NaCN{\cdot}2H_2O$, form when saturated solutions of sodium cyanide cool at temperatures below 35°C (95°F) (see **Figure 3**). Sodium cyanide dissolves in methanol (6.05 g/100 mL saturated solution at 15°C [59°F]). It also dissolves in liquid ammonia (3.7 g/100 mL NH_3 at –33°C [–27°F]).

Sodium Cyanide Reactions in Water

Sodium cyanide dissolved in water forms an equilibrium between ionized sodium cyanide and highly volatile HCN. In sodium cyanide solutions, HCN concentrations must be kept low and/or contained to avoid toxic fumes. HCN formation varies with pH, cyanide concentration, and temperature. HCN in the air around a sodium cyanide solution will also be influenced by the amount of solution surface area and ventilation. At pH 8 or less, essentially all of the cyanide will be in the HCN form in dilute solutions (see **Figure 5**). To suppress HCN formation in typical concentrated sodium cyanide make-up solutions, a pH of 12 minimum (preferably 12.5–13) should normally be used. In operating tanks, HCN in the vapor space above a 23% solution at room temperature typically will be about 250 ppm (without pH adjustment). With the pH raised to 12–12.5, HCN levels drop to around 125 ppm and below 50 ppm, around pH 13. Higher temperatures and solution concentrations increase HCN fumes. The following recommendation is made to minimize HCN formation with a modest pH increase.

When making a concentrated (e.g., 10–30%) cyanide solution, the proper procedure is to add about 0.5% sodium hydroxide (caustic) (about 50 lb [22.7 kg] sodium hydroxide/1000 gal [3785 L] water) before adding the cyanide. More sodium hydroxide will not be chemically harmful to the cyanide and will further reduce HCN levels; however, increased alkalinity increases eye hazards from splashes. For most operations, pH 12.5–13.0 is a good compromise to reduce HCN without excessively high alkalinity. If process chemistry prevents adding caustic, adequate precautions in design and operation must be taken to protect against HCN fumes, HCN polymerization, and cyanide hydrolysis.

pH is a log scale measurement, which means it takes about ten times as much sodium hydroxide to raise the pH each subsequent unit than the previous. For example, if it took 1 lb (0.45 kg) of sodium hydroxide to go from pH 9 to 10, it would take 10 lb (4.5 kg) to raise the pH from 10 to 11 and 100 lb (45.4 kg) from 11 to 12, etc. Therefore, even pH 11 water will need

Figure 3. Solubility of Sodium Cyanide in Water

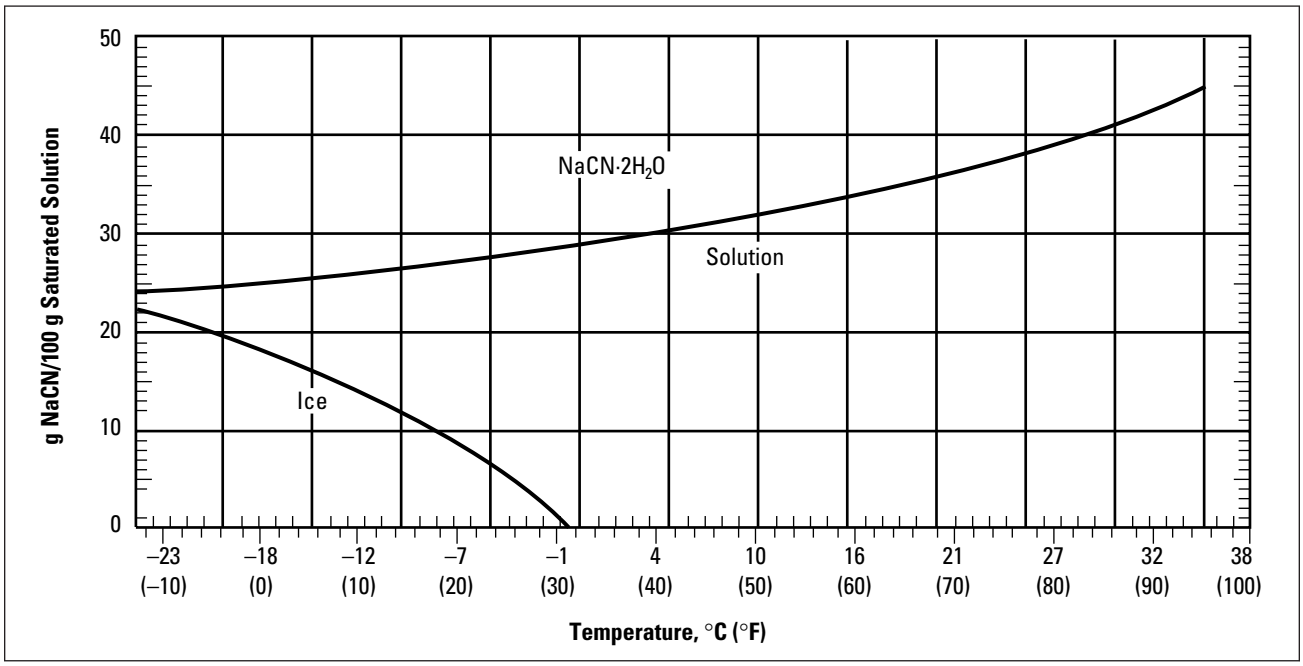


Figure 4. Densities of NaCN Solutions

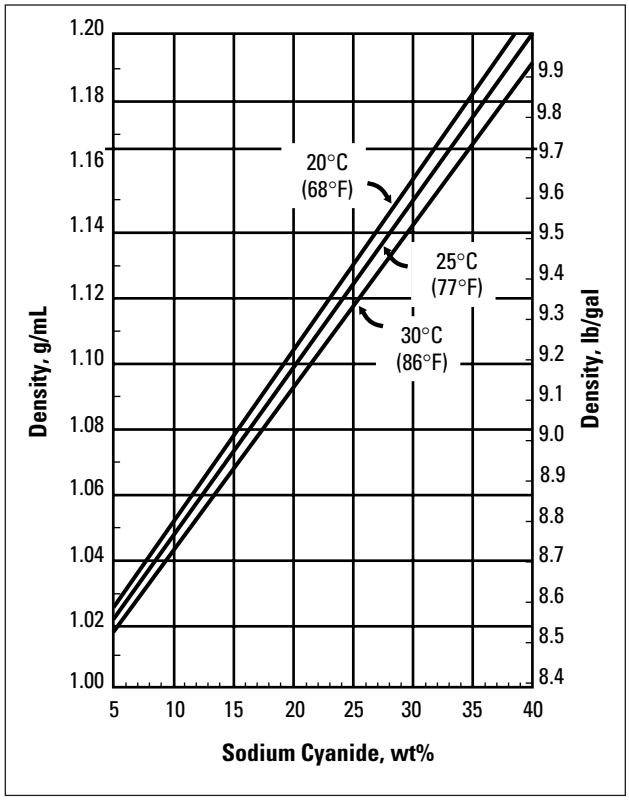
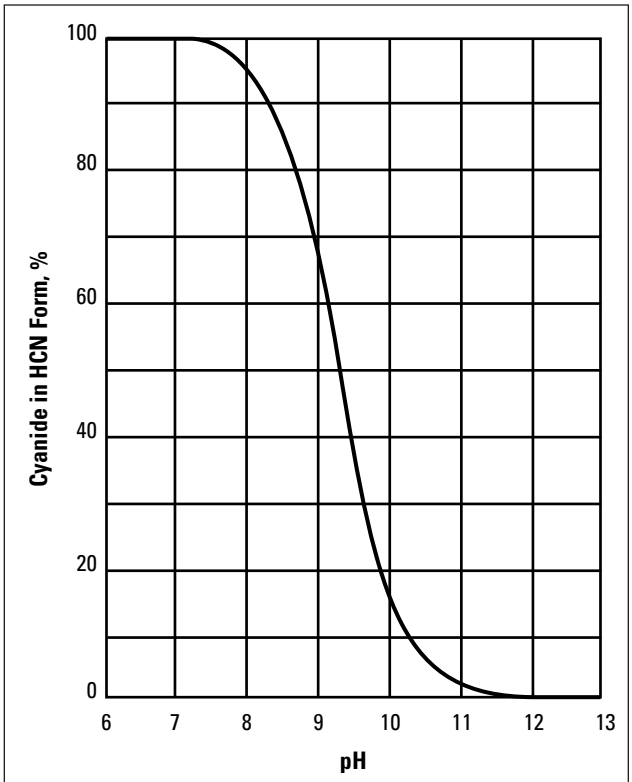


Figure 5. Effect of pH on Cyanide Ionization



Data based on work by D. Milne, 1950, for dilute sodium cyanide solutions at ambient temperature. Toxic HCN fumes increase as temperature and solution concentrations increase, requiring higher pH for safe operation.

nearly as much sodium hydroxide added to it as would the same amount of water with pH 6 to 11. Water at pH 10 or 11 does not eliminate the need to add sodium hydroxide to reduce HCN.

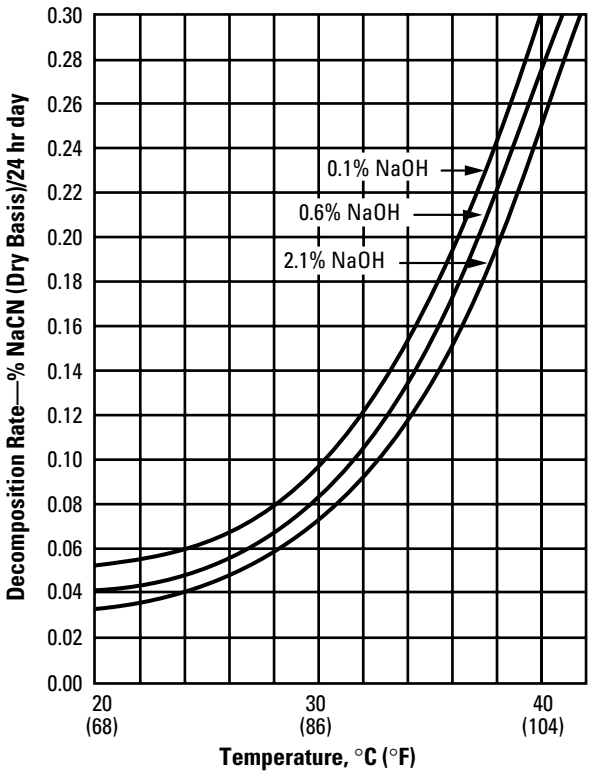
NOTE: Lime (calcium hydroxide) is not as effective as sodium hydroxide because of limited solubility, but it can be substituted to raise the pH to around 12.

Hydrogen cyanide molecules will polymerize to form the extremely inert HCN polymer. It is not unusual for HCN polymerization to occur in sodium cyanide solutions made without additional alkali, particularly if stored at elevated temperatures. In dilute solutions, HCN polymer will generate colors ranging from pale yellow to dark reddish brown. In stronger solutions, a dark brown precipitate resembling iron rust can form, which will interfere with heat transfer, plug pumps, orifices, etc., and may cause significant cyanide loss. HCN polymer will discolor chemical products. Again, high pH values give low HCN concentrations, which reduces the tendency for polymer formation.

Cyanide also reacts with water to form ammonia and formate ions. In the acid pH range, hydrolysis products are formic acid and ammonium salts. Alkaline solutions produce formate salts and volatile ammonia. With strong solutions, the volume of ammonia evolved can cause dangerous pressure buildup. One gallon of 30% sodium cyanide solution can produce more than 25 ft^3. For this reason, extra vent capacity is recommended for large, heated storage tanks.

Ordinarily, the reaction between cyanide and water proceeds slowly. However, the reaction rate increases exponentially with an increase in temperature. The critical range is around 60–70°C (140–158°F). At temperatures below this range, the reaction can be controlled by cooling and, where practical, by dilution. At higher temperatures, however, the reaction can be uncontrollable in large tanks for highly concentrated solutions and may proceed until substantially all the cyanide has been consumed, unless temperature control and adequate cooling and venting capacity exist (see **Figure 6**).

Figure 6. Decomposition Rate of NaCN Solutions



NOTE: The % NaOH shown above is the concentration in the final solution. The NaCN (as shipped–containing 0.1% NaOH), when diluted to a 30% solution, will have only 0.03% NaOH in the final solution, unless additional NaOH is added. (Decomposition rates based on DuPont experimental data using 35% NaCN solution.)

Heated sodium cyanide solution storage tanks should be equipped with facilities to measure and control solution temperature (see "Equipment" section). Heating may be needed to assist in dissolving the NaCN and to prevent freezing (see **Figures 3** and **7**). Cooling could be critically important, if the hydrolysis reaction begins to generate heat faster than it can be dissipated to the surroundings.

All the reactions discussed above consume a portion of the stored cyanide, and all are inhibited by maintaining low solution temperature and high pH.

If special precautions are taken, acidification of sodium cyanide to produce HCN gas for a chemical reaction is an acceptable procedure, but only when handled in special equipment by technically qualified people after detailed planning. HCN operations require much more stringent plans, procedures, and standards for safe operation.

CAUTION

Even in laboratory quantities, the accumulation and storage of liquid or gaseous HCN should not be considered until its properties and the required safety precautions for handling it have been studied carefully. In addition to toxicity considerations, violent exothermic polymerization reactions can occur with liquid HCN, even in the absence of air or oxygen.

Other Reactions

Oxidants, such as alkaline hypochlorite solutions, hydrogen peroxide solutions, and permanganate solutions can oxidize cyanide to sodium cyanate. These oxidation reactions find wide use in the control of cyanides in effluents. They must be done in dilute solutions at proper pH to avoid formation of highly toxic gases (see "Cyanide Destruction" section).

Strong oxidants, such as nitrites and chlorates, react violently when added to molten sodium cyanide (or vice versa).[1]

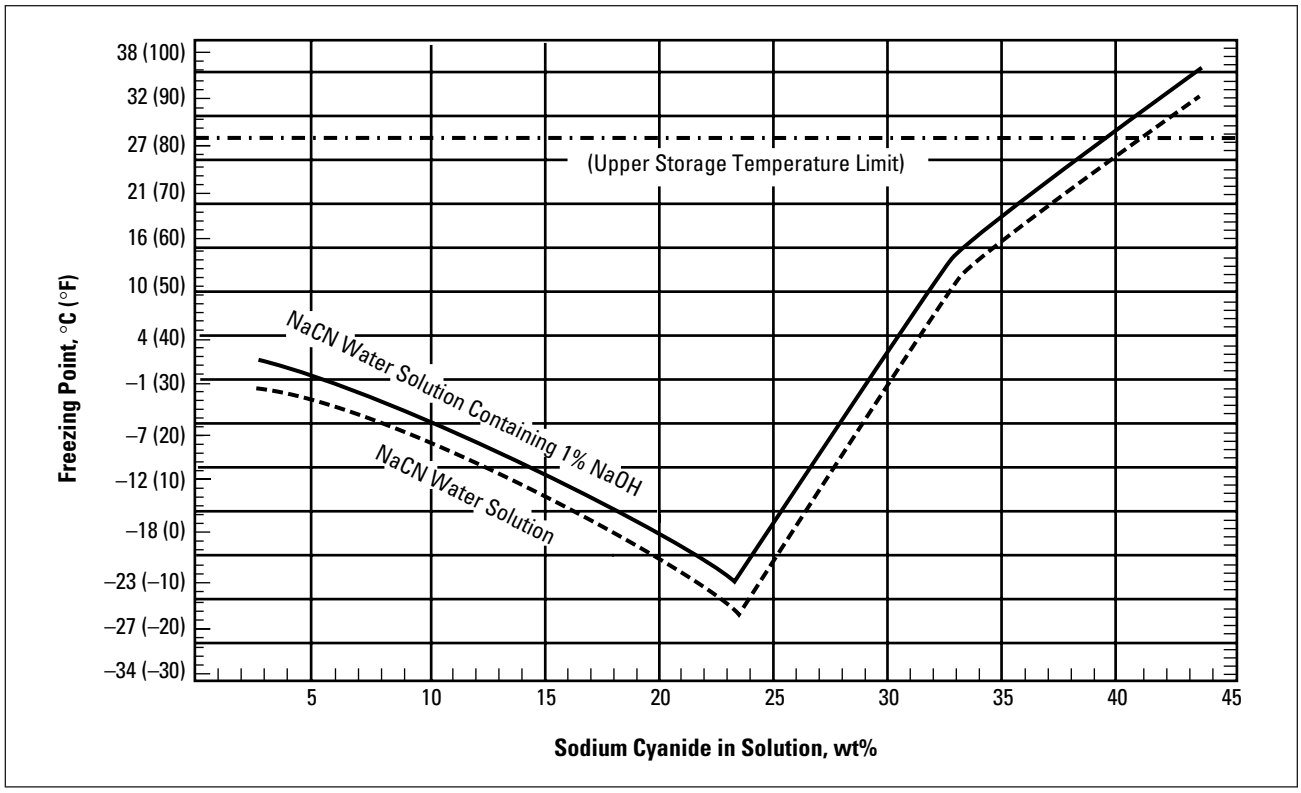
With the exception of lead and platinum, most metals (when finely divided) dissolve in aqueous sodium cyanide in the presence of oxygen.

Alkaline solutions of sodium cyanide dissolve water-insoluble cuprous and zinc cyanide with formation of sodium tricyanocuprate and tetracyanozincate, respectively.

Reacting an alkyl halide, sulfate, or toluene-sulfonate (p-$CH_3C_6H_4SO_2OR$) with sodium cyanide in aqueous alcohol, dimethylformamide (DMF), or similar aprotic solvent, leads to an alkyl cyanide (nitrile). Fusing a sodium aryl sulfonate with sodium cyanide yields the aryl nitrile; for example, sodium benzene-sulfonate (sodium phenyl sulfonate) gives benzonitrile (phenyl cyanide).

Hydrogen cyanide, generated by reacting an acid with sodium cyanide, is capable of adding to isolated double bonds and to the carbonyl group of an aldehyde or ketone. In the case of acetophenone, for example, the corresponding cyanohydrin forms, which hydrolyzes to atrolactic acid (a-phenylacetic acid, $C_6H_5[CH_3]C[OH]COOH$).[1] Similarly, when preparing an alpha-amino acid from an aldehyde or ketone by Strecker synthesis, the hydrogen cyanide and ammonia needed can come from ammonium cyanide formed in the reaction of sodium cyanide with ammonium chloride.

Figure 7. Freezing Points of Sodium Cyanide Solutions



One method of synthesizing the sodium salt of ethylen ediaminetetraacetic acid (tetrasodium EDTA, a chelating agent) combines ethylenediamine with formaldehyde and sodium cyanide in hot (80°C [175°F]) alkaline solution.

Personal Safety and First Aid

Health and Safety Hazards

See DuPont's MSDS for detailed instructions for treatment of cyanide poisoning.

Because of the toxicity of sodium cyanide, all persons working with it should be completely familiar with and observe the established safety practices.

Sodium cyanide is a fast-acting poison that can cause death quickly at low levels of exposure. Its toxic effect results from the inhibition of specific processes in body cells by restricting oxygen use in cellular respiration, particularly cells in the brain and heart. Poisoning can result from breathing cyanide gas, dust, or solution; absorption through the skin, particularly the eyes and other membranes and feet; and from ingestion. Contact with the skin may cause irritation and poisoning, particularly with prolonged contact, or if open wounds, skin abrasions, or mucous membranes are involved. Sodium cyanide is alkaline and causes eye burns. Because of the possibility of skin absorption of hydrogen cyanide fumes, air monitoring for HCN is required, even for someone wearing an air mask.

Cyanide is not a cumulative poison, and it is not a carcinogen. It is believed that there are no chronic effects of cyanide poisoning, unless repeated, prolonged exposures, well above the established limits, were to occur. With prompt treatment, recovery from overexposure is normally quick and complete.

CAUTION

Sodium cyanide in contact with acids liberates highly toxic and flammable hydrocyanic acid gas. Also, toxic amounts of HCN can be liberated from water solutions of sodium cyanide or from contact with weak alkalies, if ventilation is inadequate (see "Sodium Cyanide Reactions in Water").

Safety Precautions

The basic safety precautions are:

- Do not breathe sodium cyanide dust, solution mist, or HCN gas. Wear an approved toxic dust and mist respirator when there is danger of inhaling cyanide dust or mist. Additional protection is required for HCN gas. The respirator should be one approved by the Mine Safety and Health Administration (MSHA) or by the National Institute for Occupational Safety and Health (NIOSH).
- Avoid skin contact with cyanides, particularly contact with open wounds or skin abrasions. Wash skin promptly and thoroughly if contact occurs. Wear protective gloves when handling solid cyanides. Wear rubber gloves when handling cyanide solutions (butyl rubber has very low permeability; neoprene is more rugged with low HCN permeability and is best for many jobs involving sodium cyanide).
- Do not get in eyes. Wear approved chemical splash goggles when handling cyanide solutions and when there is danger of splashing.
- Have available and wear other protective clothing as needed for job safety. Develop clothing change procedures to ensure cyanide is not scattered around the site or inadvertently carried home.
- Immediately sweep up any spilled cyanide and place in a suitable container. Wash area and/or treat contaminated area with dilute hypochlorite solution to destroy the cyanide. Comply with federal, state, or local regulations. If approved, drain to neutral chemical waste sewer.
- Take every precaution to keep acids from contacting sodium cyanide. Do not store with acids or weak alkalies.
- Do not eat, drink, or smoke in areas where cyanide is present. Do not handle or store food or beverages in cyanide areas.
- Store sodium cyanide in a ventilated, locked area. Containers should be kept closed and their contents dry. Do not store under sprinklers; sodium cyanide will not burn, but sprinkler activation could cause an environmental problem. Local fire regulations may require sprinklers. Always check and follow local regulations. If sprinkling is required, the area must be diked to contain the runoff.
- Have antidote, emergency plans, and training in place before using cyanide. See DuPont's Sodium Cyanide MSDS for detailed instructions.

Sodium Cyanide Exposure Limits

The U.S. Department of Labor (OSHA) has ruled that an employee's exposure to sodium cyanide in any 8-hr work shift of a 40-hr week shall not exceed a time-weighted average (TWA) of 5 mg of cyanide per cubic meter of air.[2,3] It also cautions that because cyanide may penetrate the skin, control of vapor or dust inhalation alone may not be sufficient to prevent absorption of an excessive dose.

HCN Exposure Limits

The current OSHA workplace exposure limit for HCN is 11 mg/m^3 (10 ppm), ***8-hr average***. A 1989 revision of the HCN limit (along with several hundred other chemicals) to 5 mg/m^3 (4.7 ppm), ***15-min average***, was vacated by court order, and the pre-1989 limit has been reinstated. OSHA (and others) also cautions that because hydrogen cyanide may penetrate the skin, control of vapor inhalation alone may not be sufficient to prevent absorption of an excessive dose.[2,3] During all of this, the U.S. Mine Safety and Health Administration (MSHA) limit stayed at 10 ppm for HCN. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a 4.7 ppm limit instantaneous ceiling value with a similar skin notation.[4] DuPont's experience supports the current OSHA and MSHA regulatory levels. However, as a matter of practice, DuPont does not have people working for prolonged periods under conditions approaching our upper limits, because we can design/operate to avoid prolonged exposure.

In summary, HCN air quality requirements will vary from jurisdiction to jurisdiction, and it is incumbent on each user to be aware of and comply with the rules regulating exposure to HCN in their regulatory jurisdiction. The specific OSHA and MSHA exposure limit for HCN is currently 11 mg/m^3 (10 ppm) for an 8-hr TWA. The ACGIH Threshold Limit Value (TLV) is 5 mg/m^3 (4.7 ppm), 15-min TWA. This is also a ceiling value. The DuPont Acceptable Exposure Limit (AEL) is 4.7 ppm, 15-min TWA with current regulatory ceiling limitations. All of these exposure limits carry a "skin" notation indicating that HCN may penetrate the skin; therefore, control of vapor inhalation alone may not be sufficient to prevent cyanide poisoning. Also, exposure limits are subject to change, and users should stay current with regulatory changes.

Symptoms of Cyanide Poisoning

Personnel should be constantly alert for symptoms of cyanide poisoning in themselves and others. The following poison symptoms can result from other causes, but should be investigated promptly when they occur around cyanide:

Reddening of the eyes*	Nausea*
Irritation of the throat	Headache*
Palpitation	Weakness of arms and legs
Difficulty in breathing	Giddiness
Salivation	Collapse
Numbness	Convulsions

Effects of Exposure to HCN Vapor

The following toxicity data show the "Reported Human Response to Various Concentrations of HCN Vapor"[5]:

2–5 ppm	Odor threshold
10 ppm	OSHA and MSHA exposure limit, 8-hr TWA[2]
20–40 ppm	Slight symptoms after several hours
45–54 ppm	Tolerated for ½ to 1 hr without significant immediate or delayed effects
100–200 ppm	Fatal within ½ to 1 hr
300 ppm	Rapidly fatal (if no treatment)

These numbers should be considered reasonable estimates only, because data are not exact and effects vary for different people. Also, *heavy breathing from physical work will increase cyanide intake and reduce the time for symptoms to show.* The "rapidly fatal" exposure level of 300 ppm assumes no first aid or medical treatment; either is very effective if used quickly.

* Reddening of the eyes (and skin) is one of the earliest symptoms, with nausea and/or headache common in low level exposure. These three are the most readily identifiable symptoms of low level cyanide overexposure.

Prompt administration of the recovery techniques has proven very effective, but emphasis must be placed on quick action. Seconds count, and treatment should be provided within about 200 sec (3–4 min). In case of overexposure to cyanide, quick action is required to sound the alarm, remove the patient from the contaminated area, and provide treatment. With prompt treatment as prescribed, recovery is normally quick and complete with no serious aftereffects. Treatment after 3–4 min can still be effective, but chances of recovery are reduced without prompt treatment. Unlike many poisons, cyanide is not cumulative. While cyanide poisoning can be rapidly fatal, no case should be considered hopeless. Treatment should be continued until a physician certifies death.

First Aid and Medical Treatment

See DuPont's MSDS for detailed instructions for treatment of cyanide poisoning.

Ordering Cyanide Poisoning Antidote Kits and Amyl Nitrite

To obtain cyanide poisoning antidote kits and/or amyl nitrite ampules:

1. Obtain a prescription from your local physician (required because amyl nitrite is a prescription product).
2. Purchase the cyanide antidote kit from your pharmacy. The pharmacy can obtain the kit from Akorn Pharmaceuticals at (800) 932-5676.
3. Amyl nitrite can also be purchased from your local pharmacy or from Save-A-Life Systems in Ft. Wayne, IN at (800) 933-5885.

Shipping

Containers

DuPont produces sodium cyanide in briquette and granular forms.

A variety of containers are used as follows:

Nonreturnable Drums

Net weight 50-kg (110.2-lb) steel drums stacked 9–27 to a pallet.

Net weight 100-kg (220.4-lb) steel drums stacked eight to a pallet (see **Figure 8**).

Note: Drums can be stored three pallets high in a warehouse.

Figure 8. Palletized 100-kg (220-lb) Drums Being Loaded into a Truck

Figure 9. A Tuff-Pak Box Full of Bags

Tuff-Pak

- 48 20-kg (44-lb) pinch-bottom, multiwall composite bags that are hermetically sealed and water-resistant. The bags are packaged in a wooden box on a self-contained pallet. Net weight 960 kg (2116 lb). Individual bags are not to be sold separately (see **Figure 9**).

Figure 10. Partially Loaded Container of IBCs

Nonreturnable Intermediate Bulk Container (IBC)

- Water-resistant package holding 1000 kg (2205 lb). Box dimensions are 44¾ × 44¾ × 44⅜ in high (see **Figure 10**). For shipment, there are normally 20 IBCs in a container.

Returnable FLO-BIN® Containers (Briquettes Only)

- 1361- and 1497-kg (3000- and 3300-lb) net returnable FLO-BIN® containers, 12–14 bins per truck (see **Figures 11** and **14**).

Bulk Trucks

- 30% solution tank trailers (18,000 lb, 100% basis—8180 kg) are available from the Carlin, NV terminal. They can be unloaded using the customer's pump or by plant or truck air (see **Figure 13**).
- Excel I tank trucks (6804–9526 kg [15,000–21,000 lb]). These trucks are equipped with circulation pumps that will permit water addition, dissolving by circulation, and then pumping off into the customer's tank (see **Figure 15**).
- Excel II tank trucks (15,876–18,144 kg [35,000–40,000 lb]) are unloaded by circulating premeasured water from a storage tank by a driver/technician (see **Figures 12** and **16**).

Figure 11. Bins corded two abreast on a flatbed trailer. The bins are strapped to the trailer to prevent movement during transportation.

Transportation

Sodium cyanide must not be shipped by U.S. mail. The U.S. Department of Transportation (DOT)[3,6] hazard classification is Class 6.1 (Toxic) with an ID number of UN1689. A DOT toxic label is required. Transportation equipment must also be placarded with toxic placards in accordance with DOT requirements.

Sodium cyanide drums, Tuff-Paks, and IBCs should be shipped in vehicles that have secondary containment, such as vans. Pickup trucks, etc., should not be used. In case of an accident, secondary containment will minimize the impact of spilled material. Also, the driver must be in a separate compartment isolated from the cyanide.

Sodium cyanide must not be shipped with any acids (dry or liquid), food (human or animal), or ingredients for products used for human or animal consumption, including food, pharmaceuticals, food supplements, etc. Shipment with flammables and strong oxidizers should be avoided, as these mixed shipments can cause fire fighting complications, including cyanide runoff, in case of an accident and subsequent fire.

Storage and Handling

Storage and use areas should be designed so that accidental spillage can be contained and disposed of safely.

Storage Security

When sodium cyanide is stored, security should be maintained so only authorized people have access to it. Locked rooms or locked fenced areas can be used. Only the quantity required for immediate use should be removed from storage.

Figure 12. Excel II Truck

Drums

Drums of sodium cyanide should be stored inside and segregated from acids, weak alkalies, and strong oxidizing materials such as nitrates. It is also recommended that sodium cyanide be stored away from flammables and combustibles to minimize the chance of cyanide-water runoff as a result of fire fighting. Where local regulations permit, sodium cyanide drums should not be stored under sprinklers, because sodium cyanide will not burn in ordinary fires and cyanide runoff must be avoided. Storage with food or intermediates for human or animal products must be avoided. Observe all the precautions given under "Safety Precautions."

Figure 13. NaCN Solution Truck

If possible, open cyanide containers in the areas in which the cyanide is to be used. Remove the cover from the container, and remove the cyanide with a metal scoop or dump the cyanide from the container as required. Replace the cover on the container if the drum still contains cyanide. Store appropriately. Immediately pick up any spillage.

Drum Disposal

Sodium cyanide drums are nonreturnable, and it is against U.S. DOT regulations to reship or recoup the drum, except when approved for disposal of waste materials. Empty drums should be visually inspected for cyanide removal, flushed with large volumes of water, and then drained. This flush and drain cycle should be repeated three times to comply with federal regulations. Rinse water should be collected, treated, and disposed of according to local regulations (see "Cyanide Destruction" section). After cleaning, drum labels should be removed or obliterated to confirm cleaning, and the drum destroyed to prevent reuse. After the above, recycling as scrap metal is appropriate.

FLO-BIN®

A typical FLO-BIN® unloading and storage system is shown in **Figure 14**. A special design manual is available from DuPont. Contact DuPont's sales representative to discuss package and delivery options to meet specific needs.

Sodium cyanide is shipped in returnable FLO-BIN® containers (600 lb tare weight) to customers by truck or rail. In trailers, bins are shipped two abreast. Road weight limitations restrict the truck load to 12–14 bins. The advantages of FLO-BIN® deliveries are:

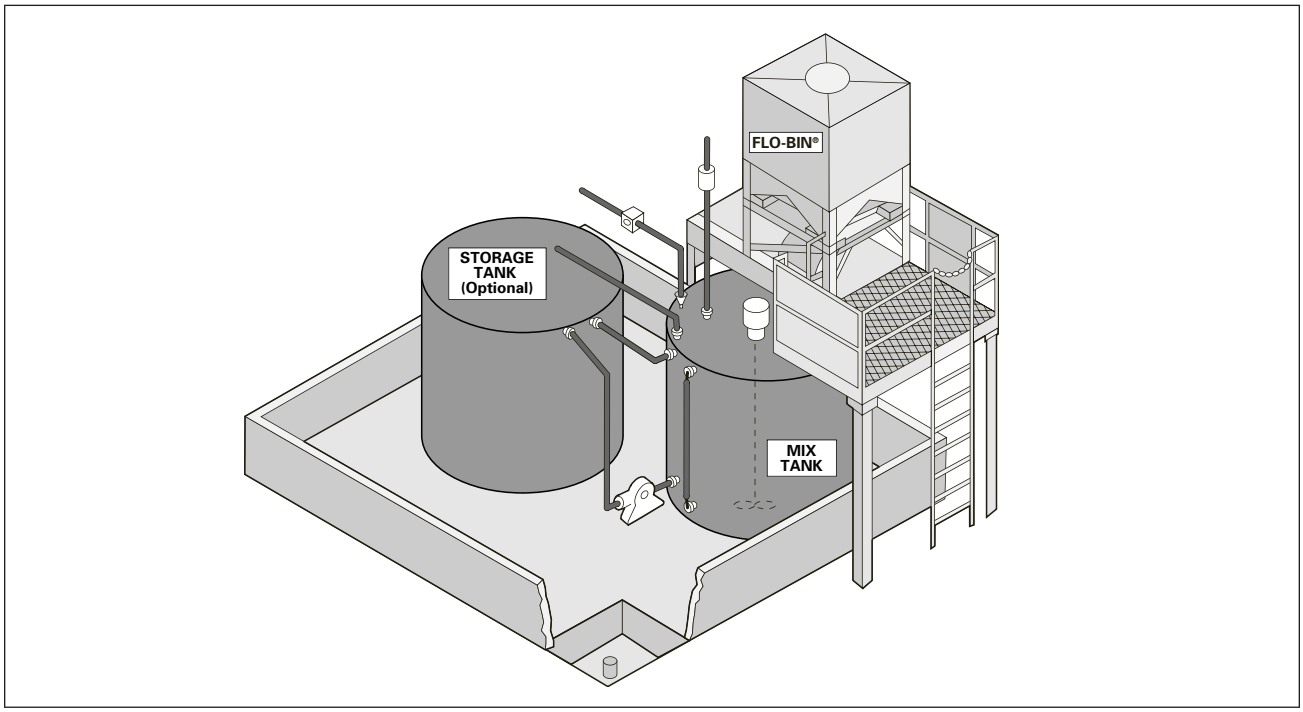
Economics—Customers using about 100,000 kg (200,000 lb) or more per year of sodium cya-nide can effect direct cost savings versus other smaller packages.

FLO-BIN® Customer Shipping Responsibility

When returning bins, the customer becomes the shipper and bears the responsibility for seeing that all safety precautions are carried out. DOT regulation 49 CFR 173.29 requires that a returnable container offered for transportation must meet the same standards as when the container previously held a greater quantity of a hazardous material. Returning bins do not have to be cleaned internally. Internal water washing is discouraged, because cyanide solution rundown is likely to create spillage, unless the bins are dried. External cleaning and inspection of each bin is required to ensure no cyanide is left on the outside and that the camlocks are locked closed with locking pins or wires.

When returning bins, secure bins with equipment provided. DO NOT reverse the poison placards (four) on car or truck. DO NOT remove or deface product label on bin.

Figure 14. Typical FLO-BIN® Unloading System



Intermediate Bulk Container (IBC)

IBCs are the ideal package for most large consumers of NaCN who are not near a manufacturing facility. IBCs are readily handled with forklift trucks. DuPont recommends stacking IBCs two high for storage. The DuPont IBC holds 1000 kg (2205 lb) of NaCN. When diluted to 23% (the minimum freezing point of a NaCN/water solution) with pH at 12 or above, the IBC will make about 3900 L (1030 gal).

The IBC is emptied by lifting the bag by the straps using a forklift or hoist and then positioning and lowering the bag onto the specially designed knife slitter that cuts the bag, allowing the contents to drop into the dissolving tank.

IBC Decontamination and Disposal

Decontamination and disposal of used IBC materials must be properly handled to prevent environmental contamination and meet regulations. The bags should be empty—this should be confirmed visually or by weight before they are sent to a disposal facility. Then, a flush and drain cycle, repeated three times, will dissolve any residual cyanide left in the bag. Care must be taken to ensure the bag material does not overlap and prevent water contact—interfering with the dissolving process. Rinse water should be collected and recycled or treated and disposed of according to local regulations. As part of the cleaning process, labels should be removed or obliterated. If burning is the method of disposal, keep in mind that all of the NaCN will probably not be destroyed during the burning process, and the ashes must be properly contained.

30% NaCN Solution

The DuPont terminal in Carlin, NV ships 30% NaCN solution as far away as 300 miles. The specially designed trailers hold 6300 gal—equivalent to 18,000 lb of dry NaCN. DuPont 30% NaCN solution is often the most convenient way to receive NaCN. The drivers are specially trained to make these deliveries and have a safety record envied in the trucking industry. DuPont offers technical assistance and support to assist with the design or modification of an existing system.

Excel Trucks

Excel trucks combine transportation and unloading safety by permitting shipment of solid sodium cyanide and unloading by dissolving the cyanide in place and then pumping the solution into appropriate storage. Excel I (see **Figure 15**) is ideal for customers with annual usage of ½ to 1 million lb, where 30% solution may not be desirable, but Excel I is only available in limited geographical areas. Excel II delivery systems (see **Figure 16**) are ideal for many large sodium cyanide users and usually require an annual NaCN usage of about 1 million lb per year to justify the larger investment compared to handling FLO-BIN® containers. Cost factors such as location (transportation), expected operating life, available space, inventory requirements, etc., should be evaluated with DuPont to determine the best system for each specific situation. Design manuals are available for Excel systems.

When dissolving the sodium cyanide in Excel systems, position the tank truck so that the hose connection can be made between the truck pipe headers and the storage tank and pump piping.

For Excel II, meter into the storage tank the amount of water and sodium hydroxide (NaOH) needed to make the desired concentration of sodium cyanide solution (about 363 kg [800 lb] NaOH for 18,144 kg [40,000 lb] NaCN). The water temperature needed for dissolving the NaCN depends on the solution concentration needed, the circulation rate, and weather conditions. The water can be preheated up to about 38°C (100°F) to speed the dissolving, but heated water is frequently not needed, unless cold weather and cold water are involved (see "Chemical Reactions" section).

Cyanide decomposition rates increase with higher temperatures, with sodium formate and ammonia being formed. Because the decomposition reaction is exothermic, provision must be made for temperature monitoring and emergency cooling, if heating is used (see "Temperature Indicators, Insulation, Heating, and Cooling").

Excel II Unloading Procedures

Position valves. Start the pump. Check the system for leaks. Circulate the water continuously from the storage tank through the tank truck from the bottom to top to flood the truck and overflow back to the storage tank. Listen to the rattling briquettes by placing your ear near the bottom of the tank trailer. Dissolving should be complete about 30 min after the rattling stops, but system experience will provide the best guide. Then, pump the sodium cyanide solution from the tank truck into the storage tank. The dissolving time varies with circulation rate, water temperature, and final concentration, but dissolving can be complete in about 1½ hr under best conditions. Typically, 3–4 hr are needed in winter, without heat, for a 20–25% concentration.

Figure 15. Typical Excel I Unloading System

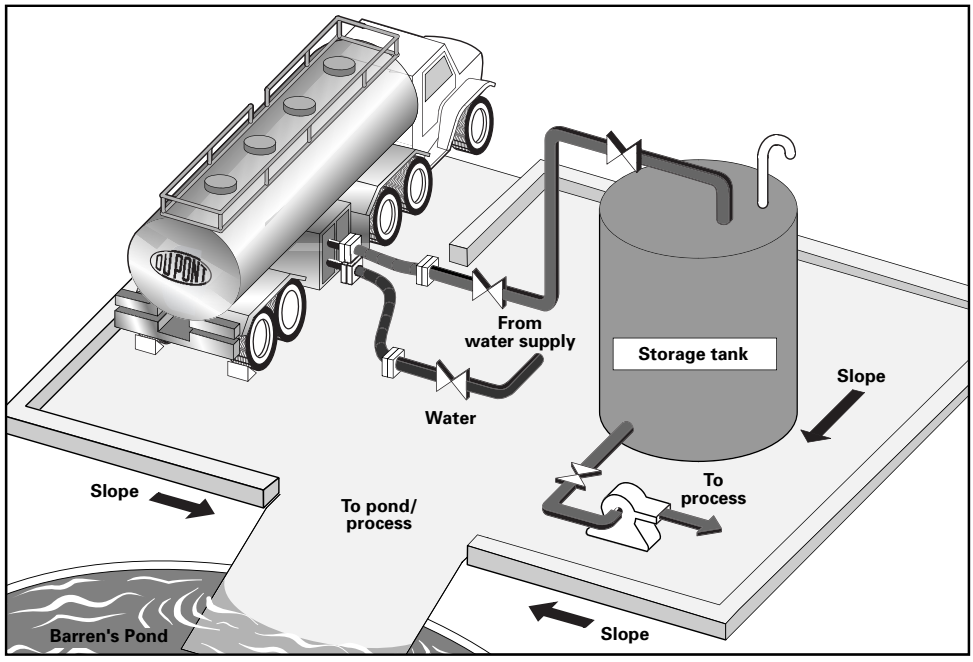
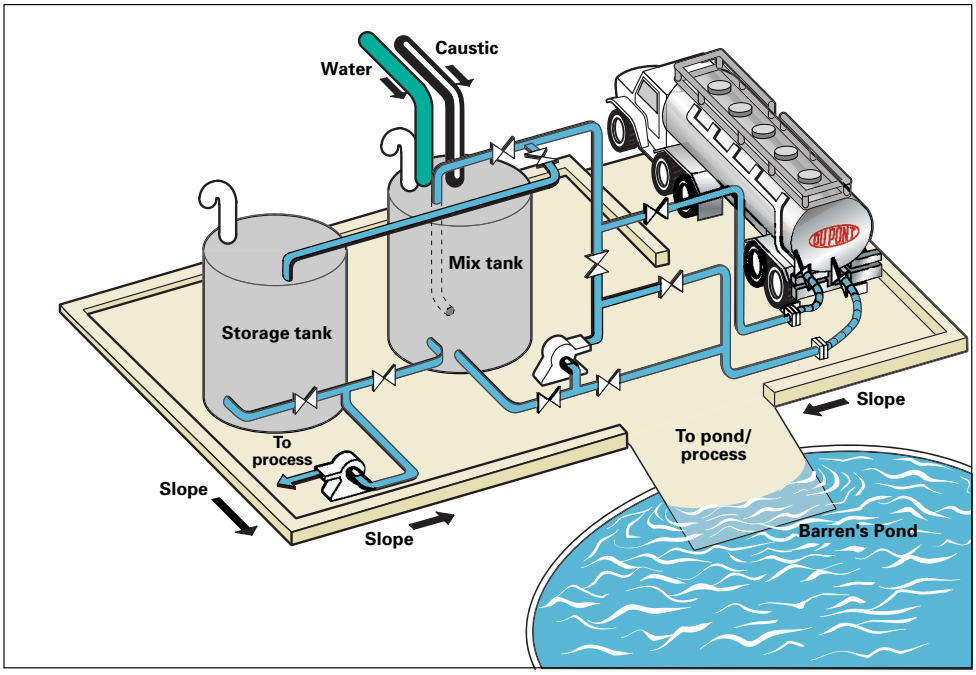


Figure 16. Typical Excel II Unloading/Storage System



Equipment

Materials of Construction

Carbon steel equipment is usually satisfactory for sodium cyanide solutions where velocities are not over 1.2–1.5 m/sec (4–5 ft/sec). At higher velocity, 304 or 316 stainless steel is sometimes recommended, because an erosion-corrosion effect occurs on steel. Carbon steel with a corrosion allowance may be acceptable instead of stainless to reduce cost, particularly if flow is frequently shut off so no erosion-corrosion is occurring. Even at very low velocities, welded, not threaded, piping should be used for all pipe materials to avoid leaks. To avoid leaks, no threaded connections should be used for piping instruments, drains, or any other connection. For pumps and instruments, 316 stainless is recommended. Valve operating conditions will determine whether carbon steel versus stainless can be used. Gaskets of Teflon® or nitrile-butadiene rubber (NBR), with Kevlar® filler, are recommended for sodium cyanide solutions.

Solution Storage Tank

Sodium cyanide solution is stored in a tank typically fabricated from ¼-in carbon steel plate. For bulk installations, top nozzles are recommended for a 15.2- to 20.3-cm (6- to 8-in) pipe vent, a 10-cm (4-in) fill and circulating line, level indicator, high-level alarm, provision for water, and caustic additions and manway. A top 4-in nozzle with a physical break in the water line will prevent backflow. Bottom openings must also be provided for a 15-cm (6-in) pump suction line, temperature control-alarm, and (optional) heating/cooling coils. The size of the storage tank depends upon the sodium cyanide shipment size and concentration of solution required. For example, 18,150 kg (40,000 lb) of sodium cyanide makes 71,000 L (18,750 gal) of 23% solution. A vertical tank 4.9 m (16 ft) in diameter by 5.0 m (16½ ft) high has a nominal 95,000-L (25,000-gal) capacity, which is sufficient to allow some outage and/or solution inventory (see **Figure 17**). The tank may be lined with neoprene to prevent buildup of iron content, if this is critical to the process. All pipe nozzles should be schedule 40 pipe minimum.

To provide mixing, a properly aligned dip tube/mixer with a siphon vent must be installed.

If the storage tank is located inside a building, all tank openings must be sealed and the tank vent routed outside the building to a safe location. This will prevent the discharge of hydrogen cyanide inside the building when the tank is being filled (see "Caustic Addition" on page 15).

Pump

For Excel II, a 316 stainless steel pump with a 10.2-cm (4-in) suction and a 7.6-cm (3-in) discharge is needed. It should be capable of delivering 2271–2650 L (600–700 gal) per minute at 18.3–21.3 m (60–70 ft) head. Small pumps will not provide sufficient agitation for tank car cyanide dissolving. Totally enclosed, fan-cooled, 25-HP motors are recommended.

Water Meter and Supply

A 7.6-cm (3-in) water meter with a preset totalizer and an automatic cutoff is recommended in the storage tank water addition line. There should be a physical disconnection in the water supply line to prevent cyanide from backing up into the water system.

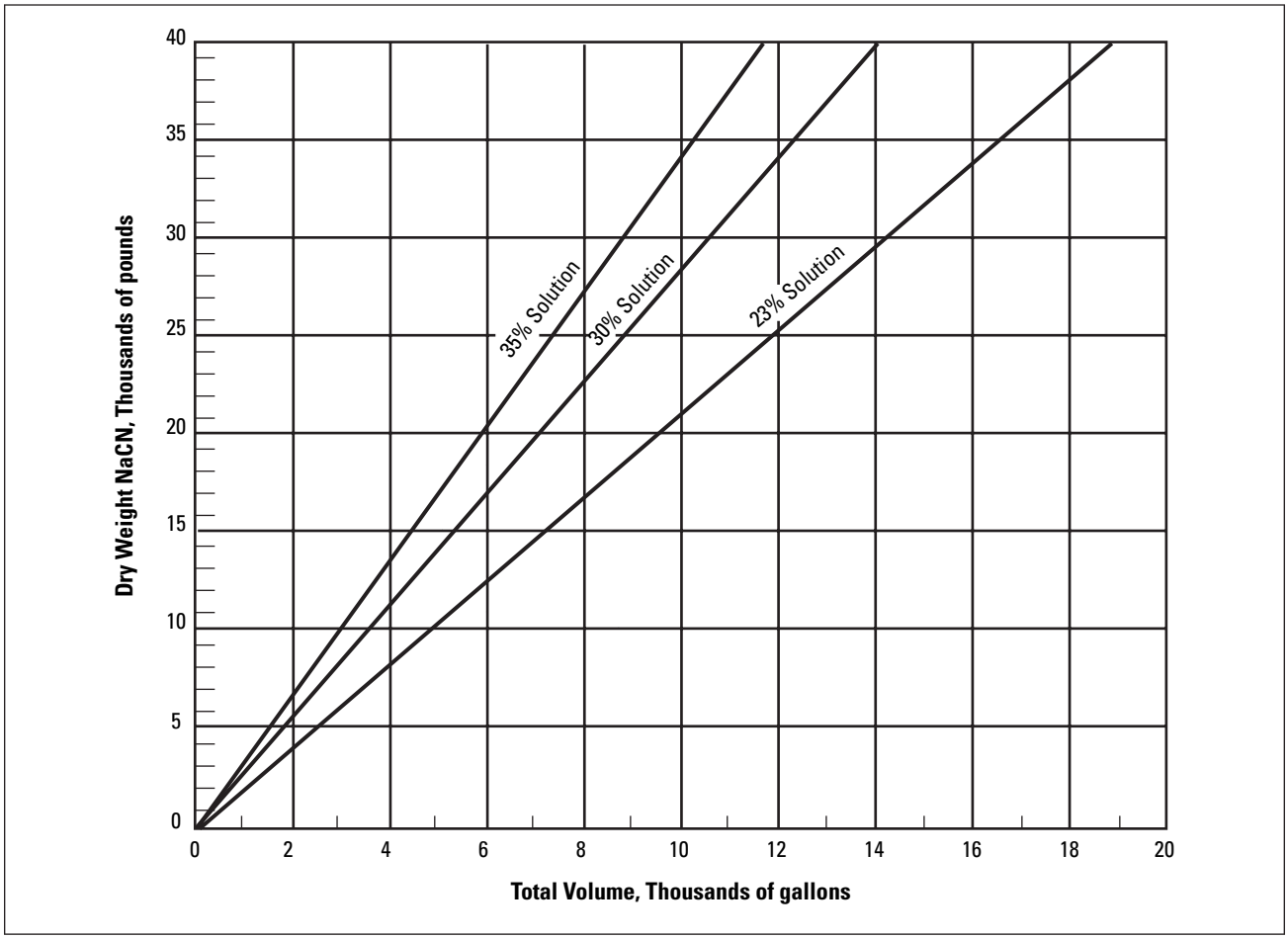
Pipe and Hoses

Welded, not threaded, carbon steel (or 304 or 316 stainless steel) pipe with minimum flanges can be used (see "Materials of Construction" for piping and gaskets). Excel II circulation piping of 10.2-cm (4-in) is recommended (except for the line from the tank to the pump inlet, which should be 6 in, to minimize NPSH losses) with all valves, pumps, etc., located inside the dike and minimum flanges outside the dike. Tank car and truck hoses should be overdesigned to ensure against failure. Hose pressure rating should be 225 psi minimum with burst pressure (including end connections) at least twice the rated pressure. Contact DuPont for hose design and vendor recommendations. Circulation piping system, including hoses, should be inspected before each use to protect against failure and a major spill. Hoses should be long enough to permit hookup, regardless of the direction the vehicle comes into the facility. Sodium cyanide solution trailer connections are located at the rear (bumper level) and middle (on top) of the trailer; Excel II trailer connections are located at the rear (bumper level); and Excel I connections are in the box located in the middle of the trailer (ground level). All connections are quick connects, except for the top solution connection, which may be either bolted or quick connect.

Drainage Control

The storage tank should be diked and have a sealed concrete bottom. No dike drain should be installed, because it might leak or be left open. The unloading area should be curbed and drainage control provided that will prevent spilled cyanide solution from draining into public water courses (see "Pipe and Hoses"). Specific spill control requirements depend on surroundings and local regulations. Impounded sodium cyanide can be reclaimed or chemically destroyed.

Figure 17. Solution Volume Curves—Gallons of Solution from Dry Weight at 35°C (95°F)



Filter

To obtain a clear solution, a filter can be used. It should be located so that it filters the solution between the tank car and the storage tank and, also, between the storage tank and process. Filters are not needed if a clear solution is not required.

Level Indicator and Alarm

A sonic liquid level indicator is preferred over a float-type instrument, as it is more reliable, easier to read, and can be installed at a convenient location. It is recommended that a high-level alarm system, equipped to shut off the pump, be installed to prevent overflowing the storage tank.

Temperature Indicators, Insulation, Heating, and Cooling

Sodium cyanide solution should be stored above the crystallization point (see **Figure 3**), but normally below 38°C (100°F), when possible, to reduce decomposition (see **Figure 6**). A temperature control system may be needed for high concentrations. Tank insulation can be fiberglass with a sheet aluminum cover, if climate and solution concentration warrant. Low pressure steam can be used to reduce localized overheating. The same coils can be used for circulating cold water when necessary. Alternately, live steam can be injected, if small concentration changes from condensation are acceptable.

CAUTION

Read the "Chemical Reactions" section carefully and note the dangers at high temperatures.

Caustic Addition

To minimize highly toxic HCN formation and prevent color formation from HCN polymerization in the stored sodium cyanide solution, sufficient caustic (sodium hydroxide) is added to give a pH 12, preferably 12.5–13. Caustic addition to provide a 0.3–0.5% solution (about 50 lb NaOH per 1000 gal water) is usually sufficient. A 50% caustic solution can be used during the summer, but 25% solution is recommended for winter to avoid freezing. Use of 22.7-kg (50-lb) bags of bead caustic may be convenient. Additions can be made directly to the tank. Caustic should be added before sodium cyanide is added. Where process chemistry prevents caustic addition, HCN formation will increase, which must be controlled by ventilation and/or other means.

Transportation Emergencies

How to Get Help

DuPont wants to be called about any transportation incident involving DuPont cyanide, regardless of whether a spill occurred. In the event of a transportation incident or other problem involving DuPont cyanide that requires immediate help, call the DuPont Cyanide Hotline at our Memphis, Tennessee plant:

Call Collect, Day or Night

(901) 357-1546

NOTE: Do not use this number for non-emergencies. Contact the sales office listed on the back cover for routine commercial or technical information.

Calling the DuPont Cyanide Hotline is the fastest way DuPont can provide guidance to assist in handling an emergency. DuPont will evaluate whether a team of specialists should be sent to the scene.

In the United States and Canada, CHEMTREC can also be called at:

(800) 424-9300

In the rest of the world, call CHEMTREC at:

001-703-527-3887

CHEMTREC uses Language Services for non-English speakers.

The DuPont or CHEMTREC information specialist on duty will ask the name and location of the caller, the name of the shipper, the product, the shipping point and destination as well as what happened, nature of any injuries, weather conditions, proximity to populated areas, etc. If you call CHEMTREC, the information specialist will then contact the manufacturer (DuPont) for further assistance.

In Canada, CANUTEC can also be called in Ottawa, Ontario, at:

(613) 996-6666

Action at the Scene

The following is intended to provide guidance to first responders to a DuPont sodium cyanide transportation emergency incident.

1. For any transportation incident involving DuPont sodium cyanide, call DuPont for assistance as soon as possible, regardless of whether there is a spill.
2. Avoid overreaction that can occur because "cyanide" is involved. Remember, in most cases, you are dealing with a dry, solid, nonvolatile material that is normally easy to clean up, unless the cyanide has contacted acid or some other incompatible chemical or is spilled into a water system. If sodium cyanide solution is spilled, the amount of HCN gas evolved will probably be greater than if dry sodium cyanide was spilled, but because of the amount of caustic contained in sodium cyanide solution, the amount of HCN will probably still be well below lethal limits (see "Effects of Exposure to HCN Vapor" on page 8)—unless the HCN vapors are somehow contained or the solution is in contact with an acid. Gasoline, diesel, or other motor oils do not generally cause large amounts of cyanide gas.
   a. The need for evacuation is highly unlikely. Unless acid and cyanide are mixed, hydrogen cyanide gas formation is limited.
   b. While rain or any water contact with sodium cyanide can produce hydrogen cyanide gas, the amount of gas is small and would not require evacuation. While dangerous levels of gas can develop in enclosed spaces, wet sodium cyanide in the open can be shoveled up by standing upwind during cleanup.
3. Shovel the cyanide into drums, plastic bags, or any suitable container.
4. If sodium cyanide solution is spilled, contain the spill as soon and as much as possible. Keep sodium cyanide out of lakes, streams, or any other water. Block off sewer system, drainage, or any other water access. Even small concentrations of cyanide can be fatal to aquatic life. As soon as is practical, place the spilled material into a container suitable for movement to a proper disposal area.
5. As with all chemical spills, approach the scene from upwind to determine what chemicals are involved. With sodium cyanide spillage, check for battery acid spillage.
6. Keep people (nonresponders) away.
7. Halt or divert traffic to prevent spreading the cyanide.
8. If raining, cover any spilled sodium cyanide with a tarp, plastic, or anything available to minimize water contact and subsequent cyanide-water runoff. Divert any water streams around the cyanide.
9. To repeat, call the DuPont Cyanide Hotline at:

   (901) 357-1546

Cyanide Destruction

The entire process in which by-products are generated should be reviewed for possible recycle of sodium cyanide, instead of disposal. If recycle is not feasible, ion exchange and reverse osmosis may be useful for concentrating cyanides, but destruction is usually easier and more economical.

The most effective and widely used chemical methods to destroy cyanide are oxidizing it to cyanate (CNO^-) with hypochlorite or hydrogen peroxide. Both methods are effective for oxidizing free and weak acid-dissociable cyanide.

For concentrated cyanide solutions, long-term high-temperature heating will destroy much of the cyanide with associated ammonia release.

Chlorination

CAUTION

Concentrated hypochlorite should not be mixed with concentrated cyanide solutions or solid cyanide, because highly toxic cyanogen chloride gas will be released. Very dilute solutions, in the correct pH range, should be used.

Chlorination of dilute sodium cyanide solutions can be accomplished by treatment with diluted solutions of sodium hypochlorite, calcium hypochlorite, or by generating hypochlorite from NaOH and Cl_2 gas. The choice of hypochlorite is an economic and safety decision. Solution concentrations of 1% sodium cyanide and 1% hypochlorite can be reacted if mixed slowly (over, say, 10 min) and with proper pH control.

Hypochlorite reacts with cyanide ions (CN^-) to produce highly toxic cyanogen chloride, which, at pH 10–11, hydrolyzes promptly to form cyanate ions (CNO^-). Because cyanogen chloride is a poisonous gas with little water solubility, the treatment process must be designed and operated to prevent cyanogen chloride fumes. Fumes are best controlled by limiting the cyanide concentration to a few thousand parts per million and controlling pH. Below pH 10, cyanogen chloride release increases; above pH 11, cyanide destruction slows, particularly above pH 11.5.

Further chlorination to destroy cyanate, sometimes referred to as "complete" chlorination, can be accomplished with additional chlorine. After reaction at pH 10.5 for 10 min or more, the pH must be reduced to 7.5–9, preferably 8–8.5, and maintained at that pH until the reaction is complete. Completion of both reactions typically requires at least 2 hr and can use eight or more parts of Cl_2 per part of CN^- (versus about three parts of Cl_2 for oxidation to CNO^-), while producing CO_2 and N_2 as reaction products. Chlorination is effective for cyanide destruction and can be automated for continuous systems. However, other waste stream components are often chlorinated, which increases chlorine consumption and may produce undesirable by-products in the effluent.

pH 10–11

Normally fastest reaction rate. Reduced HCN release and pH drop during treatment favor starting around pH 11. Higher pH will slow reaction, particularly above 11.5.

CAUTION

Adequate ventilation and HCN monitoring are important and more so as cyanide concentrations increase and pH decreases, particularly below pH 11.

pH Below 10

Causes slower reaction and release of HCN and/or cyanogen chloride gas (highly toxic, like HCN, and a powerful lachrymator, causing tearing of the eyes). Also, there is greatly increased concern about HCN release.

Acid pH

CAUTION

In addition to toxic gas release, acidic conditions can result in nitrogen trichloride formation that can separate as an insoluble oil-like material and explode violently, even in small amounts.

Hydrogen Peroxide Oxidation

CAUTION

Concentrated hydrogen peroxide should not be mixed with concentrated cyanide solutions or solid sodium cyanide, because highly toxic HCN or ammonia gas could be released. Also, high heat and oxygen gas release may cause foaming or eruption and splash workers. Dilution minimizes these problems.

Depending on the composition of the waste, additions of copper or formaldehyde may be required to destroy cyanide. The waste liquor is adjusted to pH 11 (10.5–11.5), formaldehyde or copper ions (typically with copper sulfate) added if needed, and hydrogen peroxide mixed with the solution. The solution must be agitated mechanically or with air. The reaction rate is dependent on temperature. Dilute wastes can be warmed to 38–54°C (100–130°F), but temperature elevation is usually less economical than adding 10–20% excess peroxide to shorten reaction time (which is normally about ½–1 hr at ambient temperature). Dilution and/or controlled addition rate may be needed when treating more concentrated wastes.

Chlorination is faster than peroxide oxidation and is frequently more adaptable to continuous destruction systems. Where speed is not critical, such as in batch tanks, hydrogen peroxide has several advantages including:

- Cyanogen chloride and chlorinated by-products are not produced.
- More concentrated cyanide wastes can be treated safely.
- The hazards of handling chlorine are avoided.
- Chlorine/chloride in water discharges are prohibited in some locations and can be avoided with peroxide.
- Sulfur compounds will react with hypochlorite, but not peroxide, and can increase hypochlorite costs substantially.
- Peroxide may destroy other objectionable organics.

By-products from peroxide treatment are cyanate, ammonia, and glycolic acid amide. Cyanate does not revert to cyanide in surface waters or sewage treatment systems, according to a U.S. Public Health Service study. Both the cyanate and glycolic acid amide are biodegradable. The cyanate can be readily hydrolyzed in acid solutions to ammonia.

Hydrolysis

Hydrolysis is sometimes a practical treatment for strong sodium cyanide solutions. Simply heating a 10% sodium cyanide solution for about 36 hr to 95–100°C (about 210°F) should reduce the cyanide content well below 1%, where chemical oxidation can be used more effectively. Provisions should be made to accommodate the ammonia that will be generated (see "Sodium Cyanide Reactions in Water").

Metal Complexes

Strongly bonded metal cyanides, especially iron cyanides (ferrocyanide and ferricyanide), are apt to be found in cyanide waste streams. These will not be detected by simple analytical procedures, such as titration with silver nitrate, which are normally used for measuring "free" or "weak acid-dissociable" cyanides. However, they will be included in the "total cyanide" analyses using acid distillation procedures. These complexes are not effectively destroyed by the commonly used waste treatment processes. If regulations require removal of these generally stable complexes of low toxicity, other treatment methods such as precipitation to produce a solid waste may be required.

Handling Spills

Sodium cyanide spills should be cleaned up promptly to minimize exposure of people and the environment. Shovel and sweep dry spilled material into a drum or suitable container. Keep dry spilled material dry. If solutions are spilled, immediately contain them to prevent contaminating nearby water. Contact DuPont for additional actions at a spill scene. If raining, covering the spill will reduce sodium cyanide dissolving and runoff. Decontamination of an area, after cleaning up as much cyanide as possible, can be accomplished with hypochlorite solution. A small amount of caustic (1 oz/5 gal hypochlorite solution) will help keep the pH in the 10–11 range.

References and Notes

1. Elial, E. L., and Freeman, J. P., "Organic Syntheses," Wiley, New York, Coll. Vol. 4, 58–62.
2. OSHA, 29 CFR 1910.1000, Air Contaminants.
3. Due to changing governmental regulations, such as those of the Department of Transportation, Department of Labor, U.S. Environmental Protection Agency, and the Food and Drug Administration, references to governmental requirements may be superseded. Consult and follow the current governmental regulations, such as Hazard Classification, Labeling, Worker Exposure Limitations, and Waste Disposal procedures, for up-to-date requirements for sodium cyanide.
4. "HYDROGEN CYANIDE and CYANIDE SALTS" published in 2001 by American Conference of Governmental Industrial Hygienists (ACGIH) 1330 Kemper Meadow Drive, Cincinnati, OH 45240; telephone (513) 742-2020. The ACGIH recommends a 4.7 ppm ceiling for HCN. Both OSHA and ACGIH advise avoiding skin contact.
5. "Occupational Exposure to Hydrogen Cyanide and Cyanide Salts," NIOSH Criteria Document, U.S. Department of Health, Education, and Welfare, 1976.
6. DOT, 49 CFR 712.101, Hazardous Material Table.

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H-37163-6 (5/05) Printed in the U.S.A.

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Appendix C.3

Material Safety Data Sheets – Sodium Cyanide

Safety (MSDS) data for sodium cyanide

General

Synonyms: hydrocyanic acid sodium salt, cyanogran
Molecular formula: NaCN
CAS No: 143-33-9
EC No:

Physical data

Appearance: white granules or powder
Melting point: 564 C
Boiling point: 1496 C
Vapour density: 1.7 (air = 1)
Vapour pressure:
Density (g cm^{-3}): 1.6
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility: appreciable

Stability

Stable. Incompatible with water, strong acids, strong oxidizing agents.

Toxicology

Poison - may be fatal if inhaled or swallowed. Contact with acid releases highly poisonous HCN gas. Note low LD50s below. Causes burns. Skin and eye irritant. Typical TLV/TWA 5 mg m^{-3}

Toxicity data

(The meaning of any abbreviations which appear in this section is given here.)

ORL-RAT LD50 6.4 mg kg^{-1}

IPR-RAT LD50 4.3 mg kg^{-1}

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)

Transport information

Personal protection

Safety glasses, gloves, good ventilation. **If there is any possibility of exposure to HCN, work only when a cyanide antidote kit is to hand.**

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

APPENDIX D

Ammonium Nitrate & Diesel Fuel

Appendix D.1

Material Safety Data Sheets – Ammonium Nitrate

Industrial Resources Group, Inc.

Ammonium Nitrate

Safety Procedures

Safety should be in the forefront of everyone's mind when handling hazardous products. When an accident or emergency occurs, it is very important to know what safety procedures should be used. We offer safety training and assistance to develop safety programs for your facility. Your health and safety is very important to us!

Physical Data	
Vapor Pressure:	9
Solubility in Water:	Complete (100%)
Appearance & Odor:	Clear, colorless liquid, suffocating odor.

Health Hazards	
Eyes:	Flush with large amounts of water for a minimum of 15 minutes. Get medical attention.
Skin:	Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Inhalation:	Provide fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:	Do not induce vomiting. If conscious, give water, milk or milk of magnesia. Get medical attention.
Overexposure	Severe irritation or burns of respiratory system, coughing, difficult breathing, chest pains, pulmonary edema, lung inflammation, unconsciousness, and possibly fatal.

Employee Protection	
Respiratory:	A NIOSH-approved dust respirator is recommended when exposure limit is exceeded.
Eye:	Safety goggles.
Ventilation:	Provide ventilation for nuisance dust protection to maintain exposure below exposure limits.
Other:	Other protective equipment as needed to prevent direct contact with the skin.

Fire & Explosion Hazards	
Flammable levels:	Nonflammable
Flash Point:	N/A
Extinguishing Media:	Water spray
Special Procedures:	Firefighters should wear self-contained breathing apparatus and full protective clothing. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool; do not get water inside containers.

Reactivity	
Stability:	Stable
Materials to Avoid:	Strong bases, carbonates, sulfides, cyanides, combustible materials, organic materials, strong reducing agents, most common metals, powdered metals, carbides, ammonium hydroxide, water, alcohol.
Conditions to Avoid:	Heat, light, moisture.

Spill or Leak Procedures	
Spills:	Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Ventilate area. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water. Keep combustibles (wood, paper, oil, etc.) away from spilled material.
Disposal:	Dispose in accordance with all applicable federal, state, and local environmental regulations.

We are providing this data for informational purposes only. If a person comes in contact with any of the chemicals mentioned, it is imperative to contact your local emergency personnel and/or a physician. This information is intended only as guidance for appropriate precautionary handling of the material and is believed to be accurate. Industrial Resources provides no guarantee of the accuracy or completeness of the data and shall not be liable for any damages. Users of these products are responsible for investigating and verifying the precautions and dangers involved in the application that they have chosen. Federal, state, municipal, and insurance requirements, and national safety codes must be followed and are not to be confused with the precautionary data.

Appendix D.2

Material Safety Data Sheets – Diesel Fuel

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	B-3, D-2B		

Section 1. Chemical Product and Company Identification

Product Name	**DIESEL FUEL**	**Code**	W104, W293 SAP: 120, 121, 122, 287
Synonym	Diesel 50, Diesel 50 LS, #1 Diesel , #1 Diesel LS, Diesel LC, Seasonal Diesel, Seasonal Diesel LS, Diesel AA, Domestic Marine Diesel, International marine Diesel, Seasonal Diesel Locomotive, Domestic Marine diesel LS, diesel -20°C (LS), LSD, Low Sulphur Diesel, dyed diesel, marked diesel, coloured diesel, Naval Distillate, Ultra Low Sulphur Diesel, ULS Diesel, Mining Diesel, Mining Diesel Special, Mining Diesel Special LS, High Flash Mining Diesel, Furnace Oil, Stove Oil.	**Validated on**	**2/6/2004.**
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Diesel oil.	68334-30-5	>99.9	100 mg/m³ (as total hydrocarbons) *	Not established	Not established
2) Proprietary additives.	Not available	<0.1	Not established	Not established	Not established
Aromatic content is 50% maximum (benzene: nil). Sulphur content is 0-0.50%.					

Manufacturer Recommendation	* Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Combustible liquid. Exercise caution when handling this material. Contact with this product may cause skin and eye irritation. Prolonged or repeated contact may cause skin irritation, defatting, drying and dermatitis. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	Class II - combustible liquid (NFPA).	**Flammable Limits**	LOWER: 0.7%, UPPER: 6% (NFPA)
Flash Points	Diesel Fuel: Closed Cup: >40ºC (>104ºF) Marine Diesel Fuel: Closed Cup: >60ºC (>140ºF) Mining Diesel: Closed Cup: 52ºC (126ºF)	**Auto-Ignition Temperature**	225ºC (437ºF)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, or heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Containers may explode in heat of fire. Do not cut, weld, heat, drill or pressurize empty container. Vapour explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), water vapour (H2O), smoke and irritating vapours as products of incomplete combustion. See Section 11 (Other Considerations) for information regarding the toxicity of the combustion products.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a moderate flash point above 40ºC: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.		

Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Extinguish all ignition sources. Stop leak if safe to do so. Ventilate area. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid breathing vapours or mists of material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Evacuate non-essential personnel. Ensure clean-up personnel wear appropriate personal protective equipment. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	COMBUSTIBLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated. Avoid confined spaces and areas with poor ventilation. Ensure all equipment is grounded/bonded. Wear proper personal protective equipment (See Section 8).
Storage	Store away from heat and sources of ignition. Store in dry, cool, well-ventilated area. Store away from incompatible and reactive materials (See section 5 and 10). Ensure the storage containers are grounded/bonded.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Bright oily liquid.	**Viscosity**	1.3 - 4.1 cSt @ 40ºC (104ºF)
Colour	Clear to yellow / brown (may be dyed for taxation purposes).	**Pour Point**	Variable, -50ºC to 0ºC (-58ºF to -32ºF)
Odour	Petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	150 - 371ºC (302-700ºF)	**Penetration**	Not applicable.
Density	0.80 - 0.85 kg/L @ 15ºC (59ºF)	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	4.5 (Air = 1)	**Ionicity (in water)**	Not applicable.
Vapour Pressure	Not available	**Dispersion Properties**	Not available
Volatility	Semivolatile to volatile.	**Solubility**	Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products**	May release COx, NOx, SOx, H2S, H2O, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Acute oral toxicity (LD50): 7500 mg/kg (rat).
Chronic or Other Toxic Effects	
Dermal Route:	This product contains a component (at >= 1%) that can cause skin irritation. Therefore, this product is considered to be a skin irritant. Prolonged or repeated contact may defat and dry skin, and cause dermatitis. (See Other Considerations)
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Eye Irritation/Inflammation:	This product contains a component (at >= 1%) that can cause eye irritation. Therefore, this product is considered to be an eye irritant.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	ACGIH A3: animal carcinogen. [Diesel oil] (See Other Considerations)
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.

Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer. Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal	Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	DIESEL FUEL, 3, UN1202, PGIII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations	This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List). All components of this formulation are listed on the US EPA-TSCA Inventory. All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS). This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR. Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Irritating substance. CLASS: Target organ effects. CLASS: Combustible liquid having a flash point between 37.8°C (100°F) and 93.3°C (200°F).
ADR (Europe) (Pictograms)	**NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	2
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)

Rating	
0	Insignificant
1	Slight
2	Moderate
3	High
4	Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)

DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca/msds

Western Canada, Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 2/6/2004.

Data entry by Product Safety - JDW.

APPENDIX E

Material Safety Data Sheets for Primary Hazardous Materials

Material Safety Data Sheet

Printing date 08/11/2006 Version 1 Reviewed on 08/11/2006

1 Identification of substance

· **Product details**

· **Trade name: Acetylene**

· **Article number:** 030-01-0003BOC

· **Creation date:** 08/09/2006

· **Manufacturer/Supplier:**
BOC Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
www.bocgases.ca

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER: (905) 501-0802
EMERGENCY RESPONSE PLAN NO: 2-0101

Please ensure that this MSDS is received by the appropriate person

· **Information department:** Customer Service Centre: 1-866-385-5349

2 Composition/Data on components

· **Chemical characterization:**
· **CAS No. Description**
74-86-2 Acetylene
· **Identification number(s)**
· **EINECS Number:** 200-816-9
· **EU Number:** 601-015-00-0

3 Hazards identification

· **Hazard description:**

Extremely flammable

· **WHMIS-symbols:**
A - Compressed gas
B1 - Flammable gas

· **HMIS-ratings (scale 0 - 4)**

Health = 0
Fire = 4
Reactivity = 3

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Material Safety Data Sheet

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Trade name: Acetylene

(Contd. of page 1)

· **NFPA ratings (scale 0 - 4)**

Health = 0
Fire = 4
Reactivity = 3

· **Information pertaining to particular dangers for man and environment:**
Heating may cause an explosion.
Explosive with or without contact with air.
Extremely flammable.
· **Classification system:**
The classification is in line with internationally approved calculation standards. It is expanded, however, by information from technical literature and by information furnished by supplier companies.

*
4 First aid measures

· **After inhalation:**
Supply fresh air. If required, provide artificial respiration and consult doctor. Keep patient warm.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water. Then consult a doctor.
· **After swallowing:** Not applicable

*
5 Fire fighting measures

· **Suitable extinguishing agents:**
Use fire fighting measures that suit the environment.
In the case of fires caused by ignited acetylene leaks:
- DO NOT extinguish unless it is possible (without risk) to shut-off gas flow; explosive vapours could form and re-ignition may occur.
Evacuate area as soon as possible.
· **Protective equipment:** Wear self-contained respiatory protective device.

*
6 Accidental release measures

· **Person-related safety precautions:**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventillation.
· **Measures for environmental protection:** Prevent seepage into sewage system, workpits and cellars.
· **Measures for cleaning/collecting:** Ensure adequate ventillation.

7 Handling and storage

· **Handling:** Do not mix with air or oxygen above atmospheric pressure.
· **Information for safe handling:** Open and handle cylinder with care.
· **Information about protection against explosions and fires:**
Keep ignition sources away - Do not smoke.
Protect from heat.

(Contd. on page 3)

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Trade name: Acetylene

(Contd. of page 2)

Protect against electrostatic charges.
Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use.
Prevent impact and friction.

· **Storage:**
· **Requirements to be met by storerooms and receptacles:**
Store in a cool location.
Do not expose cylinder to temperatures higher than 50°C (122 °F)
· **Information about storage in one common storage facility:** Store away from oxidizing agents.
· **Further information about storage conditions:**
Keep cylinder valve tightly closed.
Store in cool, dry conditions in well sealed receptacles.
Protect from heat and direct sunlight.
Store cylinder in a well ventilated area.
Store in accordance with local fire code and/or building code or any pertaining regulations.

*

8 Exposure controls and personal protection

· **Additional information about design of technical systems:** Adequate local ventillation.

· **Components with limit values that require monitoring at the workplace:**	
74-86-2 Acetylene (50-100%)	
EL	Simple asphyxiant

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Personal protective equipment:**
· **General protective and hygienic measures:** Wash hands before breaks and at the end of work.
· **Breathing equipment:**
Use atmosphere-supplying respirators (e.g. supplied-air: demand, pressure-demand, or continuous-flow or self-contained breathing apparatus: demand or pressure-demand or combination supplied-air with auxiliary self-contained air supply atmosphere-supplying respirator in case of insufficient ventilation.
· **Protection of hands:** Protective gloves
· **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Eye protection:**

Tightly sealed goggles

*

9 Physical and chemical properties

· **General Information**	
Form:	Gaseous.
Color:	Colorless
Odor:	Ether-like

(Contd. on page 4)

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Trade name: Acetylene

(Contd. of page 3)

· **Change in condition**	
Melting point/Melting range:	-80.8°C
Boiling point/Boiling range:	-83°C
· **Flash point:**	< 0°C
· **Ignition temperature:**	325°C
· **Danger of explosion:**	Explosive with or without contact with air.
· **Explosion limits:**	
Lower:	2.3 Vol %
Upper:	78 Vol %
· **Solubility in / Miscibility with**	
Water at 20°C:	1.185 g/l

*

10 Stability and reactivity

· **Thermal decomposition / conditions to be avoided:** To avoid thermal decomposition do not overheat.
· **Dangerous reactions** Forms explosive gas mixture with air.
· **Dangerous products of decomposition:** No dangerous decomposition products known.

11 Toxicological information

· **Acute toxicity:**
· **Primary irritant effect:**
· **on the skin:** No irritating effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.

12 Ecological information

· **General notes:** Generally not hazardous for water

13 Disposal considerations

· **Product:**
· **Recommendation:**
Cylinder and unused product should be returned to vendor. Disposable cylinder must be disposed of in accordance with local regulations.

· **Uncleaned packagings:**
· **Recommendation:**
Cylinder and unused product should be returned to vendor. Disposable cylinder must be disposed of in accordance with local regulations.

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Trade name: Acetylene

(Contd. of page 4)

· **Recommended cleansing agent:** Water, if necessary with cleansing agents.

14 Transport information

· **TDG and DOT regulations:**

· **Hazard class:** 2
· **Identification number:** UN1001
· **Packing group:** -
· **Proper shipping name (technical name):** ACETYLENE, DISSOLVED
· **Label** 2.1
· **Packaging group:** -

· **Maritime transport IMDG:**

· **IMDG Class:** 2.1
· **UN Number:** 1001
· **Label** 2.1
· **Packaging group:** -
· **EMS Number:** F-D,S-U
· **Marine pollutant:** No
· **Propper shipping name:** ACETYLENE, DISSOLVED

· **Air transport ICAO-TI and IATA-DGR:**

· **ICAO/IATA Class:** 2
· **UN/ID Number:** 1001
· **Label** 2.1
· **Packaging group:** -
· **Propper shipping name:** ACETYLENE, DISSOLVED

15 Regulations

· **Sara**

· **Section 355 (extremely hazardous substances):**

Substance is not listed.

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Trade name: Acetylene

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· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Cancerogenity categories**

· **EPA (Environmental Protection Agency)**
Substance is not listed.

· **NTP (National Toxicology Program)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

· **Canadian substance listings:**

· **Canadian Domestic Substances List (DSL)**
Substance is listed.

· **Canadian Ingredient Disclosure list (limit 0.1%)**
Substance is not listed.

· **Canadian Ingredient Disclosure list (limit 1%)**
Substance is not listed.

· **Product related hazard informations:**
The product has been classified and marked in accordance with directives on hazardous materials.

· **Hazard symbols:**
Extremely flammable

· **Risk phrases:**
Heating may cause an explosion.
Explosive with or without contact with air.
Extremely flammable.

· **Safety phrases:**
Keep out of the reach of children.

(Contd. on page 7)

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Trade name: Acetylene

(Contd. of page 6)

Keep container in a well-ventilated place.
Keep away from sources of ignition - No smoking.
Take precautionary measures against static discharges.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing MSDS:** Customer Service Centre: 1-866-385-5349
· **Contact:** Canada Technical Services: 1-866-385-5349

Material Safety Data Sheet
Carbon, Activated

ACC# 04250

Section 1 - Chemical Product and Company Identification

MSDS Name: Carbon, Activated
Catalog Numbers: S79959, S80029, C270C, C272-212, C272-500, D127-500
Synonyms: Black Pearls; Charcoal Black; Graphite Nautural; Purified Charcoal; Activated Carbon.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7440-44-0	Charcoal, activated	100	231-153-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: black solid.
Caution! May cause mechanical eye and skin irritation. May cause respiratory tract irritation. May cause central nervous system effects. May cause lung damage.
Target Organs: Lungs.

Potential Health Effects
Eye: Dust may cause mechanical irritation. May cause lacrimation (tearing), blurred vision, and photophobia. May cause chemical conjunctivitis and corneal damage.
Skin: Dust causes mechanical irritation.
Ingestion: May cause nausea, vomiting, abdominal pain, and increased salivation.
Inhalation: May cause lung damage. Olfactory fatigue may occur. Can produce delayed pulmonary edema. Inhalation of dusts cause severe irritation of the upper respiratory tract, gastrointestinal disturbances, albuminuria, gradual loss of weight, and increasing weakness.
Chronic: Chronic inhalation may lead to decreased pulmonary function.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and

lower eyelids. Get medical aid.
Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire.
Extinguishing Media: For large fires, use water spray, fog or regular foam. For small fires, use dry chemical, carbon dioxide, sand, earth, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: Not applicable.
Autoignition Temperature: 452 deg C (845.60 deg F)
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Scoop up with a nonsparking tool, then place into a suitable container for disposal. Avoid generating dusty conditions. Remove all sources of ignition.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Activated Carbon, especially when wet, can deplete oxygen from air in enclosed spaces, and dangerously low levels of oxygen may result.
Storage: Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Charcoal, activated	none listed	none listed	none listed

OSHA Vacated PELs: Charcoal, activated: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: black
Odor: odorless
pH: Not available.
Vapor Pressure: 1 mm Hg @ 3586C
Vapor Density: Not available.
Evaporation Rate: Negligible.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point:3652 deg C
Decomposition Temperature: Not available.
Solubility: insoluble in water.
Specific Gravity/Density:1.8-2.1
Molecular Formula:C
Molecular Weight:12

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation, moisture, excess heat.
Incompatibilities with Other Materials: Oxidizing agents, alkali metals, iron oxide, lead oxide, liquid oxygen, manganese oxide, metallic salts, chlorinated paraffins, dibenzoyl peroxide, 1,4-diazabicyclo{2.2.2}octane, molybdenum(IV) oxide, nitrobenzaldehyde, potassium hydroxide, sodium hydrogen carbonate.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7440-44-0: FF5250100

LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7440-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not Regulated	Not Regulated
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7440-44-0 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7440-44-0: immediate.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7440-44-0 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
Not available.
Risk Phrases:

Safety Phrases:
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)
CAS# 7440-44-0: 0
Canada - DSL/NDSL
CAS# 7440-44-0 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of B6, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 9/28/1998
Revision #4 Date: 5/19/2004

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet
Ammonium nitrate

ACC# 01290

Section 1 - Chemical Product and Company Identification

MSDS Name: Ammonium nitrate
Catalog Numbers: AC205860000, AC205860010, AC205861000, AC205865000, AC423350000, AC423350010, AC423350250, S70708, S70711, S707111, S93123, S93124, A676-212, A676-500, S75244, XXA676100LB
Synonyms: Nitric acid, ammonium salt; Norway saltpeter.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
6484-52-2	Ammonium nitrate	> 98	229-347-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white to gray to brown solid.
Danger! Strong oxidizer. Contact with other material may cause a fire. Causes eye, skin, and respiratory tract irritation. May cause methemoglobinemia. Hygroscopic (absorbs moisture from the air). Ammonium nitrate when contaminated with oil, charcoal, or other organic materials should be considered an explosive capable of detonation by combustion or by explosion of adjacent explosive materials.
Target Organs: Blood, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation.
Ingestion: Ingestion of large amounts may cause gastrointestinal irritation. Methemoglobinemia is characterized by dizziness, drowsiness, headache, shortness of breath, cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood), rapid heart rate and chocolate-brown colored blood.
Inhalation: Causes respiratory tract irritation. May cause methemoglobinemia, cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood), convulsions, tachycardia, dyspnea (labored breathing), and death. Methemoglobinemia is characterized by dizziness, drowsiness, headache, shortness of breath, cyanosis (bluish discoloration of skin due to deficient oxygenation

of the blood), rapid heart rate and chocolate-brown blood. Inhalation can cause systemic acidosis and methemoglobinemia.
Chronic: May cause methemoglobinemia, which is characterized by chocolate-brown colored blood, headache, weakness, dizziness, breath shortness, cyanosis (bluish skin due to deficient oxygenation of blood), rapid heart rate, unconsciousness and possible death. May cause digestive tract disturbances.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Absorption of this product into the body may cause cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood). Moderate degrees of cyanosis need to be treated only by supportive measures: bed rest and oxygen inhalation. For methemoglobinemia, administer oxygen alone or with Methylene Blue depending on the methemoglobin concentration in the blood. Cleansing of the entire contaminated area of the body is of utmost importance.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Strong oxidizer. Contact with other material may cause fire. May explode under confinement and high temperatures, especially if contaminated.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use flooding quantities of water as spray.
Flash Point: Not available.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 2; Special Hazard: OX

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation. Keep combustibles (wood, paper, oil, etc.,) away from spilled material.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep away from heat, sparks and flame. Keep from contact with clothing and other combustible materials. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Avoid breathing dust. Inform laundry personnel of contaminant's hazards. Avoid localized heating of ammonium nitrate, potentially leading to development of high temperature areas. Ensure that ammonium nitrate is not exposed to strong shock waves from explosives. Avoid low pH (acidic) conditions.
Storage: Do not store near combustible materials. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from acids. Keep away from reducing agents. Avoid storage on wood floors.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ammonium nitrate	none listed	none listed	none listed

OSHA Vacated PELs: Ammonium nitrate: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: solid
Appearance: white to gray to brown
Odor: odorless
pH: 5.4 (0.1 M solution)
Vapor Pressure: Negligible.
Vapor Density: Not available.
Evaporation Rate: Negligible.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point:169 deg C
Decomposition Temperature:210 deg C
Solubility: Soluble.
Specific Gravity/Density:1.725 @ 25°C

Molecular Formula:NH4NO3
Molecular Weight:80.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions. Risk of explosion if heated under confinement. Deliquescent (tending to absorb atmospheric water vapor and become liquid).
Conditions to Avoid: Dust generation, contamination, heating in a confined space.
Incompatibilities with Other Materials: Strong reducing agents, strong acids, finely powdered metals, organic matter, chlorides, combustible materials.
Hazardous Decomposition Products: Oxides of nitrogen.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 6484-52-2: BR9050000
LD50/LC50:
CAS# 6484-52-2:
Oral, rat: LD50 = 2217 mg/kg;
.

Carcinogenicity:
CAS# 6484-52-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	AMMONIUM NITRATE	AMMONIUM NITRATE
Hazard Class:	5.1	5.1
UN Number:	UN1942	UN1942
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 6484-52-2 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 6484-52-2: immediate, fire, reactive.

Section 313

This material contains Ammonium nitrate (listed as Water Dissociable Nitrate Compounds), > 98%, (CAS# 6484-52-2) which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 6484-52-2 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XI O
Risk Phrases:
R 36/37/38 Irritating to eyes, respiratory system and skin.
R 8 Contact with combustible material may cause fire.
R 9 Explosive when mixed with combustible material.

Safety Phrases:
S 17 Keep away from combustible material.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 37/39 Wear suitable gloves and eye/face protection.

WGK (Water Danger/Protection)
CAS# 6484-52-2: 1
Canada - DSL/NDSL
CAS# 6484-52-2 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of C, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 6484-52-2 is not listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #6 Date: 5/16/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Orica Canada Inc.
Maple Street
Brownsburg, PQ
For MSDS Requests: 450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137
For MSDS Requests: 303-268-5000

EMERGENCY CONTACTS
FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE:
IN CANADA 1-877-561-3636 OR IN USA CHEMTREC AT 1-800-424-9300.

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: AMEX, AMEX HD, ANFO **MATS Index:** 59531
MSDS Number: 20100 **Date Issued:** 06/16/04
Alternate Name(s): Ammonium Nitrate Fuel Oil.

Product Use: A booster-sensitive blasting agent.

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENT(S)	% (w/w)	ACGIH TWA	CAS NO.
Ammonium Nitrate	90-95	Not Listed.	6484-52-2
Diesel Fuel Oil No. 2	5-10	Not Listed.	68476-34-6

SECTION 3 - HAZARD IDENTIFICATION

Emergency Overview: Risk of explosion when burning. Irritating to eyes. May cause methemoglobinemia. May cause central nervous system (CNS) depression. Read the entire MSDS for a more thorough evaluation of the hazards.

SECTION 4 - FIRST AID MEASURES

General: If you feel unwell seek medical advice (show the label where possible).
Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Oxygen administration may be beneficial in this situation but should only be administered by personnel trained in its use. Obtain medical attention IMMEDIATELY.
Skin Contact: Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.
Eye Contact: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing and obtain medical advice.
Ingestion: If victim is alert and not convulsing, rinse mouth out and give 200-300 mL (1 cup) of water to dilute material. DO NOT induce vomiting. Never give anything by mouth to an unconscious person. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.

Note to Physicians: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, consider administering 10 cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 - FIRE-FIGHTING MEASURES

Flash Point: 52oC (125.6oF) (Diesel Fuel Oil No. 2)
Flammable Limits (Lower): Not applicable.
Flammable Limits (Upper): 4.7% (Diesel Fuel Oil No. 2)
Auto Ignition Temperature: 230-265oC (446-509oF)
Decomposition Temperature: Ammonium nitrate will spontaneously decompose at approximately 210oC (410oF)
Rate of Burning: Does not sustain burning at atmospheric pressure.
Explosive Power: 350 - 400 kJ/100 g.
Sensitivity to Mechanical Impact: 250 cm (USBM Report 7840). Not sensitive.
Sensitivity to Static Discharge: Not sensitive.
Hazardous Reactions: See 'Fire and Explosion Hazards'.
Fire and Explosion Hazards: Explodes on overheating when contained and, thus, fires involving large quantities of the material should not be fought. This product is an explosive with a mass detonation hazard. This product is classified as a flammable solid and may detonate under fire conditions.
Extinguishing Media: Water may be used on small fire. Do not attempt to fight large fires.
Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING BLASTING AGENTS OR EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area.
Fire Fighting Protective Equipment: Use self-contained breathing apparatus and special protective clothing.
NOTE: Also see "Section 10 - Stability and Reactivity".

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills, Leaks, or Releases: Collect product for re-use or disposal. For release to land, contain storm water runoff by dyking with earth or other barrier, for release to water, utilize damming, and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water for disposal. Notify applicable government authority if release is reportable or could adversely affect the environment.
Deactivating Chemicals: None known.

SECTION 7 - HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. Locate safety shower and eyewash station close to chemical handling area. Use normal good industrial hygiene and housekeeping practices.
Storage Requirements: Store under moderate temperatures recommended by technical service representative. Store under dry conditions in a well ventilated

magazine that has been approved for either blasting agent storage or explosive storage.
Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, sparks and flames. Keep containers closed. Blasting agents should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Keep away from incompatibles.
Storage Temperature: Ideal storage temperature is 10-27oC (50-80.6oF).

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

PREVENTIVE MEASURES:
Recommendations listed in this section indicate the type of equipment that will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.
Engineering Controls: Full handling precautions should be taken at all times. General ventilation is recommended. Provide adequate ventilation where operational procedures demand it.
PERSONAL PROTECTIVE EQUIPMENT:
Eye Protection: Use chemical safety goggles when there is potential for eye contact.
Skin Protection: Gloves and protective clothing made from rubber should be impervious under conditions of use. User should verify impermeability under normal conditions of use prior to general use.
Respiratory Protection: A NIOSH/MSHA-approved respirator, if required.
EXPOSURE GUIDELINES:
PRODUCT:
None established for product.
HAZARDOUS INGREDIENT(S):
Ammonium Nitrate:
Internal Guideline 5 mg/m3 (internal TWA)

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Chemical Name: Not applicable.
Chemical Family: Explosive.
Molecular Formula: Not applicable.
Appearance: Off-white prills.
Odour: Smell of fuel oil.
pH: Not available.
Vapour Pressure (mm Hg at 20°C/68°F): 0.4 (Diesel Fuel Oil No. 2)
Vapour Density (Air=1): Not available.
Boiling Point: 176oC (Diesel Fuel Oil No. 2) to 370oC (Diesel Fuel Oil No. 2) (348.8 to 698oF)
Melting Point: 170oC (338oF)
Solubility (Water): Will dissolve slowly with prolonged exposure to water.
Solubility (Other): Not available.

Specific Gravity: (Similar to water).
Evaporation Rate: Not available.
Additional Properties: Bulk density: 0.8 - 0.88 (poured); 0.92 - 1.10 (pneum. loaded).

SECTION 10 - STABILITY AND REACTIVITY

Hazardous Decomposition Products: Thermal decomposition products are toxic and may include hydrocarbons, oxides of carbon and nitrogen. Toxic gases and vapours (oxides of nitrogen) will be released by thermal decomposition (about 210oC). At higher temperatures, decomposition may be explosive, especially if confined.
Chemical Stability: Stable at room temperature.
Conditions to Avoid: Keep away from heat, impact, and friction. High temperatures, sparks, open flames and all other sources of ignition.
Incompatibility with other Substances: Avoid oxidizable materials, metal powder, bronze & other copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorates, sulphur, charcoal, coke and other finely divided combustibles. Reducing agents.
Hazardous Polymerization: Will not occur.

SECTION 11 - TOXICOLOGICAL INFORMATION

Summary: May cause irritation. May cause central nervous system (CNS) depression. May cause methemoglobinemia.
TOXICOLOGICAL DATA:
PRODUCT:
None established for product.
INGREDIENTS:
Ammonium Nitrate:

Oral LD50 (rat) = 2217 mg/kg
Dermal LD50 (rabbit) = 3000 mg/kg
Diesel Fuel Oil No. 2:
LD50 (oral, rat) = >5 g/kg
LD50 (dermal, rabbit) = >5 g/kg

POTENTIAL HEALTH EFFECTS:
Inhalation: Inhalation is not a likely route of exposure at normally encountered temperatures and is thus not applicable.
Skin Contact: May cause skin irritation. Repeated and/or prolonged contact may cause dermatitis.
Eye Contact: Moderate irritant causing moderate initial pain.
Ingestion: Highly unlikely under normal industrial use. Ingestion may cause irritation of the gastrointestinal tract.
Subchronic Effects: Ingestion may cause methemoglobinemia. initial manifestation of methemoglobinemia is cyanosis, characterized by navy blue lips, tongue and mucous membranes, with skin colour being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be

reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly, shock. CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure.
Chronic Effects: None known.
Carcinogenicity: The ingredients of this product are not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and health Administration) and not listed as carcinogens by NTP (National Toxicology Program).
Mutagenicity: There is no evidence of mutagenic potential.
Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.
Teratogenicity and Fetotoxicity: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.
Synergistic Materials: None known.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicological Information: Harmful to aquatic life at low concentrations.
Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

SECTION 13 - DISPOSAL CONSIDERATIONS

Burn under supervision of an expert at an approved explosive burning ground or destroy, by detonation in boreholes, in accordance with applicable local, state or provincial, and federal regulations. Call upon the services of an Orica Technical Representative if needed.

SECTION 14 - TRANSPORT INFORMATION

TDG Name: Explosive, Blasting, Type B
TDG Class/Division: 1.5D
Product Identification Number (PIN): UN0331
Packing Group: II
Transportation Emergency Telephone Number: 1-877-561-3636.
DOT Class: Explosive, Blasting, Type B

SECTION 15 - REGULATORY INFORMATION

CANADIAN CLASSIFICATION:
This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS (Material Safety Data Sheet) contains all the information required by the CPR.
Controlled Products Regulations (WHMIS) Classification: This product is an explosive and is not regulated by WHMIS.

CEPA / Canadian Domestic Substances List (DSL): The substance(s) in this product is/are on the Canadian Domestic Substances List (CEPA DSL).
IARC Classification: None of the components of this product are listed on IARC.
USA CLASSIFICATION:
Physical: Explosive. Oxidizer.
Health: Irritant.
Target Organ: Eye. Skin. Respiratory tract. Central nervous system. Blood/hematopoietic system.
SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements: 94% Ammonium Nitrate (6484-52-2).
Ozone Protection and 40 CFR 42: This product does not contain nor is it manufactured with ozone depleting substances.
Other Regulations/Legislation that apply to this product: Massachusetts Right-to-Know, Pennsylvania Right-to-Know, New Jersey Right-to-Know.

SECTION 16 - OTHER INFORMATION

MATS Index: 59531
Label Text: Danger! Explosive! Strong Oxidizer! May be harmful if ingested. Avoid contact with skin and eyes.
REFERENCES:
RTECS-Registry of Toxic Effects of Chemical Substances, CCINFOdisc, Canadian Centre for Occupational Health and Safety RTECS database, National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1998.
Supplier's Material Safety Data Sheets.
"CHEMINFO", through "CCINFOdisc" Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada
Sax, N. Irving, Dangerous Properties of Industrial Materials, 7th ed., Van Nostrand Reinhold Co., New York, 1989.

Prepared by: Safety, Health and Environment (303) 268-5000.

Material Safety Data Sheet

PETRO-CANADA ARCTIC 0W30 MOTOR OIL

1 . Product and company identification

Common name : PETRO-CANADA ARCTIC 0W30 MOTOR OIL

Synonym : Not available

Code : MAXSP03, 410-338

Material uses : A high performance synthetic motor oil designed to provide excellent performance in gasoline, propane and CNG engines where the manufacturer recommends an oil of ILSAC GF-4, API SM or API CF quality.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : **Petro-Canada: 403-296-3000**
Canutec Transportation:
613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Viscous liquid.

Odour : Mild petroleum oil like.

OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Emergency overview : No specific hazard.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eyes : Slightly irritating to the eyes.

Skin : Slightly irritating to the skin.

Inhalation : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	Mixture.	-

4 . First-aid measures

Eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin contact : Wash skin thoroughly with soap and water or use recognised skin cleanser. Get medical attention if irritation occurs. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse.

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

4 . First-aid measures

Ingestion : Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If potentially dangerous quantities of this material have been swallowed, call a physician immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : May be combustible at high temperature.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), phosphorus oxides (POx), zinc oxides (ZnOx), calcium oxides (CaOx), molybdenum oxides (MoOx), boron oxides (BOx), smoke and irritating vapours as products of incomplete combustion.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : In a fire or if heated, a pressure increase will occur and the container may burst.

Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Low fire hazard. This material must be heated before ignition will occur.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up : Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk. Evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/vapour/spray. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles.

Storage : Keep container tightly closed. Store away from incompatible materials (see section 10). Keep container in a cool, well-ventilated area.

8 . Exposure controls/personal protection

Product name	Exposure limits
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	**ACGIH TLV (United States). Notes: (oil mist)** TWA: 5 mg/m³ 8 hour(s). STEL: 10 mg/m³ 15 minute(s).

Consult local authorities for acceptable exposure limits.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: neoprene, nitrile, polyvinyl alcohol (PVA), Viton.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

9 . Physical and chemical properties

Physical state : Viscous liquid.
Flash point : Open cup: 233°C (451.4°F) [Cleveland.]
Auto-ignition temperature : Not available.
Flammable limits : Not available.
Colour : Amber.
Odour : Mild petroleum oil like.
pH : Not available.
Boiling/condensation point : Not available.
Pour Point : -45ºC (-49ºF)
Melting/freezing point : Not available.
Relative density : 0.8435 kg/L @ 15ºC (59ºF)
Vapour pressure : Not available.
Vapour density : Not available.
Volatility : Not available.
Odour threshold : Not available.
Evaporation rate : Not available.
Viscosity : 58.5 cSt @ 40ºC (104ºF), 10.6 cSt @ 100ºC (212ºF), VI=172
Solubility : Insoluble in water.
$LogK_{ow}$: Not available.
Softening Point : Not available.

9 . Physical and chemical properties

Dropping Point : Not available.

Penetration : Not available.

Physical/chemical properties comments : Not available.

10 . Stability and reactivity

Stability and reactivity : The product is stable.

Conditions of instability : Not available.

Incompatibility with various substances : Reactive with acids and oxidising agents .

Hazardous decomposition products : May release COx, H2S, methacrylate monomers, alkyl mercaptans, smoke and irritating vapours when heated to decomposition.

Hazardous polymerisation : Will not occur.

11 . Toxicological information

Toxicity data

Product/ingredient name	Test	Result	Route	Species
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	LD50 LD50 LC50	>5000 mg/kg >2000 mg/kg >2500 mg/m³ (4 hours)	Oral Dermal Inhalation	Rat Rabbit Rat

Specific effects

Carcinogenic effects : Not listed as carcinogenic by OSHA, NTP or IARC.

Mutagenic effects : No known significant effects or critical hazards.

Teratogenicity / Reproductive toxicity : No known significant effects or critical hazards.

Sensitisation

Ingestion : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Eyes : Slightly irritating to the eyes.

Skin : Slightly irritating to the skin.

Synergistic products : Not available.

12 . Ecological information

Ecotoxicity data

Product/ingredient name	Species	Period	Result

Environmental precautions : No known significant effects or critical hazards.

Bioconcentration factor Not available.

BOD and COD Not available.

Biodegradable/OECD Not available.

Mobility Not available.

Special remarks on the products of biodegradation Not available.

13 . Disposal considerations

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Class	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Not regulated.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

EU regulations

Risk phrases : This product is not classified according to EU legislation.

International regulations

International lists

Canada inventory status : Not determined.

EC INVENTORY (EINECS/ELINCS) : Listed

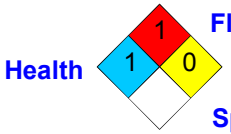
TSCA 8(b) inventory : Listed

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	1
Fire hazard	1
Reactivity	0
Personal protection	B

National Fire Protection Association (U.S.A.) :



16 . Other information

References : Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Date of printing : **2/13/2007.**

Date of issue : **2/13/2007.**

Date of previous issue : **No previous validation.**

Responsible name : **Product Safety - RS**

Version : **1**

For Copy of (M)SDS : The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

Internet: www.petro-canada.ca/msds

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Orica Canada Inc.
Maple Street
Brownsburg, PQ
For MSDS Requests: 450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137
For MSDS Requests: 303-268-5000

EMERGENCY CONTACTS

FOR CHEMICAL EMERGENCIES(24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: IN CANADA CALL THE ORICA CANADA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT 1-877-561-3636; IN THE U.S. CALL CHEMTREC (800) 424-9300. IN THE U.S. FOR LOST, STOLEN OR MISPLACED EXPLOSIVES CALL: BATF (800) 424-9555.

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: **Pentex Boosters**
MSDS Number: 60000 **Date Issued:** 11-07-05
Manufactured By: Orica Brazil Inc.
Product Use: Booster used in blasting systems

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENT(S)	% (w/w)	ACGIH TWA	CAS NO.
Trinitrotoluene (TNT)	30-50	0.1 mg/M^3(skin)	118-96-7
Pentaerythritol Tetranitrate (PETN)	50-70	Not Listed	78-11-5

Ingredients that are not listed above, that are used in the product are not hazardous as defined under current legislation.

SECTION 3 - HAZARD IDENTIFICATION

Emergency Overview: Risk of explosion by shock, friction, fire or other sources of ignition. Very toxic if swallowed. Irritating to eyes, respiratory system and skin. May cause methemoglobinemia. May cause sensitization by skin contact. Read the entire MSDS for a more thorough evaluation of the hazards.

SECTION 4 - FIRST AID MEASURES

Inhalation: If detonation fumes are inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen and contact a physician. Note: Oxygen should only be administered by a person trained in its use.
Skin Contact: Wash skin with soap and water
Eye Contact: Flush eyes with clean water for 15 minutes, then seek medical attention
Ingestion: If victim is alert and not convulsing, rinse mouth out and give 200-300 mL (1 cup) of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.
Note to Physicians: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10 cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%. Symptomatic. Do not give vasopressor drugs (e.g. epinephrine, adrenalin, ephedrine, etc.) as there may be danger of producing cardiac arrhythmia. Medical conditions that may be aggravated by exposure to this product include hypotension and skin disorders.

SECTION 5 - FIRE-FIGHTING MEASURES

Flash Point: This product does not flash.
Flammable Limits (Lower): Not Applicable
Flammable Limits (Upper): Not applicable
Auto Ignition Temperature: Not available
Decomposition Temperature: Not available
Rate of Burning: Not available
Explosive Power: Not available
Sensitivity to Mechanical Impact: Not available

Sensitivity to Static Discharge: Not available
Hazardous Reactions: Will detonate if suitably primed by heat, flame or **significant** impact. Hazardous gases produced in fire are Nitrogen Oxides and Carbon monoxide.
Fire and Explosion Hazards:
Extinguishing Media: None
Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Note: Division 1.1 explosives: Evacuate to 5000 feet (1 Mile). Consult the *North American Emergency Response Guide* number 112 for more details
Fire Fighting Protective Equipment: Not applicable.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills, Leaks, or Releases: Review fire and explosion hazards before proceeding with clean up. Remove and protect ignition sources. Wear protective equipment during clean up. Mop up with water using non sparking tools. It is suggested that only personnel trained in emergency response should respond. Verify complete account of the product (s). Notify authorities and follow applicable spill reporting requirements.
Deactivating Chemicals: Not Applicable.

SECTION 7 - HANDLING AND STORAGE

Storage Requirements: Store in compliance with applicable regulatory requirements. Keep away from ignition sources, strong shock, flames and heat. Store in a cool, dry location designed for explosives storage.
Storage Temperature: Store in accordance with the requirements of local legislation respecting explosive storage.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

PREVENTIVE MEASURES:

Engineering Controls: General ventilation should be appropriate under conditions of use.
PERSONAL PROTECTIVE EQUIPMENT:
Eye Protection: Chemical/Safety goggles are recommended.
Skin Protection: Cotton or leather gloves, clothing to protect exposed skin such as flameproof coveralls and conductive boots.
Respiratory Protection: Wear NIOSH approved respirator if concentrations are above acceptable limits.
EXPOSURE GUIDELINES:
PRODUCT: None established for product

HAZARDOUS INGREDIENT(S):

Trinitrotoluene (TNT)	ACGIH TLV – 0.1 mg/M^3 (skin)

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Alternate Name(s): Pentex CD 3 * 90, Pentex CD 5.5 * 150, Pentex CD 8 * 227, Pentex CD 12 * 340, Pentex CD 16 * 454, Pentex SB 8, Pentex SB 20, Pentex SB 60, Pentex SL 8 * 227, Pentex SL 12 * 340, Pentex SL 16 * 454
Chemical Name: Not applicable
Chemical Family: Booster explosives
Molecular Formula: Not applicable
Appearance: Tan to brown solid
Odour: No noticeable odour
pH: Not applicable
Vapour Pressure (mm Hg at 20°C/68°F): Not applicable
Vapour Density (Air=1): Not applicable
Boiling Point: Not applicable
Melting Point: 176^{o}F
Solubility (Water): Insoluble
Solubility (Other): Not available
Specific Gravity: 1.5 - 1.65
Evaporation Rate: Not applicable
Additional Properties: None

SECTION 10 - STABILITY AND REACTIVITY

Hazardous Decomposition Products: Oxides of Nitrogen and Carbon.
Chemical Stability: Stable under normal conditions.
Conditions to Avoid: Ignition sources, strong shock, heat and flame.
Incompatibility with other Substances: Not compatible with strong acids such as nitric acid.
Hazardous Polymerization: Will not polymerize.

SECTION 11 - TOXICOLOGICAL INFORMATION

Summary: Detonation may cause severe injury and death. All explosives are dangerous and must be handled carefully using approved safety procedures under the direction of competent, experienced personnel. Inhalation of explosive powders may cause nervous system irregularities including headache and dizziness. Nitrogen and Carbon Oxides generated during detonation are skin, eye and respiratory irritants.
TOXICOLOGICAL DATA:
PRODUCT: None established for product

INGREDIENTS:

Trinitrotoluene (TNT)	Oral LD50 (mouse) 25500 mg/kg
Pentaerythritol Tetranitrate (PETN)	Oral LD50 (rat) 795 mg/kg

POTENTIAL HEALTH EFFECTS:
Inhalation: High concentrations of the material may be irritating to the respiratory tract. May cause dizziness and nausea.
Skin Contact: May cause skin irritation. Repeated or prolonged contact may cause dermatitis. Can be absorbed through the skin. Evidence has indicated that an ingredient in this product may cause skin sensitization.
Eye Contact: Moderate irritant causing moderate initial pain.
Ingestion: Harmful if swallowed. May cause headache, weakness, anemia or liver injury.
Subchronic Effects: None known
Chronic Effects: None known
Carcinogenicity: Ingredients of this product are not listed as carcinogens by the National Toxicology Program (NTP), International Agency for Research for Cancer (IARC) or the Occupational Safety and Health Administration (OSHA)
Reproductive Effects: The ingredients of this product are not reproductive toxicants.
Teratogenicity and Fetotoxicity: None known
Synergistic Materials: None known.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicological Information: Harmful to aquatic life at low concentrations. (1.5 mg/L of TNT is toxic to fish)
Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds or rivers.

SECTION 13 - DISPOSAL CONSIDERATIONS

Burn under the supervision of an expert at an approved explosive burning ground or destroy by detonation in boreholes. Call upon the services of an Orica Canada Inc./Orica USA Inc. technical representative for assistance.

SECTION 14 - TRANSPORT INFORMATION

TDG Name: Boosters
TDG Class/Division: 1.1D
Product Indentification Number (PIN): UN0042
Packing Group: II
Transportation Emergency Telephone Number: IN CANADA CALL 1-877-561-3636. IN THE US CALL CHEMTREC (800) 424-9300.
Proper Shipping Name: Boosters, without detonators
DOT Label : EXPLOSIVE 1.1D
DOT Placard: EXPLOSIVES 1.1

SECTION 15 - REGULATORY INFORMATION

CANADIAN CLASSIFICATION:

Controlled Products Regulations (WHMIS) Classification: This product is an explosive and is not regulated by WHMIS.
CEPA / Canadian Domestic Substances List (DSL): All ingredients in this product are on the Canadian Domestic Substances List
IARC Classification: Not listed
USA CLASSIFICATION:
OSHA Classification:
Physical: Explosive
Health: Skin Sensitizer, Irritant.

Target Organ: Eye, skin, liver, urinary tract, gastrointestinal tract, cardiovascular system, immune system
SARA Regulations Sections 313 and 40 CFR 372: This product does not contain substances subject to reporting requirements.
Ozone Protection and 40 CFR 42: This product does not contain, nor is it manufactured with ozone depleting substances.
Other Regulations/Legislation which apply to this product: Massachusetts Right to Know, Pennsylvania Right to Know, New Jersey Right to Know.

SECTION 16 - OTHER INFORMATION

Prepared by: Orica Inc. Technical Personnel.

The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica Canada Inc./Orica USA Inc. will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein.

U.S BORAX & CHEMICAL CORP -- BORAX ANHYDROUS -- 6810-00F006161

Product Identification

Product ID:BORAX ANHYDROUS
MSDS Date:01/01/1987
FSC:6810
NIIN:00F006161
MSDS Number: BBVBH
=== Responsible Party ===
Company Name:U.S BORAX & CHEMICAL CORP/LOS ANGELES, CA 90010
Emergency Phone Num:(213) 381-5311
CAGE:FO177
=== Contractor Identification ===
Company Name:U S BORAX AND CHEMICAL CORP
Address:3075 WILSHIRE BLVD
Box:2781 T
City:LOS ANGELES
State:CA
ZIP:90010-1207
Country:US
CAGE:24611
Company Name:U.S BORAX & CHEMICAL CORP/LOS ANGELES, CA 90010
CAGE:FO177

Composition/Information on Ingredients

Ingred Name:SODIUM TETRABORATE, DECAHYDRATE
CAS:1303-96-4
RTECS #:VZ2275000
Fraction by Wt: 100%
OSHA PEL:10 MG/M3
ACGIH TLV:5 MG/M3; 9192

Hazards Identification

Effects of Overexposure:MODERATE SKIN & EYE IRRITANT

First Aid Measures

First Aid:SKIN/EYES: WASH WITH WATER.

Fire Fighting Measures

Extinguishing Media:NONE: MATERIAL HAS FIRE RETARDANT PROPERTIES.
Fire Fighting Procedures:NONE
Unusual Fire/Explosion Hazard:NONE

Accidental Release Measures

Spill Release Procedures:STANDARD DISPOSAL PROCEDURES - PRESENTS NO HEALTH HAZARD.

Handling and Storage

Handling and Storage Precautions:NONE NEEDED
Other Precautions:NONE NEEDED

Exposure Controls/Personal Protection

Respiratory Protection:NO SPECIAL PROTECTION REQUIRED.
Ventilation:LOCAL EXHAUST: NORMAL
Protective Gloves:NOT NEEDED
Eye Protection:AVOID EYE CONTACT
Other Protective Equipment:NONE
Supplemental Safety and Health
MSDS UNDATED. THEORETICAL B2O3 VALUE IN ANHYDROUS BORAX: 69.2% B2O3.

========== Physical/Chemical Properties ==========

Spec Gravity:2.4
Solubility in Water:MODERATE
Appearance and Odor:WHITE, SOLID ODORLESS
Percent Volatiles by Volume:NONE

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
NONE
Stability Condition to Avoid:KEEP DRY: SLOWLY ABSORBS ATMOSPHERIC OR FREE WATER. _
Hazardous Decomposition Products:NONE
Conditions to Avoid Polymerization:KEEP DRY.

========== Disposal Considerations ==========

Waste Disposal Methods:STANDARD DISPOSAL PROCEDURES - PRESENTS NO HEALTH HAZARD.

MATERIAL SAFETY DATA SHEET

Calcium Hydroxide

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Calcium Hydroxide

Product Use ..... Neutralization, flocculation, stabilization, absorption

Supplier Name..... ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... February 13, 2006

24-Hour Emergency Phone..... 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients..... Calcium Hydroxide >92%

CAS Number..... Calcium Hydroxide 1305-62-0

Synonym (s)..... High calcium hydrated lime, lime, slaked lime, lime putty, lime slurry, milk of lime, calcium hydroxide

Section 03 - Hazard Identification

Inhalation..... Low concentrations may cause sore throat, coughing, choking, dyspnea, and variable symptoms of headache, dizziness, and weakness. Intense exposures may result in tightness in the chest and delayed pulmonary edema. The solubility of substance allows penetration that may continue for several days.

Skin Contact / Absorption..... Can penetrate the skin slowly, producing soft, necrotic, deeply penetrating areas on contact. The extent of damage depends on the duration of contact. Removes natural skin oils.

Eye Contact..... Severe eye irritation, intense watering of the eyes, possible lesions, possible blindness when exposed for prolonged period.

Ingestion..... Causes gastrointestinal tract burns. May cause circulatory system failure. May cause perforation of the digestive tract. Causes severe pain, nausea, vomiting, diarrhea, and shock. Effects may be delayed.

Exposure Limits..... ACGIH/TLV-TWA = 5mg/m^3
NIOSH/TLV-TWA = 5mg/m^3
OSHA/PEL-TWA= 15 mg/m^3(total dust); 5mg/m^3(respirable fraction)

Section 04 - First Aid Measures

Inhalation..... Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact..... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention

Ingestion..... If victim is conscious, give 300mL of water, followed by diluted vinegar (1 part vinegar, 2 parts water) or fruit juice to neutralize the alkali. Do not induce vomiting. Contact a physician immediately.

Additional Information..... Consult a physician for all exposures except minor instances of inhalation.

Section 05 - Fire Fighting

Conditions of Flammability..... Product does not burn.

Means of Extinction..... Calcium hydroxide does not burn. Use extinguishing media appropriate to surrounding fire conditions.

Flash Point..... Not applicable

Auto-ignition Temperature..... Not applicable

Upper Flammable Limit ..... Not applicable

Lower Flammable Limit..... Not applicable

Hazardous Combustible Products... None

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards..... Not applicable

Section 06 - Accidental Release Measures

Leak / Spill..... Wear appropriate personal protective equipment. Ventilate area. Only enter area with PPE. Stop or reduce leak if safe to do so. Prevent material from entering sewers.

Deactivating Materials..... Vinegar or hydrochloric acid.

Section 07 - Handling and Storage

Handling Procedures..... Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements..... Store in a cool, DRY, well-ventilated place. Keep container tightly closed, and away from incompatible materials.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes..... Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory……..... Respiratory protection is not normally required. If use creates dust formations, then a NIOSH-approved respirator with a dust cartridge is recommended.

Gloves……..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Clothing……..……..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Footwear……..... Impervious boots of chemically resistant material should be worn at all times

Engineering Controls

Ventilation Requirements……..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure, and control of process conditions. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other……..... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State.....……...……..... Solid

Odor and Appearance…..……..... Odourless greyish white powder

Odor Threshold.....……..... Not applicable

Specific Gravity (Water=1)…….. 2.3-2.4

Vapor Pressure (mm Hg, 20C)…….. Not available

Vapor Density (Air=1)..……..... Not available

Evaporation Rate.....……..…….. Not available

Boiling Point.....……..... Not available

Freeze/Melting Point.....……..... Not available

pH......…….. 12.4 (saturated solution at 25°C)

Water/Oil Distribution Coefficient.... Not available

Bulk Density..... 320-690 kg/m^3

% Volatiles by Volume..... Not available

Solubility in Water..... 0.165g/100g(saturated solution)

Molecular Formula..... $Ca(OH)_2$

Molecular Weight..... 74.09 (anhydrous)

Section 10 - Stability and Reactivity

Stability..... Stable under normal conditions.

Incompatibility..... Boron tri-fluoride, chlorine tri-fluoride, ethanol, fluorine, hydrogen fluoride, phosphorus pentoxide; and acids

Hazardous Products of Decomposition.. Thermal decomposition at 540°C will produce calcium oxide and water. Reacts violently with strong acids. Reacts chemically with acids and many other compounds and chemical elements to form calcium based compounds. Explosive when mixed with nitro organic compounds.

Polymerization..... Will not occur

Section 11 - Toxicological Information

Irritancy..... Severe to moist skin tissue and eyes. Irritant slso to respiratory system, nasal passages and exposed cuts.

Sensitization..... Not available

Chronic/Acute Effects..... Contact dermatitis

Synergistic Materials..... Not available

Animal Toxicity Data..... LD_{50} (Oral, Mouse)= 7300mg/kg
LD_{50} (Oral, Rat)= 7340mg/kg

Carcinogenicity..... Calcium Hydroxide is not listed on the MSHA, OSHA or IARC lists of carcinogens. However, hydrated lime could contain crystalline silica, which inhaled in the form of quartz or crystobalite from occupational sources, is classified by IARC as (Group 1) carcinogenic to humans.

Reproductive Toxicity.................. Not available

Teratogenicity............................ Not available

Mutagenicity............................... Not available

Section 12 - Ecological Information

Fish Toxicity.............................. Not available

Biodegradability......................... Not available

Environmental Effects................... Not available

Section 13 - Disposal Consideration

Waste Disposal.............................Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class.. Not regulated

Group.. Not regulated

PIN Number.................................. Not regulated

Other... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.......................D2A, E

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

NSF Certification...............................Product is certified under ANSI/NSF Standard 60 for drinking water pH adustment at a maximum dosage of 650mg/L.

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

Material Safety Data Sheet
Calcium Oxide

ACC# 04030

Section 1 - Chemical Product and Company Identification

MSDS Name: Calcium Oxide
Catalog Numbers: C114-3, C114-50, C117-500
Synonyms: Lime; Quicklime; Burnt lime; Calx; Unslaked lime; Fluxing lime; Calcia; Pebble lime.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1305-78-8	Calcium oxide	>98	215-138-9

Hazard Symbols: C
Risk Phrases: 34

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white, light yellow, light gray powder. **Danger!** Corrosive. May cause severe respiratory and digestive tract irritation with possible burns. Causes eye and skin irritation and possible burns. Moisture sensitive. Reacts with water releasing heat and forming alkaline Ca(OH)2 solution.
Target Organs: Respiratory system, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Causes eye irritation and possible burns.
Skin: Contact with skin causes irritation and possible burns, especially if the skin is wet or moist. May cause deep, penetrating ulcers of the skin.
Ingestion: May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns. May cause circulatory system failure. May cause perforation of the digestive tract. May cause excess salivation, painful swallowing, rapid pulse and thermal burns.
Inhalation: May cause severe irritation of the upper respiratory tract with pain, burns, and inflammation. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation may cause

nasal septum ulceration and perforation.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Contact with moisture or water may generate sufficient heat to ignite nearby combustible materials.
Extinguishing Media: Do NOT use carbon dioxide. Do NOT use halogenated agents. Use flooding quantities of water as spray.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Use only with adequate ventilation. Avoid breathing dust.
Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from water. Corrosives area. Storage under a nitrogen blanket has been recommended.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Calcium oxide	2 mg/m3 TWA	2 mg/m3 TWA 25 mg/m3 IDLH	5 mg/m3 TWA

OSHA Vacated PELs: Calcium oxide: 5 mg/m3 TWA (not in effect as a result of reconsideration)

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Powder

Appearance: white, light yellow, light gray

Odor: Odorless.

pH: Not available.

Vapor Pressure: Negligible.

Vapor Density: Not available.

Evaporation Rate: Negligible.

Viscosity: Not available.

Boiling Point: 2850 deg C @ 760 mm Hg

Freezing/Melting Point:2570 deg C

Decomposition Temperature: Not available.

Solubility: reacts with water with evolution of heat

Specific Gravity/Density:3.3000g/cm3

Molecular Formula: CaO

Molecular Weight:56.08

Section 10 - Stability and Reactivity

Chemical Stability: Absorbs carbon dioxide from the air. Hygroscopic: absorbs moisture or water from the air. Reacts with water releasing heat and forming alkaline Ca(OH)2 solution.

Conditions to Avoid: Exposure to moist air or water.

Incompatibilities with Other Materials: React with water to form calcium hydroxide and heat; reacts with carbon dioxide to form calcium carbonate. Incompatible with ethanol, boric oxide + calcium chloride, and interhalogens such as boron trifluoride, chlorine trifluride, fluorine, hydrofluoric acid, phosphorus pentoxide, perchlorates, nitrates, and permanganates, acids.

Hazardous Decomposition Products: Calcium hydroxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 1305-78-8: EW3100000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 1305-78-8: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Neurotoxicity: No data available.
Mutagenicity: No data available.
Other Studies: No data available.

Section 12 - Ecological Information

Ecotoxicity: No data available. Mosquito fish, TLm=240 ppm/24H, Sunfish, 100 ppm/3hr. is toxic. vector snail, 300 ppm/24hr is lethal.
Environmental: No information available.
Physical: No information available.
Other: None.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 1305-78-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 1305-78-8: acute, reactive.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 1305-78-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
C
Risk Phrases:
R 34 Causes burns.

Safety Phrases:
S 25 Avoid contact with eyes.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 1305-78-8: 1

Canada - DSL/NDSL

CAS# 1305-78-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.

Canadian Ingredient Disclosure List

CAS# 1305-78-8 is listed on the Canadian Ingredient Disclosure List.

Exposure Limits

CAS# 1305-78-8: OEL-AUSTRALIA:TWA 2 mg/m3 OEL-AUSTRIA:TWA 5 mg/m3 OEL-BELGIUM:TWA 2 mg/m3 OEL-DENMARK:TWA 2 mg/m3 OEL-FINLAND:TWA 2 mg /m3 OEL-FRANCE:TWA 2 mg/m3 OEL-GERMANY:TWA 5 mg/m3 OEL-INDIA:TWA 2 mg/m3 OEL-THE NETHERLANDS:TWA 2 ppm (5 mg/m3) OEL-THE PHILIPPINES:TW A 5 mg/m3 OEL-POLAND:TWA 2 mg/m3 OEL-SWEDEN:TWA 2 mg/m3;STEL 5 mg/m3 OEL-TURKEY:TWA 5 mg/m3 OEL-UNITED KINGDOM:TWA 2 mg/m3 OEL IN BULGA RIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SING APORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #6 Date: 10/10/2001

MATERIAL SAFETY DATA SHEET

Calcium Peroxide

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Calcium Peroxide

Product Use ..... Used as a curing agent in rubber, starch modification, dough conditioner, industrial oxidizer, ingedient in deoderizers, cosmetics and dentifrices.

Supplier Name..... ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... May 8, 2006

24-Hour Emergency Phone..... 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....	Calcium Peroxide	75%
	Calcium Hydroxide	25%
CAS Number.....	Calcium Peroxide	1305-79-9
	Calcium Hydroxide	1305-62-0

Synonym (s)..... Calcium Superoxide, Solid peroxygen

Section 03 - Hazard Identification

Inhalation..... No significant long term inhalation hazard. Irritation usually subsides after exposure ceases.

Skin Contact / Absorption…….... Modest skin irritant

Eye Contact.....…….... Airborne dust is irritating to eyes. Direct contact with powder is severely irritating.

Ingestion.....……If ingested, gastrointestinal irritation but not caustic burns are to be expected.

Exposure Limits…….. No established limits for calcium peroxide. Limits for calcium hydroxide are below:

OSHA/PEL-TWA= 5mg/m^3
ACGIH/TLV-TWA= 5mg/m^3

Section 04 - First Aid Measures

Inhalation.....……..Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult or discomfort occurs, eek medical attention.

Skin Contact / Absorption……..Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact.....…….... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion.....……Do not induce vomiting. Dilute by giving one or two glasses of water. Do not give anything by mouth to an unconscious or convulsing person. Seek medical attention.

Additional Information.....…….. Notes to Physician: Modest irritation is only expected effect and should have no serious consequences except in the case of direct eye contact. If ingested, gastrointestinal irritation is to be expected. If large quantities are ingested, gastric evacuation via emesis or lavage may be used. Demulcents should be helpful. No systemic effects are expected.

Section 05 - Fire Fighting

Conditions of Flammability…….... Non-flammable

Means of Extinction.....…….....Product does not burn. Use any appropriate fire fighting agent for surrounding material. Use flooding quantities of water and water spray to cool containers.

Flash Point.....……..Not applicable

Auto-ignition Temperature……..Not applicable

Upper Flammable Limit …….. Not applicable

Lower Flammable Limit..…….. Not applicable

Hazardous Combustible Products... Under fire conditions, product may decompose and release oxygen gas that supports combustion. Mixtures with polysulphide polymers may ignite.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing Apparatus and protective clothing.

Explosion Hazards……..... Oxidizable materials can be ignited by grinding and may become explosive.

Section 06 - Accidental Release Measures

Leak / Spill.....…….. Confine spill and place into container. Dilute with a large quantity of water prior to disposal. Do not return product to original container. Flush area with water. Prevent runoff to sewer or waterways.

Deactivating Materials..…….... Water

Section 07 - Handling and Storage

Handling Procedures.....…….. Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements.....……..….. Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials and sources of heat.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes……..…….... Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory……..... NIOSH-approved respirator for dust should be worn if needed.

Gloves……..... Impervious gloves of chemically resistant material (rubber or neoprene) should be worn at all times. Wash contaminated gloves and dry thoroughly before reuse.

Clothing……..…….....Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Footwear…….....Impervious boots of chemically resistant material should be worn.

Other…….……....No other information available.

Engineering Controls

Ventilation Requirements…….....Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other……...Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State.....……...……..... Solid

Odor and Appearance…..…….. White to yellow odourless powder

Odor Threshold....…….....Not applicable

Specific Gravity (Water=1)……..2.92

Vapor Pressure (mm Hg, 20C)……..Not applicable

Vapor Density (Air=1)..……... Not available

Evaporation Rate.....……..…….. Not applicable

Boiling Point.....…….... Not applicable

Freeze/Melting Point....…….... Decomposes around 275°C

pH.....……..12-13 (% solution)

Water/Oil Distribution Coefficient.... Not available

Bulk Density.....……...27 lb/ft^3

% Volatiles by Volume……..……...0%

Solubility in Water...……..... Insoluble

Molecular Formula.....…….…..... CaO_2

Molecular Weight.....……..... Not applicable, mixture

Section 10 - Stability and Reactivity

Stability.....……...……..Stable under normal conditions. Decomposition could occur when exposed to heat or moisture.

Incompatibility.....……..…….. Incompatible with heat, heavy metals, organics, reducing agents, polysulphide polymers.

Hazardous Products of Decomposition.. Decomposition products include oxygen that supports combustion and calcium hydroxide.

Polymerization.....…….…….Will not occur.

Section 11 - Toxicological Information

Irritancy.....……..……..… Mild irritant, especially to eyes.

Sensitization.....……...……. Not available

Chronic/Acute Effects……...……..None

Synergistic Materials...……...……...Data not available

Animal Toxicity Data.....…..……...LD_{50}(oral,rat)= > 5g/kg
LD_{50}(dermal,rat)= > 10g/kg
LC_{50}(inhalation,rat,1 hour)= > 17mg/L

Carcinogenicity.....……...…….. Not considered to be carcinogenic as per ACGIH, OSHA, NTP, and IARC

Reproductive Toxicity..…...……... Data not available

Teratogenicity.....…...…….. Data not available

Mutagenicity.....……...……Data not available

Section 12 - Ecological Information

Fish Toxicity.....…….. Effect of low concentrations on aquatic life are unknown.

Biodegradability.....……..... Not available

Environmental Effects……As previously indicated, oxygen is released into environment when product is dissolved in water.

Section 13 - Disposal Considerations

Waste Disposal.....Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class..... 5.1

Group..... II

PIN Number..... UN 1457

Other.....Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....C, D2

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989

Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

Material Safety Data Sheet

Printing date 11/02/2006 Version 1 Reviewed on 11/02/2006

*

1 Identification of substance

· **Product details**

· **Trade name: Carbon Dioxide**

· **Article number:** 014-01-0001BOC

· **Creation date:** 06/01/2006

· **Manufacturer/Supplier:**
BOC Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
www.bocgases.ca

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER: (905) 501-0802
EMERGENCY RESPONSE PLAN NO: 2-0101

Please ensure that this MSDS is received by the appropriate person

· **Information department:** Customer Service Centre: 1-866-385-5349

2 Composition/Data on components

· **Chemical characterization:**
· **CAS No. Description**
124-38-9 Carbon Dioxide
· **Identification number(s)**
· **EINECS Number:** 204-696-9

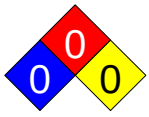
3 Hazards identification

· **Hazard description:**
· **WHMIS-symbols:**
A - Compressed gas

· **HMIS-ratings (scale 0 - 4)**

Health = 0
Fire = 0
Reactivity = 0

· **NFPA ratings (scale 0 - 4)**



Health = 0
Fire = 0
Reactivity = 0

· **Information pertaining to particular dangers for man and environment:** Not applicable.

(Contd. on page 2)

Material Safety Data Sheet

Printing date 11/02/2006 Version 1 Reviewed on 11/02/2006

Trade name: Carbon Dioxide

(Contd. of page 1)

· **Classification system:**
The classification is in line with internationally approved calculation standards. It is expanded, however, by information from technical literature and by information furnished by supplier companies.

*
4 First aid measures

· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water. Then consult a doctor.
· **After swallowing:** Not applicable

*
5 Fire fighting measures

· **Suitable extinguishing agents:**
CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
· **Protective equipment:** Wear self-contained respiatory protective device.

*
6 Accidental release measures

· **Person-related safety precautions:**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventillation.
· **Measures for environmental protection:** Prevent seepage into sewage system, workpits and/or cellars.
· **Measures for cleaning/collecting:** Ensure adequate ventillation.
· **Additional information:** No dangerous substances are released.

*
7 Handling and storage

· **Handling:**
· **Information for safe handling:** No special measures required.
· **Information about protection against explosions and fires:**
Keep ignition sources away - Do not smoke.
Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use.

· **Storage:**
· **Requirements to be met by storerooms and receptacles:**
Do not expose cylinder to temperatures higher than 50°C (122 °F)
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:**
Keep cylinder valve tightly closed.
Store cylinder in a well ventilated area.
Store in accordance with local fire code and/or building code or any pertaining regulations.

(Contd. on page 3)

Material Safety Data Sheet

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Trade name: Carbon Dioxide

(Contd. of page 2)

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8 Exposure controls and personal protection

· **Additional information about design of technical systems:** Adequate local ventillation.

· **Components with limit values that require monitoring at the workplace:**	
124-38-9 Carbon Dioxide (23-100%)	
EL	Short-term value: 15000 ppm Long-term value: 5000 ppm

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Personal protective equipment:**
· **General protective and hygienic measures:**
The usual precautionary measures for handling chemicals should be followed.
· **Breathing equipment:**
Use atmosphere-supplying respirators (e.g. supplied-air: demand, pressure-demand, or continuous-flow or self-contained breathing apparatus: demand or pressure-demand or combination supplied-air with auxiliary self-contained air supply atmosphere-supplying respirator) in case of insufficient ventilation.
· **Protection of hands:**

Protective gloves.

· **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Eye protection:** Safety glasses

9 Physical and chemical properties

· **General Information**	
Form:	Gaseous.
Color:	Colorless
Odor:	Odorless
· **Change in condition**	
Melting point/Melting range:	-56.6°C
Boiling point/Boiling range:	-78°C
· **Flash point:**	Not applicable.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Solubility in / Miscibility with**	
Water at 20°C:	2000 g/l

*

10 Stability and reactivity

· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Dangerous reactions** No dangerous reactions known.

(Contd. on page 4)

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Trade name: Carbon Dioxide

(Contd. of page 3)

· **Dangerous products of decomposition:** No dangerous decomposition products known.

11 Toxicological information

· **Acute toxicity:**
· **LD/LC50 values that are relevant for classification:** LC50 - None available.
· **Primary irritant effect:**
· **on the skin:** No irritating effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**
When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.
The substance is not subject to classification.

12 Ecological information

· **General notes:** Generally not hazardous for water

*

13 Disposal considerations

· **Product:**
· **Recommendation:**
Cylinder and unused product should be returned to vendor. Disposable cylinder must be disposed of in accordance with local regulations.

· **Uncleaned packagings:**
· **Recommendation:**
Cylinder and unused product should be returned to vendor. Disposable cylinder must be disposed of in accordance with local regulations.
· **Recommended cleansing agent:** None applicable.

*

14 Transport information

· **TDG and DOT regulations:**

· **Hazard class:** 2
· **Identification number:** UN1013
· **Proper shipping name (technical name):** CARBON DIOXIDE

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Trade name: Carbon Dioxide

(Contd. of page 4)

· **Label**	2.2

· **Maritime transport IMDG:**

· **IMDG Class:**	2
· **UN Number:**	1013
· **Label**	2.2
· **Marine pollutant:**	No
· **Propper shipping name:**	CARBON DIOXIDE

· **Air transport ICAO-TI and IATA-DGR:**

· **ICAO/IATA Class:**	2
· **UN/ID Number:**	1013
· **Label**	2.2
· **Propper shipping name:**	CARBON DIOXIDE

15 Regulations

· **Sara**

· **Section 355 (extremely hazardous substances):**

Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**

Substance is not listed.

· **TSCA (Toxic Substances Control Act):**

Substance is listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**

Substance is not listed.

· **Chemicals known to cause developmental toxicity:**

Substance is not listed.

· **Cancerogenity categories**

· **EPA (Environmental Protection Agency)**

Substance is not listed.

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Trade name: Carbon Dioxide

(Contd. of page 5)

· **NTP (National Toxicology Program)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

· **Canadian substance listings:**

· **Canadian Domestic Substances List (DSL)**
Substance is listed.

· **Canadian Ingredient Disclosure list (limit 0.1%)**
Substance is not listed.

· **Canadian Ingredient Disclosure list (limit 1%)**
Substance is listed.

· **Product related hazard informations:**
Observe the general safety regulations when handling chemicals.
The substance is not subject to classification according to the sources of literature known to us.

· **Safety phrases:**
Keep container tightly closed in a cool place.

*
16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing MSDS:** Customer Service Centre: 1-866-385-5349
· **Contact:** Canada Technical Services: 1-866-385-5349

Material Safety Data Sheet

Copper sulphate

Infosafe no. AJ1WQ **Issue Date** August 2001 **Status** ISSUED by APSSC
Classified as hazardous according to criteria of NOHSC

COMPANY DETAILS

Company Name	Asia Pacific Specialty Chemicals Limited (ABN 32000316138)
Address	15 Park Road SEVEN HILLS NSW 2147
Emergency Tel.	1800 022 037 (24H)
Tel/Fax	Tel: (02) 9839 4000 Fax: (02) 9674 6225
Other Information	New Zealand: Asia Pacific Specialty Chemicals (NZ) Limited 119 Carbine Road Mt Wellington, Auckland 6 Emergency Tel: 0800 243 622 (24H) Telephone: (09) 276 4019 Fax: (09) 276 7231

IDENTIFICATION

Product Name Copper sulphate

Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.

Other Names	**Name**	**Manf. Code**
	COPPER (II) SULPHATE ANHYDROUS	AR 00000171
	COPPER II SULPHATE	UL 00000772
	COPPER II SULPHATE	TECH 00001008
	COPPER SULPHATE ELECTROPLATING GRADE	00011316
	COPPER II SULPHATE ANHYDROUS	UL 00001007
	Blue copper	
	Blue stone	
	Blue vitriol	
	Copper(II) sulfate	
	Copper sulfate	
	Cupric sulfate	
	Cupric sulphate	
	Sulfate de cuivre	

UN Number 3077

DG Class 9

Packing Group III

Hazchem Code 2X

Poisons Schedule S6

Product Use Used in agriculture as a soil additive, pesticide, feed additive; germicide; leather and textile mordant; pigment; manufacture of batteries; electroplating and electrorefining of copper; medicine; wood and pulp preservative; engraving and lithography; ore, steel and rubber processing; asphalt treatment.

Physical Data

Appearance	Greyish-white to greenish-white hygroscopic crystals or powder.
Melting Point	650°C Decomposes
Boiling Point	Not applicable
Vapour Pressure	7.3 mmHg @ 25°C
Specific Gravity	3.603
Flash Point	Not applicable (does not burn)
Flamm. Limit LEL	Not applicable
Flamm. Limit UEL	Not applicable
Solubility in Water	Very soluble

Other Properties

Autoignition Temp.	Not applicable
Vapour Density	Not applicable
pH Value	4.0 (0.2 M @ 4°C)
Solubility in Organic Solvents	Soluble in methanol and glycerol; slightly soluble in ethanol.
Molecular Weight	159.61
Other Information	DEHYDRATION: The pentahydrate loses two water molecules of hydration at 30°C, 2 more at 110°C and becomes anhydrous by 250°C.

Ingredients

Ingredients	**Name**	**CAS**	**Proportion**
	Copper sulphate	7758-98-7	97-100 %

HEALTH HAZARD INFORMATION

Health Effects

Acute - Swallowed	Harmful if swallowed. Copper salts impart a metallic taste in the mouth. Burning sensation in the throat and repeated vomiting are typical effects. More severe poisonings cause diarrhoea and ulceration of the gastrointestinal tract. Can be fatal.
Acute - Eye	Will cause irritation in contact with the eyes. Dilute copper sulphate solutions have been used as topical antibiotics. Copper sulphate particles in the eye could cause local inflammation, tissue destruction (necrosis), corneal opacity and adhesion of the eyelid to the eye. Traces of sulphuric acid impurity may contribute to these effects.
Acute - Skin	Will cause irritation in contact with the skin, which will result in redness, itchiness, and possible dermatitis.
Acute - Inhaled	May cause irritation to the mucous membrane and upper airways. Dusts and mists (copper solutions) may also cause irritation of the nasal passages and throat. Ulceration of the nasal septum is possible, but may be due to traces of sulphuric acid impurities.
Chronic	HEALTH EFFECTS SKIN: Repeated or prolonged exposure to copper salts can cause irritation, producing itching and redness of the skin. Some individuals may become sensitized to copper sulfate and develop allergic contact dermatitis. INHALATION: Repeated inhalation of copper sulfate mists (e.g. Bordeaux mixture) may induce a condition known as 'vineyard sprayer's lung'. Greenish-tumours occur in the liver and lungs of afflicted individuals. The disease is asymptomatic until later stages. Symptoms include weakness, malaise, loss of appetite and weight, cough and greenish-brown sputum. INGESTION: Chronic occupational exposure to copper sulfate by ingestion is not likely. Symptoms would be like those of Wilson's disease, which include liver, brain, muscle and kidney disfunction.
Other Information	CARCINOGENICITY Although some individuals afflicted with 'vineyard sprayers' lung' developed lung cancer, there is no indication of an increased incidence of cancer due to copper sulfate exposure, per se. TERATOGENICITY AND EMBRYOTOXICITY There are no reports of teratogenicity or embryotoxicity in humans. Animal studies indicate that a deficiency or embryotoxicity in humans. Animal studies indicate that a deficiency or excess of copper in the body can cause significant harm to developing embryos. The net absorption of copper is limited and embryotoxic levels are unlikely from industrial exposure. TOXICOLOGICAL SYNERGISTIC MATERIALS Information not available MUTAGENICITY No human data available. Negative or inconclusive results in short-term tests. POTENTIAL FOR ACCUMULATION Copper is an essential element and its level in the body is strictly controlled. Under most conditions, excess copper is excreted in the urine and feces (via the bile). HEALTH HAZARD COMMENTS Copper salts may decrease the toxicity of molybdenum. Zinc salts may decrease the toxicity of copper salts.

First Aid

Swallowed	Immediately wash out mouth with water, and then give plenty of water to drink. SEEK IMMEDIATE MEDICAL ATTENTION.
Eye	If in eye(s) wash with copious amounts of water for approximately 15 minutes holding eyelid(s) open. Take care not to rinse contaminated water into the non-affected eye. SEEK MEDICAL ATTENTION.
Skin	Remove contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Wash gently and thoroughly with water and non-abrasive soap. Ensure contaminated clothing is washed before re-use or discard. If contact is more than of minor nature, SEEK MEDICAL ATTENTION.
Inhaled	Remove the source of contamination or move the victim to fresh air. Ensure airways are clear and have a qualified person give oxygen through a face mask if breathing is difficult. SEEK MEDICAL ATTENTION.
First Aid Facilities	Safety showers, eye wash fountains, and normal wash room facilities.
Other Information	Consult a doctor and/or the nearest Poison Control Centre for all exposures except minor instances of inhalation or skin contact. All first aid procedures should be periodically reviewed by a doctor familiar with the material and its conditions of use in the workplace.

Advice to Doctor

Advice to Doctor	Treat symptomatically or consult Poison Information Centre.

Other Health Hazard Information

PRECAUTIONS FOR USE

Exposure Limits	Copper, dusts & mists (as Cu) TWA: 1 mg/m3 Copper (fume) TWA: 0.2 mg/m3
Eng. Controls	Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personnel enclosure, control of process conditions, and process modification (e.g., substitution of a less hazardous material). Administrative controls and personal protective equipment may also be required. Use local exhaust ventilation, and process enclosure if necessary, to control airborne dust or mist. Locate dust collectors outside or where permitted by regulation. Supply sufficient replacement air to make up for air removed by exhaust system.

Personal Protection

Protective Equip.	RESPIRATORY PROTECTION: The use of a Class P2 full facepiece respirator with replaceable filter complying with AS/NZS 1715 and AS/NZS 1716 is recommended. EYE PROTECTION: The use of face shields, chemical goggles, or safety glasses with side shield protection is recommended. HAND PROTECTION: The use of Nitrile rubber gloves is recommended. CLOTHING: The use of plastic apron, sleeves, overalls, and rubber boots are recommended.
Work/Hygienic Practices	Avoid eye contact and repeated or prolonged skin contact. Wear overalls, safety glasses and impervious gloves. If risk of inhalation of spray mists exists, wear combined organic vapour / particulate respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storing or re-using.

Flammability

Fire Hazards	In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to safety information on dust explosion hazards. Not combustible.

SAFE HANDLING INFORMATION

Storage and Transport

Storage Precautions	Store in a cool, dry, well-ventilated area, out of direct sunlight. Store in suitable, labelled containers. Keep containers tightly closed when not in use and when empty. Protect from damage. Limit quantity of material in storage. Restrict access to storage area. Post warning signs when appropriate. Keep storage area separate from populated work areas. Inspect periodically for deficiencies such as damage or leaks.
Transport	Class 9 Miscellaneous dangerous goods shall not be loaded in a vehicle with: - Class 1 Explosives - Class 5. 1 Oxidizing agents (when Class 9 substance capable of igniting and burning - Class 5. 2 Organic peroxides (when Cl. 9 capable of igniting/burnin
Storage Regulations	This material is a SCHEDULED (S6) POISON and must be stored, handled and maintained according to the appropriate Commonwealth Regulations.
Handling	Avoid generating dust and mist. Use dust-tight containers. Prevent accumulations of dust. Use smallest possible amounts in designated areas with adequate ventilation. Have emergency equipment (for spills, leaks, etc.) readily available. Label containers. Keep containers closed when not in use. Empty containers may contain residues which are hazardous.
Proper Shipping Name	ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.
IERG Number	47
Packaging Method	#5.9.9

Spills and Disposal

Spills & Disposal	Increase ventilation. Evacuate all unnecessary personnel. Wear Self-Contained Breathing Apparatus (S.C.B.A) and full protective clothing to minimise skin exposure. Dampen spilled material with water to avoid airborne dust, then transfer material to a suitable container. Use absorbent paper dampened with water to pick up remaining material. Wash surfaces well with soap and water. Seal all wastes in vapour tight plasitic bags for eventual disposal. If large quantities of this material enter the waterways contact the Environmental Protection Authority, or your local Waste Management Authority.
Disposal	Disposal of this material should be undertaken by a registered chemical disposal company.

Fire/Explosion Hazard

Fire/Explos. Hazard	On burning will emit noxious fumes.
Hazardous Combustion Products	Combustion products include oxides of carbon and other noxious smoke.
Fire Fighting Procedures	Wear Self-Contained Breathing Apparutus (S.C.B.A) and full protective clothing to minimse skin exposure.
Extinguishing Media	Use extinguishing media suitable for surrounding environment.
Hazardous Reaction	STABILITY Stable under normal conditions INCOMPATIBILITY -MAT'LS TO AVOID ACETYLENE - copper salts may react to form explosive acetylides. HYDROXYLAMINE - anhydrous copper sulfate can cause ignition upon contact with hydroxylamine due to the heat of coordination.
Hazchem Code	2X

OTHER INFORMATION

Toxicology	Oral (rat) LD50 : 300 mg/kg Skin (rat) LD50 : > 2 gm/kg
Information on Ecological Effects	Harmful to aquatic life.
Risk Statement	R22 Harmful if swallowed. R36/38 Irritating to eyes and skin.
Safety Statement	S22 Do not breathe dust. S24/25 Avoid contact with skin and eyes. S36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
Hazard Category	Harmful,Irritant

CONTACT POINT

Contact

Australia: Business Hours: Mr Paul Verren
Telephone: (02) 9839 4024
After Hours: 1800 022 037
New Zealand: Business Hours: Mr Lloyd Williams
Telephone: (09) 276 4019
Emergency Tel: 0800 243 622
IMPORTANT ADVICE:
This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including its use in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact Asia Pacific Speciality Chemicals. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

End of MSDS

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-3, D-2B**		

Section 1. Chemical Product and Company Identification

Product Name	**DIESEL FUEL**	**Code**	W104, W293; SAP: 120, 121, 122, 287
Synonym	Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, P50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel	**Validated on**	**2/5/2007.**
Manufacturer	PETRO-CANADA P.O. Box 2844 150 – 6th Avenue South-West Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Distillates (petroleum), hydrodesulfurized middle	64742-80-9	100	Not established	Not established	Not established
Kerosine (petroleum), hydrodesulfurized	64742-81-0		200 mg/m³	Not established	Not established
Fuels, diesel	68334-30-5		100 mg/m³	Not established	Not established
Fuel oil no. 2	68476-30-2		100 mg/m³	Not established	Not established

Manufacturer Recommendation	Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Combustible liquid. Exercise caution when handling this material. Contact with this product may cause skin and eye irritation. Prolonged or repeated contact may cause skin irritation, defatting, drying and dermatitis. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face. Obtain medical attention immediately.
Skin Contact	Avoid direct contact. Wear chemical resistant protective clothing if necessary. Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with warm water and non-abrasive soap for 15-20 minutes or until chemical is removed. Under running water, remove contaminated clothing, shoes and leather goods (e.g., watch bands, belts, etc.). Obtain medical attention immediately. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.

Continued on Next Page

Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Repeat administration of water. If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Quickly transport victim to an emergency care facility.
Note to Physician	Not available.

Section 5. Fire-fighting Measures

Flammability	Combustible liquid.	**Flammable Limits**	Lower: 0.7% Upper: 6%
Flash Points	Diesel Fuel: Closed Cup: ≥45ºC (113ºF) Marine Diesel Fuel: Closed Cup: ≥64ºC (147ºF) Mining Diesel: Closed Cup: ≥52ºC (126ºF)	**Auto-Ignition Temperature**	225°C (437°F)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.	**Explosion Hazards in Presence of Various Substances**	Containers may explode in heat of fire. Do not cut, weld, heat, drill or pressurize empty container. Runoff to sewer may create fire or explosion hazard.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion. See Section 11 (Other Considerations) for information regarding the toxicity of the combustion products.		
Fire Fighting Media and Instructions	NAERG2004, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a moderate flash point above 40ºC: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.		

Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Extinguish all ignition sources. Evacuate non-essential personnel. Ventilate area. Stop leak if safe to do so. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. Avoid contact with spilled material. Avoid breathing vapours or mists of material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately. Ensure clean-up personnel wear appropriate personal protective equipment.

Section 7. Handling and Storage

Handling	COMBUSTIBLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Ensure all equipment is grounded/bonded. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Wear proper personal protective equipment (See Section 8). Avoid confined spaces and areas with poor ventilation. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.
Storage	Store away from heat and sources of ignition. Store in dry, cool, well-ventilated area. Store away from incompatible and reactive materials (See section 5 and 10). Ensure the storage containers are grounded/bonded.

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes As a minimum, safety glasses with side shields should be worn when handling this material. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.

Body If this material may come in contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information.)

Respiratory A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hands If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): nitrile, neoprene, polyvinyl alcohol (PVA), fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Feet Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Bright oily liquid.	**Viscosity**	1.3 - 4.4 cSt @ 40ºC (104ºF)
Colour	Clear to yellow / brown (may be dyed for taxation purposes).	**Pour Point**	Not available.
Odour	Mild petroleum oil like.	**Softening Point**	Not available.
Odour Threshold	Not available.	**Dropping Point**	Not available.
Boiling Point	150 to 371°C (302 to 699.8°F)	**Penetration**	Not available.
Density	0.8 to 0.88 kg/L @ 15ºC (59ºF)	**Oil / Water Dist. Coefficient**	Not available.
Vapour Density	4.5 [Air = 1]	**Ionicity (in water)**	Not available.
Vapour Pressure	1 kPa (7.5 mm Hg) @ 20ºC (68ºF)	**Dispersion Properties**	Not available.
Volatility	Semivolatile to volatile.	**Solubility**	Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

Section 10. Stability and Reactivity

Corrosivity	Not available.		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products**	May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation and ingestion.

Acute Lethality Acute toxicity information is not available for the product as a whole, therefore, data for some of the ingredients is provided below:

Distillates (petroleum), hydrodesulfurized middle (64742-80-9):
Acute Inhalation toxicity (LC50): 4600 mg/m³/4h (rat)

Kerosine (petroleum), hydrosulfurized (64742-81-0):
Acute Oral toxicity (LD50): >5000 mg/kg (rat)
Acute Dermal toxicity (LD50): >2000 mg/kg (rabbit)
Acute Inhalation toxicity (LC50): >5000 mg/m³/4h (rat)

Fuels, diesel (68334-30-5):
Acute Oral toxicity (LD50): 7500 mg/kg (rat)
Acute Dermal toxicity (LD50): 24500 mg/kg (mouse)

	Fuel oil no. 2 (68476-30-2): Acute Oral toxicity (LD50): 12000 mg/kg (rat)
Chronic or Other Toxic Effects	
Dermal Route:	This product contains a component (at >= 1%) that can cause skin irritation. Therefore, this product is considered to be a skin irritant. Prolonged or repeated contact may defat and dry skin, and cause dermatitis. (See Other Considerations)
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Eye Irritation/Inflammation:	Short-term exposure is expected to cause only slight irritation, if any.
Immunotoxicity:	Not available.
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	Considered to be A3 by the ACGIH (Kerosine (petroleum), hydrodesulfurized; Fuels, diesel; Fuel oil no. 2) (See Other Considerations)
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer. Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Section 12. Ecological Information

Environmental Fate	Not available.	**Persistance/ Bioaccumulation Potential**	Not available.
BOD5 and COD	Not available.	**Products of Biodegradation**	Not available.
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	DIESEL FUEL, 3, UN1202, PGIII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

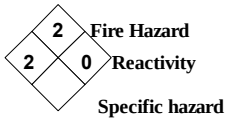
Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Irritating substance. CLASS: Target organ effects. CLASS: Combustible liquid having a flash point between 37.8°C (100°F) and 93.3°C (200°F).
ADR (Europe) (Pictograms)	NOT EVALUATED FOR EUROPEAN TRANSPORT NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.	**DOT (U.S.A) (Pictograms)**	Not evaluated for transport Non évalué pour le transport

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	2
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)



Rating
0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemical Hazard Information and Packaging Approved Supply List
COD - Chemical Oxygen Demand
CPR - Controlled Products Regulations
DOT - Department of Transportation (U.S.A.)
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substance or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List (Canada)
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning And Community Right-To-Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLV-TWA - Threshold Limit Value-Time Weighted Average
TLm - Median Tolerance Limit
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS

Prepared by Product Safety - JDW on 2/5/2007.

Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Data entry by Product Safety - JDW.

Material Safety Data Sheet

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CANUTEC (CANADA) 613-996-6666

MSDS # 1019
Date 01/24/05

Supercedes
MSDS # 1019 09/09/04

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s):

D-GEL™ 1000
DYNOSPLIT®: D1, D3/4, D 7/8
EXTRA GELATIN: 40%, 75%
GELAPRIME® F
UNIGEL®
UNIMAX®
VIBROGEL®: 1,3
Z POWDER™
DYNOMAX PRO™
Oil Well Explosive 80%
Oil Well Explosive 100%
STONECUTTER™
REDH®A
RED H® B
POWERGEL D
60% Hi-Pressure Gelatin
IRESPLIT® D
IP: 724, 738

Product Class: Packaged Dynamites and Blasting Gelatins
Product Appearance & Odor: Powdery to gelatinous solid, light tan to dark brown color. Faint, waxy odor.
DOT Hazard Shipping Description: Explosive, blasting, type A 1.1D UN0081 II
NFPA Hazard Classification: Not Available (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	ACGIH TLV-TWA
Nitroglycerin (NG)	55-63-0	1-20	0.05 ppm
Ethylene Glycol Dinitrate (EGDN)	628-96-6	8-76	0.05 ppm
Nitrocellulose	9004-70-0	0-6	No Value Established
Ammonium Nitrate	6484-52-2	0-75	No Value Established
Sodium Nitrate[1]	7631-99-4	0-50	No Value Established
Sulfur[2]	7704-34-9	0-4	No Value Established

[1] Our source of Sodium Nitrate (Chilean) may contain perchlorate ion, which occurs naturally. Although Dyno Nobel does not analyze for the presence of perchlorate anion, based on published studies, the products listed above may contain between 0 and 1,000 ppm perchlorate.

[2] This ingredient is not found in most of the products listed above.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Density: Not Applicable
Vapor Pressure: Not Applicable
Density: 0.8-1.48 g/cc

Percent Volatile by Volume: Not Applicable

Evaporation Rate (Butyl Acetate = 1): Not Applicable

Solubility in Water: Ammonium and sodium nitrates are completely soluble. NG and EGDN are very slightly soluble.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable

Flammable Limits: Not Applicable

Extinguishing Media: (See Special Fire Fighting Procedures section.)

Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: May cause irritation, redness and tearing.

Skin: Contact may result in headache, nausea and blood vessel dilation.

Ingestion: May result in headache, nausea, intestinal upset and blood vessel dilation.

Inhalation: May result in headache, nausea and blood vessel dilation.

Systemic or Other Effects: *Perchlorate*: Perchlorate can potentially inhibit iodide uptake by the thyroid and result in a decrease in thyroid hormone. The National Academy of Sciences (NAS) has reviewed the toxicity of perchlorate and has concluded that even the most sensitive populations could ingest up to 0.7 microgram perchlorate per kilogram of body weight per day without adversely affecting health. The USEPA must establish a maximum contaminant level (MCL) for perchlorate in drinking water by 2007, and this study by NAS may result in a recommendation of about 20 ppb for the MCL.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.

Skin: Remove contaminated clothing. Wash with soap and water.

Ingestion: Seek medical attention.

Inhalation: Remove to fresh air. If irritation persists, seek medical attention.

Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions. May explode when subjected to fire, supersonic shock, or high-energy projectile impact, especially when confined or in large quantities.

Conditions to Avoid: Keep away from heat, flame, ignition sources and strong shock.

Materials to Avoid (Incompatibility): Corrosives (mineral acids, bases, strong acids).

Hazardous Decomposition Products: Carbon Monoxide (CO), Hydrogen Sulfide (H_2S), Nitrous Oxides (NO_X), and Sulfur Oxides (SO_X).

Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged

and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements. Contact of this product with water may result in a reportable release.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Forced ventilation may be necessary where natural ventilation is limited. Magazines containing NG and/or EGDN based explosives must be ventilated before entry.
Respiratory Protection: None normally required.
Protective Clothing: Chemical resistant (nitrile) gloves are suggested.
Eye Protection: Safety glasses are recommended.
Other Precautions Required: Inhalation and skin contact should be minimized to avoid headaches, nausea, and blood vessel dilation. Protective clothing should be changed daily, more often if contaminated.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Keep away from heat, flame, ignition sources, and strong shock.
Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.
Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

Chemical Name	CAS Number	% By Weight
Nitroglycerin	55-63-0	1-20

The reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372 may become applicable if the physical state of this product is changed to an aqueous solution. If an aqueous solution of this product is manufactured, processed, or otherwise used, the nitrate compounds category and ammonia listing of the previously referenced regulation should be reviewed.

Disclaimer

Material Safety Data Sheet

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MSDS # 1076
Date 01/24/05

Supercedes
MSDS # 1076 01/22/03

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): ELECTRIC SUPER™ COAL
ELECTRIC SUPER™ LP
ELECTRIC SUPER™ SP
ELECTRIC SUPER™ SEISMIC
ELECTRIC SUPER™ INSTANT

Product Class: Commercial Electric Detonators and Accessory Products

Product Appearance & Odor: Metal cylinder with varying length of attached plastic coated wires.

DOT Hazard Shipping Description: Detonators, Electric 1.1B UN0030 II
Or
Detonators, Electric 1.4B UN0255 II
Or
Detonators, Electric 1.4S UN0456 II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

		EXPOSURE LIMITS	
Ingredients	**CAS#**	**OSHA PEL-TWA**	**ACGIH TLV-TWA**
Tungsten	7440-33-7	None[1]	5 mg/m^3 (TWA) 10 mg/m^3 (STEL)
Barium Chromate	10294-40-3	1 mg (CrO_3)/10m^3 (ceiling) 0.5 mg (Ba)/m^3	0.01 mg (Cr)/m^3 0.5 mg (Ba)/m^3
Lead Compounds	----------	0.5 mg (Pb)/m^3	0.5 mg (Pb)/m^3
Pentaerythritol Tetranitrate (PETN)	78-11-5	None[1]	None[2]
Boron	7440-42-8	No Value Established	No Value Established
Potassium Perchlorate[3]	7778-74-7	None[1]	None[2]
Diazodinitrophenol (DDNP)	4682-03-5	No Value Established	No Value Established
Nitrocellulose	9004-70-0	No Value Established	No Value Established

[1] Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m^3 ; respirable fraction, 5 mg/m^3 .
[2] Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m^3 ; respirable part., 3 mg/m^3 .
[3] Not all delay periods contain perchlorate. Those that do contain between from about 4 to a maximum of about 25 mg perchlorate per detonator.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Pressure: Not Applicable
Vapor Density: Not Applicable
Density: Not Applicable
Percent Volatile by Volume: Not Applicable
Solubility in Water: Not Applicable

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable
Flammable Limits: Not Applicable
Extinguishing Media: None
Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.
Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

This is a packaged product that will not result in exposure to the explosive material under normal conditions of use. Exposure concerns are primarily with post-detonation reaction products, particularly heavy metal compounds.

Eyes: No exposure to chemical hazards anticipated with normal handling procedures. Particulates in the eye may cause irritation, redness and tearing.
Skin: No exposure to chemical hazards anticipated with normal handling procedures.
Ingestion: No exposure to chemical hazards anticipated with normal handling procedures.
Inhalation: Not a likely route of exposure.
Systemic or Other Effects: None anticipated with normal handling procedures. Repeated inhalation or ingestion of post-detonation reaction products may lead to systemic effects such as respiratory tract irritation, ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Heavy metal (lead) poisoning can occur.
Carcinogenicity: ACGIH classifies Lead as a “Suspected Human Carcinogen” and insoluble Chromium VI as “Confirmed Human Carcinogen”. NTP, OSHA, and IARC consider components contained in this detonator carcinogenic.
Perchlorate: Perchlorate can potentially inhibit iodide uptake by the thyroid and result in a decrease in thyroid hormone. The National Academy of Sciences (NAS) has reviewed the toxicity of perchlorate and has concluded that even the most sensitive populations could ingest up to 0.7 microgram perchlorate per kilogram of body weight per day without adversely affecting health. The USEPA must establish a maximum contaminant level (MCL) for perchlorate in drinking water by 2007, and this study by NAS may result in a recommendation of about 20 ppb for the MCL.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.
Skin: Wash with soap and water.
Ingestion: Seek medical attention.
Inhalation: Not applicable.
Special Considerations: None

Material Safety Data Sheet

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.
Conditions to Avoid: Keep away from heat, flame, ignition sources, strong shock and electrical impulse. Do not attempt to disassemble.
Materials to Avoid (Incompatibility): Corrosives (acids and bases)
Hazardous Decomposition Products: Carbon Monoxide (CO), Nitrous Oxides (NO_x), Lead (Pb) and various oxides and complex oxides of metals.
Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.
Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.
Respiratory Protection: None normally required.
Protective Clothing: Cotton clothing is suggested.
Eye Protection: Safety glasses are recommended.
Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Keep away from heat, flame, ignition sources, strong shock, and electrical impulses.
Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.
Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

Material Safety Data Sheet

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number (Use Toxic Chemical Category Code)	% By Weight
Barium Compounds	N040	1.2
Lead Compounds	N420	0 – 0.59
Chromium Compounds	N090	1.2

Amount of Lead in Detonator Product Line *				
Product	**Pb compounds in detonator [grams]**	**Pb compounds in detonator [Wt.%]**	**Pb in detonator [grams]**	**Pb in detonator [Wt. %]**
Electric Super SP	**0.0412**	**0.588%**	**0.0357**	**0.5093%**
Electric Super LP	**0.0412**	**0.588%**	**0.0357**	**0.5093%**
Electric Super Coal	**0.0412**	**0.588%**	**0.0357**	**0.5093%**
Electric Super Seismic	**0.0000**	**0.0000%**	**0.0000**	**0.0000%**
Electric Super Instant	**0.0000**	**0.0000%**	**0.0000**	**0.0000%**

*****Applies to only the detonator (source of lead). Do not use case weight or weight of any other component.

Disclaimer

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MSDS # 1049
Date 02/07/05

Supercedes
MSDS # 1049 01/24/03

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): N-36
N-37
N-39
N-40
N-52

Product Class: Emulsifier

Product Appearance & Odor: Dark, viscous liquid with a slightly pungent hydrocarbon odor.

DOT Hazard Shipping Description: Combustible liquid, n.o.s. (Alkanolamine), NA 1993 III
Shipped in drums or bulk tanker.

NFPA Hazard Classification: Health (Blue) = 2
Flammability (Red) = 1
Reactivity (Yellow) = 0

SECTION II - HAZARDOUS INGREDIENTS

			Occupational Exposure Limits	
Ingredients:	**CAS#**	**% (Range)**	**ACGIH TLV-TWA**	**OSHA PEL-TWA**
Alkanolamine	100-37-8	1-6	10 mg/m^3	50 mg/m^3
Mineral Oil (Mist)	64742-35-4	5-70	5 mg/m^3	None

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Boiling Point: >150°C (302°F)
Vapor Density: >1
Percent Volatile by Volume: <5
Evaporation Rate (Butyl Acetate = 1): <1

Vapor Pressure: <1 mm Hg at 20°C
Density: 0.87-0.92 g/cc
Solubility in Water: Insoluble

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: 79°C (174°F) **Flammable Limits:** Not Determined
Extinguishing Media: Use carbon dioxide or dry chemical on small fires. Use foam (alcohol, polymer or ordinary) and water spray for large fires.
Special Fire Fighting Procedures: Self contained breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards: None known.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: May cause irritation, redness and tearing.
Skin: Prolonged contact may cause irritation.
Ingestion: Large amounts may be harmful if swallowed.
Inhalation: May cause dizziness, nausea, intestinal upset.
Systemic or Other Effects: None known.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.
Skin: Remove contaminated clothing. Wash with soap and water.
Ingestion: Seek medical attention.
Inhalation: Remove to fresh air. If irritation persists, seek medical attention.
Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions.
Conditions to Avoid: See Below
Materials to Avoid (Incompatibility): Strong oxidizing material can cause a reaction.
Hazardous Decomposition Products: Thermal decomposition or burning may produce Carbon Monoxide (CO) and/or Nitrogen Oxides (NO_X).
Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Use appropriate safety equipment. Use absorbent material to collect and contain for disposal. Contain large spills and pump into a suitable tank. Wash area with suitable detergent and thoroughly rinse. Follow applicable Federal, State and local reporting requirements.
Waste Disposal Method: Disposal must comply with Federal, State and local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Ventilation must be adequate to prevent exposure to high concentrations of vapors. Mechanical ventilation is recommended for enclosed areas and/or when product is at elevated temperatures.

Respiratory Protection: Do not breath vapors. A suitable respirator is strongly recommended when ventilation is marginal or the product is being handled at elevated temperatures.
Protective Clothing: Body-covering clothing and rubber gloves are recommended. Remove contaminated clothing to prevent prolonged skin contact.
Eye Protection: Safety glasses are recommended.
Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in compliance with all Federal, State, and local regulations.
Other Precautions: Store only in well-ventilated areas at temperatures below the flash point. Keep all containers tightly sealed, including empty containers. Do not breathe vapors when opening containers.

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	% By Weight
None		

Disclaimer

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Material Safety Data Sheet
Ethylene glycol

ACC# 09400

Section 1 - Chemical Product and Company Identification

MSDS Name: Ethylene glycol
Catalog Numbers: AC146750000, AC146750010, AC146750025, AC146750250, AC295530000, AC295530010, AC295530025, AC295530051, AC410010000, AC410010010, AC410010040, AC410010200, S79007, S80005, S800051, S93233, BP230-1, BP230-4, E177-20, E177-4, E178-1, E178-200, E178-4, E178-500, E178J-4, E184-4, S800052, ZZE1785C15
Synonyms: 1,2-Dihydroxyethane; 1,2-Ethanediol; Ethylene alcohol; Glycol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
107-21-1	Ethylene glycol	>95	203-473-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: viscous liquid.
Warning! Causes eye irritation. May be harmful if swallowed. May cause kidney damage. May cause central nervous system effects. Hygroscopic (absorbs moisture from the air).
Target Organs: Kidneys, central nervous system, respiratory system, eyes.

Potential Health Effects

Eye: May cause moderate eye irritation.
Skin: Low hazard for usual industrial handling. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts.
Ingestion: The lethal dose in adult humans for ethylene glycol is about 100 ml (1/3 cup). Swallowing may cause nausea, vomiting or diarrhea. Excessive exposure may cause CNS effects, cardiopulmonary effects (metabolic acidosis), and kidney failure. Toxicity follows 3-stage progression. (1) involves central nervous system effects including paralysis of eye muscles, convulsions, and coma. Metabolic acidosis and cerebral swelling may also occur. (2) involves cardiopulmonary system with symptoms of hypertension, rapid heart beat, and possible cardiac failure. (3) involves severe kidney abnormalities including possible renal failure.
Inhalation: If ethylene glycol is heated or misted in work areas that are poorly ventilated, vapor/mist may accumulate and cause respiratory irritation and symptoms such as headache and

nausea. Material has a very low vapor pressure at room temperature, so inhalation exposures are not expected unless material is heated or misted.
Chronic: May cause kidney injury. Repeated excessive exposure to ethylene glycol may cause irritation of the upper respiratory tract. In humans, effects have been reported on the central nervous system, including nystagmus (involuntary, rapid, rhythmic movement of the eyeball).

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: 111 deg C (231.80 deg F)
Autoignition Temperature: 398 deg C (748.40 deg F)
Explosion Limits, Lower:3.20 vol %
Upper: 15.30 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Avoid breathing spray or mist.
Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from moisture.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethylene glycol	100 mg/m3 Ceiling (aerosol only)	none listed	none listed

OSHA Vacated PELs: Ethylene glycol: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Glove protection is not normally required.

Clothing: Protective garments not normally required.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear, colorless - syrupy - viscous

Odor: sweetish odor

pH: Not available.

Vapor Pressure: 0.05 mm Hg @ 20 deg C

Vapor Density: 2.14 (air=1)

Evaporation Rate: Not available.

Viscosity: 21cP @ 20 deg C

Boiling Point: 197 deg C @ 760 mmHg

Freezing/Melting Point:-13 deg C

Decomposition Temperature: Not available.

Solubility: Soluble.

Specific Gravity/Density:1.113 g/ml

Molecular Formula:C2H6O2

Molecular Weight:62.06

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions. Hygroscopic: absorbs moisture or water from the air.

Conditions to Avoid: Moisture, excess heat.

Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, isocyanates, aliphatic amines, caustics.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 107-21-1: KW2975000
LD50/LC50:
CAS# 107-21-1:
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, eye: 100 mg/1H Mild;
Draize test, rabbit, eye: 0.012 ppm/3D;
Draize test, rabbit, eye: 1440 mg/6H Moderate;
Oral, mouse: LD50 = 5500 mg/kg;
Oral, rat: LD50 = 4700 mg/kg;
Skin, rabbit: LD50 = 9530 uL/kg;
.
Ethylene glycol is more acutely toxic for humans than for laboratory animals by ingestion. The single oral lethal dose for humans has been estimated at 1.4 ml/kg (1.56 g/kg) or about 100 ml (111 g) for an adult.
Carcinogenicity:
CAS# 107-21-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.
Teratogenicity: An expert panel convened by the NTP's Center for the Evaluation of Risks to Human Reproduction concluded 2/13/03 that developmental and reproductive risks stemming from exposure to the chemicals propylene glycol and ethylene glycol are negligible.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 41000 mg/L; 96 Hr.; Unspecified
Fish: Bluegill/Sunfish: LC50 = 27500-41000 mg/L; 96 Hr.; Unspecified
Fish: Goldfish: LC50 = 27500-41000 mg/L; 96 Hr.; Unspecified
Water flea Phytobacterium phosphoreum: LC50 = 46300 mg/L; 48 Hr.; Unspecified

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated	Not Regulated
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 107-21-1 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 107-21-1: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 107-21-1: immediate, delayed.

Section 313

This material contains Ethylene glycol (CAS# 107-21-1, >95%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 107-21-1 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 107-21-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

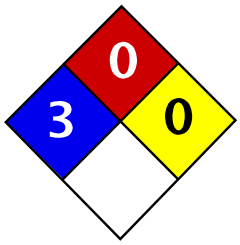
R 22 Harmful if swallowed.

Safety Phrases:

WGK (Water Danger/Protection)
CAS# 107-21-1: 0
Canada - DSL/NDSL
CAS# 107-21-1 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 107-21-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 5/12/1999
Revision #8 Date: 7/24/2006



Health	3
Fire	0
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Ferric chloride hexahydrate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ferric chloride hexahydrate

Catalog Codes: SLF1390, SLF1903

CAS#: 10025-77-1

RTECS: NO5425000

TSCA: TSCA 8(b) inventory: Ferric chloride hexahydrate

CI#: Not available.

Synonym: Iron (III) Chloride Hexahydrate

Chemical Name: Ferric Chloride Hexahydrate

Chemical Formula: FeCl3.6H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ferric chloride hexahydrate	10025-77-1	100

Toxicological Data on Ingredients: Ferric chloride hexahydrate LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion. Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of inhalation. Slightly hazardous in case of skin contact (permeator). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to kidneys, liver, spleen, cardiovascular system, Urinary system, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage:
Hygroscopic. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States]
TWA: 1 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid powder or lumps)

Odor: Not available.

Taste: Not available.

Molecular Weight: 270.3 g/mole

Color: Yellow. Brown.

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: 37°C (98.6°F)

Critical Temperature: Not available.

Specific Gravity: 1.82 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, heat

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Hygroscopic

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.
May cause damage to the following organs: kidneys, liver, spleen, cardiovascular system, Urinary system, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion.
Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).
Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: LDL [Rat] - Route: Oral; Dose: 900 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagen)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Causes irritation and burns of the skin. This compound has been infrequently associated with skin sensitization in humans.
Eyes: Causes eye irritation and burns. Higher exposures may lead to corneal or conjunctival ulceration.
Ingestion: Harmful if swallowed. Causes irritation of the gastrointestinal (digestive) tract with nausea, vomiting, diarrhea and hemorrage and possible burns. May cause severe and permanent damage to the digestive tract. Delayed effects may include cardiovascular disturbances, liver/kidney damage, cerebral coma and possible death.
Inhalation: Causes irritation of the respiratory tract with possible burns.
Chronic Potential Health Effects:
May affect genetic material
Ingestion: May affect liver/spleen (increased iron levels and damage), urinary system (Kidneys, ureter, bladder), central nervous system, and cardiovascular system.
Eyes: May cause eye discoloration.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Ferric Chloride, Anhydrous UNNA: 1773 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Ferric chloride hexahydrate
Minnesota: Ferric chloride hexahydrate
California: Ferric chloride hexahydrate
TSCA 8(b) inventory: Ferric chloride hexahydrate

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R22- Harmful if swallowed.
R34- Causes burns.
S25- Avoid contact with eyes.
S36/37/39- Wear suitable protective clothing, gloves and eye/face protection.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Synthetic apron.
Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:32 PM

Last Updated: 10/09/2005 05:32 PM

MSDS Number: **F1360** * * * * * *Effective Date:* ***08/10/04*** * * * * * *Supercedes:* ***11/02/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

FERRIC SUBSULFATE SOLUTION

1. Product Identification

Synonyms: Ferric sulphate, basic, solution; iron hydroxide sulfate; Monsel's solution
CAS No.: 1310-45-8
Molecular Weight: 737.7
Chemical Formula: Fe4(OH)2(SO4)5 (approx.) solution
Product Codes:
J.T. Baker: 2041
Mallinckrodt: 5548, 6430

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ferric Subsulfate	1310-45-8	40 - 70%	Yes
Water	7732-18-5	30 - 60%	No

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Orange (General Storage)

Potential Health Effects

Although little information is available in the literature, it is expected that the health hazards for iron compounds reflect those for this material.

Inhalation:
May cause irritation to the respiratory tract.
Ingestion:
Low toxicity in small quantities but larger dosages may cause nausea, vomiting, diarrhea, and black stool. Pink urine discoloration is a strong indicator of iron poisoning. Liver damage, coma, and death from iron poisoning has been reported.
Skin Contact:
No adverse effects expected.
Eye Contact:
Splashes may cause irritation.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Wash thoroughly with running water. Get medical advice if irritation develops.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

7. Handling and Storage

Store in a tightly closed container. Protect against physical damage, direct sunlight, and freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-ACGIH Threshold Limit Value (TLV):
1 mg/m3 (TWA) soluble iron salt as Fe
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the

exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Reddish-brown liquid.

Odor:
Nearly odorless.

Solubility:
Miscible in water.

Specific Gravity:
ca. 1.54

pH:
Acidic to litmus.

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
Decomposes.

Melting Point:
No information found.

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
No information found.

Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Freezes at cool temperatures. Light sensitive.

Hazardous Decomposition Products:
Oxides of sulfur and the contained metal.

Hazardous Polymerization:
Will not occur.
Incompatibilities:
No incompatibility data found.
Conditions to Avoid:
Light and low temperatures.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

--------\Cancer Lists\--

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Ferric Subsulfate (1310-45-8)	No	No	None
Water (7732-18-5)	No	No	None

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Ferric Subsulfate (1310-45-8)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Ferric Subsulfate (1310-45-8)	Yes	Yes	No	No
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Ferric Subsulfate (1310-45-8)	No	No	No	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Ferric Subsulfate (1310-45-8)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.

Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
INTENDED FOR FDA APPROVED USE ONLY.
NOT ON THE TSCA INVENTORY.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes.

Product Use:

For Food and Drug or Research and Development use

Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET

Hydrochloric Acid

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Hydrochloric acid, inhibited hydrochloric acid

Product Use ..... Acidizing (activation) of petroleum wells, scale removal, ore reduction, metal cleaning, pH adjustment, industrial acidizing, generation of chlorine dioxide, regeneration of ion exchange resins.

Supplier Name..... ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... May 31, 2005

24-Hour Emergency Phone..... 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....	Hydrochloric Acid	15-36.5%
CAS Number.....	Hydrochloric Acid	7647-01-0
Synonym (s).....	Aqueous hydrogen chloride, muriatic acid	

Section 03 - Hazard Identification

Inhalation..... Vapour or mist can cause irritation to nose, throat, and upper respiratory tract. Symptoms include: coughing, choking, and bleeding of the nose and gums. Severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Skin Contact / Absorption..... Contact may produce severe irritation or corrosive skin damage, depending upon length of contact and amount of acid. Effects range from dermititis, photo sensitization, redness, swelling, pain, permanent scarring, to death.

Eye Contact..... Low concentrations of vapour or mist can be irritating, causing redness. Concentrated vapour, mist or splashed liquid can cause severe irritation, burns and permanent blindness.

Ingestion..... Causes severe burns of the mouth, esophagus, and stomach, with consequent pain, nausea, vomiting, diarrhea, circulatory collapse, and possibly death.

Exposure Limits..... ACGIH/PEL-C= 5ppm (hydrochloric acid)

Section 04 - First Aid Measures

Inhalation..... Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists

Eye Contact..... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention

Ingestion..... Do not induce vomiting. If vomiting occurs, lean victim forward to prevent breathing in vomitus. Rinse mouth out with water. If the victim can swallow, give 1 cup of water or milk to dilute. If vomiting occurs, rinse the mouth out and give another cup of water. Do not give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention.

Additional Information..... Not available

Section 05 - Fire Fighting

Conditions of Flammability……..... Non-flammable

Means of Extinction.....……..... Product does not burn. Where fire is involved, use any fire fighting agent appropriate for surrounding material; use water spray to cool fire-exposed surfaces.

Flash Point...…….. Not applicable

Auto-ignition Temperature……. Not applicable

Upper Flammable Limit …….. Not applicable

Lower Flammable Limit...……... Not applicable

Hazardous Combustible Products... Hydrogen and chlorine gas formed at temperatures over 1500°C.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards……..... Normally none, but when in contact with metals explosive hydrogen gas may be evolved.

Section 06 - Accidental Release Measures

Leak / Spill.....……... Wear appropriate personal protective equipment. Ventilate area. Only enter area with PPE. Stop or reduce leak if safe to do so. Prevent material from entering sewers.

Deactivating Materials...……... Soda ash, lime, limestone

Section 07 - Handling and Storage

Handling Procedures.....……... Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements.....…….…. Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials. Store away from incompatible materials such as oxidizing materials, reducing materials, strong bases.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes..... Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory..... At concentrations up to 50 ppm, chemical charge respirator or air-purifying respirator is recommended. Above this level, a self-contained breathing apparatus is required.

Gloves..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Clothing..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Footwear..... Impervious boots of chemically resistant material should be worn at all times

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure, and control of process conditions. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State..... Liquid

Odor and Appearance..... Colourless or slightly yellow, fuming liquid with a pungent odour.

Odor Threshold..... Detectable at 1-5ppm

Specific Gravity (Water=1)..... 1.16-1.19 (30-35%); 1.08 (15%)

Vapor Pressure (mm Hg, 20C)..... 100mm Hg at 20°C (35%)

Vapor Density (Air=1)..... 1.268

Evaporation Rate..... < 1

Boiling Point..... 90.5°C (30%)

Freeze/Melting Point..... -51°C (30%)

pH..... < 1

Water/Oil Distribution Coefficient.... < 1

Bulk Density..... Not available

% Volatiles by Volume..... 100%

Solubility in Water..... Completely miscible

Molecular Formula..... HCl

Molecular Weight..... 36.46

Section 10 - Stability and Reactivity

Stability..... Stable, heat and contamination could cause decomposition.

Incompatibility..... Incompatible with strong bases, metals, phosphines, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde, hypochlorites, cyanides, sulphides.

Hazardous Products of Decomposition.. Contact with hypochlorites liberates chlorine gas. May react violently with incompatible substances. May release toxic and/or flammable gases such as hydrogen and phosphine gas. Considerable amounts of heat may be evolved.

Polymerization..... Will not occur.

Section 11 - Toxicological Information

Irritancy..... Severe irritant, corrosive to eyes and skin.

Sensitization..... Not available

Chronic/Acute Effects..... Prolonged exposure can cause erosion and discolouration of teeth and chronic imflammation of nose, throat, and airways. Repeated or prolonged contact to dilute solutions can cause dermatitis.

Synergistic Materials..... Not available

Animal Toxicity Data..... LC_{50}(inhalation,mouse,4 hour)= 757ppm
LD_{50}(oral,rabbit)= 900mg/kg

Carcinogenicity..... Not considered to be carcinogenic by IARC and ACGIH.

Reproductive Toxicity..... Not available

Teratogenicity..... Not available

Mutagenicity..... Not available

Section 12 - Ecological Information

Fish Toxicity..... Not available

Biodegradability..... When released into the soil, this material is not expected to biodegrade.

Environmental Effects..... Extremely toxic to aquatic life by lowering the pH below 5.5. When released into the soil, this material may leach into groundwater.

Section 13 - Disposal Consideration

Waste Disposal.....Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class..... 8

Group..... II

PIN Number..... UN1789

Other..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....E, D1

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond BC	12431 Horseshoe way	V7A 4X6	604-272-4000	604-272-4596
Calgary AB	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton AB	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon SK	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina SK	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg MB	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga ON	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

Material Safety Data Sheet
HYDROFLUORIC ACID

Print Date: March 2007

SECTION 1 – Chemical Product and Company Identification

MSDS Name: HYDROFLUORIC ACID MSDS Preparation Date: 02-2007, Supersedes 02-2004, 02-2001 & 02-98

Synonyms or Generic ID: Fluohydric acid, fluoric acid, hydrofluoric acid solution
Seastar Product Codes: IQ-05-0500, IQ-05-4000, IQ-05-200L, BA-05-0250, BA-05-0500, BA-05-1000, BA-05-2000, OF-05-4000, PDV-05-REFILL
Canadian TDG Classification: 8 6.1 PKG Gr II **Formula:** HF
PIN (UN# / NA#): UN1790 **Molecular Wt:** 20.01
Canadian WHMIS Class: Class E; Class D Div 1 Sub A; Class D Div 2 Sub A

Supplier: Seastar Chemicals Inc, 10005 McDonald Park Road, Sidney, BC V8L 5Y2 CANADA
Tel: (250) 655-5880, **Fax:** (250) 655-5888

CANUTEC (CAN): (613)-996-6666

SECTION 2 – Composition/Information on Ingredients

CAS #	Chemical Name	Percent	EINECS/ELINCS	TLV	Hazard
7732-18-5	Water	Balance	231-791-2	N/av	None
7664-39-3	Hydrofluoric acid	47-51%	231-634-8	ACFIH – as F: 2.5 mg/m^3 TWA (listed under FLUORIDES); NIOSH – as F: 3 ppm TWA; 2.5 mg/m^3 TWA; C 6 ppm (15 min); c 5 mg/m^3 (15 min); OSHA – 3 ppm TWA	Corrosive

Hazard Symbols: T+ C Risk Phrases: 26/27/28 35

SECTION 3 – Hazards Identification

EMERGENCY OVERVIEW

Colourless liquid with a pungent, irritating, penetrating odour. Concentrations above 40% fume in air. Will not burn. Cylinders or tanks may rupture and explode if heated. Highly reactive. Contact with metals, such as iron or steel, slowly releases flammable and potentially explosive hydrogen gas. VERY TOXIC. May be fatal if inhaled, absorbed through the skin or swallowed. CORROSIVE to the nose, throat and respiratory tract. Causes lung injury-effects may be delayed. CORROSIVE to the eyes and skin. Causes severe burns. May cause blindness and permanent scarring. Absorbed fluoride can cause metabolic imbalances with irregular heartbeat, nausea, dizziness, vomiting and seizures. Long-term exposure may cause skeletal fluorosis (weakened bone structure).
Target Organs: Lungs, teeth, eyes, skin, bone, mucous membranes.

Potential Health Effects

Primary Route(s) of Entry: Inhalation and ingestion. Skin contact. Eye contact. Skin absorption.
Effects of Acute Exposure: May be fatal by ingestion, inhalation or skin absorption. Corrosive. Acute effects may be delayed.
LD50/LC50: CAS# 7732-18-3: Oral, rat: LD50 = >90 mL/kg. CAS# 7664-39-3: Inhalation, mouse: LC50 = 342 ppm/1H. Inhalation, rate: LC50 = 1276 ppm/1H.
Eyes: Contact with liquid or vapor can cause irritation or severe burns or conjunctivitis, and possible irreversible eye damage. Solutions as dilute as 2% or lower may cause burns.
Skin: Both liquid and vapour can cause severe burns, which may not be immediately painful or visible. May be fatal if absorbed through the skin. Causes severe burns with delayed tissue destruction. Substance is rapidly absorbed through the skin. Penetration may continue for several days. Causes severe tissue necrosis and bone destruction. May cause hypocalcemia and death. Solutions as dilute as 2% or lower may cause burns. LD50: skin-mouse 500 mg/kg.
Ingestion: Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause systemic toxic effects on the heart, liver, and kidneys. Depletes calcium levels in the body which, if left untreated, can lead to hypocalcemia and death.
Inhalation: May cause severe irritation of the upper respiratory tract with pain, burns, and inflammation. May cause pulmonary edema and severe respiratory disturbances. Depletes calcium levels in the body which can led to hypocalcemia and death.

Effects of Chronic Exposure: Acute exposure above 5 ppm may irritate eyes and respiratory tract. Also causes severe eye and skin burns. Repeated inhalation may cause osteofluorosis and permanent respiratory damage. Prolonged or repeated exposure may cause permanent bone structure abnormalities. To the best of our knowledge, the chronic toxicity of this substance has not been fully investigated.

SECTION 4 – First Aid Measures

Eyes: Immediately flush eyes with large amounts of water for at least 15 minutes, holding the lids apart to ensure flushing of the entire surface. Get competent medical aid immediately. If a physician is not immediately available, apply one or two drops of 0.5 tetracine hydrochloride solution followed by a second irrigation for at least 15 minutes or until a physician is available.
Skin: Get medical aid immediately. Rinse area with copious quantities of water for at least 15 minutes. Remove contaminated clothing and shoes.
FIRST AID: (SKIN ONLY) IF AVAILABLE, AFTER THOROUGH WASHING (PREFERRED METHOD), A 2.5% CALCIUM GLUCONATE GEL SHOULD BE APPLIED TO THE BURNED AREA, [OR] THE BURNED AREA SHOULD BE IMMERSED IN A SOLUTION OF 0.2% ICED AQUEOUS BENZETHONIUM CHLORIDE, OR 0.13% ICED AQUEOUS BENZALKONIUM CHLORIDE. IF IMMERSION IS NOT PRACTICAL, TOWELS SHOULD BE SOAKED WITH ONE OF THE ABOVE SOLUTIONS AND USED AS COMPRESSES FOR THE BURNED AREA. IDEALLY, COMPRESSES SHOULD BE CHANGED EVERY TWO MINUTES. IT IS SUGGESTED THAT A CERTAIN QUANTITY OF EITHER PREPARED SOLUTION OR THE CALCIUM GLUCONATE GEL BE KEPT ON HAND AT ALL TIMES. SOLUTIONS SHOULD BE REPLACED ANNUALLY IF NOT PREVIOUSLY USED.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove patient from exposure to fresh air immediately. Administer approved oxygen supply if breathing is difficult. Administer artificial respiration or CPR if breathing has ceased. Call a physician. Keep patient lying down, quiet and warm.
Notes to Physician: Due to delayed and persistent symptoms, observe patient closely for 48 hours. Prompt action is essential in all cases of contact.
Antidote: Always have calcium gluconate gel on hand. The use of infilitration therapy and intraarterial therapy for hydrofluoric acid burns resulting from concentrations greater than 20% should be made by qualified medical personnel. Calcium gluconate may be administered intravenously slowly to bind to the fluoride ion. This administration needs to be monitored under the supervision of a physician.

SECTION 5 – Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water Reactive. Material will react with water and may release a flammable and/or toxic gas. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Reacts with most metals to form highly flammable hydrogen gas, which can form explosive mixtures with air.
Extinguishing Media: Use water spray to cool fire-exposed containers. Substance is non-flammable; use agent most appropriate to extinguish surrounding fire.
Auto-ignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: NFPA Hazard Rating: Health – 4; Flammability – 0; Reactivity – 1.
Explosion Limits: Lower: Not available. Upper: Not available.

SECTION 6 – Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches, which lead to waterways. Wear a self-contained breathing apparatus and appropriate personal protection (see Exposure Controls, Personal Protection section 8). Neutralize spill with sodium bicarbonate. Use water spray to disperse the gas/vapor. Remove all sources of ignition.
Steps to be taken in case material is released or spilled: Wear full protective equipment. Contain spills and cautiously dilute with large excess of water. Neutralize carefully with soda ash or lime. Material will fume during neutralization; approach from upwind. Provide good ventilation. Flush residue in accordance with applicable disposal regulations.
Waste disposal method: According to all applicable regulations. Avoid runoff.

SECTION 7 – Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before re-use. Use with adequate ventilation. Do not get on skin or in eyes. Do not ingest or inhale.

Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in metal or glass containers. Do not store in direct sunlight. Keep tightly closed. Empty container may contain hazardous residue. Do not add any other material to the container. Do not wash down the drain. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking or food consumption while handling. Store in approved containers only. Do not add water to acids. Instead, dilute by adding acid to water cautiously and with agitation.
Storage Code: White.

SECTION 8 – Exposure Control/Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Exposure Limits:

Chemical Name	*ACGH*	*NIOSH*	*OSHA*
Water	None listed.	None listed.	None listed.
Hydrofluoric acid	As F: 2.5 mg/m^3 TWA (listed under FLUORIDES)	As F: 3 ppm TWA; 2.5 mg/m^3 TWA; C 6 ppm (15 min); C 5 mg/m^3 (15 min)	3 ppm TWA

OSHA Vacated PELs Hydrofluoric acid: as F: 3 ppm TWA

Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133. Wear face shield.
Skin: Wear appropriate protective neoprene gloves to prevent skin exposure. Wear acid-resistant jacket, trousers and boots sufficient to protect skin.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respiratory Protection: Wear appropriate OSHA/MSHA approved chemical cartridge respirator regulations found in 29CFR 1910.134. If more than TLV, do not breathe vapour. Wear self-contained breathing apparatus. Always use an NIOSH-approved respirator when necessary.
Ventilation: Use only in a chemical fume hood. Adequate ventilation to maintain vapour/dust below TLV.
Other Protective Equipment: Make eye bath and emergency shower available.

SECTION 9 – Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colourless
Odour: strong odour
pH: Weak acid
Vapour Pressure: Varies with concentration; 50% (w/w): 1.64 kPa (12.3 mm Hg) at 20 ^{0}C (calculated).
Vapour Density: 1.86 at 25 ^{0}C (air = 1) (HF gas)
Evaporation Rate: Varies with concentration
Viscosity: No information available.
Boiling Point: Varies with concentration; 48% (w/w): 108 ^{0}C (226.4 ^{0}F); 38.2% (w/w): 112.2 ^{0}C (234 ^{0}F)
Freezing/Melting Point: Varies with concentration; 48% (w/w): -37 ^{0}C (-34.6 ^{0}F)
Decomposition Temperature: No information available.
Solubility: Soluble in water in all proportions. Soluble in ethanol; slightly soluble in diethyl ether, benzene, toluene, xylene and tetralin.
Specific Gravity/Density: 50% (w/w): 1.18 at 20 ^{0}C (water = 1).
Molecular Formula: HF
Molecular Weight: 20.0054

SECTION 10 – Stability and Reactivity

Chemical Stability: Normally stable.
Conditions to Avoid: Incompatible materials, metals.
Incompatibilities with Other Materials: Substance is incompatible with over 35 specific chemicals. Please refer to the NFPA Fire Protection Guide for specifics. Heat. Glass, concrete and other silicon-bearing materials will yield silicon tetrafluoride. Pressure build-up from this process has been known to blow up glass containers. Carbonates, sulphides, and cyanides will yield toxic gases such as carbon dioxide, hydrogen sulphide and hydrogen cyanide. Alkalis, some oxides, fluorine and other water-reactive materials will cause strong exothermic reactions that can be violent. Reacts with most common metals to produce hydrogen. Is corrosive to many materials, including leather, rubber and many organics.
Hazardous Decomposition Products: Fluoride fumes.
Hazardous Polymerization: Has not been reported.

SECTION 11 – Toxicological Information

RTECS: CAS# 7732-18-5: ZC0110000. CAS# 7664-39-3: MW7875000.
LD50/LC50: CAS# 7732-18-3: Oral, rat: LD50 = >90 mL/kg. CAS# 7664-39-3: Inhalation, mouse: LC50 = 342 ppm/1H. Inhalation, rate: LC50 = 1276 ppm/1H.
Carcinogenicity: CAS# 7732-18-5: Not listed as a carcinogen by ACGIH, IARC, NIOSH, NTP, OSHA, or CA Prop 65. CAS# 7664-39-3: ACGIH: Not listed. California: Not listed. NIOSH: Not listed. NTP: Not listed. OSHA: Not listed. IARC: [present] (when used in drinking water) (listed as 'FLUORIDES, INORGANIC').
Epidemiology: No information available.
Teratogenicity: Embryo or fetus: death, ihl-rat TCLo=4980 ug/m^3/4H (1-22 D preg).
Reproductive: Fertility: post-implantation mortality and pre-implantation mortality, ihl-rat TCLo=470 uf/m^3/4H.
Mutagenicity: DNA Damage: D. melanogaster-ihl 1300 ppb/6W Sex Chromosome Loss/Non-disjunction: D. melanogaster-ihl 2900 ppb.
Neurotoxicity: No information available.

SECTION 12 – Ecological Information

Ecotoxicity: No information available. Fish (fresh water) 60 ppm lethal (time period not specified).
Environmental: No information reported. **Physical**: No information available **Other**: None.

SECTION 13 – Disposal Considerations

Dispose of in a manner consistent with federal, provincial/state/territorial, and local regulations.
RCRA D-Maximum Concentration of Contaminants: None of the components are on this list.
RCRA D Series – Chronic Toxicity Reference Levels: None of the components are on this list.
RCRA F Series Wastes: None of the components are on this list.
RCRA P Series Wastes: None of the components are on this list.
RCRA U Series Wastes: CAS# 7664-39-3: waste number U134 (Corrosive waste, Toxic waste).
RCRA Substances Banned from Land Disposal: CAS# 7664-39-3 is banned from land disposal according to RCRA.

SECTION 14 – Transport Information

Proper Shipping Name: HYDROFLUORIC ACID, solution, with not more than 60 percent hydrofluoric acid
Hazard Class: 8 (6.1) **UN Number:** UN1790 **Packing Group:** II

SECTION 15 – Regulatory Information

US Federal

TSCA: CAS# 7732-18-5 is listed on the TSCA Inventory. CAS# 7664-39-3 is listed on the TSCA Inventory.
Health and Safety Reporting List: None of the components are on this list.
Chemical Test Rules: None of the components are on this list.
TSCA Section 12b: None of the components are on this list.
TSCA Significant New Use Rule (SNUR): None of the components are on this list.
CERCLA Reportable Quantities (RQ): CAS# 7664-39-3: final RQ = 100 pounds (45.4 kg).
SARA Threshold Planning Quantities (TPQ): CAS# 7664-39-3: TPQ = 100 pounds.
SARA Hazard Categories: CAS# 7664-39-3: acute, chronic.
SARA Section 313: This material contains Hydrofluoric acid (CAS# 7664-39-3, 48-50%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act – Hazardous Air Pollutants (HAPs): CAS# 7664-39-3 is listed as a hazardous air pollutant (HAP).
Clean Air Act – Class 1 Ozone Depletors: None of the components are on this list.
Clean Air Act – Class 2 Ozone Depletors: None of the components are on this list.
Clean Water Act – Hazardous Substances: CAS# 7664-39-3 is listed as a Hazardous Substance under the CWA.
Clean Water Act – Priority Pollutants: None of the components are on this list.
Clean Water Act – Toxic Pollutants: None of the components are on this list.
OSHA – Highly Hazardous: CAS #7664-39-3 is considered highly hazardous by OSHA.

US State

State Right to Know: Hydrofluoric acid can be found on the following state Right-to-Know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California Prop 65: No information available.
California No Significant Risk Level: No information available.

European/International Regulations

European Labelling in Accordance with EC Directives:
Hazard Symbols: T+ C
Risk Phrases: R 35 Causes severe burns.
R 35 Causes severe burns.
Safety Phrases: S 7/9 Keep container tightly closed and in a well-ventilated place.
S 25 In case of contact with eyes, rinse imediately with plenty of water and seek medical advice.
S 36/37 Wear suitable protective clothing and gloves.

WGKK (Water Danger/Protection): No information available.
Canadian DSL/NDSL: CAS# 7732-18-5 is listed on Canada's DSL/NDSL List.
CAS# 7664-39-3 is listed on Canada's DSL/NDSL List.
Canadian WHMIS Classification: This product has a WHMIS classification of D1A, E.
Canada Ingredient Disclosure List: CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.
CAS# 7664-39-3 is listed on Canada's Ingredient Disclosure List.
Exposure Limits: OES-United Kingdom: TWA (listed as FLUORIDES): as F: 2.5 mg/m^3 TWA. OES-United Kingdom: STEL as F: 3 ppm STEL; 2.5 mg/m^3 STEL.

SECTION 16 – Other Information

The statements contained herein are offered for informational purposes only and are based upon technical data. Seastar Chemicals Inc believes them to be accurate but does not purport to be all-inclusive. The above-stated product is intended for use only by persons having the necessary technical skills and facilities for handling the product at their discretion and risk. Since conditions and manner of use are outside our control, we (Seastar Chemicals Inc) make no warranty of merchantability or any such warranty, express or implied with respect to information and we assume no liability resulting from the above product or its use. Users should make their own investigations to determine suitability of information and product for their particular purposes.

The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

HYDROGEN PEROXIDE (70%)

8250CR Revised 12-OCT-1996

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"ALBONE", "TYSUL" are registered trademarks of DuPont.

Corporate MSDS Number : DU000113
Formula : H2O2
Molecular Weight : 34.02

Tradenames and Synonyms

"ALBONE"
"TYSUL"
"ALBONE" SG

Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont Chemical Solutions Enterprise
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS
Product Information : 1-800-441-7515 (outside the U.S. 302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S. 703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S. 302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
HYDROGEN PEROXIDE	7722-84-1	70
WATER	7732-18-5	30

Components (Remarks)

Strength is expressed in weight percent (WT%).

HAZARDS IDENTIFICATION

Potential Health Effects

Hydrogen peroxide may cause severe irritation or burns of the skin, eyes and mucous membranes. Splashes in the eye can cause severe eye damage with ulceration of the cornea, and may cause irreversible eye damage, including blindness. Skin exposure can result in bleaching of the skin and hair.

Inhalation of concentrated vapors can cause irritation of the nose and throat with chest discomfort, cough, difficulty in breathing and shortness of breath.

Ingestion can cause irritation of the upper gastrointestinal tract with pain and distention of the stomach and esophagus due to liberation of oxygen.

Gross overexposure by ingestion may be fatal.

HUMAN HEALTH EFFECTS:

Skin contact with aqueous solutions of less than 50% may cause irritation with discomfort or rash. Higher or prolonged exposure may result in skin burns or ulceration. Evidence suggests that skin permeation can occur in amounts capable of producing systemic toxicity. Effects of eye contact with aqueous solutions of less than 5% may include eye irritation with discomfort, tearing, or blurring of vision. Higher or prolonged exposure may result in eye corrosion with corneal or conjunctival ulceration. Contact with aqueous concentrations of greater than 10% may result in eye corrosion with corneal or conjunctival ulceration with possible irreversible eye damage, including blindness.

Overexposure by inhalation may cause irritation of the upper respiratory passages or nonspecific discomfort such as nausea, headache, or weakness. Higher inhalation exposure may lead to temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath; or fatality from gross overexposure. Ingestion may cause irritation of the gastrointestinal tract with upper abdominal pain, "heartburn", nausea, vomiting, and diarrhea. "Coffee grounds" vomitus and black tarry stools may occur as a result of gastrointestinal tract bleeding. Additional effects from overexposure include red blood cell destruction or gas embolism. When used as colonic lavage, hydrogen peroxide has caused gas embolism and gangrene of the intestine at concentrations down to 0.75%. Gross overexposure by ingestion may be fatal.

Individuals with preexisting diseases of the skin, eyes, or lungs may have increased susceptibility to the toxicity of excessive exposures.

(HAZARDS IDENTIFICATION - Continued)

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION
If inhaled, immediately remove to fresh air . If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash contaminated clothing and shoes promptly and thoroughly.

EYE CONTACT
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION
If swallowed, do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

If swallowed, large amounts of oxygen may be released quickly. The distention of the stomach or esophagus may be injurious. Insertion of a gastric tube may be advisable.

FIRE FIGHTING MEASURES

Flammable Properties

Will not burn, but decomposition, which may be caused by heat or contamination, will release oxygen which will increase the explosive limit range and burning rate of flammable vapors.

(FIRE FIGHTING MEASURES - Continued)

Fire and Explosion Hazards:

Powerful oxidizer. Contact with clothing or combustibles will frequently cause fire. Contact with organic liquids or vapors may cause immediate fire or explosion, especially if heated. Under certain circumstances, detonation may be delayed. Oxygen release from hydrogen peroxide may force organic or hydrogen vapors into an explosive range. Follow appropriate National Fire Protection Association (NFPA) codes.

Extinguishing Media

Use only water.

Fire Fighting Instructions

Flood with water. Cool tank/container with water spray.

Wear full protective clothing (rubber suit and boots) including chemical splash goggles or hood and self-contained breathing apparatus.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Comply with Federal, State, and local regulations on reporting releases of wastes. Flood area with water and drain to an approved chemical sewer or wastewater treatment system, including municipal sewers if approved. May be destroyed with sodium metabisulfite or sodium sulfite (1.9 lbs. SO2 equivalent per lb. of peroxide) after diluting to 5-10% peroxide.

The Extremely Hazardous Substance List Reportable Quantity is 1 lb. for 70% hydrogen peroxide.

If HYDROGEN PEROXIDE (70%) is spilled and not recovered, or is recovered as a waste for treatment or disposal, the CERCLA Reportable Quantity is 100 lbs. (release of an unlisted Hazardous Waste characteristic of ignitibility).

HANDLING AND STORAGE

Handling (Personnel)

Use extreme care when attempting any reactions because of fire and explosion potential (immediate or delayed). Conduct all initial experiments on a small scale and protect personnel with adequate shielding as the reactions are unpredictable, and may be delayed, and may be affected by impurities, contaminants, temperature, etc. Do not get in eyes. Avoid contact with skin and clothing. Wash thoroughly after handling. Avoid contact with flammable or combustible materials. Avoid contamination from any source including metals, dust, and organic materials. In the event of an accident where large volumes of hydrogen peroxide might come into contact with external fires or with incompatible chemicals, a one-half mile area from the incident should be evacuated.

Storage

Store in a properly vented container or in approved bulk storage facilities. Do not block vent. Do not store on wooden pallets. Do not store where contact with incompatible materials could occur, even with a spill (see "Hazardous Reactivity"). Have water source available for diluting. Do not add any other product to container. Never return used or unused peroxide to container, instead dilute with plenty of water and discard. Rinse empty containers thoroughly with clean water before discarding. (See "Waste Disposal".)

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use sufficient ventilation to keep employee exposure below recommended exposure limits.

Personal Protective Equipment

EYE/FACE PROTECTION

Wear coverall chemical splash goggles. In addition, where the possibility exists for eye or face contact due to splashing or spraying of material, wear chemical splash goggles/full-length face shield combination.

RESPIRATORS

Where there is potential for airborne exposure in excess of applicable limits, wear NIOSH approved respiratory protection.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

PROTECTIVE CLOTHING

Where there is potential for skin contact, have available and wear as appropriate: impervious gloves, apron, pants, jacket, hood, and boots; or totally encapsulating chemical suit with breathing air supply. Permeation data supplied by vendors indicate that impervious materials such as natural rubber, natural rubber plus neoprene, nitrile, or polyvinylchloride afford adequate protection.

Do not wear leather gloves or leather shoes (uppers or soles) because they can ignite following contact with peroxide. Cotton clothing can also ignite. This effect may be within minutes, or delayed. Clothing fires and skin damage occur less quickly with 50% or lower hydrogen peroxide than with 70% material, but adequate personal protection is essential for all industrial concentrations. Protective skin creams offer no protection from hydrogen peroxide and should not be used.

Exposure Guidelines

Applicable Exposure Limits

HYDROGEN PEROXIDE

PEL	(OSHA)	: 1 ppm, 1.4 mg/m3 (90%) - 8 Hr TWA
TLV	(ACGIH)	: 1 ppm, 1.4 mg/m3, 8 Hr. TWA, A3
AEL *	(DuPont)	: None Established

* AEL is DuPont’s Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: 126 C (259 F) @ 760 mm Hg
Vapor Pressure	: 8 mm Hg @ 25 C (77 F) 20 mm Hg @ 40 C (104 F)
Vapor Density	: 1.02 Calculated
Melting Point	: -40 C (-40 F)
Evaporation Rate	: 1
Solubility in Water	: 100 WT%
pH	: Apparent pH = 0.5
Form	: Clear liquid
Color	: Colorless
Specific Gravity	: 1.3 @ 25 C (77 F)
Odor	: Pungent (slight), Irritating.

STABILITY AND REACTIVITY

Chemical Stability

Unstable with heat or contamination; liberation of oxygen gas may result in dangerous pressures. (See "Decomposition", below.)

Incompatibility with Other Materials

Incompatible with most flammables/combustibles (see "Fire and Explosion Hazards") as well as cyanides, nitric acid, potassium permanganate, and many other oxidizing and reducing agents. Mixtures with both organics and some acids may be especially reactive.

Decomposition

Contamination or heat may cause self-accelerating exothermic decomposition with oxygen gas and steam release that can cause dangerous pressures. May react dangerously with rust, dust, dirt, iron, copper, heavy metals or their salts (such as mercuric oxide or chloride), alkalis, and with organic materials (especially vinyl monomers).

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

Inhalation 8-hour LC50	:	>2,000 ppm in rats (90% H_2O_2)
Skin absorption LD50	:	9,200 mg/kg (70% H_2O_2) in rabbits
Oral LD50	:	805 mg/kg (70% H_2O_2) in rats

At aqueous concentrations of less than 50% hydrogen peroxide skin irritation occurs, but at greater concentrations hydrogen peroxide is corrosive to the skin. Concentrations less than 5% in aqueous solutions are eye irritants; solutions between 5% and 10% range from severe eye irritants to being corrosive; concentrations greater than 10% are corrosive to the eye. The compound is not a skin sensitizer in animals.

Repeated inhalation exposures produced nasal discharge, bleached hair, and respiratory tract congestion with some deaths occurring in rats and mice exposed to concentrations greater than 67 ppm. Dogs exposed by inhalation to 7 ppm for 6 months had lung and skin irritation.

The effects from single high oral doses include convulsions. Repeated administration of the compound in the diet of

(TOXICOLOGICAL INFORMATION - Continued)

animals resulted in growth inhibition, reduced weight gain, abnormal liver function, ulcers, and discoloration of the stomach lining with swelling. Long-term administration to mice in the drinking water resulted in gastric erosions and duodenal hyperplasia.

One study by skin application suggested no carcinogenic activity. Results of an ingestion study with mice suggested that hydrogen peroxide might be carcinogenic. However, the FDA and other organizations have reviewed this study and concluded there is insufficient evidence that hydrogen peroxide is carcinogenic. An unpublished, long-term study with rats revealed no evidence of carcinogenicity. Female rats treated with 10% hydrogen peroxide produced offspring of lower body weight and some structural abnormalities, but these changes were attributed to maternal toxicity. Hydrogen peroxide produced genetic damage to bacterial and mammalian cells in culture, but one study in animals indicated it did not produce genetic damage. Limited tests in animals demonstrate no reproductive toxicity.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

96-hour LC50, catfish: 37.4 mg/L

DISPOSAL CONSIDERATIONS

Waste Disposal

Comply with Federal, State, and local regulations. If approved, may be diluted and drained to a municipal sewer or waste treatment plant. May be diluted and drained through a scrap metal pit (iron, copper, etc.) to reduce peroxide concentration. Hydrogen peroxide may be an RCRA regulated hazardous waste upon disposal due to the oxidizing characteristic under the ignitibility category.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO

Proper Shipping Name	: HYDROGEN PEROXIDE AQUEOUS SOLUTIONS, STABILIZED
Hazard Class	: 5.1
UN No.	: 2015
DOT/IMO Label	: OXIDIZER, CORROSIVE

(TRANSPORTATION INFORMATION - Continued)

Subsidiary Hazard Class : 8
Packing Group : I

Shipping Containers

Tank Cars.
Tank Trucks.

ISO (Sea) Tanks
Bottles

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : No
Fire : No
Reactivity : Yes
Pressure : Yes

LISTS:

SARA Extremely Hazardous Substance	-Yes
CERCLA Hazardous Material	-(*)
SARA Toxic Chemicals	-No

*See Disposal Information.

CANADIAN WHMIS CLASSIFICATIONS:

C; E; F

HYDROGEN PEROXIDE (70%) is listed by OSHA as a Highly Hazardous Chemical in Appendix A to 29 CFR 1910.119. Use of this product may require compliance with 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals.

OTHER INFORMATION

NFPA, NPCA-HMIS

NFPA Rating
Health : 2
Flammability : 0
Reactivity : 3

Oxidizer.

(Continued)

NPCA-HMIS Rating
Health : 3
Flammability : 0
Reactivity : 3

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

For further information, see DuPont HYDROGEN PEROXIDE Storage and Handling Bulletin.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsible for MSDS : MSDS Coordinator
> : DuPont Chemical Solutions Enterprise
Address : Wilmington, DE 19898
Telephone : (800) 441-7515

# Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-2, D-2A, D-2B**		

Section 1. Chemical Product and Company Identification

Product Name	**JET B AVIATION TURBINE FUEL**	**Code**	W219 SAP: 150, 151, 152
Synonym	Jet B; Jet B DI; JP-4; Jet F-40; NATO F-40; Turbine Fuel, Aviation, Wide Cut Type (CAN/CGSB-3.22).	**Validated on**	**2/8/2005.**
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as aviation turbine fuel. May contain a fuel system icing inhibitor.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Complex mixture of petroleum hydrocarbons (C6-C14).	64741-41-9	>99	Not established	Not established	Not established
Benzene	71-43-2	<0.5	0.5 ppm	2.5 ppm	Not established
Fuel System Icing Inhibitor (FSII) (if added*): Diethylene Glycol Monomethyl Ether	111-77-3	≤0.15	Not established	Not established	Not established
Anti-static, antioxidant, corrosion inhibitor and metal deactivator additives. * Please note that Jet B DI, JP-4, Jet F-40 and NATO F-40 all contain Fuel System Icing Inhibitor (FSII).corrosion inhibitor	Not applicable	<0.1	Not applicable	Not applicable	Not applicable

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. Skin and eye contact can cause irritation. Inhalation of vapours can cause irritation of the respiratory tract and CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death. Aspiration into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. May cause cancer. May cause teratogenicity/embryotoxicity. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face. Obtain medical attention immediately.
Skin Contact	Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with warm water and non-abrasive soap for 5 minutes or until chemical is removed.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). Remove source of contamination or move victim to fresh air. If breathing is difficult, oxygen may be beneficial if administered by trained personnel, preferably on a doctor's advice. DO NOT allow victim to move about unnecessarily. Immediately transport victim to an emergency care facility.

Continued on Next Page

Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Repeat administration of water.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	Flammable liquid (NFPA).	**Flammable Limits**	LOWER: 1.3% UPPER: 8% (NFPA)
Flash Points	CLOSED CUP: -31ºC (-24°F) (NFPA)	**Auto-Ignition Temperature**	240°C (464°F) (NFPA)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a very low flash point: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.		

Section 6. Accidental Release Measures

Material Release or Spill	IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Evacuate non-essential personnel. Extinguish all ignition sources. Ventilate area. Stop leak if safe to do so. Avoid contact with spilled material. Do not allow spilled material to enter sewer systems as vapours may accumulate and may cause an explosion/fire hazard. If spilled in a confined space, ensure appropriate confined space entry protocols are followed. Ensure clean-up personnel wear appropriate personal protective equipment. Use appropriate inert absorbent material to absorb spilled product. Do not use paper or other flammable materials to absorb product. Collect used absorbent for later disposal. Avoid breathing vapours or mists of material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	FLAMMABLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Wear proper personal protective equipment (See Section 8). Ensure all equipment is grounded/bonded. Avoid confined spaces and areas with poor ventilation. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product.
Storage	Store away from heat and sources of ignition. Store away from incompatible and reactive materials (See section 5 and 10). Ensure the storage containers are grounded/bonded. Keep container tightly closed. Store in dry, cool, well-ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	As a minimum, safety glasses with side shields should be worn when handling this material.
Body	If this material may come into contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information).
Respiratory	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister with a dust, fume of mist filter (R, or P series) may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): neoprene, polyvinyl alcohol (PVA), and fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	Not available (similar to gasoline)
Colour	Clear and colourless.	**Pour Point**	Freezing Point: <-51ºC (<-60ºF) for Jet B/Jet B DI; <-58ºC (<-72ºF) for Jet Fuel F-40.
Odour	Gasoline like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	50 to 270°C (122 to 518°F)	**Penetration**	Not applicable.
Density	0.75 to 0.80 kg/L @ 15ºC (59ºF).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	3.5 (Air = 1)	**Ionicity (in water)**	Not available
Vapour Pressure	21 kPa (158 mmHg) @ 37.8ºC (100ºF).	**Dispersion Properties**	Not available
Volatility	Volatile.	**Solubility**	Insoluble in water. Partially miscible in some alcohols. Miscible in other petroleum solvents.

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Can react with strong oxidizing agents, uranium hexafluoride, diborane. Incompatible with halogens and halogen compounds.	**Decomposition Products**	May release COx, NOx, SOx, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Acute toxicity information is not available for the product as a whole, therefore, data for some of the ingredients is provided below:

Based on toxicity of similar product.
Acute oral toxicity (LD50): >5000 mg/kg (rat).
Acute dermal toxicity (LD50): >5000 mg/kg (rabbit).
Acute inhalation toxicity (LC50): >5000 mg/m³/4h (rat).

Benzene
Acute oral toxicity (LD50): 930 mg/kg (rat).
Acute dermal toxicity (LD50): >9400 mg/kg (rabbit).
Acute inhalation toxicity (LC50): 13200 ppm/4h (rat).

Diethylene Glycol Monomethyl Ether
Acute oral toxicity (LD50): 4140-5180 mg/kg (rat).
Acute dermal toxicity (LD50): >2000 mg/kg (rabbit).
Acute inhalation toxicity (LC50): >50000 mg/m³/4h (rat).

Chronic or Other Toxic Effects

Dermal Route:	Skin contact can cause irritation. Prolonged or repeated contact may defat and dry skin, and cause dermatitis.
Inhalation Route:	Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may lead to aspiration of the liquid, especially if vomiting occurs. This may result in chemical pneumonitis (inflammation of the lungs) and/or pulmonary edema (an accumulation of fluid in the lungs).
Eye Irritation/Inflammation:	Short-term exposure is expected to cause only slight irritation, if any.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	Benzene is tumorigenic by RTECS criteria.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product contains a component(s) at >= 0.1% that has been shown to cause teratogenicity and/or embryotoxicity in laboratory tests. Therefore, this product is considered to be a teratogen/embryotoxin [Diethylene Glycol Monomethyl Ether].
Carcinogenicity (ACGIH):	ACGIH A1: confirmed human carcinogen. [Benzene]
Carcinogenicity (IARC):	IARC Group 1: carcinogenic to Humans. [Benzene]
Carcinogenicity (NTP):	NTP Group 1: known to be a carcinogen. [Benzene]
Carcinogenicity (IRIS):	EPA/IRIS Class A: human carcinogen.
Carcinogenicity (OSHA):	Benzene is an OSHA known carcinogen.
Other Considerations	No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal	Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	FUEL, AVIATION, TURBINE ENGINE, 3, UN1863, PGII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe) Not evaluated.

HCS (U.S.A.)

CLASS: Contains material which may cause cancer.
CLASS: Flammable liquid having a flash point lower than 37.8°C (100°F).
CLASS: Toxic.
CLASS: Irritating substance.
CLASS: Target organ effects.

ADR (Europe) (Pictograms)

NOT EVALUATED FOR EUROPEAN TRANSPORT

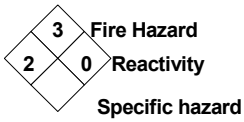
NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.

DOT (U.S.A) (Pictograms)

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	3
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)



Rating

0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
CNS - Central Nervous System
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPA - Environmental Protection Agency
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazard Communication Standard
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
RTECS - Registry of Toxic Effects of Chemical Substances
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS

Prepared by Product Safety - JDW on 2/8/2005.

Internet: www.petro-canada.ca/msds **Fuels & Solvents:** **Western Canada, Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228** **Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385** **For Product Safety Information: (905) 804-4752**	**Data entry by Product Safety - JDW.**

Panasonic®

BATTERY SALES GROUP

MATERIAL SAFETY DATA SHEET

LC SEALED LEAD ACID BATTERY SERIES

Section I: Chemical Product and Company Identification

Product Identity: Sealed Lead Acid Battery

Trade Name: Panasonic LC Valve Regulated Lead Acid Battery Series

Distributor:
Panasonic Industrial Company - Battery Sales Group
Two Panasonic Way/7A-1, Secaucus, New Jersey 07094

Manufacturer:
Matsushita Battery Industrial
Osaka, 570, Japan

For Chemical Emergency
Spill, Leak, Fire, Exposure or Accident
Call CHEMTREC – Day or Night - 24 hours
1-800-424-9300
Outside the USA: 1-703-527-3887 (collect)

Telephone Number for General Information
Toll Free 1-800-793-3772
Internet: www.panasonic.com/batteries

Section II: Hazardous Ingredients / Identity Information

Component	Common Name	Chemical Name	Approximate % by wt. or vol.	OSHA PEL	ACGIH TLV	CAS#
Lead	(Negative Electrode and Grid)	Pb	48~53 wt%	0.05 mg/m^3	0.15 mg/m^3	7439-92-1
Lead Oxide	(Positive Electrode)	PbO_2	23~26%	0.05 mg/m^3	0.15 mg/m^3	1309-60-0
Lead Sulfate	(Positive and Negative Electrode)	$PbSO_4$	< 1. wt%	0.05 mg/m^3	0.15 mg/m^3	7446-14-2
Sulfuric Acid	(Electrolyte)	H_2SO_4	7~10 wt%	1.0 mg/m^3	1.0 mg/m^3	7664-93-9

Percentages of components are dependant both on the model of the battery and state of charge/discharge of the battery. Sulfuric Acid is reportable under Sections 302, 311, 312 and 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). Reportable Quantity: 500 lbs for sulfuric acid and 10,000 lbs for lead. See Section XII, Page 3 for more information.

Overall Chemical Reaction: $PbO2 + Pb + 2H_2SO_4 \rightleftharpoons 2PbSO_4 + 2H_2O$

Note: Panasonic Sealed Lead Acid batteries are a sealed, non-spillable design. Under normal use and handling the customer has no contact with the internal components of the battery or the chemical hazards. Under normal use and handling these batteries do not emit regulated or hazardous substances. Warning: Battery terminals/posts and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands thoroughly after working with batteries and before eating, drinking or smoking.

Section III: Physical / Chemical Characteristics

Boiling Point:	Electrolyte 110°C - 112°C
Vapor Pressure:	Electrolyte 11.7 mm Hg. at 20°C
Vapor Density (AIR = 1):	Electrolyte 3.4
Solubility in Water:	Lead, Lead Oxide and Lead Sulfate are insoluble in water. Sulfuric Acid is 100% soluble in water.
Appearance and Odor:	The entire battery is a solid article consisting of an opaque plastic case with two protruding lead terminals. The battery is odorless. Sulfuric Acid is a liquid.
Specific Gravity (H2O = 1)	Electrolyte 1.300

Health Hazard Information (Acute and Chronic) - Sulfuric Acid only.

The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mist containing sulfuric acid" as a Category I carcinogen, a substance that is carcinogenic to humans. This classification does not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within the battery. Inorganic acid mist (sulfuric acid mist) is not generated under normal use of this product. Misuse of the product, such as overcharging, may however result in the generation of sulfuric acid mist.

Routes of Entry:	By inhalation (mist), skin and eyes, ingestion.
Acute:	Tissue destruction on contact. May cause 2nd and 3rd degree burns or blindness. Ingestion will cause corrosive burns on contact. May be fatal if swallowed.
Chronic:	Inhalation of mists may cause upper respiratory irritation.
Signs and Symptoms:	Irritation and burning of exposed tissues.
Medical Conditions:	Respiratory disorders may be aggravated by prolonged inhalation of mists.

Section IV: Emergency and First Aid Procedures

Battery Electrolyte

Inhalation:	Remove to fresh air. Give oxygen or artificial respiration if needed. **Get immediate medical attention.**
Eye Contact:	Flush with plenty of water for at least 15 minutes. **Get immediate medical attention.**
Skin Contact:	Remove contaminated clothing and flush affected areas with plenty of water for at least 15 minutes.
Ingestion:	Do not induce vomiting. Dilute by giving large quantities of water. If available give several glasses of milk. Do not give anything by mouth to an unconscious person. **Give CPR if breathing has stopped. Get immediate medical attention.**

Section V: Fire and Explosion Hazard Data

Flash Point:	Not Applicable
Flammable Limits:	Lower 4.10% (Hydrogen gas) Upper 74.20%
Extinguishing Media:	Dry chemical, foam, halon or CO_2.

Special Fire Fighting Procedures:
If batteries are on charge, turn off power. Use positive pressure, self-contained breathing apparatus in fighting fire. Water applied to electrolyte generates heat and causes it to splatter. Wear acid resistant clothing. Ventilate area well.
Unusual Fire and Explosion Hazards:
Hydrogen and oxygen gases are generated in cells during normal battery operation or when on charge. (Hydrogen is flammable and oxygen supports combustion). These gases enter the air through the vent caps during battery overcharging. To avoid risk of fire or explosion, keep sparks and other sources of ignition away from the battery. Do not allow metal objects to simultaneously contact both positive and negative terminal of batteries. Ventilate area well.

Section VI: Reactivity Data

Stability:	Stable under normal conditions.
Conditions to Avoid:	Sparks and other sources of ignition. Prolonged overcharge. Fire or explosion hazard due to possible hydrogen gas generation.

Incompatibility:
Combination of sulfuric acid with combustibles and organic materials may cause fire and explosion. Avoid strong reducing agents, most metals, carbides, chlorates, nitrates, picrate.
Hazardous Decomposition Products: Hydrogen gas may be generated in an overcharged condition, in fire or at very high temperatures. CO, CO_2 and sulfur oxides may emit in fire.
Hazardous polymerization will not occur.

Section VII: Precautions for Safe Handling and Use

Steps to be Taken in Case of Broken Battery Case or Electrolyte Leakage:
Neutralize any electrolyte or exposed internal battery parts with soda ash (sodium bicarbonate) until fizzing stops. Keep untrained personnel away from electrolyte and broken battery. Place broken battery and clean-up materials in a plastic bag or non-metallic container. Dispose of clean-up materials as a hazardous waste. Ventilate area as hydrogen gas may be given off during neutralization.
Waste Disposal Method:
Federal and State laws prohibit the improper disposal of all lead acid batteries. The battery end users (owners) are responsible for their batteries from the date of purchase through their ultimate disposal. The only legally acceptable method of disposal of lead acid batteries is to recycle them at a Resource Conservation and Recovery Act (RCRA) approved secondary lead smelter. The Panasonic SAV-LEAD Recycling Program allows for the recycling of lead-acid batteries in an environmentally sound manner. For more information on the SAV-LEAD Recycling Program call toll-free, 1-800-SAV-LEAD (1800-728-5323). These batteries are chemically identical to common automotive starter batteries and can be recycled with automotive lead-acid batteries.
HAZARDOUS WASTE CODES: D002, D008.
Precautions to be Taken in Handling, Storing and Transportation:
Store in cool, dry area away from combustible materials. Do not store in sealed, unventilated areas. Avoid overheating and overcharging.
Other Precautions:
Do not charge in unventilated areas. Do not use organic solvents or other than recommended chemical cleaners on battery.

Section VIII: Control Measures / Personal Protection

General:

Normal room ventilation is sufficient during normal use and handling. Recommend 2 to 3 room air changes per hour to prevent buildup of hydrogen gas.

Personal Protective Equipment (In the Event of Battery Case Breakage):

Always wear safety glasses with side shields or full face shield.
Use rubber or neoprene gloves.
Wear acid resistant boots, apron or clothing.

Work/Hygienic Practices:

Remove jewelry, rings, watches and any other metallic objects while working on batteries. All tools should be adequately insulated to avoid the possibility of shorting connections. DO NOT lay tools on top of battery. Be sure to discharge static electricity from tools and individual person by touching a grounded surface in the vicinity of the batteries, but away from cells. Batteries are heavy. Serious injury can result from improper lifting or installation. DO NOT lift, carry, install or remove cells by lifting or pulling the terminal posts for safety reasons and because terminal posts and post seals may be damaged. DO NOT wear nylon clothes or overalls as they can create static electricity. DO KEEP a fire extinguisher and emergency communications device in the work area.

IMPORTANT:

Wash hands thoroughly after working with batteries and before eating, drinking or smoking.

Section IX: Regulatory Information

NFPA Hazard Rating for Sulfuric Acid:

Flammability (Red) = 0 Health (Blue) = 3 Reactivity (Yellow) = 2

Section X: Transportation Information

Identification and Proper Shipping Name:

Batteries – Wet, Non-Spillable, Electric Storage, UN 2800.

DOT - Unregulated, meets the requirements of 49 CFR 173, 159 (d).

IATA/ICAO - Unregulated, meets the requirements of Special Provision A67.

IMO - Unregulated.

***For all modes of transportation, each battery and outer package must be labeled: "Non-Spillable" or "Non-Spillable Battery." This label must be visible during transportation. * Batteries must be securely packed to prevent short-circuiting.**

Section XI: California Proposition 65 Information

The State of California has determined that certain battery terminals contain lead and lead compounds, *and handling this product may also expose you to sulfuric acid mist*, chemicals known to the State of California to cause cancer and reproductive harm. IMPORTANT: WASH HANDS THOROUGHLY AFTER WORKING WITH BATTERIES AND BEFORE EATING, DRINKING OR SMOKING.

Section XII: Other Information - Notice to Readers

General Product Description – LC VRLA Batteries

Panasonic LC Batteries are **sealed** (valve regulated) non-spillable lead-acid batteries with pasted lead-calcium plates. The electrolyte is held captive in an Absorbed Glass Mat (AGM) separator between plates that immobilize the electrolyte in the cell. AGM separator material is a highly porous, absorbent micro fiberglass mat mixed with polymer fibers. There is no "free" electrolyte to leak out if the cell is tipped over (cell case and cover are sealed together) or if the cell is punctured. The AGM separator material immobilizes the electrolyte and creates a situation where the spill of electrolyte is highly unlikely. Typical accidents where a battery case is punctured results in a slight drip or a slow ooze of material out of the cell that cannot be characterized as a spill.

Panasonic LC VRLA batteries are also different from conventional **unsealed** (wet/flooded) cells because they contain only a minimum amount of electrolyte. VRLA battery electrolyte is a dilute mixture of sulfuric acid in water, which typically has a specific gravity between 1.270 and 1.3. Specific Gravity is a measure of the density of a liquid as compared to that of water, which has a specific gravity of 1.000. Pure sulfuric acid has a specific gravity of 1.835.

NOTE: Panasonic LC batteries do not contain a gel electrolyte.

General Product Description - LC VRLA Batteries (continued)

During normal battery installation, operation and maintenance, the user has NO contact with the internal components of the battery or its internal hazardous chemicals.

Panasonic LC batteries are UL recognized under the file number: Matsushita Electric Industrial Co. Ltd., Matsushita Electric Corp. of America, File #MH13723, 1 Panasonic Way, Secaucus, NJ 07094.

MSDS Preparation Date: 9/2005 **Supersedes: 5/2001**
Preparer: Charles P. Monahan **Director, Regulatory Compliance** **201-392-6464**
Printed in the U.S.A.

Supplemental Information on Panasonic Valve-Regulated Lead Acid Batteries

Transportation

All Panasonic valve-regulated lead acid batteries are considered "non-spillable" for purposes of transportation by the U.S. Department of Transportation (DOT), International Civil Aviation Administration (ICAO), the International Air Transport Association (IATA) and the International Maritime Dangerous Goods regulations (IMDG). They are considered "non-spillable" by DOT by passing the Vibration Test and Pressure Differential Test as required in 49 CFR 173.159(d). They are also considered to be "non-spillable" by both ICAO and IATA by exceeding the requirements of Special Provisions "A67" as defined in their 1998 Handbooks.

Our batteries are authorized for transportation on deck or under deck storage on either a passenger or cargo vessel by passing the Vibration and Pressure Differential Tests as described in the International Maritime Dangerous Goods Regulations (IMDG).

To transport these batteries as "non-spillable" they must be shipped in a condition that would protect them from short-circuits and be securely packaged so as to withstand conditions normal to transportation. For transportation by a consumer, in or out of a device, they are unregulated thus requiring no additional special handling or packaging.

All of our lead acid batteries and their outside packaging, manufactured after September 30, 1995 are labeled "NON-SPILLABLE" per 49 CFR 173.159(d). If you repackage our batteries either as batteries or as a component of another product you must label the outer package "NON-SPILLABLE" per 49 CFR 173.159(d).

Assure Proper Recycling!

Valve-Regulated Lead Acid batteries destined for recycling can be managed under the federal *Universal Waste Rule* codified at 40 CFR Part 273.

In the event of disposal, dispose only in accordance with federal, state and local regulation. Batteries generated as a waste are subject to the Resource Conservation and Recovery Act (RCRA) as a D008 (lead) hazardous waste.

Panasonic VRLA Recycling Program

The Panasonic 1-800-SAV-LEAD Recycling Program for the collection and recycling of valve-regulated lead acid batteries (VRLA) covers all Panasonic Valve-Regulated Lead Acid Batteries. The proper disposal of spent VRLA batteries is becoming more of a critical issue, both from the viewpoint of environmental stewardship and from compliance with federal and state environmental regulations. Panasonic recognizes the burdens and responsibilities that have been placed on our customers to properly dispose of spent VRLA batteries and is proud to offer this voluntary nationwide battery recycling program.

Federal and State Requirements for Proper Disposal

Federal and State laws prohibit the improper disposal of all lead acid batteries. The battery end users (owners) are responsible for their batteries from the date of purchase through their ultimate disposal. The only legally acceptable method of disposal of lead acid batteries is to recycle them at Resource Conservation and Recovery Act (RCRA) approved secondary lead smelter. This Panasonic 1-800-SAV-LEAD Recycling Program will allow for you to arrange for the recycling of your VRLA batteries from anywhere in the United States. The Program will accept Panasonic and other VRLA batteries regardless of manufacturer. Panasonic will handle all VRLA batteries returned in an environmentally sound manner designed to comply with all applicable Federal and State laws and regulations. Panasonic will send batteries only to fully-permitted secondary lead smelters that we believe meet the highest environmental standards. Once the VRLA batteries are received by Panasonic, the cost to transport the batteries to the secondary lead smelter and the actual recycling costs will be borne by Panasonic.

See the next page for How the 1-800-SAV-LEAD Recycling Program Works

Supplemental Information on Panasonic Valve-Regulated Lead Acid Batteries (Cont.)

How the 1-800-SAV-LEAD Recycling Program Works

1) We encourage all of our customers to serve as VRLA collection centers for your customers, thereby establishing a reverse distribution network between the end user and the secondary lead recycling facility.
2) All shipments to our national consolidation facility must be prepaid. No freight collect shipments will be accepted. All freight collect and non-VRLA batteries will be returned to the shipper.
3) Panasonic will maintain on file all necessary documentation for EPA reference. A copy will be provided upon request.
4) All batteries must be shipped, prepaid to Ebco Battery Company that serves as our national consolidation facility. (See *exception* below).

SHIPPING ADDRESS:
Ebco Battery Company
4017 Warm Springs Road
Columbus, Georgia 31909

5) Only VRLA batteries that meet the U.S. Department of Transportation (DOT) "NON-SPILLABLE" (49 CFR 173.159d) requirements will be accepted by this program.
6) Panasonic reserves the right to alter or discontinue this program at any time.

Packaging Requirements

1) All VRLA batteries must be fully discharged and packaged in a manner as to insure safe handling and conform to all applicable DOT regulations. (49 CFR 173.159d). A dab of silicon caulking or non-conductive tape on each terminal will ensure that no direct shorts occur during shipment.
2) VRLA battery shipments should be made in pallet quantities whenever possible.
3) Palletized shipments should be secured with metal bands or poly-wrapped with stack height limited to four (4) feet.
4) VRLA batteries shipped on pallets should be of uniform size or be stacked with the larger batteries on the bottom.
5) VRLA batteries should be stacked upright in a head-to-base arrangement. Each layer should be separated by cardboard to prevent accidental shorting.
6) Smaller quantities of VRLA batteries may be shipped via standard UPS. Be sure that each box does not exceed the UPS weight limit of 70 lbs. A dab of silicon caulking or non-conductive tape on each terminal will ensure that no shorts occur during shipment.
7) The outside of every pallet and individual box must be labeled "NON-SPILLABLE" as required by DOT regulations. This label must be visible during transportation.

Exception:

Full-Truck-Loads – All full-truck-load shipments of VRLA batteries must be scheduled 48 hours in advance. To schedule shipments to our consolidation site, please be sure to fax a scheduling request (including contact name and phone number) to Ebco Battery Company at fax: (706) 569-6774.

Consumer Users of Panasonic VRLA Batteries

All Panasonic VRLA batteries are chemically identical to common automotive starter batteries and can be returned to any site that accepts automotive lead acid batteries for recycling. Examples include retailers of automotive batteries, automotive service centers, scrap metal dealers, etc...

For additional information on this program or information on how to recycle other Panasonic batteries please call your local Panasonic Battery Sales Group sales office.

Panasonic Batteries
Panasonic Industrial Company
A Division of Panasonic Corporation of North America
Two Panasonic Way
Secaucus, NJ 07094
Toll Free: 877-726-2228
Fax: 847-468-5750
e-mail: oembatteries@us.panasonic.com
Internet: www.panasonic.com/batteries

CANADA COLORS & CHEMICALS LTD
80 SCARSDALE ROAD
DON MILLS, ONTARIO, CANADA M3B 2R7
(416)-449-7750

PRODUCT : MAGNAFLOC 10 CODE: 557050

SECTION 01: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER/SUPPLIER.....CIBA SPECIALTY CHEMICALS
900 ROUTE 9 NORTH
WOODBRIDGE, NJ
USA ; 07095-1015
PREPARED BY.....ENVIRONMENTAL & REGULATORY AFFAIRS DEPARTMENT
PREPARATION DATE.....APR 30/2003
PRODUCT NAME.....MAGNAFLOC 10
PRODUCT CODE.....557050
CHEMICAL FORMULA.....N.AV.
CHEMICAL FAMILY.....ANIONIC POLYCRYLAMIDE
MATERIAL USE.....FLOCCULANT

SECTION 02: COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS/COMPOSITION	EXPOSURE LEVELS	LD/50, ROUTE, SPECIES	LC/50, ROUTE, SPECIES
NO KNOWN HAZARDOUS INGREDIENTS.			

SECTION 03: HAZARDS IDENTIFICATION

ROUTE OF ENTRY:
SKIN CONTACT.....REPEATED OR PROLONGED EXPOSURE MAY CAUSE SLIGHT SKIN IRRITATION.
SKIN ABSORPTION.....N.AV.
EYE CONTACT.....EYE CONTACT MAY CAUSE SLIGHT IRRITATION AND/OR REDNESS.
INHALATION.....INHALED DUST MAY CAUSE RESPIRATORY IRRITATION.
INGESTION.....N.AV.
EFFECTS OF ACUTE EXPOSURE.....REFER TO ROUTE OF ENTRY. ROUTE OF ENTRY: INHALATION.
MEDICAL CONDITIONS AGGRAVATED....EXISTING RESPIRATORY CONDITIONS.
BY OVEREXPOSURE

SECTION 04: FIRST AID MEASURES

INSTRUCTIONS:.....EYE CONTACT: FLUSH EYES WITH WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION. SKIN CONTACT: WASH AFFECTED AREA WITH PLENTY OF WATER AND SOAP, IF AVAILABLE, FOR SEVERAL MINUTES. GET MEDICAL ATTENTION IF IRRITATON OCCURS. CONTAMINATED CLOTHING SHOULD BE WASHED BEFORE RE-USE. INHALATION: REMOVE TO FRESH AIR. GET MEDICAL ATTENTION IF RESPIRATORY IRRITATION DEVELOPS OR IF BREATHING BECOMES DIFFICULT. INGESTION: IF CONSCIOUS, GIVE 2 TO 4 GLASSES OF WATER TO DRINK, BUT DO NOT INDUCE VOMITING. GET MEDICAL ATTENTION. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS

PRODUCT : MAGNAFLOC 10 CODE: 557050

SECTION 04: FIRST AID MEASURES

INSTRUCTIONS:.....OR CONVULSING PERSON.

SECTION 05: FIRE FIGHTING MEASURES

FLAMMABILITY/COMBUSTIBILITY.....SEE FLASH POINT
FLAMMABILITY
IF YES, UNDER WHICH.....N.AV.
CONDITIONS?
EXTINGUISHING MEDIA.....CARBON DIOXIDE, DRY CHEMICAL, FOAM, IN PREFERENCE TO A WATER SPRAY.
SPECIAL PROCEDURES.....WATER MAY CREATE A SLIP HAZARD. USE SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT.
FLASH POINT (C), METHOD.....N.AP.
AUTO IGNITION TEMPERATURE.....N.AV.
UPPER FLAMMABLE LIMIT (% BY.....N.AV.
VOL.)
LOWER FLAMMABLE LIMIT (% BY.....N.AV.
VOL.)
EXPLOSION DATA
- EXPLOSIVE POWER.....DANGER! EXPLOSION RISK!. THIS PRODUCT CAN FORM AN EXPLOSIVE DUST/AIR MIXTURE. AVOID DUST FORMATION AND CONTROL IGNITION SOURCES. EMPLOY GROUNDING, VENTING AND EXPLOSION RELIEF PROVISIONS IN ACCORD WITH ACCEPTED ENGINEERING PRACTICES IN PROCESS OPERATIONS CAPABLE OF GENERATING DUST/OR STATIC ELECTRICITY.
- RATE OF BURNING.....N.AV.

SENSITIVITY TO STATIC.....SEE ABOVE
DISCHARGE
- SENSITIVITY TO IMPACT.....NONE

HAZARDOUS COMBUSTION PRODUCTS...OXIDES OF CARBON AND NITROGEN, VARIOUS HYDROCARBONS, AND/OR AMMONIA WHICH MAY BE IRRITATING OR HARMFUL.

SECTION 06: ACCIDENTAL RELEASE MEASURES

LEAK/SPILL.....PRODUCT BECOMES SLIPPERY AND DIFFICULT TO HANDLE WHEN WET; SPILLS ARE BEST HANDLED WHILE STILL DRY. SWEEP UP AND COLLECT DRY PRODUCT. ABSORB WET PRODUCT WITH VERMICULITE OR OTHER INERT MATERIAL AND PLACE IN CLOSABLE CONTAINER FOR DISPOSAL. SCRUB AREA WITH DRY ABSORBENT AND THEN FLUSH RESIDUE WITH WATER TO ELIMINATE SLIP HAZARD. DISPOSE IN ACCORDANCE WITH LOCAL, PROVINCIAL AND FEDERAL REGULATIONS.

SECTION 07: HANDLING AND STORAGE

PRODUCT : MAGNAFLOC 10 CODE: 557050

SECTION 07: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT	WARNING!. DUST GENERATED IN HANDLING OF THIS PRODUCT CAN BE EXPLOSIVE IF SUFFICIENT QUANTITIES ARE MIXED IN AIR, IN WHICH CASE IGNITION SOURCES SHOULD BE AVOIDED. EMPLOY GROUNDING, VENTING AND EXPLOSION RELIEF PROVISIONS IN ACCORD WITH ACCEPTED ENGINEERING PRACTICES IN PROCESS OPERATIONS CAPABLE OF GENERATING DUST/OR STATIC ELECTRICITY. HANDLE IN ACCORDANCE WITH GOOD INDUSTRIAL PRACTICE, HANDLE WITH CARE AND AVOID UNNECESSARY PERSONAL CONTACT. AVOID CONTACT WITH EYES AND PROLONGED OR REPEATED SKIN CONTACT. AVOID CONTINUOUS OR REPETITIVE BREATHING OF DUST. USE ONLY WITH ADEQUATE VENTILATION. REMOVE CONTAMINATED CLOTHING; LAUNDER OR DRY-CLEAN BEFORE REUSE. WASH THOROUGHLY WITH SOAP AND WATER AFTER USING. FOR INDUSTRIAL USE ONLY. SLIP HAZARD WHEN WET.
STORAGE NEEDS	MATERIAL IS SLIPPERY WHEN WET. STORE IN THE ORIGINAL CONTAINER, SECURELY CLOSED, IN A COOL AND DRY LOCATION. AVOID EXTREMES OF TEMPERATURE AND IGNITION SOURCES.

SECTION 08: EXPOSURE CONTROLS/PERSONAL PROTECTION

GLOVES/ TYPE	WEAR IMPERVIOUS GLOVES AS A STANDARD PROCEDURE.
RESPIRATORY/TYPE	USE NIOSH APPROVED DUST RESPIRATOR.
EYE/TYPE	USE CHEMICAL GOGGLES WHICH MEET CSA STANDARDS TO PROTECT AGAINST DUST PARTICLES.
FOOTWEAR/TYPE	WEAR CHEMICAL RESISTANT FOOTWEAR.
CLOTHING/TYPE	WEAR GAUNTLETS AND APRON, ESPECIALLY FOR TRANSFER OF BULK QUANTITIES OF CONCENTRATED PRODUCT.
OTHER/TYPE	EYE BATH AND SAFETY SHOWER.
ENGINEERING CONTROLS	WORK IN WELL VENTILATED AREAS. PROVIDE MECHANICAL VENTILATION TO PREVENT DUST CONCENTRATIONS.

SECTION 09: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	SOLID/WHITE GRANULAR POWDER
ODOUR	NO SIGNIFICANT ODOUR
ODOUR THRESHOLD	N.AP.
VAPOUR PRESSURE (MMHG)	N.AP.
VAPOUR DENSITY (AIR=1)	N.AP.
BY VOLUME	
BY WEIGHT	
EVAPORATION RATE	N.AP.
BOILING POINT	~100 C
MELTING POINT (C)	N.AV.
PH	~6 (1% SOLUTION)
SPECIFIC GRAVITY (WATER=1)	~0.75
SOLUBILITY IN WATER (% W/W)	SOLUBLE, SOLUBILITY LIMITED BY VISCOSITY
COEFFICIENT OF WATER/OIL DIST	N.AV.

PRODUCT : MAGNAFLOC 10 CODE: 557050

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY:
YES.....STABLE
NO, WHICH CONDITIONS?.....AVOID WET, DAMP OR UMID CONDITIONS, EXTREMES OF TEMPERATURE, AND IGNITION SOURCES.
COMPATABILITY WITH OTHER SUBSTANCES:
YES
NO, WHICH ONES?.....AVOID CONTACT WITH STRONG OXIDANTS SUCH AS LIQUID CHLORINE, ENRICHED GASEOUS OR LIQUID OXYGEN, AND SODIUM OR CALCIUM HYPOCHLORITE.
REACTIVITY CONDITIONS?.....SEE ABOVE
HAZARDOUS PRODUCTS OF.....SEE HAZARDOUS COMBUSTION PRODUCTS

SECTION 11: TOXICOLOGICAL INFORMATION

EXPOSURE LIMIT OF MATERIAL.....N.AV.
LC 50 OF MATERIAL, SPECIES &.....N.AV.
ROUTE
LD 50 OF MATERIAL, SPECIES &.....ACUTE ORAL (RAT) IS EXPECTED TO BE >2,000 MG/KG (BY ANALOGY
ROUTE TO SIMILAR MATERIALS). DERMAL - N.AV.
CARCINOGENICITY OF MATERIAL.....NOT A KNOWN CARCINOGEN
REPRODUCTIVE EFFECTS.....NONE KNOWN
MUTAGENICITY.....NOT A KNOWN MUTAGEN
TERATOGENICITY.....NOT A KNOWN TERATOGEN
IRRITANCY OF MATERIAL.....ACUTE EYE (RABBIT): NOT AN IRRITANT (BY ANALOGY TO SIMILAR MATERIALS). ACUTE DERMAL (RABBIT): NOT AN IRRITANT (BY ANALOGY TO SIMILAR MATERIALS). SEE SECTION 03
SENSITIZING CAPABILITY OF.....NOT A KNOWN SENSITIZER
MATERIAL
SYNERGISTIC MATERIALS.....N.AV.

SECTION 12: ECOLOGICAL CONSIDERATIONS

ECOLOGICAL INFORMATION.....FROM TESTS ON A PRODUCT RANGE, THE FOLLOWING RESULTS ARE EXPECTED:. ACUTE FISH TOXICITY: LC50, 96-HR, ZEBRA FISH (BRACHYDANIO RERIO): 357 MG/L. ACUTE INVERTEBRATE TOXICITY: EC50, 48-HR, DAPHNIA MAGNA: 212 MG/L. ACUTE ALGAE TOXICITY: EC50, 72-HR, ALGAE (CHLORELLA VULGARIS): >1000 MG/L. ACUTE BACTERIA TOXICITY: EC50, 24-HR, BACTERIA (PSEUDOMONAS PUTIDA): 892 MG/L

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL.....ALL DISPOSAL METHODS MUST BE. IN ACCORDANCE WITH MUNICIPAL, PROVINCIAL AND FEDERAL REGULATIONS.

PRODUCT : MAGNAFLOC 10 CODE: 557050

SECTION 14: TRANSPORT INFORMATION

TDG CLASSIFICATION.....NOT REGULATED
SPECIAL SHIPPING INSTRUCTIONS....N.AP.

SECTION 15: REGULATORY INFORMATION

CPR COMPLIANCE.....THIS IS NOT A REGULATED PRODUCT. THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CPR AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

SECTION 16: OTHER INFORMATION

N.AP.=NOT APPLICABLE
N.AV.=NOT AVAILABLE

Material Safety Data Sheet

PETRO-CANADA SUPREME 5W-30, 10W-30, 10W-40, 20W-50 MOTOR OIL

1 . Product and company identification

Common name : PETRO-CANADA SUPREME 5W-30, 10W-30, 10W-40, 20W-50 MOTOR OIL

Code : 410-344, MOSP53; 410-341, MOSP13; 410-342, MOSP14; 410-343, MOSP25

Material uses : Supreme is designed for the lubrication of all gasoline, propane and CNG engines where the manufacturer recommends the use of API SM quality oils. SAE 5W-30 and 10W-30 grades also meet the requirements of ILSAC GF-4.

Manufacturer : PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of emergency : **Petro-Canada: 403-296-3000**
Canutec Transportation:
613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Odour : Mild petroleum oil like.

OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Emergency overview : No specific hazard.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eyes : Slightly irritating to the eyes.

Skin : Slightly irritating to the skin.

Inhalation : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Repeated skin exposure can produce local skin destruction or dermatitis. Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	Mixture	-

The base oil may be a mixture of the following CAS#s: 8042-47-5, 64742-46-7, 64742-52-5, 64742-54-7, 72623-84-8, 72623-85-9, 72623-86-0, 72623-87-1, 178603-64-0, 178603-65-1, 178603-66-2, 445411-73-4

4 . First-aid measures

Eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin contact : Wash skin thoroughly with soap and water or use recognised skin cleanser. Get medical attention if irritation occurs. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse.

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

Ingestion : Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If potentially dangerous quantities of this material have been swallowed, call a physician immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

5 . Fire-fighting measures

Flammability of the product : May be combustible at high temperature.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), phosphorus oxides (POx), calcium oxides (CaOx), zinc oxides (ZnOx), molybdenum oxides (MoOx), boron oxides, smoke and irritating vapours as products of incomplete combustion.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : No specific hazard.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Low fire hazard. This material must be heated before ignition will occur.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment.

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : If emergency personnel are unavailable, contain spilt material. For small spills, add absorbent (soil may be used in the absence of other suitable materials), scoop up material and place in a sealable, liquid-proof container for disposal. For large spills, dyke spilt material or otherwise contain material to ensure runoff does not reach a waterway. Place spilt material in an appropriate container for disposal.

7 . Handling and storage

Handling : Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk. Evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/vapour/spray. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidising agents, acids.

Storage : Keep container tightly closed. Store away from incompatible materials (see section 10). Keep container in a cool, well-ventilated area.

8 . Exposure controls/personal protection

Product name	Exposure limits
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	**ACGIH TLV (United States). Notes: (oil mist)** TWA: 5 mg/m^3 8 hour/hours. STEL: 10 mg/m^3 15 minute/minutes.

Consult local authorities for acceptable exposure limits.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control airborne levels. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

8 . Exposure controls/personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: neoprene, nitrile, polyvinyl alcohol (PVA), Viton.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

9 . Physical and chemical properties

Physical state : Viscous liquid.

Flash point : Open cup:≥227°C (440.6°F) (Cleveland.).

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Colour : Light amber.

Odour : Mild petroleum oil like.

pH : Not applicable.

Boiling/condensation point : Not available.

Pour Point : **5W-30**: -45ºC (-49ºF) **10W-30**: -36ºC (-33ºF) **10W-40**: -36ºC (-33ºF) **20W-50**: -24ºC (-11ºF)

Melting/freezing point : Not available.

Relative density : 0.856 to 0.8784 kg/L @ 15ºC (59ºF)

Vapour pressure : Not available.

Vapour density : Not available.

Volatility : Not available

Odour threshold : Not available.

Evaporation rate : Not available.

Viscosity : **5W-30**: 61.8 cSt @ 40°C (104ºF), 10.4 cSt @ 100ºC (212ºF), VI=159; **10W-30**: 66.0 cSt @ 40°C (104ºF), 10.2 cSt @ 100ºC (212ºF), VI=141; **10W-40**: 94.9 cSt @ 40°C (104ºF), 13.9 cSt @ 100ºC (212ºF), VI=149; **20W-50**: 170.8 cSt @ 40°C (104ºF), 18.9 cSt @ 100ºC (212ºF), VI=125

Solubility : Insoluble in water.

LogK_{ow} : Not available.

Softening Point : Not available.

Dropping Point : Not available.

Penetration : Not available.

Physical/chemical properties comments : Not available.

10 . Stability and reactivity

Stability and reactivity : The product is stable.

Conditions of instability : Not available.

Incompatibility with various substances : Reactive with oxidising agents and acids.

Hazardous decomposition products : May release COx, H2S, alkyl mercaptans, methacrylate monomers, smoke and irritating vapours when heated to decomposition.

Hazardous polymerisation : Will not occur.

11 . Toxicological information

Toxicity data

Product/ingredient name	Test	Result	Route	Species
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	LD50 LD50 LC50	>5000 mg/kg >2000 mg/kg >2500 mg/m^3 (4 hour/hours)	Oral Dermal Inhalation	Rat Rabbit Rat

Specific effects

Carcinogenic effects : Not listed as carcinogenic by OSHA, NTP or IARC.

Mutagenic effects : No known significant effects or critical hazards.

Teratogenicity / Reproductive toxicity : No known significant effects or critical hazards.

Sensitisation

Ingestion : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Eyes : Slightly irritating to the eyes.

Skin : Slightly irritating to the skin.

Synergistic products : Not available.

12 . Ecological information

Ecotoxicity data

Product/ingredient name	Species	Period	Result

Environmental precautions : No known significant effects or critical hazards.

Bioconcentration factor Not available.

BOD and COD Not available.

Biodegradable/OECD Not available.

Mobility Not available.

Special remarks on the products of biodegradation Not available.

13 . Disposal considerations

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Class	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Not regulated.

U.S. Federal regulations : Not available.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

EU regulations

Risk phrases : This product is not classified according to EU legislation.

International regulations

International lists

CANADA INVENTORY (DSL) : Not determined.

EC INVENTORY (EINECS/ELINCS) : Listed

TSCA 8(b) inventory : Listed

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	1
Fire hazard	1
Reactivity	0
Personal protection	B

National Fire Protection Association (U.S.A.) :

References : Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Date of printing : **7/28/2006.**

Date of issue : **7/24/2006.**

Date of previous issue : **No previous validation.**

Responsible name : **Product Safety - JDW**

Version : **1**

For Copy of (M)SDS : The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

16 . Other information

Internet: www.petro-canada.ca/msds

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

NITRIC ACID

Infosafe no. AJ12Z **Issue Date** February 2002 **Status** ISSUED by APSSC
Classified as hazardous according to criteria of NOHSC

COMPANY DETAILS

Company Name	Asia Pacific Specialty Chemicals Limited (ABN 32000316138)
Address	15 Park Road SEVEN HILLS NSW 2147
Emergency Tel.	1800 022 037 (24H)
Tel/Fax	Tel: (02) 9839 4000 Fax: (02) 9674 6225
Other Information	New Zealand: Asia Pacific Specialty Chemicals (NZ) Limited 119 Carbine Road Mt Wellington, Auckland 6 Emergency Tel: 0800 243 622 (24H) Telephone: (09) 276 4019 Fax: (09) 276 7231

IDENTIFICATION

Product Code TECH 00000625

Product Name NITRIC ACID

Proper Shipping Name NITRIC ACID

Other Names	**Name**	**Manf. Code**
	NITRIC ACID (NOT GREATER THAN 70%)	
	NITRIC ACID 57%	TECH 00001128
	NITRIC ACID 70%	AR 00000341
	NITRIC ACID 70%	CP 00001650
	NITRIC ACID 70% W/W	TECH 00001380
	NITRIC ACID MIN 65% PICOPUR	RDEH 06030015
	NITRIC ACID 70%	CP 00004990
	Aqua fortis	
	Hydrogen nitrate	
	Nitric acid other than red fuming, all concentrations	

UN Number 2031

DG Class 8

Packing Group II

Hazchem Code 2PE

Poisons Schedule S6

Physical Data

Appearance Colourless to pale yellow liquid with sharp, irritating fumes. Soluble in water.

Boiling Point 122 deg C, 68% strength, constant boiling

Vapour Pressure No Data

Specific Gravity 1.3 - 1.42 at 15 deg C

Flash Point No Data

Flamm. Limit LEL No Data

Other Properties

pH Value	Acid
Formula	HNO3
Molecular Weight	63.01

Ingredients

Ingredients	Name	CAS	Proportion
	Nitric acid	7697-37-2	0-70 %

HEALTH HAZARD INFORMATION

Health Effects

Acute - Swallowed	Damage to oesophagus and stomach may result in onset of fever and can be fatal.
Acute - Eye	Contamination of eyes can result in permanent injury.
Acute - Skin	Causes severe burns.
Chronic	Chronic exposure to mists or fumes may result in erosion of the teeth, bronchial irritation with chronic cough and attacks of bronchial pneumonia.
Other Information	Considered to be harmful by all exposure routes. Vapour is severe irritant to the eyes, mucous membranes and respiratory tract. Exposure to high concentrations of acid in the form of liquid, vapour, mist or the decomposition product nitrogen dioxide, may lead to pulmonary oedema. Symptoms and effects from overexposure may be delayed several hours.

First Aid

Eye	Urgently seek medical assistance. Transport to hospital or medical centre.
Skin	Wash affected areas with copious quantities of water immediately. Remove contaminated clothing and wash skin thoroughly. Seek medical attention if swelling, redness, blistering or irritation occurs

Advice to Doctor

Advice to Doctor	Consult Poisons Information Centre. If exposure has been severe and/or symptoms marked, observation in hospital for 48 hours should be considered because of the possibility of delayed pneumonitis and pulmonary oedema.

Other Health Hazard Information

PRECAUTIONS FOR USE

Exposure Limits	Name	STEL (mgm3)	STEL (ppm)	TWA (mgm3)	TWA (ppm)	FootNote
	Nitric acid	10	4	5.2	2	

Other Exposure Info.

(TLV-TWA) 2 ppm, 5 mg/m3 STEL 4 ppm, 10 mg/m3, Worksafe Aust.
SAMPLING & ANALYSIS Use appropriate instrumentation and sampling strategy (location, timing, duration, frequency, and number of samples). Interpretation of the sampling results is related to these variables and the analytical method.
EXPOSURE CONTROL Note: Exposure to this material can be controlled in many ways. The measures appropriate for a particular worksite depend on how this material is used and on the extent of exposure. Use this general information to help develop specific control measures. Ensure that control systems are properly designed and maintained. Comply with occupational, environmental, fire and other applicable regulations.

Eng. Controls

Maintain concentration below recommended exposure limit. ENGINEERING CONTROLS Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical (local exhaust) ventilation, process or personnel enclosure, control of process conditions, and process modification (e.g., substitution of a less hazardous material). Administrative controls and personal protective equipment may also be required. Local exhaust ventilation is necessary when this material is heated or a mist created. Use a corrosion-resistant ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside. Supply sufficient replacement air to make up for air removed by exhaust systems.

Personal Protection

Protective Equip.	RESPIRATORY PROTECTION If engineering controls and work practices are not effective in controlling exposure to this material, then wear suitable personal protective equipment including approved respiratory protection. Have appropriate equipment available for use in emergencies such as spills or fire. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection. PERSONAL PROTECTION RECOMMENDATIONS: Use good occupational work practice. Avoid all contact. Use with adequate ventilation. If inhalation risk exists wear respirator or air-wash hood. EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATION OR IDLH CONDITIONS: A SCBA with a full facepiece and operated in a pressure-demand or other positive-pressure mode, or a supplied-air respirator with a full facepiece and operated in pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode. IDLH value: 100 ppm. ESCAPE: An air purifying full facepiece respirator EYE/FACE PROTECTION Chemical safety goggles. A face shield may also be necessary. SKIN PROTECTION Impervious gloves, coveralls, boots, and/or other resistant protective clothing. Have a safety shower/eye-wash fountain readily available in the immediate work area. An impervious full-body encapsulating suit and respiratory protection may be required in some operations. PERSONAL PROTECTION COMMENTS Remove contaminated clothing promptly. Immediately immerse in water and keep thoroughly wet until discarded or laundered. Inform laundry personnel of contaminant's hazards. Do not eat, drink or smoke in work areas. Wash hands thoroughly after handling this material. Maintain good housekeeping.

Flammability

Fire Hazards	Non flammable.
Other Precautions	Never pour water into this substance when dissolving or diluting. Always add it slowly to the water to avoid boiling and splattering.

SAFE HANDLING INFORMATION

Storage and Transport

Storage Precautions	Class 8 products are not to be loaded with class 1, 4.3, 5, 6 (when class 6 is a cyanide and class 8 is an acid), 7 or foodstuffs or foodstuff empties. Store in a well ventilated area and out of direct sunlight. Keep containers closed at all times. Store away from oxidisable, caustic and combustible materials.
Other Storage Info.	Vapours heavier than air, prevent concentration in sumps and hollows. DO NOT enter confined spaces where vapour may have collected. Use good occupational work practice. Strong oxidising agent, can lead to fire or explosion with organic and/or combustible materials.
Proper Shipping Name	NITRIC ACID
EPG Number	8D1
IERG Number	40
Packaging Method	5.9.8RT5,RT8

Spills and Disposal

Spills & Disposal	Carefully dilute with water or neutralise with soda ash or slaked lime. After dilution or neutralisation, approved liquid waste land fill site should be suitable. Full protective clothing should be worn, including impervious footwear and breathing apparatus.

Fire/Explosion Hazard

Fire/Explos. Hazard	Fire fighters to wear self-contained breathing apparatus if risk of exposure to products of decomposition. Non flammable. However, if involved in a fire, highly toxic fumes of NOx will be given off. Keep containers cool with water spray.
Hazardous Reaction	Powerful oxidising agent. Highly corrosive to most metals. Will react explosively with organic materials. Highly toxic fumes evolved during reaction. Hygroscopic. Darkens on exposure to light due to nitrogen dioxide formation. INCOMPATIBILITY: Bases, reducing agents, alcohols, alkali metals, brass, copper, copper alloys, galvanised iron, aluminium, corrodes steel, organic materials, and amines.
Hazchem Code	2PE

OTHER INFORMATION

Toxicology	LDLo (man): unreported route, 110 mg/kg. Human fatal dose approx. 1 ml More detailed information about the effects of chemicals on health can be obtained from Worksafe Australia.
Information on Ecological Effects	Harmful to aquatic life.
Risk Statement	R35 Causes severe burns.
Safety Statement	S2 Keep out of reach of children. S23 Do not breathe gas/fumes/vapour/spray S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S27 Take off immediately all contaminated clothing. S24/25 Avoid contact with skin and eyes.
Pkg. & Labelling	As required by the ADG Code and the Standard for the Uniform Scheduling of Drugs and Poisons.
Hazard Category	Very Corrosive
Manufacturers Advice	Catalogue numbers 06038270 and 06038274 are S5 poisons (Fed).
Empirical Formula & Structural Formula	HNO3

CONTACT POINT

Contact	Australia: Business Hours: Mr Paul Verren Telephone: (02) 9839 4024 After Hours: 1800 022 037 New Zealand: Business Hours: Mr Lloyd Williams Telephone: (09) 276 4019 Emergency Tel: 0800 243 622 IMPORTANT ADVICE: This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including its use in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact Asia Pacific Speciality Chemicals. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

End of MSDS

Material Safety Data Sheet

Dyno Nobel Inc.
2650 Decker Lake Boulevard, Suite 300
Salt Lake City, Utah 84119
Phone: 801-364-4800 Fax: 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

MSDS # 1030
Date 03/31/06

Supercedes
MSDS # 1030 01/24/05

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): DYNO® AP, DYNO® AP PLUS, DYNO® AP PLUS LD
DYNO® MC, DYNO® MC PLUS
DYNO® SL, DYNO® SL PLUS
DYNO® XTRA
IRECOAL® E-5 / DYNO® E5
IREMITE® TX / DYNO® TX
POWERMITE®
POWERMITE® AP, POWERMITE® SL, POWERMITE® PLUS
POWERMITE® SL PLUS
POWERMITE® LD, POWERMITE® LD PLUS
POWERMITE® Canadian
POWERMITE® RAISE BOMB™
DX 1004
DYNOSPLIT® AP

Product Class: Packaged Emulsion Explosives

Product Appearance & Odor: White or pink opaque semi-solid, which will appear gray if product contains aluminum. Little or no odor. Typically paper or plastic chub packaging.

DOT Hazard Shipping Description: Explosive, Blasting, Type E 1.1D UN0241 II

NFPA Hazard Classification: Not Available (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients	CAS#	% (Range)	ACGIH TLV-TWA
Ammonium Nitrate	6484-52-2	60-80	No Value Established
Sodium Nitrate[1]	7631-99-4	10-18	No Value Established
Aluminum	7429-90-5	0-10	10 mg/m^3
Mineral Oil (mist)	64742-35-4	0-3	5 mg/m^3

[1] Our source of Sodium Nitrate (Chilean) may contain perchlorate ion, which occurs naturally. Although Dyno Nobel does not analyze for the presence of perchlorate anion, based on published studies, the products listed above may contain between 50 and 350 ppm perchlorate.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

Material Safety Data Sheet

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable

Vapor Pressure: Not Applicable

Vapor Density: (Air = 1) Not Applicable

Density: 0.95-1.25 g/cc

Percent Volatile by Volume: <20 (water)

Solubility in Water: Product partially dissolves very slowly in water.

Evaporation Rate (Butyl Acetate = 1): <1

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: >100°C **Flammable Limits:** Not Applicable
Extinguishing Media: (See Special Fire Fighting Procedures section.)
Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.
Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: May cause irritation, redness and tearing.
Skin: Prolonged contact may cause irritation.
Ingestion: Large amounts may be harmful if swallowed.
Inhalation: Not a likely route of exposure.
Systemic or Other Effects: *Perchlorate*: Perchlorate can potentially inhibit iodide uptake by the thyroid and result in a decrease in thyroid hormone. The National Academy of Sciences (NAS) has reviewed the toxicity of perchlorate and has concluded that even the most sensitive populations could ingest up to 0.7 microgram perchlorate per kilogram of body weight per day without adversely affecting health. The USEPA must establish a maximum contaminant level (MCL) for perchlorate in drinking water by 2007, and this study by NAS may result in a recommendation of about 20 ppb for the MCL.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists seek medical attention.
Skin: Remove contaminated clothing. Wash with soap and water.
Ingestion: Seek medical attention.
Inhalation: If irritation occurs, remove to fresh air.
Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantity.
Conditions to Avoid: Keep away from heat, flame, ignition sources and strong shock.
Materials to Avoid (Incompatibility): Corrosives (strong acids and strong bases or alkalis).
Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO)
Hazardous Polymerization: Will not occur.

Material Safety Data Sheet

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.
Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.
Respiratory Protection: None normally required.
Protective Clothing: Gloves and work clothing that reduce skin contact are suggested.
Eye Protection: Safety glasses are recommended.
Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State and local regulations. Keep away from heat, flame, ignition sources and strong shock.
Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.
Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

The reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372 may become applicable if the physical state of this product is changed to an aqueous solution. If an aqueous solution of this product is manufactured, processed, or otherwise used, the nitrate compounds category and ammonia listing of the previously referenced regulation should be reviewed.

Disclaimer

LAFARGE NORTH AMERICA

MSDS

Revised February 15, 2005

Material Safety Data Sheet

PRODUCT NAME: PORTLAND CEMENT

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

Supplier

Name: Lafarge North America Inc.
Address: 12950 Worldgate Drive, Suite 500
Herndon, VA 20170
Telephone: 703-480-3600

Product Identifier

Hydraulic Cement, Oil Well Cement, White Cement, Portland Cement Type I, IA, II, IIA, II L.A., III, IIIA, IV, IVA, V, VA, 10, 20, 30, 40, 50, OWH, OWG Cement, OW Class G HSR

Note: This MSDS covers many products. Individual composition of hazardous constituents will vary.

WHMIS Classification: D2A, E

Emergency Telephone Numbers

Health & Transportation: CHEMTREC 1-800-424-9300 or 703-527-3887

2. INFORMATION ON COMPONENTS

Component Name	%	CAS No.
Tri-Calcium Silicate	20 - 70	12168-85-3
Di-Calcium Silicate	10 - 60	10034-77-2
Tetra-Calcium- Alumino-Ferrite	5 - 15	12068-35-8
Calcium Sulfate	2 - 10	Various
Tri-Calcium Aluminate	1 - 15	12042-78-3
Calcium Carbonate	0 - 5	1317-65-3
Magnesium Oxide	0 - 4	1309-48-4
Calcium Oxide	0 - 0.2	1305-78-8
Crystalline Silica	0 - 0.2	14808-60-7
Chromates	0 - 0.005	Various

Component Name	EXPOSURE LIMITS OSHA PEL TWA	ACGIH TLV TWA
Portland Cement (CAS 65997-15-1)*		
(Respirable Dust)	5 mg/m^3	
(Total Dust)	15 mg/m^3	10 mg/m^3
Calcium Sulfate		
(Respirable Dust)	5 mg/m^3	
(Total Dust)	15 mg/m^3	10 mg/m^3
Calcium Carbonate		
(Respirable dust)	5 mg/ m^3	
(Total Dust)	15 mg/m^3	10 mg/m^3
Magnesium Oxide	15 mg/m^3	10 mg/m^3
Calcium Oxide	5 mg/m^3	2 mg/m^3
Crystalline Silica Quartz		0.05 mg/m^3
Quartz (Respirable)	10 mg/ m^3/ (%SiO_2+2)	
Quartz (Total Dust)	30 mg/ m^3/ (%SiO_2+2)	
Chromates	0.1 mg(CrO_3)/ m^3	0.05 mg(Cr)/m^3
Nuisance Dust		
(Respirable)	5 mg/m^3	3 mg/m^3
(Total / Inhalable)	15 mg/m^3	10 mg/m^3

*This value is for particulate matter containing no asbestos and < 1% crystalline silica.

3. HAZARD IDENTIFICATION

Emergency Overview

Solid; grey powder; odorless.

Potential Health Effects

INHALATION (acute): Breathing dust may cause nose, throat or lung irritation and choking. The described effect depends on the degree of exposure.

INHALATION (chronic): Prolonged or repeated exposure may cause lung injury including silicosis. This product may contain crystalline silica. Crystalline silica has been classified by IARC as a known human carcinogen. Some human studies indicate potential for lung cancer from crystalline silica exposure. Risk of injury depends on duration and level of exposure. Long term exposures which result in silicosis may result in additional health effects.

EYE CONTACT (acute/chronic): May cause eye irritation, severe burns and damage to cornea.

SKIN CONTACT (acute/chronic): May cause dry skin, redness, discomfort, irritation or severe burns. May produce allergic reaction potentially associated with hexavalent chromium. Thickening of the skin (scleroderma) may be associated with exposure to high levels of crystalline silica.

INGESTION (acute/chronic): Ingestion of large amounts may cause intestinal distress.

4. FIRST AID MEASURES

INHALATION: Move person to fresh air. Seek medical attention for discomfort.

EYE CONTACT: Rinse thoroughly with water. Seek medical attention for abrasions.

SKIN CONTACT: Wash with soap and water. Use moisturizing creams for irritated skin. Seek medical attention for burns.

INGESTION: Do not induce vomiting, but drink plenty of water. Seek medical attention for discomfort.

5. FIREFIGHTING MEASURES

Flashpoint and Method: None.
Flammable Limits: Not combustible.
Autoignition Temperature: None.
General Hazard: Avoid breathing dust.
Firefighting Instructions: Treat adjacent material.
Firefighting Equipment: This product is not a fire hazard. Self contained breathing apparatus is recommended to limit exposures to smoke from any combustion source.
Hazardous Combustion Products: None.

6. ACCIDENTAL RELEASE MEASURES

General: Wind blown dust may cause the hazards identified in Section 3. Remove spilled material to limit potential harm.
Land Spill Clean up spilled material.
Water Spill: Clean up spilled material.

7. HANDLING AND STORAGE

General: Avoid accidental release. Store dry and away from water.
Storage Temperature: Unlimited.
Storage Pressure: Unlimited.
Empty Containers: Dispose of containers in an approved landfill or incinerator.

8. EXPOSURE CONTROL & PERSONAL PROTECTION

Engineering Controls
Use exhaust ventilation to maintain dust levels below exposure limits in workplaces with poor ventilation and dusty conditions.
Personal Protection
RESPIRATORY PROTECTION: Under ordinary conditions no respiratory protection is required. Wear a NIOSH approved respirator when exposed to dust above exposure limits.
EYE PROTECTION: Wear glasses or safety goggles to prevent contact with eyes. Wearing contact lenses when using this product under dusty conditions is not recommended.
SKIN PROTECITON: Wear impervious gloves, shoes and protective clothing to prevent skin contact.

9. PHYSICAL AND CHEMICAL PROPERTIES

Vapor Pressure:	Not measurable
Vapor Density:	Not measurable
Specific Gravity:	3.2
Solubility in Water:	Slight (0.1 - 1.0%)
Evaporation Rate:	Not measurable
pH (in water):	12 - 13
Boiling Point:	>1000^{o} C
Freezing Point:	None, solid
Viscosity:	None, solid

10. STABILITY AND REACTIVITY

General: Product is stable but must be kept dry. Reacts with water forming polymerized silicates and calcium oxide.
Incompatible Materials and Conditions to Avoid: Must be kept dry. Dissolves in hydrofluoric acid producing corrosive silicon tetrafluoride gas. Silicates react with powerful oxidizers such as fluorine, chlorine trifluoride and oxygen difluoride.
Hazardous Decomposition: None, powdered solid.

11. MSDS PREPARATION AND TOXICOLOGICAL INFORMATION

For detailed toxicological information contact:
Environment, Health & Safety and Public Affairs
Lafarge North America
12950 Worldgate Drive, Suite 500
Herndon, VA 20170
(703) 480-3600

12. ECOLOGICAL INFORMATION

For detailed ecological information: See Section 11 above.

13. DISPOSAL CONSIDERATIONS

Dispose in landfill in accordance with all applicable regulations. Any disposal practice must be in compliance with local, provincial, state and federal laws and regulations. Contact local environmental agency for specific rules.

14. REQUIRED TRANSPORT INFORMATION

Not a hazardous material for DOT or TDG shipping.

15. REGULATORY INFORMATION

This product has been classified ni accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

OSHA Hazard Communication Rule, 29 CFR 1910.1200:
This product is considered by OSHA to be a hazardous chemical and should be included in the employer's hazard communication program.

CERCLA/SUPERFUND, 40 CFR 117,302: Not listed.

SARA TITLE III, Sections 311-312 Hazard Category:
This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 and is considered a hazardous chemical and a delayed health hazard.

SARA Section 313 Information:
This product contains NONE of the substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Toxic Substance Control Act (TSCA):
Some constituents identified in this product are listed on the TSCA Inventory.

California Proposition 65:
CHRYSTALLINE SILICA (CAS - 14808-60-7) is considered to be a carcinogen by the state of California.

WHMIS Information
This product contains substances considered to be hazardous by Health Canada and is a controlled product. Consult local authorities for acceptable exposure limits. WHMIS Information – 613-957-2342

16. OTHER INFORMATION

Abbreviations:

CAS No	Chemical Abstract Service number
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ACGIH	American Conference of Governmental Industrial Hygienists
TLV	Threshold Limit Value
TWA	Time Weighted Average (8 hour)
CL	Ceiling Limit
mg/m^3	milligrams per cubic meter
IARC	International Agency for Research on Cancer
NIOSH	National Institute for Occupational Safety and Health
pH	negative log of hydrogen ion
>	greater than
DOT	U.S. Department of Transportation
TDG	Transportation of Dangerous Goods
CFR	Code for Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
SARA	Superfund Amendments and Reauthorization Act
WHMIS	Workplace Hazardous Materials Information System

Information in this MSDS is believed to be current and accurate at the time provided. It is the user's obligation to determine the conditions of safe use of this product.

MATERIAL SAFETY DATA SHEET (MSDS)

SODIUM CYANIDE

1. Product Identification

Synonyms: Hydrocyanic acid, sodium salt

CAS No.: 143-33-9

Molecular Weight: 49.01

Chemical Formula: NaCN

2. Composition/Information on Ingredients

Ingredient	CAS No.	Percent	Hazardous
Sodium Cyanide	143-33-9	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CONTACT WITH ACIDS LIBERATES POISONOUS GAS. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS BLOOD, CARDIOVASCULAR SYSTEM, CENTRAL NERVOUS SYSTEM AND THYROID.

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 – None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: Goggles; Lab Coat; Vent Hood; Proper Gloves
Storage Color Code: Blue (Health)

Potential Health Effects

In most cases, cyanide poisoning causes a deceptively healthy pink to red skin color. However, if a physical injury or lack of oxygen is involved, the skin color may be bluish. Reddening of the eyes and pupil dilation are symptoms of cyanide

poisoning. Cyanosis (blue discoloration of the skin) tends to be associated with severe cyanide poisonings.

Inhalation:
Corrosive to the respiratory tract. The substance inhibits cellular respiration and may cause blood, central nervous system, and thyroid changes. May cause headache, weakness, dizziness, labored breathing nausea and vomiting, which can be followed by weak and irregular heart beat, unconsciousness, convulsions, coma and death.

Ingestion:
Highly Toxic! Corrosive to the gastro-intestinal tract with burning in the mouth and esophagus, and abdominal pain. Larger doses may produce sudden loss of consciousness and prompt death from respiratory arrest. Smaller but still lethal doses may prolong the illness for one or more hours. Bitter almonds odor may be noted on the breath or vomitus. Other symptoms may be similar to those noted for inhalation exposure.

Skin Contact:
Corrosive. May cause severe pain and skin burns. Solutions are corrosive to the skin and eyes, and may cause deep ulcers which heal slowly. May be absorbed through the skin, with symptoms similar to those noted for inhalation.

Eye Contact:
Corrosive. Symptoms may include redness, pain, blurred vision, and eye damage.

Chronic Exposure:
Prolonged or repeated skin exposure may cause a "cyanide" rash and nasal sores.

Aggravation of Pre-existing Conditions:
Workers using cyanides should have a preplacement and periodic medical exam. Those with history of central nervous system, thyroid, skin, heart or lung diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

In case of cyanide poisoning, start first aid treatment immediately, then get medical attention. A cyanide antidote kit (amyl nitrite, sodium nitrite and sodium thiosulfate) should be available in any cyanide work area. Actions to be taken in case of cyanide poisoning should be planned and practiced before beginning work with cyanides. Oxygen and amyl nitrite can be given by a first responder before medical help arrives. Allow victim to inhale amyl nitrite for 15-30 seconds per minute until sodium nitrite and sodium thiosulfate can be administered

intravenously (see Note to Physician). A new amyl nitrite ampule should be used every 3 minutes. If conscious but symptoms (nausea, difficult breathing, dizziness, etc.) are evident, give oxygen. If consciousness is impaired (non-responsiveness, slurred speech, confusion, drowsiness) or the patient is unconscious but breathing, give oxygen and amyl nitrite by means of a respirator. If not breathing, give oxygen and amyl nitrite immediately by means of a positive pressure respirator (artificial respiration).

Inhalation:
If inhaled, remove to fresh air. Administer antidote kit and oxygen per pre-planned instructions if symptoms occur. Keep patient warm and at rest. Do not give mouth to mouth resuscitation.

Ingestion:
If ingested, antidote kit and oxygen should be administered per above. If the patient is conscious, immediately give the patient activated charcoal slurry. Never give anything by mouth to an unconscious person. Do not induce vomiting as it could interfere with resuscitator use.

Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse. Administer antidote kit and oxygen per preplanned instructions if symptoms occur.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
If patient does not respond to amyl nitrite, inject intravenously with 10mL of a 3% solution of sodium nitrite at a rate of not more than 2.5 to 5 mL per minute. Once nitrite administration is complete, follow directly with 50 mL of a 25% solution of sodium thiosulfate at the same rate by the same route. Give victim oxygen and keep under observation. If exposure was severe, watch victim for 24-48 hours. If signs of cyanide poisoning persist or reappear, repeat nitrite and thiosulfate injections 1 hour later in 1/2 the original doses. Cyanocabalamin (B12), 1 mg intramuscularly, may speed recovery. Moderate cyanide exposures need be treated only by supportive measures such as bed rest and oxygen.

5. Fire Fighting Measures

Fire:
Not combustible, but upon decomposition or contact with acids, this material releases highly flammable and toxic hydrogen cyanide gas.

Explosion:
Not considered an explosion hazard, but upon heating with chlorates or nitrites to 450C (842F) may cause an explosion. Violent explosion occurs if melted with nitrite salt. Sealed containers may rupture when heated.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do Not use carbon dioxide. Carbon dioxide can react with this material in the presence of moisture to produce hydrogen cyanide. Water spray may be used to keep fire exposed containers cool. Reacts slowly with water to form hydrogen cyanide.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Spills:
Ventilate area of leak or spill. Allow only qualified personnel to handle spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Collect material and place in a closed container for recovery or disposal. Do not flush to sewer! Decontaminate liquid or solid residues in spill area with sodium or calcium hypochlorite solution.

US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from incompatibles. Workers must carefully follow good hygienic practices, including no eating, drinking, or smoking in workplace. Proper use and maintenance of protective equipment is essential. Workers using cyanide need preplacement and annual medical exams. Special training should be given to workers using cyanide. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Do not store near combustibles or flammables because subsequent fire fighting with water could lead to cyanide solution runoff. Do not store under sprinkler systems. All persons with the potential for cyanide poisoning should be trained to provide immediate First Aid using oxygen and amyl nitrite. A cyanide antidote kit (amyl nitrite, sodium nitrite, and sodium thiosulfate) should be readily available in cyanide

workplaces. The antidotes should be checked annually to ensure they are still within their shelf-lives. Identification of community hospital resources and emergency medical squads in order to equip and train them on handling cyanide emergencies is essential.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
OSHA Permissible Exposure Limit (PEL): 5 mg/m3 skin (TWA) (as CN)

ACGIH Threshold Limit Value (TLV): 5 mg/m3 (STEL) Ceiling, skin, as CN

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White deliquescent granular solid.

Odor:
Almond odor. Bitter almonds.

Solubility:
48 g/100 cc @ 10C (50F)

Specific Gravity:
1.60 @ 25C/4C

pH:
Aqueous solutions are strongly alkaline.

% Volatiles by volume @ 21C (70F):
0

Boiling Point:
1496C (2725F)

Melting Point:
564C (1047F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
1 @ 817C (1503F)

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Very stable when dry. Moisture will cause slow decomposition, releasing poisonous hydrogen cyanide gas.

Hazardous Decomposition Products:
Emits toxic fumes of cyanide and oxides of nitrogen when heated to decomposition.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Acid. nitrates, nitrites, chlorates, fluorine, magnesium, and strong oxidizers. Reacts with acids to liberate toxic and flammable hydrogen cyanide gas. Water or weak alkaline solutions can produce dangerous amounts of hydrogen cyanide in confined areas. Reacts with carbon dioxide in air to form hydrogen cyanide

gas.

Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Oral rat LD50: 6440 ug/kg. Investigated as a tumorigen, mutagen, reproductive effector.

Cancer Lists

		NTP Carcinogen		
Ingredient	CAS No.	Known	Anticipated	IARC Category
Sodium Cyanide	143-33-9	No	No	None

12. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:
This material is expected to be very toxic to aquatic life. This material is expected to be very toxic to terrestrial life.

13. Disposal Considerations

Cyanides must be oxidized to harmless waste before disposal. An alkaline solution (pH about l0) is treated with chlorine or commercial bleach in excess to decompose cyanide. When cyanide-free, it can be neutralized. Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, SODIUM CYANIDE, SOLID

Hazard Class: 6.1

UN/NA: UN1689, Packing Group: I

Information reported for product/size: 12KG

International (Water, I.M.O.)

Proper Shipping Name: SODIUM CYANIDE, SOLID

Hazard Class: 6.1

UN/NA: UN1689, Packing Group: I

Information reported for product/size: 12KG

15. Regulatory Information

Chemical Inventory Status - Part 1

Ingredient	CAS No.	TSCA	EC	Japan	Australia
Sodium Cyanide	143-33-9	Yes	Yes	Yes	Yes

Chemical Inventory Status - Part 2

Ingredient	CAS No.	Korea	Canada DSL	Canada NDSL	Phil.
Sodium Cyanide	143-33-9	Yes	Yes	No	Yes

Federal, State & International Regulations - Part 1

Ingredient	CAS No.	SARA 302 RQ	SARA 302 TPQ	SARA 313 List	SARA 313 Chemical Catg.
Sodium Cyanide	143-33-9	10	100	No	Cyanide Comp.

Federal, State & International Regulations - Part 2

Ingredient	CAS No.	CERCLA	RCRA 261.33	TSCA 8(d)
Sodium Cyanide	143-33-9	10	P106	No

Chemical Weapons Convention: Yes
TSCA 12(b): Yes
CDTA: Yes
SARA 311/312: Acute: Yes
Chronic: Yes
Fire: No
Pressure: No
Reactivity: No (Pure/Solid)

Australian Hazchem Code: 4X

Poison Schedule: S7

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3**
Flammability: **0**
Reactivity: **1**

Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CONTACT WITH ACIDS LIBERATES POISONOUS GAS. CAUSES BURNS TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS BLOOD, CARDIOVASCULAR SYSTEM, CENTRAL NERVOUS SYSTEM AND

THYROID.

Label Precautions:
Do not breathe dust.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:
In all cases, get medical attention immediately. Keep a cyanide antidote kit (amyl nitrite, sodium nitrite and sodium thiosulfate) in area of product use or storage. First-aiders must take precautions to avoid contact with cyanide substance. If ingested, administer antidote kit and oxygen per pre-planned instructions. If the patient is conscious, immediately give the patient activated charcoal slurry. Never give anything by mouth to an unconscious person. Do not induce vomiting as it could interfere with resuscitator use. If inhaled, remove to fresh air. Administer antidote kit and oxygen per pre-planned instructions if symptoms occur. Keep patient warm and at rest. Do not give mouth to mouth resuscitation. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Administer antidote kit and oxygen per preplanned instructions if symptoms occur.

Product Use:
Laboratory reagent, metal finishing, metals extraction

Revision Information:
Oct. 2003.

Disclaimer:

****

The information contained herein is provided in good faith but no representation is made as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose.

****

MSDS Number: **S4034** * * * * * *Effective Date:* ***07/07/04*** * * * * * *Supercedes:* ***05/11/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM HYDROXIDE

1. Product Identification

Synonyms: Caustic soda; lye; sodium hydroxide solid; sodium hydrate
CAS No.: 1310-73-2
Molecular Weight: 40.00
Chemical Formula: NaOH
Product Codes:
J.T. Baker: 3717, 3718, 3721, 3722, 3723, 3728, 3734, 3736, 5045, 5565
Mallinckrodt: 7001, 7680, 7708, 7712, 7772, 7798

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.
Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appears days after exposure.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

---

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard. Hot or molten material can react violently with water. Can react with certain metals, such as aluminum, to generate flammable hydrogen gas.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.

US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Do not store with aluminum or magnesium. Do not mix with acids or organic materials.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
2 mg/m3 Ceiling
- ACGIH Threshold Limit Value (TLV):
2 mg/m3 Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White, deliquescent pellets or flakes.

Odor:
Odorless.

Solubility:

111 g/100 g of water.
Specific Gravity:
2.13
pH:
13 - 14 (0.5% soln.)
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1390C (2534F)
Melting Point:
318C (604F)
Vapor Density (Air=1):
> 1.0
Vapor Pressure (mm Hg):
Negligible.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.
Hazardous Decomposition Products:
Sodium oxide. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Sodium hydroxide in contact with acids and organic halogen compounds, especially trichloroethylene, may causes violent reactions. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, magnesium, tin, and zinc cause formation of flammable hydrogen gas. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon monoxide. Precautions should be taken including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.
Conditions to Avoid:
Moisture, dusting and incompatibles.

---

11. Toxicological Information

Irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe; investigated as a mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Hydroxide (1310-73-2)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

International (Water, I.M.O.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Sodium Hydroxide (1310-73-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Hydroxide (1310-73-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Hydroxide (1310-73-2)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Hydroxide (1310-73-2)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: Yes (Pure / Solid)

Australian Hazchem Code: 2R
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give

anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S4034** * * * * * *Effective Date:* ***07/07/04*** * * * * * *Supercedes:* ***05/11/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM HYDROXIDE

1. Product Identification

Synonyms: Caustic soda; lye; sodium hydroxide solid; sodium hydrate
CAS No.: 1310-73-2
Molecular Weight: 40.00
Chemical Formula: NaOH
Product Codes:
J.T. Baker: 3717, 3718, 3721, 3722, 3723, 3728, 3734, 3736, 5045, 5565
Mallinckrodt: 7001, 7680, 7708, 7712, 7772, 7798

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.
Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appears days after exposure.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:

MATERIAL SAFETY DATA SHEET

Sodium Nitrate

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Sodium Nitrate

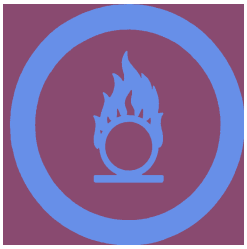
Product Use ..... Laboratory reagent

Supplier Name..... ClearTech Industries Inc.
2303 Hanselman Avenue
Saskatoon SK S7L 5Z3
Canada

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... August 12, 2005

24-Hour Emergency Phone..... 306-664-2522



Section 02 - Composition / Information on Ingredients

Hazardous Ingredients..... Sodium Nitrate 98-100%

CAS Number..... Sodium Nitrate 7631-99-4

Synonym (s)..... Nitratine, nitric acid, sodium salt, sodium saltpeter, sodium nitrate, crystal

Section 03 - Hazard Identification

Inhalation..... Inhalation of dust irritates the respiratory tract. Symptoms may include coughing, shortness of breath.

Skin Contact / Absorption..... May cause irritation, symptoms including redness, itching, and pain.

Eye Contact..... May cause irritation, symptoms including redness, itching, and pain.

Ingestion..... May cause gastroenteritis and abdominal pains. Other symptoms may include dizziness, bloody diarrhea, convulsions, and collapse. Purging and diuresis can be expected. Small repeated doses may cause headache and mental impairment. Rare cases of nitrates being converted to the more toxic nitrites have been reported, mostly with infants

Exposure Limits..... Not available

Section 04 - First Aid Measures

Inhalation..... Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists

Eye Contact..... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention

Ingestion..... Do NOT induce vomiting. Never give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into thelungs.

Additional Information..... Treatment based on sound judgment of physician and individual reactions of patient.

Section 05 - Fire Fighting

Conditions of Flammability..... Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Means of Extinction..... Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire-exposed containers cool.

Flash Point..... Not applicable

Auto-ignition Temperature……. Not applicable

Upper Flammable Limit …….. Not applicable

Lower Flammable Limit..……..... Not applicable

Hazardous Combustible Products... Emits nitrous oxides when heated to decomposition.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards……..... Explosive with shock, heat or friction. Sodium Nitrate decomposes explosively when heated > 538°C.

Section 06 - Accidental Release Measures

Leak / Spill.....……... Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills:clean up spills in a manner that does not disperse dust into the air. Use nonsparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. Small amounts of residue may be flushed to sewer with plenty of water.

Deactivating Materials..……..... Not available

Section 07 - Handling and Storage

Handling Procedures.....…….... Keep locked up. Keep away from heat. Keep away from sources of ignition. Keep away from combustible materials. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. DO NOT ingest. DO NOT breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, acids.

Storage Requirements.....……..…... Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool and well-ventilated area. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes..... Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory..... For dusty or misty conditions, wear NIOSH-approved dust or mist respirator. In case of spill or leak resulting in unknown concentration, use NIOSH approved supplied air respirator.

Gloves..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Clothing..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing with soap and water, dry thoroughly before reuse.

Footwear..... Impervious boots of chemically resistant material should be worn at all times

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure, and control of process conditions. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State..... Solid

Odor and Appearance..... Odorless, colourless prills pellets

Odor Threshold..... Not applicable

Specific Gravity (Water=1)..... 2.26

Vapor Pressure (mm Hg, 20C)..... Not available

Vapor Density (Air=1)..... Not available

Evaporation Rate..... Not available

Boiling Point..... 380°C

Freeze/Melting Point..... 306.8°C

pH..... 7 (aqueous solution)

Water/Oil Distribution Coefficient.... Not available

Bulk Density..... Not available

% Volatiles by Volume..... 0%

Solubility in Water..... 92g/100g water @ 25°C

Molecular Formula..... $NNaO_3$

Molecular Weight..... 85.01

Section 10 - Stability and Reactivity

Stability..... Product is stable

Incompatibility..... Reacts with acids to emit toxic fumes of nitrogen dioxide. Contact with the following may cause an explosion: barium rhodanide, boron phosphide, cyanides, sodium thiosulfate, sodium hypophosphite, sulfur plus charcoal, powdered aluminum and aluminum oxide. Fibrous organic material such as jute, wood, and similar cellulosic materials can become highly combustible by nitrate impregnation.

Hazardous Products of Decomposition.. Oxides of nitrogen

Polymerization..... Will not occur

Section 11 - Toxicological Information

Irritancy..... Skin contact and eye contact

Sensitization..... Not available

Chronic/Acute Effects..... May cause gastroenteritis and abdominal pains. Other symptoms may include dizziness, bloody diarrhea, convulsions, and collapse. Purging and diuresis can be expected. Small repeated doses may cause headache and mental impairment. Rare cases of nitrates being converted to the more toxic nitrites have been reported, mostly with infants.

Synergistic Materials..... Not available

Animal Toxicity Data..... Not available

Carcinogenicity..... Not available

Reproductive Toxicity..... Not available

Teratogenicity..... Not available

Mutagenicity..... Not available

Section 12 - Ecological Information

Fish Toxicity..... Not available

Biodegradability..... Possibly hazardous short-term degradation products are not likely. However, long term degradation products may arise. The products of degradation are less toxic than the product itself.

Environmental Effects..... Not available

Section 13 - Disposal Consideration

Waste Disposal.....Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class..... 5.1

Group..... III

PIN Number..... UN 1498

Other..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....C, D2

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond BC	12431 Horseshoe way	V7A 4X6	604-272-4000	604-272-4596
Calgary AB	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton AB	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon SK	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina SK	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg MB	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga ON	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

Material Safety Data Sheet

SULPHURIC ACID

Infosafe no. AJ1YR **Issue Date** September 2001 **Status** ISSUED by APSSC
Classified as hazardous according to criteria of NOHSC

COMPANY DETAILS

Company Name	Asia Pacific Specialty Chemicals Limited (ABN 32000316138)
Address	15 Park Road SEVEN HILLS NSW 2147
Emergency Tel.	1800 022 037 (24H)
Tel/Fax	Tel: (02) 9839 4000 Fax: (02) 9674 6225
Other Information	AUSTRALIA: Division of: Asia Pacific Specialty Chemicals Limited A.C.N. 000 316 138 15 Park Road, Seven Hills, NSW, 2147 Tel: (02) 9839 4000, Fax: (02) 9674 6225 NEW ZEALAND: Asia Pacific Specialty Chemicals (NZ) Limited 119 Carbine Road, Mt. Wellington, Auckland 6 Tel: (09) 276 4019, Fax: (09) 276 7231.

IDENTIFICATION

Product Code AR 00000534

Product Name SULPHURIC ACID

Proper Shipping Name SULFURIC ACID

Other Names	**Name**	**Manf. Code**
	SULPHURIC ACID SG 1.500 - 60%	BATT 00002227
	SULPHURIC ACID SG 1.62 - 70%	BATT 00002238
	SULPHURIC ACID MILK TEST	LC 00001599
	SULPHURIC ACID 98%	TECH 00000535
	SULPHURIC ACID SG 1.235	BATT 00004725
	SULPHURIC ACID	UL 00001262
	Sulfuric acid	
	Oil of vitriol	
	Fertiliser acid	
	Electrolyte acid	
	SULPHURIC ACID SG 1.820 - 92%	BATT 00001596
	SULPHURIC ACID 70%	TECH 00001593
	SULPHURIC ACID 80%	TECH 00004364
	SULPHURIC ACID 89% MILK TEST	LC 00001598
	SULPHURIC ACID 92%	CP 00001637

UN Number 1830

DG Class 8

Packing Group II

Hazchem Code 2P

Poisons Schedule S6

Product Use Fertilizers, explosives, electroplating, dyes, drugs, detergents, adhesives, plastics, paints, tanning, food processing.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Preparation/Revision Date:
03/19/07

Distributor:
Teledyne Isco, Inc.
P.O. Box 82531
Lincoln, NE 68501-2531

Phone Number: (402) 464-0231

Hours: Mon.-Fri. 8:00a.m.-4:30p.m. CST

Product Name: RediSep® - Normal Phase, Reverse Phase C-18, Amine, Cyano, Diol, SAX, SCX

Solid Sample Cartridges – 5g, 25g, 65g, 270g

Silica Gel

Product Content: Amorphous Silicon Dioxide
or
Derivatized Amorphous Silicon Dioxide

2. COMPOSITION / INFORMATION ON INGREDIENTS

Component: Amorphous Silicon Dioxide, chemically prepared **CAS #**: 7631-86-9

Additional Information: See section 8 for exposure limits.

3. HAZARDS IDENTIFICATION

NFPA ratings (scale 0 – 4)

Health = 1
Fire = 0
Reactivity = 0

HIMS – ratings (scale 0 – 4)

Health	1
Fire	0
Reactivity	0

The statements contained herein are offered for informational purposes only and are based upon technical data that Teledyne Isco, Inc. believes to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OR MERCHANTABILITY, FITNESS OR OTHERWISE.

4. FIRST AID MEASURES

Emergency First Aid:
GET MEDICAL ASSISTANCE IF ANY ADVERSE EFFECTS SHOULD DEVELOP.

Skin: Immediately rinse with water. Generally the product does not irritate the skin.

Eyes: Immediately rinse under running water for at least 15 minutes, lifting upper and lower eyelids occasionally.
Inhalation: Supply fresh air.

Ingestion: If large amounts are swallowed, wash mouth out with water.

5. FIRE FIGHTING MEASURES

Suitable extinguishing agents:
CO_2, extinguishing powder or water spray. Fight larger fire with alcohol resistant foam.

Fire Fighting Procedures: Use fire fighting measures that suit the environment.

Protective equipment: Wear protective equipment.

Fire & Explosion Hazards: Not an explosion hazard

Flammability: Not flammable

Flash Point (ºF): Not applicable

Auto Igniting: Not self igniting

Additional Information:
Dispose of fire debris and contaminated water in accordance with official regulations.

6. ACCIDENTAL RELEASE MEASURES

Person-related safety precautions: Avoid formation of dust. Wear protective clothing.

Measures for cleaning/collecting: Vacuuming or wet sweeping may be used to avoid dust dispersal.

Measures for environmental protection: Containerize for reclamation or disposal.

Additional information: See section 7 for safe handling.
See section 8 for information on personal protection equipment.
See section 13 for disposal information.

7. HANDLING AND STORAGE

Handling:

Information for safe handling: Prevent formation of dust.

Information about protection against explosions and fires:
The product is not flammable. When pouring into a container of flammable liquid, ground both containers electrically to prevent a static electric spark.

Storage:

Information about storage conditions: Keep container tightly sealed.

Information about storage in one common storage facility: None required.

Class according to regulation on flammable liquids: None Applicable

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component: Amorphous Silicon Dioxide, chemically prepared **CAS #**: 7631-86-9

Exposure Limits: **NIOSH short term value – IDLH:** 3000mg/m^3
OSHA TWA – PEL: 80/(%SiO_2) mg/m^3
NIOSH TWA – REL: 6mg/m^3
ACGIH TWA – TLV: 10mg/m^3 Total Dust
5mg/m^3 Respirable fraction

Personal Protective Equipment:

General protection and hygienic measures:
The usual precautionary measures for handling chemicals should be followed.

Breathing equipment:
If exposure limit is exceeded, a suitable respiratory protective device is recommended.

Eye protection: Safety glasses.

Protection of hands: The glove material has to be impermeable to the product/ the substance/ the preparation.

Body protection: Protective work clothing.

9. PHYSICAL AND CHEMCIAL PROPERTIES

Physical State: RediSep® - Solid, (50mm Average particle size) powder
Solid Sample Cartridge 5g, 25g – Solid, 40-63µm powder
Solid Sample Cartridge 65g, 270g – Solid, 75-150µm powder

Color: White to off-white
Odor: None
pH at 20ºC (68ºF): 6.0-8.0 (5% slurry)
Melting Point (ºC): Undetermined
Density: Not determined
Bulk Density (lb/ft^3): 25-35
Solubility in Water (%): Insoluble

10. STABILITY AND REACTIVITY

Thermal decomposition/conditions to be avoided:
No decomposition if used according to specifications.

Dangerous Reactions: Reacts with Hydrogen Fluoride.

Dangerous products of decomposition: No dangerous decomposition products known.

11. TOXICOLOGICAL INFORMATION

Component: Amorphous Silicon Dioxide, chemically prepared **CAS #**: 7631-86-9

Acute toxicity:
Oral – LD50: 10000 mg/kg (rat)
Dermal – LD50: >5000 mg/kg (rabbit) OECD 402
Inhalative – LC50: >0.139 mg/l/14h (rat)

Primary irritant effect:

On the skin: May cause irritation with dryness and abrasion.

In the eye: May cause abrasion, redness and pain.

Sensitization: No sensitizing effects known.

Subacute to chronic toxicity:
Amorphous silicon dioxide, chemically prepared:
No negative effects were determined during tests for chronic oral toxicity, carcinogenicity, teratogenicity and fertility. No irreversible changes and no symptoms of silicosis were determined during tests for chronic inhalative toxicity.

Additional toxicological information:
When used and handled according to specifications, the product does not have any harmful effects based on the experience and information provided to us by the manufacturer.

12. ECOLOGY INFORMATION

Component: Amorphous Silicon Dioxide, chemically prepared **CAS #**: 7631-86-9

Aquatic toxicity: **Fish – LC50 (96 h):** >10000 mg/l (Brachydanio rerio) OECD 202
Water Flea – EC50 (24 h): >1000 mg/l (Daphnia magna) OECD 202

General Note: Generally not hazardous for water.

13. DISPOSAL CONSIDERATIONS

EPA Waste Numbers: None

Dispose of in accordance with all federal, state, provincial and local regulations.

14. TRANSPORT INFORMATION

Not regulated as hazardous goods by DOT, ADR, IMO or IATA.

15. REGULATORY INFORMATION

None of the ingredients are listed under the following:

SARA section 313 and 355
Proposition 65
EPA
IARC
NTP
TLV-ACGIH
NIOSH-Ca
OSHA-Ca
Canadian NDSL

All ingredients are listed with the following:

TSCA
MAK
Canadian DSL
Japan ENCS
Korea ECL
Philippines: PICCS
Australia: AICS
European EINECS

16. OTHER INFORMATION

The statements contained herein are offered for informational purposes only and are based upon technical data that Teledyne Isco, Inc. believes to be accurate. It is intended for use only by persons having the necessary technical skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OR MERCHANTABILITY, FITNESS OR OTHERWISE.

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Material Safety Data Sheet
Sulfur (Precipitated and Sublimed)

ACC# 22280

Section 1 - Chemical Product and Company Identification

MSDS Name: Sulfur (Precipitated and Sublimed)
Catalog Numbers: S71209, S79172, S79173, S79173-1, S79173-2, S79173-3, S594-500, S595-500, S791731, S791732, S791733
Synonyms: Sulphur; Brimstone.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7704-34-9	Sulfur	100	231-722-6

Hazard Symbols: XI
Risk Phrases: 36

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow. May cause respiratory and digestive tract irritation. Flammable solid. Causes eye irritation. May cause skin irritation. **Warning!** May cause central nervous system effects.
Target Organs: Central nervous system.

Potential Health Effects

Eye: Causes eye irritation. Effects may be delayed. May cause lacrimation (tearing), blurred vision, and photophobia. May cause chemical conjunctivitis and corneal damage.

Skin: May cause skin irritation and possible burns.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Olfactory fatigue may occur. Can produce delayed pulmonary edema.
Chronic: Chronic inhalation may cause effects similar to those of acute inhalation. Effects may be delayed.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water. Get medical aid if irritation or symptoms occur.
Inhalation: Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: Evacuate area and fight fire from a safe distance. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Dust can be an explosion hazard when exposed to heat or flame. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion. Flammable solid. May burn rapidly with flare burning effect. May re-ignite after fire is extinguished.
Extinguishing Media: Water spray may cause frothing. For large fires, use water spray, fog or regular foam. Contact professional fire-fighters immediately. For small fires, use dry chemical, carbon dioxide, sand, earth, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section

8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Scoop up with a nonsparking tool, then place into a suitable container for disposal. Avoid generating dusty conditions. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. May form flammable dust-air mixtures. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Use with adequate ventilation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sulfur	none listed	none listed	none listed

OSHA Vacated PELs: Sulfur: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR ?1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: yellow
Odor: rotten egg-like
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 445 deg C
Freezing/Melting Point:113 deg C
Autoignition Temperature: 450 deg F (232.22 deg C)
Flash Point: 405 deg F (207.22 deg C)
Decomposition Temperature: Not applicable.
NFPA Rating: (estimated) Health: 2; Flammability: 1; Reactivity: 0
Explosion Limits, Lower:3.3%
Upper: 46.0%
Solubility: Insoluble in water.
Specific Gravity/Density: 2.07
Molecular Formula:S
Molecular Weight:32.06

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid: High temperatures, incompatible materials, ignition sources, dust generation, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Sulfur oxides (SOx), including sulfur oxide and sulfur dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7704-34-9: WS4250000
LD50/LC50:
Not available.

Carcinogenicity:

CAS# 7704-34-9: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: No information available.
Other Studies: No data available.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	SULFUR				No information available.
Hazard Class:	9				
UN Number:	NA1350				
Packing Group:	III				

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7704-34-9 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7704-34-9: acute, chronic, flammable.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7704-34-9 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.
European / International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
XI
Risk Phrases:
R 36 Irritating to eyes.

Safety Phrases:

WGK (Water Danger / Protection)
CAS# 7704-34-9: 1
Canada
CAS# 7704-34-9 is listed on Canada's DSL List. CAS# 7704-34-9 is listed on Canada's DSL List.
This product has a WHMIS classification of B4, D2B.
CAS# 7704-34-9 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #3 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Physical Data

Appearance	Colourless (pure) to brownish liquid, denser than water, choking fumes if heated, hygroscopic.
Melting Point	10 degrees C
Boiling Point	270 degrees C
Vapour Pressure	< 0.001 mm Hg at 20 degrees C
Specific Gravity	approx 1 - 1.8 mg/ml
Flash Point	No Data
Flamm. Limit LEL	No Data

Other Properties

pH Value	0.3, 1N solution
Formula	H2SO4
Molecular Weight	98.08
Other Information	Soluble in water in all proportions, soluble in most organic solvents (may react).

Ingredients

Ingredients	Name	CAS	Proportion
	Sulphuric acid	7664-93-9	0-98 %
	Water to make total of 100%		

HEALTH HAZARD INFORMATION

Health Effects

Acute - Swallowed	Can kill if swallowed. Will cause severe damage to the mucous membranes. May cause severe burns to the mouth,throat and stomach. Ingestion can cause nausea and vomiting. Ingestion can result in abdominal pain.
Acute - Eye	Corrosive to eyes; contact can cause corneal burns. Permanent eye damage,including loss of sight,may occur.
Acute - Skin	Highly corrosive to skin. Causes severe burns.
Acute - Inhaled	Harmful by inhalation. Possible harmful corrosive effects. High concentrations of vapour can cause severe irritation of the respiratory tract.

First Aid

Swallowed	Rinse mouth thoroughly with water immediately. Give water to drink. DO NOT induce vomiting. Seek immediate medical assistance. Poison Information Centres in each State capital city can provide additional assistance for scheduled poisons.
Eye	Immediately irrigate with copious quantity of water for at least 15 minutes. Eyelids to be held open. Seek immediate medical assistance.
Skin	Wash affected areas with copious quantities of water immediately. Remove contaminated clothing and wash before re-use. Treat skin and clothing with 1% sodium bicarbonate solution to neutralize acid residues. If irritation occurs seek medical advice.
Inhaled	Remove victim from exposure - avoid becoming a casualty. Allow patient to assume most comfortable position and keep warm.Keep at rest until fully recovered. If breathing laboured and patient cyanotic (blue), ensure airways are clear and have qualified person give oxygen through a face mask. If breathing has stopped apply artificial respiration at once. In the event of cardiac arrest, apply external cardiac massage. Seek medical attention.

Advice to Doctor

Advice to Doctor	Consult Poisons Information Centre. Treat symptomatically as for strong acids.

Other Health Hazard Information

PRECAUTIONS FOR USE

Exposure Limits	Name	STEL (mgm3)	STEL (ppm)	TWA (mgm3)	TWA (ppm)	FootNote
	Sulphuric acid	3		1		

Other Exposure Info. TLV/TWA: 1 mg/m3, STEL: 3 mg/m3 Worksafe Aust.
Odour Threshold: > 1 mg/m3 IDLH Value: 80 mg/m3

Eng. Controls Maintain concentration below recommended exposure limit.
Use with local exhaust ventilation or:
Combination particulate/gas respirator, Class B, (Inorganic vapour).
Self contained breathing apparatus may be needed for prolonged periods of exposure.

Personal Protection

Protective Equip. The following personal protective equipment must be worn.
Overalls or similar protective apparel.
Safety glasses,goggles or faceshield as appropriate.
Rubber boots.
Elbow-length PVC gloves.
Splash apron.
Wash contaminated clothing and protective equipment before storing/re-using.
Avoid all contact.

Flammability

Fire Hazards The product is considered non-combustible. Its other hazardous properties should however be considered if it is involved in a fire.
Contact with moisture or water may generate heat.
Contact with strong alkalis may generate heat.

Other Precautions Prolonged exposure to mists and vapours can cause erosion of teeth, chronic irritation of eyes, nose and throat and chronic inflammation of airways. 77 - 98% acid causes 2nd and 3rd degree burns of skin on short contact and is very injurious to the eyes.
In October 1992 the International Agency for Research on Cancer (IARC) classified occupational exposure to strong inorganic acid mists containing sulphuric acid as carcinogenic to humans, ie a Group 1 carcinogen.
Further information can be obtained from N.S.W WorkCover Authority publication dated September 1993.

SAFE HANDLING INFORMATION

Storage and Transport

Storage Precautions	Store in well ventilated area. Store in a cool,dry place. Keep dry - reacts with water; may lead to drum rupture. Keep containers securely sealed and protected against physical damage. Store away from strong bases. Not to be loaded with Class 1, 4.3, 5.1, 5.2, 6*,7, Foodstuff and foodstuff empties. (* where the Class 6 substance is a cyanide and the Class 8 substance is an acid).
Other Storage Info.	Corrosive to most metals in the presence of moisture, liberating hydrogen gas, (potential explosion). Reacts violently or explosively with a wide range of organic and inorganic chemicals, including water, alcohol, carbides, chlorates, picrates, nitrates, metals and other combustibles.
Proper Shipping Name	SULFURIC ACID
EPG Number	8A2
IERG Number	40
Packaging Method	5.9.8RT8

Spills and Disposal

Spills & Disposal	Shut off all possible sources of ignition. Clear area of all unprotected personnel. Contain using sand and earth - prevent run-off into drains and waterways. For large spills notify Emergency Services. In the event of a small spill: Neutralise remaining product with lime or soda ash, adjusting pH to 6-10. Flush to sewer as a greatly diluted solution. Wear full protective clothing (see Personal Protection/Ventilation Section) .Self contained breathing apparatus may be needed for prolonged periods of exposure. Refer to appropriate State Waste Disposal Authority Observe local regulations.

Fire/Explosion Hazard

Fire/Explos. Hazard	Decomposes on heating emitting toxic fumes. Oxides of sulphur Fire fighters to wear self-contained breathing apparatus if risk of exposure to products of decomposition. Reacts violently with water.
Hazchem Code	2P

OTHER INFORMATION

Toxicology	Oral LD50(rat): 2140 mg/kg
Environ. Protection	Highly toxic to aquatic life. Avoid contaminating waterways. The product is strongly acidic and hence may react with metals to produce hydrogen, a flammable gas.
Risk Statement	R35 Causes severe burns.
Safety Statement	S2 Keep out of reach of children. S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30 Never add water to this product. S24/25 Avoid contact with skin and eyes.
Pkg. & Labelling	As required by the ADG Code and the Standard for the Uniform Scheduling of Drugs and Poisons. RISK AND SAFETY PHRASES R35- Causes severe burns. S2- Keep out of reach of children S26- In case of contact with eyes ,rinse immediately with plenty of water and contact a doctor or Poisons Information Centre. S30- Never add water to this product.
Hazard Category	Very Corrosive
Manufacturers Advice	Dilution of acid should always be carried out by slowly adding acid to water with constant stirring. Concentrated acid reacts violently with water, generating heat and causing splattering. In the case of fire, use extinguisher appropriate for burning material. Water used on adjacent fires must be carefully handled if acid has spilt.
References	CCINFO, CHRIS
Empirical Formula & Structural Formula	H2SO4
Other Information	Sulphuric acid: with not more than 51% acid, Group text EPG 8A1 with more than 51% acid, Group text EPG 8A2

CONTACT POINT

Contact

Australia: Business Hours: Mr Bob Wells, Tel: (02) 9839 4000
After Hours: Tel: 1800 022 037
NEW ZEALAND: Mr. Lloyd Williams, (09) 276 4019
IMPORTANT ADVICE:
This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including its use in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact APS Chemicals. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

End of MSDS

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-2, D-2A, D-2B**		

Section 1. Chemical Product and Company Identification

Product Name	**GASOLINE, UNLEADED**
Synonym	Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, Super Premium (94 RO), TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3
Material Uses	Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.

Code W102E

Validated on 7/4/2005.

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Gasoline	8006-61-9	85-100	300 ppm	500 ppm	Not established
Methyl tert-butyl ether	1634-04-4	0-15	50 ppm	Not established	Not established
Benzene	71-43-2	<1.5	0.5 ppm	2.5 ppm	Not established
Note: Petro-Canada does not use MTBE in the manufacturing of its gasoline, however MTBE can be introduced from time to time through the use of external gasoline blendstocks.					

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. May cause cancer. May cause heritable genetic effects (mutagenicity). This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Contact with this product may cause skin and eye irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face. Obtain medical attention immediately.
Skin Contact	Avoid direct contact. Wear chemical resistant protective clothing if necessary. Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with warm water and non-abrasive soap for 15-20 minutes or until chemical is removed. Under running water, remove contaminated clothing, shoes and leather goods (e.g., watch bands, belts, etc.). Obtain medical attention immediately. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.

Continued on Next Page

Ingestion	NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Repeat administration of water. If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Quickly transport victim to an emergency care facility.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	Flammable liquid (NFPA).	**Flammable Limits**	Lower: 1.3%; Upper: 7.6% (NFPA).
Flash Points	Closed Cup: -50 to -38°C (-58 to -36°F), ASTM D56 Standard Test Method for Flash Point by Tag Closed Tester.	**Auto-Ignition Temperature**	257°C (495°F) (NFPA).
Fire Hazards in Presence of Various Substances	Extremely flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), polynuclear aromatic hydrocarbons, phenols, smoke and irritating vapours as products of incomplete combustion. See Section 11 (Other Considerations) for information regarding the toxicity of the combustion products.		
Fire Fighting Media and Instructions	NAERG2004 GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a very low flash point: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.		

Section 6. Accidental Release Measures

Material Release or Spill	IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Evacuate non-essential personnel. Ventilate area. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Ensure clean-up personnel wear appropriate personal protective equipment. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Avoid breathing vapours or mists of material. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	FLAMMABLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Wear proper personal protective equipment (See Section 8). Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Ensure all equipment is grounded/bonded. Avoid confined spaces and areas with poor ventilation. Do not ingest this product.
Storage	Store as flammable material. Store away from incompatible and reactive materials (See section 5 and 10). Store away from heat and sources of ignition. Store in dry, cool, well-ventilated area. Keep container tightly closed. Ensure the storage containers are grounded/bonded. Avoid direct sunlight.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection	- ***The selection of personal protective equipment varies, depending upon conditions of use.***
Eyes	As a minimum, safety glasses with side shields should be worn when handling this material.
Body	If this material may come in contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information.)
Respiratory	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): polyvinyl alcohol (PVA), fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	Not available.
Colour	Clear to slightly yellow, undyed liquid. May be dyed red for taxation purposes.	**Pour Point**	Not applicable.
Odour	Gasoline. MTBE has a terpene-like odour.	**Softening Point**	Not applicable.
Odour Threshold	Less than 1 ppm.	**Dropping Point**	Not applicable.
Boiling Point	25 to 220°C (77 to 428°F) Initial boiling point by ASTM D86 Standard Test Method.	**Penetration**	Not applicable.
Density	0.685 - 0.80 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	3 to 4 (Air = 1) (NFPA).	**Ionicity (in water)**	Not available
Vapour Pressure	<107 kPa @ 37.8ºC (100ºF)	**Dispersion Properties**	Not available
Volatility	Volatile.	**Solubility**	Hydrocarbon components virtually insoluble in water. Soluble in alcohol, ether, chloroform, and benzene. Dissolves fats, oils and natural resins.

Section 10. Stability and Reactivity

Corrosivity	Non corrosive.		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids, interhalogens and uranium hexafluoride.	**Decomposition Products**	May release COx, NOx, phenols, polynuclear aromatic hydrocarbons, acrid smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Gasoline (8006-61-9): Acute Oral toxicity (LD50): 13600 mg/kg (rat) Acute Dermal toxicity (LD50): >5000 mg/kg (rabbit) MTBE (1634-04-4): Acute Oral toxicity (LD50): 2963 mg/kg (rat) Acute Dermal toxicity (LD50): >6800 mg/kg (rabbit) Acute Inhalation toxicity (LC50): 23576 ppm/4h (rat) Benzene (71-43-2):

	Acute Oral toxicity (LD50): 930 mg/kg (rat) Acute Dermal toxicity (LD50): >9400 mg/kg (rabbit) Acute Inhalation toxicity (LC50): 13229 ppm/4h (rat)
Chronic or Other Toxic Effects	
Dermal Route:	Contact may cause skin irritation. Prolonged or repeated contact may defat and dry skin, and cause dermatitis.
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Eye Irritation/Inflammation:	Contact may cause eye irritation.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product contains a component(s) at >= 0.1% that has been shown to cause mutagenicity in laboratory tests. Therefore, this product is considered to be a mutagen. (Benzene)
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be A1 by the ACGIH. Benzene (71-43-2)] [Considered to be A3 by the ACGIH. Gasoline (8006-61-9), MTBE (1634-04-4)]
Carcinogenicity (IARC):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be carcinogenic to humans (group 1) by IARC. Benzene (71-43-2)] [Considered to be carcinogenic to humans (group 2B) by IARC. Gasoline (8006-61-9)]
Carcinogenicity (NTP):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Known to be a human carcinogen according to NTP. Benzene (71-43-2)]
Carcinogenicity (IRIS):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be carcinogenic by IRIS. Benzene (71-43-2)]
Carcinogenicity (OSHA):	This product contains the following chemical(s) at >=0.1% that are listed as carcinogenic compounds. Therefore this product is considered to be carcinogenic. [Considered to be carcinogenic by OSHA. Benzene (71-43-2)]
Other Considerations	Gasoline engine exhaust is possibly carcinogenic to humans (IARC Group 2B).

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	GASOLINE, 3, UN1203, PGII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

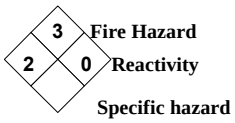
Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Contains material which may cause cancer. CLASS: Flammable liquid having a flash point lower than 37.8°C (100°F). CLASS: Irritating substance. CLASS: Target organ effects.
ADR (Europe) (Pictograms)	NOT EVALUATED FOR EUROPEAN TRANSPORT NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.	**DOT (U.S.A) (Pictograms)**	Not evaluated for transport Non évalué pour le transport

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	3
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)



Rating
0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemical Hazard Information and Packaging Approved Supply List
COD - Chemical Oxygen Demand
CPR - Controlled Products Regulations
DOT - Department of Transportation (U.S.A.)
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substance or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List (Canada)
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning And Community Right-To-Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLV-TWA - Threshold Limit Value-Time Weighted Average
TLm - Median Tolerance Limit
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS

Prepared by Product Safety - JDW on 7/4/2005.

Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Data entry by Product Safety - JDW.

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Personal Protective Equipment
	**WHMIS CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).**	

Section 1. Product and Company Identification

Product Name / Trade name	**Varsol**	**Associated Product's Item Code**	**13-374HD**
Synonym	Petroleum Distillate	**CAS #**	64742-88-7
Chemical Family	Aliphatic hydrocarbon (Solvent.)	**Validation Date**	**June 26 2006**
Chemical Formula	Not applicable. (mixture of hydrocarbons)	**Print Date**	June 26 2006
Manufacturer	Recochem Inc. 850 Montee de Liesse Montreal, Quebec 514-341-3550	**In Case of Emergency**	Recochem Inc. Communications and Regulatory Affairs Department (905) 791-1788
Material Uses	Consumer products: Various.		

Section 2. Hazardous Ingredients

Name	CAS #	% by Weight	Exposure Limits	
			Canadian Values (ACGIH)	U.S. Values (OSHA)
Petroleum distillate	64742-88-7	100	**ACGIH (Canada, 2003).** TWA: 100 ppm 8 hour(s). TWA: 525 mg/m^3 8 hour(s).	Petroleum distillate **OSHA (United States, 2003).** TWA: 500 ppm 8 hour(s). TWA: 2900 mg/m^3 8 hour(s).

Section 3. Hazard Identification

Emergency Overview	CAUTION! Combustible liquid. HARMFUL OR FATAL IF SWALLOWED. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Keep out of reach of children.
Potential Acute Health Effects	**See Section #11: "Toxicological Information" for further human health effects.** This product may cause mild irritatation to eyes and skin upon contact. Prolonged and repeated contact with skin can cause drying of the skin resulting in irritation and dermatitis. Inflammation of the eye is characterized by mild redness, watering, and itching. Skin inflammation is characterized by mild itching, scaling, reddening. Ingestion can cause burning sensation, vomiting, drowsiness and in severe cases pulmonary edema. Inhalation of excessive amounts may result in impairment, such as drowsiness, lack of coordination, headache and nausea.
Note to Physician	Aspiration hazard if swallowed- can enter lungs and cause damage. Small amounts of liquid aspirated into the respiratory system during ingestion or from vomiting may cause mild to severe pulmonary injury and possible death.

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Section 4. First Aid Measures

Eye Contact	Rinse with water for a few minutes. If irritation persists, seek medical attention.
Skin Contact	Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. If irritation persists, get medical attention. Wash contaminated clothing before reusing.
Inhalation	Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting. Allow the victim to rest in a well-ventilated area. Seek medical attention.

Section 5. Fire Fighting Measures

Products of Combustion	Carbon oxides (CO, CO_2), smoke, fumes.
Fire Fighting Media and Instructions	Combustible liquid, insoluble in water. SMALL FIRE: Use DRY chemicals, CO_2, alcohol foam or water spray. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Fire Hazards	Container explosion may occur under fire conditions or when heated. Vapour may travel considerable distance to source of ignition and flash back. Vigourously supports combustion. Combustible when exposed to heat or flame.
Explosion Hazards	Vapours may travel along ground and flashback along vapour trail.

Section 6. Accidental Release Measures

Small Spill and Leak	Absorb with an inert material and put the spilled material in an appropriate waste disposal.
Large Spill and Leak	Combustible liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Prevent entry into sewers and surface waterways. Absorb with DRY earth, sand or other non-combustible material. Place in appropriate container and dispose of in accordance with regional regulations.

Section 7. Handling and Storage

Handling	Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.
Storage	**See Section #10 for applicable incompatible materials.** Combustible materials should be stored away from extreme heat and away from strong oxidizing agents. Keep away from heat. Keep away from sources of ignition. Keep container tighltly closed in a cool, well-ventilated place. Keep out of reach of children.

Section 8. Exposure Controls, Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.
Personal Protection	
Eyes	Safety glasses.
Body	No special protective clothing is required.
Respiratory	Wear appropriate respirator when ventilation is inadequate. Be sure to use an approved/certified respirator or equivalent.
Hands	Gloves (impervious materials such as Viton®, Neoprene® or butyl rubber).

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Section 9. Physical and Chemical Properties

Physical State and Appearance	Liquid.	**Odour**	Petroleum distillates
Molecular Weight	Not applicable.	**Taste**	Not available.
pH	Not applicable.	**Colour**	Colourless.
Boiling/Condensation Point	150 to 210°C (302 to 410°F)	**Volatility**	100% (v/v). 100% (w/w).
Melting/Freezing Point	-58°C (-72.4°F)	**Evaporation Rate**	0.1 compared to Butyl acetate.
Specific Gravity	0.79 (Water = 1)	**Odour Threshold**	Not available.
Vapour Pressure	2.2 mm of Hg (@ 20°C)	**Viscosity**	Kinetic: 1.14 cS
Vapour Density	4.8 (Air = 1)	**Solubility**	Easily soluble in diethyl ether, n-octanol. Insoluble in water.
VOC Content	790 (g/l).	**Other Properties**	Not available.

The Product is:	Combustible.
Auto-ignition Temperature	229°C (444.2°F)
Flash Point	Closed cup: 42°C (107.6°F). (Tagliabue. (ASTM D56))
Flammable Limits	LOWER: 1% UPPER: 13.3%
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks and static discharge. This product is combustible if exposed to heat or when in involved in a fire and in contact with combustible materials which may act as a wick.

Section 10. Stability and Reactivity

Stability	The product is stable.
Conditions of Instability	No additional remark.
Incompatibility with Various Substances	Reactive with oxidizing agents.

Section 11. Toxicological Information

Routes of Entry	Eye contact. Inhalation. Ingestion.
Toxicity to Animals	Acute oral toxicity (LD50): >5000 mg/kg [Rat].

Acute Effects on Humans

Eyes	May cause mild eye irritation.
Skin	May cause mild skin irritation.
Inhalation	Slightly hazardous in case of inhalation. Exposure to very high concentrations can cause dizziness, lightheadness, headache, nausea, and blurrred vision. Higher levels may cause unconsciousness.
Ingestion	This product is of very low acute toxicity. Aspiration hazard if swallowed- can enter lungs and cause damage.

Continued on Next Page

Chronic Effects on Humans	**CARCINOGENIC EFFECTS**: Not available. **MUTAGENIC EFFECTS**: Not available. **TERATOGENIC EFFECTS**: Not available. **DEVELOPMENTAL TOXICITY**: Not available. Prolonged and repeated contact with skin can cause drying of the skin resulting in irritation and dermatitis. Effect of chronic exposure include soporific or intoxicating effect if prolonged and in sufficient concentration. Avoid breathing vapour or mist.

Section 12. Ecological Information

Ecotoxicity	**For accidential discharges into environment, see Section #6: "Accidential Release Measures" for suggested instructions.** No additional remark.

Section 13. Disposal Considerations

Waste Information	Waste must be disposed of in accordance with federal, state or provincial and local environmental control regulations.

Section 14. Transport Information

Canada Transportation of Dangerous Goods (TDG) Information

Primary Class	Class 3: Flammable liquid.
Subsidiary Class (if applicable)	-
Proper shipping name	PETROLEUM DISTILLATES, N.O.S.
Hazard Identification Number	UN 1268
Packing Group	III
Special Provisions	In containers of 450L or less this product is not classified as a Dangerous Goods according to TDG exemption 1.33

International Maritime Dangerous Goods (IMDG) Transportation Information

Primary Class	Class 3: Flammable liquid.
Subsidiary Class (if applicable)	-
Proper shipping name	PETROLEUM DISTILLATES, N.O.S.
Hazard Identification Number	UN 1268
Packing Group	III
Marine Pollutant	Not pollutant.
Special Provisions	In containers of 5 L (5Kg) capacity or less this product is classified as a "Consumer Commodity" under IMDG regulations.

No placard (handling and hazard label) required.

United States Department of Transportation (DOT) Information

Primary Class	Class 3: Flammable liquid.
Subsidiary class (if applicable)	-
Proper shipping name	PETROLEUM DISTILLATES, N.O.S.

Continued on Next Page

Hazard Identification Number	UN 1268
Packing Group	III
Special Provisions	In containers of 454L or less this product is not classified as a Gangerous Good according to exception 173.150 f(1-2)
International Air Transport Association (IATA)	For air shipment classification and associated regulations, please refer to the latest edition of IATA Dangerous Goods Regulations.

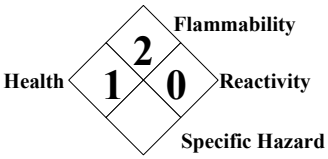
Section 15. Other Regulatory Information and Pictograms

WHMIS Classification (Canada)	WHMIS CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Canada Domestic Substances List (DSL) Status	This product and/ or all of its components are on the DSL.
HCS Classification (U.S.A.)	Combustible liquid
U.S.A. Regulatory Lists	This product and/ or all of its components are on the TSCA inventory list.

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	2
Reactivity	0
Personal Protection	G

National Fire Protection Association (U.S.A.)



Section 16. Other Information

Validated and verified by Compliance and Technical Information Manager on June 26 2006 | **Printed** June 26 2006

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