

APPENDIX III-D

Traffic Management Plan



ECHO BAY MINES LTD.

HIGHWAY AND WINTER ROAD

DRIVERS'

POLICY AND PROCEDURES

MANUAL

DISTANCE **YELLOWKNIFE - LUPIN**

YELLOWKNIFE TO:	KM	MILES
Tibbit Lake	70	43
South Gordon Lake	121	75
North Gordon Lake	164	102
South Brown Lake	178	111
North Brown Lake	185	115
South Drybones Lake	212	132
North Drybones Lake	222	138
Lockhart Camp	238	148
North Lockhart Lake	248	154
South Warbuton Bay	250	155
North Warbuton Bay	259	161
Portage Bay	298	185
North McKay Lake	383	238
Lac De Gras Camp	407	253
North Lac De Gras Lake	430	267
North Lac Sauvage Lake	451	280
South Hardy Lake	470	292
South Pallet Lake	491	305
North Pallet Lake	520	323
South Contwoyto Lake	523	325
Lupin Camp	637	396

THE PRESIDENT'S MESSAGE

Welcome to Echo Bay Mines Ltd.

We sincerely mean that. You are a key part of Echo Bay and we want you to know this, so that, you may join with all of the people who are part of the Echo Bay Family for mutual satisfaction and success.

The key to a long and happy relationship both at home and at work is communication and understanding. This Employee's Handbook has been prepared to help introduce you to Echo Bay Mines and to serve as a future reference guide throughout the years ahead. It is just common sense that we will all do our jobs better, more positively and with more personal satisfaction if we understand the company and it's goals. This handbook is designed to assist in that understanding.

Echo Bay Mines Ltd. is in the mining industry throughout North America. Our goals are ambitious. Our potential is unlimited. Our standards are high. They have to be. There is no room for mediocrity in our industry or in today's world. People are the difference between success and failure. I think that we have some of the best and each of us is a key player. The old saying that a chain is only as strong as it's weakest link certainly applies.

If you are a new driver or lease operator, then congratulations because we obviously think that you will be an important addition to our team.

We operate over a wide geographic area including public highways and private roads; in our storage facilities, job shops and offices and other owned job sites and plant locations. Safety, service and satisfaction are vital to our success. Therefore it is essential that we have and abide by detailed procedures, rules and regulations. These are contained in this handbook. We will all be required to abide by these and be familiar with them.

Going back to communication, it is important to remember that to be effective, communications must be continuous and two way. Management encourages your views, criticisms and suggestions as they relate to the Driver's Handbook and other matters. Please communicate your ideas in a positive manner to your Department Manager and/or our Safety Manager.

Thank you,



Richard C. Kraus
President

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THE COMPANY

Echo Bay Mines is one of the largest gold producers in North America. The company has four major producing gold mines, one of them located in Canada and three in the United States: Lupin, Northwest Territories; McCoy/Cove, Nevada; Round Mountain, Nevada; and Kettle River, Washington State. Echo Bay produces about 700,000 ounces of gold a year, and 8 million ounces of silver

In addition to its four producing mines, the company owns two very large development projects in Alaska, the 100% owned Alaska-Juneau project and the 50% owned Kensington project. Together, the Alaskan projects have the potential to increase Echo Bay's gold production by an amount in the order of 450,000 ounces annually, an increase of more than 60%.

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Public Relations and Safety

When you enter a Contract of Employment with Echo Bay Mines Ltd., you become a representative of the company. Your attitude towards the general public, driving habits and courtesy are all important components of the image that you create for Echo Bay Mines Ltd. In an effort to portray the best image possible to the general public it is important that you:

1. Obey all safety and traffic regulations.
2. Never insist on the right-of-way, even though you may be legally entitled to it.
3. Always drive in the proper lane and stay there, unless passing another vehicle when safe to do so.
4. Assist other motorists passing you. If a motorist is experiencing difficulty passing, slow down and let the motorist pass safely. Motorists do not realize the length of the average unit is about the length of three or more cars.
5. Avoid stopping so as to interfere with other traffic.
i.e. Double parking on roads or highways
6. Always be considerate of overly-cautious drivers. A large unit driving closely behind may rattle a driver which may cause a serious accident, in which you may be involved.
7. Acknowledge the courtesy of other drivers.
8. Avoid applying your brakes quickly or cutting in when passing. The other driver may not be a professional. Base your judgment on the fact that his or her reflexes are possibly considerably slower than yours.
9. Drive defensively at all times. Never take another driver's signal for granted, as he may change his mind at the last moment.
10. Be constantly alert and thinking of potential road and weather hazards.
11. Avoid unnecessary use of your air horn. This sound may startle a motorist to the extent that it could cause a serious accident.
12. Maintain a distance of at least 500 feet when travelling on the public highway, and 1/2 kilometre when on the ice road. This will allow for safe stopping distances and also other traffic to pass safely.

Company Rules and Regulations

- A. The Company shall have the right to suspend, discipline or dismiss any employee or lease operator for any or all of the following:
1. Consumption of intoxicants or narcotic drugs while on duty.
 2. Reporting for work under the influence of intoxicants or narcotics.
 3. The carrying of intoxicants or narcotics in vehicles owned or leased by Echo Bay Mines Ltd.
 4. Dishonesty, false reports or willful damage to or loss of company equipment.
 5. Conversion or theft of company property.
 6. Improper conduct towards the general public or company personnel.
 7. Consistent and obvious disregard for personal appearance.
 8. Failure to comply with the rules of the camps owned or leased by the company
 9. Accidents resulting in bodily injury, death or same caused by careless or reckless disregard for the safety of an employee while in the course of employment with the company and to the personnel or property of the company or to the property of other persons.
 10. Tardiness.
 11. Carrying unauthorized passengers or goods in vehicles owned or leased by Echo Bay Mines Ltd.
 12. Falsification of Log Books.
 13. Failure to properly complete and submit all paper work as required by the company
 14. Failure to comply with any company rules and regulations that may from time to time be issued hereafter.
i.e. Speed posted on ice road

The above list is by no means exhaustive and is presented without prejudice to any and all of management's rights subject to appropriate statutory authority.

- B. Owner-operated trucks will be hired as leased operators by the company. Any and all company rules and regulations noted in this Drivers Policy and Procedures Manual must be strictly adhered to by all leased operators.

The prospective lease operators tractor and or trailer will be inspected by Echo Bay Mines or as directed by E.B.M.L. prior to any lease agreement being entered into. A tractor and or a trailer inspection report will be completed on all equipment with a notation made on same of any and all shortages or defective equipment. Any and all shortages or deficiencies must be corrected prior to the equipment pulling any loads for the company

The following is a list of equipment required by all lease operators:

- 1 - Revolving amber light (Mounted on the cab of the tractor)
- 1 - Headache rack - dimensions - 4' x 8' full screen or solid back or oilfield headache rack on winch tractors
- 1 Set of regulation mud flaps for mounting on the rear of the tractor
- 8 - Tie down chains 3/8 or larger
- 8 - Boomers 3/8 or larger
- 1 - 5ABC fire extinguisher or
- 2 - 4ABC fire extinguishers
- 1 Regulation hard hat
- 2 Sets of tire chains (triples)
- 1 Steering chain recommended
- 1 Set regulation flags and flares or
- 1 set of 3 triangle reflectors
- 12 Corner guards
- 4 or more pieces of belting or rubber for use under tiedown chains
- 4 or more extended load light assemblies
- 2 Overdimensional signs (Red and white D sign)

C. Decals

Tare weight and G.V.W weight must be displayed on each of the tractors. The unit number assigned to all tractors and trailers will be displayed on both sides of the unit for easy identification.

D. Company Forms

As a driver or lease operator for E.B.M.L., it is necessary that certain forms be completed and as such constitutes a vital part of your job function. The various forms that will be your responsibility are listed below and outlined on the following pages.

It is crucial that these forms be completed fully and accurately for they serve as both our records, your records, and in certain cases, government records.

1. Cry Sheet - (*Drivers report of defective equipment*) - To be prepared daily by company driver or lease operator to record and report all defects to equipment. (Appendix A - copy of driver's daily vehicle inspection report)
2. Driver's Daily Log - Appendix B
 - A. The company requires that all drivers keep daily logs of all trips pulled. The Federal Government N.S.C. requires a total of all hours worked by each driver
 - B. Drivers will turn in, at the end of every trip, the original log sheet attached to the bill of lading. The duplicate copies are the driver's personal record and are to be kept for a period of 14 days in the possession of the driver
 - C. The log shall be prepared, maintained and submitted for a 24 hour calendar day beginning at midnight.
 - D. The driver shall certify the correctness of logs by signing his name in full.
 - E. Show month, day and year for which the log is prepared.
 - F. Show total mileage driven.
 - G. Show tractor and trailer numbers.
 - H. Show driver's home terminal.
i.e. Lockhart

- I. Show the actual period or periods during the day spent in activities specified in Lines 1-2-3-4 by drawing a continuous line between appropriate time markers.
- J. In the column "Total Hours", the hours and fractions thereof shown in each of Lines 1-2-3-4. This total must be 24 hours. Enter the origin of the trip requiring more than one calendar day. The log for each day shall show the origin and final destination at the bottom of the log with the points of beginning and ending the travel of that day shown as required by (F) in "Remarks". If a driver departs and returns the same day the "Destination" or turn around point shall be the furthest point reached before the driver begins his return trip.

Line 1 - Off duty - self explanatory
Line 2 - Sleeping berth - self explanatory
Line 3- Driving - all time spent at the controls of a motor vehicle in operation.
Line 4 - On duty (Not driving) - All time spent by a driver in performing duties other than driving; such as loading, unloading, preparing reports, remaining in charge of disabled vehicles, stops for meals, unless driver has been relieved of his duties.
- K. All drivers will complete the update on back of front cover daily and have log book ready for inspection by dispatcher prior to being dispatched.

Appendix C

3. Bill of Lading

Certain information is required and it is the driver's responsibility to ensure the following are noted on all B.O.L..

- A. Date
- B. Tractor and Trailer Numbers
- E. Pickup and Delivery Points
- F. Description of the goods being carried
- G. Number of pieces
- H. Weight
- I. Signature of shipper or dispatcher

- J. Load transferred from or to another unit not this unit's name and number
- K. If load dollied off, note where, why, and on whose instructions
- L. Packing slips or any papers pertaining to the load must be turned in to receiver
- M. Show all trailer numbers used for that load on B.O.L.
- N. Important - Damaged loads or shortages - Check cargo before loading if damaged not on B.O.L. and have shipper sign. If load is damaged in transit or unloading report to your dispatcher and get a signature of the receiver
- O. Shipper's special instructions - Notify dispatcher.
- P. All B.O.L. are to be handed in upon completion of every trip. Holding B.O.L. only results in holding up a complete trip and may make that trip miss payroll cutoff for yourself and any other truck involved in that particular trip.
- Q. It is important to ensure that you have a copy of the original B.O.L. if your load is a makeup load.
i.e. A load that is made up of 2 or more Bills of Ladings

Appendix D

Accident Reports

Although the fundamental aim of the company is to eliminate accidents and their causes, the fact that accidents do occur must be recognized. In the event that an accident does occur, the driver involved shall follow the procedures outlined below:

1. Secure your equipment.
2. Set out warning devices, flags, flares or reflectors to warn other motorists.
3. Assist the injured.
i.e. Make injured comfortable. Do not move or treat seriously injured.
4. Do not leave the accident scene unless absolutely necessary.
5. Notify dispatch and police.

6. Gather the following information:
 - a. Names, addresses, and telephone numbers of all those involved such as owners, drivers and passengers.
 - b. Name of the injured and the place they were taken for medical treatment.
 - c. Vehicle Damage - Estimate of loss including cargo.
 - d. Witnesses names, addresses and licence numbers.
 - f. Time, location, weather, road and light conditions, obstructions, etc.
 - g. Diagram of the accident scene, clearly indicating the direction of travel of all vehicles involved their final positions and distances.
 - h. Complete a company accident report as soon as possible after returning to a company location or office.

DO NOT

1. Sign anything.
2. Admit responsibility or agree to pay for anything.
3. Move or treat the injured.
4. Make statements to anyone except the investigating police officer, Echo Bay Mines Ltd. official or company insurance adjuster.
5. Argue - Remain calm and courteous at all times.
6. Move the vehicles unless absolutely necessary
i.e. Fire or instructed by police.
7. Blame the other party

Where any employee is involved in an accident, a careful review shall be made of the circumstances surrounding the accident. A decision shall be made as far as any disciplinary action that might have to be taken.

Where any driver is involved in a number of accidents or damage claims attributable to that employee the company shall have the right to disciplinary action or to and including dismissal. However, each accident or claim shall be judged on its own merits and circumstances.

Damaged Equipment Report

1. All company drivers and lease operators are required to complete cry sheets, or damaged equipment reports.
2. Any damage to company trailers or other equipment will be noted on the company form Damage to Equipment Report. This is the damage to trailers that has not been reported on the cry sheets, or it may be the damage noted on the cry sheets that must be charged to the lease operator due to negligence in operation of that equipment.
3. The D.E.R. will be completed by the repair shop and submitted to the dispatcher or superintendent for perusal. The Superintendent will discuss the damages to the equipment with the lease operator responsible. If it is found that damage was caused by the lease operator's negligence, the cost of repairs will be deducted from the lease operator

Appendix E

Pre-Trip Procedure

Prior to the commencement of a trip, the following shall be inspected:

1. Oil and coolant levels
2. All instrument gauges
3. Brakes - tractor and trailer
4. Air system tractor and trailer
5. Windshield wipers
6. Lights - headlights, signal lights and marker
Lights are to be clean and in working order on both the tractor and trailer.
Always drive with your lights on.
7. Tires and tire pressures, chains and spare if so equipped, wheel nuts, and wheel hubs.

8. Defroster and heater
9. All mirrors and glass cleaned if needed.
10. All licences, registrations, operating authority and permits
11. Safety equipment - flares, fire extinguishers
12. Check load for proper securement.
13. Do you have all paper work for this trip?
i.e. Bill of Lading

Appendix F

Enroute Inspection

First check of the vehicle and cargo is to be carried out within 45 miles of origin. Checks then to be carried out every 100 miles or 4 hours. Note check stops on log.

1. Check all tires.
2. Visual check for oil or coolant leaks.
3. Visual check of all wheel nuts and feel wheel hubs for excessive heat. Check oil level in sight glasses.
4. Visual check of air hoses and light connections.
5. Clean lights and lenses when necessary
6. Make complete visual check of equipment and load.
7. If a tractor or trailer wheel has been changed the nuts have a tendency to loosen within the first 100 miles.

Fuel and Repairs

1. All trucks are to top off fuel tanks at Yellowknife and or Lockhart prior to travelling north.
2. Emergency repairs will be available at Lupin Minesite or at the road camps. All major repairs will be carried out in Yellowknife, or as directed by an E.B.M.L. authorized person.

Post Trip Procedures:

1. Fuel unit if in Yellowknife or if truck going north from Lockhart.
2. Check oil and coolant levels.
3. Check all belts.
i.e. Fan, compressor
4. Visually check all wheel nuts on tractor and trailer, and check oil in sight glasses.
5. Check all tires.
6. Drain air tanks on tractor and trailer.
7. Clean lights on tractor and trailer.
8. Park trailers and tractors in designated areas.
9. Complete cry sheet on both tractors and trailers.
10. Check all documents to make certain each has been accurately completed.
11. Check in with dispatch.

Road Failure

When breakdowns occur that cannot be repaired by the driver and jeopardize the overall safety of the trip or further risk damage to equipment or cargo, the following procedure is to be followed:

- A. Ascertain the nature of the breakdown where possible. Be prepared to answer the following questions:
 1. What type of failure?
 2. What is exact location and direction of travel?
i.e. North, South
 3. Can unit be moved under its own power?
 4. Loaded or empty?
 5. What parts are required? (if possible)

6. The driver will follow the course of action that is recommended by the dispatcher or other authorized company Supervisor.
7. If no communication with dispatch is possible, travel to nearest camp by first available means and call dispatch.
i.e. Lockhart, Yellowknife, Lac. de Gras or Lupin

Winter Operations

Ice Road Rules and Regulations

1. All vehicles are subject to search by Echo Bay Mines Representatives at any time while on the winter road, and at all Echo Bay camps or facilities.
2. Speed limits will be set and monitored by Echo Bay Mines Ltd.
3. Vehicle separation is mandatory with the minimum separation being one-half kilometre between vehicles.
4. Vehicles are not to travel alone and a minimum of two vehicles are to travel together (subject to the minimum separation) at all times, or as directed by dispatch.
5. Road maintenance is not to be interfered with or hindered in anyway and has precedence over hauling.
6. Road closures will be set by Echo Bay Representatives as required at Echo Bay's discretion.
7. Spills must be reported immediately to dispatch who in turn will notify the Government of the Northwest Territories Spill Line.
Telephone Number (403)920-8130
8. Drivers are required to take a minimum 8 hour rest period in a 24 hour period.
9. All drivers and/or leased units will stop when requested to do so by E.B.M.L. Supervisors.
10. All trucks will fuel up at Yellowknife before travelling north. You will top off tanks at Lockhart. This is a must. Emergency fuel will also be available at Lac. de Gras and Lupin. Please do not take on fuel at these locations (Lac. de Gras - Lupin) unless necessary (i.e. weathered in).

11. Chains - Drivers are requested to use good judgement in deciding when to install and remove tire chains. When the tire chains are installed they are to be kept tight to avoid damage to chains, tires and the unit. The speed of the unit is to be reduced accordingly
12. Changing tires - It is the driver's responsibility to change tires enroute. Do not run a flat any further than is necessary to find a safe place to change it. This includes trailer tires.
13. Extreme changes in oil pressure and motor temperatures should be investigated immediately. If unable to rectify the problem, notify dispatch for further instructions.
14. Changes in engine, rear-end or transmission noises could be a warning of a failure and need to be investigated. If unable to correct problem, notify dispatch.
15. Generally speaking, idling of motors is a must in winter operations. When necessary to idle engines for extended periods of time, it is important that the proper r.p.m.s be maintained.
16. Drivers are to observe the necessary warmup times.
17. When leaving your unit unattended, your wheels must be blocked to prevent any movement of the unit should the brakes release due to loss of air
18. You may be required to assist in the servicing and repairs on your vehicle.
19. You are not to overnight in Yellowknife unless authorized to do so by dispatch.
20. Your loads will be arranged by dispatch at Lockhart. Fuel haulers must have a "Fill Slip" to load fuel at the plant. This slip will be provided by dispatch. Drivers must receive instructions from a plant representative prior to loading of your first load.
21. Emergency repairs will be available at the Lupin minesite or at the road camps. All major repairs will be carried out in Yellowknife, or as directed by an E.B.M.L. authorized person.
22. All drivers must have adequate winter clothing and should carry a good sleeping bag as well, in case of emergency. Drivers are advised to carry food rations that can be obtained at the camps on the road.
23. Remember you are in the North and it gets cold, temperatures to -50°C. Be safe and keep warm.

24. All drivers must have completed a valid Dangerous Goods Course and/or WHIMIS, and have a valid certificate.
25. Stopping for rest periods on the ice (ie. lakes) will not be permitted.
26. Haul trucks will not be permitted to travel into Yellowknife unless authorized to do so by E.B.M.L. supervisor on dispatch.

Safeguarding of Cargo

1. Ensure adequately powered cranes, forklifts or winches are utilized while loading cargo.
2. Slings must be used when loading or unloading. Do not use chains as slings.
3. Be sure you know the location and description of cargo you are to load before leaving the dispatch office.
4. Do not load or attempt to load anything other than the cargo described on your B.O.L. or what dispatch has adequately described to you.
5. Upon arriving at the destination, again ensure that you have the proper equipment to unload your cargo.
6. Be sure that your load of cargo is properly secured to the trailer prior to any movement.
i.e. Proper number of chains and boomers and/or straps and winches.

Improvement of Operations

Echo Bay Mines Ltd. welcomes and encourages the driver input into the operations process. Any reasonable suggestion presented by a driver for the improvement of the overall efficiency of the operations shall be reviewed and considered. All suggestions pertaining to such matters should be forwarded in writing to dispatch.

Above all else, a driver or lease operator with Echo Bay Mines Ltd., fulfil your function as a driver in the safest manner possible - **Don't take chances.** Safety on the road and in the yard is of unprecedented importance. At all times exercise good judgement, defensive driving and avoid risks. It is our sincere hope that your term of service with Echo Bay Mines Ltd. will be both enjoyable and accident free.

Safety Code of Practice

Safety and safety consciousness is not a one time, one place affair and it requires continual care and attention. Towards this objective a safety code or practice has been drafted, establishing a set of working rules and regulations which should act as a guideline for the actions of all company drivers or leased operators. Through application of the code, it is believed that the entire company can work more effectively for an improved safety record and towards accident prevention; thereby lessening the chance injury and physical property loss.

On the following pages, the rules and regulations making up the code are outlined.

The Workplace

1. Workers shall ensure that all machinery, equipment, workplaces, and storage facilities are inspected on a regular basis, and kept in safe operating condition.
2. Workers shall ensure that all tools used are kept in clean, proper working order and replace in their proper storage area upon the completion of their use. It shall be the Supervisor's responsibility to see that this remains the practice.
3. Every work area shall be kept clean and free from any slipping or tripping hazard. Where in a shop maintenance area oil, grease, or some other substance that could create a hazard is spilled, the workperson responsible will see that the substance is properly cleaned up, or covered as soon as possible. It is the Supervisor's job to see that this cleanup is carried out as soon as possible.
4. Metal stripping, blocking, garbage, or other debris shall not be allowed to accumulate and buildup a potential hazard.
5. The Supervisor shall ensure that a proper refuse (garbage) area is set up and that all scrap and garbage collected is placed in that area. It shall further be the Supervisor's job to see that regular collection arrangements are made for this debris, or that, where possible and admissible, burnable garbage is burned, so as not to allow potential contamination or other hazards. The burning of the garbage must be supervised.
6. Wiping rags must be kept in a metal container and not allowed to accumulate in piles that potentially could cause a fire hazard.

- 7 Floors, stairs and platforms shall be kept clean and well maintained.
8. Flammable liquids and/or toxic or harmful substances shall be stored in safe, approved containers and the contents properly identified.
- 9 Racks for storage materials and/or items of inventory shall be adequately secured and stable, being placed on acceptable level and solid foundations.
10. Safe access and exit from work areas shall be maintained and kept clear at all times.
11. It shall be up to the Supervisor to ensure that all persons not authorized or instructed to be in any given work area are cleared from the area. It shall be the Supervisor's privilege to ask any unauthorized personnel or persons felt to be disrupting work practices, procedures or conduct to leave.
12. It shall be the Supervisor's responsibility to see that all rules and regulations set out in this code are maintained and enforced. Where a violation occurs, he will be responsible for the correction of the violation (where possible).
13. Before any equipment or vehicles are moved out of shop areas all access openings and doors will be adequately opened to permit the safe, unobstructed removal of that equipment or vehicle.
- 14 Fire extinguishers in all shop areas shall be fully serviced and operational at all times with periodic checks made biweekly to ensure that there has been no tampering with or bleeding of this equipment. Anyone caught unnecessarily triggering a fire extinguisher or otherwise rendering firefighting equipment inoperable shall be liable for immediate termination.
- 15 Every shop or staging area shall have a fully stocked, approved first aid kit. Periodic checks will be made to ensure that the first aid kit is complete and any required supplies requisitioned. It shall be the Supervisor's responsibility to see that this is carried out.
16. All equipment being repaired in shop or maintenance areas shall be properly blocked, whenever jacking or hoisting is required.
- 17 All employees working in or visiting the shop or maintenance areas shall exercise extreme caution in walking or moving between, around, under or in front of equipment or vehicles.
18. All employees must familiarize themselves with the location of firefighting equipment and the proper operation of this equipment.

- 19 Designated fire exits for each camp, office, shop area and storage facility shall be clearly outlined and posted.
20. It shall be the Supervisor's responsibility to see that all methods and procedures adequate to render the place of work safe and secure from potential accidents and injuries are enforced, regardless of their being a written regulation or guideline to the effect or not.

Safety Bulletins

The Safety Manager shall send out various safety posters, notices, and safety related bulletins. All safety bulletins and notices are to be posted by the Supervisor or his or her delegate in a conspicuous place accessible to all employees at that camp or work area.

Safety bulletins, posters and notices shall not be removed unless authorization is received from the Supervisor or the Safety Manager

Basic Emergency First Aid

In the advent of serious injury from an accident and you are called upon to assist with basic first aid, the following points may be used as a guide:

1. Respond quickly - your promptness may save a life.
2. Remain calm and organized.
3. Notify Supervisor and give accurate location and number of injured requiring assistance. Notify police, doctor and call an ambulance if possible.
- 4 Keep the injured person warm with blankets or jackets.
5. Do not move the injured person, unless it is necessary to prevent further injury
i.e. fire
6. In case of a fracture immobilize injured area immediately if medical help is not readily available. Apply a splint to prevent movement.
- 7 In case of bleeding:
Control bleeding as soon as possible by using a pressure bandage or elevation. Remember to release pressure bandage every 20 minutes if total constriction is required.

8. In case of shock:
Most injuries are accompanied by shock. When possible lay the injured person on his or her back and elevate the feet approximately 12" Cover the patient with a blanket or jacket for warmth.
- 9 In case of burns:
Do not cover a burn area with any cream or lotion. Cover the burn area with a clean bandage only

Workers Compensation Board Act and Regulations

All W.C.B. notices and bulletins shall be posted for the information of all employees as required under the W.C.B. act of the ruling jurisdiction.

Nothing in this code of practice shall reduce, violate, or limit the application of specific W.C.B. directives as issued by the W.C.B. Nor shall they reduce, violate, or limit the application of the applicable W.C.B. act in that jurisdiction where employees are working.

Where W.C.B. inspection reports are completed with respect to company vehicles or work procedures and submitted to the immediate Supervisor, he shall as soon as possible submit a copy of the report to the Safety Department at head office, requesting acknowledgement of the notice and instructions if applicable.

All injuries shall be forthwith reported to the Supervisor or the person in charge of that area. The required workers report of the accident is to be completed and submitted to the Supervisor. He will in turn enter the particulars of the accident or illness in the Report of Accident or Industrial Illness Record Book. The Supervisor will then complete a W.C.B. form completed by employers and forward both forms directly to the Safety Department at head office.

All Supervisors are to ensure all reported injuries are noted in the W.C.B. Report of Illness and Injury Book. This record book must be kept up-to-date and available for inspection by a W.C.B. Inspector

The Safety Manager will keep an up-to-date record of all illness or injuries to employees. He or she will also be responsible for submission of the annual reports that are required by the W.C.B.

Administration of the Code of Practice

Supervisor's Responsibilities:

1. Determine that all employees are working by the safety rules established in the Code of Practice.

2. Determining:
 - a. The existence of unsafe working conditions or practices.
 - b. That fire fighting equipment and fire escapes are adequately maintained.
 - c. That the emergency response equipment is properly stocked and maintained.
 - d. That tools, equipment, machinery, and parts being used by himself or herself or employees are in safe operating condition.
3. Recording recommendations with respect to safety concerns that require further action and reporting these to the proper authority
4. Assisting in the prompt investigation of accidents and injury claims through on-site interviews, inspection and consultations.
5. Conducting thorough inspections of the work place or job site as established in the Code of Practice or at least a minimum of once monthly unless otherwise required.
6. Ensuring that regular Safety Committee meetings are held by his own Project Safety Committee at least once a month to discuss:
 - a. Current accident and injury claims, their causes and means of prevention.
 - b. Reports of inspections and investigations.
 - c. Action taken on previous Committee suggestions, and the results to date.
 - d. Where no action was taken, reasons as to why they were not taken should be outlined.
 - e. New suggestions, concerns, and complaints relating to safety policy and procedure.
 - f. New policies being adapted by management.
- 7 Submitting to head office a complete, concise, and accurate accident report (on the designated W.C.B. forms) with respect to all accidents and/or injury claims.

8. Reviewing, editing, and forwarding a copy of the Safety Committee meeting minutes to head office.
9. Implementing and maintaining such new procedures, regulations and innovations as prescribed in the area of accident prevention and safety by Operations Supervisors and Managers, the Safety Department and management as a whole.
10. To administer such disciplinary action as required for safety code violations.
11. Review accident prevention measures and communicate concerns about these to head office.
12. To receive, consider and dispose of safety concerns and problems.
13. To identify and control potential safety hazards.
14. Alerting management how better safety regulations can be made and enforced.
15. Completing W.C.B. forms with respect to any injury claim and forwarding the report to head office for furtherance to the W.C.B.

Disputes and Discipline

Disputes:

Where a dispute arises as to the application of a rule or regulation, of the Code of Practice, or a matter of safety concern is expressed for which no ruling exists, the Supervisor or designate, in his or her absence, shall rule on the matter and his or her decision shall be final in that instance.

Where, because of circumstances, the Supervisor decides the special safety related measures must be undertaken, the Supervisor's decision shall be binding.

All disputes, such as outlined above, shall be reported to head office no later than 24 hours after the dispute is reported and a ruling handed down.

Discipline:

The company reserves its right to exercise judgement on all matters where good conduct and discipline are concerned, and to take disciplinary action it judges appropriate under the circumstances at the time.

Breach of the following regulations can or will result in immediate dismissal:

1. Use of alcohol or drugs while on duty or on company property or under the influence of same.
2. Theft from the company.
3. Total disregard of company safety standards and procedures. This can easily be denoted by damage to equipment or cargo.
4. Criminal action outside of company activities.

Summary

Echo Bay Mines Ltd. have become specialists in their field and the reputation we have developed in the industry is second to none. We are all proud of being professionals.

It now becomes your responsibility and duty to become fully familiar with and follow the guidelines set out in this manual. The observance of company rules, regulations, and policies shall be considered a condition of employment.

SIGNATURE OF ACKNOWLEDGEMENT

I have read and fully understand all rules and regulations contained herein and agree to abide by them. I recognize that failure to do so may result in discipline, suspension, or discharge. I will return this manual upon request or when leaving the services of the company.

Name _____

Address _____

Telephone _____

Employee's
Signature _____

Date _____

Person to notify in case of an accident or injury

Name _____

Address _____

Telephone _____

Relationship _____

APPENDIX A

ECHO BAY MINES LTD. VEHICLE SAFETY INSPECTION AND CONDITION REPORT

Nº 10970

To be completed at the beginning of each trip and at intervals of NO more than 800 kilometres.

MILEAGE IN _____ MILEAGE OUT _____
 TRACTOR NO. _____ TRAILER NO. _____
 TRIP REPORT NO. _____

Driver must ✓ items as inspected. List those defects for correction in the space provided at bottom of form

1. PRE-TRIP INSPECTION	✓	3. ENROUTE INSPECTION: ROAD CHECK	✓
a. ENGINE OIL, ANTIFREEZE LEVELS	✓	To be completed after the first 50 kilometres and at intervals of 150 kilometres thereafter.	
b. COOLANT LEVEL	✓	a. TIRES	✓
c. BELT TENSION	✓	b. WHEELS AND LUGS	✓
d. FUEL	✓	c. OIL LEAKS	✓
2. CHECK (After starting the engine):	✓	d. FUEL LEAKS	✓
a. LIGHTS - headlamps, tail lamps, turn signals, stop lamps	✓	e. CARGO - SECURE	✓
b. BRAKES Brake adjustment (Maximum slack adjuster travel 1.5 inches.) Compressor build up time from 50 to 90 PSI not to exceed 3 minutes. Air tanks have been drained, tractor protection valve functioning properly, no audible leaks and braking system functioning properly.	✓	4. END OF TRIP INSPECTION	✓
c. HORN - electric and air	✓	a. FUEL UNIT	✓
d. WINDSHIELD WIPERS	✓	b. DRAIN AIR TANKS	✓
e. STEERING - for excessive play	✓	c. LIGHTS AND LICENSE	✓
f. TIRES AND WHEELS SECURE Wheels are secure. Tire tread depth and condition is acceptable	✓	d. PARK UNIT IN A SAFE AREA	✓
g. WINDSHIELD CONDITION	✓	OIL ADDED _____	✓
h. MIRRORS - adjustment	✓	COOLANT ADDED _____	✓
i. SAFETY EQUIPMENT	✓	<input type="checkbox"/> UNIT IS ROADWORTHY <input checked="" type="checkbox"/> UNIT REQUIRES CORRECTION	
j. VEHICLE DOCUMENTATION, INSURANCE, AUTHORITIES, ETC	✓	Completed form is to be submitted to the Maintenance Department in Edmonton.	

REMARKS AND REPAIRS REQUIRED: (Identify unit number for each remark or repair)

1. Fuel Filter
 Fuel Filter

THE ABOVE UNIT IS ROADWORTHY: _____ DRIVER'S SIGNATURE 25.10.2011

APPENDIX B

DRIVER DAILY LOG FICHE JOURNALIERE DU CONDUCTEUR

MONTH 2/ DAY 7 YEAR 77 SHIFT START TIME 6:11 AM POSTE DE TRAVAIL DEBUTE 6:11 AM STARTING ODOMETER 1475 ODOMETRE AU DEBUT

TRUCK/TRACTOR LIC PLATE 573521 UNIT # 104 TRAILER(S) LIC PLATE 104 UNIT # 104 MILES (KM) TODAY 1475 MILES (KM) ALIQUOT HUI

CARRIERS (S) TRANSPOURTEURS ROUTIER(S) MILES (KM) DRIVEN TODAY 1475 MILES (KM) CONDUITS AUJOURD'HUI

MAIN/PRINCIPAL OFFICE ADDRESS ADRESSE DE L'ETABLISSEMENT PRINCIPAL HOME TERMINAL ADDRESS TERMINUS D'ATTACHE

DUTY STATUS - ACTIVITE Use Local Time Standard at Home Terminal GRID - GRILLE Utiliser l'heure locale au terminus d'attache Total Hours
MIDNIGHT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 NOON
1. Off Duty / Période de repos
2. Sleeper / Berth / Temps - couchette
3. Driving / Heures de conduite
4. On Duty (not driving) / Heures de service autres que heures de conduite

REMARKS / OBSERVATIONS

DRIVER'S NAME / NOM DU CONDUCTEUR E. J. 711 CO-DRIVER'S NAME / AUTRE CONDUCTEUR(S)

DRIVER'S SIGNATURE [Signature] CERTIFIED TRUE & CORRECT / ATTESTÉE VÉRIDIQUE EXACTE CO-DRIVER'S SIGNATURE [Signature] CERTIFIED TRUE & CORRECT / ATTESTÉE VÉRIDIQUE EXACTE

Original (white) Submit to Carrier / Original (blanc) Remettre à transporteur routier
Duplicate (yellow) Driver Retain / Double (jaune) Le conducteur le Garde

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APPENDIX C

PRESS HARD, YOU ARE MAKING MULTIPLE COPIES
White - ORIGINAL Yellow - BILLING COPY Green - RECEIVING COPY Blue - SHIPPER'S COPY Pink - TRUCKER'S COPY

ECHO BAY MINES LTD. ISSUED AT SHIPPER'S REQUEST COMBINATION SHORT FORM OF STRAIGHT BILL OF LADING - EXPRESS SHIPPING CONTRACT N° 00001

TO 11/10/81 DATE Feb 20 - 1
1105 4202 - 97 P.O. NUMBER 1000000000

TRUCK NUMBER 1361 TRAILER NUMBERS 1361 - 1362

Received at the point of origin on the date specified, from the shipper mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of package unknown) marked, consigned and destined as indicated below, which the carrier agrees to carry and to deliver to the consignee at the said destination, if on its own authorized route or otherwise to clause to be carried by another carrier on the route to said destination at the applicable rates.

BILL OF LADING NUMBER	COMMODITY	QUANTITY	WEIGHT	LITRES
<u>1361</u>	<u>Woolly, Red</u>	<u>12 bales</u>	<u>17,000</u>	
<u>1362</u>	<u>CEMENT</u>	<u>7 bales</u>	<u>12,000</u>	

DECLARED VALUE: MAXIMUM LIABILITY (\$4.41/KG) \$2.00 PER POUND COMPUTED ON TOTAL WEIGHT OF THE SHIPMENT UNLESS DECLARED VALUATION STATES OTHERWISE

DECLARED VALUE EXPLANATION	CONSIGNEE'S SIGNATURE	DISPATCHER

NOTICE OF CLAIM (a) No carrier is liable for loss, damage or delay to any goods under the Bill of Lading unless notice thereof setting out particulars of the origin, destination and date of shipment of the goods and the estimated amount claimed in respect of such loss, damage or, delay is given in writing to the originating carrier or the delivering carrier within sixty (60) days after the delivery of the goods, or in the case of failure to make delivery, within nine (9) months from the date of shipment. (b) The final statement of the claim must be filed within nine (9) months from the date of shipment together with a copy of the paid freight bill. NO CLAIM WILL BE RECOGNIZED UNLESS REPORTED TO THE CARRIER WITHIN 7 DAYS.

DRIVER INSTRUCTIONS 11/10/81

3rd TRIP REPORT				DRIVER'S NAME	DRIVER NUMBER	N° 00001
DATE	YEAR	MO.	DAY	FROM	TO	FUEL PURCHASES
11/10/81						

2nd TRIP REPORT				DRIVER'S NAME	DRIVER NUMBER	N° 00001
DATE	YEAR	MO.	DAY	FROM	TO	FUEL PURCHASES
11/10/81						

1st TRIP REPORT				DRIVER'S NAME	DRIVER NUMBER	N° 00001
DATE	YEAR	MO.	DAY	FROM	TO	FUEL PURCHASES
11/10/81						

APPENDIX D

ECHO BAY MINES LTD.

DRIVER #1		DRIVER #2	
NAME: <u>1 Smith</u>	NAME: <u>2 Jones</u>	ADDRESS: <u>345 Main St</u>	ADDRESS: <u>678 Main St</u>
PHONE: <u>777-1234</u> BUSINESS: <u>555-1234</u>	PHONE: <u>444-5678</u> BUSINESS: <u>333-5678</u>	DRIVER'S LICENCE #: <u>12345678</u>	DRIVER'S LICENCE #: <u>87654321</u>
INSURANCE CO.: <u>ABC Insurance</u>	INSURANCE CO.: <u>DEF Insurance</u>	AGENT: <u>John Doe</u>	AGENT: <u>Jane Smith</u>
POLICY NUMBER: <u>123456789</u>	POLICY NUMBER: <u>987654321</u>	VEHICLE REGISTRATION: <u>12345678</u>	VEHICLE REGISTRATION: <u>87654321</u>
UNIT NUMBER: <u>1234</u>	UNIT NUMBER: <u>5678</u>	REGISTERED OWNER: <u>Echo Bay Mines Ltd.</u>	REGISTERED OWNER: <u>Echo Bay Mines Ltd.</u>
DATE OF ACCIDENT: <u>Jan 28 - 93</u>	TIME: <u>10:15 AM</u>	LOCATION (INCLUDE NAME OF LAKE, PORTAGE, APPROX. MILEAGE): <u>13 miles N of Smith Lake</u>	
CONDITION OF VEHICLE BEFORE ACCIDENT: <u>Good</u>	CONDITION OF VEHICLE BEFORE ACCIDENT: <u>Good</u>	AFTER ACCIDENT: <u>1 - F - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26 - 27 - 28 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37 - 38 - 39 - 40 - 41 - 42 - 43 - 44 - 45 - 46 - 47 - 48 - 49 - 50 - 51 - 52 - 53 - 54 - 55 - 56 - 57 - 58 - 59 - 60 - 61 - 62 - 63 - 64 - 65 - 66 - 67 - 68 - 69 - 70 - 71 - 72 - 73 - 74 - 75 - 76 - 77 - 78 - 79 - 80 - 81 - 82 - 83 - 84 - 85 - 86 - 87 - 88 - 89 - 90 - 91 - 92 - 93 - 94 - 95 - 96 - 97 - 98 - 99 - 100</u>	AFTER ACCIDENT: <u>1 - F - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26 - 27 - 28 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37 - 38 - 39 - 40 - 41 - 42 - 43 - 44 - 45 - 46 - 47 - 48 - 49 - 50 - 51 - 52 - 53 - 54 - 55 - 56 - 57 - 58 - 59 - 60 - 61 - 62 - 63 - 64 - 65 - 66 - 67 - 68 - 69 - 70 - 71 - 72 - 73 - 74 - 75 - 76 - 77 - 78 - 79 - 80 - 81 - 82 - 83 - 84 - 85 - 86 - 87 - 88 - 89 - 90 - 91 - 92 - 93 - 94 - 95 - 96 - 97 - 98 - 99 - 100</u>
WHERE DAMAGE OCCURRED: <u>Back wheel</u>	WHERE DAMAGE OCCURRED: <u>Front wheel</u>	EST. DAMAGE \$ <u>1200.00</u>	EST. DAMAGE \$ <u>1200.00</u>

(CIRCLE APPROPRIATE HEADING) ROAD CONDITIONS

1 - NORMAL ICE ROAD CONDITIONS	5 - DUSK	9 - LAKE CRACKED ICE
2 - DARKNESS	6 - EARLY MORNING	10 - CLEAR GOOD VISIBILITY
3 - SNOWING	7 - BRIGHT SUN	11 - WATER ON ROAD
4 - ICE FOG	8 - ON CURVE (PORTAGE)	

SKETCH OF ACCIDENT SCENE — JOIN DOTS THEN DRAW IN VEHICLE — THEN COMPLETE "CIRCUMSTANCES OF ACCIDENT" FORM FOLLOWING.

NORTH
→

APPENDIX E

ECHO BAY MINES LTD.

DAMAGED EQUIPMENT LOG

DATE: <u>JAN 28 - 93</u>	SHOP LOCATION: <u>Lockhart Lk.</u>	UNIT NO.: <u>1386</u>
NATURE OF DAMAGE:		REPORTED BY: <u>Todd Flannitsch</u>
<u>2 Tires skidded</u>		
PROBABLE CAUSE:		
<u>Driver Failed To increase with wheels</u>		
<u>Went Turning</u>		
COST OF REPAIR:	\$ VALUE	
<u>2 New Tires</u>	<u>658.00</u>	
<u>Freight</u>	<u>200.00</u>	
<u>Slope Time 4 hrs x 50.00</u>	<u>200.00</u>	
<u>16 W</u>	<u>Phil Flannitsch</u>	TOTAL COST <u>\$ 1050.00</u>
SHOP FOREMAN	WH SUPERINTENDENT	

APPENDIX F

TRACTOR TRAILER PRE-TRIP INSPECTION

APPROACHING VEHICLE — Look for oil, water or fuel leaks.

INSIDE CAB

- 1) Apply parking brake, start engine.
- 2) Check oil pressure, warning lights and air pressure (for vacuum).
Deplete pressure until warning buzzer sounds.
- 3) Sound the horn, test for excess amounts of wheel play
- 4) Test washer/wiper and examine windshield for cracks.
- 5) Check mirrors on both sides of cab to ensure they are clean and aligned.
- 6) Test heater/defroster blower
- 7) Check for charged fire extinguisher and emergency equipment.
- 8) Turn on all lights/flashers (low beam headlamps) and apply trailer emergency brakes.

LEAVE CAB (engine running) & WALK TOWARD REAR

- 1) Check to ensure that the fuel tank cap is tightly secured and no leaks.
- 2) Drain air tanks.
- 3) Examine left rear tractor wheels and tires for lugs, cuts, wear and inflation (thump tires).
- 4) Ensure that the 5th wheel is locked.
- 5) See if electrical connector is firmly seated and free from chafing.
- 6) *Inspect air hoses for chafing, air leaks and proper support.*
- 7) Ensure that the landing gear is raised and secured.
- 8) Where applicable, check for proper placarding and shipping papers.
- 9) Inspect and clean sidemarker lights and reflectors.
- 10) Where applicable, inspect sliding tandem lock.
- 11) Inspect left rear trailer wheels/tires. Check for air brake leaks.

REAR OF TRAILER

- 1) Check to see if all lights are burning and clean as required. All reflectors *should be intact.*
- 2) Ensure that all doors (or tie-downs) are secured.

RIGHT & LEFT SIDES OF VEHICLE

- 1) Inspect lights, reflectors, tires and wheels.

FRONT OF TRACTOR

- 1) Inspect front tires and wheels.
- 2) Inspect headlamps, clearance & identification lights, flashers & turn signals.

BACK IN CAB

- 1) Depress dimmer switch, observe high beam lights.
- 2) With trailer brakes still on, release tractor brakes and (in 1st gear) gently engage clutch to test tractor/trailer coupling.
- 3) Apply foot brake for 1 minute. Air loss should not exceed 4 psi/minute for combination rig.

THIS AGREEMENT is effective the day of

BETWEEN

(hereinafter called the "Operator")

OF THE FIRST PART

- and -

ECHO BAY MINES LTD., a body corporate, incorporated under the Laws of Canada, having its Head Office in the City of Edmonton, in the Province of Alberta

(hereinafter called "EBM")

OF THE SECOND PART

WHEREAS EBM has obtained a licence from the Department of Indian Affairs and Northern Development to use and occupy certain lands in the Northwest Territories for the purpose of constructing and operating an access road from Tibbet Lake to EBM's Lupin Mine at Contwoyto Lake.

AND WHEREAS such access road is a seasonal road constructed largely on frozen lakes, rivers and streams and is therefore useful only during a short period of time each winter (which period varies with the weather conditions encountered).

AND WHEREAS Operator wishes to utilize such access road for the purposes of hauling goods in quantities exceeding three (3) ton.

Therefore The Parties Agree As Follows:

1. In this Agreement:

- (a) "Dangerous Goods" means at any time Goods of any nature or kind which either:
 - (i) any legislation then in force restricts or controls the storage, handling or transportation of, including without limitation *The Transportation of Dangerous Goods Act (Canada)*, *The Transportation of Dangerous Goods Act 1990* (Northwest Territories) and regulations thereunder, or

- (ii) constitute "deleterious substances" or "contaminants" under *The Fisheries Act (Canada)* or *The Environmental Protection Act* (Northwest Territories),
- (b) "Goods" means all materials, equipment, substances or products of whatsoever nature or kind,
- (c) "Licence" means Licence #75 M/11-1-2 issued by the Licensor,
- (d) "Licensor" means Her Majesty the Queen in right of Canada as represented by the Department of Indian Affairs and Northern Development,
- (e) "Licence Area" means the lands described in the sketch appended hereto;
- (f) "Term" means the period from January 1st to April 15, 1994; and
- (g) "Winter Road" means the road (primarily an ice road) constructed by EBM in the Licence Area.

2. Subject to Operator complying with the terms and conditions of this Agreement, EBM grants to Operator (including any contractors or agents retained by the Operator and approved by EBM) a non-exclusive, non-assignable permission to use EBM's Winter Road for the purposes of transporting Goods on the Winter Road. In this Agreement all reference to the Operator or EBM shall include their respective directors, officers and employees, where applicable.

3. Subject to EBM's rights to close or suspend use of the Winter Road or portions thereof as specified below, the permission granted herein shall only continue during the Term and shall apply only insofar as the uses referred to in this Agreement. EBM does not, by entering into this Agreement, undertake to construct, maintain or operate the Winter Road for a specific period of time or at all and EBM shall have no liability to Operator if Operator is unable to make the use it desires of the Winter Road.

4. Operator acknowledges that the Winter Road is constructed primarily over terrain (tundra, lakes, rivers and streams) which can only be used when frozen sufficiently to both facilitate passage and protect the terrain from damage. As a consequence EBM shall have the right to suspend usage of, or close, all or any part of the Winter Road when, in EBM's sole discretion, continued use of the Winter Road or portion involved may be unsafe or may threaten the future usefulness of the Winter Road or may result in EBM being in breach of its obligations under the Licence.

5 Operator shall pay to EBM the sum of \$0 13 per loaded ton/kilometre for Goods transported on the Winter Road (in either direction) and shall reimburse EBM for any taxes or other assessments levied on EBM in relation to the Licence Area by reason of Operator's use of the Winter Road and its activities in relation thereto. Operator is advised that the consideration paid to EBM is based on Operator bearing a share of EBM's cost of constructing, maintaining, replacing and operating the Winter Road ("Winter Road Costs") which is proportionate to Operator's estimated use of the Winter Road (in ton/kilometres) compared to EBM's estimate of total usage by all commercial users, including EBM, of the Winter Road (in ton/kilometres)

EBM will allow any independent auditors properly engaged in public practice in Alberta or the Northwest Territories and retained by the Operator at the Operator's expense to review EBM's records relating to the Winter Road Costs to verify the reasonableness of EBM's charge in relation to both the costs incurred and to be incurred and the estimated usage provided such auditors covenant to keep confidential all specific information made available to them for the purposes of their reasonableness check

6. Operator's use of the Winter Road shall be entirely at the Operator's risk. Neither EBM nor the Licensor shall have any liability to the Operator (including any contractors or agents retained by the Operator) for any loss or damage suffered by Operator (including any contractors or agents retained by the Operator) directly or indirectly as a result of its use of the Winter Road howsoever and whensoever caused, including without limiting the generality of the foregoing, negligence of EBM or the Licensor, or their respective contractors or agents, or any of the following:

- (a) delays in the construction, maintenance, repair, replacement or operation of the Winter Road;
- (b) the state of repair or maintenance of the Winter Road or lack thereof, however arising;
- (c) the acts or omissions of any person using the Winter Road;
- (d) the promulgation (or lack thereof) of rules and regulations by EBM or the Licensor; and
- (e) the erection (or failure thereof) by EBM of warning signs relative to the Winter Road.

Notwithstanding the foregoing, collision damage to Operator's vehicles to the extent attributable to the negligence of EBM, its employees or agents is not excluded by this paragraph 6

- 7 The Operator shall, prior to making any use of the Winter Road, provide EBM with
- (a) an estimate of the quantities of Goods proposed to be shipped on the Winter Road (including start and end points of shipment on the Winter Road);
 - (b) Operator's plan relative to clean-up of any spills or other debris in the Licence Area or repair of damage to the Winter Road, in either case resulting from Operator's use of the Winter Road;
 - (c) a description of Operator's equipment, facilities and personnel available (including location) for clean-up of spills or repair or damage cause to the Winter Road or other terrain in its Licence Area,
 - (d) a list of the contractors or agents, if any, and the employees proposed to be used by the Operator, in its use of the Winter Road during the term;
 - (e) a list of the vehicles and loading proposed to be used in the transportation of goods on the Winter Road, and
 - (f) the name of Operator's representative(s) (on a 24 hour a day basis) for the purposes of this Agreement.

The Operator shall give EBM specific prior notice of each occasion on which it intends to use the Winter Road for the transportation of Dangerous Goods. Such notice shall specify the nature of the Dangerous Goods, the quantity of Dangerous Goods involved, the portions of the Winter Road used and complete details as to the type of vehicles and containers proposed to be used. Such notice shall be given not less than 24 hours prior to the proposed commencement of use of the Winter Road to transport the Dangerous Goods. EBM shall have the right to inspect the Dangerous Goods, the transporting vehicles(s) and container(s) and all papers related to such transportation and to either restrict (see paragraph 8(c)) or set special conditions applicable to the use of the Winter Road for the carriage of such Dangerous Goods. The granting of any permission by EBM for the Operator to use the Winter Road (with or without special conditions) for the carriage of Dangerous Goods shall not reduce or limit the Operator's liability under this Agreement for any loss or damage which occurs as a result of such use.

8 Notwithstanding the execution of this Agreement and any other specific rights of inspection or control provided to EBM in this Agreement, EBM shall have the right to prevent the Operator from making use of the Winter Road, if in EBM's sole reasonable opinion

- (a) Operator is unlikely to be able to safely use the Winter Road having regard to the vehicles and loading proposed,
- (b) Operator is unlikely to be able to quickly clean-up any spills which may occur or to remedy any damage potentially caused,
- (c) the Operator proposes to transport Dangerous Goods in any circumstances which EBM considers as constituting, due to their hazardous nature, an unacceptable risk to the environment or EBM (insofar as its liability obligations under the Licence); or
- (d) the Operator proposes to use a contractor or agent which, or an employee who, EBM has not approved, such approval not be unreasonably withheld.

If at any time the Operator wishes to use the winter Road to haul a load which exceeds the weight restrictions then being imposed by EBM, the Operator shall advise EBM of all details relevant to such load and obtain EBM's specific prior approval (confirmed by fax) to the use of the Winter Road to transport such load. Any approval by EBM may contain special terms and conditions to be followed by the Operator and may be issued on the condition that the Operator is responsible for any extraordinary costs involved by EBM in relation to the use of the Winter Road for the carriage of the over weight load.

9. EBM shall advise the Operator of each occasion on which EBM proposes to conduct a regularly scheduled check of the depth of ice on the Winter Road. Such notice shall be given at least 24 hours in advance of the scheduled commencement of the check. The Operator shall have the right, at its expense, to have its personnel accompany EBM's personnel while conducting the check. In any case where a check of ice conditions is required on an emergency basis, EBM may commence the check without giving the Operator prior notice but shall advise the Operator as soon as practicable of the nature and location of the checks being made and the Operator shall be entitled to have its personnel accompany EBM's personnel in performing such checks as soon as its personnel are able to get to the appropriate location(s).

Where the Operator requests that a check of ice be made and EBM agrees that a check is reasonable in the circumstances, EBM will proceed to carry out the check and the Operator's personnel may accompany EBM's personnel. Where the Operator requests that a check be made and EBM refuses to perform the same, the Operator may carry out such check. In any such

case the Operator will advise EBM of the place and time of the check and EBM shall have the right to have its personnel present

10 The Operator shall clean up all spills of Goods and any substances originating in the Operator's vehicles or equipment in the Licence Area and repair any damage to terrain in the Licence Area, in either case to the standard required by the Licensor or any legislation. Upon expiry of the Term, Operator shall remove from the Winter Road all buildings, equipment, materials, fuel or other storage containers utilized by Operator.

11. Operator shall immediately report to EBM details of any accident, spill or travel infraction which Operator becomes aware of relative to use of the Winter Road. Operator shall also advise EBM of any damage to terrain in the Licence Area of which Operator becomes aware.

12. Operator shall comply (and ensure compliance by its contractors, employees and agents) with all rules and regulations issued by EBM relative to use of the Winter Road, including without limitation the following

- (a) all vehicles are subject to search by EBM's representatives at any time while on the Winter Road where EBM has reasonable cause to believe that the vehicles are transporting alcohol, drugs or Dangerous Goods;
- (b) maximum speed limits will be set by EBM;
- (c) alcohol and drugs are prohibited on the Winter Road, and at any camps on the Winter Road;
- (d) vehicle separation is mandatory with the minimum separation being one-half kilometre between vehicles;
- (e) vehicles are not to travel alone and a minimum of two vehicles are to travel together (subject to the minimum separation) at all times;
- (f) road maintenance is not to be interfered with or hindered in any way and is to take precedence over hauling;
- (g) road closures will be set by EBM's representatives as required at EBM's sole discretion,

- (h) fuel and Dangerous Goods spills must be reported immediately to EBM and the environmental protection agency (through the spill line, telephone number 403-920-8130),
- (i) drivers are required to rest a minimum of 8 hours in any 24 hour period,
- (j) all drivers will stop when requested to do so by EBM;
- (k) overland travel shall be suspended if rutting or gouging occurs, and
- (l) survey monuments shall not be damaged or moved

EBM will advise the Operator by signs on the Winter Road or by fax of changes made from time to time in the rules applicable to the use of the Winter Road. Until the Operator (or its personnel or contractors) receives notice of any change by either of the forms of notice specified, the rules in effect prior to the change will be deemed to be in effect for the purposes of this Agreement

13 In addition to using its best efforts to ensure that its employees comply with the rules of the road set out above, the Operator shall, upon being advised or made aware of any infraction by its employees of said rules, impose or cause to be imposed on such employees the following penalties, to the extent applicable having regard to terms of employment:

- (a) exceeding the speed limit
 - (i) first offence - three (3) days suspension without pay;
 - (ii) second offence - seven (7) days suspension without pay;
 - (iii) third offence - the driver will be banned from driving on the Winter Road for the remainder of the haul season, or
 - (iv) accident resulting from speeding - the driver will be banned from driving on the Winter Road for the remainder of the haul season.
- (b) alcohol and drugs
 - (i) the driver will be banned from driving on the Winter Road (the driver will not be permitted to continue the trip during which the infraction was discovered)

- (c) vehicle separation infractions
 - (i) first offence - written warning,
 - (ii) second offence - three (3) days suspension without pay,
 - (iii) third offence - seven (7) days suspension without pay;
 - (iv) fourth offence - the driver will be banned from driving on the Winter Road for the remainder of the haul season.
- (d) interference with road maintenance activities:
 - (i) first offence - written warning;
 - (ii) second offence - the driver will be banned from driving on the Winter Road for the remainder of the haul season.
- (e) ignoring a road closure posting:
 - (i) first offence - seven (7) days suspension without pay;
 - (ii) second offence - the driver will be banned from driving on the Winter Road for the remainder of the haul season.
- (f) non-reporting of fuel or Dangerous Goods spills:
 - (i) first offence - seven (7) days suspension without pay;
 - (ii) second offence - the driver will be banned from driving on the Winter Road for the remainder of the haul season.
- (g) failure to observe required rest period:
 - (i) first offence - written warning;
 - (ii) second offence - three (3) days suspension without pay;
 - (iii) third offence - seven (7) days suspension without pay;

- (iv) fourth offence or (i), (ii) or (iii) above, coupled with any other offence - the driver will be banned from driving on the Winter Road for the remainder of the haul season
- (h) refusal to stop when requested to do so.
- (i) the driver will be banned from driving on the Winter Road for the remainder of the haul season.

The Operator shall also require that any contractor or agent retained by the Operator contractually imposes, to the extent possible, all of the aforementioned penalties on its employees, having regard to the terms of their employment.

14 Operator acknowledges that the Winter Road has been constructed by EBM primarily for its own use and that significant quantities of EBM goods and fuel are scheduled to be transported on the Winter Road. It shall be Operator's responsibility to schedule its use of the Winter Road with EBM such that its usage does not conflict with EBM's proposed use. Operator shall bear all costs or losses (of either Operator or EBM) arising as a result of Operator failing to properly schedule its use of the Winter Road with EBM

Without limiting the generality of the foregoing and to assist in co-ordinating their respective use of the Winter Road, EBM and the Operator will provide to each other, by fax, their then current dispatch for vehicles using the Winter Road at least three times a day within the following time periods:

0800	-	0830 hours
1200	-	1300 hours
1800	-	1900 hours

In addition to providing the daily dispatch information specified, EBM will advise the Operator of all road closures and openings as soon as is practicable after such information is available.

15. EBM shall have the right to terminate this Agreement on notice to the Operator in any of the following circumstances:

- (a) if the Operator shall fail to fulfil any obligation under this Agreement and such failure shall continue for more than ten (10) days after notice from EBM to remedy the same;

- (b) if the Operator shall become bankrupt or insolvent or acknowledges its bankruptcy or insolvency or be ordered wound up by a court of competent jurisdiction or make a general assignment for the benefit of creditors or have a receiver, receiver and manager or trustee in bankruptcy appointed on its behalf

16. Neither EBM nor the Operator shall be liable to the other for any failure to perform or delay in the performance of, its obligations hereunder, nor be deemed to be in breach of this Agreement if such failure or delay has arisen from "Force Majeure" "Force Majeure" means circumstances and conditions beyond the control of the party affected thereby which render it impossible for such party to fulfil its obligation under this Agreement or which will delay such fulfilment. Force Majeure shall include, but not be limited to, the following matters: war; acts of foreign enemy; civil war, earthquake, flood, fire or other natural physical disaster; strike or lock-out Shortages of labour, materials, transportation or utilities shall not constitute Force Majeure unless caused by circumstances which are themselves Force Majeure. Lack of finances or inability to perform because of the financial condition of a party shall not constitute Force Majeure.

If either EBM or the Operator is prevented from, or delayed in, performing any of its obligations under this Agreement by Force Majeure, such party shall as soon as possible notify the other party of the circumstances constituting Force Majeure and of the obligations the performance of which will thereby be delayed or prevented and the party giving the notice shall thereupon be excused the performance or punctual performance, as the case may be, of such obligations in the period of time directly attributable to such prevention or delay.

17. The Operator shall at all times during the period in which the Operator is involved in any way in using the Winter Road maintain (and cause its contractors or agents to maintain) the following insurance coverage:

- (a) Workers' Compensation insurance covering all employees engaged in such work in accordance with the statutory requirements of the applicable authority;
- (b) vehicle/aircraft/watercraft/snowcraft liability insurance covering all motor vehicles, aircraft, watercraft or snowcraft owned, operated, leased, licensed or chartered by or on behalf of the Operator, its contractors and agents providing coverage for the injury or death of one or more persons and the damage or destruction of property (including loss of use thereof) as a result of any one accident or occurrence to a limit of not less than 6 million dollars;
- (c) a policy of comprehensive general liability insurance providing coverage for EBM, the Operator, its contractors and agents and their directors, officers, and

employees for damages relating to bodily injury or death sustained by any person or persons, personal injury, damage to or destruction of property (including damage or loss sustained by reason of loss of use thereof (such loss of use to include the loss of use of property which has not been injured, destroyed)) by or due to an accident or occurrence in an amount of not less than 6 million dollars,

- (d) if requested by EBM in circumstances where such coverage is not reasonably provided through any other of the insurances referred to above, insurance affording environmental protection coverage with limits of liability of not less than 2 million dollars in respect of each occurrence or accident

All policies of insurance required to be provided by the Operator shall be subject to the approval of EBM as to the insurer and as to the adequacy of the protection. The Operator shall furnish, and cause each contractor or agent engaged by it to furnish, to EBM, prior to commencement of any work, certified copies or satisfactory evidence of the obtaining and maintaining in force of all required insurance. All such policies shall contain a provision that the policies cannot be cancelled or materially altered without at least thirty (30) days prior written notice to EBM. All policies which do not insure EBM as a named insured shall include a waiver of subrogation in favour of EBM, its directors, officers and employees.

18 The Operator shall indemnify and save harmless EBM (including its directors, officers and employees) from any and all claims, demands, losses, costs, damages, actions, suits or proceedings by whosoever made, sustained, brought or prosecuted in any manner based upon, occasioned by or attributable to:

- (a) the acts or omissions of the Operator (including its contractors or agents) and their respective employees in the License Area or on the Road; or
- (b) the performance, non-performance or improper performance of its obligations under this Agreement by the Operator (including contractors and agents) and their respective employees, whether occasioned by negligence or otherwise;

and whether the same arises before or after termination of this Agreement.

19. The Operator shall, in using the Winter Road and in performing its obligations pursuant to this Agreement, comply with all laws, regulations, codes and other requirements of governmental authorities applicable thereto

The Operator shall cause any of its contractors or agents using the Winter Road and performing obligations on behalf of the Operator pursuant to this Agreement, to comply with

all laws, regulations, codes and other requirements of Governmental authorities applicable thereto.

The Operator further undertakes that all its employees and its contractors or agents, using the Winter Road, will be experienced and skilled in their tasks and that all vehicles and equipment utilized will be in good operating condition, properly maintained and fully equipped with all safety, clean-up and survival equipment required by EBM.

20. All notices, including requests, demands, invoices and other communications pursuant to this Agreement shall be in writing and shall be deemed to have been given only if personally delivered or mailed by prepaid registered mail or faxed

TO EBM AT: Echo Bay Mines Ltd
 Box 93
 Nisku, Alberta
 TOC 2GO
 Attention: Director, Transportation
 Fax: (403) 890-7060

TO OPERATOR AT.

Any notices personally delivered in the manner set out herein shall be deemed given when personally delivered and any notices mailed in the manner set out below shall be deemed given on the third (3rd) business day following the day of mailing (in the absence of postal disruptions) and any notices faxed shall be deemed given on the business day following the day of faxing.

Either party may from time to time by proper notice, change its address as detailed herein.

21. Time shall be of the essence of this Agreement.

22. Captions and headings appearing in this Agreement are inserted merely to facilitate reference and shall have no bearing on the interpretation of the provisions hereof.

23. In the event any of the terms or conditions of this Agreement or the application of any such terms and conditions to any party or circumstance shall be held invalid by any court or other regulatory authority having jurisdiction, the remainder of this Agreement or the application of the terms and conditions contained herein to parties or circumstances other than those as to which it is held invalid shall not be affected thereby.

24. This Agreement shall when duly executed constitute the entire contract between the parties and shall supersede and replace all other existing agreements between the parties in respect of the subject matter hereof

25. The obligations imposed by this Agreement and the rights and remedies available hereunder shall be in addition to and not in limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law

26. No action or failure to act by a party shall constitute a waiver of any right or duty of either of the parties under this Agreement nor shall any such action or failure to act constitute an approval of or acquiescence in any breach hereof, except where specifically agreed to in writing.

27. The law of the Northwest Territories shall govern the interpretation of this Agreement and the parties hereby attorn to the jurisdiction of the courts in the Northwest Territories.

28. This Agreement may be executed in counterparts each of which shall be deemed to be an original and all of which shall be construed together as one original instrument.

29. Termination of this Agreement shall not affect the validity of any provisions of this Agreement which are, expressly or by implication, to serve or take effect on or after such termination or to continue to apply after termination.

30. If the Operator disagrees with any rules, regulations or decisions of EBM relating to the use of the Winter Road made by EBM pursuant to its authority under this Agreement and made after the date of this Agreement, the Operator shall give notice to EBM within 7 days of receipt of notice of the rule, regulation or decision of EBM which is disputed setting out the basis of the dispute. If the Operator gives EBM the required notice, EBM agrees that, insofar as EBM is concerned, any right of the Operator to refer such dispute to the Director (as defined in the License) for resolution shall not be prejudiced so long as the Operator refers the dispute to the Director prior to the date which is 30 days after the date of closure of the Winter Road and further that compliance by the Operator with the rule, regulation or decision in the interim shall be without prejudice to any such right of referral to the Director. Unless and until the Director varies a rule, regulation or decision of EBM such rule, regulation or decision shall be in force

and complied with. Decisions of the Director on any deferred dispute shall have no retroactive effect unless the Director so directs and the Director has the authority to make that direction.

EXECUTED BY THE PARTIES effective as the day and year first set out above.

ECHO BAY MINES LTD.

Per: _____

Per: _____

Per: _____

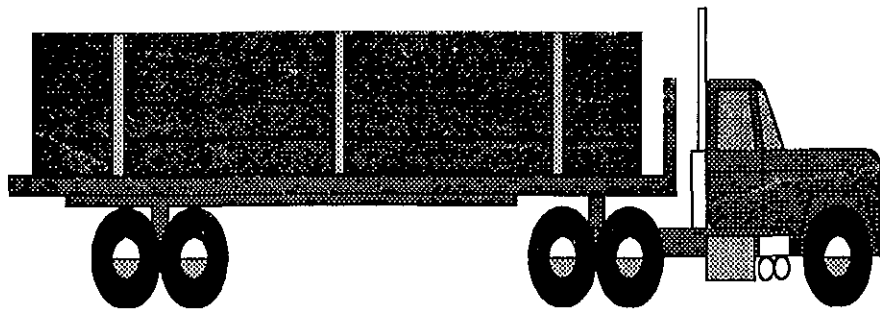
Per: _____

TRANSPORTATION EMERGENCY RESPONSE PLAN

**ECHO BAY MINES LTD.
WINTER ROAD OPERATIONS**

**P.O. Box 93
Nisku, Alberta
T0C 2G0**

**Phone: (403) 890 - 4580
Fax: (403) 890-7065**



November , 1993

Dear Sir:

**Re: Oil and Toxic Material Spill Contingency Plan
Echo Bay Mines Ltd.
Winter Road Operations**

RECEIVED
AUG - 5 1994

BHP MINERALS CANADA LTD.
VANCOUVER, B.C.

As required enclosed is a revised copy of the above captioned plan I would ask that you destroy all other copies of the Plan submitted to you in the past. Echo Bay will continue to update the Plan as required and will forward such updates as necessary to you

We respectfully request the board's approval at your earliest convenience.

Please feel free to contact me for any clarifications.

Yours Truly,

A handwritten signature in dark ink, appearing to read "Phil Flaumitsch", written over a horizontal line.

Phil Flaumitsch

W R. Superintendent

ECHO BAY MINES LTD.

AVIATION DEPARTMENT, EDMONTON INTERNATIONAL AIRPORT
BOX 93, NISKU, ALBERTA T0C 2G0
TELEPHONE (403) 890 7979
FAX (403) 890-7060
TELEX 037-43184

RECEIVED
AUG - 5 1994
BHP MINERALS CANADA LTD.
VANCOUVER, B.C.

August 03, 1994

BHP MINERALS CANADA LTD.
1050 West Pender Street
Suite # 1600
Vancouver, B.C.
V6E 3S7

Attention: **Mr. Daniel D. Johnson**
Project Manager
Engineering and Construction

Re: **ECHO BAY EMERGENCY RESPONSE PLAN.**

Dear Dan;

Attached for your review are the following; a brief history of the Echo Bay Mines Winter Road, Driver Policy and Procedures Manual, and the Transportation Emergency Response Plan. Amendments to the Response Plan will be issued prior to the start of the 1995 Winter Road Season.

As per our telephone conversation of this date, Echo Bay will have completed all camp and equipment overhauls and will have taken receipt of all new equipment prior to January 01, 1995.

We are targeting September 15th, 1994 as a deadline to have the 1995 Third Party Haul rates and User Agreements prepared for distribution.



If you have any further questions regarding the enclosed material please contact myself or Phil Flaumitsch.

Regards

A handwritten signature in black ink, appearing to read 'Al Philpott', with a stylized, cursive script.

Al Philpott

DIRECTOR OF TRANSPORTATION

AP:rf

enclosure.

ECHO BAY WINTER ROAD HISTORY

First Year: 1982 to 1983

There was an old road from Tibet Lake to the South End of Warburton Bay. Robinson's Trucking was hired by Echo Bay to open the road from Tibet to Lac De Gras. Echo Bay opened the road from the Lupin Mine Site to Lac De Gras. Robinson's Trucking (RTL) had the contract to haul all fuel and freight to the mine site.

Second Year: 1983 to 1984

RTL was given a contract to open the road from Tibet to Drybones Lake. Echo Bay looked after maintenance for the entire road during this year.

Third Year: 1984 to 1985

RTL again was given the contract to do the first pass over the Winter Road. Then Echo Bay was responsible for the maintenance for the entire year and RTL had the fuel and freight haul for this year.

Fourth Year: 1985 to 1986

Echo Bay purchased small equipment for opening and maintaining the Winter Road. RTL had the fuel and freight haul to the Lupin Mine Site. However, Echo Bay put two trucks on the fuel haul to compare costs with the RTL haul. We found that Echo Bay could haul fuel cheaper.

Fifth Year: 1986 to 1987

Echo Bay opened and maintained the Winter Road and at different times would hire RTL equipment to help maintain the road . Echo Bay also added two more fuel trucks and did a lot of widening and upgrading (construction) on the portion of the road south of Drybones Lake.

Sixth Year: 1987 to 1988

Echo Bay looked after opening and maintaining the road again this year. During this period Echo Bay did a lot of portage upgrading and construction south of Lac De Gras. The sum of approximately \$450,000.00 was spent to complete this construction. During this year RTL had the contract for all of the freight being hauled to Lupin and about 50% of the fuel being hauled to Lupin. Echo Bay were operating 15 dry lease trucks with EBM employed truck drivers and they were responsible for hauling the rest of the fuel - approximately 50%.

Seventh Year: 1988 to 1989

Echo Bay again opened and maintained the Winter Road. Due to the fact that this was a year of extreme weather conditions, Echo Bay hired one plow truck, two dozers, and one grader from RTL to help keep the road open on the north end.

Eighth Year: 1989 to 1990

Again Echo Bay was responsible for opening and maintaining the Winter Road. RTL had the contract for all of the freight and 50% of the fuel - Echo Bay hauled the other 50%. More construction work was done on the south end of the road; widening and improving portages by gravelling problem areas

Ninth Year: 1990-1991

In June of 1990 Echo Bay received the L.O. for the Winter Road from Tibet Lake to the Lupin Mine Site. Echo Bay opened and maintained the Winter Road using RTL as a contractor for the movement of all freight and 50% of the fuel. More construction work was done at this time on the north end, with a summer project on Portage #1.

Tenth Year: 1991-1992

Echo Bay opened and maintained the Winter Road. RTL was the haul contractor for all freight and 50% of the fuel. Echo Bay was not pleased with the costs, so we had to look at getting better rates. During this period we reviewed the cost of the fuel haul: RTL verses EBM and the cost of freight from Edmonton to the Lupin Mine Site. Echo Bay then decided to get pricing on freight Edmonton to Lockhart Lake and hiring of Leased Operators to haul from Lockhart Lake to Lupin. There were two prices received: one from Robinson's Trucking and one from Grimshaw Trucking. There was a significant difference between the contractor's prices - with Grimshaw being the lessor of the two bidders. At this point Echo Bay decided to go with Grimshaw's Proposal for freight movement and decided to go with Leased Operator's on the fuel haul to obtain cost savings.

Eleventh Year: 1992 to 1993

Echo Bay opened and maintained the Winter Road. Grimshaw was awarded the Freight Contract to Lockhart Lake. Echo Bay used Leased Operators for freight from Lockhart Lake to the Lupin Mine. The fuel haul was done by renting tankers and using Leased Operators. There was a great cost savings for Echo Bay Mines.

Twelfth Year: 1993-1994

Echo Bay was responsible for opening and maintaining the Winter Road from Tibet Lake to the Lupin Mine Site. Road Opening was started in mid-December 1993 in hopes of getting the road opened earlier - mainly to help the Diamond Exploration Companies. It also helped Echo Bay because as of March 1, 1994 the fuel and freight re-supply for Lupin was 90% complete - this is earlier than ever before.

For the 1993-94 Winter Road season, Echo Bay put the Freight Haul out to tender. This tender went to Robinson Trucking and Grimshaw Trucking. Grimshaw was awarded the freight contract for two years with an option for the third year.

TRANSPORTATION EMERGENCY RESPONSE PLAN

**ECHO BAY MINES LTD.
WINTER ROAD OPERATIONS**

**P.O. Box 93
Nisku, Alberta
T0C 2G0**

**Phone: (403) 890 - 4580
Fax: (403) 890-7065**

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RECORD OF AMENDMENTS

[illegible]

DISTRIBUTION LIST

[illegible]

DISTRIBUTION LIST

[illegible]

Revised November 1993

**ECHO BAY MINES LTD.
Oil and Toxic Material
Spill Contingency Plan
Winter Road Project**

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The purpose of the Echo Bay Mines Ltd (EBM) Oil and Toxic Material Spill Contingency Plan is to outline the means for responding to spills of petroleum products or toxic materials in a way that will minimize potential health hazards, environmental damage, and clean up costs. The objectives of the Plan are

- 1 to describe potential health and environmental risks arising from the release of any environmentally hazardous material along the winter road to the mine
- 2 to define procedures for the containment and clean up of the spills
- 3 to define the reporting procedure and communications network to be used in to event of a spill
- 4 to identify specific individuals and their responsibilities in a spill response situation
- 5 to provide an inventory of equipment and materials which could be used to safely contain a spill of petroleum or toxic material
- 6 to provide a list of contacts through which more equipment and supplies could be obtained in response to a spill
7. to provide a list of contacts which could provide more detailed information about specific toxic materials and accepted methods of containment, treatment and disposal The most toxic materials which are to be hauled are Sodium Cyanide and Lead Nitrate

Petroleum products which could pose an environmental threat in case of a spill include.

- diesel fuel - tanker
- aviation fuel - tanker
- gasoline - tanker
- lubricating oils - cubes or tanker
- hydraulic fluids - cubes or tanker

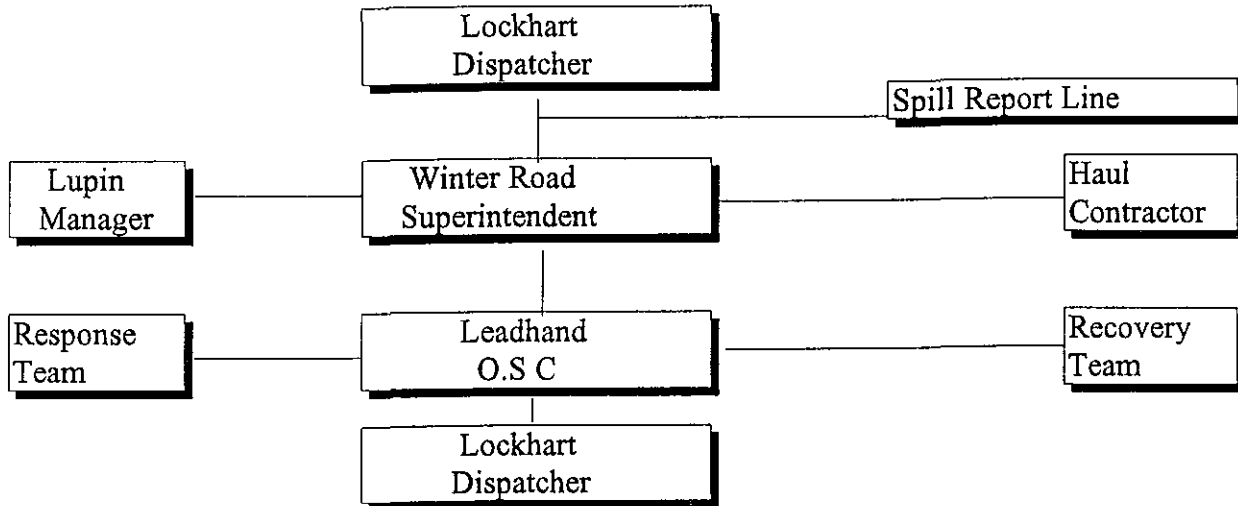
Less toxic substances to be hauled include.

- anfo (ammonium nitrate/fuel oil mixture) - Sealed Van
- ethylene (glycol-based antifreeze) - Flat Deck
- hydrated lime - Flat Deck
- ferric sulphate - Flat Deck

The bulk of the above mentioned substances will be stored and used in the mine/mill complexes with some being used at the exploration camps. All of these materials will be transported to the mine by truck along the winter road during the period of January through April each year.

SECTION 2

NOTIFICATION OF SPILL



RESPONSE TEAM ORGANIZATION

1. Rapid Response Team Training

Key winter road personnel are trained by the Petroleum Industry Training Service in the techniques of product containment, recovery and cleanup in the event of product discharge. These personnel are employees whose regular duties are with construction and maintenance of the road, safety and security or with the haul contractor. Training on recovery of hazardous chemicals will be provided by the suppliers as required. Echo Bay winter road personnel are trained on the self-contained breathing apparatus at the Lupin Mine Site. This training is also available to the Haul Contractor through the Mine Rescue Station located in Yellowknife, N W T.

2. Upon being informed of a toxic/hazardous spill on the Winter Road or at Lockhart or a Lac De Gras, The Winter Road Superintendent and/or his Leadhand(s) shall liaise with the Haul Contractor and offer Echo Bay's assistance in the containment, recovery and clean-up of a spill. Upon notification of a spill he/they will
 - a. proceed to the location,
 - b. assess the situation,
 - c. make arrangements for first aid and removal of injured personnel,
 - d. coordinate equipment support (with contractor, dependent on location),
 - e. make arrangements for necessary personnel required;
 - f. bring with him/them or have transported to the spill site, the necessary clean-up equipment from that available at the nearest location (Lockhart - Lac De Gras - Lupin - Yellowknife),
 - g. liaise with Emergency Response Personnel regarding containment, clean-up, and disposal procedures (SPILL REPORT LINE 403-920-8130),
 - h. make arrangements for removal of damaged vehicles,
 - i. turn over spill clean-up operation to the contractor on his arrival at the scene,

He/they shall also (if petroleum):

- a. protect the life/lives of anyone in the spill area;
- b. isolate or remove any potential ignition sources, if possible;
- c. locate likely sources or cause of spill and stop flow or release, (DO NOT TAKE UNNECESSARY RISKS)
- d. assess the likely size, extent and condition of spill,
- e. control access to area until assistance arrives;
- f. attempt to contain spread of the spill if possible using available equipment/materials,
- g. record all relevant information for reporting purposes,
- h. fill out "SPILL REPORT" as completely as possible,
- i. mail one copy of the completed form to:
 - Regional Manager
 - Water Resources Division
 - Northern Affairs Program
 - Indian and Northern Affairs Canada (INAC)
 - Box 1500
 - Yellowknife, NWT
 - X1A 2R3
- j. retain original report copies, sending copies to:
 - i) INAC above
 - ii) Mine Manager(Lupin), General Superintendent(Lupin), Winter Road Superintendent
 - iii) Edmonton Head Office Attn M. Walker 429-5863
 - iv) Edmonton Head Office Attn. Andy Hamel 890-4580
 - v) Lupin Mine Attn Dave Hohnstein 429-8756

RECOVERY TEAM

The role of the Recovery Team shall be as follows.

- a assemble the necessary personnel and equipment required to contain/clean-up/dispose of the spill
- b ensure all personnel are properly attired or have the proper clothing in their possession (should know what is required because of information passed from spill site),
- c proceed to the scene and report to the Winter Road Leadhand,
- d. assess the possibilities of danger to life, environment and equipment/property,
- e if necessary cordon/rope off the area,
- f determine if any chemical is escaping into the environment - remain upwind at all times,
- g. under the direction of the Leadhand or his designate take the necessary action required to reduce/stop/control any further chemical or petroleum product from escaping or causing damage to the environment (DO NOT TAKE UNNECESSARY RISKS),
- h attempt to determine the extent of environmental damage (if any) and whether it extends outside the original containment area,
- i liaise with Emergency Response Personnel regarding clean-up procedures and disposal
 - i) Spill Report Line - Yellowknife (403)920-8130
 - ii) Transportation Emergency Assistants Plan (403)477-8339
 - iii) Canutech (613)996-6666
 - iv) Dupont (901)357-1546
 - v) Transportation Emergency (800)424-9300
 - vi) Explosives Limited (403)255-7776
 - vii) I C I Canada (800)561-3636
- j The above will require the following information (use your spill report)
 - i) Name of Caller - Echo Bay/ Haul Contactor
 - ii) Name of Shipper - Dupont/Gulf/CIL, etc.

- iii) Name of Product - Sodium Cyanide/Lime/Acid, etc
- iv) Point of Departure - Edmonton/Yellowknife/USA
- v) Destination - Lupin/Yellowknife
- vi) Accident/Incident

1 **Response Team Action**

The role of the Response Team on arrival at a spill (if a fuel tanker) shall be as follows

- a. determine if anyone requires medical attention or is in danger from escaping product,
- b report location of accident/incident,
- c report product involved diesel/gasoline/aviation fuel/glycol, etc ,
- d determine if any product is escaping and
 - i) how much
 - ii) how to contain/stop/control leak
 - iii) install hatch cone for pumping off product (if necessary)
 - iv) contain the spill by taking the necessary action (dyking - sorbent booms - pits - etc)

2 **Recovery Team Action**

- a. connect hatch cones to pump off hoses;
- b release hatch lock inside hatch cone cover;
- c open shut-off valve,
- d commence off-loading vehicle;
- e should it not be possible int install hatch cone covers it may be necessary to puncture the tank on the high side and pump fuel out - "Caution" - a spark proof drill or other non-sparking tool should be used for this recovery procedure
- f after off-loading is completed, upright vehicle and remove from area,

- g. clean up containment area and remove to burn/disposal site,
- h. ensure all equipment is cleaned and stored in appropriate location should it be required at a later date (replace any equipment that cannot be used again)

The role of the Response Team after consultation with the Leadhand - O.S.C or their designates on arrival at a petroleum spill (other than a fuel tanker) should be as follows

- a. assemble the necessary personnel and equipment required to contain the spill,
- b. proceed to the scene with the Response Team and coordinate the overall containment/clean-up;
- c. assess the possibilities of any danger to life, property, or equipment,
- d. determine if any product is escaping,
- e. take necessary action required to reduce/stop/contain any further product from escaping;
- f. attempt to determine the extent of the damage and how far it extends beyond the original area,
- g. if contained within a berm, pump out that which is recoverable, then remove and replace the soil within the berm (transport it to the disposal site and burn it),
- h. if outside the berm attempt to determine whether the cause is from overflow or a damaged berm/line./line. Should the cause be a damaged liner, repair or replace it, and determine if it would be safe to burn off the spilled fuel or would the surrounding soil have to be removed to a disposal area and burned

ALERTING AND REPORTING PROCEDURES

SECTION 3

- 1 Whenever petroleum products or toxic materials become involved in a spill a potential disaster exists. This may result in loss of life, property or the financial cost of environmental clean up. This rapidity with which a spill is contained, cleaned up and disposed of, the less environmental damage and the lower the financial cost.
- 2 Therefore, the Contingency Plan deals with spills which might occur enroute to Lupin on the Winter Road.
- 3 Any spill occurring while fuel or toxic materials are being transported on the Winter Road must, and regardless of quantity spilled (Spill Quantities on p 12), will be reported immediately to the Lockhart Dispatcher who is responsible for notifying the proper authorities and calling the Spill Report Line 920-8130.

It shall be at the discretion of the Winter Road Superintendent of Echo Bay Mines to determine whether or not the road closure will be implemented until clean up of the spill is complete or a road by-pass is cleared.

AREAS OF CONCERN

The following locations are designated as area of concern.

Winter Road Grimshaw Trucking's Yard
Echo Bay Hangar and Yard
Lockhart Camp
Lac De Gras Camp
Winter Road - entire 390 miles

- 4 Any person(s) discovering or being involved in a petroleum or toxic material spill shall - on the Winter Road - notify

TITLE	LOCATION	TELEPHONE
Dispatcher	Lockhart Lake	435-7486
Winter Road Superintendent		429-8750 or 962-6721
Leadhand	Lockhart Lake	H.F 4765 or 435-7486
Leadhand	Lac De Gras	H.F. 4765 or 435-7412
Leadhand	Yellowknife	920-4835
Leadhand	Lupin	429-8764 or 8750
	H.F Radio Frequency	4765.0 - 4441.0
Grimshaw Trucking	Yellowknife	873-4548 or 4542
Lupin Mine Manager	Lupin	429-8787 or 429-5863
or Lupin Assistant Manager	Lupin	
Mgr Environmental & Regulatory Affairs - D Hohnstein	Lupin	429-8756 or 487-1795
Insurance Manager - P Suguira	Edmonton	429-5841 or 467-0309
Safety & Training - A Stuart	Lupin	429-8779

It shall be the responsibility of the Mine Manager or his designate to notify E B M Officers

- a) On receipt of pertinent data pertaining to petroleum/toxic material spill the following steps shall be taken
- 1 fill out "SPILL REPORT" as completely as possible before making report
 2. Report immediately to Yellowknife using the 24 hour Spill Report Line
24 HOUR SPILL REPORT LINE (403) 920-8130
 - 3 Where a fax machine is available follow up immediately by sending a copy of the Spill Report to: **FAX: (403) 873-6924**

NOTE Telephone calls can be made collect by informing the operator that you wish to

EMERGENCY TELEPHONE NUMBERS

Transportation Emergency Assistance Program (TEAP)	403-477-8339
Canutech	613-996-6666
Dupont	901-357-1546
Chemtrec	800-424-9300
Explosives Limited (24 hour number)	403-255-7776
I C I Canada (24 hour number)	800-561-3636

EMERGENCY RESPONSE TEAM

1	Vic Broadhead	Lac De Gras
2	Ron Lebrun	Lac De Gras
3	Allister(Scotty) Gardiner	Lac De Gras
4	Phil Flaumitsch	Lac De Gras
5	Don Stauffer	Lockhart Lake
6	Todd Flaumitsch	Lockhart Lake
7	Carl Ljunggren	Lockhart Lake
8.	Curtis Piesinger	Lockhart Lake
9	Walter Sopher	Lupin
10	Floyd Richardson	Yellowknife
11	Andy Hamel	Lockhart Lake

TABLE I

Quantities or Levels for Immediate Reporting		
Item	Column I	Column II
	Class and Division	Quantities or Levels
1	1	All
2	2 1	At least 100 L*
3	2 2	At least 100 L*
4	2 3	All
5	2 4	All
6	3	At least 200 L
7	4	At least 25 kg
8	5 1	At least 50 kg or 50 L
9	5 2	At least 1 kg or 1 L
10	6.1	At least 5 kg or 5 L
11	6 2	All
12.	7	Any discharge or a radiation level exceeding 10 mSv/h at the package surface and 200 uSv/h at 1 m from the package surface
13	8	At least 5 kg or 5 L
14	9 1	At least 50 kg
15	9 2	At least 1 kg
16	9 3	At least 5 kg or 5 L

* Container capacity

Reported by D-6630	Position, Employer, Location "A-1" "A-1", "A-1" "A-1" "A-1"	Telephone D-6630
Reported to P-6630 D-6630	Position, Employer, Location "A-1" "A-1", "A-1" "A-1" "A-1"	Telephone D-6630

SECTION 4

SPILL CONTAINMENT/RECOVERY EQUIPMENT - LOCATION

Spill containment/recovery equipment shall be at Yellowknife, Lockhart and Lac De Gras.

It shall include but not be limited to

Manpower

Heavy Equipment ie loaders, dozers, trucks & tankers

Sorbent Booms & Pads

Valves & Fittings

Hatch Cone Covers

Pumps & Parts

Polyethylene

Shovels - Assortment

Tiger Torches & Propane Bottles

Needle Bars and/or Ice Chisels

Ice Augers, Parts & Extensions

Hoses (of various sizes) & Fittings

Chainsaws & Parts

Hammers (varying sizes)

Lumber

Pri-Bars

Cable Cutters

Fire Extinguishers

Cable Slings & Shackles

Rakes & Pitch Forks

Dust Masks

All equipment is in a self contained van and is stored in such a manner as to be readily available on short notice. On completion of each spill response exercise, all equipment and materials are cleaned/replace and stored for further used should the need arise

GOVERNMENT AGENCIES**SECTION 5**Government of the NWT

* Mr Ken Hall	Business:	873-7654
* Mr Harvey Gauker (Alternate)	FAX.	873-0221
* Mr Neil Thompson (Alternate)		
* After hours Spill Line		920-8130

Government of Canada

* INAC Land Use & Water Use	FAX.	873-5763
* Mr Kevin McDonnell, Water Resources	Business.	920-8238
* Mr Howard Madill, Land Use	Business.	920-8257
* Mr Jim Umpherson, Reg Mgr., Land Use	Business	920-8165

EPS

* Mr Magnus Bourque	Business.	920-6060
	FAX.	873-8185
* Mr Dave Tilden	Business.	920-6060
	FAX	920-6054

Spill Report Line

Department of Renewable Resources	Telephone.	920-8130
	FAX	873-6924

EMERGENCY TELEPHONE NUMBERS

Transportation Emergency Assistance Plan	(403) 477-8339
Canutech	(613) 996-6666
Dupont	(901) 357-1546
Chemtrec	(800) 424-9300
Explosives Limited	(403) 255-7776
ICI Canada	(800) 561-3636

Sorbents

C.I.L Stanchem (403) 424-1754

North-Tech Environmental (403) 434-9431

Envirotech Nisku Inc (403) 955-8897

Spill Containment, Recovery & Disposal

SECTION 6

(Petroleum Products)

- a Containment - Oil leaking out of the vents of an overturned tanker or through a crack or puncture in a tanker wall may be stopped by means of various plugging/patching/sealing devices and/or compounds. Containment may thus be effected within the tanker itself.

Oil spilling onto frozen snow covered terrain may be contained by constructing a dyke out of snow. Dykes can be built either manually with shovels or with heavy equipment such as graders and bulldozers where practical. The impermeability of dykes (and hence the containment efficiency) may be ensured by lining the dyke with a polyethylene plastic liner, plastic tarpaulin or similar synthetic material. Alternatively, in sub-zero temperatures, water may be sprayed or poured over the dykes. The water will freeze in place forming a relatively impervious barrier to the oil. The latter method assumes that water is available or may be accessed from the spill site. Synthetically lined dykes are more effective than just snow or snow and ice-lined dykes. Oil spilled onto an ice surface of a river or lake may also be contained by snow dykes.

Containment dykes may also be constructed from sand or gravel if such materials are available in an unfrozen form. Trucks or other heavy equipment will normally be required to transport and handle sand and gravel, though the dykes themselves can be fashioned manually with shovels.

Trenching or ditching can be used as a method for containing and/or intercepting the flow of oil from land spills. Heavy equipment such as dozers are available on the Winter Road. Ice and snow, loose sand, gravel and surface layers of organic material can usually be scraped or dug away until a solidly frozen substrate is reached. Trenching in solid frozen ground or rocky substrates is normally neither practical nor possible.

Containment of oil under an ice surface is a very difficult task and oil should be stopped from entering water. First one has to know where the oil is. The simplest and most economic technique for detecting where the oil is, is to drill holes through the ice using an ice auger. In a river, once the oil is located, slots may be cut in the ice using chain saws. Once the ice blocks are removed the oil will rise into the slots and be amenable to recovery or disposal by on site burning. Containment of oil under river ice is difficult in practice. Containment of oil under lake ice is virtually impossible.

- b Recovery - Diesel oil can sometimes be off-loaded from a leaking tank trailer through the dispensing manifold or by suction hose through the hatch covers on top of the trailer. Unfortunately, this is not always possible with a tank trailer which is turned over on its side or in an upside down position. A second method of off-loading a leaking tanker would entail putting a hole in the tanker compartments with a spark-proof drill or other non sparking tool and pumping the tank contents to a standby vessel, to avoid igniting vapours contained within the tanker. This technique would not be suitable for highly volatile products like gasoline but could work on less volatile substances, such as diesel oil. Fire and safety consultants as well as salvage experts would have to be consulted to develop a safe but workable technique for this type of recovery operation. Safety shall be paramount.

Spilled fuel contained within a dyked area can be recovered by pumping it into a standby tanker. The standby tanker pump, if available, will normally be able to accomplish the task. Alternately, a portable pump may be utilized. Spilled oil contained in dykes, trenches, or pooled on the ground may also be picked up by means of a vacuum truck.

Fuel which has collected in ice slots or holes drilled through the ice can be picked up by suction hoses connected to either a portable pump, vacuum truck, or standby tanker. Suction hoses should be screened at the suction end to prevent snow, ice or debris from clogging the line or pump. Portable pumps and power augers have a habit of freezing up or being difficult to operate in extreme cold. A Hermann-Nelson type heater may be used when available to alleviate freeze-up problems.

Sorbent materials can be very useful in recovery operations for picking up oil which cannot be recovered by pumping or other means. Natural sorbents include straw, peat moss and sawdust. Synthetic sorbent pad materials such as 3M Brand, Conwed and other commercially available products are easier to use and more efficient than natural sorbents. Shovels, rakes, and pitchforks are invaluable in any oil spill clean-up and recovery operation.

Bladder type fuel tanks may be used to store recovered oil and have the advantage of being readily portable. An economic and simple means of storing recovered oil, used sorbents and oil containment debris is to use 45 gallon drums.

- c Disposal - Oil which has been recovered by pumping into portable tanks, drums or a standby tanker can often be reclaimed and reused. Water and debris can be separated from the pure fuel by gravimetric means in a tank. In this manner, financial losses can be cut and the disposal problem reduced.

The simplest means of disposal is by in-situ combustion. The most efficient means of igniting diesel oil for in-situ combustion is with a large size portable propane torch, otherwise known as a tiger torch. Highly flammable products such as gasoline or alcohol, or combustible products, such as wood, may also be used to promote ignition of a spilled product. The objective is to raise the temperature

of the spilled product to its fire point, whereby sustained combustion will be possible. Spilled oil should be ignited where it has pooled naturally or been contained by dykes, trenches or depressions. Oil which has collected in slots in river ice may also be disposed of by in-situ combustion if sufficient holes are drilled in the ice. Once all the holes are drilled, the oil which collects in the holes may be ignited.

Liquid oil wastes (which cannot be reclaimed), oil contaminated snow and debris and oil residues left after in-situ combustion will be picked up and disposed of at a land disposal site approved by government authorities. Disposal sites exist along the winter road corridor and are in general terms located at abandoned gravel pits which have been approved by INAC--Land Resources. Disposal at local municipal dumps may be an alternative if required, in this case GNWT would be consulted. Burning of oily residues at these disposal sites may be possible once warm weather returns. Appendix A is a map showing the winter road alignment and approved disposal site locations.

Dump Sites.

- Dry Bones Lake
- North Gordon lake
- North Waite Lake
- Portage #1
- Portage #10
- Lupin Mine

Prior to the use of a disposal site the proper authorities will be contacted for approval.

Prior to any burning at any location the proper government authorities will be contacted for approval.

ACTION PLANS

The following pages contain 10 "Action Plans", one for each type of substance which, if spilled in a significant amounts at sensitive locations, could cause noticeable environmental damage. Each action plan contains the following:

- a suggested initial spill response actions
- b notable hazards of the material(s)
- c suggested action for fire, if applicable
- d recommended recovery methods
- e recommended disposal methods
- f basic properties of the material(s)
- g statement of potential environmental threat posed by the material(s)
- h description of the containers used for transportation and storage of the materials
- i name of the supplier of the material(s)
- j. applicable first aid procedures (where available)

Each action plan is intended to be a guide for an OSC (On Scene Commander) or Haul Contractor. Because it is impossible to address every potential spill situation along the winter road, the action plans have been formulated to suit the more likely spill possibilities, and may not be applicable in every case. The ultimate decision-making responsibility for spill response actions must lie with the OSC.

As referenced early in this plan, training courses are provided as required to assure proper response techniques, each staff member directly involved in the winter road program and in contact with potential spill situations will be issued with a spill response handbook, which will outline the procedures to follow for response, containment, clean-up and disposal of spill contaminants.

MATERIAL SAFETY DATA SHEETS
&
ACTION PLANS FOR SPILLS OF

- a Diesel Fuel
- b Gasoline and Aviation Fuel
- c lubricating and Hydraulic Oils
- d.Ethylene Glycol Antifreeze
- e.Sodium Cyanide
- f Hydrated Lime
- g Soda Ash
- h.Class I Explosives
- i.Lead Nitrate
- j Ferric Sulphate

ACTION PLAN FOR SPILL OF DIESEL FUEL

Initial Spill

- Response
- STOP the flow if possible
 - CONTAIN flow of oil by dyking, barricading or blocking flow by any means available Use earth moving equipment if nearby
 - if flow has reached flowing natural stream, mobilize team to deploy river boom, skimmer, and sorbent booms
 - if possible, pump fuel into a tanker unit

- Hazards
- slightly toxic by ingestion, highly toxic if aspirated
 - flammable

- Action for fire
- use carbon dioxide, dry chemical, foam, or water spray (fog), although water may spread the fire
 - use fog streams to protect rescue teams and trapped people
 - use water to cool surface of tanks
 - divert the diesel fuel to an open area and let it burn off under control
 - if the fire is put out before all diesel fuel is consumed, beware of re-ignition
 - where diesel fuel is running downhill, try to contain it as quickly as possible
 - rubber tires are almost impossible to extinguish after involvement with a fire. Have vehicles with burning tires removed from danger area

A. DIESEL FUEL

Recovery

- unburned diesel fuel can be soaked up by sand and peat moss, or by chemical sorbents such as Graboil or Conwed
- if necessary, contaminated soil should be excavated
- diesel fuel entering the ground can be recovered by digging sumps or trenches
- diesel fuel on a water surface should be recovered by skimmers and sorbent booms (See Section on Recovery of Oil Spills)

Disposal

- incineration under controlled conditions
- burial at an approved site

Properties

- chemical composition mixture of hydrocarbons in the range C9 to C18
- clear, oily liquid
- not soluble, floats in water

Environmental

Threat

- moderately toxic to fish and other aquatic organisms
- harmful to waterfowl
- may create unsightly film on water

Containers

- transported by tanker truck and stored in the tank farm

Supplier

- As per annual tendering



MATERIAL SAFETY DATA SHEET

P. 26

WHMIS CLASSIFICATION

Combustible Liquid (Class B3)
Poisonous Material (Class D2)

PRODUCT CODE: N/A

DATE PREPARED: April 1, 1992

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

DIESEL FUEL

Other Names:

Diesel 20X, 0, 15, 20, 25, 30, 40, 40S, 50, 60
Diesel AA, Diesel GM 35, 45
Domestic Marine Diesel

Chemical Synonyms and Family:

Petroleum hydrocarbon

Name of Manufacturer/Supplier
Address & Emergency Phone Number

Petro-Canada (403) 296-3000
P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Diesel fuels are distillate fuels suitable for use in high and medium speed
internal combustion engines of the compression ignition type.

SECTION II

TRANSPORTATION

UN Number: 1202

Primary Classification: 3.3

Subsidiary Classification: NR

Compatibility Groups: N/A

CANUTEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

Complex mixture of petroleum
hydrocarbons* (C₉ - C₁₈).

ALLOWABLE LIMITS (8 h)

5 mg/m³ (oil mist)**

% (VOL.)

>99.9

CAS

68334-30-5

Anti-static additive, cetane improver, pour
point depressant.

N/A

<0.1

N/A

* Aromatic content is 38% maximum (benzene nil)

** Petro-Canada recommendation.

SECTION IV **PHYSICAL DATA**

Density: (@ 15°C)	0.78-0.90 kg/L	Boiling Point/Range: (@ 1 atm)	145-371°C (approx.)
Vapour Pressure: (@ 25°C)	1 kPa (approx.)	Percent Volatile: (@ 20°C)	U
Vapour Density: (@ 20°C)	4.5 (approx.)	Evaporation Rate:	N/A
Solubility in Water:	Insoluble		
Viscosity (Kinematic): (@ 40°C)	1.2-4.1 cSt		
Pour Point:	-50 to -6°C (-58 to 20°F)	Appearance: & Odour	Clear to yellow, bright oily liquid with hydrocarbon odour.**

** May be dyed purple or red for taxation purposes.

SECTION V **FIRE & EXPLOSION DATA**

Flash Point (method used= COC):	40°C (minimum)
Flammable limits in air (% by volume):	Lower 0.7% Upper 6.0%
Auto-Ignition Temperature:	>225°C
Fire and Explosion Hazards:	Treat as combustible liquid. Do not cut, drill or weld empty containers.

MODERATE FIRE HAZARD

Extinguishing Media:	Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.
Fire Fighting Procedures:	Use full protective equipment and self-contained breathing apparatus. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Do not point solid water stream directly into burning product to avoid spreading fire.

SECTION VI **HEALTH HAZARD INFORMATION**

Toxicity Data

* Estimated acute LD₅₀ = 7650 mg/kg (rat, oral); practically non-toxic.
Rabbit primary dermal irritation index (Draize) = 6.8; extremely irritating. Rabbit eye irritation index (Draize) = 0; non-irritating.

Effects of Overexposure**Inhalation:**

Inhalation of vapours or mist will cause headaches, nausea, dizziness, and intoxication; severe central nervous system depressant.

Skin and Eyes:

Irritation, defatting and drying of skin. Prolonged exposure to skin may cause chapping, cracking or possibly dermatitis. Eye contact may cause irritation, but not permanent damage.

Ingestion:

Ingestion is unlikely.

Based on API Study #79-6 on diesel

Emergency and First Aid Procedures Information

Skin: Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.

Eyes: Copious warm water flush - 15 minutes. Physician assessment mandatory.

Inhalation: Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation is required, physician assessment is mandatory.

Ingestion: DO NOT INDUCE VOMITING. If vomiting - take care to prevent aspiration. Give 250 mL (1/2 pint) of milk to drink. Mandatory physician assessment.

Notes to Physician Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII

REACTIVITY DATA

Stability: Stable under normal storage and use.

Conditions to avoid: Excessive heat, sources of ignition, formation of oil mist.

Materials to avoid: Strong oxidizing agents (strong acids, peroxides, chlorine, etc.).

Hazardous Decomposition products: CO_x, SO_x, smoke on combustion.

Can hazardous polymerization occur?: No.

SECTION VIII

SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled:

Avoid contact. Use full protective equipment and breathing apparatus if required. **ELIMINATE IGNITION SOURCES.** Contain spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using electrically grounded explosion-proof pumps. Place absorbent in closed metal containers. **DO NOT FLUSH TO SEWER.**

Waste Disposal Method:

Dispose in approved, **SECURE** contaminated waste landfill site or licenced waste recycler facility. Check with applicable jurisdictions for specific disposal requirements.

SECTION IX**SPECIAL PROTECTION INFORMATION****Ventilation:**

General ventilation. Use explosion-proof mechanical ventilation suitable for group D atmospheres.

Respiratory Protection:

Up to 5 mg/m³ (oil mist), none required. From 5 to 50 mg/m³, use an approved organic vapour respirator suitable for oil mist in areas with sufficient oxygen. Above 50 mg/m³, use full-face air-supplied or self-contained breathing apparatus.

Protective Gloves:

For direct contact with hydrocarbons of more than 2 hours, VITON or NITRILE recommended. Otherwise, PVC gloves may be worn.

Eye Protection:

Chemical goggles if splashing likely.

Other Protective Clothing:

Wear long sleeved clothing to minimize skin contact.

SECTION X**SPECIAL PRECAUTIONS**

Store in cool, well-ventilated area. Electrically ground/bond during pumping or transfer to avoid static accumulation. **AVOID SKIN CONTACT AND INHALATION.** Practice good personal hygiene. **DO NOT SIPHON BY MOUTH OR USE AS A CLEANING SOLVENT.** Launder work clothes frequently. Petro-Canada recommends an allowable exposure of 5 mg/m³ (oil mist) when handling DIESEL FUELS.

SECTION XI**REFERENCES**

- ACGIH, Threshold Limit Values and Biological Exposure Indices for 1991.
CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.
API, Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
Environment Canada Manual for Spills of Hazardous Materials, March, 1984.
Patty's Industrial Hygiene and Toxicology, 3rd Edition, Vol. 2B, 1981.
NIOSH, The Industrial Environment - Its Evaluation and Control, 1973.
API, Acute Toxicity Tests on Diesel Fuel, API # 79-6, 1980.
API, The Toxicology of Petroleum Hydrocarbons, May, 1982.

Petro-Canada and its affiliates assume no responsibility for injury to anyone caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Petro-Canada and its affiliates assume no responsibility for injury to anyone caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee and third persons assume the risk in their use of the material.

Petro-Canada



MATERIAL SAFETY DATA SHEET

P.30

WHMIS CLASSIFICATION

Combustible Liquid (Class B3)
Poisonous Material (Class D2)

PRODUCT CODE: N/A

DATE PREPARED: April 1, 1992

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

FUEL OIL

Other Names:

Furnace Oil 20X, 20, 25, 27C, 30, 40, 50, 55
Furnace Oil O Special, 16, 20X Special
Economy Diesel

Chemical Synonyms and Family:

Petroleum hydrocarbon

Name of Manufacturer/Supplier
Address & Emergency Phone Number:

Petro-Canada (403) 296-3000
P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Fuel Oils are distillate fuels suitable for use in liquid fuel burning equipment
without preheating.

SECTION II

TRANSPORTATION

UN Number: 1202

Primary Classification: 3.3

Subsidiary Classification: 9.2

Compatibility Groups: N/A

CANUTEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

Complex mixture of petroleum
hydrocarbons.* (C₉ - C₂₀)

ALLOWABLE LIMITS (8 h)

5 mg/m³ (oil mist)**

% (VOL.)

>99.9

CAS

68334-30-5
64742-81-0

Anti-static additive, stabilizer.

N/A

<0.1

N/A

* Aromatic content is 50% maximum (% volume). Nil benzene present.

** Petro-Canada recommendation.

SECTION IV		PHYSICAL DATA	
Density: (@ 15°C)	0.87 - 0.90 kg/L	Boiling Point/Range: (@ 1 atm)	150 - 360°C (approx.)
Vapour Pressure: (@ 25°C)	1 kPa (approx.)	Percent Volatile: (@ 20°C)	U
Vapour Density: (@ 20°C)	4.5 (approx.)	Evaporation Rate:	N/A
Solubility in Water:	Insoluble		
Viscosity (Kinematic): (@ 40°C)	1.7 cSt (approx.)		
Pour Point:	-40 to -6°C (approx.)	Appearance: & Odour	Clear to yellow, bright oily liquid with hydrocarbon odour.**

** May be dyed purple or red for taxation purposes.

SECTION V		FIRE & EXPLOSION DATA
Flash Point (method used= COC):		45°C (minimum)
Flammable limits in air (% by volume):		Lower 0.7% Upper 6.0%
Auto-ignition Temperature:		>225°C
Fire and Explosion Hazards:		Treat as combustible liquid. Do not cut, drill or weld empty containers.
MODERATE FIRE HAZARD		
Extinguishing Media:		Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.
Fire Fighting Procedures:		Use full protective equipment and self-contained breathing apparatus. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Do not point solid water stream directly into burning product to avoid spreading fire.

SECTION VI		HEALTH HAZARD INFORMATION
Toxicity Data		*Estimated acute LD ₅₀ > 5000 mg/kg (rat, oral): practically non-toxic. Rabbit primary dermal irritation index (Draize) = 4-6.8: moderately to extremely irritating. Rabbit eye irritation index (Draize) = 0-1.3: non-irritating.
Effects of Overexposure		
Inhalation:		Inhalation of vapours or mist will cause headaches, nausea, dizziness, and intoxication; severe central nervous system depressant.
Skin and Eyes:		Irritation, defatting and drying of skin. Prolonged exposure to skin may cause chapping, cracking or possibly dermatitis. Eye contact may cause irritation, but not permanent damage.
Ingestion:		Overexposure due to ingestion is unlikely for adults since taste and smell limit the amount swallowed. May be harmful or fatal if swallowed.

* Based on API Study #79-6, 83-09.

Emergency and First Aid Procedures Information

Skin: Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.

Eyes: Copious warm water flush - 15 minutes. Physician assessment mandatory.

Inhalation: Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation is required, physician assessment mandatory.

Ingestion: DO NOT INDUCE VOMITING. If vomiting - take care to prevent aspiration. Give 250 mL (1/2 pint) of milk. Mandatory physician assessment.

Notes to Physician Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII**REACTIVITY DATA**

Stability: Stable under normal storage and use.

Conditions to avoid: Excessive heat, sources of ignition, formation of oil mist.

Materials to avoid: Strong oxidizing agents (strong acids, peroxides, chlorine, etc.)

Hazardous Decomposition products: CO_x, SO_x, smoke on combustion.

Can hazardous polymerization occur?: No.

SECTION VIII**SPILL OR LEAK PROCEDURES**

Steps to be taken if material is released or spilled: Avoid contact. Use full protective equipment and breathing apparatus if required. ELIMINATE IGNITION SOURCES. Contain spill, absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using electrically grounded explosion-proof pumps. Place absorbent in closed metal containers. DO NOT FLUSH TO SEWER.

Waste Disposal Method: Incinerate at licensed waste reclaimer facility. Check with applicable jurisdictions for specific disposal requirements.

SECTION IX

SPECIAL PROTECTION INFORMATION

Ventilation:

General ventilation. Use explosion-proof mechanical ventilation suitable for group D atmospheres.

Respiratory Protection:

Up to 5 mg/m³ (oil mist), none required. From 5 to 50 mg/m³, use an approved organic vapour respirator suitable for oil mist in areas with sufficient oxygen. Above 50 mg/m³, use full-face air-supplied or self-contained breathing apparatus.

Protective Gloves:

For direct contact with hydrocarbons of more than 2 hours, VITON or NITRILE recommended. Otherwise, PVC gloves may be worn.

Eye Protection:

Chemical goggles if splashing likely.

Other Protective Clothing:

Long sleeved clothing to minimize skin contact.

SECTION X

SPECIAL PRECAUTIONS

Store in cool, well-ventilated area. Electrically ground/bond during pumping or transfer to avoid static accumulation. AVOID SKIN CONTACT AND INHALATION. Practice good personal hygiene. DO NOT SIPHON BY MOUTH OR USE AS A CLEANING SOLVENT. Launder work clothes frequently. Petro-Canada recommends an allowable exposure of 5 mg/m³ (oil mist) when handling FUEL OILS.

SECTION XI

REFERENCES

- ACGIH. Threshold Limit Values and Biological Exposure Indices for 1991.
CONCAWE. First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.
API. Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
Environment Canada Manual for Spills of Hazardous Materials, March, 1984.
NIOSH. The Industrial Environment - Its Evaluation and Control, 1973.
Patty's Industrial Hygiene and Toxicology, 3rd Edition, Vol. 2B, 1981.
API. The Toxicology of Petroleum Hydrocarbons, May, 1982.
API. API Studies 78-2, 78-3 and 78-4, 1979; 79-6, 1980; 83-9, 1986.

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ACTION PLAN FOR GASOLINE & AVIATION FUEL SPILLS

Initial Spill

Response

- STOP the flow if possible
- ELIMINATE all possible sources of IGNITION, eg extinguish cigarettes, shut off motors (from a remote location if surrounded by vapours)
- EVACUATE danger area
- CAREFULLY CONSIDER the hazards and merits of trying to contain the spill. Contain only if safe to do so, and obvious benefit containment is apparent, eg. contain if flowing towards a creek. Otherwise leave gasoline to spread and evaporate. Do not attempt to contain gasoline spill on water. Allow it to spread and evaporate.
- VENTILATE vapours if spilled in an enclosed area

Hazards

- highly flammable
- forms explosive mixture with air
- easily ignited by flame or spark
- moderately toxic by ingestion, highly toxic if aspirated

Action for Fire

- use carbon dioxide, dry chemical, foam or water spray (fog), although water may spread the fire
- use jet streams to wash away burning gasoline
- use fog streams to protect rescue team and trapped people
- use water to cool surface of tanks
- divert the gasoline to an open area and let it burn off under control

- if the fire is put out before all gasoline is consumed, beware of re-ignition
- where gasoline is running downhill, try to contain it at the bottom prior to reaching lakes or streams
- rubber tires are almost impossible to extinguish after involvement with a fire have vehicles with burning tires removed from the danger area

Recovery

- unburned gasoline can be soaked up by sand and peat moss, or by commercial sorbents such as Graboil or Conwed
- if necessary, contaminated soil should be excavated
- gasoline entering the ground can be recovered by digging sumps or trenches

Disposal

- evaporation
- incineration under controlled conditions

GASOLINE AND AVIATION FUEL

Properties

- chemical composition. mixture of hydrocarbons in the range of C4 to C12
- amber coloured liquids
- volatile
- not soluble, floats in water

Environmental

Threat

- moderately toxic to fish and other aquatic organisms
- may create unsightly film on water

Containers

- Gasoline and aviation fuel will be transported by tanker trucks and stored in the tank farm Aviation fuel will be transported in steel drums and stored at the airstrip in limited quantities

Supplier

As per annual tendering



MATERIAL SAFETY DATA SHEET

WHMIS CLASSIFICATION

Flammable Liquid (Class B2)
Poisonous Material (Class D2)

PRODUCT CODE: N/A

DATE PREPARED: April 1, 1992

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

JET B AVIATION TURBINE FUEL

Other Names:

Jet B, Jet B DI, International Jet B, International Jet B DI, Jet Fuel JP-4, Jet Fuel F-40, Turbine Fuel, Aviation, Wide Cut Type (CAN/CGSB-3.22-M).

Chemical Synonyms and Family:

Petroleum hydrocarbon

Name of Manufacturer/Supplier
Address & Emergency Phone Number:

Petro-Canada (403) 296-3000
P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Used as aviation turbine fuel. May contain a fuel system icing inhibitor.

SECTION II

TRANSPORTATION

UN Number: 1863

Primary Classification: 3.1

Subsidiary Classification: NR

Compatibility Groups: N/A

CANUTEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

Complex mixture of aliphatic and aromatic hydrocarbons. (C₆ - C₁₄)*

ALLOWABLE LIMITS (8 h)

300 ppm (vapour)**

% (VOL)

100

CASE

64741-41-9

* Contains trace amounts of conventional gasoline additives such as antioxidant, anti-static additive and icing inhibitor (2-methoxyethanol).

** Petro-Canada recommendation.

FLAMMABLE LIQUID

Trade Name: JET B AVIATION TURBINE FUEL.

SECTION IV		PHYSICAL DATA	
Density: (@ 15°C)	0.750-0.801 kg/L	Boiling Point/Range: (@ 1 atm)	50-250°C (approx.)
Vapour Pressure: (@ 25°C)	21 kPa (RVP max.)	Percent Volatile: (@ 20°C)	N/A
Vapour Density: (@ 20°C)	3.5 (approx.)	Evaporation Rate:	0.7 - 1.2 (n-butyl acetate = 1)
Solubility in Water:	Insoluble		
Viscosity (Kinematic): (@ 38°C)	<<7 cSt		
Freezing Point:	-51°C (max.)	Appearance: & Odour	Colourless, clear liquid with hydrocarbon odour.

SECTION V		FIRE & EXPLOSION DATA	
Flash Point (method used= COC):		-25°C (minimum)	
Flammable limits in air (% by volume):		Lower 1.3% Upper 7.6%	
Auto-Ignition Temperature:		240°C	
Fire and Explosion Hazards:		Easily ignitable by flame or spark. Vapours are heavier than air and may travel: considerable distance to sources of ignition and flash back. Do not cut, drill or weld empty containers.	
EXTREME FIRE HAZARD			
Extinguishing Media:		Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.	
Fire Fighting Procedures:		Use full protective equipment and self-contained breathing apparatus. Stop flow. Contain spill. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Isolate all ignition sources in area of spill. Use gas detector in confined spaces. To avoid spreading fire do not point solid water stream directly into burning fuel.	

SECTION VI		HEALTH HAZARD INFORMATION	
Toxicity Data		Estimated acute LD ₅₀ >14000 mg/kg (rat, oral); practically non-toxic	
Effects of Overexposure			
Inhalation:		Irritation of nose and throat; headache, nausea, vomiting, dizziness, fatigue, light-headedness, reduced coordination and unconsciousness; central nervous system depression; kidney and liver damage from long-term exposure. May be narcotic in high concentrations.	
Skin and Eyes:		Drying, cracking or inflammation of skin. Prolonged exposure to skin may cause dermatitis. Eye contact may cause irritation, but not permanent damage.	
Ingestion:		Overexposure due to ingestion is unlikely for adults since taste and smell limit the amount swallowed. Harmful or fatal if swallowed.	

NOTE 1: AVOID BREATHING VAPOUR. AVOID CONTACT WITH SKIN AND EYES. AVOID ASPIRATION. NOTE 2: Jet B Aviation Turbine Fuel contains a small quantity of benzene which is a suspect human carcinogen.

Emergency and First Aid Procedures Information

Skins: Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.

Eyes: Copious warm water flush - 15 minutes. Physician assessment if eyes inflamed.

Inhalation: Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation required, physician assessment mandatory.

Ingestion: DO NOT INDUCE VOMITING. If vomiting - take care to prevent aspiration. Give 250 mL (1/2 pint) of milk to drink. Mandatory physician assessment.

Notes to Physician Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII**REACTIVITY DATA**

Stability:	Stable under normal storage and use.
Conditions to avoid:	Sources of ignition, heating greatly increases fire and explosion hazards.
Materials to avoid:	Strong oxidizing agents (nitric acid, sulfuric acid, chlorine, ozones, peroxides, etc.) which causes detonation on contact.
Hazardous Decomposition products:	CO _x , SO _x , partially oxidized hydrocarbons, smoke on combustion.
Can hazardous polymerization occur?:	No.

SECTION VIII**SPILL OR LEAK PROCEDURES**

Steps to be taken if material is released or spilled:	Evacuate personnel. Avoid contact. Use full protective equipment and breathing apparatus. Eliminate ignition sources. Shut off source of spill. Absorb with inert absorbent such as dry clay, and or diatomaceous earth, commercial sorbents, or recover using electrically grounded explosion-proof pumps. Place absorbent in closed metal containers. DO NOT FLUSH TO SEWER. Large spills may be pumped from upwind locations using vacuum trucks and extended hoses. Large pools may be covered with foam to prevent vapour evolution. Immediate shut down and evacuation if wind shifts. Constant monitoring is required.
Waste Disposal Method:	Dispose in approved, SECURE contaminated waste landfill site or licensed waste recycler facility. Check with applicable jurisdictions for specific disposal requirements.

SECTION IX

SPECIAL PROTECTION INFORMATION

Ventilation:

General ventilation. Use explosion-proof mechanical ventilation suitable for group D atmospheres. Local exhaust, if necessary, to control vapours to allowable limits.

Respiratory Protection:

Up to 3000 ppm, use an approved full-face organic vapour cartridge respirator. Above this level, use full-face air-supplied or self-contained breathing apparatus.

Protective Gloves:

For direct contact with hydrocarbons of more than 2 hours, VITON or NITRILE recommended.

Eye Protection:

Chemical goggles if splashing likely.

Other Protective Clothing:

Tyvek protective clothing to prevent all contact. DO NOT USE NATURAL RUBBER, NEOPRENE, BUTYL RUBBER OR PVC (polyvinyl chloride).

SECTION X

SPECIAL PRECAUTIONS

HANDLE AS EXTREMELY FLAMMABLE LIQUID. DO NOT USE AS CLEANING FLUID OR SIPHON BY MOUTH. Store in cool, well-ventilated area. Electrically ground/bond during pumping or transfer to avoid static accumulation. PRECAUTIONS SHOULD BE TAKEN TO MINIMIZE SKIN CONTACT AND INHALATION. High standards of personal hygiene are necessary. Wash skin thoroughly with soap and water after contact and before eating. Launder work clothes frequently. Petro-Canada recommends an allowable exposure of 300 ppm when handling JET B AVIATION TURBINE FUEL.

SECTION XI

REFERENCES

- ACGIH, Threshold Limit Values and Biological Exposure Indices for 1991.
CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.
API, Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
Environment Canada Manual for Spills of Hazardous Materials, March, 1984.
NIOSH, The Industrial Environment - Its Evaluation and Control, 1973.
Patty's Industrial Hygiene and Toxicology, 3rd Edition, Vol. 2B, 1981.
API, The Toxicology of Petroleum Hydrocarbons, May, 1982.
API, API Project #1443, September 12, 1980.
API, In Vitro and In Vivo Mutagenicity Studies, Final Report, August 13, 1979.

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Petro-Canada



MATERIAL SAFETY DATA SHEET

P.4I

WHMIS CLASSIFICATION

Combustible Liquid (Class B3)
Poisonous Material (Class D2)

PRODUCT CODE: N/A

DATE PREPARED: January 1, 1993

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

JET A/A-1 AVIATION TURBINE FUEL

Other Names:

Jet A-1, A-2; Jet A-1 DI, A-2 DI, Aviation Turbine Kerosine (ATK), International Jet A-1, A-2, International A-1 DI, A-2 DI, Turbine Fuel, Aviation, Kerosine Type - (CAN/CGSB-3.23-M).

Chemical Synonyms and Family:

Petroleum hydrocarbon

Name of Manufacturer/Supplier
Address & Emergency Phone Number

Petro-Canada (403) 296-3000
P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Used as aviation turbine fuel. May contain a fuel system icing inhibitor.

SECTION II

TRANSPORTATION

UN Number: 1863

Primary Classification: 3.3

Subsidiary Classification: 9.2

Compatibility Groups: N/A

CAN/ITEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

Complex mixture of petroleum
hydrocarbons.* (C₉ - C₁₆)

ALLOWABLE LIMITS (8 h)

5 mg/m³ (mist)**
300 ppm (vapour)**

% (VOL.)

>99.9

CAS

8008-20-6
64742-81-0

Anti-static additive, antioxidant, metal
deactivator.

N/A

0.1

N/A

* Aromatic content is 22% maximum (Benzene nil). May contain icing inhibitor (<0.2%).

** Petro-Canada recommendation.

Trade Name: JET A/A-1 AVIATION TURBINE FUEL

SECTION IV		PHYSICAL DATA	
Density: (@ 15°C)	0.774 - 0.839 kg/L	Boiling Point/Range: (@ 1 atm)	160-300°C (approx.)
Vapour Pressure: (@ 25°C)	<0.7 kPa	Percent Volatile: (@ 20°C)	50% in 10 h (approx.)
Vapour Density: (@ 20°C)	4.5 (approx.)	Evaporation Rate: (n-butyl acetate = 1)	<0.1
Solubility in Water:	Insoluble		
Viscosity (Kinematic): (@ -20°C)	8 cSt		
Freezing Point:	-47°C (maximum)	Appearance:	Colorless, clear liquid with hydrocarbon odour. & Odour

SECTION V		FIRE & EXPLOSION DATA	
Flash Point (method used=	COC):	38°C (minimum)	
Flammable limits in air (% by volume):		Lower 0.6% Upper 5%	
Auto-ignition Temperature:		224°C	
Fire and Explosion Hazards:		Treat as combustible liquid. Do not cut, drill or weld empty containers.	
MODERATE FIRE HAZARD			
Extinguishing Media:		Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.	
Fire Fighting Procedures:		Use full protective equipment and self-contained breathing apparatus. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Do not point solid water stream directly into burning product to avoid spreading fire.	

SECTION VI		HEALTH HAZARD INFORMATION	
<u>Toxicity Data</u>		*Acute LD ₅₀ > 15000 mg/kg (rat, oral); practically non-toxic. Rabbit dermal primary skin irritation score (Draize)= 1.96; mildly irritating. Rabbit eye irritation index (Draize) = 2.67; mildly irritating.	
<u>Effects of Overexposure</u>			
Inhalation:		Inhalation of vapours or mist will cause headaches, nausea, dizziness and intoxication.	
Skin and Eyes:		Defatting or drying of skin. Prolonged exposure to skin may cause chapping, cracking or possibly dermatitis. Vapours or mist may irritate eyes.	
Ingestion:		Overexposure due to ingestion is unlikely for adults since taste and smell limit the amount swallowed. Harmful or fatal if swallowed.	

*Based on API Project #1443 on Jet Fuel A which quotes oral rat LD₅₀ > 25 mL/kg.

Emergency and First Aid Procedures Information

Skins: Remove contaminated clothing - launder before reuse. Soap and water wash.
Discard saturated leather articles.

Eyes: Copious warm water flush - 15 minutes. Physician assessment mandatory if eyes inflamed.

Inhalation: Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation required, physician assessment mandatory.

Ingestion: DO NOT INDUCE VOMITING. If vomiting - take care to prevent aspiration. Give 250 mL (1/2 pint) of milk to drink. Mandatory physician assessment.

Notes to Physician Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII

REACTIVITY DATA

Stability: Stable under normal storage and use.

Conditions to avoid: Excessive heat, sources of ignition, formation of oil mist.

Materials to avoid: Strong oxidizing agents (strong acids, peroxides, chlorine, etc.).

Hazardous Decomposition products: CO_x, SO_x, smoke on combustion.

Can hazardous polymerization occur?: No.

SECTION VIII

SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled:	Avoid contact. Use full protective equipment and breathing apparatus. ELIMINATE IGNITION SOURCES. Contain spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using electrically grounded explosion-proof pumps. Place used absorbent and rags in closed metal containers. DO NOT FLUSH TO SEWER.
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Waste Disposal Method: Dispose in approved, **SECURE** contaminated waste landfill site or licenced waste reclaimer facility. Check with applicable jurisdictions for specific disposal requirements.

Trade Name: JET A/A-1 AVIATION TURBINE FUEL

SECTION IX

SPECIAL PROTECTION INFORMATION

Ventilation:

General ventilation. Use explosion-proof mechanical ventilation suitable for group D atmospheres.

Respiratory Protection:

Under 5 mg/m^3 , none required. From 5 to 50 mg/m^3 , use an approved organic vapour respirator suitable for oil mist in areas with sufficient oxygen. Above this level, use full-face air-supplied or self-contained breathing apparatus.

Protective Gloves:

For direct contact with hydrocarbons of more than 2 hours, VITON or NITRILE, recommended.

Eye Protection:

Chemical goggles if splashing likely.

Other Protective Clothing:

Long sleeved clothing to minimize skin contact.

SECTION X

SPECIAL PRECAUTIONS

Store in cool, well-ventilated area. Electrically ground/bond during pumping or transfer to avoid static accumulation. Precautions should be taken to minimize skin contact and inhalation. Practice good personal hygiene. DO NOT SIPHON BY MOUTH OR USE AS A CLEANING SOLVENT. Launder work clothes frequently. Petro-Canada recommends an allowable exposure of 5 mg/m^3 (mist) when handling JET A/A-1 AVIATION TURBINE FUEL.

SECTION XI

REFERENCES

- ACGIH, Threshold Limit Values and Biological Exposure Indices for 1991.
- CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.
- API, Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
- Environment Canada Manual for Spills of Hazardous Materials, March, 1984.
- NIOSH, The Industrial Environment - Its Evaluation and Control, 1973.
- Patty's Industrial Hygiene and Toxicology, 3rd Edition, Vol. 2B, 1981.
- API, The Toxicology of Petroleum Hydrocarbons, May, 1982.
- API, API Project #1443, September 12, 1980.
- API, In Vitro and In Vivo Mutagenicity Studies, Jet Fuel A, Final Report, August 13, 1979.

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MATERIAL SAFETY DATA SHEET

P.

WHMIS CLASSIFICATION

Flammable Liquid (Class B2)
Poisonous Material (Class D2)

PRODUCT CODE: N/A

DATE PREPARED: April 1, 1992

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

UNLEADED GASOLINE

Other Names:

Maximum Supreme, Maximum Plus and Maximum Unleaded Gasoline,
Unleaded "Plus" Gasoline, Unleaded Gasoline (US Grade)

Chemical Synonyms and Family:

Petroleum hydrocarbon

Name of Manufacturer/Supplier
Address & Emergency Phone Number:

Petro-Canada (403) 296-3000
P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Unleaded gasoline is used as a motor vehicle fuel. Maximum Supreme,
Maximum Plus and Maximum contain an advanced deposit control
additive.

SECTION II

TRANSPORTATION

UN Number: 1203

Primary Classification: 3.1

Subsidiary Classification: N/A

Compatibility Groups: N/A

CANUTEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

Complex mixture of aliphatic & aromatic
hydrocarbons. (C₄ - C₁₂)*

ALLOWABLE LIMITS (8 h)

300 ppm (gasoline)

% (VOL)

100

CAS

8006-61-9

* Contains trace amounts of conventional gasoline additives such as antioxidant, MMT (organo-manganese compound) and dye. May also contain methyl-tertiary-butyl ether (MTBE), CAS #1634-04-4, up to 11% volume and benzene from 0 - 5% volume.

FLAMMABLE LIQUID

NR-Not Regulated

N/A-Not Applicable

U-Unknown

Cette fiche est aussi disponible en français.

UN0000000000

Page 1 of 4

Trade Name: UNLEADED GASOLINE

SECTION IV		PHYSICAL DATA	
Density: (@ 15°C)	0.7 - 0.8 kg/L (approx.)	Boiling Point/Range: (@ 1 atm)	25-220°C (approx.)
Vapour Pressure: (@ 37.8°C)	56-107 kPa	Percent Volatile: (@ 20°C)	100%
Vapour Density: (@ 20°C)	3-4 (approx.)	Evaporation Rate:	4 (approx.) (n-butyl acetate = 1)
Solubility in Water	Insoluble		
Viscosity (Kinematic): (@ 40°C)	0.6 cSt		
pH:	Max: 9.0	Appearance: & Odour	Clear, undyed liquid (Maximum); Clear green liquid (Maximum Supreme); Clear light green liquid (Maximum Plus); gasoline odour.**

**May be dyed red or purple for taxation purposes.

SECTION V		FIRE & EXPLOSION DATA	
Flash Point (method used= COC):		- 50°C (minimum)	
Flammable limits in air (% by volume):		Lower 1.4%	Upper 7.6%
Auto-ignition Temperature:		257°C	
Fire and Explosion Hazards:		Easily ignitable by flame or spark. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Do not cut, drill or weld empty containers.	
EXTREME FIRE HAZARD			
Extinguishing Media:		Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.	
Fire Fighting Procedures:		Use full protective equipment and self-contained breathing apparatus. Stop flow. Contain spill. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Isolate all ignition sources in area of spill. Use gas detector in confined spaces. To avoid spreading fire do not point solid water stream directly into burning product.	

SECTION VI		HEALTH HAZARD INFORMATION	
Toxicity Data		* Estimated acute LD ₅₀ = 12750 mg/kg (rat, oral); practically non-toxic. Rabbit dermal primary skin irritation score (Draize) = 0.98; slightly irritating. Rabbit eye irritation index (Draize) = 0; no irritation. IARC states that gasoline is possibly carcinogenic to humans (Group 2B).	
Effects of Overexposure			
Inhalation:		Irritation of nose and throat; headache, nausea, vomiting, dizziness, fatigue, light-headedness, reduced coordination and unconsciousness; central nervous depressant; kidney and liver damage from long-term exposure. May be narcotic in high concentrations.	
Skin and Eyes:		Drying, cracking or inflammation of skin. Prolonged exposure to skin may cause dermatitis. Eye contact may cause irritation, but not permanent damage.	
Ingestion:		Overexposure due to ingestion is unlikely for adults since taste and smell limit the amount swallowed. May be harmful or fatal if swallowed.	

NOTE 1: AVOID BREATHING VAPOUR. AVOID CONTACT WITH SKIN AND EYES. AVOID ASPIRATION. NOTE 2: GASOLINE CONTAINS A SMALL AMOUNT OF BENZENE WHICH IS A SUSPECTED HUMAN CARCINOGEN.

* Based on API Study PS-6 on Unleaded Motor Gasoline which quotes oral, rat LD₅₀ = 18.75 mL/kg.

Emergency and First Aid Procedures Information:

- Skin:** Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.
- Eyes:** Copious warm water flush - 15 minutes. Physician assessment if irritation persists.
- Inhalation:** Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation is required, physician assessment mandatory.
- Ingestion:** DO NOT INDUCE VOMITING. If vomiting - take care to prevent aspiration. Give 250 mL (1/2 pint) of milk. Mandatory physician assessment.
- Notes to Physician:** Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII

REACTIVITY DATA

- Stability:** Stable under normal storage and use.
- Conditions to avoid:** Sources of ignition; heating greatly increases fire and explosion hazards.
- Materials to avoid:** Strong oxidizing agents (nitric acid, sulfuric acid, chlorine, ozones, peroxides, etc.) which cause detonation on contact.
- Hazardous Decomposition products:** CO₂, oxides of manganese, partially oxidized hydrocarbons, smoke on combustion.
- Can hazardous polymerization occur?:** No.

SECTION VIII

SPILL OR LEAK PROCEDURES

- Steps to be taken if material is released or spilled:** Evacuate personnel. Avoid contact. Use full protective equipment and breathing apparatus. Eliminate ignition sources. Shut off source of spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using electrically grounded explosion-proof pumps. Place absorbent in closed metal containers. DO NOT FLUSH TO SEWER. Large spills may be pumped from upwind locations using vacuum trucks and extended hoses. Large pools may be covered with foam to prevent vapour evolution. Immediate shut down and evacuation if wind shifts. Constant monitoring required.
- Waste Disposal Method:** Dispose in approved, SECURE contaminated waste landfill site or licensed waste reclaimer facility. Check with applicable jurisdictions for specific disposal requirements.

Trade Name: UNLEADED GASOLINE

SECTION IX

SPECIAL PROTECTION INFORMATION

Ventilation:

General ventilation. Use explosion-proof mechanical ventilation suitable for group D atmospheres. Local exhaust, if necessary, to control vapours to allowable limits.

Respiratory Protection:

Between 300 ppm and 3000 ppm, use an approved full-face organic vapour cartridge respirator in areas with adequate oxygen. Above this level, use full-face air-supplied or self-contained breathing apparatus.

Protective Gloves:

For direct contact with hydrocarbons of more than 2 hours, VITON or NITRILE recommended. Otherwise PVC gloves may be worn.

Eye Protection:

Chemical goggles if splashing likely.

Other Protective Clothing:

Long sleeved clothing to minimize skin contact.

SECTION X

SPECIAL PRECAUTIONS

HANDLE AS EXTREMELY FLAMMABLE LIQUID. DO NOT USE AS CLEANING FLUID OR SIPHON BY MOUTH. Store in cool, well-ventilated area. Electrically ground/bond during pumping or transfer to avoid static accumulation. PRECAUTIONS SHOULD BE TAKEN TO MINIMIZE SKIN AND EYE CONTACT AND INHALATION. High standards of personal hygiene are necessary. Wash skin thoroughly with soap and water after contact and before eating. Launder work clothes frequently. Petro-Canada recommends an allowable exposure of 300 ppm when handling UNLEADED GASOLINE.

SECTION XI

REFERENCES

- CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.
- ACGIH, Threshold Limit Values and Biological Exposure Indices for 1991.
- API, Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
- ITI, Toxic and Hazardous Industrial Chemicals Safety Manual, 1982.
- CONCAWE, Health Aspects of Petroleum Fuels - General Principles, April, 1985.
- API, Petroleum Process Stream terms included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
- API, Acute Toxicity Tests, API #PS-6, Unleaded Gasoline, July 16, 1982.
- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 45, 1987.

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ACTION PLAN FOR LUBRICATING & HYDRAULIC OIL SPILLS

Initial Spill

Response

- STOP the flow if possible
- ELIMINATE open flame ignition sources
- CONTAIN flow of oil by dyking, barricading or blocking flow by any means available Use earth moving equipment if nearby
- if flow has reached a flowing natural stream mobilize the team to deploy river boom, skimmer and sorbent booms

Hazards

- slightly toxic by ingestion
- combustible

Action for Fire

- use carbon dioxide, dry chemical, foam or water spray (fog), although water may spread the fire
- use fog streams to protect rescue team and trapped people
- use water to cool surface of tanks
- divert the oil to an open area and let it burn off under control
- if the fire is put out before all oil is consumed, beware of re-ignition
- rubber tires are almost impossible to extinguish after involvement with a fire Have vehicles with burning tires removed from the danger area.

Recovery

- unburned oil can be soaked up by sand and peat moss, or by chemical sorbents, such as Graboil or Conwed

- if necessary, contaminated soil should be excavated
- oil on a water surface should be recovered by skimmers and sorbent booms

Disposal

- incineration under controlled conditions
- burial at an approved site

Properties

- chemical composition: mixture of hydrocarbons and conventional industrial oil additives
- generally viscous liquids, various colours
- not soluble, floats on water

Environmental

Threat

- moderately toxic to fish and other aquatic organisms
- harmful to waterfowl
- may create unsightly film on water and shorelines

Containers

- transported by tanker truck or cubes (which is a self contained unit with an eight drum capacity).

Supplier

As per annual tendering



MATERIAL SAFETY DATA SHEET

P.5I

WHMIS CLASSIFICATION

Not Controlled

PRODUCT CODE: 490-785, 787, 866, 779

DATE: February 15, 1991

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

RALUBE 40, 40CP, 1340, 1740

Other Names:

None.

Chemical Synonyms and Family:

Petroleum hydrocarbon.

Name of Manufacturer/Supplier
Address & Emergency Phone Number:Petro-Canada Inc. (403) 296-3000
P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Ralube Oils are designed to lubricate the medium speed diesel engines,
which power railway locomotives.

SECTION II

TRANSPORTATION

UN Number: NR

Primary Classification: NR

Subsidiary Classification: NR

Compatibility Groups: NR

CANUTEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

ALLOWABLE LIMITS (8 HR.)

% (VOL.)

CAS

Severely hydrotreated hydrocarbon oil.
(C₂₆-C₆₆)5 mg/m³ (oil mist)

>85

72623-85-9
72623-83-7

Performance package, antifoam

N/A

<15

N/A

Trade Name: **RALUBE 40, 40CP, 1340, 1740**

SECTION IV		PHYSICAL DATA	
Density: (@ 15°C)	0.88 kg/L	Boiling Point/Range: (@ 1 atm)	> 402°C (approx.)
Vapour Pressure: (@ 25°C)	<0.001 kPa	Percent Volatile: (@ 20°C)	0%
Vapour Density: (@ 20°C)	N/A	Evaporation Rate:	N/A
Solubility in Water:	Negligible		
Viscosity (Kinematic): (@ 40°C)	121, 142, 137, 141 cSt		
Pour Point:	-18, -12, -24, -12 °C	Appearance: & Odour	Dark amber viscous liquid with hydrocarbon odour.

SECTION V		FIRE & EXPLOSION DATA	
Flash Point (method used= COC):		216, 235, 250, 238 °C (minimum)	
Flammable limits in air (% by volume):		N/A	
Auto-ignition Temperature:		>365°C	
Fire and Explosion Hazards:		Addition of water or foam may cause frothing. Do not cut, drill or weld empty containers.	
LOW FIRE HAZARD			
Extinguishing Media:		Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.	
Fire Fighting Procedures:		Contain spill. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Do not point solid water stream directly into burning oil to avoid spreading. Self-contained breathing apparatus should be worn to protect against possible release of toxic chlorocarbons and oxides of sulphur if oil is burning.	

SECTION VI		HEALTH HAZARD INFORMATION	
<u>Toxicity Data</u>		*Estimated acute LD ₅₀ >5000 mg/kg (rat, oral): practically non-toxic. Severely hydrotreated base oils are negative when tested by the modified Ames test.	
<u>Effects of Overexposure</u>			
Inhalation:		If sprayed or misted may cause chemical pneumonitis.	
Skin and Eyes:		Mildly irritating to eyes. Prolonged or repeated contact with skin may cause mild irritation and possibly dermatitis.	
Ingestion:		Low toxicity on ingestion. Has laxative effect.	

* Based on toxicity of paraffinic base oils and paraffinic petroleum distillates only.

Emergency and First Aid Procedures Information

Skin: Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.

Eyes: Copious warm water flush - 15 minutes. Physician assessment if eyes inflamed.

Inhalation: Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation is required, physician assessment mandatory.

Ingestion: DO NOT INDUCE VOMITING. Force fluids. Activated charcoal tablets.

Notes to Physician Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII**REACTIVITY DATA**

Stability:

Stable.

Conditions to avoid:

Excessive heat, formation of oil mist.

Materials to avoid:

Strong oxidizing agents (peroxides, chlorine, strong acids, etc.).

Hazardous Decomposition products:

CO_x, SO_x, NO_x, oxides of calcium, chlorocarbons, smoke on combustion.

Can hazardous polymerization occur?:

No.

SECTION VIII**SPILL OR LEAK PROCEDURES**

Steps to be taken if material is released or spilled:

Contain spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using pumps. Scoop up used absorbent and rags into drums.

Waste Disposal Method:

Dispose in approved, SECURE landfill site or licensed waste reclaimer facility.

SECTION IX

SPECIAL PROTECTION INFORMATION

Ventilation:

General ventilation.

Respiratory Protection:

Normally not necessary. If mist generated by heating, spraying, etc. wear approved organic vapour respirator suitable for oil mist in areas with sufficient oxygen.

Protective Gloves:

For direct contact with hydrocarbons of more than two hours, VITON or NITRILE recommended. Otherwise, PVC gloves may be worn.

Eye Protection:

None normally required; chemical goggles if splashing likely or high-pressure system used.

Other Protective Clothing:

Wear long sleeved clothing to minimize skin contact.

SECTION X

SPECIAL PRECAUTIONS

Store in cool, well-ventilated area. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods. Avoid inhalation and skin contact especially when handling used oil. An API study has indicated that prolonged or repeated skin exposure to used motor oils can cause skin cancer in mice.

SECTION XI

REFERENCES

ACGIH, Threshold Limit Values and Biological Exposure Indices for 1989-90.
CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.
API, Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
API, Acute Toxicity Tests - Paraffinic Oil, API Study 78-10, 79-4.
Petro-Canada Inc., Petro-Canada Report on Modified Ames Tests of Petroleum Basestocks, 1986.
NIOSH, The Industrial Environment - Its Evaluation and Control, 1973.
API Med. Res. Publication (1983) The Carcinogenicity of New and Used Lubricants.

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Petro-Canada Inc.



MATERIAL SAFETY DATA SHEET

P.5

WHMIS CLASSIFICATION

Not Controlled

PRODUCT CODE: 420-001, 002, 003, 004, 005

DATE PREPARED: January 1, 1993

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

SUPER PLUS 10W, 20W20, 30, 40, 50

Other Names:

None

Chemical Synonyms and Family:

Petroleum hydrocarbon

Name of Manufacturer/Supplier

Petro-Canada (403) 296-3000

Address & Emergency Phone Number:

P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Super Plus Oils are universal crankcase lubricants, developed specifically for mixed commercial fleets. They are suitable for all types of heavy-duty diesel, gasoline, propane and natural gas engines.

SECTION II

TRANSPORTATION

UN Number: NR

Primary Classification: NR

Subsidiary Classification: NR

Compatibility Groups: NR

CANUTEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

ALLOWABLE LIMITS (8 h)

% (VOL)

CAS

Severely hydrotreated paraffinic oil and
solvent refined heavy paraffinic distillate.
(C20-C66)5 mg/m³ (oil mist)

>88

72623-87-1
72623-85-9
64741-88-4
72623-83-7
72623-84-8
72623-86-0

Pour point depressant, silicone defoamer.

U

<1

N/A

Organo-zinc-phosphorus additive*

U

<11

N/A

*Contains zinc dialkyldithiophosphate (0.13% as Zn).

NR-Not Regulated

N/A-Not Applicable

U-Unknown

Cette fiche est aussi disponible en français.

W307E(9301)

Page 1 of 4

Trade Name: SUPER PLUS 10W, 20W20, 30, 40, 50

SECTION IV		PHYSICAL DATA	
Density: (@15°C)	0.87 to 0.89 kg/l	Boiling Point/Range: (@ 1 atm)	>345°C (approx)
Vapour Pressure: (@ 25°C)	<0.01 kPa	Percent Volatile: (@ 20°C)	0%
Vapour Density: (@ 20°C)	N/A	Evaporation Rate:	N/A
Solubility in Water:	Negligible		
Viscosity (Kinematic): (@ 40°C)	35, 63, 92, 146, 224 cSt (non-shear-thinning)		
Pour Point:	- 27 to -12°C	Appearance: & Odour	Light amber viscous liquid with hydrocarbon odour.

SECTION V		FIRE & EXPLOSION DATA	
Flash Point (method used= COC):	212°C (minimum)		
Flammable limits in air (% by volume):	N/A		
Auto-Ignition Temperature:	> 250°C		
Fire and Explosion Hazards:	Addition of water or foam may cause frothing. Do not cut, drill or weld empty containers.		
LOW FIRE HAZARD			
Extinguishing Media:	Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.		
Fire Fighting Procedures:	Contain spill. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Do not point solid water stream directly into burning oil to avoid spreading.		

SECTION VI		HEALTH HAZARD INFORMATION	
<u>Toxicity Data</u>		* Estimated acute LD ₅₀ > 5000 mg/kg (rat, oral): practically non-toxic. Severely hydrotreated base oils are negative when tested by the modified Ames test.	
<u>Effects of Overexposure</u>			
Inhalation:		Negligible hazard at normal temperatures (up to 38°C). Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.	
Skin and Eyes:		Mildly irritating to eyes. Prolonged or repeated contact with skin may cause mild irritation and possibly dermatitis.	
Ingestion:		Low toxicity on ingestion. Has laxative effect.	
*Based on toxicity of severely hydrotreated paraffinic oils only.			

Trade Name: SUPER PLUS 10W, 20W20, 30, 40, 50

Emergency and First Aid Procedures Information

Skins: Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.

Eyes: Copious warm water flush - 15 minutes. Physician assessment if eyes inflamed.

Inhalation: Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation is required, physician assessment mandatory.

Ingestion: DO NOT INDUCE VOMITING. Force fluids. Activated charcoal tablets.

Notes to Physician Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII

REACTIVITY DATA

Stability:

Stable.

Conditions to avoid:

Excessive heat, formation of oil mist.

Materials to avoid:

Strong oxidizing agents (peroxides, chlorine, strong acids, etc.).

Hazardous Decomposition products:

CO₂, NO_x, SO₂, oxides of zinc, calcium and phosphorus, smoke on combustion

Can hazardous polymerization occur?:

No.

SECTION VIII

SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled:

Contain spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using pumps. Scoop up used absorbent into drums.

Waste Disposal Method:

Dispose in approved, SECURE contaminated waste landfill site or licensed waste reclaimer facility. Check with applicable jurisdictions for specific disposal requirements.

Trade Name: SUPER PLUS 10W, 20W20, 30, 40, 50

SECTION IX

SPECIAL PROTECTION INFORMATION

Ventilation:

General ventilation.

Respiratory Protection:

Normally not necessary. If mist generated by heating, spraying, etc. wear approved organic vapour respirator suitable for oil mist in areas with sufficient oxygen.

Protective Gloves:

For direct contact of two hours or more, use NITRILE or VITON. Otherwise, PVC may be worn.

Eye Protection:

None normally required; chemical goggles if splashing likely or high-pressure system used.

Other Protective Clothing:

Long sleeved clothing to minimize skin contact.

SECTION X

SPECIAL PRECAUTIONS

Store in cool, well-ventilated area. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods. Avoid inhalation and skin contact especially when handling used oil. An API study has indicated that prolonged or repeated skin exposure to used motor oils can cause cancer in mice. Reference: API Med. Res. Publication (1983). The Carcinogenicity of New and Used Lubricants.

SECTION XI

REFERENCES

- Gerarde, H. W., Toxicological Studies on Hydrocarbons, Arch Environ Health, 1963.
 Gosselin, R. E., Smith, R. P. and Hodge, H. C., 'Kerosene' in Clinical Toxicology of Commercial Products, Fifth Edition, Williams & Wilkins, Baltimore, 1984.
 CONCAWE, Health Aspects of Lubricants, Document 5/87, Section 4.2, October 1987.
 Parson, R. D. and Winek, C. L., Aspiration Toxicity of Ketones, Clinical Toxicology, 1980.
 ACGIH, Threshold Limit Values and Biological Exposure Indices for 1991.
 CONCAWE, First Aid Measures, Medical Toxicology Data and Professional Advice to Clinicians on Petroleum Products, February 1983.
 API, Petroleum Process Stream Terms Included in the Chemical Substances Inventory Under the Toxic Substances Control Act (TSCA), 1983.
 API, Acute Toxicity Tests-Paraffinic Oil, API Study 78-9, 78-10, 79-4.
 NIOSH, The Industrial Environment-Its Evaluation and Control, 1973
 Petro-Canada, Petro-Canada Report on Modified Ames Tests of Petroleum Basestocks, 1986.

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MATERIAL SAFETY DATA SHEET

WHMIS CLASSIFICATION

Not Controlled

PRODUCT CODE: 420-006, 007

DATE PREPARED: January 1, 1993

SECTION I

MATERIAL IDENTIFICATION

Trade Name:

SUPER PLUS SAE 10W-30, 15W-40

Other Names:

None

Chemical Synonyms and Family:

Petroleum hydrocarbon

Name of Manufacturer/Supplier
Address & Emergency Phone Number

Petro-Canada (403) 296-3000
P.O. Box 2844, Petro-Canada Centre
Calgary, Alberta T2P 3E3

Poison Control Centre Numbers:

Consult local telephone directory for emergency numbers.

Application:

Super Plus Multigrades are universal crankcase lubricants developed for mixed commercial fleets. They are suitable for diesel, gasoline, propane and compressed natural gas engines, powershift transmissions and hydraulic systems, with particular emphasis on winter operation.

SECTION II

TRANSPORTATION

UN Number: NR

Primary Classification: NR

Subsidiary Classification: NR

Compatibility Groups: NR

CANUTEC Transport Emergency No. (613) 996-6666

SECTION III

COMPOSITION

COMPONENTS

ALLOWABLE LIMITS (8 h)

% (VOL)

CAS

Severely hydrotreated paraffinic oil.
(C₂₀ - C₄₅)

5 mg/m³ (oil mist)

>82

72623-87-1
72623-85-9
72623-86-0

Viscosity Index Improver, antifoam

N/A

<7

N/A

Organo-zinc-phosphorous additive*

N/A

<11

N/A

* Contains zinc dialkyldithiophosphate (≤ 0.13% as Zn).

Trade Name: SUPER PLUS SAE 10W-30, 15W-40

SECTION IV		PHYSICAL DATA	
Density: (@ 15°C)	0.87 kg/L	Boiling Point/Range: (@ 1 atm)	>349°C
Vapour Pressure: (@ 25°C)	< 0.001 kPa	Percent Volatile: (@ 20°C)	0%
Vapour Density: (@ 20°C)	N/A	Evaporation Rate:	N/A
Solubility in Water:	Negligible		
Viscosity (Kinematic): (@ 60°C)	63.99 cSt		
Pour Point:	-33 to -30°C	Appearance: & Odour	Light amber viscous liquid with hydrocarbon odour.

SECTION V		FIRE & EXPLOSION DATA
Flash Point (method used= COC):		205 °C (minimum)
Flammable limits in air (% by volume):		Unknown
Auto-ignition Temperature:		>250°C
Fire and Explosion Hazards:		Addition of water or foam may cause frothing. Do not cut, drill or weld empty containers.
LOW FIRE HAZARD		
Extinguishing Media:		Dry chemical or carbon dioxide for small fires. Water spray or foam for large fires.
Fire Fighting Procedures:		Wear self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode when fighting fires to protect against possible release of toxic oxides if oil is burning. Contain spill. Cover with extinguishing agent. Use water spray to cool fire-exposed containers and as a protective screen. Do not point solid water stream directly into burning oil to avoid spreading.

SECTION VI		HEALTH HAZARD INFORMATION
Toxicity Data		* Estimated acute LD ₅₀ > 5000 mg/kg (rat, oral); practically non-toxic. Severely hydrotreated base oils are negative when tested by the modified Ames test.
Effects of Overexposure		
Inhalation:		Negligible hazard at normal temperatures (up to 38°C). Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Skin and Eyes:		Mildly irritating to eyes. Prolonged or repeated contact with skin may cause mild irritation and possibly dermatitis.
Ingestion:		Low toxicity on ingestion. Has laxative effect.
*Based on toxicity of severely hydrotreated paraffinic oil only.		

Trade Name: SUPER PLUS SAE 10W-30, 15W-40

Emergency and First Aid Procedures Information

Skin: Remove contaminated clothing - launder before reuse. Soap and water wash. Discard saturated leather articles.

Eyes: Copious warm water flush - 15 minutes. Physician assessment if eyes inflamed.

Inhalation: Evacuate to fresh air. Apply Cardio Pulmonary Resuscitation if required. Administer oxygen if available. If resuscitation is required, physician assessment mandatory.

Ingestion: DO NOT INDUCE VOMITING. Force fluids. Activated charcoal tablets.

Notes to Physician Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated.

SECTION VII

REACTIVITY DATA

Stability:	Stable.
Conditions to avoid:	Excessive heat, formation of oil mist.
Materials to avoid:	Strong oxidizing agents (peroxides, chlorine, strong acids, etc.).
Hazardous Decomposition products:	CO _x , SO _x , NO _x , oxides of zinc, phosphorous and calcium; smoke on combustion.
Can hazardous polymerization occur?:	No.

SECTION VIII

SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled:	Contain spill. Absorb with inert absorbent such as dry clay, sand or diatomaceous earth, commercial sorbents, or recover using pumps. Scoop up used absorbent and rags into drums.
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Waste Disposal Method: Dispose in approved, SECURE contaminated waste landfill site or licenced waste recycler facility. Check with applicable jurisdictions for specific disposal requirements.

Trade Name: SUPER PLUS SAE 10W-30, 15W-40

SECTION IX

SPECIAL PROTECTION INFORMATION

Ventilation:

General ventilation.

Respiratory Protection:

Normally not necessary. If mist generated by heating, spraying, etc. wear approved organic vapour respirator suitable for oil mist in areas with sufficient oxygen.

Protective Gloves:

For direct contact with hydrocarbons of more than 2 hours, VITON or NITRILE recommended. Otherwise, PVC gloves may be worn.

Eye Protection:

None normally required; chemical goggles if splashing likely or high-pressure system used.

Other Protective Clothing:

Wear long sleeved clothing to minimize skin contact.

SECTION X

SPECIAL PRECAUTIONS

Store in cool, well-ventilated area. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods. Avoid inhalation and skin contact especially when handling used oil. An API study has indicated that prolonged or repeated skin exposure to used motor oils can cause cancer in mice.

SECTION XI

REFERENCES

- Gerarde, H. W., Toxicological Studies on Hydrocarbons, Arch Environ Health, 1963.
 Gosselin, R. E., Smith, R. P., and Hodge, H. C., 'Kerosene' in Clinical Toxicology of Commercial Products, Fifth Edition, Williams & Wilkins, Baltimore, 1984.
 CONCAWE, Health Aspects of Lubricants, Document 5/87, Section 4.2, October 1987.
 Parson, R. D. and Winek, C. L., Aspiration Toxicity of Ketones, Clinical Toxicology, 1980.
 ACGIH, Threshold Limit Values and Biological Exposure Indices for 1991.
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Petro-Canada

ACTION PLAN FOR ETHYLENE GLYCOL ANTIFREEZE SPILL

Initial Spill

Response

- STOP the flow at source if possible
- ELIMINATE open flame ignition sources
- CONTAIN flow of liquid by dyking, barricading or blocking flow by any means available
- PREVENT antifreeze from entering any flowing streams

Hazards

- moderately toxic by ingestion and inhalation
- flammable

Action for Fire

- use carbon dioxide, dry chemical, foam or water spray (fog)

Recovery

- ethylene glycol antifreeze can be soaked up by peat moss or by commercial sorbents such as Hazorb
- access to spilled or recovered ethylene glycol by mammals should be prevented

Disposal

- incineration under controlled conditions
- burial at an approved site

Properties

- chemical composition 96% ethylene glycol
4% water and rust inhibitors
- clear, syrupy liquid
- soluble in water
- flammable

Environmental

Threat

- low to moderate toxicity for fish and other aquatic organisms
- attractive smell and taste to some mammals & toxic by ingestion

Containers

- transported and stored in steel drums or cubes (which is a self-contained unit with an 8 drum capacity)
- DOW Chemical of Canada Ltd

VAN WATERS & ROGERS LTD 9800 VAN HORNE WAY RICHMOND, B C. V6X 1W5

SALES ORDER:

VAN WATERS & ROGERS PRODUCT: 77953

MSDS NUMBER: L1249

VERSION: 1

DATE PRINTED: 26/10/93

ECHO BAY MINES LTD
3300 MANULIFE PLACE
10180 - 101 STREET
EDMONTON, ALTA. T5J 3S4

WHMIS CODES: D.2A D.2B

-----EMERGENCY ASSISTANCE-----

For Emergency Assistance Involving Chemicals
Call CHEMTREC (800) 424-9300

-----PRODUCT INFORMATION-----

Product Name: UCARTHERM₄ CLEAR HEAT TRANSFER FLUID VW&R Code: L1249

Common Name/Synonym: PM-6195
CAS Registry Number: N/AP (mixture)
Chemical Name: ~~Ethylene glycol~~ (mixture)
Chemical Family: Ethylene glycol
Formula: N/AP (mixture)
Molecular Weight: N/AP (mixture)
Product Use: Heat transfer fluid.

-----PREPARATION INFORMATION-----

Date Issued: 01/93
Supercedes: New Issue
Prepared By: MSDS Coordinator. Contact during business hours, Eastern
Time (416) 736-9299

-----HAZARDOUS INGREDIENTS-----

Component(s)/CAS No	% wt.	Exposure Limits, ppm	
		OSHA PEL	ACGIH TLV
Ethylene glycol (107-21-1)	94	50* vapour	50* vapour
Potassium hydroxide (1310-58-3)	1	2 mg/m3*	2 mg/m3*
Water and processing additives (N/A)	3	N/D	N/D
Dipotassium hydrogen phosphate (7758-11-4)	2	N/D	N/D

*Ceiling

Local regulated limits may vary

-----PHYSICAL PROPERTIES-----

Boiling Point (C at 760 mm Hg): 164.5
Melting Point: N/D
Freezing Point: -24 C
Specific Gravity (Water=1): 1.133 at 20/20 C
Vapour Pressure (at 20 C): 1.2 mmHg
Vapour Density (air = 1): 2.1
pH: N/D

Solubility in Water (% by weight): 100
Volatile: 96.27 by weight
Evaporation Rate (Butyl Acetate=1): 0.1
Lower Threshold: N/D
Coefficient of Water/Oil Distribution: N/D
Appearance and Odour: Transparent colourless liquid; mild odour.
Physical State: Liquid.

-----FIRE AND EXPLOSION INFORMATION-----

Flash Point/Method: 126.7 C, Pensky-Martens closed cup, ASTM D 93
129.4 C, Cleveland open cup, ASTM D 92
Lower Flammable Limit, % by volume: approx. 3.2
Upper Flammable Limit, % by volume: approx. 15
Upper and lower limits for ethylene glycol.

Autoignition Temperature: N/D

Extinguishing Media: Use alcohol-type or all-purpose-type foam by manufacturers' recommended techniques for large fires. Use water spray, carbon dioxide, or dry chemical media for small fires.

Special Fire Fighting Procedures: Do not spray pool fires directly; a solid stream of water or foam directed into hot, burning liquid may cause frothing. Use self-contained breathing apparatus and protective clothing.

Unusual Fire and Explosion Hazards: None currently known.

Hazardous Combustion Products: Burning can produce carbon dioxide and/or carbon monoxide.

Explosion Data

Sensitivity to Mechanical Impact: N/D

Sensitivity to Static Discharge: N/D

Conditions of Flammability: N/D

-----HAZARDOUS REACTIVITY-----

Stability: Stable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: None currently known.

Materials to Avoid: Explosive decomposition may occur if combined with strong acids or strong bases and subjected to elevated temperatures. Therefore, avoid strong acids and strong bases at elevated temperatures. Avoid contamination with strong oxidizing agents, and materials reactive with hydroxyl compounds

Hazardous Decomposition Products: Burning can produce carbon dioxide and/or carbon monoxide

Conditions of Reactivity: None currently known.

-----FIRST AID MEASURES-----

If Inhaled: Remove to fresh air. Call a physician if symptoms persist.

In Case of Eye Contact: Immediately flush eyes with water for several minutes.

In Case of Skin Contact: Remove contaminated clothing and flush skin with water

If Ingested: If conscious, give 2 glasses of water and induce vomiting. Call a physician immediately. If medical advice is delayed and the person has swallowed moderate volumes of ethylene glycol (a few ounces), then give three to four ounces of hard liquor such as whiskey.

Notes to Physician: The principal toxic effects of ethylene glycol, when swallowed, are kidney damage and metabolic acidosis. Ethanol is antidotal, and its early administration may block the formation of nephrotoxic metabolites of ethylene glycol in the liver. Ethanol should be given intravenously, as a 5% solution in sodium bicarbonate, at a rate of about

10 mL ethanol per hour. A desired therapeutic level of ethanol in blood is 100 mg/dL. Hemodialysis may be required. 4-Methylpyrazole, a potent inhibitor of alcohol dehydrogenase, has been used therapeutically to decrease the metabolic consequences of ethylene glycol poisoning before coma, seizure, and renal failure have occurred (20 mg/kg/day).

Pulmonary oedema with hypoxemia has been described in a number of patients following poisoning with ethylene glycol. The mechanism of production has not been elucidated, but it appears to be noncardiogenic in origin in several cases. Respiratory support with mechanical ventilation and positive end-expiratory pressure may be required. There may be cranial nerve involvement in the late stages of toxicity from swallowed ethylene glycol. In particular, effects have been reported involving the seventh, eighth, and ninth cranial nerves, presenting with bilateral facial paralysis, diminished hearing, and dysphagia.

-----HEALTH HAZARD INFORMATION-----

Primary Routes of Exposure: Inhalation, eye contact, ingestion.

Signs, Symptoms and Effects of Exposure

Inhalation: May cause irritation of the nose and throat with headache, particularly from mists. High vapour concentrations (caused, for example, by heating the material in an enclosed and poorly ventilated workplace) may produce nausea, vomiting, headache, dizziness, and irregular eye movements.

Eye Contact: Liquid, vapour, and mist may cause discomfort in the eye with persistent conjunctivitis, seen as slight excess redness of the conjunctiva. Serious corneal injury is not anticipated.

Skin Contact: No evidence of adverse effects from available information.

Skin Absorption: No evidence of adverse effects from available information.

Ingestion: May cause abdominal discomfort or pain, nausea, vomiting, dizziness, drowsiness, malaise, blurring of vision, irritability, lumbar pain, oliguria, uremia, and central nervous system effects, including irregular eye movements, convulsions, and coma. Cardiac failure and pulmonary oedema may develop. Severe kidney damage follows the swallowing of large volumes of ethylene glycol. May be fatal. A few reports have been published describing the development of weakness of the facial muscles, diminished hearing, and difficulty with swallowing during the late stages of severe poisoning.

Chronic Effects of Exposure: Effects of repeated overexposure: Inhalation of mists may produce signs of central nervous system involvement, particularly dizziness and nystagmus.

Medical Conditions Aggravated by Exposure: May aggravate existing kidney diseases.

Additional Information: N/D

-----TOXICITY DATA-----

Ethylene Glycol

LD50 Oral (rat): 4700 mg/kg, RTECS (1991)
LD50 Dermal (rabbit): 9530 mg/kg, RTECS (1991)
LC50 (species): N/D

Potassium Hydroxide

LD50 Oral (rat): 273 mg/kg, RTECS (1991)
LD50 Dermal (rabbit): N/D
LC50 (species): N/D

Water & processing additives

LD50 Oral (rat): N/D
LD50 Dermal (rabbit): N/D
LC50 (species): N/D

Potassium Hydrogen Phosphate

LD50 Oral (rat): N/D
LD50 Dermal (rabbit): N/D

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LC50 (species): N/D

carcinogenicity: Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol causes dose-related increases in tumour incidence, or a different pattern of tumours compared with untreated controls. The absence of a carcinogenic potential for ethylene glycol has been supported by numerous in vitro genotoxicity studies showing that it does not produce mutagenic or clastogenic effects.

Sodium tolytriazole has demonstrated mutagenic activity in a bacterial test system. A correlation has been established between mutagenic activity and carcinogenic activity in many chemicals.

Sensitization: Repeated skin contact may, in a very small proportion of cases, cause sensitization with the development of allergic contact dermatitis. The incidence is significantly less than 1% with the undiluted material.

Irritancy: N/D

Reproductive Effects: N/D

Teratogenicity: Ethylene glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. The no-effect dose for developmental toxicity for ethylene glycol given by gavage over the period of organogenesis has been shown to be 150 mg/kg/day for the mouse and 500 mg/kg/day for the rat. Also, in a preliminary study to assess the effects of exposure of pregnant rats and mice to aerosols at concentrations 150, 1000, and 2500 mg/m³ for 6 hours a day throughout the period of organogenesis, teratogenic effects were produced at the highest concentration, but only in mice. The conditions of these latter experiments did not allow a conclusion as to whether the developmental toxicity was mediated by inhalation of aerosol, percutaneous absorption of ethylene glycol from contaminated skin, or swallowing of ethylene glycol as a result of grooming the wetted coat. In a further study, comparing effects from high aerosol concentration by whole-body or nose-only exposure, it was shown that nose-only exposure resulted in maternal toxicity (1000 and 2500 mg/m³) and developmental toxicity with minimal evidence of teratogenicity (2500 mg/m³). The no-effect concentration (based on maternal toxicity) was 500 mg/m³. In a further study in mice, no teratogenic effects could be produced when ethylene glycol was applied to the skin of pregnant mice over the period of organogenesis. The above observations suggest that ethylene glycol is to be regarded as an animal teratogen; there is currently no available information to suggest that ethylene glycol has caused birth defects in humans. Cutaneous application of ethylene glycol is ineffective in producing developmental toxicity; exposure to high aerosol concentration is only minimally effective in producing developmental toxicity; the major route for producing developmental toxicity is perorally.

Mutagenicity: Numerous in vitro genotoxicity studies have shown that ethylene glycol does not produce mutagenic or clastogenic effects. Sodium tolytriazole has demonstrated mutagenic activity in a bacterial test system

Toxicologically Synergistic Products: N/D

Other Data: N/D

Environmental Effects: N/D

-----PREVENTATIVE MEASURES-----

Ventilation (Engineering Controls): General (mechanical) room ventilation is expected to be adequate if handled in covered equipment. Local exhaust ventilation is needed at points where vapours can be expected to escape to the workplace air.

Personal Protective Equipment

Respiratory: NIOSH or MSHA approved self-contained breathing apparatus in high vapour concentrations

Eye: Monogoggles or face shield.

Clothing: N/D

Footwear: N/D

Hands: Natural rubber, nitrile, neoprene, or PVC gloves.

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MATERIAL SAFETY DATA SHEET

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Other Protective Measures: Eye bath and safety shower.

Precaution to Take for Spills or Leaks: Wear suitable protective equipment. Small spills can be flushed with large amounts of water. Larger spills should be collected for disposal.

Waste Disposal Method: Incinerate in a furnace where permitted under appropriate federal, provincial, and local regulations. At very low concentrations in water, ethylene glycol is readily biodegradable in a biological wastewater treatment plant.

Storage and Handling Precautions and Equipment: DANGER! Harmful or fatal if swallowed. Causes eye irritation. Prolonged or repeated breathing of mist or vapour is harmful. May cause kidney and nervous system damage. Ethylene glycol causes birth defects in laboratory animals.

Do not swallow. Avoid contact with eyes. Do not breathe mist from spray. Avoid prolonged or repeated breathing of vapour. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

Special Shipping Information: N/D

Other Precautions: The maximum recommended skin temperature on the heat transfer fluid side of a heat exchanger is 160C. If the fluid is exposed to excessively high temperatures, thermal degradation can occur; organic acids and other irritating fumes could result. Respiratory protection, such as an air-supplied mask, may be needed until the fumes can be removed.

Undyed, this heat transfer fluid is not suitable for use in any system where contamination of drinking water supply is possible.

WARNING: Sudden release of hot organic chemical vapours or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions.

Any use of this product in elevated-temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions. Further information is available in a technical bulletin entitled "Ignition Hazards of Organic Chemical Vapours."

FOR INDUSTRIAL USE ONLY

-----REGULATORY INFORMATION-----

TDG Classification

Shipping Name: Non-Regulated
UN: N/R
Class:
PKG:

WHMIS Classification: D.2A; D.2B

Listed on the Domestic Substances List (DSL): Yes

-----FOR PRODUCT AND SALES INFORMATION-----

Contact Your Local Van Waters & Rogers Ltd. Branch Office.

-----NOTICE-----

VAN WATERS & ROGERS LTD. EXPRESSLY DISCLAIMS ALL EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT PROVIDED.

-----REVISION INFORMATION-----

Legend: N/AP - Not Applicable. N/D - No Data Available.

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===== END OF MSDS =====

ACTION PLAN FOR SODIUM CYANIDE SPILLS

Initial Spill

Response

- TEST for presence of hydrocyanic acid (HCN) gas
- DO NOT ENTER area containing sodium cyanide dust or HCN gas without self-contained breathing apparatus
- STOP spill at source if possible
- PREVENT solid sodium cyanide from contacting acid, acid salts, or water
- if sodium cyanide does contact water, CONTAIN solution to as small an area as possible Consider dyking
- if HCN gas is being produced, WEAR PROTECTIVE CLOTHING AND BREATHING APPARATUS, VENTILATE AND ADD HYDRATED LIME to slow the reaction
- ISOLATE area of spill, preferably by roping off affected area and posting appropriate hazard signs

Hazards

- extremely toxic by ingestion or inhalation (of dust or gas)
- corrosive to skin, due to strong alkalinity
- liberates highly toxic HCN gas if sodium cyanide comes in contact with any acid or acid salts
- contact with carbon dioxide produces HCN gas in lesser, but possibly dangerous quantities
- contact with water may produce small amounts of HCN gas
- HCN gas can be absorbed through the skin

Action for Fire

- sodium cyanide is not flammable and will not support combustion, however, HCN gas is flammable
- **DO NOT USE CARBON DIOXIDE** extinguishers to fight a fire involving sodium cyanide, as this may produce toxic and flammable HCN gas
- if water is used to fight a fire involving sodium cyanide, treat run-off as though it was a spill of sodium cyanide solution Do not allow run-off to reach a stream.

Recovery

- spills of sodium cyanide on dry surfaces can be shovelled into containers Crews should wear dust masks while shovelling or sweeping up spills. Beware of contacting the skin with solid NaCN because it can be absorbed through the skin
- spills of solid sodium cyanide on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of sodium cyanide being dissolved. Affected area should be sprayed with solution of calcium hypochlorite to neutralize cyanide into an HCN gas as this gas is highly toxic Personnel so employed shall be required to utilize a self-contained breathing apparatus
- sodium cyanide, as a solid or in solution, must not be allowed access to any flowing stream, as its recovery from such a stream is virtually impossible
- soil contaminated with sodium cyanide should be excavated if the affected ground water threatens to travel to an adjacent flowing stream
- solutions of sodium cyanide which are not recovered can be neutralized by addition of lime and calcium hypochlorite
- sorbents may be used to contain and recover spilled solutions

Disposal

- solid sodium cyanide recovered from a spill may be used in the mill if it is of acceptable quality
- solid sodium cyanide, all sodium cyanide solutions recovered from the spills, and soil containing sodium cyanide should be added to the mill circuits under the direction of the Mill Superintendent, or disposed of in the tailings pond

Properties

- chemical formula NaCN
- white solid (briquettes)
- very soluble in water
- aqueous solution is strongly alkaline and decomposes rapidly
- solid sodium cyanide absorbs moisture from the air, and tends toward a liquid state

Environmental

Threat

- very toxic to fish and other forms of aquatic life at concentrations considerably less than 1 mg/l

Containers

- transported and stored in 100 kg steel drums and 1360 kg Flo-Bins

Supplier

- Dupont

Cyanide Antidote

Keep the following solutions, obtainable from any pharmacist, ready for use

- a 158 grams B P ferrous sulphate crystals ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) and 3 grams of B P citric acid dissolved in 1 litre of water
- b 60 grams anhydrous sodium carbonate (Na_2CO_3) dissolved in 1 liter of distilled water

DOSE Mix equal quantities of a and b to make approximately 250 ml (8 oz) glassful and swallow the mixture The above solutions will keep indefinitely provided the ferrous sulphate is stored away from direct sunlight

Health Hazards

- 1 Sodium Cyanide spills should be cleaned up promptly to minimize exposure to people and the environment Shovel and/or sweep up spilled material into a drum or other suitable covered container;
- 2 Owing to the toxicity of Sodium Cyanide, it is important that all persons coming in contact with it be completely familiar with and observe established safety procedures,
- 3 Sodium Cyanide is a rapidly fatal poison when taken internally Poisoning may occur if sodium cyanide dust is inhaled Prolonged contact with the skin may cause irritation and possibly poisoning, particularly if there are open wounds or skin abrasions Sodium Cyanide causes eye burns,
- 4 Sodium Cyanide in contact with acids or weak alkalies liberates highly toxic and flammable hydrocyanic Acid (HCN) gas. Also, toxic amounts of HCN can be liberated from water solutions of Sodium Cyanide,
- 5 Take every precaution to keep acids or weak alkalies from contacting Sodium Cyanide **DO NOT STORE WITH ACIDS OR WEAK ALKALIES;**

- 6 NEVER STORE, HANDLE, OR CONSUME FOOD OR BEVERAGES IN AREAS WHERE SODIUM CYANIDE IS BEING USED, HANDLED OR STORED,
- 7 When being stored keep the Sodium Cyanide dry Keep containers closed Store the sodium Cyanide in a dry, well ventilated area Keep away from oxidizing agents

Safety Precautions

- 1 All personnel responding to a spill clean up are to be properly attired (rubber suit - rubber gloves - rubber boots - dust mask - respirator/air pack - sleeves and cuffs taped so no cyanide dust will come in contact with the skin) The accident/incident and location will indicate attire required Use common sense when responding to petroleum/toxic spills,
- 2 Do not breath dust or gas Wear an approved dust respirator when there is danger of inhaling cyanide dust or use an approved air pack,
- 3 Avoid contact of cyanide with the skin Do not allow contact with open wounds or skin abrasions,
- 4 Do not get cyanide dust in eyes Wear approved chemical splash goggles when handling cyanide solutions and where there is danger of splashing
- 5 Immediately sweep onto a shovel any spilled cyanide and place in a suitable closeable container Dry spills occurring outside - excavate solid and dispose of it in the tailings pond
- 6 Wash all outer clothing thoroughly upon completion of clean-up and shower vigorously
- 7 Remain upwind at all times when conducting clean-up operations involving sodium cyanide spills

Symptoms of Cyanide Poisoning

Personnel should be constantly alert and prepared to take immediate action in case of exposure to cyanide. The following symptoms of cyanide poisoning are easily recognized

- a Reddening of the eyes
- b Irritations of the throat
- c. Palpitation
- d. Difficulty in breathing
- e Salivation
- f Nausea
- g Headache
- h Weakness of arms and legs
- i Giddiness
- j Collapse and convulsions
- k Numbness
- l Death

Effects of Exposure to HCN Vapour

Toxicity data 300 PPM - Rapidly fatal
100 - 240 PPM - Fatal within 1/2 to 1 hour
45 - 54 PPM - Tolerated 1/2 to 1 hour without immediate or
 delayed effect
20 - 40 PPM - Slight symptoms after several hours
10 PPM - Threshold limit/Time-weighted average for normal
 8 hour day
2 - 5 PPM - Odour threshold

In case of overexposure to HCN, quick action is called for in removing the victim from the contaminated area and administering first aid and medical treatment. While cyanide poisoning is rapidly fatal, no case should be considered hopeless as long as there is a heartbeat (only a physician can certify death).

First Aid Treatment when Administering AMYL Nitrite

- * **WARNING:** Any person giving first aid should be careful to keep the broken pearls away from his own mouth and nose, otherwise he may inhale sufficient amyl nitrite to become dizzy and be incompetent to give proper assistance. Since amyl nitrite is flammable, be careful to remove all sources of ignition, such as open flames or cigarettes, before breaking the pearls.

1 If patient is conscious and breathing.

Break the amyl nitrite pearl in a cloth and hold lightly under the patient's nose for 15 seconds, repeating five times at about 15 second intervals. If necessary, repeat this procedure every five minutes with fresh pearls until three or four pearls have been given.

2 If patient is unconscious but breathing.

Break the amyl nitrite pearl in a cloth and hold lightly under the patient's nose for 15 seconds, repeating five times at about 15 second intervals. If necessary, repeat this procedure every five minutes with fresh pearls until three or four pearls have been given. If recovery is not forthcoming, give oxygen from an inhalator.

3 If patient has stopped breathing.

Give artificial respiration until breathing starts. Also, Break the amyl nitrite pearl in a cloth and hold lightly under the patient's nose for 15 seconds, repeating five times at about 15 second intervals. If necessary, repeat this procedure every five minutes with fresh pearls until three or four pearls have been given.

4 Inhalation of Cyanide.

If inhaled, carry patient to fresh air. Have patient lie down. Administer antidote (as in 1, 2, or 3 above) and remove contaminated clothing. Keep patient quiet and warm until physician/nurse arrives.

5 Ingestion of Cyanide.

If cyanide has been swallowed, administer antidote (as in 1, 2, or 3, above) give patient one pint of 1% sodium thiosulphate solution (or soapy or mustard water) by mouth and induce vomiting Repeat until vomit fluid is clear Never give anything by mouth to an unconscious person

6 Skin or Eye Contact:

In case of contact of sodium cyanide with skin or eyes immediately flush with plenty of water for at least 15 minutes

Medical Treatment - By Physician/Registered Nurse ONLY

1 Treatment of Cyanide Poisoning.

Have someone break an amyl nitrite pearl in a cloth and hold it tightly under the patient's nose for 15 seconds, repeating five times at about 15 second intervals while preparations for the sodium nitrite and sodium thiosulphate injections are made

Discontinue administration of amyl nitrite and inject the solution of sodium nitrite (10 ml of a 3% solution) intravenously at the rate of 2.5 ML/minute, then immediately inject the sodium thiosulphate (50ML of a 25% solution) at the same rate, taking care to avoid extravasation

Watch patient continuously for 24 - 48 hours If there is any return of symptoms during this period, repeat the treatment, but use one half the amounts of sodium nitrite and sodium thiosulphate solutions.

If signs of excessive methaemoglobinaemia develop (ie. blue skin and mucous membranes, vomiting, shock and coma), 1% methylene blue solution should be given intravenously A total dose of one to two mg/kg of body weight should be administered over a period of five to ten minutes and should be repeated in one hour if necessary In addition, oxygen inhalation will be helpful and a transfusion of whole fresh blood may be considered if there has been mechanical injury with bleeding or internal blood loss simultaneously with the cyanide exposure

NOTE: A second injection of the antidotes on one half the dosage initially used can be administered two hours after the initial treatment to help the patient ward off a relapse

2 Treatment of Cyanide Sores

In case any sore or irritation of the skin develops coincidentally with handling cyanide or its solutions, consult a physician or dermatologist. (At Lupin contact the Nurse)

3 Treatment of Burns

Burns from molten cyanide mixtures are the same as those from alkalies and should be treated in a similar manner. Wash the burns thoroughly with warm water to remove all cyanide and alkalies present, then treat as any burn and consult a physician. (At Lupin contact the Nurse)

DUPONT CANADA INC.

MATERIAL SAFETY DATA SHEET

MATERIAL IDENTIFICATION

Sodium Cyanide

MSDS NUMBER : CEC00007
CORPORATE NUMBER : DU000290

"CYANOBRIK", "CYANOGRAN", "CYANO-DOL" are registered trademarks of Du Pont.

Revision Date : 06-Oct-93
Date Printed : 12-Oct-93

MANUFACTURER/DISTRIBUTOR

Du Pont Canada Inc.
P.O. Box 2200
Mississauga
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L5M 2H3

PHONE NUMBERS

PRODUCT INFORMATION : 1-(800)387-2122
TRANSPORT EMERGENCY : 1-(613)348-3616
MEDICAL EMERGENCY : 1-(613)348-3616

GRADE : "CYANOBRIK"; "CYANOGRAN"; "CYANO-DOL";
COMPOUNDERS GRADE
CHEMICAL FAMILY : ALKALI METAL CYANIDE

TRADE NAMES / SYNONYMS

Cyanide of Sodium
Prussiate of Soda

CAS NAME : SODIUM CYANIDE
CAS NUMBER : 143-33-9
FORMULA : NaCN
TSCA INVENTORY STATUS : Reported/Included
NFPA RATINGS : Health: 3 Flammability: 0 Reactivity: 1
NPCA-HMIS RATINGS : Health: 3 Flammability: 0 Reactivity: 1
Personal Protection rating to be supplied by
user depending on use conditions.

WHMIS CLASSIFICATION

CLASS D Division 1 Subdivision A : Very Toxic Material/Acute
Lethality

CLASS D Division 2 Subdivision B : Toxic Material. Skin or Eye
Irritant.

NOTICE FROM DU PONT: The information on 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.

MSDS No. CEC00007

DU PONT
Material Safety Data Sheet

Page 2

COMPONENTS

<u>Material</u>	<u>CAS Number</u>	<u>%</u>
Sodium Cyanide	143-33-9	100

DSL: REPORTED/ INCLUDED

PHYSICAL DATA

Boiling Point : 1,496 deg C (2,725 deg F) at 760 mm Hg.
Vapor Pressure : Negligible
Vapor Density : Not volatile
Melting Point : 564 deg C (1,047 deg F)
Water Solubility : 37 WT % at 20 deg C (68 deg F)
pH : 11.3-11.7 Typical for 5-25% solutions-no pH
adjustment
Form : Solid, granular or briquettes
Color : White
Specific Gravity : 1.6

Odor : None (but can have slight ammonia and/or
hydrogen cyanide odor if damp).

HAZARDOUS REACTIVITY

Instability : Very stable when dry.
Decomposition : Moisture will cause slow decomposition, releasing
poisonous hydrogen cyanide and ammonia gases.
Polymerization : Polymerization will not occur.

Incompatibility : Large amounts of poisonous, flammable
hydrogen cyanide (HCN) gas will be
evolved from contact with acids. Reacts
violently with strong oxidizing agents.
Water or weak alkaline solution can
produce dangerous amounts of hydrogen
cyanide in confined areas.

FIRE AND EXPLOSION DATA

Will not burn.

FIRE AND EXPLOSION HAZARDS

Will not burn. Sodium cyanide will not be destroyed in an
ordinary fire involving combustible materials such as paper
or wood. Follow appropriate National Fire Protection
Association (NFPA) codes.

(FIRE AND EXPLOSION DATA - Continued)

EXTINGUISHING MEDIA

Use water on fires near sodium cyanide but minimize amount of water if containers are opened or burned (see "Incompatibility" above). Also, judgement should be used in light of runoff problems (see "Special Fire Fighting Instructions" below). In some cases it may be desirable to let a fire burn out by itself. DO NOT use carbon dioxide (CO₂) which reacts with sodium cyanide to produce hydrogen cyanide if moisture is present.

SPECIAL FIRE FIGHTING INSTRUCTIONS

Sodium cyanide dissolves readily in water; therefore, cyanide solution runoff may occur if containers are opened or burned. Runoff should be contained to avoid environmental or safety problems. Contained cyanide solution can be detoxified with hypochlorite.

HEALTH HAZARD INFORMATION

May be fatal if inhaled, swallowed, or absorbed through skin. Contact with acids or weak alkalis liberates poisonous gas. Causes eye burns and may irritate skin.

ANIMAL DATA:

Oral LD50: 15 mg/kg in rats

The compound is a skin and eye irritant in tests with laboratory animals. Toxic effects described in animals from exposure by inhalation, ingestion, or skin contact include asphyxia (lack of oxygen), dyspnea (shortness of breath), ataxia (incoordination), tremors, coma, and lethality by disrupting oxidative metabolism. Tests in bacterial and mammalian cell cultures demonstrate no mutagenic activity. Tests for embryotoxicity in animals have shown an embryotoxic or teratogenic effect only at exposure levels very nearly lethal to the maternal animals. Observance of the established exposure limits and prevention of skin contact with sodium cyanide solutions should be adequate to prevent adverse health effects on anyone in the workplace, including the conceptus (fetus).

HUMAN HEALTH EFFECTS:

Overexposure by skin contact may include skin irritation with discomfort and rash. Eye contact may include irritation or burns with discomfort, tearing or blurring of vision. Excessive and prolonged contact may result in permanent eye damage.

Effects of skin contact, inhalation or ingestion overexposures to cyanide are characterized by central

(HEALTH HAZARD INFORMATION - Continued)

nervous system excitation followed by depression. Symptoms may include:

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

Convulsions, coma and death due to respiratory arrest may occur without first aid or medical treatment.

Cyanosis (bluish discoloration of the skin) is a sign that follows cardiovascular collapse and apnea (absence of breathing). Reported chronic effects of acute, severe overexposures may not be due to cyanide per se but to the hypoxic (oxygen deficient) state. There appears to be no cumulative effects from repeated exposures. Reports of chronic thyroid effects from occupational exposure to cyanide fail to establish a well defined cause-effect relationship.

Individuals with preexisting diseases of the central nervous system may have increased susceptibility to the toxicity of excessive exposures.

CARCINOGENICITY

None of the components in this material is listed by IARC, NTP, OSHA, or ACGIH as a carcinogen.

EXPOSURE LIMITS

Sodium Cyanide

AEL * (Du Pont): None Established
TLV (ACGIH) : 5 mg/m³, as CN - 8 Hr TWA, skin
PEL (OSHA) : 5 mg/m³, as CN - 8 Hr TWA, skin

- * AEL is Du Pont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

SAFETY PRECAUTIONS

Emergency pre-planning and training are needed before beginning to work with sodium cyanide since prompt treatment is essential in cases of cyanide poisoning. Always have Cyanide Antidote Kits on hand.

Do not breathe dust, mist, or hydrogen cyanide gas. Do not get in eyes. Avoid contact with skin and clothing. Do not carry foodstuffs, beverages, or tobacco where contamination with cyanide is possible. Wash thoroughly after handling. Wash contaminated clothing before reuse.

FIRST AID

FIRST AID AND MEDICAL TREATMENT

Treatment for cyanide poisoning can be provided in two ways, "First Aid" and "Medical Treatment". Both require immediate action to prevent further harm or death. First aid using oxygen and amyl nitrite can be given by a layperson before trained medical help arrives. Medical treatment may require intravenous injections of sodium nitrite and sodium thiosulfate, and must be administered by qualified medical personnel. Even if a doctor or nurse is present, the need for fast treatment dictates using first aid treatment with oxygen and amyl nitrite while medical treatment materials for intravenous injection are being prepared. Experience shows that first aid given promptly is usually the only treatment needed for typical accidental poisonings. Larger cyanide exposure increases the need for medical treatment.

Medical treatment with standard intravenous doses of sodium nitrite followed by sodium thiosulfate is reserved for patients who do not regain clear consciousness with oxygen and amyl nitrite. However, even under optimum conditions, amyl nitrite can be administered faster and should be used even if medical treatment follows.

Any site where cyanide is handled should always stock the materials listed for First Aid supplies and Medical Treatment Kits. Identification of community hospital resources and emergency medical squads in order to equip and train them prior to an exposure is essential. All employees who will work with cyanide must be trained, and routinely practice rescue and first aid actions for cyanide exposures.

In case of cyanide poisoning, start first aid treatment immediately, then call a physician.

FIRST AID SUPPLIES

Adequate first aid supplies for cyanide poisoning should be conveniently placed throughout cyanide areas and should be immediately accessible at all times. They should be routinely inspected (typically daily) by people who would use them in an emergency. The total number of each item listed below should be adequate to handle the largest number of exposure cases reasonably anticipated, taking into account that some supplies may be wasted, destroyed, or inaccessible in the emergency.

1. Oxygen Resuscitators - The Flynn Series III Model by O-Two Systems (800-387-3405) has performed well in DuPont use. It is lightweight, rugged, and easy to use.
2. Amyl Nitrite Ampules (antidote) - One box of one dozen

(FIRST AID - Continued)

ampules per station is usually satisfactory. Locate stations throughout the cyanide area.

CAUTION: Amyl nitrite is not stable and must be replaced every 1 to 2 years. Store in the original dated box, away from heat. A common DuPont practice is to use the resuscitator as the storage point for the amyl nitrite ampules. Avoid storage on vehicles where temperatures can reach 60-66 deg C (140-150 deg F) or more. Storage in high temperature climates may require replacement before the expiration date. Also, excessive cold storage may limit the vapor pressure of amyl nitrite and may reduce its evaporating property. Kits and amyl nitrite should be accessible, but secured against tampering or theft.

**FIRST AID INFORMATION CONTINUED IN NOTES TO PHYSICIAN

NOTES TO PHYSICIAN

**INFORMATION CONTINUED FROM FIRST AID SECTION

3. A set of cyanide first aid instructions should be located at each amyl nitrite storage location. Workers should be fully trained since in a real emergency there will be insufficient time to "read the book".

MEDICAL TREATMENT KITS

Medical Treatment Kits for cyanide poisoning should be conveniently located for easy access by medical people. Materials for intravenous injection are intended for use only by a physician or fully qualified medical personnel. The location of kits should be carefully planned as part of the emergency preplan. Suggested locations for kits include:

- in or near the cyanide area
- plant medical station
- entrance guard house
- local hospital
- doctor's office and residence

Medical Treatment Kits should contain the following:

1. One box containing one dozen (12) amyl nitrite ampules.
2. Two sterile ampules of sodium nitrite solution (10 mL of a 3% solution in each).
3. Two sterile ampules of sodium thiosulfate solution (50 mL of a 25% solution in each).
4. One 10 mL sterile syringe. One 50 mL sterile syringe. Two sterile intravenous needles. One tourniquet.

Material Safety Data Sheet

(FIRST AID - Continued)

5. One dozen gauze pads.
6. Latex gloves.
7. A "Biohazard" bag for disposal of bloody/contaminated equipment.
8. A set of cyanide instructions on first aid and medical treatment.

NOTE: Amyl Nitrite Ampules and "Medical Treatment Kits" can be purchased through local pharmacies with a physician's prescription. The pharmacy can order kits by calling the Lilly Wholesaler at:

Eastern Region	1-203-741-0761
Midwestern Region	1-317-276-3377
Western Region	1-209-443-2626

Amyl Nitrite Notes:

1. Amyl nitrite is highly volatile and flammable; do not smoke or use around a source of ignition.
2. If treating patient in a windy or drafty area, provide something--a rag, shirt, wall, drum, cupped hand, etc.--to prevent the amyl nitrite vapors from being blown away. Keep the ampule upwind from the nose. The objective is to get amyl nitrite into the patient's lungs.
3. Rescuers should avoid amyl nitrite inhalation to avoid becoming dizzy and losing competence.
4. Lay the patient down. Since amyl nitrite dilates blood vessels and lowers blood pressure, lying down will help prevent unconsciousness.
5. Do not overuse; excessive use might put the patient in shock. This has not occurred in practice at DuPont plants, and we are not aware of any death or serious aftereffects from treatment with amyl nitrite. (See MEDICAL TREATMENT section.)

FIRST AID

1. If no symptoms, no treatment is necessary; decontaminate patient.
2. If conscious but symptoms (nausea, shortness of breath, dizziness) are evident, give oxygen.
3. If consciousness is impaired (slurred speech, drowsiness), give oxygen and amyl nitrite.

(FIRST AID - Continued)

4. If unconscious but breathing, give oxygen and amyl nitrite by means of a respirator.

***INFORMATION CONTINUED IN ADDITIONAL INFORMATION AND REFERENCES SECTION.

PROTECTION INFORMATION

GENERALLY APPLICABLE CONTROL MEASURES AND PRECAUTIONS

Good general ventilation should be provided to keep dust, mist, and hydrogen cyanide gas below exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Recommended minimum protection: chemical splash goggles and rubber gloves (butyl or neoprene preferred).

Have available and use as appropriate: face shield; rubber suits, aprons, and boots; disposable toxic dust and mist respirators; self-contained breathing air supply (in case of emergency); hydrogen cyanide detector; first aid and medical treatment supplies, including oxygen resuscitators.

DISPOSAL INFORMATION

AQUATIC TOXICITY

96-hour LC50 values range from 0.05-1.7 mg/L (several species). Cyanide appears to be more toxic to aquatic life than terrestrial life.

SPILL, LEAK, OR RELEASE

NOTE: Review FIRE AND EXPLOSION HAZARDS and SAFETY PRECAUTIONS before proceeding with clean up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean up.

Sweep up and shovel into a covered container or plastic bag, pending transfer, to secure the spill. Cover and keep spillage dry. Flush spill area with a dilute solution of sodium hypochlorite or calcium hypochlorite to destroy the cyanide. Comply with Federal, State, and local regulations on reporting releases. The EPA Reportable Quantity is 10 lbs.

WASTE DISPOSAL

This material may be an RCRA Hazardous Waste (P-106). Do not flush cyanide into sewers which may contain an acid. Detoxify with dilute sodium hypochlorite, hydrogen peroxide, or calcium hypochlorite. Comply with Federal, State, and local regulations on disposal methods used to achieve the constituent based treatment standard, if permitted; or transfer to a licensed disposal contractor.

Material Safety Data Sheet

Page

SHIPPING INFORMATION
-----TDG

Proper Shipping Name : SODIUM CYANIDE, SOLID
Pin No. : UN 1689
TDG Class : 6.1 (9.2)
TDG Packaging Group: I

DOT

Proper Shipping Name : SODIUM CYANIDE
Hazard Class : 6.1
UN/NA No. : UN 1689
DOT Labels(s) : POISON
Special Information: MARINE POLLUTANT

DOT/IMO

Proper Shipping Name : SODIUM CYANIDE, SOLID
Hazard Class : 6.1
UN No. : 1689
DOT/IMO Label : POISON
Special Information: MARINE POLLUTANT
Packaging Group : I

Reportable Quantity : 10 lbs.

Shipping Containers

"CYANO-DOL" railcars and trucks; hopper rail-
cars; "Flo-Bins" (3000lb net); 2000lb bag in
a box: 100 kilo, 100 lb, & 200lb steel drums.
Reportable Quantity: 10 lb/4.54 kg

STORAGE CONDITIONS

Store in properly labeled containers in dry, ventilated,
secured areas. Keep containers closed and contents dry. Do
not store with acids or acid salts, containers with water or
weak alkalis, or oxidizing agents. Do not handle or store
food, beverages, or tobacco in cyanide areas. Do not store
near combustibles or flammables because of cyanide solution
run-off from water used for fire fighting.

TITLE III HAZARD CLASSIFICATIONS

Acute : Yes
Chronic : No
Fire : No
Reactivity : Yes
Pressure : No

(TITLE III HAZARD CLASSIFICATIONS - Continued)

Lists:

Extremely Hazardous Substance	- Yes
CERCLA Hazardous Substance	- Yes
Toxic Chemical	- Yes

ADDITIONAL INFORMATION AND REFERENCES

INFORMATION CONTINUED FROM OTHER EXPOSURE LIMITS

The "Skin" notation indicates that cyanide may penetrate the skin (especially if the skin is broken). Control of vapor, dust, and mist inhalation alone may not be sufficient to prevent an excessive dose.

INFORMATION CONTINUED FROM NOTES TO PHYSICIAN SECTION

5. If not breathing, give oxygen and amyl nitrite by means of a positive pressure respirator. To give amyl nitrite, break an ampule in a cloth and insert into lip of mask for 15 seconds, then take away for 15 seconds. Repeat 5-6 times. If necessary, use a fresh ampule every 3 minutes until the patient regains consciousness (usually 1-4 ampules). Continue to give oxygen simultaneously to aid recovery. If massive exposure occurred, consider keeping the first one or two ampules in the lip of the mask continuously.

The exposed person should be removed from the contaminated area, contaminated clothing removed and the individual washed off. The rescuer and/or person providing first aid is subject to exposure if the affected person's clothing is wetted with cyanide. Rescue and contact with a wetted person should be done by rescuers wearing self-contained breathing air (SCBA) and other personal protective equipment. For sodium cyanide solution, SCBA is normally not needed. Contact with hydrogen cyanide must be avoided by rescuers, but short contact with solid cyanides or solutions is normally not a problem if skin washing is prompt. As soon as possible, even while clothing is being removed or washing is taking place, first aid should be started.

INHALATION

If consciousness is impaired, oxygen and amyl nitrite should be administered.

Carry the patient to an uncontaminated atmosphere. Keep the patient warm and calm.

(ADDITIONAL INFORMATION AND REFERENCES - Continued)

SKIN CONTACT

If consciousness is impaired, oxygen and amyl nitrite should be administered.

Immediately flush with large quantities of water for 5 minutes after contact or suspected contact, and completely remove all contaminated clothing (including shoes or boots). Flushing with water for 5 minutes is sufficient to effectively remove cyanide from the patient's skin. Call a physician.

EYE CONTACT

If consciousness is impaired, oxygen and amyl nitrite should be administered.

Immediately flush the eyes with large quantities of water for 5 minutes while holding the eyelids apart.

Do not try to neutralize with "acids" or "alkalies". Eye contact will require further evaluation and possibly treatment. Continue rinsing the eye during transport to the hospital. Call a physician.

INGESTION

If consciousness is impaired, oxygen and amyl nitrite should be administered.

If the patient is conscious, immediately give patient one pint of 1% sodium thiosulfate solution (or plain water) by mouth and induce vomiting. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Call a physician. Give oxygen.

MEDICAL TREATMENT

EXPERIENCE SHOWS THAT FIRST AID GIVEN PROMPTLY IS USUALLY THE ONLY TREATMENT NEEDED FOR TYPICAL INDUSTRIAL CYANIDE EXPOSURE. LARGER CYANIDE EXPOSURE INCREASES THE NEED FOR MEDICAL TREATMENT.

Do not overact. Although prompt action is essential when poisoning has occurred, a lucid, conscious person who can communicate does not have significant cyanide poisoning and treatment will rarely be necessary. "Treat what you see" is a good rule of thumb.

(ADDITIONAL INFORMATION AND REFERENCES - Continued)

"Preventive" use of cyanide antidote in the absence of impaired consciousness may not be warranted. Keep the patient calm by reassurance over the next 30 minutes, and closely monitor the patient's condition. Consider assuring intravenous access in cases where significant toxicity is possible but may be delayed. Mildly symptomatic patients who remain alert may be managed by supportive care only.

If cyanide skin contact has been prolonged and/or extensive, watch the individual closely at least 30 minutes to assure there is no delayed absorption into the bloodstream.

INTRAVENOUS ANTIDOTE

Establishment of IV access with normal saline, Ringer's lactate, or other available IV fluid will facilitate administration of the antidote.

1. Sodium nitrite: Adult - 10 mL of 3% solution (300 mg)

Draw solution from the ampule and inject slowly over 4-5 minutes (2 to 2.5 mL/minute). Monitor blood pressure frequently, and slow the rate of injection if hypotension (low blood pressure) occurs.

2. Sodium thiosulfate: Adult - 50 mL of 25% solution (12.5 grams).

Follow sodium nitrite with sodium thiosulfate injected at a rate of 2.5 mL/minute (10-20 minutes).

The total time for injection of both components of the antidote at the recommended rates is lengthy, approximately 20-25 minutes.

AVOID OVERTREATMENT

Both amyl nitrite and sodium nitrite produce methemoglobin. Methemoglobin cannot carry oxygen or carbon dioxide, and therefore its presence reduces the oxygen carrying capacity of the blood. This itself is potentially harmful when methemoglobin levels exceed 20-30%.

Consider the body weight and condition of the patient when treating a cyanide exposed patient with sodium nitrite. Avoid excessive use. Should injection be stopped for any reason, keep track of the amount administered in case treatment needs to be restarted.

If symptoms persist or recur after initial treatment, repeat the antidote at one half the original doses one hour after the original administration. Monitor methemoglobin levels in every patient treated by the intravenous antidote.

(ADDITIONAL INFORMATION AND REFERENCES - Continued)

RECOVERY AND DISPOSITION

For most accidental inhalation poisonings, patients are revived in a few minutes with complete recovery within 1 to 2 hours.

If necessary, the patient should be monitored for 24 to 48 hours. Any patient whose symptoms require the use of IV antidote should be considered for admittance to an intensive care unit.

Observe for return of symptoms. Monitor methemoglobin levels, blood pH and oxygenation through arterial blood gas analysis. Calculate anion gap from serum electrolytes; cyanide poisoning causes lactate accumulation and an anion gap metabolic acidosis.

Delayed neurotoxic effects are not expected consequences of cyanide exposure although these neurotoxic effects may occur if hypoxia (oxygen deficiency) was prolonged or occurred following massive cyanide exposure.

ADVERSE EFFECTS

Nitrites can produce hypotension through peripheral vasodilation (widening of the blood vessels). Methemoglobin formation, although considered a therapeutic effect, may cause symptoms if levels exceed 20-30%. Recommended doses usually produce methemoglobin levels under 20%. Headache, nausea, vomiting, and syncope may follow nitrite administration. While it is important to be aware of the effects from nitrite therapy, there have been no long-lasting effects associated with this treatment regimen for cyanide exposure in DuPont's experience and knowledge.

CAUTION:

DO NOT USE IN MEDICAL APPLICATIONS INVOLVING PERMANENT IMPLANTATION IN THE HUMAN BODY.

Responsibility for MSDS

: CHEMICALS & PIGMENTS
MISSISSAUGA, ONTARIO
416-821-3300

End of MSDS

ACTION PLAN FOR SPILL OF HYDRATED LIME

Initial Spill

Response

- STOP spill at source if possible
- PREVENT hydrated lime from contacting water
- if lime does contact water, CONTAIN solution to as small an area as possible

Hazards

- skin irritant

Action for Fire

- no special precautions

Recovery

- spills of hydrated lime on dry surfaces can simply be shovelled into containers
- spills of lime on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of lime being dissolved
- sorbents may be used to contain and recover spilled solutions

Disposal

- hydrated lime recovered from a spill may be used in the mill if it is of acceptable quality
- solid lime and all lime solutions should be disposed of in the tailings pond

Properties

- chemical formula Ca(OH)_2
- white crystalline powder
- slightly soluble in water

Environmental**Threat**

- toxic to fish and other aquatic life at concentrations in the order of 50mg/l and greater

Containers

- transported and stored in lined paper bags which are palletized and double stretch wrapped

Supplier

- Dupont

SALES ORDER:

P.95

VAN WATERS & ROGERS PRODUCT: 12073

SDS NUMBER: L1299 VERSION: 1

DATE PRINTED: 26/10/93

ECHO BAY MINES LTD
3300 MANULIFE PLACE
10180 - 101 STREET
EDMONTON, ALTA. T5J 3S4

WHMIS CODES: E

-----EMERGENCY ASSISTANCE-----

For Emergency Assistance Involving Chemicals
Call CHEMTREC (800) 424-9300

-----PRODUCT INFORMATION-----

Product Name: HYDRATED LIME[®] VW&R Code: L1299

Common Name/Synonym: Calcium Hydroxide; Calcium Hydrate, slaked lime; caustic lime

CAS Registry Number: 1305-62-0

Chemical Name: N/D

Chemical Family: N/D

Formula: Ca(OH)₂

Molecular Weight: 74.09

Product Use: Cement, water treatment, mining, pulp and paper.

-----PREPARATION INFORMATION-----

Date Issued: 09/92

Supersedes: 02/89 (P1318)

Prepared By: MSDS Coordinator. Contact during business hours,
Eastern Time (416) 736-9299.

-----HAZARDOUS INGREDIENTS-----

Component(s), CAS No	% wt	Exposure Limits, mg/m3	
		OSHA PEL	ACGIH TLV
Calcium Hydroxide (1305-62-0)	95-100	5	5

Local regulated limits may vary

-----PHYSICAL PROPERTIES-----

Boiling Point: 2850 °C

Melting Point: 580 °C

Freezing Point: N/D

Specific Gravity (Water=1): 2.3

Vapour Pressure: N/D

Vapour Density: N/D

pH: 11.6-12.6 Strong alkaline.

Solubility in Water: Negligible (<0.1%)

% Volatile: 0

Evaporation Rate (Butyl Acetate=1): N/D

Odour Threshold: N/D

Coefficient of Water/Oil Distribution: >1

Appearance and Odour: White or white-grey solid Odourless.

Physical State: Solid.

-----FIRE AND EXPLOSION INFORMATION-----

L1299

MATERIAL SAFETY DATA SHEET

PAGE 2

Flash Point/Method: N/AP
Lower Flammable Limit: N/AP
Upper Flammable Limit: N/AP
Autoignition Temperature: N/AP
Extinguishing Media: Use extinguishing media appropriate for surrounding fire.
Special Fire Fighting Procedures: Fire-fighters should wear self-contained breathing apparatus with full facepiece operated in positive pressure mode
Unusual Fire and Explosion Hazards: N/AP
Hazardous Combustion Products: N/AP
Explosion Data
Sensitivity to Mechanical Impact: N/AP
Sensitivity to Static Discharge: N/AP
Conditions of Flammability: Non-flammable.

-----HAZARDOUS REACTIVITY-----

Stability: Stable.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Air, dusting.
Materials to Avoid: Strong acids, nitromethane, nitroethane, nitropropane, phosphorus, maleic anhydride.
Hazardous Decomposition Products: None identified.
Conditions of Reactivity: N/D

-----FIRST AID MEASURES-----

If Inhaled: Move to fresh air. Apply artificial respiration and/or cardiopulmonary resuscitation (CPR) if necessary. Keep warm and at rest. Get medical attention immediately.

In Case of Eye Contact: Immediately flush eyes with a gentle stream of warm water for at least 15 min. lifting upper and lower lids at intervals. Get medical attention immediately

In Case of Skin Contact: Flush skin with large amounts of water while removing contaminated clothing. Get medical attention.

If Ingested: Do not induce vomiting. If conscious rinse residual calcium hydroxide from mouth with water and give one or two glasses of milk or water. If vomiting occurs have victim lean forward to reduce risk of vom entering lungs. Get medical attention immediately.

Notes to Physician: Basic (alkaline) chemical. Relatively low water solubility, therefore less corrosive than sodium hydroxide. Unlike calcium oxide (quicklime) does not liberate large amounts of heat on contact with water

-----HEALTH HAZARD INFORMATION-----

Primary Routes of Exposure: Inhalation, skin and eye contact, ingestion

Signs, Symptoms and Effects of Exposure

Inhalation: Dusts and mists may cause irritation of mouth, nose, throat and possibly lungs.

Eye Contact: Irritation and possible eye damage. Material may be difficult to remove from the eye

Skin Contact: Irritation and mild burns may occur. Prolonged or repeated contact may cause dermatitis

Ingestion: May cause burning sensation and limited damage to mouth, throat and esophagus. Stomach cramps may also occur

Chronic Effects of Exposure: N/D

Medical Conditions Aggravated by Exposure: Chronic respiratory disease, asthma disorders.

Additional Information: N/D

L1299

MATERIAL SAFETY DATA SHEET

PAGE 1

-----TOXICITY DATA-----

LD50 Oral (rat): 7340 mg/kg
LD50 Oral (mouse): 7300 mg/kg
LD50 Dermal (rabbit): N/D
LC50: N/D

Carcinogenicity: Not listed NTP; IARC; OSHA.
Sensitization: N/D
Irritancy: Yes
Reproductive Effects: N/D
Teratogenicity: N/D
Mutagenicity: N/D
Toxicologically Synergistic Products: N/D
Other Data: N/D
Environmental Effects: N/D

-----PREVENTATIVE MEASURES-----

Ventilation (Engineering Controls): Use local ventilation for control of high dust situations. Otherwise general ventilation normally adequate

Personal Protective Equipment

Respiratory: Use respirator approved by NIOSH/MSHA for silica or toxic dust when dust is generated. For very high or unknown concentrations wear full face positive pressure SABA or self-contained breathing apparatus.
Eye: Wear chemical splash goggles (unless full face respirator worn).
Clothing: Coveralls.
Footwear: Avoid getting material inside.
Hands: Wear neoprene, natural rubber or polyethylene gloves. (Do not use PVA gloves)
Other Protective Measures: Barrier creams on exposed skin.

Action to Take for Spills or Leaks: Warn others. Wear appropriate protective clothing and equipment. Stop further spillage, and contain spilled material. Recover spilled material for recycle/reuse, or for disposal to secure landfill

Waste Disposal Method: Dispose in accordance with all applicable federal, provincial, and local environmental regulations

Storage and Handling Precautions and Equipment: Keep container tightly closed. Store in a cool, dry area protected from damage and away from acids. Suitable for any general chemical storage area. Avoid skin and eye contact. Avoid inhaling dust

Special Shipping Information: N/D
Other Precautions: N/D

-----REGULATORY INFORMATION-----

TDG Classification

Shipping Name: Non-Regulated
UN: N/R
Class:
PKG:

WHMIS Classification: E

Listed on the Domestic Substances List (DSL): Yes

-----FOR PRODUCT AND SALES INFORMATION-----

Contact Your Local Van Waters & Rogers Ltd. Branch Office.

-----NOTICE-----

VAN WATERS & ROGERS LTD. EXPRESSLY DISCLAIMS ALL EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT PROVIDED.

-----REVISION INFORMATION-----

L1294

MATERIAL SAFETY DATA SHEET

PAGE 4

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32: Three-year revision Reconstruction

Legend: N/AP - Not Applicable N/D - No Data Available

===== END OF MSDS =====

ACTION PLAN FOR SPILL OF SODA ASH

Initial Spill

Response

- STOP spill at source if possible
- PREVENT soda ash from contacting water
- if soda ash does contact water, CONTAIN solution to as small an area as possible

Hazards - none

Action for Fire - no special precautions

Recovery

- spills of soda ash on dry surfaces can simply be shovelled into containers
- spills of soda ash on wet surfaces or exposed to rain should be shovelled into water proof containers as soon as possible to minimize the quantity of soda ash being dissolved
- sorbents may be used to contain and recover spilled solutions

Disposal

- soda ash of acceptable quality recovered from a spill may be used in the mill under the direction of the Mill Superintendent
- solid soda ash and all soda ash solutions should be disposed of in the tailings pond

Properties

- chemical formula Na_2CO_3
- greyish-white powder
- soluble in water

Environmental

Threat - toxic to fish and other aquatic life at concentrations in the order of 100 mg/l and greater

Containers

- transported and stored in lined paper bags which are palletized and double stretch wrapped

Supplier - Van Waters and Rogers Ltd.

VAN WATERS & ROGERS LTD 9800 VAN HORNE WAY RICHMOND, B.C. V6X 1W5

SALES ORDER:

VAN WATERS & ROGERS PRODUCT: 62225

MSDS NUMBER: L1349

VERSION: 1

DATE PRINTED: 26/10/93

ECHO BAY MINES LTD
3300 MANULIFE PLACE
10180 - 101 STREET
EDMONTON, ALTA. T5J 3S4

WHMIS CODES: D.2B

-----EMERGENCY ASSISTANCE-----

For Emergency Assistance Involving Chemicals
Call CHEMTREC (800) 424-9300

-----PRODUCT INFORMATION-----

Product Name: SODA ASH;

VW&R Code: L1349

Common Name/Synonym: Sodium Carbonate

CAS Registry Number: 497-19-8

Chemical Name: Sodium Carbonate

Chemical Family: N/D

Formula: Na₂CO₃

Molecular Weight: 105.99

Product Use: Soda salts; glass; soap, cleaners and water softeners; pulp and paper; photographic agent.

-----PREPARATION INFORMATION-----

Date Issued: 06/93

Supersedes: 11/90 (P1120)

Prepared By: MSDS Coordinator Contact during business hours, Eastern
Time (416) 736-9299.

-----HAZARDOUS INGREDIENTS-----

Component(s)/CAS No.	% wt.	Exposure Limits, mg/m ³		
		OSHA PEL	ACGIH TLV	ONTARIO TWA EV
Sodium Carbonate (497-19-8)	100	15* 5**	10*	10*

* Nuisance particulates, total dust

**Nuisance particulates, respirable fraction

Local regulated limits may vary

-----PHYSICAL PROPERTIES-----

Boiling Point: N/D

Freezing/Melting Point: 854 C

Specific Gravity (Water=1): 2.533 g/cc at 25 C

Vapour Pressure: N/AP

Vapour Density (air=1): N/AP

pH 1% solution: 11.3

Solubility in Water: 17% solution at 20 C

% Volatile: N/AP

Evaporation Rate (Ether=1): N/AP

Flash Threshold: N/AP

Efficient of Water/Oil Distribution: N/D

Appearance and Odour: Odourless, white powder

Physical State: Solid.

L1349

MATERIAL SAFETY DATA SHEET

PAGE 2

-----FIRE AND EXPLOSION INFORMATION-----

Flash Point/Method: N/AP
Lower Flammable Limit: N/AP
Upper Flammable Limit: N/AP
Autoignition Temperature: N/AP

Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Special Fire Fighting Procedures: For fire fighting wear NIOSH-approved, self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: N/D

Hazardous Combustion Products: Heating soda ash liberates CO₂.
 $\text{Na}_2\text{CO}_3(\text{solid}) = \text{Na}_2\text{O}(\text{solid}) + \text{CO}_2(\text{gas})$

Explosion Data

Sensitivity to Mechanical Impact: N/AP
Sensitivity to Static Discharge: N/AP
Conditions of Flammability: N/AP

-----HAZARDOUS REACTIVITY-----

Stability: Stable.
Hazardous Polymerization: Will not occur.

Conditions to Avoid: Simultaneous exposure to soda ash and lime dusts (CaO). In the presence of moisture (i.e. perspiration) the two materials combine to form corrosive caustic soda (NaOH) which may cause burns.

Materials to Avoid: Contact with acids will release carbon dioxide gas. Can react violently with red hot aluminum metal; fluorine gas; lithium; and 2,4,6-trinitrotoluene.

Hazardous Decomposition Products: Heating soda ash liberates CO₂.
 $\text{Na}_2\text{CO}_3(\text{solid}) = \text{Na}_2\text{O}(\text{solid}) + \text{CO}_2(\text{gas})$

Conditions of Reactivity: N/D

-----FIRST AID MEASURES-----

If Inhaled: Promptly remove to fresh air. Restore and/or support breathing. Consult a physician for observation and treatment.

In Case of Eye Contact: Flush eyes promptly with plenty of running water for at least 15 minutes and get medical attention.

In Case of Skin Contact: Remove contaminated clothing. Wash affected area of skin with soap and water. Get medical attention if irritation persists.

If Ingested: If conscious, give 2 to 3 glasses of water to drink to dilute the material. DO NOT INDUCE VOMITING. Contact a physician.

Notes to Physician: N/D

-----HEALTH HAZARD INFORMATION-----

Primary Routes of Exposure: Inhalation, skin and eye contact, ingestion.

Signs, Symptoms and Effects of Exposure

Inhalation: Inhalation of product may irritate nose, throat and lungs.

Eye Contact: May irritate or burn eyes.

Skin Contact: May cause skin irritation from prolonged contact, especially in hot weather.

Ingestion: Although low in toxicity, ingestion can be harmful. May cause nausea, vomiting, stomach ache, and diarrhea.

Chronic Effects of Exposure: Excessive contact may produce "soda ulcers" on hands and perforation of the nasal septum.

L1349

MATERIAL SAFETY DATA SHEET

PAGE 3

ditional Conditions Aggravated by Exposure: N/D
ditional Information: N/D

-----TOXICITY DATA-----

LD50 Oral (rat): 2800 mg/kg
LD50 Dermal (rabbit): N/D
LC50 (species): N/D

Carcinogenicity: N/D

Sensitization: Sensitivity reactions may occur from prolonged and repeated exposure.

Irritancy: N/D
Reproductive Effects: N/D
Teratogenicity: N/D
Mutagenicity: N/D
Toxicologically Synergistic Products: N/D
Other Data: N/D

Environmental Effects: Degradability - N/AP
Aquatic Toxicity: TLm 48 hr mosquito-fish = 840 mg/l
TLm 96 hr mosquito-fish = 1200 mg/l

-----PREVENTATIVE MEASURES-----

Ventilation (Engineering Controls): Local exhaust - in all areas where dusty or misty conditions prevail. Natural ventilation - adequate for other areas.

Personal Protective Equipment

Respiratory: For dusty or misty conditions, wear NIOSH-approved dust or mist respirator.

Eye: For dusty or misty conditions, or when handling solutions where there is reasonable probability of eye contact, wear chemical safety goggles and hard hat. Under these conditions do not wear contact lenses.

Clothing: As a minimum, wear long-sleeve shirt, trousers for routine product use.

Footwear: N/D

Hands: Wear gloves for routine product use. Cotton gloves permitted for dry product, impervious gloves when handling solutions.

Other Protective Measures: Eye wash facility should be provided in storage and general work areas.

Action to Take for Spills or Leaks: Shovel up dry chemical and place into an empty container with cover. Cautiously spray residue with plenty of water. Keep contaminated water from entering sewers and water courses.

Waste Disposal Method: Consistent with the requirements of local waste disposal authorities. If permitted by applicable disposal regulations, bury in a solid waste landfill or dissolve and neutralize as follows: Dissolve in water using caution as solution can get hot. Neutralize with acid and flush to sewer with plenty of water. Good ventilation is required during neutralization due to release of CO2 gas. Neutralized waste may have to be disposed of by an approved contractor.

Storage and Handling Precautions and Equipment: Store in a cool, dry area away from acids. Prolonged storage may cause product to cake and become wet from atmospheric moisture. Avoid contact with eyes or prolonged skin contact. Avoid breathing dust. Use good personal hygiene and housekeeping.

Special Shipping Information: N/D

Other Precautions: When dissolving, add to water cautiously and with

irring; solutions can get hot

-----REGULATORY INFORMATION-----

ADG Classification

Shipping Name: Non-Regulated

UN: N/R

Class:

PKG:

WHMIS Classification: D.2B

Listed on the Domestic Substances List (DSL): Yes

-----FOR PRODUCT AND SALES INFORMATION-----

Contact Your Local Van Waters & Rogers Ltd. Branch Office.

-----NOTICE-----

VAN WATERS & ROGERS LTD. EXPRESSLY DISCLAIMS ALL EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT PROVIDED.

-----REVISION INFORMATION-----

06/93: Reconstruction P1120.

Legend: N/AP - Not Applicable. N/D - No Data Available.

===== END OF MSDS =====

REFER TO ERP2 - 0081

**ACTION PLAN FOR SPILL OF ANFO EXPLOSIVES
& ALL CLASS I EXPLOSIVES**

Initial Spill

Response

- STOP spill at source if possible
- ELIMINATE all possible sources of ignition
- PREVENT anfo from contacting water
- if anfo does contact water, CONTAIN solution to as small an area as possible Consider dyking
- ISOLATE area of spill preferably by roping off affected area

Hazards

- may explode under confinement or high temperatures
- flammable
- low toxicity

Action for Fire

- for fires involving large quantities of anfo, evacuate and do not attempt to fight fire
- for fires involving small quantities of anfo, use large amounts of water to extinguish
- anfo may detonate in fire, under severe impact or confinement

Recovery

- spills of anfo on dry surfaces can simply be shovelled into containers
- spills of anfo on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of ammonium nitrate being dissolved

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- 9

9

- chemical composition 94% prilled ammonium nitrate (NH_4NO_3)
6% No 2 fuel oil
- trade name Amex II
- small porous pellets coated with oil, may be dyed with bright colours (yellow)
- ammonium nitrate is very soluble in water, the oil is not soluble and will float
- strong oxidizing agent
- flammable

Environmental

Threat

- ammonium nitrate is moderately toxic to fish and other aquatic organisms Toxicity increases with increased pH of the water

Containers

- anfo will be transported and stored in 25 kg poly bags

Supplier

- Explosives Limited
Calgary, Alberta
- C I L

Explosives, Blasting, Type B
1.5D UN 0331

ICI Canada Inc.
P.O. Box 200, Station "A"
North York, Ontario
Canada, M2N 6H2

AMEX II / AN/FO (Bulk)

MATERIAL SAFETY DATA SHEET

Date Issued: 91 04 17

Index: EXP 0112/91B

**FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL THE ICI CANADA
TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT 1-800-561-3636.**

PRODUCT IDENTIFICATION

Product Name: ANFO (Bulk)
Chemical Name: Not applicable.
Synonyms: AMEX II (Bulk)
Chemical Family: Explosives.
Molecular Formula: Not applicable.
Product Use: A booster-sensitive explosive used in surface and underground applications.

REGULATORY SECTION

Controlled Products Regulations Classification: This product is an explosive and is not regulated by WHMIS.

OSHA Hazard Communication (29CFR 1910.1200) Classification: Explosive; oxidizer; irritant (eye).

CANADIAN TDG ACT SHIPPING DESCRIPTION

Shipping Name: Explosive, Blasting, Type B
Shipping Class/Division: 1.5D
Product Identification No (PIN): UN0331
Packing Group: II

U.S. DOT Classification: Refer to the "Code of Federal Regulations".

Other Regulations: Not available.

Read the entire MSDS for the complete hazard evaluation of this product.

AMEX II / AN/FO (Bulk)

Page 2

HAZARDOUS INGREDIENTS OF PRODUCT

Hazardous Ingredients	%(w/w)	ACGIH TLV	CAS No.
Ammonium Nitrate	60-100	Not listed	6482-52-2
Fuel Oil No. 2	5-10	5 mg/m ³	64742-81-0

PHYSICAL PROPERTIES

Physical State: Solid.

Appearance and Odour: Off-white pellets commonly called prills; smell of fuel oil.

Odour Threshold: Not available.

Boiling Range (Deg. C): Not applicable.

Melting/Freezing Point (Deg. C): Approx. 170 Deg. C (for ammonium nitrate).

Vapour Pressure: Not applicable.

Specific Gravity: Not available.

Vapour Density: Not applicable.

Bulk Density: 0.8-0.88 (poured); 0.92-1.10 (pneum-loaded).

Evaporation Rate: Not available.

Solubility: Soluble in water.

% Volatile by Volume: Not available.

pH: Not available.

Coefficient of Water/Oil Distribution: Not available.

Sensitivity to Mechanical Impact: 250 cm (USBM Report 7840) (insensitive).

Rate of Burning: Not available.

Explosive Power: 855 cal./g

Sensitivity to Static Discharge: Insensitive.

REACTIVITY DATA

Stability:

Under Normal Conditions: Stable.

Under Fire Conditions: Flammable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: High temperatures and friction.

Materials to Avoid: Strong oxidizers.

Hazardous Decomposition or Combustion Products: Thermal decomposition products are toxic and may include hydrocarbons, oxides of carbon and nitrogen.

FIRE AND EXPLOSION DATA

Flash Point (Deg. C) (Method): 60 Deg. C (PMCT D93) for fuel oil.

Autoignition Temperature: 230-265 Deg. C

Flammability Limits in Air (%): LEL: Not applicable.

UEL: Not applicable.

Fire Extinguishing Media: See below.

AMEX II / AN/FO (Bulk)

Page 3

Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area.

Other Fire or Explosion Hazards: Not applicable.

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit: None established for this product. See "HAZARDOUS INGREDIENTS OF PRODUCT" Section.

Toxicological Data: This product has not been tested.

Ammonium Nitrate LD₅₀ (oral, rat) = 4820 mg/kg (1)

Carcinogenicity Data: The ingredient(s) of this product is (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).

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity/Fetotoxicity Data: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.

Synergistic Materials: None known.

EFFECTS OF EXPOSURE WHEN:

. **Inhaled:** Because of the presence of fuel oil, this product may be irritating to the nose, throat and respiratory tract and may cause central nervous system (CNS) depression in cases of extreme exposure. See "Other Health Effects" Section.

. **In contact with the skin:** Prolonged and repeated contact may cause mild irritation.

. **In contact with the eyes:** This product causes irritation, redness and pain.

. **Ingested:** This product causes irritation, a burning sensation of the mouth, throat and respiratory tract and abdominal pain. May cause methemoglobinemia and central nervous system (CNS) depression. See "Other Health Effects" Section.

Other Health Effects: If ingested, Nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include cyanosis (due to methemoglobin formation), nausea, dizziness and increased heart rate.

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.

FIRST AID PROCEDURES WHEN:

. **Inhaled:** If respiratory problems arise, move the victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.

. **In contact with the skin:** Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.

. **In contact with the eyes:** 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 attention.

. **Ingested:** If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.

Emergency Medical Care: Treat symptomatically.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which 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: General ventilation is recommended.

Respiratory Protection: A NIOSH/MSHA-approved respirator, if required.

Skin Protection: Gloves made from rubber should be impervious under conditions of use. User should verify impermeability under normal conditions of use prior to general use. The use of coveralls is recommended.

Eye Protection: Use chemical safety goggles when there is potential for eye contact.

Other Personal Protective Equipment: Locate safety shower and eyewash station close to chemical handling area.

Handling Procedures and Equipment: This product is an explosive and should only be used under the supervision of an experienced blaster.

Storage Temperature (Deg. C): See below.

Storage Requirements: This product is not stored.

Other Precautions: Avoid breathing in dust and vapours. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Stop and contain the spill. Eliminate all sources of ignition. Clean up using non-sparking tools. Collect contaminated soil and water for treatment or disposal. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers. Notify applicable government authority if release is reportable or could adversely affect the environment.

Environmental Effects: Harmful to aquatic life at low concentrations.

Deactivating Chemicals: Not applicable.

Waste Disposal Methods: Burn under supervision of an expert at a government-approved explosive burning ground or destroy, by detonation in boreholes, with explosives in accordance with applicable local, provincial and federal regulations. Call upon the services of an ICI Canada Technical Representative.

ADDITIONAL INFORMATION AND SOURCES USED

1. RTECS-Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, Vol I-V, 1985-1986 edition, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1987.
 2. Supplier's Material Safety Data Sheets.
-

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 ICI Canada 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. This Material Safety Data Sheet is valid for three years.

Date Issued: 91 04 17

Date Revised: 91 04 17

MSDS Index No: EXP 0112/91B

Prepared By: Safety, Health and Environment (416) 229-8252

Detonators, electric, for blasting
1.1B UN 0030

ICI Canada Inc.
P.O. Box 200, Station "A"
North York, Ontario
Canada, M2N 6H2

ELECTRIC DETONATOR OR ELECTRIC BLASTING CAP

MATERIAL SAFETY DATA SHEET

Index: CXU 0004/90A

Date: 91 08 05

FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL THE ICI CANADA
TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT 1-800-561-3636.

HAZARD SUMMARY (29 CFR 1910.1200)

Physical Hazards: Explosive.

Health Hazards: This is a packaged product that will not result in exposure
to the contents under normal conditions.

1. PRODUCT IDENTIFICATION

Product Name: Electric Detonator or Electric Blasting Cap.

Product Class: Explosive initiator.

SHIPPING DESCRIPTION / UNITED NATIONS (U.S. DOT)

Shipping Name: Detonators, Electric (DETONATORS, CLASS A)

Shipping Class/Division: 1.1B (EXPLOSIVE, CLASS A)

Product Identification No (PIN): UN0030

Packing Group: II

COMPOSITION

An aluminum or copper shell containing:

Ignition Composition

Pentaerythritol Tetranitrate (PETN)

Lead Azide

(May include a lead sheathed delay element(s); may include a delay
composition.)

Electric Detonator or Electric Blasting Cap

Page 2

2. PHYSICAL PROPERTIES

Description: Ingredients are housed in an aluminum or copper shell. Used for initiation of explosive mixtures.

3. FIRE AND EXPLOSION DATA

Flash Point (method): Not applicable.

Autoignition Temperature: Explodes at 177°C

Flammability Limits in Air (%): Not applicable.

Fire Extinguishing Media: See below.

Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area.

Other Fire or Explosion Hazards: Explosive with mass detonation hazard.

4. REACTIVITY DATA

Stability:

Under Normal Conditions: Can explode on impact.

Under Fire Conditions: May explode if heated.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: Heat, impact, radio frequency energy, stray current, static electricity.

Materials to Avoid: Not applicable.

Hazardous Decomposition or Combustion Products: Vapours of NO_x, CO and lead fumes.

5. TOXICOLOGICAL AND HEALTH DATA

Toxicological Data: This is a manufactured article and may release hazardous products during detonation. Detonation products include NO, NO₂, CO, SO₂ and lead fumes.

Recommended Exposure Limits:

	OSHA PEL	ACGIH TLV
Nitrogen Dioxide	5 ppm-ceiling	3 ppm
Nitric Oxide	25 ppm	25 ppm
Carbon Monoxide	50 ppm	50 ppm
Sulfur Dioxide	5 ppm	2 ppm
Lead	0.05 mg/m ³	0.15 mg/m ³

6. PREVENTIVE MEASURES

Handling Procedures and Equipment: All personnel should keep clear during detonation. Avoid inhalation of smoke and vapours.

Storage Temperature (°C): Ambient temperatures.

Storage Requirements: Product should be stored in a cool dry environment and not stored in close proximity to high explosive material.

Other Precautions: This product is an explosive. Meet all legal requirement for shipping and magazinging.

7. ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Pick up by hand. Use normal precautions taken for handling explosives.

Environmental Effects: None known.

Deactivating Chemicals: Not applicable.

Waste Disposal Methods: Return to ICI or contact ICI Technical Representative to arrange for destruction by detonation under ICI supervision.

8. ADDITIONAL INFORMATION AND SOURCES USED

1. Documentation of the Threshold Limit Values and Biological Exposure Indices, 5th ed., American Conference of Governmental Industrial Hygienists Inc., Cincinnati, 1986.
 2. Grayson, Martin, Ed., Kirk-Othmer Concise Encyclopedia of Chemical Technology, 3rd ed., John Wiley and Sons, New York, 1985.
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Date issued: August 1986
Date revised: 91 08 05
MSDS index no: CXU 0004/90A

ICI Canada Inc.
P.O. Box 200, Station "A"
North York, Ontario
Canada, M2N 6H2

ROCK BOLT CUTTER

MATERIAL SAFETY DATA SHEET

Date Issued: 91 07 18

Index: EXP 0129/91C

FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL THE ICI CANADA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT 1-800-561-3636.

PRODUCT IDENTIFICATION

Product Name: ROCK BOLT CUTTER

Chemical Name: A mixture of pentaerythritol tetranitrate (PETN) and trinitrotoluene (TNT).

Synonyms: Not applicable.

Chemical Family: Nitrate esters, aromatic nitrates.

Molecular Formula: Not applicable.

Product Use: A charge used in underground mining for cutting rock bolt or rock cable.

REGULATORY SECTION

Controlled Products Regulations Classification: This product is an explosive and is not regulated by WHMIS.

OSHA Hazard Communication (29CFR 1910.1200) Classification: Irritant (eye and skin); oxidizer; explosive.

CANADIAN TDG ACT SHIPPING DESCRIPTION

Shipping Name: Boosters

Shipping Class/Division: 1.1D

Product Identification No (PIN): UN0042

Packing Group: II

U.S. DOT Classification: Refer to the "Code of Federal Regulations".

Other Regulations: Not available.

Read the entire MSDS for the complete hazard evaluation of this product.

HAZARDOUS INGREDIENTS OF PRODUCT

Hazardous Ingredients	%(w/w)	ACGIH TLV	CAS No.
Pentaerythritol Tetranitrate (PETN)	40-70	Not listed.	70-11-5
Trinitrotoluene	30-60	0.5 mg/m ³ (skin)	118-96-7

(Pentolite is the name given to the high explosive mixture of PETN and TNT.)

PHYSICAL PROPERTIES

Physical State: Solid.

Appearance and Odour: Pentolite is a yellow to brown solid. Granular or in mold.

Odour Threshold: Not applicable.

Boiling Range (Deg. C): Not available.

Melting/Freezing Point (Deg. C): 75-82

Vapour Pressure: Not available.

Specific Gravity: 1.60-1.66

Vapour Density: Not available.

Bulk Density: Not available.

Evaporation Rate: Not available.

Solubility: Negligible in water (less than 0.1%); soluble in acetone.

% Volatile by Volume: Not available.

pH: Not applicable.

Coefficient of Water/Oil Distribution: Not available.

Sensitivity to Mechanical Impact: Not available.

Rate of Burning: Not applicable.

Explosive Power: Not available.

Sensitivity to Static Discharge: Not available.

REACTIVITY DATA

Stability:

Under Normal Conditions: Stable.

Under Fire Conditions: Flammable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: High temperatures and/or rapid heating.

Materials to Avoid: Strong acids, alkalies and oxidizers.

Hazardous Decomposition or Combustion Products: Thermal decomposition products are toxic and may include oxides of carbon and nitrogen.

FIRE AND EXPLOSION DATA

Flash Point (Deg. C) (Method): Not applicable.

Autoignition Temperature: Not available.

Flammability Limits in Air (%): LEL: Not applicable.

UEL: Not applicable.

Fire Extinguishing Media: See below.

Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area.

Other Fire or Explosion Hazards: Not applicable.

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit: None established for this product. See "HAZARDOUS INGREDIENTS OF PRODUCT" Section.

Toxicological Data: This product has not been tested.

Pentaerythritol Tetranitrate LD50 (oral,mouse) = 25500 mg/kg (3)

Trinitrotoluene LD50 (oral,rat) = 795 mg/kg (1)

Carcinogenicity Data: The ingredient(s) of this product is (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).

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity/Fetotoxicity Data: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.

Synergistic Materials: None known.

EFFECTS OF EXPOSURE WHEN:

. **Inhaled:** Inhalation is not a likely route of exposure at normally encountered temperatures and is thus not applicable.

. **In contact with the skin:** This product may cause irritation.

. **In contact with the eyes:** This product causes irritation, redness and pain.

. **Ingested:** Ingestion of large amounts may cause nausea, gastrointestinal upset and abdominal pain. May cause central nervous system (CNS) depression, methemoglobinemia, accelerated heart rate and low blood pressure. Prolonged and repeated contact may cause liver damage and kidney damage. See "Other Health Effects" Section.

Other Health Effects: If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include cyanosis (due to methemoglobin formation), nausea, dizziness and increased heart rate.

PETN is a vasodilator. It promotes peripheral pooling of the blood and decreases venous return to the heart. This results in an overall lowering of the blood pressure.

Initial manifestation of methemoglobinemia is cyanosis, characterized by navy blue, almost black lips, tongue, and mucous membranes, with skin colour being slate gray. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia.

Chronic TNT exposure has been shown to cause liver damage in man.

Signs and symptoms of kidney damage generally progress from oliguria, to blood in the urine, to total renal failure.

It is our belief that, under conditions of normal occupational exposure, this product should not pose such hazards to the worker.

FIRST AID PROCEDURES WHEN:

. **Inhaled:** If respiratory problems arise, move the victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.

. **In contact with the skin:** Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.

. **In contact with the eyes:** 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 attention.

. **Ingested:** If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.

Emergency Medical Care: Medical conditions that may be aggravated by exposure to this product include cardiovascular disorders.

Do not give vasopressor drugs (e.g. epinephrine, ephedrine etc.) as there may be danger of cardiac arrhythmia.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which 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: General ventilation is recommended.

Respiratory Protection: A NIOSH/MSHA-approved respirator, if required.

Skin Protection: Use gloves made of material which has been found by user to be impervious under conditions of use.

Eye Protection: Safety glasses with side shields are recommended to prevent eye contact.

Other Personal Protective Equipment: The use of proper hearing protection when firing the charge is recommended.

Handling Procedures and Equipment: This product is an explosive and should only be used under the supervision of an individual trained in its use.

Storage Temperature (Deg. C): See below.

Storage Requirements: Store in a ventilated secure magazine, at ambient temperatures.

Other Precautions: See above.

ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Stop and contain the spill. Eliminate all sources of ignition. Clean up using non-sparking tools. Collect contaminated soil and water for treatment or disposal. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers. Notify applicable government authority if release is reportable or could adversely affect the environment.

Environmental Effects: Harmful to aquatic life at low concentrations.

Deactivating Chemicals: Not applicable.

Waste Disposal Methods: Burn under supervision of an expert at a government-approved explosive burning ground or destroy, by detonation in boreholes, with explosives in accordance with applicable local, provincial and federal regulations. Call upon the services of an ICI Technical Representative.

ADDITIONAL INFORMATION AND SOURCES USED

1. RTECS-Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, Vol I-V, 1985-1986 edition, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1987.
 2. Clayton, G.D. and Clayton, F.E., Eds., *Patty's Industrial Hygiene and Toxicology*, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
 3. Supplier's Material Safety Data Sheets.
 4. Gosselin, R.E., *et al.*, Eds., *Clinical Toxicology of Commercial Products*, 5th ed., Williams and Wilkins, Baltimore, 1984.
 5. "CHEMINFO", through "CCINFodisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
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Date Issued: 91 07 18
Date Revised: 91 07 18
MSDS Index No: EXP 0129/91C

Prepared By: Safety, Health and Environment (416) 229-8252

Material Safety Data Sheet

Conforms to Requirement of 29CFR 1910.1200

Atlas Powder Company

15301 Dallas Parkway Suite 1200 Dallas, Texas 75248-4629

DYNAMITES AND GELATINS - ALL GRADES

PREPARED BY: Paul E Theriault REVISION DATE: December, 1990

EMERGENCY TELEPHONE NUMBERS: East of the Mississippi: 717/386-4121
West of the Mississippi: 417/624-0212
Chemtec: 800/424-9300

PRODUCT IDENTIFICATION:

	<u>CAS. NO.</u>	<u>RTECS NO.</u>	<u>TSCA LISTED</u>	<u>OSHA PEL</u>
<u>Hazardous Ingredients:</u>				
Nitroglycerin (NG)	55-63-0	QX2100000	Y	10 mg/m ³ skin
Ethylene Glycol Dinitrate (EGDN)	628-96-6	KW5600000	Y	10 mg/m ³ skin
Ammonium Nitrate (AN)	6484-52-2	BR9050000	Y	N/A
Sodium Nitrate (SN)	7631-99-4	WC5600000	Y	N/A

SECTION 313 REPORTABLE MATERIAL % BY WEIGHT

<u>PRODUCT</u>	<u>NITROGLYCERINE % BY WEIGHT</u>	<u>PRODUCT</u>	<u>NITROGLYCERINE % BY WEIGHT</u>
Power Primer	2.9	H& Prime	3.3
Giant Gelatin	2.9	SeisPrime	16.7
Gelmax	2.1	Florigel 330	2.2
Kleen Kut	2.0	Dynashear	5.0
POWERditch	2.7	Petrogel	5.1
Coalites	1.0	Petrogel A	16.7
Gel Coalite Z	3.2	Geldyne	3.0
Gel Coalite 3	1.8	Forcite 75	4.0
Farmex Ditching	5.0	Powertrac	3.0
Oilwell 3C	6.6	Xactex	3.0
Oilwell 100%	27.7	Geogel	16.7
Extra dynamite	1.5		

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES:

	<u>NG</u>	<u>EGDN</u>	<u>AN</u>	<u>SN</u>
Vapor Pressure - 20°C	.0003*	05*	0	0
Flash Point °C	nd	217(d)	d	nd
Melting Point °C	13.2	-20	155	317
Boiling Point °C	d	d	190	nd
Specific Gravity	1.591	1.48	1.725	2.265
Molecular Weight	277.1	152.1	83	85
Odor	Pungent	Pungent	None	None
Appearance	Yellow Oil	Colorless	White solid	White solid

nd = no data

d = dissociates

Solubility in water: Salts are soluble in water, but the nitrated esters (NG and EGDN) are only slightly soluble.

Appearance and odor: A mixture of absorbants, white oxidizing salts Tan color with white granules Slightly sweet odor.



DOT: CLASS A EXPLOSIVE

DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVES. Immediately evacuate the area for a minimum of one mile. May detonate when exposed to sparks or open flame. Avoid smoke from fire as carbon monoxide or nitric oxides may be generated.

REACTIVITY DATA

Stability: Stable under normal conditions. May explode when subjected to fire or shock.
Hazardous decomposition or by products: Gases produced are nitrogen oxides and carbon oxides
Hazardous polymerization: Will not occur

HEALTH DATA:

Ventilate magazines before entering. Nitroglycerine is a vasodilator and can cause headache, dizziness, weakness and nausea.

LISTINGS:

	<u>NTP Annual Report on Carcinogens</u>	<u>IARC Monographs</u>	<u>OSHA Carcinogen</u>
NG/EGDN	No	No	No
Ammonium Nitrate	No	No	No
Sodium Nitrate	No	No	No

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID - Wash exposed skin with soap and water. If eyes are exposed, flush with water for fifteen minutes. If inhaled, remove to fresh air and consult a physician if symptoms persist. If ingested, consult a physician.

PROCEDURES FOR CLEAN UP OF SPILLS AND LEAKS:

Contact manufacturer for emergency cleanup and disposal procedures. Keep crowds at a distance. In the event of a spill, contact Chemtrec at 800/424-9300. Completely isolate the spill area and absorb with a material such as sawdust or wood pulp. Sweep up gently with non-sparking and non-static generating tools and place material in a non-combustible container. Destroy the contaminated material at an environmentally approved facility. NOTE: Recovered spill residues are hazardous waste and must be disposed of in accordance with all applicable Federal, State and local Regulations.

No smoking or open flames. Avoid skin contact and breathing of fumes.

PRECAUTIONS FOR SAFE HANDLING AND USE:

Exposure can occur through inhalation and skin absorption. Wear protective clothing and gloves when handling products. Wash exposed skin with soap and water. Launder clothes daily. Use cotton gloves over thin latex gloves. Latex and cotton gloves should be changed every 2 hours; cotton gloves should be changed more frequently if they become soiled. The cotton gloves may be laundered and reused. NG will eventually penetrate the latex, but they will afford temporary protection. NG will also penetrate natural and synthetic rubber gloves. Clothing should not have pockets and shoes should have rubber non-sparking conductive soles. No metal should be on clothing or shoes.

CONTROL MEASURES:

VENTILATION: Avoid exposure to vapors. Provide local exhaust to minimize vapor concentration and dust inhalation. Ventilate magazine prior to entry.

PERSONAL PROTECTIVE EQUIPMENT: Wear suitable protective clothing and gloves to prevent skin contact. Immediately remove and launder wet clothing. An organic vapor respirator is recommended in cases of vapor exposure.

EYE PROTECTION - Safety glasses with side shields

STORAGE: Follow BATF standards for storage (27 CFR 151 Subpart 3) and OSHA Standards for Storage and Use (29 CFR 1910.109). See Institute of Makers of Explosives Publications for information.

DISCLAIMER: The above information taken from various published and unpublished sources is believed to be accurate and represents the best information available to us. However, we make no warranty of the accuracy of such information, express or implied, and assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

Explosives, Blasting, Type E
1.1D UN 0241

ICI Canada Inc.
P.O. Box 200, Station "A"
North York, Ontario
Canada, M2N 6H2

SUPERFRAC 4000 & 7000

MATERIAL SAFETY DATA SHEET

Date Revised: 91 07 25

Index: EXP 0127/91C

FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL THE ICI CANADA
TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT 1-800-561-3636.

PRODUCT IDENTIFICATION

Product Name: SUPERFRAC 4000 & 7000
Chemical Name: Not applicable.
Synonyms: Not applicable.
Chemical Family: Doped emulsion explosives.
Molecular Formula: Not applicable.
Product Use: A detonator-sensitive emulsion explosive, used in surface and
underground applications.

REGULATORY SECTION

Controlled Products Regulations Classification: This product is an explosive
and is not regulated by WHMIS.

OSHA Hazard Communication (29CFR 1910.1200) Classification: Explosive;
oxidizer; irritant (eye, skin).

CANADIAN TDG ACT SHIPPING DESCRIPTION

Shipping Name: Explosive, Blasting, Type E
Shipping Class/Division: 1.1D
Product Identification No (PIN): UN 0241
Packing Group: II

U.S. DOT Classification: Refer to the "Code of Federal Regulations."

Other Regulations: Not available.

Read the entire MSDS for the complete hazard evaluation of this product.

HAZARDOUS INGREDIENTS OF PRODUCT

Hazardous Ingredients	%(w/w)	ACGIH TLV	CAS No.
Ammonium Nitrate	60-100	Not listed.	6484-52-2
Sodium Nitrate	5-10	Not listed.	7631-99-4
Aluminum *	1-5	5 mg/m ³ (pyro powders)	7429-90-5
Glass Microspheres	3-7	10 mg/m ³ (fibrous glass dust)	Not available.

* Only SUPERFRAC 7000 contains Aluminum.

PHYSICAL PROPERTIES

Physical State: Very viscous liquid.

Appearance and Odour: Odourless, orange-coloured.

Odour Threshold: Not available.

Boiling Range (Deg. C): Not applicable.

Melting/Freezing Point (Deg. C): Not applicable.

Vapour Pressure: Not applicable.

Specific Gravity: 1.00 - 1.50

Vapour Density: Not applicable.

Bulk Density: 1000 - 1100 kg/m³

Evaporation Rate: Not applicable.

Solubility: Not soluble in water.

% Volatile by Volume: Not applicable.

pH: 4.0 - 6.0

Coefficient of Water/Oil Distribution: Approx. 94:6

Sensitivity to Mechanical Impact: Greater than 1 meter.

Rate of Burning: Does not sustain burning at atmospheric pressure.

Explosive Power: ASV 325 - 400 kJ/100 g

Sensitivity to Static Discharge: Not sensitive.

REACTIVITY DATA

Stability:

Under Normal Conditions: Stable.

Under Fire Conditions: Flammable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: Heat, impact and friction.

Materials to Avoid: Strong oxidizing and reducing agents.

Hazardous Decomposition or Combustion Products: Thermal decomposition products may include small quantities (ppm) of carbon and nitrogen oxides.

FIRE AND EXPLOSION DATA

Flash Point (Deg. C) (Method): Not applicable.

Autoignition Temperature: Ammonium nitrate will spontaneously decompose at approx. 250 Deg. C.

Flammability Limits in Air (%): LEL: Not applicable.
UEL: Not applicable.

Fire Extinguishing Media: See below.

Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area.

Other Fire or Explosion Hazards: Not applicable.

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit: None established for this product. See "HAZARDOUS INGREDIENTS OF PRODUCT" Section.

Toxicological Data: This product has not been tested.

Ammonium Nitrate LD50 (oral,rat) = 4820 mg/kg (1)

Sodium Nitrate LD50 (oral,rabbit) = 1960-2680 mg/kg (4)

Carcinogenicity Data: The ingredient(s) of this product is (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).

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity/Fetotoxicity Data: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.

Synergistic Materials: None known.

EFFECTS OF EXPOSURE WHEN:

- . **Inhaled:** Inhalation is not a likely route of exposure at normally encountered temperatures and is thus not applicable.
- . **In contact with the skin:** Prolonged and repeated contact may cause mild irritation.
- . **In contact with the eyes:** This product causes irritation, redness and pain.
- . **Ingested:** Ingestion of large amounts may cause nausea, gastrointestinal upset and abdominal pain. May cause methemoglobinemia. See "Other Health Effects" Section.

Other Health Effects: Initial manifestation of methemoglobinemia is cyanosis, characterized by navy blue, almost black lips, tongue, and mucous membranes, with skin colour being slate gray. 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 cyanosis (due to methemoglobin formation), nausea, dizziness and increased heart rate.

FIRST AID PROCEDURES WHEN:

- . **Inhaled:** Inhalation is not a likely route of exposure at normally encountered temperatures and is thus not applicable.
- . **In contact with the skin:** Wash affected areas thoroughly with soap and water. If irritation persists, obtain medical advice.
- . **In contact with the eyes:** 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 attention.
- . **Ingested:** If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. **DO NOT** induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention **IMMEDIATELY**.

Emergency Medical Care: Treat symptomatically.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which 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: General ventilation is recommended.

Respiratory Protection: A NIOSH/MSHA-approved respirator, if required.

Skin Protection: Gloves made from rubber should be impervious under conditions of use. User should verify impermeability under normal conditions of use prior to general use. Also, the use of coveralls is recommended.

Eye Protection: Use chemical safety goggles when there is potential for eye contact.

Other Personal Protective Equipment: See above.

Handling Procedures and Equipment: These products are explosives and should only be used under the supervision of an experienced blaster.

Storage Temperature (Deg. C): See below.

Storage Requirements: Store in a cool, well-ventilated area (or ventilate before entering) away from strong oxidizing and reducing agents. Keep away from heat, sparks and flame. Keep containers closed. Do not expose sealed containers to temperatures above 50 Deg. C.

Other Precautions: Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Stop and contain the spill. Eliminate all sources of ignition. Clean up using non-sparking tools. Collect contaminated soil and water for treatment or disposal. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers. Notify applicable government authority if release is reportable or could adversely affect the environment.

Environmental Effects: Water-insoluble and remains explosive. With extended time periods, some ingredients will solubilize.

Deactivating Chemicals: Detergents will break up the emulsions if mixed in.

SUPERFRAC 4000 & 7000

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Waste Disposal Methods: Burn under supervision of an expert at a government-approved explosive burning ground or destroy, by detonation in boreholes, with explosives in accordance with applicable local, provincial and federal regulations. Call upon the services of an ICI Canada Technical Representative.

ADDITIONAL INFORMATION AND SOURCES USED

1. RTECS-Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, Vol I-V, 1985-1986 edition, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1987.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
3. Supplier's Material Safety Data Sheets.

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 ICI Canada 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. This Material Safety Data Sheet is valid for three years.

Date Issued: 91 07 25
Date Revised: 91 07 25
MSDS Index No: EXP 0127/91C

Prepared By: Safety, Health and Environment(416) 229-8252

**Cord, detonating
1.1D UN 0065**

ICI Canada Inc.
P.O. Box 200, Station "A"
North York, Ontario
Canada, M2N 6H2

DETONATING CORDS**MATERIAL SAFETY DATA SHEET****Index:** CXU 0010/900**Date:** 91 08 05

FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL THE ICI CANADA
TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT 1-800-561-3636.

HAZARD SUMMARY (29 CFR 1910.1200)**Physical Hazards:** Explosive.**Health Hazards:** This is a packaged product that will not result in exposure to the contents under normal conditions.**1. PRODUCT IDENTIFICATION**

Product Name: TRUNKLINE, PLAIN, AQUAFLEX, B-LINE, E-CORD, REINFORCED
PRIMACORD, SCUF-FLEX, BOOSTER CORD, UNILINE, XTND, XT PRIMACORD, AP-CORD,
ATLAS No., ETILINE, ETI-SPECIAL, CORDTEX

Product Class: Detonating cords.**SHIPPING DESCRIPTION / UNITED NATIONS (U.S. DOT)****Shipping Name:** Cord, Detonating (CORD, DETONATING)**Shipping Class/Division:** 1.1D (EXPLOSIVE, CLASS A)**Product Identification No (PIN):** UN0065**Packing Group:** II**COMPOSITION**

A cord containing a Pentaerythritol Tetranitrate (PETN) core.

2. PHYSICAL PROPERTIES

Description: Some cords are covered with PVC plastic and others covered with wax and polyethylene plastic.

TRUNKLINE, PLAIN, AQUAFLEX, B-LINE, E-CORD, REINFORCED PRIMACORD,
SCUF-FLEX, BOOSTER CORD, UNILINE, XTND, XT PRIMACORD, AP-CORD, ATLAS No.,
ETILINE, ETI-SPECIAL, CORDTEX

Page 2

3. FIRE AND EXPLOSION DATA

Flash Point (method): Not applicable.

Autoignition Temperature: PETN explodes at 205-215°C.

Flammability Limits in Air (%): Not applicable.

Fire Extinguishing Media: See below.

Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS.
Immediately evacuate all personnel from the area.

Other Fire or Explosion Hazards: May ignite if heated.

4. REACTIVITY DATA

Stability:

Under Normal Conditions: Can explode on impact.

Under Fire Conditions: Will not explode en mass in a hot fire.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: The B-Line cords have limited tensile strength and abrasion resistance. Refer to the Product Bulletin for proper applications and use procedures.

Materials to Avoid: The PVC plastic covering or wax covering will, in time, be affected by diesel oil.

Hazardous Decomposition or Combustion Products: Vapours of NO_x and CO.

5. TOXICOLOGICAL AND HEALTH DATA

Toxicological Data: This is a manufactured article and may release hazardous products during detonation. Detonation products include NO, NO₂, CO, SO₂.

Recommended Exposure Limits:

	OSHA PEL	ACGIH TLV
Nitrogen Dioxide	5 ppm-ceiling	3 ppm
Nitric Oxide	25 ppm	25 ppm
Carbon Monoxide	50 ppm	50 ppm
Sulphur Dioxide	5 ppm	2 ppm

6. PREVENTIVE MEASURES

Handling Procedures and Equipment: Damaged cords can lead to misfired holes - potentially, the most hazardous of all blasting situations. Avoid abrasion of cord on hole collars or casing pipes.

TRUNKLINE, PLAIN, AQUAFLEX, B-LINE, E-CORD, REINFORCED PRIMACORD,
SCUF-FLEX, BOOSTER CORD, UNILINE, XTND, XT PRIMACORD, AP-CORD, ATLAS No.,
ETILINE, ETI-SPECIAL, CORDTEX

Page 3

Storage Temperature (°C): Ambient temperatures.

Storage Requirements: Store detonating cords in clean, dry, well-ventilated magazines, and must be stored in compliance with Federal, Provincial, State and Municipal regulations. Must be stored only in magazines licensed for the storage of High Explosives.

Other Precautions: This product is an explosive. Meet all legal requirement for shipping and magazinging.

7. ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Pick up cautiously as per normal precautions taken in handling explosives.

Environmental Effects: None known.

Deactivating Chemicals: Not applicable.

Waste Disposal Methods: Destroy them by connecting them, in bundles to the back row of a blast. Burning under supervision of an expert at an approved location. Call upon the services of an ICI Technical Representative.

8. ADDITIONAL INFORMATION AND SOURCES USED

1. Documentation of the Threshold Limit Values and Biological Exposure Indices, 5th ed., American Conference of Governmental Industrial Hygienist Inc., Cincinnati, 1986.
 2. Grayson, Martin, Ed., Kirk-Othmer Concise Encyclopedia of Chemical Technology, 3rd ed., John Wiley and Sons, New York, 1985.
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Date issued: August 1986
Date revised: 91 08 05
MSDS index no: CXU 0010/900

Prepared By: Safety, Health and Environment (416) 229-8252

Detonator assemblies, nonelectric, for blasting 1.1B UN 0360
ICI Canada Inc.
P.O. Box 200, Station "A"
North York, Ontario
Canada, M2N 6H2

DETONATORS - NONEL, ANOLINE, CORDLINE, EXEL
CONSTADET, EXEL, EXEL BLASTMASTER, NONEL IREDET, DETINEL, EXEL SHD, EXEL
T & D, HANDIDET

MATERIAL SAFETY DATA SHEET

Index: CXU 0005/900

Date: 91 08 05

FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL THE ICI CANADA
TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT 1-800-561-3636.

HAZARD SUMMARY (29 CFR 1910.1200)

Physical Hazards: Explosive.

Health Hazards: This is a packaged product that will not result in exposure
to the contents under normal conditions.

1. PRODUCT IDENTIFICATION

Product Name: NONEL, ANOLINE, CORDLINE, EXEL CONSTADET, EXEL, EXEL
BLASTMASTER, NONEL IREDET, DETINEL Delay Detonators, EXEL SHD, EXEL T & D,
HANDIDET.

Product Class: Non-electric Delay Detonators.

SHIPPING DESCRIPTION / UNITED NATIONS (U.S. DOT)

Shipping Name: Detonators assemblies, non-electric (DETONATORS, CLASS A)

Shipping Class/Division: 1.1B (EXPLOSIVE, CLASS A)

Product Identification No (PIN): UN0360

Packing Group: II

COMPOSITION

A signal line containing an explosive charge of PETN (ANOLINE/CORDLINE) or
HMX/Al blend (NONEL/EXEL) and a detonator containing:

Pentaerythritol Tetranitrate (PETN)

Lead Azide

(May include a lead sheathed delay element(s); may include a delay
composition.)

DETONATORS - NONEL, ANOLINE, CORDLINE, EXEL CONSTADET, EXEL, EXEL
BLASTMASTER, NONEL IREDET, DETINEL, EXEL SHD, EXEL T & D, HANDIDET Page 2

2. PHYSICAL PROPERTIES

Description: Ingredients are housed in an aluminum shell.

3. FIRE AND EXPLOSION DATA

Flash Point (method): Not applicable.

Autoignition Temperature: PETN explodes at 205-215°C

Flammability Limits in Air (%): Not available.

Fire Extinguishing Media: See below.

Fire Fighting Procedures: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS.
Immediately evacuate all personnel from the area.

Other Fire or Explosion Hazards: High explosive with mass detonation hazards.

4. REACTIVITY DATA

Stability:

Under Normal Conditions: Can explode on impact.

Under Fire Conditions: May detonate if heated.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: Shock, impact or heat that may detonate the product.

Materials to Avoid: Oxidizing materials.

Hazardous Decomposition or Combustion Products: Vapours of NO_x, CO and lead fumes.

5. TOXICOLOGICAL AND HEALTH DATA

Toxicological Data: This is a manufactured article and may release hazardous products during detonation. Detonation products include NO, NO₂, CO, SO₂ and lead fumes.

Recommended Exposure Limits:

	OSHA PEL	ACGIH TLV
Nitrogen Dioxide	5 ppm-ceiling	3 ppm
Nitric Oxide	25 ppm	25 ppm
Carbon Monoxide	50 ppm	50 ppm
Sulfur Dioxide	5 ppm	2 ppm
Lead	0.05 mg/m3	0.15 mg /m3

6. PREVENTIVE MEASURES

Handling Procedures and Equipment: All personnel should keep clear during detonation. Avoid inhalation of smoke and vapours.

Storage Temperature (°C): Ambient temperatures.

Storage Requirements: Product should be stored in a cool dry environment and not stored in close proximity to high explosive material.

Other Precautions: This product is an explosive. Meet all legal requirement for shipping and magazinging.

7. ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Pick up cautiously as per normal precautions taken in handling explosives.

Environmental Effects: None known.

Deactivating Chemicals: Not applicable.

Waste Disposal Methods: Return to ICI or contact ICI Technical Representative to arrange for destruction by detonation under ICI supervision.

8. ADDITIONAL INFORMATION AND SOURCES USED

1. Documentation of the Threshold Limit Values and Biological Exposure Indices, 5th ed., American Conference of Governmental Industrial Hygienists Inc., Cincinnati, 1986.
 2. Grayson, Martin, Ed., Kirk-Othmer Concise Encyclopedia of Chemical Technology, 3rd ed., John Wiley and Sons, New York, 1985.
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Date issued: August 1986
Date revised: 91 08 05
MSDS index no: CXU 0005/900

Prepared By: Safety, Health and Environment (416) 229-8252

LEAD NITRATE

MANUFACTURE:FLORIDIENNE CHIMIE (BELGIUM)

Moisture-1.2% to 1.4%

Iron-5 PPM maximum

Copper-5PPM maximum

Nitric Acid-0.005% maximum

Insolubles-0.02% maximum

Chloride-0.002 % to 0.004%

Appearance-White crystals

Odour-Odourless

VAN WATERS & ROGERS LTD 3800 VAN HORNE WAY RICHMOND, B C V6X 1W5

SALES ORDER:

VAN WATERS & ROGERS PRODUCT: 35/38

MSDS NUMBER: L1261 VERSION: 1

DATE PRINTED: 26/10/93

ECHO BAY MINES LTD
3300 MANULIFE PLACE
10180 - 101 STREET
EDMONTON, ALTA. T5J 3S4

WHMIS CODES: C D.1A D.2A

-----EMERGENCY ASSISTANCE-----

For Emergency Assistance Involving Chemicals
Call CHEMTREC (800) 424-9300

-----PRODUCT INFORMATION-----

Product Name: LEAD NITRATE VW&R Code: L1261

Common Name/Synonym: Lead Nitrate
CAS Registry Number: 10099-74-8
Chemical Name: Lead Nitrate
Chemical Family: N/D
Formula: $Pb(NO_3)_2$
Molecular Weight: N/D
Product Use: N/D

-----PREPARATION INFORMATION-----

Date Issued: 10/92
Supercedes: 04/89 (P1959)
Prepared By: MSDS Coordinator. Contact during business hours, Eastern
Time (416) 736-9299.

-----HAZARDOUS INGREDIENTS-----

Component(s)/CAS No.	wt	Exposure Limits, mg/m3	
		OSHA PEL	ACGIH TLV
Lead Nitrate (10099-74-8)	>99	0.01*	0.15*

*as Pb

Local regulated limits may vary

-----PHYSICAL PROPERTIES-----

Boiling Point: Decomposes at 470 C
Melting Point: N/AP
Freezing Point: N/AP
Specific Gravity (Water=1 at 4 C): 4.53
Vapour Pressure: N/AP
Vapour Density: N/AP
pH: N/D
Solubility in Water: Soluble
Other solvents: Slightly soluble in alcohol.
% Volatile: N/D
Evaporation Rate (Butyl Acetate=1): N/D
Flour Threshold: N/D
Coefficient of Water/Oil Distribution: N/D
Appearance and Odour: White semi-transparent crystals.
Physical State: Solid, oxidizer

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MATERIAL SAFETY DATA SHEET

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-----FIRE AND EXPLOSION INFORMATION-----

Flash Point/Method: N/AP

Lower Flammable Limit: Promotes combustion

Upper Flammable Limit: Promotes combustion

Autoignition Temperature: Not applicable

Extinguishing Media: Use flooding amounts of water to extinguish the fire

Special Fire Fighting Procedures: Wear self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Releases toxic gaseous oxides of Nitrogen. When coming in contact with easily oxidizable materials, it may cause ignition, violent combustion or explosion. Promotes combustion of inflammables.

Hazardous Combustion Products: N/D

Explosion Data

Sensitivity to Mechanical Impact: N/D

Sensitivity to Static Discharge: N/D

Conditions of Flammability: N/D

-----HAZARDOUS REACTIVITY-----

Stability: Stable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: High temperatures.

Materials to Avoid: Reducing agents, combustible materials such as wood, cloth, or organic materials, metals such as iron and copper and their alloys and any other oxidizable materials.

Hazardous Decomposition Products: Will liberate toxic oxides of nitrogen.

Conditions of Reactivity: N/D

-----FIRST AID MEASURES-----

If Inhaled: Remove patient to fresh air. If not breathing, give artificial respiration. Obtain medical attention.

In Case of Eye Contact: Flush eyes with running water for at least 20 minutes, holding eyelids open. If irritation persists, obtain medical attention immediately.

In Case of Skin Contact: Flush affected area with running water for at least 20 minutes. If irritation persists, obtain medical attention.

If Ingested: Unless unconscious or convulsing, give large amount of water to induce vomiting. Obtain medical attention immediately.

Notes to Physician: N/D

-----HEALTH HAZARD INFORMATION-----

Primary Routes of Exposure: Inhalation, skin and eye contact, ingestion.

Signs, Symptoms and Effects of Exposure

Inhalation: Material contains lead which is a cumulative poison. May cause headaches, dizziness, nervousness, depression, numbness, aching muscles, weakness, laboured breathing, abdominal discomfort, nausea and vomiting.

Eye Contact: Dust is an irritant which may cause redness, possible blurred vision.

Skin Contact: Irritant.

Ingestion: See "Inhalation" for symptoms. Symptoms generally take a longer time to become prevalent when material is ingested rather than inhaled.

Chronic Effects of Exposure: N/D

Medical Conditions Aggravated by Exposure: N/D

Additional Information: N/D

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MATERIAL SAFETY DATA SHEET

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-----TOXICITY DATA-----

LD50 Oral (rat): N/D
LD50 Dermal (rabbit): N/D
LC50 (species): N/D

Carcinogenicity: Lead compounds are listed by the International Agency for Research on Cancer (IARC) as group 2B - possibly carcinogenic to humans.

Sensitization: N/D

Irritancy: N/D

Reproductive Effects: N/D

Teratogenicity: N/D

Mutagenicity: N/D

Toxicologically Synergistic Products: N/D

Other Data: N/D

Environmental Effects: May be toxic to aquatic life if exposed to materials for a long period of time through small leaks or uncontained spills. Lead may accumulate in the ecosystem and become hazardous to man.

-----PREVENTATIVE MEASURES-----

Ventilation (Engineering Controls): Local mechanical exhaust ventilation is preferred.

Personal Protective Equipment

Respiratory: NIOSH approved air-purifying respirator for concentrations up to 10 times TLV. Air supplied respirator for higher concentrations.

Eye: Safety glasses with side shields.

Clothing: Face mask, overalls.

Footwear: N/D

Hands: Rubber or cotton gloves.

Other Protective Measures: N/D

Action to Take for Spills or Leaks: In all cases notify applicable government authority if spill is significant. Stop and contain leak or spill. Sweep or shovel material into containers for reuse. Do not allow material to reach waterways.

Neutralizing Chemicals: Add material to great amount of water and add Soda Ash. Neutralize with 6M HCL.

Waste Disposal Method: Consult federal, provincial and local regulations on chemical waste disposal. May be possible to dispose of in a secure, sanitary landfill site.

Storage and Handling Precautions and Equipment: Store in a cool, dry place. Do not store on wooden floors. Store away from all other chemicals and potential sources of contamination. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing.

Do not cut, grind, weld, or drill on or near this container.

Special Shipping Information: N/D

Other Precautions: Containers, even those that have been emptied, will retain product residue. Always obey hazard warnings and handle empty containers as if they were full.

-----REGULATORY INFORMATION-----

TDG Classification

Shipping Name: Lead Nitrate
UN: 1469
Class: 5.1 (6.1) (9.2)
PKG: II

WHMIS Classification: C; D.1A; D.2A

Listed on the Domestic Substances List (DSL): Yes

-----FOR PRODUCT AND SALES INFORMATION-----

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MATERIAL SAFETY DATA SHEET

PAGE 4

Contact Your Local Van Waters & Rogers Ltd. Branch Office.

-----NOTICE-----

VAN WATERS & ROGERS LTD. EXPRESSLY DISCLAIMS ALL EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT PROVIDED.

-----REVISION INFORMATION-----

10/92: 3-year update. Reconstruction.

Legend: N/AP - Not Applicable. N/D - No Data Available.

===== END OF MSDS =====

FERRIC SULFATE SOLUTION

VAN WATERS & ROGERS LTD 9800 VAN HORNE WAY RICHMOND, B.C V6X 1W5

SALES ORDER:

VAN WATERS & ROGERS PRODUCT: 26560
 SDS NUMBER: P1653 VERSION: 3
 DATE PRINTED: 26/10/93

ECHO BAY MINES LTD
 3300 MANULIFE PLACE
 10180 - 101 STREET
 EDMONTON, ALTA. T5J 3S4

WHMIS CODES: E

-----EMERGENCY ASSISTANCE-----

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL CHEMTREC
 (800) 424-9300.

-----FOR PRODUCT AND SALES INFORMATION-----

CONTACT YOUR LOCAL VAN WATERS & ROGERS BRANCH OFFICE

-----PRODUCT IDENTIFICATION-----

PRODUCT NAME: FERRIC SULFATE SOLUTION CAS NO.: 10028-22-5
 COMMON NAMES/SYNONYMS: IRON SULFATE 50% VW&R CODE: P1653

FORMULA: FE2 O12 S3 DATE ISSUED: 01/93
 HAZARD RATING (MANUFACTURER) SUPERCEDES: 12/89
 HEALTH: 3 HAZARD RATING SCALE:
 FIRE: 0 0=MINIMAL 3=SERIOUS
 REACTIVITY: 0 1=SLIGHT 4=SEVERE
 SPECIAL: NONE 2=MODERATE

-----HAZARDOUS INGREDIENTS-----

COMPONENT	CAS NO.	%	EXPOSURE LIMITS, MG/M3			HAZARD
			OSHA PEL	ACGIH TLV	OTHER LIMIT	
FERRIC SULFATE	10028-22-5	48.7	NONE	1 (AS FE)	NONE	CORROSIVE
SULFURIC ACID	7664-93-9	1.3	1	1	NONE	CORROSIVE
WATER	7732-18-5	BAL	NONE	NONE	NONE	NONE

-----PHYSICAL PROPERTIES-----

BOILING POINT, DEG F: 212 VAPOR PRESSURE, MM HG/20 DEG C: NOT APPLICABLE
 MELTING POINT, DEG F: <0 VAPOR DENSITY (AIR=1): NOT APPLICABLE
 SPECIFIC GRAVITY (WATER=1): 1.48 WATER SOLUBILITY, %: 55
 APPEARANCE AND ODOR: EVAPORATION RATE (BUTYL ACETATE=1): NOT APPLICABLE
 RED CLEAR LIQUID, ODORLESS

-----FIRST AID MEASURES-----

IF INHALED: REMOVE TO FRESH AIR GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING GET IMMEDIATE MEDICAL ATTENTION.
 IN CASE OF EYE CONTACT: IMMEDIATELY FLUSH EYES WITH LOTS OF RUNNING WATER FOR 15 MINUTES, LIFTING THE UPPER AND LOWER EYELIDS OCCASIONALLY. GET IMMEDIATE MEDICAL ATTENTION.
 IN CASE OF SKIN CONTACT: IMMEDIATELY FLUSH SKIN WITH LOTS OF RUNNING WATER FOR 15 MINUTES. REMOVE CONTAMINATED CLOTHING AND SHOES; WASH BEFORE REUSE. GET IMMEDIATE MEDICAL ATTENTION

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MATERIAL SAFETY DATA SHEET

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SWALLOWED: DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE LOTS OF WATER MILK. GET IMMEDIATE MEDICAL ATTENTION. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON.

-----HEALTH HAZARD INFORMATION-----

PRIMARY ROUTES OF EXPOSURE: EYE CONTACT AND SKIN CONTACT.

SIGNS AND SYMPTOMS OF EXPOSURE

INHALATION: VAPORS AND MISTS ARE EXTREMELY CORROSIVE TO THE NOSE, THROAT, AND MUCOUS MEMBRANES.

EYE CONTACT: LIQUID, AND MISTS ARE CORROSIVE TO THE EYES. BRIEF CONTACT OF THE LIQUID OR MISTS WILL SEVERELY DAMAGE THE EYES AND PROLONGED CONTACT MAY CAUSE PERMANENT EYE INJURY.

SKIN CONTACT: NO IRRITATION IS LIKELY AFTER BRIEF CONTACT BUT MAY BE IRRITATING AFTER PROLONGED CONTACT.

SWALLOWED: MISTS AND LIQUID ARE CORROSIVE TO THE MOUTH AND THROAT AND RESPIRATORY TRACT. SWALLOWING THE LIQUID BURNS THE TISSUES, CAUSES SEVERE ABDOMINAL PAIN, NAUSEA, VOMITING, AND COLLAPSE.

CHRONIC EFFECTS OF EXPOSURE: NO SPECIFIC INFORMATION AVAILABLE.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: NONE REPORTED.

-----TOXICITY DATA-----

ORAL: RAT LD50 = 2.5-5.0 G/KG

DERMAL: RABBIT LD50 > 2.0 G/KG

INHALATION: NO DATA FOUND

MUTAGENICITY: THIS MATERIAL IS NOT CONSIDERED TO BE A CARCINOGEN BY THE NATIONAL TOXICOLOGY PROGRAM, THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER, OR THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION.

OTHER DATA: NONE

-----PERSONAL PROTECTION-----

VENTILATION: LOCAL MECHANICAL EXHAUST VENTILATION CAPABLE OF MAINTAINING EMISSIONS AT THE POINT OF USE BELOW THE PEL.

RESPIRATORY PROTECTION: IF USE CONDITIONS GENERATE MISTS, WEAR A NOISH-APPROVED RESPIRATOR APPROPRIATE FOR THOSE EMISSION LEVELS. APPROPRIATE RESPIRATORS MAY BE A FULL FACEPIECE AIR-PURIFYING CARTRIDGE RESPIRATOR EQUIPPED FOR ACID GASES/MISTS, A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE, OR A SUPPLIED-AIR RESPIRATOR.

EYE PROTECTION: CHEMICAL GOGGLES AND FULL FACESHIELD UNLESS A FULL FACEPIECE RESPIRATOR IS ALSO WORN. IT IS GENERALLY RECOGNIZED THAT CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH CHEMICALS BECAUSE CONTACT LENSES MAY CONTRIBUTE TO THE SEVERITY OF AN EYE INJURY.

PROTECTIVE CLOTHING: ACID-RESISTANT SLICKER SUIT WITH RUBBER APRON, RUBBER BOOTS WITH PANTS OUTSIDE, AND RUBBER GLOVES WITH GAUNTLETS.

OTHER PROTECTIVE MEASURES: AN EYEWASH AND SAFETY SHOWER SHOULD BE NEARBY AND READY FOR USE.

-----FIRE AND EXPLOSION INFORMATION-----

FLASH POINT, DEG F: NONE
METHOD USED: NOT APPLICABLE

FLAMMABLE LIMITS IN AIR, %
LOWER: NOT APPLICABLE UPPER: NOT APPLICABLE

EXTINGUISHING MEDIA: THIS MATERIAL IS NOT COMBUSTIBLE. USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

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SPECIAL FIRE FIGHTING PROCEDURES: FIRE FIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. USE WATER TO COOL NEARBY CONTAINERS AND STRUCTURES EXPOSED TO FIRE.

USUAL FIRE AND EXPLOSION HAZARDS: NONE REPORTED

-----HAZARDOUS REACTIVITY-----

STABILITY: STABLE POLYMERIZATION: WILL NOT OCCUR
CONDITIONS TO AVOID: TEMPERATURES ABOVE 1112 DEG F.

MATERIALS TO AVOID: REACTS WITH LIME AND OTHER BASIC MATERIALS TO FORM INSOLUBLE IRON SALTS. SOLUTION IS CORROSIVE TO MILD STEEL, COPPER ALLOYS, GALVANIZED STEEL, PAINTS, ENAMELS AND CONCRETE.

HAZARDOUS DECOMPOSITION PRODUCTS: AT TEMPERATURES ABOVE 1112 DEG F (600 DEG C) MAY LIBERATE IRON OXIDE AND SULFUR TRIOXIDE.

-----SPILL, LEAK, AND DISPOSAL PROCEDURES-----

ACTION TO TAKE FOR SPILLS OR LEAKS: WEAR ACID-RESISTANT SLICKER SUIT AND COMPLETE PROTECTIVE EQUIPMENT INCLUDING RUBBER GLOVES, RUBBER BOOTS, AND A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE OR A SUPPLIED-AIR RESPIRATOR. IF THE SPILL OR LEAK IS SMALL, A FULL FACE-PIECE AIR-PURIFYING CARTRIDGE RESPIRATOR EQUIPPED FOR ACID MISTS MAY BE SATISFACTORY. IN ANY EVENT, ALWAYS WEAR EYE PROTECTION. FOR SMALL SPILLS OR DRIPS, MOP OR WIPE UP AND DISPOSE OF IN DOT-APPROVED WASTE CONTAINERS. FOR LARGE SPILLS, CONTAIN BY DIKING WITH SOIL OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND CAREFULLY NEUTRALIZE WITH SODA ASH OR LIME. IF SODA ASH IS USED, PROVIDE ADEQUATE VENTILATION TO DISSIPATE THE CARBON DIOXIDE GAS. KEEP NON-NEUTRALIZED MATERIAL OUT OF SEWERS, STORM DRAINS, SURFACE WATERS, AND SOIL. COMPLY WITH ALL APPLICABLE GOVERNMENTAL REGULATIONS ON SPILL REPORTING, AND HANDLING AND DISPOSAL OF WASTE.

DISPOSAL METHODS: DISPOSE OF CONTAMINATED PRODUCT AND MATERIALS USED IN CLEANING UP SPILLS OR LEAKS IN A MANNER APPROVED FOR THIS MATERIAL. CONSULT APPROPRIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES TO ASCERTAIN PROPER DISPOSAL PROCEDURES.

NOTE: EMPTY CONTAINERS CAN HAVE RESIDUES, GASES AND MISTS AND ARE SUBJECT TO PROPER WASTE DISPOSAL, AS ABOVE.

-----SPECIAL PRECAUTIONS-----

STORAGE AND HANDLING PRECAUTIONS: STORE IN A COOL, DRY, WELL-VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. KEEP CONTAINER TIGHTLY CLOSED WHEN NOT IN USE. DO NOT USE PRESSURE TO EMPTY CONTAINER. WASH THOROUGHLY AFTER HANDLING. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING. STORAGE AND EQUIPMENT MATERIALS SHOULD INCLUDE FIBERGLASS REINFORCED PLASTICS, RUBBER, LEAD, TYPE 304 OR BETTER GRADES OF STAINLESS STEEL.

REPAIR AND MAINTENANCE PRECAUTIONS: NONE.

OTHER PRECAUTIONS: CONTAINERS, EVEN THOSE THAT HAVE BEEN EMPTIED, WILL RETAIN PRODUCT RESIDUE AND VAPORS. ALWAYS OBEY HAZARD WARNINGS AND HANDLE EMPTY CONTAINERS AS IF THEY WERE FULL.

-----PREPARATION INFORMATION-----

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-----NOTICE-----

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-----REVISION-----

/89: REVISED HAZARD RATING.

01/93: REVIEWED IN ACCORDANCE WITH WHMIS REGULATIONS.

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NO CHANGE OF INFORMATION.

END OF MSDS