Date: 8 March 1991
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5701

SITE SAFETY AND HEALTH PLAN (SSHP) FOR A TRANSPORTABLE INCINERATION SYSTEM (TIS) AT THE SAVANNA ARMY DEPOT ACTIVITY (SADA) WASHOUT LAGOON AREA

Appendices

Submitted to:

U.S. Army Corps of Engineers
Toxic and Hazardous Waste Management Branch
Kansas City District
Kansas City, Missouri 64106-2896

20070424312

Submitted by:

Weston Services, Incorporated
West Chester, Pennsylvania 19380

8 March 1991

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Date: 8 March 1991
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APPENDIX A

PROFESSIONAL PROFILES

Date: 8 March 1991
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GEORGE M. CRAWFORD, JR., CIH

Registration

Certified Industrial Hygienist

Fields of Competence

Management of programs in health and safety, industrial hygiene, occupational disease study, hazardous material spill prevention, spill cleanup, treatment, and disposal; training in health, safety, industrial hygiene and toxicology, risk assessment, and medical research.

Experience Summary

- Has 17 years of management experience in environmental and industrial health, safety, toxicology, hazardous materials control, and emergency response activities, and medical research for government, industry, and academia.

- Management of hazardous materials activities has included work at dioxin, PCB, asbestos, pesticides, heavy metals, and solvents spill or disposal sites, involving extent of contamination studies, risk assessments, designing and implementing removal, containment, treatment, and disposal plans for spill prevention measures and spill response plans, and providing training in emergency response, safety, toxicology, and risk assessment.

- Health and safety program management has included responsibility for industrial hygiene and safety auditing, training, incident investigation, organization and direction of fire brigade and emergency squad, field site inspection, material safety data programs, providing and monitoring routine medical examination and emergency medical care, community relations and interindustry relations for emergency response and support.

- Industrial hygiene program management has included planning and conducting audits to determine workers' exposures; evaluating confined-space entry procedures and exhaust systems; establishing programs for worker awareness and providing training; designing and evaluating engineering controls to reduce employees' exposure to contaminants or physical hazards; consultation in toxicology, chemical safety and health. Industrial health program management has included planning and implementing studies to gather occupational disease data, epidemiology studies, control studies, community health studies, physiological testing of workers, selection of equipment and budget preparation for programs with interindustry, medical facility, and government liaison to coordinate studies and data management. Medical research has included managing research efforts to determine causes and treatment effects for metabolic diseases.

GEORGE M. CRAWFORD, JR., CIH
(continued)

Credentials

B.S., Biology -- Juniata College (1967)

Employment History

1982-Present WESTON
1980-1982 Rollins Environmental Services (NJ), Inc.
1969-1980 Pennsylvania Department of Environmental Resources, Bureau of Occupational Health
1967-1969 Columbia University, and National Institutes of Health

Key Projects

Design of Containment and Filtration System, Site Safety Officer. Containment and treatment of water from a dioxin-contaminated scrap metal yard, involving design of the containment and filtration system, contractor monitoring for performance, serving as site safety officer, and cost monitoring.

Dioxin Contamination Reduction. Dioxin contamination reduction, involving development of generic decontamination procedures for industrial and residential sites that included vacuuming with high-efficiency particulate filtering vacuums after surface decontamination and "wet water" solutions. Procedure was effectively used in a residential/commercial community in New Jersey and at a community swimming pool.

Dioxin Stabilization. Dioxin stabilization for landfill disposal, involving the design of solidification process and a water filtration process for treating and stabilizing dioxin-contaminated sludge and water. PCB/chlorinated solvent contamination characterization, involving work with a multigovernment agency group to develop well water monitoring, groundwater mapping, establishment of pumping wells to help contain spread of groundwater contamination, and mapping of extent of soil contamination in a residential area and at a recreation area in New York, where dumping of PCB-containing oils and solvents had occurred.

Pesticide Dump Cleanup Monitoring, New Jersey, Multipesticide Disposal Site. Involved safety and contractor monitoring and included development of sampling strategy for determining thoroughness of cleanup.

Safety Programs, Manager and Trainer. Managed and gave training programs for safety in hazardous materials response, risk assessment, confined-space entry, and carcinogen handling.

GEORGE M. CRAWFORD, JR., CIH
(continued)

Health, Safety, Medical Programs, Hazardous Waste, Supervisor. Supervised all aspects of health, safety, and medical programs; fire and first-aid response; community emergency preparedness programs; and security for a major hazardous waste cleanup, treatment, and disposal company. Included on-site stabilization of sludge and lining of sludge basins at a disposal plant, plant reconstructions, field projects for cleanup of hazardous wastes from industrial sites and illegal disposal sites.

Industrial Hygiene Programs, Manager/Consultant. Managed industrial hygiene programs evaluating exposures of workers to dusts, chemicals, and noise through sampling and audits, and designed plans to control exposures through engineering control. Also included evaluation of exhaust systems, evaluation of confined-space entry procedures, and training and consultation in health, safety, and environmental compliance.

Data Gathering on Disabilities and Diseases for Occupational Health Programs, Manager. Performed physiological testing; data management; epidemiology studies; and budgeting, intergovernment, medical, and industrial liaison to coordinate studies and manage data.

Publications

Crawford, G., Jr. "Development of Patterns of Coalworker's Pneumonoconiosis." Proceedings of The National Academy of Sciences Conference on Coal Workers Pneumonoconiosis, 1969.

Crawford, G., Jr. "Life Expectancy of Pennsylvania Coal Miners." Archives of Environmental Health, September 1971.

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JOHN R. THOMPSON

Experience Summary

Has over 39 years experience in positions with progressively increasing management responsibilities and has demonstrated the ability to develop and manage comprehensive programs ranging from the immediate to long-range, involving organizations from local to international.

Has been engaged by various companies as a consultant in the fields of munitions demilitarization, and instruction in explosives and industrial safety. Those projects required application of experience in various logistics disciplines, personnel management, and over 5 years of providing direct technical training for military and civilian personnel from base levels to senior managers.

Experience has involved wholesale and retail logistics, including receipt, storage, issue, safety, maintenance, transportation, quality assurance, and demilitarization. Has held management positions from base level to senior positions at depots, in CONUS areas, and at a NICP/NMP.

Employment History

1989-Present	Consultant
1986-1989	U.S. Armament, Munitions, and Chemical Command, Rock Island, IL, Chief, Surveillance Operations Division
1984-1986	U.S. Army Defense Ammunition Center and School, Savanna, IL, Senior Quality Assurance Specialist
1981-1984	Fort Shafer, Hawaii, Central Ammunition Management Office -- Pacific
1950-1981	U.S. Army -- Various assignments

Key Projects

Consultant in the Fields of Munitions Demilitarization, and Instruction in Explosives and Industrial Safety. Projects have required application of experience in various logistics disciplines, personnel management, and over 5 years of providing direct technical training for military and civilian personnel from base levels to senior managers.

Headquarters U.S. Armament, Munitions and Chemical Command, Rock Island, IL, Chief, Surveillance Operations Division. Responsibilities included planning and directing worldwide ammunition stockpile reliability programs. Execution of the stockpile reliability programs required extensive coordination with all services, several major subordinate commands, and overseas major commands. Other responsibilities included development of worldwide guidance and direction in the areas of quality assurance and explosive safety.

JOHN R. THOMPSON
(continued)

These programs impacted Army, and other service, procurement, maintenance, transportation, and demilitarization programs. Duties also entailed direct command relationships with AMCCOM government-owned, contractor-operated; and government-owned, government-operated plants and depot operations. Dollar values of material in the stockpile involved was measured in the billions, with immediate budgetary management of this position in excess of $8 million per year.

U.S. Army Defense Ammunition Center and School, Savanna, IL, Senior Quality Assurance Specialist (Ammunition Surveillance). Was responsible for managing a staff of civilian employees responsible for reviewing U.S. Army ammunition operations at all levels, from troop CONUS and OCONUS level, to depot operations, to plant operations, and to headquarters management of munitions. Areas involved included receipt, storage, issue, explosive safety, transportation, renovation, inventory, quality assurance, and demilitarization of all munitions commodities. Duties also involved providing technical advice and guidance to U.S. Army and other service components on logistics management and military construction of ammunition facilities. During this period was selected as a member of an Army Material Command team reviewing demilitarization and stockpile management. Significant recommendations for improvement in logistics management were presented to senior U.S. Army managers as a result of this review.

Fort Shafer, Hawaii, Central Ammunition Management Office - Pacific. Assistant to the Commander for ammunition quality assurance and explosive safety programs throughout the Pacific area of operations. As the senior member of the Quality Assurance Specialist (Ammunition Surveillance) program in the Pacific area, was responsible for providing career guidance to more than 60 careerists throughout three major commands. Through these careerists, was responsible for coordinating logistics management of U.S. and allied nations munitions stockpiles from the Indian Ocean to northeast Asia. These stockpiles included approximately 1 million short tons stored under conditions varying from unit basic load to extended shipboard storage. Due to extremely varied conditions there were many unique problems pertaining to this stockpile, which required prompt attention. Was responsible for developing solutions to these problems or coordinating solutions between the overseas command and appropriate CONUS commands/staffs.

U.S. Army -- Various Assignments. Held progressively responsible positions with the U.S. Army in six depot assignments, five OCONUS assignments, and four headquarters assignments.

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FRANK H. CRIST

Experience Summary

Has over 44 years experience in development of tools, equipment, and technology for the manufacture, maintenance, modification, surveillance, and demilitarization of conventional, chemical (both lethal and nonlethal), and special munitions. Includes 23 years as Director of the Army's major engineering office for the design, fabrication, and testing of equipment and systems for disposal, renovation, maintenance, and surveillance of conventional, toxic, and nonlethal chemical munitions. Was also assigned responsibility as associate systems manager for development and operation of Rocky Mountain Arsenal, Dugway Proving Ground, and Tooele Army Depot Chemical Agent Munitions Disposal System. Had 9 years experience in engineering and planning of munition operations at Letterkenny Army Depot prior to transfer to Tooele Army Depot.

Has a strong background in arsenal and depot ammunition operations, equipment, methodologies, and procedures, together with a thorough knowledge of the environmental and safety constraints. Has managed large-scale ammunition automation projects and the development of demilitarization equipment for projects now in operation at ammunition depots and storage facilities throughout the world. Has provided consultation on automation with robotics applications in ammunition operations and incineration technology to Department of Defense contractors.

Employment History

1980-Present	Special Consultant
1958-1981	Tooele Army Depot, Director of Ammunition Equipment Directorate
1956-1959	Tooele Army Depot, Ammunition Equipment Directorate, Chief, Research Test and Materials Division
1946-1956	Letterkenny Army Depot, Assistant for Supply Operations Engineering Office

Key Projects

As a private consultant has provided expertise for new and improved ammunition operations, automation of hazardous operations, and incineration technology for disposal of hazardous wastes to the following companies:

- Aerojet Solid and Liquid Propellant Facility, Sacramento, California.
- Soil Systems, Inc., Marietta, Georgia.
- Booker Associates, St. Louis, Missouri.
- Global Chemical Co., Los Angeles, California.
- Northrop Services, Inc., Anaheim, California.

FRANK H. CRIST
(continued)

- Litton Systems, Inc., Chatsworth, California.

- El Dorado Engineering Inc., Salt Lake City, Utah - Board of Directors and frequent project participation including work done for CH_2M Hill, NASA, General Atomics, Morton Thiokol, Aerojet, IT, Lurgi, TRW, Hercules, Teledyne Brown, PERI, and several military installations.

Tooele Army Depot, Tooele, Utah, Director of the Ammunition Equipment Directorate (AED). As Director, planned and managed all activities of the AED. The AED provided centralized engineering services to the Department of Defense (DOD) Single Manager for ammunition located at Rock Island Arsenal, Rock Island, IL. The mission of AED was to conceive, design, and develop technology, systems, and equipment for the worldwide maintenance, modification, renovation, and demilitarization of DOD ammunition in support to the DOD Single Manager for Ammunition. The unique and highly specialized expertise of the AED personnel was continuously utilized by other DOD activities such as Project Deseret (open air testing of CBR weapons); Project Manager for selected ammunition; Corps of Engineers Project Manager for pollution abatement in the Army (APAP), USATHAMA, Edgewood Area, MD (disposal of toxic chemical munitions), Depot Systems Command (special ammunition studies, etc.); DOD Explosive Safety Board (special analysis of explosives hazards and conduct of complex explosive testing); Project Manager for ammo containerization; and Project Manager for development of bombs and related components.

AED was composed of over 100 scientists, engineers, specialists, technicians, draftsmen, and a small shop of model makers. The mission of AED was to conceive, design, develop, proof test, fabricate, or procure specialized equipment required to perform surveillance, maintenance, modification, renovation, and demilitarization of all munitions. The funded workload of AED exceeded $19 million in a fiscal year.

The work at AED required a detailed knowledge of ammunition, ammunition components, and the hazards associated with handling and processing these items. An integral part of the development process was a full-scale pilot model developed and tested with live munitions to determine its suitability for field production line use. Operational shields of barricades, supplied as an integral part of the ammunition equipment, were subjected to the maximum credible incident possible in a production line situation. All such operational shields were certified by AED to comply with MIL-STD-398 before being supplied to worldwide DOD requisitioners of standardized ammunition processing equipment.

A major responsibility of the AED was to develop new and novel technology for demilitarization of ammunition. Typical projects included development of a microwave meltout unit for recovery of explosions for reuse, development of solvent washout of explosives for recycling with use of the spent solvent enriched with considerable explosive as fuel for a turbine-powered electrical generator, and chemical conversion of incapacitating agent CS (tear gas) to O-chlorostyrene. The AED has developed a multitude of incineration systems with pollution control of noxious effluents produced by the operation.

FRANK H. CRIST
(continued)

Other appointments or special duties assigned while Director of AED were as follows:

- Associate systems manager for the development of the Chemical Agent Munitions Disposal System (CAMDS), equipment and technology for demilitarization of M34 GB-filled bombs at Rocky Mountain Arsenal and cleanup of M55 GB-filled rockets at Dugway Proving Ground.
- Special advisor and consultant to the Joint Logistics Commanders Ammunition Panel on demilitarization of munitions.
- Served on several Joint Commanders Ammo Panels (JCAP), Joint Army, Navy and Air Force Panels (JANAF), and Army Blue Ribbon Panels.
- Member of steering group for a DARCOM ammunition demilitarization study.
- Chairman of a DESCOM ammunition demilitarization study.
- Member of an Army Blue Ribbon Panel for a special investigation of ammunition demilitarization operations at a DESCOM depot.
- Guest speaker for the American Chemical Society, DOD Explosive Safety Board seminars, American Defense Preparedness Association meetings, DARCOM safety conferences, DARCOM environmental conferences, and other ammunition operations or engineering symposiums. Averaged 5 to 10 of these assignments per year.

Tooele Army Depot, Ammunition Equipment Directorate, Chief, Research Test and Manuals Division. Supervised industrial engineers and specialists in research of ammunition facts required for intelligent design of process equipment. This division extensively tested the equipment with inert and live ammunition. Upon completion of testing, quantities of the equipment were fabricated for worldwide distribution. Division personnel were field representatives to install equipment and train operational and maintenance personnel on a production line.

Letterkenny Army Depot, Chambersburg, PA, Assistant for Supply Operations Engineering Office. During approximately 5 years in this office was assigned many depot improvement and modernization projects in the general supply and maintenance areas such as shop production, line layout, design of new missile rebuilt facility, and design of special jigs and fixtures for the production line. Also provided maintenance, modification, and rebuild of combat and transport vehicles and their components. Produced a considerable number of machine designs for the disassembly and reassembly of ammunition.

FRANK H. CRIST
(continued)

Honors and Awards

Special Certificate from General Frank Bessom, CG, U.S. Army Material Command, 1966.

Department of the Army Decoration for Meritorious Civilian Service from General Henry Miley, CG U.S. Army Material Command, 1971, for work done in support of chemical munitions disposal operations.

Department of the Army Decoration for Meritorious Civilian Service from Major General John Welch, CG Depot Systems Command for engineering and scientific contributions to the development of demilitarization technology.

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JILL A. DURANCEAU

Fields of Competence

Organic extractions; organic analysis of PCBs, solvents, volatiles, polynuclear aromatic hydrocarbons, and explosives; and field instrumentation analysis. Site safety.

Experience Summary

Gas chromatographic analysis of PCBs, volatiles, solvents, polynuclear aromatic hydrocarbons, and explosives; HPLC analysis of explosives; site safety officer; technician for mobile laboratory; sample preparation for all organics.

Credentials

B.S., Forestry -- University of Wisconsin at Stevens Point (1985)

Employment History

1988-Present	WESTON
1987-1988	American Express
1986-1987	Kirkwood Animal Hospital
1985-1986	Hilltop Lutheran Neighborhood Center

Key Projects

Site safety officer and technician for cleanup with the Transportable Thermal Destruction unit at Illinois Environmental Protection Agency's Paxton Avenue Lagoons site. Responsible for site monitoring, inspection and safety equipment ordering, also extraction and analysis of soil and water.

Technician for explosives testing at an ammunition plant in Tennessee. Responsible for analysis of explosives using HPLC.

Technician for explosives testing at an ammunition plant in Nevada. Responsible for extraction and analysis of explosives using HPLC.

Technician for oil spill cleanup in Valdez, Alaska. Responsible for extraction and analysis of water, rocks, and animal parts.

Technician and supervisor for soil-gas field analysis. Responsible for analysis of soil-gas using an ECD and FID.

Technician for PCB cleanup with the Transportable Thermal Destruction Unit at Illinois Environmental Protection Agency's Beardstown site. Responsible for extraction and analysis of soils and waters.

JILL A. DURANCEAU
(continued)

Technician for the mobile laboratory during volatiles field analysis in Hampstead, Maryland. Responsible for extraction and analysis of volatiles using purge and trap and ECD.

CURRICULUM VITAE

ROBERT B. SWOTINSKY, M.D., M.P.H.

WORK EXPERIENCE

1987 - - Senior Clinical Associate, Washington Occupational Health Associates, Inc. Dr. Swotinsky has over five years of experience in clinical medicine. Some of Dr. Swotinsky's activities include:

- Development and implementation of occupational medical surveillance programs for nationwide companies.
- Consultations to corporations and individuals regarding exposure to occupational and environmental health hazards.
- Clinical evaluations of hazardous waste site workers, persons with potential exposure-related disease, and of general internal medicine patients.
- Workers compensation evaluations.
- Development and management of workplace substance abuse testing programs.

1988 - - Clinical Instructor in Medicine, The George Washington University School of Medicine, Washington, D.C.

1985 - 1987 - Occupational Medicine Resident, University of Southern California, Los Angeles, CA

- Hazard evaluations with Cal/OSHA's medical unit.
- Clinical evaluations of persons with potential exposure-related illness.
- Development of a respiratory protection program for the Los Angeles City Medical Department.
- Epidemiologic research.

EDUCATION

1985 - 1987 - Residency in Occupational Medicine, University of Southern California.

1987 - M.P.H., Epidemiology; University of California at Los Angeles; National Research Award Traineeship.

1984 - 1985 - Intern, Department of Medicine; Hartford Hospital, Connecticut.

1984 - M.D., Vanderbilt University; Nashville, TN.

1980 - B.S., Chemical Engineering; B.S., Life Sciences; Massachusetts Institute of Technology.

MEDICAL LICENSURE

1985 - Ohio (52233)
1985 - California (G55645)
1985 - Maryland (D32846)
1987 - District of Columbia (17066)
1988 - Virginia (0101041891)

CERTIFICATIONS

1989 - American Board of Preventive Medicine (Occupational Medicine)
1987 - Advanced Cardiac Life Support
1985 - National Board of Medical Examiners

SCHOLARSHIPS, HONORS & AWARDS

1980 - Tau Beta Pi (Engineering Honor Society)
1985 - National Research Service Award Traineeship

PROFESSIONAL ORGANIZATIONS

Medical Society of the District of Columbia
American College of Occupational Medicine
Metropolitan Washington College of Occupational Medicine

SELECTED RESEARCH & CONSULTING ACTIVITIES

1990 - - Project Manager for Perland Environmental Technologies, Inc., medical surveillance and drug testing programs; coordinate examinations of hazardous waste site and emergency response workers performed by physician subcontractors at 5 locations nationwide; oversee record reviews and the generation of reports; respond to technical and programatic inquiries.

1989 - - Faculty, Medical Review Officer Training Course; present multiple lectures in these 2-day courses sponsored by the American College of Occupational Medicine, and attended by over 1000 physicians.

1989 - - Project Manager for Buckeye Pipe Line Company medical monitoring and drug testing programs; monitor 300 employees at over 20 locations; coordinate and oversee local medical providers; respond to technical and programatic inquiries.

1988 - - Project Manager for USDA Occupational Health Maintenance Program for research laboratory workers; oversee record reviews and the generation of reports of over 2000 medical exams annually; provide epidemiologic analyses of medical data; respond to technical and programatic inquiries.

1988 - - Project Manager for ICF Kaiser Engineers, Inc., medical surveillance program; coordinate examinations of hazardous waste site and emergency response workers performed by physician subcontractors at 15 locations nationwide; oversee record reviews and the generation of reports of over 300 exams annually; respond to technical and programatic inquiries.

1988 - - Project Manager for Chemical Waste Management, Inc., medical and drug testing programs; monitor over 2,000 employees at over 60 locations; coordinate, oversee, and audit local medical providers; respond to technical and programatic inquiries.

SCIENTIFIC PUBLICATIONS

Contributing Author, Occupational Medicine Forum, Journal of Occupational Medicine: 1987-Present.

Swotinsky RB: Heat Stress. Occupational and Environmental Reporter, 3: June 1989.

Buckley JD, Robinson LL, Swotinsky RB, et al: Occupational Exposures of Parents of Children with Acute Nonlymphocytic Leukemia, Cancer Research: 49:4030-37, 1989.

Swotinsky RB, Chase KC: Health Effects of Exposure to Ammonia, American Journal of Industrial Medicine: 17:515-21, 1990.

Swotinsky RB, Chase KC: The Medical Review Officer. Journal of Occupational Medicine: 32:1003-8, 1990.

Swotinsky RB: The Medical Review Officer Punchlist. Washington DC: Washington Occupational Health Associates, 1990.

Swotinsky RB: The Medical Review Officer's Role in the Department of Transportation Drug Testing Procedures, Journal of Occupational Medicine: 32:385, 1990 (abstract).

SCIENTIFIC PRESENTATIONS

Asbestos: Regulations and Health Effects. Southeastern Electric Exchange - Alexandria VA, 1988

Faculty, Medical Review Officer Training Course: American College of Occupational Medicine - Chicago IL, Washington DC, Houston TX, San Francisco CA, and Pittsburgh PA; 1990-1991.

The Medical Review Officer Role in DOT Drug Testing. American College of Occupational Medicine Annual Meeting - Houston TX, 1990.

Workplace Drug Testing Programs. Kentucky Medical Association Annual Meeting - Louisville KY, 1990.

The Medical Review Officer. Kentucky Occupational Medical Association Annual Meeting - Louisville KY, 1990.

Drug Testing in the Pipeline Industries. Buckeye Pipe Line Annual Meeting - Skytop PA, 1990.

The Physician's Role in Workplace Drug Testing Programs. American College of Preventive Medicine Annual Meeting - Baltimore MD, 1991.

Drug Testing in the Workplace. Semiconductor Safety Association Annual Meeting - Phoenix AZ, 1991.

CURRICULUM VITAE

KENNETH H. CHASE, M.D., F.A.C.P.M.

WORK EXPERIENCE

1980 -	- President, Washington Occupational Health Associates, Inc., Washington, DC
1980 -	- Assistant Clinical Professor of Medicine, George Washington University School of Medicine, Washington, DC
1978 - 1980	- Director, Occupational and Environmental Medicine Programs, George Washington University School of Medicine, Washington, DC
1973 - 1980	- Assistant Professor of Medicine, Department of Medicine, George Washington University School of Medicine, Washington, DC
1970 - 1973	- Attending Physician, University of Maryland Health Center, College Park, MD
1970 - 1972	- Research Associate, National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD

EDUCATION

1972 - 1973	- Third Year Resident, Department of Medicine, Georgetown University Hospital, Washington, DC
1970 - 1972	- Research Associate, National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD
1969 - 1970	- Second Year Resident, Department of Internal Medicine, The University of Michigan Medical Center, Ann Arbor, MI
1968 - 1969	- First Year Resident, Department of Internal Medicine, The University of Michigan Medical Center, Ann Arbor, MI
1964 - 1968	- M.D., School of Medicine, University of California at Los Angeles
1964 - 1966	- Graduate School, Department of Physiology, University of California at Los Angeles
1962 - 1964	- B.A., (Mathematics), University of California at Los Angeles
1960 - 1962	- El Camino College, Los Angeles, CA

MEDICAL LICENSURE

1988	- Virginia (#0101042332)
1983	- New Jersey (#41838)
1982	- Tennessee (#13838)
1981	- New York (#147667)
1980	- Delaware (#C1001854)
1973	- District of Columbia (#3561)
1970	- Maryland (#D-08066)
1969	- California (#A023674)

BOARD CERTIFICATION

1984 - American Board of Preventive Medicine (Occupational Medicine)
1973 - American Board of Internal Medicine
1968 - Board of Medical Examiners, State of California

MILITARY SERVICE

1970 - 1972 - United States Public Health Service, Surgeon (Lt. Commander), National Institutes of Health, Bethesda, MD

SCHOLARSHIPS, HONORS & AWARDS

1988 - Fellow, American Academy of Occupational Medicine
1986 - Fellow, American Occupational Medical Association
1985 - Fellow, American College of Preventive Medicine
1981 - 1984 - American Medical Association Physician's Recognition Award
1977 - 1980 - American Medical Association Physician's Recognition Award
1974 - 1977 - American Medical Association Physician's Recognition Award
1971 - 1973 - American Medical Association Physician's Recognition Award
1972 - Distinguished Lecture Series, University of Utah
1966 - 1968 - Medical Scientist Fellowship, Life Insurance Medical Research Fund
1964 - Honors in Mathematics, University of California at Los Angeles

PROFESSIONAL ORGANIZATIONS

Aerospace Medical Association
American Academy of Occupational Medicine (Fellow)
American College of Physicians
American College of Preventive Medicine (Fellow)
American Industrial Hygiene Association
American Medical Association
  Section Council on Preventive Medicine (AOMA Representative)
American Occupational Medical Association (Fellow)
  Committee on History, Mission, Goals, and Philosophy (Chairman)
  Committee on Occupational Medicine Practice
  Committee on Occupational and Clinical Toxicology
  House of Delegates (Delegate)
  Section for Private Practioners of Occupational Medicine (Co-Chairman)
American Society of Internal Medicine
District of Columbia Society of Internal Medicine
George Washington University Hospital Medical Staff
  Disaster Committee
Medical Society of the District of Columbia
  Committee on Occupational and Environmental Health (Chairman)
National Capital Occupational Medicine Association
  Board of Directors; Immediate Past-president
Society for Risk Analysis

SELECTED RESEARCH & CONSULTING ACTIVITIES

1989 -	- Project Director for the U.S. Marshals Service to coordinate, conduct, and monitor the results of physical examinations for U.S. Marshals on a nationwide basis.
1988 -	- Consulting Medical Director to ICF, Inc., responsible for the design and implementation of medical surveillance program for workers at hazardous waste sites on a nationwide basis.
1987 -	- Consulting Medical Director to CH2M Hill, responsible for the design and implementation of medical surveillance program for workers at hazardous waste sites on a nationwide basis.
1987 - 1989	- Consultant to Texas Eastern Transmission Company for technical support in the evaluation of worker and environmental exposure to PCBs and other compounds.
1985 - 1986	- Project Director for the City of Los Angeles Department of Water & Power to develop/support a comprehensive Environmental Health Management System - characterize hazards of nearly 500 chemical products; extensive IH sampling and analysis; develop handling and monitoring procedures
1985 - 1986	- Project Director for the Edison Electric Institute to conduct a comprehensive critical review of health effects literature relevant to PCBs, dibenzofurans and dioxins including risk assessments for complex mixtures
1984 - 1985	- Project Director for two major U.S. utilities to assess adequacy of capacitor clean-up standards, including spill modeling and health risk assessment
1983 - 1986	- Consultant to Clement Associates, Inc; literature review and risk assessment for workers at risk of exposure to PCB-containing fluids including dioxins and dibenzofurans for the Electric Power Research Institute; literature review update on Agent Orange for the Veterans Administration
1983 -	- Consultant to Chemical Waste Management, Inc.; evaluate the environment of hazardous waste workers at risk of exposure to numerous waste chemicals and metals; develop and administer a corresponding occupational medical surveillance program on nationwide basis
1982 - 1987	- Consultant to the Federal National Mortgage Association (Fannie Mae); provide occupational health support services to the Supervisor, Health Administration for corporate staff employees
1982 -	- Project Director for USDA to provide occupational medical support services on a nation-wide basis for employees of the Agricultural Research Services Agency
1982 - 1983	- Consultant to Washington Metropolitan Area Transit Authority (METRO); review of existing medical services program to the end of recommending changes and enhancements required to provide more effective control of Worker's Compensation costs
1981 - 1988	- Consultant to University of Maryland; evaluate the occupational environments of 6,000 employees and recommend medical surveillance procedures for those at risk of exposure to a combination of pesticides, herbicides, noise, radiation, toxic chemicals and dusts and biohazards

1981 - - Consultant to Printing Industries of Metropolitan Washington, DC, Inc.; design and implementation of Hearing Conservation Programs for 70 member companies, including sound level surveys, audiometric testing and processing, training programs and computerized recordkeeping

1981 - - Consultant to VERSAR, Inc.; design and implementation of medical surveillance programs for workers at risk of exposure to PCBs, dioxins, dibenzofurans and other chlorinated hydrocarbons in California and New York

1981 - 1989 - Consultant to George Washington University; design and implementation of medical monitoring program for employees engaged in pesticide and herbicide formulation and application

1981 - 1983 - Consultant to Kiplinger Washington Editors, Inc.; design, implementation and staffing of a comprehensive employee health program for 600 workers at risk of exposure to noise, pigments and organic solvents

1980 - - Senior Physician for Occupational and Environmental Medicine, Biometric Research Institute; program development in various occupational and environmental health projects with emphasis on clinical correlations

1980 - 1982 - Consultant to The Washington Post; evaluate and recommend procedures for monitoring exposures to organic solvents, ink pigments, lead fumes, noise and other hazardous agents

1980 - 1981 - Consultant to the U.S. International Communication Agency; design and coordinate clinical, toxicologic and industrial hygiene surveys of workers exposed to toxic chemicals (ketones, plasticizers and polymers)

1979 - - Consultant to various law firms and insurance companies; evaluate and prepare expert witness testimony in cases involving occupational or environmental exposures to asbestos, benzene, diisocyanates, lead, lindane, PCBs, and other substances

1979 - - Consultant to AMTRAK; design and execution of controlled studies to evaluate the toxicity of chlorinated hydrocarbons including PCBs, trichlorobenzene and tetrachlorobenzene in exposed workers

1979 - 1981 - Consultant to PEPCO; advise management on medical monitoring procedures for exposures to lead, PCBs and noise

1979 - 1980 - Consultant to U.S. Department of Energy; case review and recommendations under the Energy Building Temperature Restrictions for the Office of Hearings & Appeals

1978 - 1979 - Advisor to Project Director, GWU Science Communications Division; Occupational Cancer Training Project. funding by NCI and OSHA

1978 - 1979 - Co-investigator, GWU Department of Medicine; effects of low-level ionizing radiation on rates of death by cancer, funded by the Nuclear Regulatory Commission

1977 - 1978 - Special Consultant to Assistant Secretary for Health (HEW); investigation and report on quality of medical care at St. Elizabeth's Hospital (NIMH)

1976 - 1979 - Member, Institutional Review Board; Medical Research Applications, Inc. Phase III Clinical Toxicologic Studies of LAAM (LL- alpha -acetyl - methodol) in addict population, funded by NIDA (NIH)

1976 - 1977 - Medical Consultant, METRO; part of occupational health team concerned with diving medicine

1975 - 1979 - Medical Director, AMTRAK; responsible for design and implementation of medical policies and procedures including toxicologic medical surveillance programs

1974 - 1980 - Attending Physician; George Washington University Medical Center Employee Health Service

1974 - 1975 - Medical Consultant, AMTRAK; development of medical standards for all field employees

1974 - - Executive physical program design and implementation for Washington offices of Union Pacific, RCA, AMTRAK, American Petroleum Institute, Exxon, Peat, Marwick & Mitchell, National School Boards Association, and others

1970 - 1973 - Attending Physician; University of Maryland Health Center, College Park, MD

1970 - 1972 - Electroencephalographic correlates of "autistic" Rhesus monkeys; National Institute of Child Health and Human Development

1970 - 1972 - Neuropathologic studies of the auditory cortex in squirrel monkeys; National Institute of Child Health and Human Development

1969 - 1970 - Computerized methodology for aldosterone assays in double dilution radioisotope techniques; University of Michigan Department of Endrocrinology

1966 - 1968 - Epidemiologic and physiologic studies in multiple sclerosis; Departments of Neurology, UCLA School of Medicine and the Royal Victoria Infirmary, Newcastle-Upon-Tyne, England

1966 - 1967 - Efficacy of measles vaccine in field studies; UCLA School of Public Health

1965 - 1966 - Autonomic integrity in immunosympathectomized mice; UCLA Department of Physiology

1964 - 1965 - Embryological morphogenesis: Computer verification of mathematicochemical theories of pigment pattern formation; UCLA Department of Zoology

1963 - 1964 - Molecular orbital calculations of chemical binding energies by computer methods; UCLA Department of Chemistry

1962 - 1964 - Power spectral analysis of EEGs in humans and chimps; NASA Space Biology Lab, UCLA Brain Research Institute

1962 - 1963 - Uterine contraction-fetal heart rate studies by computer analysis; Loma Linda School of Medicine

SCIENTIFIC PUBLICATIONS

Chase, K.H.: Pericardial Fibrosis as a Complication of Pleuropulmonary Asbestosis, in preparation

Shields, P.G., Whysner, J.A., Chase, K.H.: Polychlorinated Biphenyls and Other Polyhalogenated Aromatic Hydrocarbons in Sullivan, J. (ed.), Hazardous Materials Toxicology (Baltimore: Williams & Wilkins) in press

Date: 8 March 1991
Revision No.: 1

RALPH W. HAYES
President, El Dorado Engineering, Inc.

Experience Summary

Has over 19 years of professional experience. This includes President and founder of a science and engineering firm, and Deputy Director and Chief Engineer for the U.S. Army's major engineering office for the design, fabrication, and testing of equipment and systems for disposal, renovation, maintenance, and surveillance of conventional, toxic, and nonlethal chemical munitions. Also has headed projects for major complex explosive and hazardous waste incineration design, fabrication, and testing as well as complex machine design projects.

Credentials

M.S., Mechanical Engineering -- Brigham Young University (1971)
B.S., Mechanical Engineering -- Brigham Young University (1971)
Ph.D. level courses in advanced fluid mechanics (1977)
Personnel Management for Executives (1978)
Course instructor for Master of Management graduate program, Westminster College, Salt Lake City, Utah

Employment History

1981-Present	El Dorado Engineering Inc.
1979-1981	Tooele Army Depot, Ammunition Equipment Office, Deputy Director, Chief Engineer
1977-1979	Tooele Army Depot, Ammunition Equipment Office, Chief, Chemical Systems Engineering Branch
1971-1977	Tooele Army Depot, Ammunition Equipment Office, Project Engineer
1974	Consultant to Brigham Young University, Electrical Engineering Department
1971	U.S. Steel - Geneva, Junior Engineer

Key Projects

President, El Dorado Engineering Inc., Salt Lake City, Utah. Principal-in-Charge of an engineering firm engaged in electrical, mechanical, and chemical engineering covering a wide range of projects such as robotics, hazardous waste disposal, utility upgrades, and machine design and automation.

Served as Project Manager of diverse projects such as the following:

- Project Manager for the design and permitting of a solid and liquid hazardous waste incinerator at the DOE Pantex facilities.

RALPH W. HAYES
(continued)

- Project Manager for a $3,000,000 open end contract in support of the Chemical Agent Munitions Disposal System.

- Project Manager of an evaluation of the propellant disposal facility including wet air oxidation and fluidized bed facilities at the Naval Ordnance Station, Indian Head, MD, and recommendations for additional facilities.

- Served as Principal Investigator for the $500,000 development and validation of a computer model to predict combustion and dispersion from open burning and open air detonation of explosives and propellants.

- Served as Project Manager for the $500,000 modeling and air emissions testing program for permitting disposal of the Pershing Missile motor as part of INF treaty.

- Served as Project Manager on modeling for the Environmental Impact Statement for Shuttle Booster manufacturing and test facilities.

- Project Manager of major incineration facility feasibility studies.

- Served on the EPA National Permit Assistance Team to assist EPA Washington, DC in the review of hazardous waste permits.

- Named to the ASTM committee for establishing standards and test methods for hazardous waste treatment and disposal.

- Project Manager for the design of a high temperature, vacuum, blast-resistant explosive item test chamber and control of toxic and hazardous effluents at Crane Naval Weapons Center, Indiana.

- Project Manager for design of MX missile storage facility at Hill Air Force Base, Utah.

- Project Manager for the preparation of Part B Hazardous Waste Permit Applications for installations in five different states. This included the first hazardous waste surface impoundment permit and first RCRA exemption for an explosive waste incinerator.

- Project Manager for the design and permitting of a commercial hazardous waste incinerator.

Provided professional, technical, and administrative leadership to Tooele Ammunition Equipment Office (AEO). AEO is composed of over 100 scientists, engineers, specialists, technicians, draftsmen, and model makers. The mission of AEO is to conceive, design,

RALPH W. HAYES
(continued)

fabricate, or procure specialized equipment required to perform surveillance, maintenance, renovation, and/or demilitarization of conventional, chemical, and special ammunition.

Projects supervised were highly technical engineering projects such as complex machine design for the Ammunition Peculiar Equipment program, robotics, and remote-controlled barricaded operations for toxic and hazardous environments, barricade testing and certification, the design of major incineration facilities, chemical conversion systems, and chemical processes, preoperational and investigative surveys of proposed and existing major ammunition disposal complexes.

He has received several special assignments while in this position:

- Member, Joint Army, Navy, Air Force Panel (JCAP) that reviews, catalogs, and evaluates emerging technology for the disposal of ammunition and ammunition-related items throughout all DOD areas.

- Acted as the Depot Systems Command representative of the JCAP Panel, which provided official policy on the Hazardous Waste Regulations of the Resource Conservation and Recovery Act as they apply to DOD and provided comment to EPA on draft policy.

- One of three members on a special JCAP subpanel to study open burning/open detonation for the disposal of explosives, propellants, and pyrotechnics.

- Was extensively involved in formulating policy resulting in the curtailment of open burning of white phosphorus and CS-filled items at all CONUS Depots due to potentially hazardous pollution from these operations.

- Was Chairman of the Army Demil Study Energy Committee formulating energy policy for all future demilitarization operations.

Supervised professional engineers and technicians involved in a variety of munition programs involving chemical systems and the electrical and controls support for the AEO. Besides supervising the work of others, served as project engineer on large complex projects. Major projects included:

- Supervising and directing support of a 35 man-year level-of-effort in the development of machines, equipment, and methodology for the $67 million Chemical Ammunition Disposal System at Tooele, Utah.

- Original technical director of many of the incineration programs being done in a worldwide effort to support the U.S. Army Armament Materiel and Readiness Command (ARRCOM), U.S. Army Depot System Command (DESCOM), and the Corps of Engineers (COE). Engineers and program managers in ARRCOM, U.S.

RALPH W. HAYES
(continued)

Army Materiel Development and Readiness Command (DARCOM), Defense Logistics Agency, and the private sector in general, have all sought his personal technical advice on ammunition and hazardous chemical disposal.

- Project Engineer on the design and construction of 22 incinerators/air pollution control systems.
- Tasked to provide an initial technical review of the Western Area Demil Facility (WADF), (a $76 million ammunition facility) to determine potential technical problems prior to the Army assuming this facility from the Navy as the single manager.
- Project Engineer on the development of a contaminated waste processor, which includes the incinerator, associated feed systems, and air pollution control systems.
- Project Engineer on the initial feasibility system of white phosphorus munition demil/conversion to phosphoric acid. Included incinerator adaptation, feed system, and phosphoric acid conversion system.
- Provided consulting to Edgewood Arsenal on initial concepts for BZ incineration and supervised feasibility testing of BZ-simulated incineration test.
- Technical group named "Center of Competence" for technology for disposal of all Army-contaminated wastes.

Served as Project Engineer on many Army AEO ammunition programs. Was responsible for design, development, and testing. Typical projects included:

- Assignment to a special task force to troubleshoot problems at the M34 chemical ammunition disposal facility at Rocky Mountain Arsenal. Many of his evaluations, diagnoses, and corrections were responsible for this program being completed ahead of schedule.
- Project Engineer on the development of an explosive waste incinerator, feed system, and air pollution control system.
- Demonstrated feasibility of melting explosive with microwave energy.
- Designed machine for high production rate rotary pull-apart for disassembly of projectiles.
- Designed ammunition peculiar equipment for the accomplishment of demilitarization and renovation of obsolete munitions.

RALPH W. HAYES
(continued)

- Developed modification and adaptation of NASA computer program developed for rocket motor thrust to predict pollutants formation in combustion and detonation of explosives.

- Designed and developed technology for the first air pollution control systems for explosives incineration.

Air pollution sampling and simple design tasks at U.S. Steel - Geneva on scrubbers and electrostatic precipitators and wastewater sampling.

Publications

"Recycling Explosives," Paper presented at Department of Defense Explosive Safety Seminar, Los Angeles, CA, 1980.

"Demilitarization Technology," Paper presented at Ammunition Conference, Rock Island, IL, 1980.

"Contaminated Waste Incinerators," Paper presented at Department of Defense Incineration Conference, Edgewood, MD, 1978.

"Melting Explosives with Microwave Energy," Paper presented at International Microwave Power Institute, Milwaukee, WI, 1974.

"Microwave Frequency Effects on Melting Explosives," Paper presented at International Microwave Power Institute, Minneapolis, MN, 1976.

"Slide Rules," Idaho Engineer, 1965.

Date: 8 March 1991
Revision No.: 1

LOUIS KRAUSE, E.I.T.

Registration

Engineer-in-Training in the Commonwealth of Pennsylvania

Fields of Competence

Occupational health and safety and industrial hygiene program management, including monitoring of compliance with Federal OSHA regulations; regulatory agency negotiations; contract specification and plant operating procedures development; wastewater treatment equipment design and selection; site closures under RCRA and ECRA.

Experience Summary

Nine years experience in environmental engineering and pollution control for large industrial facilities, including aerospace manufacturing plants. Management of company-wide occupational health and safety, industrial hygiene, and pollution control programs, including monitoring and documentation of compliance with all applicable Federal and state regulatory agency requirements.

Credentials

B.S., Psychology -- The Pennsylvania State University (1969)
B.S., Environmental Engineering -- Temple University (1981)
Graduate Studies in Environmental Science -- Drexel University (in progress)

Employment History

1988-Present	WESTON
1983-1988	General Electric/RCA Aerospace and Defense Division
1981-1983	C&D Batteries (an Allied Company)
1979-1981	L. Robert Kimball Associates

Key Projects

Managed the occupational health and safety program for a major aerospace contractor. This involved setting policy and establishing procedures for compliance with various OSHA regulations (Injury Standard, etc.).

Managed a deep injection well project; involved coordinating, reviewing, and approving hydrologic reports and studies, and conducting written and personal negotiations with regulatory agencies. Managed PCB site cleanup, involved editing detailed cleanup contract specifications, selection of a contractor, and coordination of contracted work.

LOUIS KRAUSE, E.I.T.
(continued)

Managed the closure of a sludge drying bed in conformance with RCRA.

Managed compliance with the New Jersey Environmental Clean Up Responsibility Act.

Audited industrial facilities for compliance with regulations and corporate policy regarding health, safety, and pollution control. Audits included the establishment of action plans where necessary to achieve compliance, and working with plant management to establish goals and the means to reach those goals. Audited waste solvent disposal firms. Audited sewage treatment system for safety and maintenance needs.

Wrote detailed workers' compensation procedure manual for a major aerospace manufacturer. Wrote specifications for a corporatewide contract for the inspection and evaluation of PCB transformers, set criteria for the evaluation, and selected the contractor. Wrote contract specifications for the removal and disposal of PCB transformers. Wrote plant procedures for operating equipment, handling hazardous waste, and ensuring compliance with permits and regulations. Wrote and initiated a plant recordkeeping system for information pertaining to regulatory compliance.

Responsible for regulatory contact, including negotiating permits, meeting with state officials, submitting detailed comments, and preparing documents and reports for submission to regulatory agencies.

Designed and selected water treatment equipment, including clarifiers, polymer feed, and acid neutralization. Designed sanitary sewer and pump station alterations.

WILLIAM F. WALKER

Experience Summary

Has over 26 years experience with DOD (all branches), NASA, several foreign governments, and the commercial sector, with a proven track record of bottom line results in explosive ordnance disposal (EOD) operations and programs. Special qualifications include 14 years in the U.S. Air Force as an EOD technician. Spent the first 8 years in hands-on positions as an EOD technician in the field, including liaison tours with the English and Canadian governments, a tour in a combat zone SEA, and a tour with NASA in direct support of the Apollo program. His last 6 years in the military were spent in EOD staff functions including EOD munitions evaluations, EOD technical publication development and editing, EOD curriculum development, and computer installation in support of EOD publication and curriculum development efforts. After retiring from active duty, went to work with a government contractor providing direct EOD support to the Navy. Attained the position of Vice President at Science and Management Resources, Inc. and in that capacity managed all contracts providing curriculum to the U.S. Naval School, Explosive Ordnance Disposal, at Indian Head, Maryland. After leaving SMR, joined Human Factors Applications, Inc. where he has worked in direct support of EOD projects, including the Area Point Search System APSS, the MK 16 Mod 0 Underwater Breathing Apparatus, the EOD foreign student curriculum, and EOD range clearances for the Army Corps of Engineers at Aberdeen Proving Ground. Is presently developing the curriculum for the EOD operator and assistant course, which will replace the present EOD courses, as well as installing a desktop publishing system.

Education

B.S., Computer Programming -- LaSalle University
Private Pilot, Andrews AFB, MD
Attained 65 credits at the University of Maryland and Charles County Community College in Business Management and Computer Science
U.S. Naval School, Explosive Ordnance Disposal, EODS, Indian Head, MD
Instructional System Development (ISD), Ellyson, Pensacola, FL
Instructional System Development (Single Standard), EODS, Indian Head, MD
U.S. Navy Instructor School (Accelerated), FTC, Norfolk, VA
Criterion Referenced Instruction (CRI), Redstone Arsenal, AL
EOD SEA Refresher AZR46470-1, Lowry AFB, CO
EOD Refresher 5AZN46470-PDS, EODS, Indian Head, MD
Advanced Refresher, EODS, Indian Head, MD
Chemical and Biological EOD Training, Fort McClellan, AL
Armament Systems Officers Fundamentals, Air University, AL
Weapons Maintenance Supervisor (F-105D), Bitburg AB, Germany
Weapons Maintenance Supervisor, AMF-46270-22, Dow AFB, ME
Introduction to Computer Technology, DODCI, Washington, DC

WILLIAM F. WALKER
(continued)

Employment History

1984-Present Human Factors Applications, Inc., Master EOD Specialist
1980-1984 Science and Management Resources, Inc.
1959-1979 U.S. Air Force, EOD Technician

Key Projects

Human Factors Applications Inc., Master EOD Specialist. As an EOD training systems analyst has been directly responsible for the development of contracted curricula under NAVSEA OD 45519 and MIL STD 1379 and serves as a Master EOD Specialist conducting range clearance operations for the U.S. Army Corps of Engineers. Developed curriculum materials under ISD to support the EOD Area Point Search System (APSS). Under the Single Standard of OD 45519, developed curriculum materials for the EOD mixed gas diving operator/maintenance course, the EOD Mk 643 Mod 0 explosive device container, the Mk 62 Mod 0 wet steam generator, the Mk 22 Mod 0 ferrous ordnance locator, and the Mk 1 Mod 0 fiberscope. Was instrumental in the development of the International EOD surface training course (ISEODT) to be given to all foreign students attending EOD school. Is presently developing the entire EOD operator and assistant courses, which will replace the existing EOD curriculum.

Science and Management Resources, Inc. Joined Science and Management Resources, Inc., as the director of curriculum development. Recruited additional staff and using the Instructional Systems Development model (ISD) and Criterion Referenced Instruction (CRI) produced and delivered two complex training packages for the Joint Service Explosive Ordnance Disposal School. In addition, added office automation to SMR's capabilities and was promoted to Vice President.

U.S. Air Force - Worldwide, EOD Technician. As a member of the Air Force from 1977 to 1979 was assigned to the Naval School, Explosive Ordnance Disposal as an instructor. In the Curriculum Instructional Standards Office (CIS) developed or reviewed and updated all student guides and lesson guides used in the school's nine courses, bringing them in line with the ISD format. Was assigned a special project to convert the entire curriculum from IBM mag-card to the new word processing format. Served as a member of the word processing implementation team for the command.

From 1975 to 1976 trained Air Force EOD teams for a classified mission in Canada, which required extensive knowledge of U.S. and Canadian ordnance. As a result, the team was rated the best in the U.S. Air Force Air Defense Command. Also developed training for, and participated in, Joint U.S./Canadian EOD operations that included the use and movement of demolition materials across international borders.

WILLIAM F. WALKER
(continued)

From 1974 to 1975 served as an Air Force Senior EOD technician at the U.S. Naval EOD Technology Center, where he approved the release of EOD publications into the USAF system. Also maintained a computerized index of all U.S. and foreign munitions, cross-referenced to the corresponding EOD publication. In order to ensure that the publications conformed to all the requirements of the Joint Service EOD program, represented the USAF as a member of the Joint Service verification team during testing, verification and validation of EOD procedures.

From 1972 until 1973 was an EOD team member whose duties required daily response to battle-damaged aircraft and to several installation security system attacks. Special duties included responding to bomb threats requiring immediate recognition of foreign and improvised munitions, their condition, and potential threat. Duties also included insertion behind enemy lines to destroy classified components of crashed aircraft requiring instant recognition of all encountered ordnance, its condition, its operational use, and its clandestine uses. These duties required extensive knowledge of all foreign and U.S. ordnance used in Southeast Asia. Also volunteered as a member of a team whose mission was to hand deploy hazardous ordnance from an unpressurized C-130 aircraft flying at 20,000 feet over enemy territory.

As a member of the EOD Team at Patrick AFB, Florida from 1968 to 1972, developed EOD procedures for all launches of Atlas, Agena, Polaris/Poseidon, Apollo/Saturn missile systems, and the Mk 48 torpedo. Other duties included improvised explosive device (IED) response to the local community; support of test projects on the Dragon missile; joint USAF, USN, USCG operations to recover missiles destroyed in flight; and extensive VIP support to the U.S. Secret Service.

Provided EOD support to the National Broadcasting Company (NBC) for both presidential conventions of 1972.

From 1968 to 1970 as a member of the EOD detachment at RAF Welford, England, was responsible for the team training as well as developing an ordnance identification course and presenting it to all U.S. and U.K. personnel employed by the Air Force. He also participated in several U.S./U.K. EOD operations, involving U.S. and U.K. ordnance as well as clandestine items used by the IRA.

As a member of an AFLC detachment, from 1966 until 1968, was on a team that had to be airborne in 1 hour from notification. The team's primary mission was to respond anywhere in the world to a nuclear weapon accident. Was also selected to participate in a joint USAF/Atomic Energy Commission (AEC) effort developing and implementing response procedures for a nuclear accident involving any of the developmental weapons that the AEC may need to move or test in the Pacific Test Range. Secondary missions included

WILLIAM F. WALKER
(continued)

recovery of all ordnance items confiscated by customs agents from the thousands of military personnel returning from SEA through the terminal at Travis AFB and responding to bomb threats, both on- and off-base.

Spent the first 6 years in the USAF, from 1960 to 1965, as a weapons mechanic working on B-52 aircraft and F-105 aircraft, as well as several NATO aircraft. Three years of this time was spent in Germany where he gained an extensive knowledge of NATO ordnance.

Date: 8 March 1991
Revision No.: 1

APPENDIX B

LETTER TO MEDICAL CONSULTANT

WASHINGTON OCCUPATIONAL HEALTH ASSOCIATES, INC.
Suite 410
1120 19th Street, N.W.
Washington, D.C. 20036

Consultants in Occupational and Environmental Health

Telephone (202) 463-6698
Telecopier (202) 223-6525

January 7, 1991

Ms. Carol Tarka
Manager, Medical Programs
Roy F. Weston, Inc.
Weston Way
West Chester, PA 19380

RE: SAVANNA ARMY DEPOT ACTIVITY (SADA) Project

Dear Ms. Tarka:

I reviewed selected portions of the Site Specification, Site Safety and Health Plan and the Work Plan for the SADA project. Per your instructions, I limited this review to sections that were detailed in your 19 December 1990 letter.

This review made me aware of the site's conditions and the proposed work plan for the Savanna Army Depot Activity (SADA), Savanna Illinois project. Potential exposure to 2,4,6-trinitrotoluene (TNT) is a particular concern. Section 15.1 of the site specifications notes that TNT in blood or urine should be measured as "determined by physician." Review of several toxicology and biological monitoring texts[1,2,3,4,5] uncovered no reference to blood or urine TNT levels and, as far as I know, none exists. The NIOSH/OSHA guideline for medical surveillance of workers exposed to TNT at potentially hazardous levels states that the following laboratory tests should be included:[5]

- Complete blood count, with differential
- Liver function tests
- Urinalysis with microscopic

These tests are already included in WESTON's existing Protocol I medical surveillance protocol. I recommend that workers at this site also undergo pre-exposure and monthly blood methemoglobin tests. The frequency of methemoglobin testing may be decreased after the results of initial biological monitoring are reviewed. Blood methemoglobin is an ACGIH-adopted biological exposure index for methemoglobin inducers.[6] TNT is a methemoglobin inducer; and, methemoglobin is the most appropriate test for biologically monitoring TNT exposure. If you accept these recommendations, Section 5.1 of the Site Safety and Health Plan should be modified accordingly.

Because it is impractical for Roche to provide satisfactory methemoglobin tests on a nationwide basis, WOHA must be notified in advance in order to coordinate these analyses with the clinic(s) and local laboratory(s).

Washington Occupational Health Associates, Inc. (WOHA) will assist WESTON in administering its medical surveillance program requirements for the

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JAN 11 1991
HEALTH & SAFETY

SADA project. Both Dr. Chase and I are board certified in occupational medicine. Copies of our resumes are enclosed.

I trust that this adequately addresses your immediate needs with respect to the SADA project, as expressed in your December 19, 1990 letter. Please do not hesitate to contact me if you have any questions.

Sincerely yours,

Robert Swotinsky, M.D., M.P.H.
Senior Clinical Associate

RS/cv

Enclosures

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1. ACGIH. Documentation of the Threshold Limit Values and Biological Exposure Indices, American Conference on Governmental Industrial Hygienists, Cincinnati, OH, 1986.

2. Baselt RC. Biological Monitoring Methods for Industrial Chemicals, PSG Publishing Co., Littleton, MA, 1988.

3. Lauwerys RR. Industrial Chemical Exposure, Guidelines for Biological Monitoring, Biomedical Publications, Davis, CA, 1983.

4. Kneip TJ, Crable JV. Methods for Biological Monitoring, American Public Health Association, Washington, D.C., 1988.

5. NIOSH/OSHA. Occupational Health Guidelines for Chemical Hazards, U.S. Department of Health and Human Services, Washington, D.C.

6. ACGIH. 1990-1991 Threshold Limit Values and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1990, p. 60.

APPENDIX C

DAILY SAFETY INSPECTION CHECKLIST

APPENDIX C

DAILY SAFETY INSPECTION CHECKLIST

Week of _____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Weekly
INSPECTOR								
APR								
Cleaned daily								
Stored daily								
Inspected weekly								
Maintained								
SCBA								
Stored daily								
Air supply adequate								
Weekly checkout								
FIRE EXTINGUISHERS								
In proper location								
Charged								
Inspection current								
FIRST AID KIT								
In proper location								
Adequately stocked								
SAFETY SHOWER								
Daily test								
EYE WASHES								
In proper location								
Full								
LADDERS								
Daily proper use								
Inspected weekly								

APPENDIX C
(continued)

Week of _____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Weekly
HOUSEKEEPING								
Daily -- General								
Stairs, walks, ramps, railings								
Daily -- Boards tight								
Handrails in place								
Chains in place								
Hopper safety Rail/cable tight								
Machine guards in place								
CYLINDERS								
Daily -- Chained upright								
No leaks								
Oxidation separated from fuels								
CHEMICAL STORAGE								
Daily -- Located within storage area								
No leaks								
No combustible material								
Flammables separated from corrosives and oxidizers								
Flammables stored away from trailer								

Key:

APR = Air purifying respirators
SCBA = Self-contained breathing apparatus

APPENDIX D

MATERIAL SAFETY DATA SHEETS

- TNT
- NB
- 1,3-DNB
- TNB
- 2,4-DNT
- 2,6-DNT
- Tetryl
- RDX
- HMX
- Lead
- C-25 Shielding Gas (25% Carbon dioxide 75% argon mixture)
- 736 Heat Resistant Sealant
- ABC Dry Chemical
- Acetone (Dimethyl Ketone)
- Acetylene
- Air
- Welding Consumables and Related Products
- Argon
- A-1025 Helium Mixture
- Carbon Dioxide
- Caustic Soda
- Compressed Air
- Coral Plastic
- EZ Weld Multipurpose Solvent Cement
- Ferroquest
- Fiber Glass Reinforcements
- Filtrasorb 200 Activated Carbon
- 1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon)
- Glid-Guard - Heat Resistant Coatings
- Halon 1211
- Haynes Corrosion Resistant Alloys
- H-W ES Castable LI
- Hi Heat Resisting Aluminum
- FG-2 Liquefied Gas
- Methanol
- Methylene Chloride
- Propane
- Nitrogen
- Nitrous Oxide
- Fuel Oils
- Oxygen
- Phoxbond
- Redi-Mix Concrete
- Refractory Bricks or Shapes
- Sodium Hydroxide
- Steel (Carbon and Alloy)
- Ufala (High Alumina Brick)
- Webcol Alcohol Prep Pads

Date: 8 March 1991
Revision No.: 1

TRINITROTOLUENE (TNT)

CHEMICAL NAME
TRINITROTOLUENE

FORMULA
C7H5N3O6

SYNONYMS
TNT
2,4,6-TRINITROTOLUENE

NCI-C56155
UN 0209
TRITON
TOLITE
TOLUENE, 2,4,6-TRINITRO-
UN 1356
BENZENE, 2-METHYL-1,3,5-TRINITRO-
ENTSUFON
ALPHA-TNT
TNT-TOLITE

TOLIT
TRINITROTOLUENE, DRY
S-TRINITROTOLUENE
SYM-TRINITROTOLUOL
2,4,6-TRINITROTOLUOL
TRITOL
TROTYL
TROTYL OIL
OHS24330

PERMISSIBLE EXPOSURE LIMIT
1.5 MG/M3 OSHA TWA (SKIN NOTATION)
0.5 MG/M3 ACGIH TWA (SKIN NOTATION)
MUTAGENIC DATA (RTEC)
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 3 - REACTIVITY 3 - PERSISTENCE 2

TOXICOLOGY: TNT IS A PRIMARY SKIN IRRITANT, SKIN SENSITIZER, NUEROTOXIN, NEPHROTOXIN, HEPATOTOXIN, AND BONE MARROW DEPRESSANT. ACUTE POISONING RESULTS IN CYANOSIS, NAUSEA, APLASTIC OR HEMOLYTIC ANEMIA,JAUNDICE, AND POSSIBLY OLIGURIA OR ANURIA. IN EXTREME CASES, PERIPHERAL NEURITIS, CONVULSIONS AND COMA MAY OCCUR.
VAPORS AND DUSTS IRRITATE THE EYES AND MUCOUS MEMBRANES. EXPOSURE MAY DISCOLOR THE SKIN, HAIR, AND NAILS. SEVERE DERMATITIS IS PRODUCED IN MANY WORKERS EXPOSED TO TNT. CASES OF SENSITIZATION HAVE BEEN REPORTED.
INFORMATION IS NOT AVAILABLE ON WARNING PROPERTIES OF TRINITROTOLUENE.
THE THRESHOLD LIMIT VALUE WAS SET TO PREVENT SYSTEMIC POISONING.
ORL-RAT LD50: 820 MG/KG
ORL-MUS LD50:1009 MG/KG
ORL-CAT LDLO:1850 MG/KG

ORL-RBT LDLO: 500 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NOT APPLICABLE

PHYSICAL DESCRIPTION
COLORLESS TO PALE YELLOW, ODORLESS SOLID

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 227

BOILING POINT AT 1 ATM, F: EXPLODES 464 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.013 G
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): EXPLODES
VAPOR PRESSURE @ 20 C, MMHG: 0.05 MM
MELTING POINT, F: 178 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NA
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NA
AUTOIGNITION TEMPERATURE: 887 F
SPECIFIC GRAVITY: 1.654

INCOMPATIBILITIES
STRONG OXIDIZERS
AMMONIA
STRONG ALKALIES
EXPLOSIVE HAZARD AT HIGH TEMPERATURES
THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC
SHOCK MAY DETONATE OR EXPLODE
REDUCING AGENTS

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

EMPLOYERS SHALL ENSURE THAT CLOTHING CONTAMINATED WITH THIS SUBSTANCE IS PLACED IN CLOSED CONTAINERS FOR STORAGE UNTIL IT CAN BE DISCARDED OR

UNTIL THE EMPLOYER PROVIDES FOR THE REMOVAL OF THE CONTAMINANT FROM THE CLOTHING. IF THE CLOTHING IS TO BE LAUNDERED OR OTHERWISE CLEANED TO REMOVE THE CONTAMINANT, THE EMPLOYER SHALL INFORM THE PERSON PERFORMING THE CLEANING OF THE HAZARDOUS PROPERTIES OF THE SUBSTANCE.

ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION. (THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY;

BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.)
UNSUBSTITUTED NITRO COMPOUNDS:
EXCELLENT/GOOD:
POLYVINYL ALCOHOL

FAIR/POOR:
NATURAL RUBBER
NITRILE RUBBER

FAIR/GOOD:

CHLORINATED POLYETHYLENE
POLYURETHANE
POLYVINYL CHLORIDE
VITON

A WIDE VARIATION IN RATINGS IS INDICATED FOR THE FOLLOWING MATERIALS:
BUTYL RUBBER
NEOPRENE

GOGGLES

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE DUST-RESISTANT SAFETY GOGGLES WHICH COMPLY WITH 29CFR1910.133(A)(2)-(A)(6) WHERE THIS SOLID MAY CONTACT THE EYES.

WASHING CHEMICALS FROM THE SKIN

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT ALL EMPLOYEES SUBJECT TO SKIN CONTACT WITH THIS SUBSTANCE WASH WITH SOAP OR MILD DETERGENT AND WATER ANY AREAS OF THE BODY WHICH MAY HAVE CONTACTED THE SUBSTANCE AT THE END OF EACH WORK DAY.
EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE SKIN BECOMES CONTAMINATED WITH THIS SUBSTANCE PROMPTLY WASH OR SHOWER WITH SOAP OR MILD DETERGENT AND WATER TO REMOVE ANY CONTAMINANT FROM THE SKIN.

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHO HANDLE THIS SUBSTANCE WASH

THEIR HANDS THOROUGHLY WITH SOAP OR MILD DETERGENT AND WATER BEFORE EATING, SMOKING, OR USING TOILET FACILITIES.

ROUTINE CHANGING OF WORK CLOTHING

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE CLOTHING MAY HAVE BECOME CONTAMINATED WITH THIS SUBSTANCE CHANGE INTO UNCONTAMINATED CLOTHING BEFORE LEAVING THE WORK PREMISES.

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT NON-IMPERVIOUS CLOTHING WHICH BECOMES CONTAMINATED WITH THIS SUBSTANCE BE REMOVED PROMPTLY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

SPECIFIC EMERGENCY PROVISIONS

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES DO NOT EAT OR SMOKE IN AREAS WHERE THIS SUBSTANCE IS HANDLED, PROCESSED OR STORED.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

5 MG/M3

- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

12.5 MG/M3
- SUPPLIED-AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE

25 MG/M3
- SUPPLIED-AIR RESPIRATOR

  WITH A FULL FACE-PIECE
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE

1000 MG/M3
- SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE

ESCAPE

- AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER HAVING A HIGH EFFICIENCY PARTICULATE FILTER
- APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION
SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS

LIVER DAMAGE
JAUNDICE
CYANOSIS
SNEEZING
COUGHING
THIRST
PERIPHERAL NEURITIS
MUSCULAR PAIN
KIDNEY DAMAGE
DERMATITIS

LEUKOCYTOSIS
TOXIC HEPATITIS
CARDIOVASCULAR DISTURBANCE
ALBUMINURIA
SEIZURE
NEPHRITIS
PALLOR
NAUSEA
ANOREXIA
BONE MARROW DEPRESSION

APLASTIC ANEMIA
HEMOLYTIC ANEMIA
OLIGURIA
ANURIA
CONVULSIONS
COMATOSE
HEADACHE
METHEMOGLOBINEMIA
SKIN SENSITIZATION
GASTROINTESTINAL IRRITATION

MUCOUS MEMBRANE IRRITATION
LEUKOPENIA
CATARACTS
ECZEMA
ERYTHEMA
ICTERUS
CONJUNCTIVITIS
RESPIRATORY IRRITATION
ANGINA
VOMITING

DIARRHEA
HEPATIC ENLARGEMENT

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

INGESTED TRINITROTOLUENE/TRINITROBENZENE:
EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE OR EMESIS.

MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.

41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

MONITORING/LEVELS MEASUREMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

SUMMARY REVIEW COMPLETED/PUBLISHED TOXIC SUBSTANCES CONTROL ACT (TSCA)

REGULATION PROPOSED TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(A)

SUBSTANCE LISTED HAZARDOUS
STATE OF CALIFORNIA ADMINISTRATIVE CODE
TITLE 22. SOCIAL SECURITY
DIVISION 4. ENVIRONMENTAL HEALTH
CHAPTER 30. MINIMUM STANDARDS FOR MANAGEMENT OF HAZARDOUS AND EXTREMELY HAZARDOUS WASTES

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.32 EPA HAZARDOUS WASTE NO. K045: SPENT CARBON FROM THE TREATMENT OF WASTEWATER CONTAINING EXPLOSIVES. (R)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
RESPIRATORY HISTORY

PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY
HISTORY OF ASTHMA OR ALLERGIES
BLOOD DISEASE
BLOOD CHEMISTRY
RENAL AND LIVER FUNCTIONS
LIVER FUNCTION
VISION TEST
EYE DISEASE
CHRONIC RESPIRATORY DISEASE

CENTRAL NERVOUS SYSTEM EXAMINATION
KIDNEY FUNCTION
URINALYSIS
COMPLETE BLOOD COUNT
HEMATOLOGY
SGOT
SGPT
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
PRE-PLACEMENT AND UP TO SEMI-ANNUAL UNDER SPECIFIC CONDITIONS
ATTENTION TO SMOKING, ALCOHOL, MEDICATION, AND EXPOSURE TO CARCINOGENS

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL
SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT

ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,
EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED
BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS

LIVER PROFILE BLOOD TESTS
COMPLETE BLOOD COUNT

LEAKS AND SPILL PROCEDURES

A REPORTABLE QUANTITY OF ONE HUNDRED POUNDS APPLIES TO THIS SUBSTANCE ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA) BY EXHIBITING ONE OR MORE OF THE CHARACTERISTICS OF IGNITABILITY, CORROSIVITY, OR REACTIVITY IDENTIFIED IN 40CFR261.21 THROUGH 261.23. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85

****

DEPARTMENT OF TRANSPORTATION HAZARD CLASS

49CFR172.101 HAZARDOUS MATERIALS TABLE

(DRY FORM)
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

EXPLOSIVE A

****

INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

(DRY FORM)
CLASS 1-EXPLOSIVE
DIVISION 1.1
COMPATIBILITY GROUP D

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

EXPLOSIVE
(WITH APPROPRIATE DIVISION NUMBER AND COMPATIBILITY GROUP LETTER)

****

FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DANGEROUSLY EXPLOSIVE
* FLOOD WITH WATER
* COOL ALL AFFECTED CONTAINERS WITH FLOODING QUANTITIES OF WATER

* APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
* KEEP MATERIAL WET
* DO NOT ATTEMPT TO SWEEP UP DRY MATERIAL

PERSONNEL PROTECTION:
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS MATERIAL

EVACUATION PROCEDURE:
* IF FIRE UNCONTROLLABLE OR CONTAINER EXPOSED TO DIRECT FLAME EVACUATE FOR RADIUS OF 5000 FEET

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

****
EPA HAZARDOUS WASTE NUMBER D003
WASTE WHICH EXHIBITS THE CHARACTERISTIC OF REACTIVITY 40CFR261.23

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88

(52FR35898 9/23/87)

CAS NUMBER
118-96-7

REGISTRY TOXIC CHEMICALS NUMBER
XU0175000

BULLETINS

SPECIAL INFORMATION
IGNITES READILY. WHEN INVOLVED IN A FIRE, TOXIC FUMES ARE EVOLVED.
IN CLOSED COMPARTMENTS, THESE FUMES MAY FORM AN EXPLOSIVE MIXTURE WITH AIR.
EXPLOSIVE AND SENSITIVE TO FRICTION IN THE DRY STATE.
MAY FORM EXTREMELY SENSITIVE COMPOUNDS WITH HEAVY METALS OR THEIR SALTS.

Date: 8 March 1991
Revision No.: 1

NITROBENZENE

CHEMICAL NAME
NITROBENZENE

FORMULA
C6H5NO2

SYNONYMS
NITRO BENZOL
OIL OF MIRBANE

NCI-C60082
UN 1662
NITROBENZOL
BENZENE, NITRO-
ESSENCE OF MIRBANE
ESSENCE OF MYRBANE
MIRBANE OIL
NITROBENZOL, LIQUID
OIL OF MYRBANE
OHS16590

PERMISSIBLE EXPOSURE LIMIT
1 PPM OSHA TWA (SKIN NOTATION)
1 PPM (5 MG/M3) ACGIH TWA (SKIN NOTATION)
EXPERIMENTAL CARCINOGEN (NTP)
MUTAGENIC DATA (RTEC)
REPRODUCTIVE EFFECTS DATA (RTECS)
AQUATIC TOXICITY RATING 2 (TLM96 10-100 PPM)
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 2 - REACTIVITY 0 -

TOXICOLOGY: NITROBENZENE IS AN EYE AND SKIN IRRITANT, A SKIN SENSITIZER AND A METHEMOGLOBIN FORMER. POISONING MAY AFFECT THE CENTRAL NERVOUS SYSTEM. PROLONGED EXPOSURE MAY AFFECT THE BONE MARROW, SPLEEN, KIDNEYS, AND LIVER.

SINCE THE ODOR THRESHOLD IS WITHIN TWICE THE PERMISSABLE EXPOSURE LIMITS, NITROBENZENE IS CONSIDERED TO HAVE ADEQUATE WARNING PROPERTIES.

PREGNANT WOMEN AND PERSONS WITH GLUCOSE-6-PHOSPHATE DEHYDROGENASE DEFICIENCY OR BLOOD DISORDERS MAY BE AT INCREASED RISK FROM EXPOSURE.

CONSUMPTION OF ALCOHOL MAY INCREASE TOXIC EFFECTS.

ORL-WMN TDLO:	200 MG/KG	UNK-MAN LDLO:	35 MG/KG
ORL-RAT LD50:	640 MG/KG	SKN-RAT LD50:	2100 MG/KG
ORL-MUS LD50:	590 MG/KG	IPR-MUS LD50:	640 MG/KG
SCU-RAT LDLO:	800 MG/KG	SCU-MUS LDLO:	286 MG/KG
ORL-DOG LDLO:	750 MG/KG	INV-DOG LDLO:	150 MG/KG
ORL-CAT LDLO:	1 GM/KG	SKN-CAT LDLO:	25 GM/KG
ORL-RBT LDLO:	700 MG/KG	SKN-RBT LDLO:	600 MG/KG
IPR-GPG LDLO:	500 MG/KG	SCU-GPG LDLO:	800 MG/KG
ORL-MAM LDLO:	1000 MG/KG	SKN-MUS LDLO:	480 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
200 PPM
OSHA/NIOSH

PHYSICAL DESCRIPTION
GREENISH-YELLOW CRYSTALS OR YELLOW, OILY LIQUID;
ODOR OF VOLATILE ALMOND OIL.

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 123

BOILING POINT AT 1 ATM, F: 411 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.2 G
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): 190 F
VAPOR PRESSURE @ 20 C, MMHG: <1 MM
MELTING POINT, F: 42 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 40
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 1.8 @ 200 F
AUTOIGNITION TEMPERATURE: 900 F
SPECIFIC GRAVITY: 1.2037
VAPOR DENSITY (AIR=1): 4.3

ODOR THRESHOLD: 1.9 PPM
OCTANOL/WATER PARTITION COEFFICIENT: 1.85-1.88

INCOMPATIBILITIES
NITRIC ACID
CAUSTICS
ACTIVE METALS
TIN
ZINC

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE

PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT ANY POSSIBLITY OF SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

EMPLOYERS SHALL ENSURE THAT CLOTHING WHICH HAS HAD ANY POSSIBILITY OF

BEING CONTAMINATED WITH THIS SUBSTANCE IS PLACED IN CLOSED CONTAINERS FOR STORAGE UNTIL IT CAN BE DISCARDED OR UNTIL THE EMPLOYER PROVIDES FOR THE REMOVAL OF THE CONTAMINANT FROM THE CLOTHING. IF THE CLOTHING IS TO BE LAUNDERED OR OTHERWISE CLEANED TO REMOVE THE CONTAMINANT, THE EMPLOYER SHALL INFORM THE PERSON PERFORMING THE OPERATION OF THE HAZARDOUS PROPERTIES OF THE SUBSTANCE.

-- -- --

ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED

PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION. (THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY; BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.)
NITROBENZENE:
EXCELLENT/GOOD:
POLYVINYL ALCOHOL
VITON

FAIR/GOOD:
BUTYL RUBBER

NEOPRENE/STYRENE-BUTADIENE RUBBER
CHLORINATED POLYETHYLENE
POLYURETHANE

FAIR/POOR:
NATURAL RUBBER
NEOPRENE
NITRILE RUBBER
POLYVINYL CHLORIDE

GOGGLES
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE SPLASH-PROOF SAFETY GOGGLES WHICH COMPLY WITH 29CFR1910.133(A)(2)-(A)(6) WHERE THIS LIQUID MAY CONTACT THE EYES.

WASHING CHEMICALS FROM THE SKIN
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES

FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE SKIN BECOMES CONTAMINATED WITH THIS SUBSTANCE IMMEDIATELY WASH OR SHOWER WITH SOAP OR MILD DETERGENT AND WATER TO REMOVE ANY CONTAMINANT FROM THE SKIN. EMPLOYERS SHALL ENSURE THAT ALL EMPLOYEES SUBJECT TO SKIN CONTACT WITH THIS SUBSTANCE WASH WITH SOAP OR MILD DETERGENT AND WATER ANY AREAS OF THE BODY WHICH MAY HAVE CONTACTED THE SUBSTANCE AT THE END OF EACH WORK DAY.

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHO HANDLE THIS SUBSTANCE WASH

THEIR HANDS THOROUGHLY WITH SOAP OR MILD DETERGENT AND WATER BEFORE EATING, SMOKING, OR USING TOILET FACILITIES.

ROUTINE CHANGING OF WORK CLOTHING

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE CLOTHING HAS HAD ANY POSSIBILITY OF BEING CONTAMINATED WITH THIS SUBSTANCE CHANGE INTO

UNCONTAMINATED CLOTHING BEFORE LEAVING THE WORK PREMISES.

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT NON-IMPERVIOUS CLOTHING WHICH BECOMES CONTAMINATED WITH THIS SUBSTANCE BE REMOVED IMMEDIATELY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

SPECIFIC EMERGENCY PROVISIONS

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

WHERE THERE IS ANY POSSIBILITY OF EXPOSURE OF AN EMPLOYEE'S BODY TO THIS SUBSTANCE, EMPLOYERS SHALL PROVIDE FACILITIES FOR QUICK DRENCHING OF THE BODY WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

EMPLOYERS SHALL ENSURE THAT EMPLOYEES DO NOT EAT OR SMOKE IN AREAS WHERE THIS SUBSTANCE IS HANDLED, PROCESSED OR STORED.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

10 PPM

- CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

25 PPM

- SUPPLIED-AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE
- POWERED AIR-PURIFYING RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE

50 PPM

- CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE WITH A FULL FACE-PIECE
- GAS MASK WITH AN ORGANIC VAPOR CANISTER (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE

- SUPPLIED-AIR RESPIRATOR WITH A FULL FACE-PIECE

200 PPM

- SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE

ESCAPE

- GAS MASK WITH AN ORGANIC VAPOR CANISTER (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY

INHALATION
SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS

HEADACHE

DRY THROAT
CYANOSIS
MUCOUS MEMBRANE IRRITATION
SKIN IRRITATION
VOMITING
TINNITUS
WEAKNESS
EXCITATION
DROWSINESS
LETHARGY

STUPOR
CONFUSION
SENSITIZATION DERMATITIS
BLOODY STOOLS
DYSPNEA
VISUAL DISTURBANCE
NUMBNESS
HYPERALGIA
HYPOTENSION
TACHYCARDIA

TREMORS
ATAXIA
ANEMIA
DYSURIA
JAUNDICE
KIDNEY DAMAGE
LIVER DAMAGE
SPLEEN DAMAGE
BLADDER ULCERATION
ANOXIA

CONVULSIONS
COMA

CARDIOVASCULAR COLLAPSE
METHEMOGLOBINEMIA

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF THIS CHEMICAL GETS ON SKIN, IMMEDIATELY FLUSH CONTAMINATED SKIN WITH WATER. IF THIS CHEMICAL PENETRATES CLOTHING, IMMEDIATELY REMOVE THE CLOTHING AND FLUSH THE SKIN WITH WATER. GET MEDICAL ATTENTION PROMPTLY.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

INGESTED NITRO/AMINO COMPOUNDS:
EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE OR EMESIS USING ACTIVATED CHARCOAL. GIVE OXYGEN IF RESPIRATION IS SHALLOW OR IF ANOXIA IS PRESENT.
ANTIDOTE - FOR SEVERE METHEMOGLOBINEMIA, GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG (1 MG/KG) SLOWLY INTRAVENOUSLY.
(ALL ANTIDOTES MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
FURTHER TREATMENT - IF METHEMOGLOBINEMIA DOES NOT RESPOND TO METHYLENE BLUE, HEMODIALYSIS OR EXCHANGE TRANSFUSION IS USEFUL.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

METHEMOGLOBINEMIA - GIVE 100% OXYGEN BY MASK IF PATIENT SHOWS SIGNS OF DYSPNEA OR AIR HUNGER. REMOVE POISON BY GASTRIC LAVAGE OR EMESIS FOLLOWED BY CATHARSIS. WASH SKIN THOROUGHLY WITH SOAP AND WATER.

GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG INTRAVENOUSLY OVER A 10 MINUTE PERIOD. ADMINISTRATION OF METHYLENE BLUE MAY CAUSE HYPERTENSION, NAUSEA, AND DIZZINESS. LARGER DOSES (>500 MG) WILL CAUSE VOMITING, DIARRHEA, CHEST PAIN, MENTAL CONFUSION, CYANOSIS, AND SWEATING. HEMOLYTIC ANEMIA HAS OCCURED SEVERAL DAYS AFTER ADMINISTRATION.

IF METHYLENE BLUE IS NOT AVAILABLE, GIVE ASCORBIC ACID, 1 G SLOWLY INTRAVENOUSLY.
(ANTIDOTE MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

LIVER DAMAGE - REMOVE FROM EXPOSURE TO ALL CHEMICALS AND DRUGS. MAINTAIN COMPLETE BED REST. AVOID ANESTHESIA OR SURGICAL PROCEDURES. AVOID DEHYDRATION OR OVERHYDRATION.

IF VOMITING SEVERE AND ORAL FLUIDS NOT RETAINED, REPLACE VOMITUS WITH AN EQUAL QUANTITY OF 100% DEXTROSE IN NORMAL SALINE. IN RENAL FUNCTION ADEQUATE, GIVE 1 LITER OF 5%

DEXTROSE OR INVERT SUGAR IN NORMAL SALINE PLUS 1-3 LITERS OF 10% DEXTROSE OR INVERT SUGAR IN DISTILLED WATER INTRAVENOUSLY EVERY TWENTY-FOUR HOURS.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS
EYES
SKIN

BLOOD
CENTRAL NERVOUS SYSTEM
GASTROINTESTINAL
KIDNEYS
LIVER

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING

WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

OSHA STANDARD 29CFR1910.106 FLAMMABLE AND COMBUSTIBLE LIQUIDS
APPLIES TO THE HANDLING, STORAGE, AND USE OF FLAMMABLE AND COMBUSTIBLE

LIQUIDS WITH A FLASH POINT BELOW 200 F

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES

CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

SUBSTANCE LISTED AS TOXIC POLLUTANT UNDER CLEAN WATER ACT (CWA) SECTION 307(A)

40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. - INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR27533 06/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

40CFR261.33(F) DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINERS, AND SPILL RESIDUES THEREOF
COMMERCIAL CHEMICAL PRODUCT OR MANUFACTURING CHEMICAL INTERMEDIATE IDENTIFIED AS TOXIC WASTE UNLESS OTHERWISE DESIGNATED.
45FR33084 05/19/80

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.

41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

PREREGULATORY ASSESSMENT IN DEVELOPMENT/PROGRESS CLEAN AIR ACT (CAA)

40CFR122, APPENDIX D - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATION TESTING REQUIREMENTS
TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GS/MS)
48FR14153 04/01/83

REGULATION PROMULGATED CLEAN WATER ACT (CWA) SECTION 311
40CFR117

ANALYTICAL METHODS DEVELOPMENT IN DEVELOPMENT/PROGRESS CLEAN AIR ACT (CAA)

EPISODE REPORT IN DEVELOPMENT/PROGRESS CLEAN WATER ACT (CWA)

MONITORING/LEVELS MEASUREMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR260

SOURCE/EXPOSURE ASSESSMENT COMPLETED/PUBLISHED CLEAN AIR ACT (CAA)

SUMMARY REVIEW COMPLETED/PUBLISHED TOXIC SUBSTANCES CONTROL ACT (TSCA)

CRITERIA DOCUMENT IN DEVELOPMENT/PROGRESS CLEAN WATER ACT (CWA) SECTION 304(A)

CHEMICAL HAZARD INFORMATION PROFILE (CHIP) PUBLISHED BY EPA OFFICE OF PESTICIDES AND TOXIC SUBSTANCES

SUBSTANCE LISTED HAZARDOUS
STATE OF CALIFORNIA ADMINISTRATIVE CODE
TITLE 22. SOCIAL SECURITY
DIVISION 4. ENVIRONMENTAL HEALTH
CHAPTER 30. MINIMUM STANDARDS FOR MANAGEMENT OF HAZARDOUS AND EXTREMELY HAZARDOUS WASTES

SUBSTANCES LISTED APPENDIX A - CONSENT DECREE LIST OF INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7, 1976. SITE 8ERC2120, DDC 1976. MODIFIED MARCH 9, 1979, SITE 12ERC1833, DDC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

40CFR261.31 EPA HAZARDOUS WASTE NO. F004: SPENT NON-HALOGENATED SOLVENT AND STILL BOTTOMS FROM THE RECOVERY OF THIS SOLVENT.(T)
SENATE BILL S.757 WOULD DIRECT EPA TO REVIEW, BY 7/1/85, DISPOSAL OF WASTES CONTAINING THIS SUBSTANCE TO DETERMINE

WHETHER IT SHOULD BE BANNED FROM LAND DISPOSAL

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K025: DISTILLATION BOTTOMS FROM THE PRODUCTION OF NITROBENZENE BY THE NITRATION OF BENZENE.

(T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K104: COMBINED WASTEWATER STREAMS GENERATED FROM NITROBENZENE/ANILINE PRODUCTION.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K058: WASTEWATER TREATMENT SLUDGES GENERATED BY THE FOLLOWING SUBCATEGORIES OF THE LEATHER TANNING AND FINISHING INDUSTRY: HAIR PULP/CHROME TAN/RETAN/WET FINISH; HAIR SAVE/CHROME TAN/RETAN/WET FINISH; AND THROUGH-THE-BLUE. (R,T)

15CFR399.2, SUPPLEMENT 1 - COMMODITY INTERPRETATION 24: CHEMICALS VALIDATED LICENSE REQUIRED FOR EXPORT TO LIBYA, NORTH KOREA, VIETNAM, KAMPUCHEA, OR CUBA
45FR85942 12/30/80
46FR23942 04/29/81
47FR143 01/05/82
47FR41512 09/21/82
47FR51860 11/18/82
47FR58124 12/29/82

SUBSTANCE LISTED WEST VIRGINIA DEPARTMENT OF LABOR LISTING OF HAZARDOUS SUBSTANCES

SUBSTANCE LISTED COMMONWEALTH OF VIRGINIA STATE BOARD OF HEALTH HAZARDOUS WASTE MANAGEMENT REGULATIONS UNDER AUTHORITY OF THE CODE OF VIRGINIA, AS AMENDED, CHAPTER 6, TITLE 32.1, ARTICLE 3, SOLID WASTE MANAGEMENT

EPA HAS ISSUED A FINAL TEST RULE REQUIRING THE MANUFACTURERS AND PROCESSORS OF THE C9 AROMATIC HYDROCARBON FRACTION (WHICH CONTAINS ISOMERS OF ETHYLTOLUENE AND TRIMETHYLBENZENE AS PRIMARY COMPONENTS), OTHER THAN THOSE WHO MANUFACTURE AND PROCESS THIS FRACTION SOLELY AS AN IMPURITY, TO TEST THE C9 AROMATIC FRACTION FOR NEUROTOXICITY, MUTAGENICITY, DEVELOPMENTAL TOXICITY, REPRODUCTIVE EFFECTS, AND ONCOGENICITY (UNLESS CERTAIN MUTAGENICITY TEST RESULTS ARE NEGATIVE).
50FR20662 05/17/85

SECTION 302 OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 ESTABLISHES A THRESHOLD PLANNING QUANTITY OF 10,000 POUNDS FOR THIS SUBSTANCE. THE OWNER OR OPERATOR OF A FACILITY SUBJECT TO THIS SECTION SHALL PROVIDE NOTIFICATION TO THE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH THE FACILITY IS LOCATED ON OR BEFORE MAY 17, 1987 OR WITHIN SIXTY DAYS AFTER A FACILITY FIRST BECOMES SUBJECT TO THE REQUIREMENTS OF THIS SECTION.
52FR13397 4/22/87

SECTION 313 OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF

1986 REQUIRES THAT THE OWNER OR OPERATOR OF A FACILITY SUBJECT TO THE THE REQUIREMENTS OF THIS SECTION SHALL COMPLETE A TOXIC CHEMICAL RELEASE FORM FOR THIS SUBSTANCE ON OR BEFORE JULY 1, 1988, AND ANNUALLY THEREAFTER ON OR BEFORE JULY 1 AND SHALL CONTAIN DATA REFLECTING RELEASES DURING THE PRECEDING CALENDAR YEAR. COVERED FACILITIES: A FACILITY THAT HAS 10 OR MORE FULL TIME EMPLOYEES; A FACILITY THAT IS IN STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES 20 THROUGH 39; A FACILITY THAT MANUFACTURED, IMPORTED OR PROCESSED THIS SUBSTANCE IN AMOUNTS THAT EXCEED THE FOLLOWING THRESHOLD QUANTITIES FOR THE CALENDAR YEARS: 1987 - 75,000 POUNDS PER YEAR

1988 - 50,000 POUNDS PER YEAR
1989 - AND THEREAFTER 25, 000 POUNDS PER YEAR
FOR A USE OTHER THAN MANUFACTURING, IMPORTING OR PROCESSING THE QUANTITY IS 10,000 POUNDS FOR THE APPLICABLE CALENDAR YEAR.
FOR FURTHER INFORMATION CONTACT:
EDWARD A KLEIN, DIRECTOR, TSCA ASSISTANCE OFFICE (TS-799), OFFICE OF TOXIC SUBSTANCES, ENVIRONMENTAL PROTECTION AGENCY, RM. E-543, 401 M ST., SW., WASHINGTON, DC 20460, (202)554-1411.

SUBSTANCE LISTED UNDER THE STATE OF FLORIDA TOXIC SUBSTANCES IN THE

WORKPLACE RIGHT TO KNOW LAW, CHAPTER 442 OF THE FLORIDA STATUTES.

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16, ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF CALIFORNIA HAZARDOUS SUBSTANCES INFORMATION AND TRAINING ACT, CALIFORNIA LABOR CODE, DIVISION 5, CHAPTER 2.5

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

SUBSTANCE LISTED UNDER THE STATE OF ILLINOIS TOXIC SUBSTANCES DISCLOSURE TO EMPLOYEES ACT, TITLE 56, CHAPTER I, SUBCHAPTER B, SECTION 205.

40CFR172 THIS SUBSTANCE IDENTIFIED IN THE PRELIMINARY ASSESSMENT INFORMATION RULE (PAIR). MANUFACTURERS AND IMPORTERS WHO PRODUCE THIS SUBSTANCE ARE REQUIRED TO SUBMIT PRODUCTION VOLUME, END USE AND EXPOSURE

DATA TO THE ENVIRONMENTAL PROTECTION AGENCY.

MEDICAL SURVEILLANCE REQUIRED
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES

MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS
48FR38187 08/22/83
48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION

INDUSTRIAL EXPOSURE HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
SPECIAL ATTENTION TO HISTORY OF ALCOHOL USE

BLOOD CHEMISTRY
COMPLETE BLOOD COUNT
LIVER FUNCTION
MORPHOLOGICAL BLOOD SLIDES
KIDNEY FUNCTION
PRE-PLACEMENT AND ANNUAL EXAMS
URINALYSIS
CARDIOVASCULAR DISEASE
OBSERVE FOR HEINZ BODIES RBC
SKIN EXAM

VISION TEST

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,

EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
METHEMOGLOBIN DETERMINATION
URINE PHENOL

CONVULSIONS - BLOOD ANALYSIS FOR GLUCOSE, CALCIUM, UREA NITROGEN AND CARBON DIOXIDE
ELECTROCARDIOGRAM

LEAKS AND SPILL PROCEDURES
A REPORTABLE QUANTITY OF ONE THOUSAND POUNDS APPLIES TO THIS SUBSTANCE ESTABLISHED BY SECTIONS 101(14) AND 102(B) OR ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA). SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS

SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONCE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85
REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION

(40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

POISON B

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

POISON

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INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 6.1-POISONOUS (TOXIC) SUBSTANCE

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

POISON

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FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* EXTINGUISH FIRE USING AGENT SUITABLE FOR TYPE OF SURROUNDING FIRE

(MATERIAL ITSELF DOES NOT BURN OF BURNS WITH DIFFICULTY)
* USE WATER IN FLOODING QUANTITIES AS FOG
* USE ALCOHOL FOAM OR CO2 OR DRY CHEMICAL EXTINGUISHERS

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY

FURTHER TREATMENT - TREAT LIVER FAILURE AND HEMOLYTIC REACTIONS. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

GASTRIC LAVAGE - GIVE PATIENT GLASS OF WATER PRIOR TO PASSING OF STOMACH TUBE. LAY PATIENT ON ONE SIDE, WITH HEAD LOWER THAN WAIST. IMMOBILIZE A STRUGGLING PATIENT WITH A SHEET OR BLANKET. MEASURE DISTANCE ON TUBE FROM MOUTH TO EPIGASTRIUM, MARK TUBE WITH INDELIBLE MARKING OR TAPE. REMOVE DENTURES AND OTHER FOREIGN OBJECTS FROM MOUTH. OPEN MOUTH, USE GAG IF NECESSARY. EXTEND HEAD BY LIFTING THE CHIN. PASS TUBE OVER TONGUE AND TOWARD BACK OF THROAT WITHOUT EXTENDING HEAD OR NECK. IF OBSTRUCTION IS MET BEFORE THE MARK ON TUBE REACHES LEVELS OF TEETH, DO NOT FORCE, BUT REMOVE TUBE AND REPEAT PROCEDURE UNTIL TUBE PASSES TO MARK. PLACE END OF TUBE IN GLASS OF WATER. IF TUBE IS OBSTRUCTED WHEN INTRODUCED ABOUT HALFWAY TO THE MARK, IT MAY HAVE ENTERED TRACHEA.

AFTER TUBE IS PLACED IN STOMACH, ASPIRATE FIRST TO REMOVE STOMACH CONTENTS BY IRRIGATION SYRINGE. SAVE STOMACH CONTENTS FOR EXAMINATION, AND REPEAT INTRODUCTION AND WITHDRAWAL OF 100-300 ML WARM WATER UNTIL AT LEAST 3 LITERS OF CLEAR RETURN ARE OBTAINED. USE ACTIVATED CHARCOAL AT BEGINNING OF LAVAGE TO AID IN POISON INACTIVATION. LEAVE 50 GRAMS OF CHARCOAL SUSPENDED IN WATER IN THE STOMACH. IF INTRODUCTION AND REMOVAL OF LAVAGE FLUID BY GRAVITY REQUIRES MORE THAN FIVE MINUTES, ASSIST WITH ASEPTO SYRINGE. PREVENT ASPIRATION WITH CUFFED ENDOTRACHEAL TUBE. AVOID GIVING LARGE QUANTITIES OF WATER.

MASSAGE OF EPIGASTRIUM WHILE STOMACH TUBE IS BEING ASPIRATED MAY AID IN POISON REMOVAL.

IF PATIENT COMATOSE, INTUBATE TRACHEA WITH CUFFED ENDOTRACHEAL TUBE. SUCCINYLCHLORINE MAY BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL TO EASE INSERTION OF TRACHEAL CATHETER PRIOR TO PASSAGE OF STOMACH TUBE.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

LIVER DAMAGE - REMOVE FROM EXPOSURE TO ALL CHEMICALS AND DRUGS. MAINTAIN COMPLETE BED REST. AVOID ANESTHESIA OR SURGICAL PROCEDURES. AVOID DEHYDRATION OR OVERHYDRATION. IF VOMITING SEVERE AND ORAL FLUIDS NOT RETAINED, REPLACE VOMITUS WITH AN EQUAL QUANTITY OF 100% DEXTROSE IN NORMAL SALINE. IN RENAL FUNCTION ADEQUATE, GIVE 1 LITER OF 5% DEXTROSE OR INVERT SUGAR IN NORMAL SALINE PLUS 1-3 LITERS OF 10% DEXTROSE OR INVERT SUGAR IN DISTILLED WATER INTRAVENOUSLY EVERY TWENTY-FOUR HOURS.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

HEMOLYTIC REACTION - FOR HEMOGLOBINURIA WITH NORMAL KIDNEY FUNCTION, MAINTAIN URINE OUTPUT AT 200 ML/HOUR BY GIVING 4-8 LITERS OF FLUID DAILY ORALLY OR INTRAVENOUSLY. FLUROSEMIDE, 20-80 MG ORALLY OR INTRAVENOUSLY EVERY 4-8 HOURS, MAY BE NECESSARY. ALKALINIZE URINE BY GIVING 1-2 GRAMS SODIUM BICARBONATE EVERY FOUR HOURS. MONITOR CENTRAL NEROUS PRESSURE AND ELECTROLYTES DURING FORCED DIURESIS. MANNITOL ADMINISTRATION MAY BE NEEDED TO MAINTAIN URINE OUTPUT.

40CFR261.32 EPA HAZARDOUS WASTE NO. K047: PINK/RED WATER FROM TNT OPERATIONS. (R)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K044: WASTEWATER TREATMENT SLUDGES FROM THE MANUFACTURING AND PROCESSING OF EXPLOSIVES. (R)

SUBSTANCE LISTED ANNUAL LIST OF EXPLOSIVE MATERIALS SUBJECT TO REGULATION UNDER 18 U.S.C. CHAPTER 40, IMPORTATION, MANUFACTURE, DISTRIBUTION AND STORAGE OF EXPLOSIVE MATERIALS. 48FR55061 12/08/83

SEE PUBLICATION 'ATF: EXPLOSIVES LAW AND REGULATIONS', BY BUREAU OF ALCOHOL, TOBACCO AND FIREARMS, DEPARTMENT OF THE TREASURY. OBTAIN FROM SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402

CHEMICAL HAZARD INFORMATION PROFILE (CHIP) PUBLISHED BY EPA OFFICE OF PESTICIDES AND TOXIC SUBSTANCES

SUBSTANCE LISTED WEST VIRGINIA DEPARTMENT OF LABOR LISTING OF HAZARDOUS SUBSTANCES

SUBSTANCE LISTED UNDER THE STATE OF FLORIDA TOXIC SUBSTANCES IN THE WORKPLACE RIGHT TO KNOW LAW, CHAPTER 442 OF THE FLORIDA STATUTES.

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16, ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF CALIFORNIA HAZARDOUS SUBSTANCES INFORMATION AND TRAINING ACT, CALIFORNIA LABOR CODE, DIVISION 5, CHAPTER 2.5

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

SUBSTANCE LISTED UNDER THE STATE OF ILLINOIS TOXIC SUBSTANCES DISCLOSURE TO EMPLOYEES ACT, TITLE 56, CHAPTER I, SUBCHAPTER B, SECTION 205.

THIS SUBSTANCE TESTED FOR MUTAGENESIS/GENETIC TOXICITY BY THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)

MEDICAL SURVEILLANCE REQUIRED

GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS
48FR38187 08/22/83

IF SERUM HEMOGLOBIN EXCEEDS 1.5 G/DL, TOTAL EXCHANGE TRANSFUSION MAY PREVENT RENAL FAILURE.
TREAT METHEMOGLOBINEMIA WITH METHYLENE BLUE.
(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS
EYES

SKIN
RESPIRATORY SYSTEM
BLOOD
CENTRAL NERVOUS SYSTEM
CARDIOVASCULAR SYSTEM
GASTROINTESTINAL
KIDNEYS
LIVER

STATUS OF REGULATORY ENFORCEMENT

OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR

* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL

* KEEP UPWIND
* AVOID BODILY CONTACT WITH MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS MATERIAL
* IF CONTACT WITH MATERIAL ANTICIPATED, WEAR FULL PROTECTIVE CLOTHING

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FOLLWING INFORMATION FROM DEPARTMENT OF TRANSPORTATION/U.S. COAST GUARD "CHEMICAL RESPONSE INFORMATION SYSTEM", REGARDING WATER SPILLS:

* U.S. COAST GUARD REQUIRES 24 HOUR ADVANCE NOTICE TO CAPTAIN OF THE PORT WHEN THIS SUBSTANCE IS SCHEDULED TO ARRIVE AT PORT WHEN TRANSPORTED IN BULK QUANTITY
* SUBSTANCE SINKS IN WATER
* RESTRICT ACCESS OF GENERAL PUBLIC WHEN APPRECIABLE DANGER ARISES FROM SPILL
* RESTRICT HUMAN USE WHEN SUBSTANCE INVOLVED
* RESTRICT FARM USE WHEN SUBSTANCE SPILLED IN WATER USED FOR IRRIGATION OR ANIMALS
* RESTRICT INDUSTRIAL USE WHEN SPILLED SUBSTANCE COULD CORRODE MACHINERY OR IF POSSIBILITY OF IGNITION FROM HIGHLY FLAMMABLE VAPORS DEVELOPS
* PUMP SINKING LIQUID OR FINELY DIVIDED SOLIDS
* USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES

* HIGHLY CORROSIVE, AVOID DIRECT CONTACT, CONTACT WITH SKIN OR EYES CAN CAUSE IRRITATION OR BURNS
* BURNING NOT RECOMMENDED, FIRE DIFFICULT TO CONTROL AND/OR POISONOUS GAS IS FORMED

LISTED BY U.S. COAST GUARD UNDER CARGO COMPATIBILITY GROUP NITRO COMPOUNDS, INCOMPATIBLE WITH THE FOLLOWING MATERIALS: CAUSTICS, AMMONIA, ALIPHATIC AMINES, ALKANOLAMINES, AROMATIC AMINES

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

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EPA HAZARDOUS WASTE NUMBER U169
NITROBENZENE (I,T)

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER

SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88

(52FR35898 9/23/87)

CAS NUMBER
98-95-3

REGISTRY TOXIC CHEMICALS NUMBER
DA6475000

Date: 8 March 1991
Revision No.: 1

1,3-DINITROBENZENE

CHEMICAL NAME
M-DINITROBENZENE

FORMULA
C6H4N2O4

SYNONYMS
1,3-DINITROBENZOL
1,3-DINITROBENZENE

BENZENE, M-DINITRO-
BENZENE, 1,3-DINITRO-
BINITROBENZENE
2,4-DINITROBENZENE
OHS13100

PERMISSIBLE EXPOSURE LIMIT
1 MG/M3 OSHA TWA (SKIN NOTATION)
150 PPB ACGIH TWA (SKIN NOTATION)
MUTAGENIC DATA (RTEC)

CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 0 - REACTIVITY 3 - PERSISTENCE 2

TOXICOLOGY: DINITROBENZENES ARE METHEMOGLOBIN FORMERS. SEE DINITROBENZENE.
SKN-MAN TDLO: 4 MG/KG/2 DY-INTERMITTENT
ORL-RAT LD50: 83 MG/KG
ORL-DOG LDLO:600 MG/KG
ORL-CAT LDLO: 27 MG/KG
ORL-RBT LDLO:400 MG/KG

IVN-DOG LD50: 10 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
200 MG/M3
OSHA/NIOSH

PHYSICAL DESCRIPTION
YELLOW CRYSTALS

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 168.1
BOILING POINT AT 1 ATM, F: 556 F AT 756 MM
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.05 G
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): EXPLODES
VAPOR PRESSURE @ 20 C, MMHG: <1 MM
MELTING POINT, F: 194 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NA
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NA
SPECIFIC GRAVITY: 1.5759 AT 64 F

INCOMPATIBILITIES
STRONG OXIDIZERS
CAUSTICS
ACTIVE METALS

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE

PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT SKIN CONTACT WITH THIS SUBSTANCE WHERE SKIN CONTACT MAY OCCUR. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

EMPLOYERS SHALL ENSURE THAT CLOTHING CONTAMINATED WITH THIS SUBSTANCE IS PLACED IN CLOSED CONTAINERS FOR STORAGE UNTIL IT CAN BE DISCARDED OR UNTIL THE EMPLOYER PROVIDES FOR THE REMOVAL OF THE CONTAMINANT FROM THE CLOTHING. IF THE CLOTHING IS TO BE LAUNDERED OR OTHERWISE CLEANED TO REMOVE THE CONTAMINANT, THE EMPLOYER SHALL INFORM THE PERSON PERFORMING THE CLEANING OF THE HAZARDOUS PROPERTIES OF THE SUBSTANCE.

BEFORE LEAVING THE WORK PREMISES.

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT NON-IMPERVIOUS CLOTHING WHICH BECOMES CONTAMINATED WITH THIS SUBSTANCE BE REMOVED PROMPTLY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

SPECIFIC EMERGENCY PROVISIONS
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

WHERE EXPOSURE OF AN EMPLOYEE'S BODY TO THIS SUBSTANCE MAY OCCUR,

EMPLOYERS SHALL PROVIDE FACILITIES FOR QUICK DRENCHING OF THE BODY WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

EMPLOYERS SHALL ENSURE THAT EMPLOYEES DO NOT EAT OR SMOKE IN AREAS WHERE THIS SUBSTANCE IS HANDLED, PROCESSED OR STORED.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

5 MG/M3
- DUST AND MIST RESPIRATOR

  EXCEPT SINGLE-USE RESPIRATORS

10 MG/M3
- DUST AND MIST RESPIRATOR
  EXCEPT SINGLE-USE RESPIRATORS
  AND QUARTER-MASK RESPIRATORS
- FUME OR HIGH-EFFICIENCY PARTICULATE RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

50 MG/M3
- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
  WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE, HELMENT, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE

200 MG/M3
- POWERED AIR-PURIFYING RESPIRATOR
  WITH A HIGH-EFFICIENCY FILTER
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW MODE

ESCAPE

- DUST AND MIST RESPIRATOR

-- -- --

ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION. (THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY; BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.)
UNSUBSTITUTED NITRO COMPOUNDS:
EXCELLENT/GOOD:
POLYVINYL ALCOHOL

FAIR/POOR:
NATURAL RUBBER
NITRILE RUBBER

FAIR/GOOD:
CHLORINATED POLYETHYLENE
POLYURETHANE
POLYVINYL CHLORIDE
VITON

A WIDE VARIATION IN RATINGS IS INDICATED FOR THE FOLLOWING MATERIALS:
BUTYL RUBBER
NEOPRENE

GOGGLES
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE DUST-RESISTANT

SAFETY GOGGLES WHICH COMPLY WITH 29CFR1910.133(A)(2)-(A)(6) WHERE THIS SOLID MAY CONTACT THE EYES.

WASHING CHEMICALS FROM THE SKIN
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE SKIN BECOMES CONTAMINATED WITH THIS SUBSTANCE PROMPTLY WASH OR SHOWER WITH SOAP OR MILD DETERGENT AND WATER TO REMOVE ANY CONTAMINANT FROM THE SKIN.

EMPLOYERS SHALL ENSURE THAT ALL EMPLOYEES SUBJECT TO SKIN CONTACT WITH THIS SUBSTANCE WASH WITH SOAP OR MILD DETERGENT AND WATER ANY AREAS OF THE BODY WHICH MAY HAVE CONTACTED THE SUBSTANCE AT THE END OF EACH WORK DAY.

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHO HANDLE THIS SUBSTANCE WASH THEIR HANDS THOROUGHLY WITH SOAP OR MILD DETERGENT AND WATER BEFORE EATING, SMOKING, OR USING TOILET FACILITIES.

ROUTINE CHANGING OF WORK CLOTHING

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE CLOTHING MAY HAVE BECOME CONTAMINATED WITH THIS SUBSTANCE CHANGE INTO UNCONTAMINATED CLOTHING

EXCEPT SINGLE-USE RESPIRATORS
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION
SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS

SCOTOMA
VISUAL DISTURBANCE
METHEMOGLOBINEMIA
HYPOXEMIA
CYANOSIS
HEADACHE
DIZZINESS
CONFUSION
WEAKNESS
HEMOLYTIC ANEMIA

THIRST
CENTRAL NERVOUS SYSTEM DAMAGE
STUPOR
RESPIRATORY DEGENERATION
STUPOR
HYPOTENSION
WEIGHT LOSS
CONVULSIONS
COMATOSE
BLADDER ULCERATION

KIDNEY DAMAGE
JAUNDICE
LIVER DAMAGE
SPLEEN DAMAGE
BONE MARROW DEPRESSION
EYE IRRITATION
CORNEAL DAMAGE
SKIN PIGMENTATION
NAUSEA
VOMITING

ATAXIA
DYSPNEA
TACHYCARDIA
LIGHTHEADEDNESS
EUPHORIA

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF THIS CHEMICAL GETS ON SKIN, IMMEDIATELY FLUSH CONTAMINATED SKIN WITH WATER. IF THIS CHEMICAL PENETRATES CLOTHING, IMMEDIATELY REMOVE THE CLOTHING AND FLUSH THE SKIN WITH WATER. GET MEDICAL ATTENTION PROMPTLY.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

INGESTED NITRO/AMINO COMPOUNDS:
EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE OR EMESIS USING ACTIVATED CHARCOAL. GIVE OXYGEN IF RESPIRATION IS SHALLOW OR IF ANOXIA IS PRESENT.
ANTIDOTE - FOR SEVERE METHEMOGLOBINEMIA, GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG (1 MG/KG) SLOWLY INTRAVENOUSLY.
(ALL ANTIDOTES MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
FURTHER TREATMENT - IF METHEMOGLOBINEMIA DOES NOT RESPOND TO METHYLENE BLUE, HEMODIALYSIS OR EXCHANGE TRANSFUSION IS USEFUL.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

METHEMOGLOBINEMIA - GIVE 100% OXYGEN BY MASK IF PATIENT SHOWS SIGNS OF DYSPNEA OR AIR HUNGER. REMOVE POISON BY GASTRIC LAVAGE OR EMESIS FOLLOWED BY CATHARSIS. WASH SKIN THOROUGHLY WITH SOAP AND WATER.

GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG INTRAVENOUSLY OVER A 10 MINUTE PERIOD. ADMINISTRATION OF METHYLENE BLUE MAY CAUSE HYPERTENSION, NAUSEA, AND DIZZINESS. LARGER DOSES (>500 MG) WILL CAUSE VOMITING, DIARRHEA, CHEST PAIN, MENTAL CONFUSION, CYANOSIS, AND SWEATING. HEMOLYTIC ANEMIA HAS OCCURED SEVERAL DAYS AFTER ADMINISTRATION.

IF METHYLENE BLUE IS NOT AVAILABLE, GIVE ASCORBIC ACID, 1 G SLOWLY INTRAVENOUSLY.
(ANTIDOTE MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

LIVER DAMAGE - REMOVE FROM EXPOSURE TO ALL CHEMICALS AND DRUGS. MAINTAIN COMPLETE BED REST. AVOID ANESTHESIA OR SURGICAL PROCEDURES. AVOID DEHYDRATION OR OVERHYDRATION. IF VOMITING SEVERE AND ORAL FLUIDS NOT RETAINED, REPLACE VOMITUS WITH AN EQUAL QUANTITY OF 100% DEXTROSE IN NORMAL SALINE. IN RENAL FUNCTION ADEQUATE, GIVE 1 LITER OF 5%

DEXTROSE OR INVERT SUGAR IN NORMAL SALINE PLUS 1-3 LITERS OF 10% DEXTROSE OR INVERT SUGAR IN DISTILLED WATER INTRAVENOUSLY EVERY TWENTY-FOUR HOURS.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS
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RESPIRATORY SYSTEM
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48FR53280 11/25/83

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OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)

45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12

41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

40CFR261.33(F) DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINERS, AND SPILL RESIDUES THEREOF
COMMERCIAL CHEMICAL PRODUCT OR MANUFACTURING CHEMICAL INTERMEDIATE IDENTIFIED AS TOXIC WASTE UNLESS OTHERWISE DESIGNATED.
45FR33084 05/19/80

REGULATION PROPOSED TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(A)

SUBSTANCE LISTED HAZARDOUS
STATE OF CALIFORNIA ADMINISTRATIVE CODE
TITLE 22. SOCIAL SECURITY
DIVISION 4. ENVIRONMENTAL HEALTH
CHAPTER 30. MINIMUM STANDARDS FOR MANAGEMENT OF HAZARDOUS AND EXTREMELY HAZARDOUS WASTES

SUBSTANCE SUBJECT TO REQUIREMENTS OF GENERAL INDUSTRY SAFETY ORDER (GISO) 5194 OR TITLE 8 OF CALIFORNIA ADMINSTRATIVE CODE AND DIVISION 5, CHAPTER 2.5 OF CALIFORNIA LABOR CODE

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.32 EPA HAZARDOUS WASTE NO. K025: DISTILLATION BOTTOMS FROM THE PRODUCTION OF NITROBENZENE BY THE NITRATION OF BENZENE.
(T)

15CFR399.2, SUPPLEMENT 1 - COMMODITY INTERPRETATION 24: CHEMICALS
VALIDATED LICENSE REQUIRED FOR EXPORT TO LIBYA, NORTH KOREA, VIETNAM,

KAMPUCHEA, OR CUBA
45FR85942 12/30/80
46FR23942 04/29/81
47FR143 01/05/82
47FR41512 09/21/82
47FR51860 11/18/82
47FR58124 12/29/82

SUBSTANCE LISTED WEST VIRGINIA DEPARTMENT OF LABOR LISTING OF HAZARDOUS SUBSTANCES

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

SUBSTANCE CANDIDATE FOR POSSIBLE RECOMMENDATION FROM THE INTERAGENCY TESTING COMMITTE (ITC) TO EPA, TO GE GIVEN PRIORITY CONSIDERATION FOR THE PROMULGATION OF TESTING

RULES PURSUANT TO TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 4(A).
48FR51519 11/09/83
48FR55043 12/08/83 (CORRECTION)

SUBSTANCE LISTED UNDER THE STATE OF FLORIDA TOXIC SUBSTANCES IN THE WORKPLACE RIGHT TO KNOW LAW, CHAPTER 442 OF THE FLORIDA STATUTES.

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16, ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16, ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

MEDICAL SURVEILLANCE REQUIRED
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS
48FR38187 08/22/83
48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
RESPIRATORY HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
COMPLETE BLOOD COUNT
BLOOD CHEMISTRY
WITH EMPHASIS ON:
GGTP

LDH

SGOT
SGPT
PULMONARY FUNCTIONS
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
URINALYSIS
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

NUCLEAR REG. 0041 - -

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES, EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
METHEMOGLOBIN DETERMINATION
CONVULSIONS - BLOOD ANALYSIS FOR GLUCOSE, CALCIUM, UREA NITROGEN AND CARBON DIOXIDE

LEAKS AND SPILL PROCEDURES
A REPORTABLE QUANTITY OF ONE HUNDRED POUNDS APPLIES TO THIS SUBSTANCE

ESTABLISHED BY SECTIONS 101(14) AND 102(B) OR ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA). SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS

49CFR172.101 HAZARDOUS MATERIALS TABLE

NOT LISTED

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INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 6.1-POISONOUS (TOXIC) SUBSTANCE

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

POISON

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

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EPA HAZARDOUS WASTE NUMBER D003
WASTE WHICH EXHIBITS THE CHARACTERISTIC OF REACTIVITY 40CFR261.23

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE

THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA

REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88
(52FR35898 9/23/87)

CAS NUMBER
99-65-0

REGISTRY TOXIC CHEMICALS NUMBER
CZ7350000

BULLETINS

SPECIAL INFORMATION
MIXTURES OR COMMERCIAL PRODUCTS MAY MELT AT SIGNIFICANTLY LOWER TEMPERATURES.
IF INVOLVED IN A FIRE, MAY EXPLODE.

Date: 8 March 1991
Revision No.: 1

TRINITROBENZENE

CHEMICAL NAME
TRINITROBENZENE

FORMULA
C6H3N3O6

SYNONYMS
TNB
1,3,5-TRINITROBENZENE

UN 0214
TRINITROBENZENE, DRY
TRINITROBENZENE, WET
DC3860000
BENZENITE
UN 1354
BENZENE, 1,3,5-TRINITRO-
S-TRINITROBENZENE
SYM-TRINITROBENZENE
SYMMETRIC TRINITROBENZENE

OHS24250

PERMISSIBLE EXPOSURE LIMIT
NONE ESTABLISHED
MUTAGENIC DATA (RTEC)
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 3 - REACTIVITY 3 - PERSISTENCE 2

TOXICOLOGY: SEE TRINITROTOLUENE.
ORL-RAT LD50:450 MG/KG

ORL-MUS LD50:572 MG/KG
ORL-GPG LD50:730 MG/KG
IVN-MUS LD50: 32 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION
LIGHT GREENISH-YELLOW CRYSTALS

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 213.12
BOILING POINT AT 1 ATM, F: DECOMPOSES
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.035 G
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): EXPLODES
VAPOR PRESSURE @ 20 C, MMHG: 0.3846 MM AT 252 F
MELTING POINT, F: 254 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE
SPECIFIC GRAVITY:-1.76

INCOMPATIBILITIES
EXPLOSIVE HAZARD AT HIGH TEMPERATURES
SHOCK MAY DETONATE OR EXPLODE
THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC
REDUCING AGENTS

PERSONAL PROTECTIVE EQUIPMENT
NO NIOSH/OSHA DATA; RECOMMEND
PREVENT ANY POSSIBILITY OF SKIN CONTACT

WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE

CLOTHING" INDICATES THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION. (THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY; BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.)
UNSUBSTITUTED NITRO COMPOUNDS:
EXCELLENT/GOOD:
POLYVINYL ALCOHOL

FAIR/POOR:

NATURAL RUBBER
NITRILE RUBBER

FAIR/GOOD:
CHLORINATED POLYETHYLENE
POLYURETHANE
POLYVINYL CHLORIDE
VITON

A WIDE VARIATION IN RATINGS IS INDICATED FOR THE FOLLOWING MATERIALS:

BUTYL RUBBER
NEOPRENE

GOGGLES
NO STANDARD REQUIREMENT, BUT ADVISE EYE PROTECTION TO PREVENT ANY POSSIBILITY OF EYE CONTACT
WEAR FACE SHIELD OR VENTED GOGGLES

WASHING CHEMICALS FROM THE SKIN
NO STANDARD REQUIREMENT, BUT ADVISE WASHING

IMMEDIATELY WHEN SKIN BECOMES CONTAMINATED

ROUTINE CHANGING OF WORK CLOTHING
NO STANDARD REQUIREMENT, BUT ADVISE CHANGING
IF THERE IS ANY POSSIBILITY THAT CLOTHING MAY BE CONTAMINATED

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
NO STANDARD REQUIREMENT, BUT ADVISE REMOVING
IMMEDIATELY IF IT BECOMES WET

SPECIFIC EMERGENCY PROVISIONS
NO NIOSH/OSHA DATA, ADVISE:
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

NO SPEC ADVISE

- DUST MASK
  EXCEPT SINGLE-USE RESPIRATORS
  AND QUARTER-MASK RESPIRATORS
- FUME OR HIGH-EFFICIENCY PARTICULATE RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS
- SUPPLIED-AIR RESPIRATOR

HIGH LEVELS
- SELF-CONTAINED BREATHING APPARATUS

  WITH A FULL FACE-PIECE, HELMENT, OR HOOD

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY

INHALATION
INGESTION
SKIN ABSORPTION
SKIN OR EYE CONTACT

SYMPTOMS
NASAL IRRITATION
SKIN PIGMENTATION
FATIGUE
WEAKNESS
DIZZINESS
HEADACHE
NAUSEA
VOMITING
CYANOSIS

INSOMNIA
HEMOLYSIS
WEIGHT LOSS
CENTRAL NERVOUS SYSTEM DEPRESSION
LIVER DAMAGE
TOXIC HEPATITIS
KIDNEY DAMAGE
JAUNDICE
DERMATITIS
ANOREXIA

ANURIA
OLIGURIA
CONVULSIONS
COMATOSE
HEMATURIA
BONE MARROW DAMAGE
METHEMOGLOBINEMIA
DYSPNEA

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED AND PERSON IS CONSCIOUS, IMMEDIATELY GIVE PERSON LARGE QUANTITIES OF WATER. AFTER WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

ORGANS
EYES
RESPIRATORY SYSTEM
SKIN
BLOOD
CENTRAL NERVOUS SYSTEM
GASTROINTESTINAL

KIDNEYS
LIVER
BONE MARROW

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES

CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

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48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR260

REGULATION IN DEVELOPMENT/PROGRESS COMPREHENSIVE ENVIRONMENTAL

RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 101

40CFR261.33(F) DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINERS, AND SPILL RESIDUES THEREOF COMMERCIAL CHEMICAL PRODUCT OR MANUFACTURING CHEMICAL INTERMEDIATE IDENTIFIED AS TOXIC WASTE UNLESS OTHERWISE DESIGNATED.
45FR33084 05/19/80

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SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

MEDICAL SURVEILLANCE REQUIRED
NO NIOSH/OSHA DATA; ADVISE:
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS

48FR38187 08/22/83
48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY

PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
BLOOD CHEMISTRY
SKIN EXAM
WEIGHT
GASTROINTESTINAL

CENTRAL NERVOUS SYSTEM EXAMINATION
LIVER FUNCTION
URINALYSIS
KIDNEY FUNCTION
RENAL AND LIVER FUNCTIONS

CERTIFICATIONS
NO FEDERAL AGENCY REQUIREMENT, BUT DUE TO HAZARDOUS NATURE OF SUBSTANCE, ADVISE FOLLOWING:

HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES, EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
BLOOD CHEMISTRY
URINALYSIS
COMPLETE BLOOD COUNT
LIVER PROFILE BLOOD TESTS
IF SYMPTOMS OF CENTRAL NERVOUS SYSTEM OCCUR, OBTAIN BLOOD GLUCOSE AND RECTAL TEMPERATURE. PERFORM COMPLETE NEUROLOGIC EXAMINATION AND ANY OTHER SPECIFIC NEUROLOGIC TESTS AS APPLICABLE

CONVULSIONS - BLOOD ANALYSIS FOR GLUCOSE, CALCIUM, UREA NITROGEN AND CARBON DIOXIDE

LEAKS AND SPILL PROCEDURES

A REPORTABLE QUANTITY OF TEN POUNDS APPLIES TO THIS SUBSTANCE ESTABLISHED BY SECTIONS 101(14) AND 102(B) OR ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA). SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS

SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE

REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

(DRY FORM)
CLASS A EXPLOSIVE

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

EXPLOSIVE A

****

INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

(DRY FORM)
CLASS 1-EXPLOSIVE
DIVISION 1.1
COMPATIBILITY GROUP D

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

EXPLOSIVE
(WITH APPROPRIATE DIVISION NUMBER AND COMPATIBILITY GROUP LETTER)

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FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF

HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DANGEROUSLY EXPLOSIVE
* FLOOD WITH WATER
* COOL ALL AFFECTED CONTAINERS WITH FLOODING QUANTITIES OF WATER
* APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:

* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
* KEEP MATERIAL WET
* DO NOT ATTEMPT TO SWEEP UP DRY MATERIAL

PERSONNEL PROTECTION:
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT

* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER

* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS MATERIAL

EVACUATION PROCEDURE:
* IF FIRE UNCONTROLLABLE OR CONTAINER EXPOSED TO DIRECT FLAME EVACUATE FOR RADIUS OF 5000 FEET

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

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EPA HAZARDOUS WASTE NUMBER U234
TRINITROBENZENE (R,T)

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE

TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88
(52FR35898 9/23/87)

CAS NUMBER
99-35-4

REGISTRY TOXIC CHEMICALS NUMBER
DC3850000

BULLETINS

SPECIAL INFORMATION

MAY FORM EXTREMELY SENSITIVE COMPOUNDS WITH HEAVY METALS OR THEIR SALTS.
IGNITES READILY, EVOLVING TOXIC FUMES.
EXPLOSIVE AND SENSITIVE TO FRICTION IN DRY STATE.

Date: 8 March 1991
Revision No.: 1

2,4-DINITROTOLUENE

CHEMICAL NAME
2,4-DINITROTOLUENE

FORMULA
C7H6N2O4

SYNONYMS
DNT
2,4-DNT

NCI-C01865
1-METHYL-2,4-DINITROBENZENE
2,4-DINITROTOLUOL
O,P-DINITROTOLUENE
UN 2038
BENZENE, 1-METHYL-2,4-DINITRO-
OHS28640

PERMISSIBLE EXPOSURE LIMIT
1.5 MG/M3 OSHA TWA (SKIN NOTATION)

1.5 MG/M3 ACGIH TWA (SKIN NOTATION)
5 MG/M3 ACGIH STEL (SKIN NOTATION) (NOTICE OF INTENDED CHANGE 84-85)
POSITIVE CARCINOGEN IN RATS (NCI)
NEGATIVE CARCINOGEN IN MICE (NCI)
MUTAGENIC DATA (RTEC)
TUMORIGENIC DATA (RTEC)
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 1 - REACTIVITY 3 - PERSISTENCE 2

TOXICOLOGY: SEE DINITROTOLUENE.

ORL-RAT LD50: 268 MG/KG
ORL-RAT LD50: 268 MG/KG
ORL-MUS LD50: 790 MG/KG
ORL-GPG LD50:1300 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION
YELLOW CRYSTALS

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 182.15
BOILING POINT AT 1 ATM, F: DECOMPOSES 572 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 300 PPM
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): 404 F
VAPOR PRESSURE @ 20 C, MMHG: 1 MM
MELTING POINT, F: 160 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLODES
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLODES

SPECIFIC GRAVITY: 1.3208 AT 160 F
VAPOR DENSITY (AIR=1): 6.3

INCOMPATIBILITIES
HEAT
EXPLOSIVE HAZARD AT HIGH TEMPERATURES
THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC
STRONG OXIDIZERS
CAUSTICS
ACTIVE METALS

TIN
ZINC

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH MOLTEN DINITROTOLUENE;
PREVENT SKIN CONTACT WITH DINITROTOLUENE OR LIQUIDS CONTAINING DINITRO-TOLUENE, WHERE SKIN CONTACT MAY OCCUR

WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE

CLOTHING" INDICATES THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION. (THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY; BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.)
UNSUBSTITUTED NITRO COMPOUNDS:
EXCELLENT/GOOD:
POLYVINYL ALCOHOL

FAIR/POOR:

NATURAL RUBBER
NITRILE RUBBER

FAIR/GOOD:
CHLORINATED POLYETHYLENE
POLYURETHANE

POLYVINYL CHLORIDE
VITON

A WIDE VARIATION IN RATINGS IS INDICATED FOR THE FOLLOWING MATERIALS:

BUTYL RUBBER
NEOPRENE

GOGGLES
PREVENT ANY POSSIBILITY OF EYE CONTACT

WASHING CHEMICALS FROM THE SKIN
IMMEDIATELY WHEN SKIN BECOMES CONTAMINATED AND AT THE END OF WORK SHIFT

ROUTINE CHANGING OF WORK CLOTHING

AFTER WORK SHIFT

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
PROMPTLY IF IT IS NON-IMPERVIOUS AND CONTAMINATED

SPECIFIC EMERGENCY PROVISIONS
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

15 MG/M3
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

75 MG/M3
- SUPPLIED-AIR RESPIRATOR

  WITH A FULL FACE-PIECE, HELMENT, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE

200 MG/M3
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE, HELMENT, OR HOOD
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ESCAPE
- GAS MASK
  WITH AN ORGANIC VAPOR CANISTER
  (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
  WITH A HIGH-EFFICIENCY PARTICULATE FILTER

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION

SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS
EYE IRRITATION
SKIN IRRITATION
DERMATITIS
SKIN PIGMENTATION
RESPIRATORY IRRITATION

MUCOUS MEMBRANE IRRITATION
METHEMOGLOBINEMIA
CYANOSIS
ASPHYXIA
RESPIRATORY DISTRESS
HEADACHE
NAUSEA
VOMITING
IRRITABILITY
DROWSINESS

INSOMNIA
VERTIGO
DIZZINESS
CENTRAL NERVOUS SYSTEM DEPRESSION
DYSPNEA
HEMOLYTIC ANEMIA
HYPOTENSION
WEIGHT LOSS
STUPOR
COMATOSE

CONVULSIONS
BLADDER ULCERATION
KIDNEY DAMAGE
JAUNDICE
LIVER DAMAGE
INSOMNIA
ARTHRALGIA

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES

WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED

SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF THIS CHEMICAL GETS ON SKIN, IMMEDIATELY FLUSH CONTAMINATED SKIN WITH WATER. IF THIS CHEMICAL PENETRATES CLOTHING, IMMEDIATELY REMOVE THE CLOTHING AND FLUSH THE SKIN WITH WATER. GET MEDICAL ATTENTION PROMPTLY.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

INGESTED NITRO/AMINO COMPOUNDS:
EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE OR EMESIS USING ACTIVATED CHARCOAL. GIVE OXYGEN IF RESPIRATION IS SHALLOW OR IF ANOXIA IS PRESENT.
ANTIDOTE - FOR SEVERE METHEMOGLOBINEMIA, GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG (1 MG/KG) SLOWLY INTRAVENOUSLY.
(ALL ANTIDOTES MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
FURTHER TREATMENT - IF METHEMOGLOBINEMIA DOES NOT RESPOND TO METHYLENE BLUE, HEMODIALYSIS OR EXCHANGE TRANSFUSION IS USEFUL.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

METHEMOGLOBINEMIA - GIVE 100% OXYGEN BY MASK IF PATIENT SHOWS SIGNS OF DYSPNEA OR AIR HUNGER. REMOVE POISON BY GASTRIC LAVAGE OR EMESIS FOLLOWED BY CATHARSIS. WASH SKIN THOROUGHLY WITH SOAP AND WATER.

GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG INTRAVENOUSLY OVER A 10 MINUTE PERIOD. ADMINISTRATION OF METHYLENE BLUE MAY CAUSE HYPERTENSION, NAUSEA, AND DIZZINESS. LARGER DOSES (>500 MG) WILL CAUSE VOMITING, DIARRHEA, CHEST PAIN, MENTAL CONFUSION, CYANOSIS, AND SWEATING.

HEMOLYTIC ANEMIA HAS OCCURED SEVERAL DAYS AFTER ADMINISTRATION.

IF METHYLENE BLUE IS NOT AVAILABLE, GIVE ASCORBIC ACID, 1 G SLOWLY INTRAVENOUSLY.
(ANTIDOTE MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

LIVER DAMAGE - REMOVE FROM EXPOSURE TO ALL CHEMICALS AND DRUGS. MAINTAIN COMPLETE BED REST. AVOID ANESTHESIA OR SURGICAL PROCEDURES. AVOID DEHYDRATION OR OVERHYDRATION.

IF VOMITING SEVERE AND ORAL FLUIDS NOT RETAINED, REPLACE VOMITUS WITH AN EQUAL QUANTITY OF 100% DEXTROSE IN NORMAL SALINE. IN RENAL FUNCTION ADEQUATE, GIVE 1 LITER OF 5% DEXTROSE OR INVERT SUGAR IN NORMAL SALINE PLUS 1-3 LITERS OF 10% DEXTROSE OR INVERT SUGAR IN DISTILLED WATER INTRAVENOUSLY EVERY TWENTY-FOUR HOURS.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS
EYES
SKIN
RESPIRATORY SYSTEM
BLOOD
CENTRAL NERVOUS SYSTEM
CARDIOVASCULAR SYSTEM
KIDNEYS
LIVER

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED AS TOXIC POLLUTANT UNDER CLEAN WATER ACT (CWA) SECTION 307(A)

40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR27533 06/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

40CFR122, APPENDIX D - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATION TESTING REQUIREMENTS
TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GS/MS)
48FR14153 04/01/83

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

RISK DOCUMENTATION/ASSESSMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

RISK DOCUMENTATION/ASSESSMENT COMPLETED/PUBLISHED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

SUMMARY REVIEW COMPLETED/PUBLISHED TOXIC SUBSTANCES CONTROL ACT (TSCA)

REGULATION PROPOSED CLEAN WATER ACT (CWA) SECTION 311

40CFR261.33(F) DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINERS, AND SPILL RESIDUES THEREOF
COMMERCIAL CHEMICAL PRODUCT OR MANUFACTURING CHEMICAL INTERMEDIATE IDENTIFIED AS TOXIC WASTE UNLESS OTHERWISE DESIGNATED.
45FR33084 05/19/80

REGULATION PROPOSED TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(A)

ANALYTICAL METHODS DEVELOPMENT IN DEVELOPMENT/PROGRESS CLEAN WATER ACT (CWA)

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

TOXIC SUBSTANCE CONTROL ACT (TSCA) SECTION 8(E) INITIAL

EVALUATION OF SUBSTANTIAL RISK SUBMITTED TO EPA, 1982

CHEMICAL HAZARD INFORMATION PROFILE (CHIP) PUBLISHED BY EPA OFFICE OF PESTICIDES AND TOXIC SUBSTANCES

SUBSTANCE LISTED HAZARDOUS
STATE OF CALIFORNIA ADMINISTRATIVE CODE
TITLE 22. SOCIAL SECURITY

DIVISION 4. ENVIRONMENTAL HEALTH
CHAPTER 30. MINIMUM STANDARDS FOR MANAGEMENT OF HAZARDOUS AND EXTREMELY HAZARDOUS WASTES

SUBSTANCES LISTED APPENDIX A - CONSENT DECREE LIST OF INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7, 1976. SITE 8ERC2I20, DDC 1976. MODIFIED MARCH 9, 1979, SITE 12ERC1833, DDC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K025: DISTILLATION BOTTOMS FROM THE PRODUCTION OF NITROBENZENE BY THE NITRATION OF BENZENE. (T)

SELECTED BY NATIONAL TOXICOLOGY PROGRAM (NTP) FOR SHORT-TERM IN VIVO REPRODUCTIVE TOXICITY ASSAY IN FY 1982

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)

46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76

46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

SUBSTANCE LISTED ANNUAL LIST OF EXPLOSIVE MATERIALS SUBJECT TO REGULATION UNDER 18 U.S.C. CHAPTER 40, IMPORTATION, MANUFACTURE, DISTRIBUTION AND STORAGE OF EXPLOSIVE MATERIALS.
48FR55061 12/08/83

SEE PUBLICATION 'ATF: EXPLOSIVES LAW AND REGULATIONS', BY BUREAU OF ALCOHOL, TOBACCO AND FIREARMS, DEPARTMENT OF THE

TREASURY. OBTAIN FROM SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402

SUBSTANCE LISTED COMMONWEALTH OF VIRGINIA STATE BOARD OF HEALTH HAZARDOUS WASTE MANAGEMENT REGULATIONS UNDER AUTHORITY OF THE CODE OF VIRGINIA, AS AMENDED, CHAPTER 6, TITLE 32.1, ARTICLE 3, SOLID WASTE MANAGEMENT

SECTION 313 OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 REQUIRES THAT THE OWNER OR OPERATOR OF A FACILITY SUBJECT TO THE

THE REQUIREMENTS OF THIS SECTION SHALL COMPLETE A TOXIC CHEMICAL RELEASE FORM FOR THIS SUBSTANCE ON OR BEFORE JULY 1, 1988, AND ANNUALLY THEREAFTER ON OR BEFORE JULY 1 AND SHALL CONTAIN DATA REFLECTING RELEASES DURING THE PRECEDING CALENDAR YEAR. COVERED FACILITIES: A FACILITY THAT HAS 10 OR MORE FULL TIME EMPLOYEES; A FACILITY THAT IS IN STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES 20 THROUGH 39; A FACILITY THAT MANUFACTURED, IMPORTED OR PROCESSED THIS SUBSTANCE IN AMOUNTS THAT EXCEED THE FOLLOWING THRESHOLD QUANTITIES FOR THE CALENDAR YEARS:
1987 - 75,000 POUNDS PER YEAR
1988 - 50,000 POUNDS PER YEAR

1989 - AND THEREAFTER 25, 000 POUNDS PER YEAR
FOR A USE OTHER THAN MANUFACTURING, IMPORTING OR PROCESSING THE QUANTITY IS 10,000 POUNDS FOR THE APPLICABLE CALENDAR YEAR.
FOR FURTHER INFORMATION CONTACT:
EDWARD A KLEIN, DIRECTOR, TSCA ASSISTANCE OFFICE (TS-799), OFFICE OF TOXIC SUBSTANCES, ENVIRONMENTAL PROTECTION AGENCY, RM. E-543, 401 M ST., SW., WASHINGTON, DC 20460, (202)554-1411.

SUBSTANCE LISTED BY THE NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 1983, CHAPTER 315, N.J.S.A. 34: A-1. EMPLOYERS COVERED:

SIC CODES 20-39, 46-49, 51, 75, 76, 80, 82, AND 84.

SUBSTANCE LISTED UNDER THE STATE OF FLORIDA TOXIC SUBSTANCES IN THE WORKPLACE RIGHT TO KNOW LAW, CHAPTER 442 OF THE FLORIDA STATUTES.

SUBSTANCE LISTED UNDER THE STATE OF CALIFORNIA HAZARDOUS SUBSTANCES INFORMATION AND TRAINING ACT, CALIFORNIA LABOR CODE, DIVISION 5, CHAPTER 2.5

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY

RIGHT TO KNOW ACT, P.L. 734, NO. 159.

THIS SUBSTANCE TESTED FOR MUTAGENESIS/GENETIC TOXICITY BY THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)

MEDICAL SURVEILLANCE REQUIRED
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS
48FR38187 08/22/83
48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY

PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
RESPIRATORY HISTORY
BLOOD CHEMISTRY
GGTP
LDH
SGOT
SGPT
COMPLETE BLOOD COUNT
RENAL AND LIVER FUNCTIONS

WITH EMPHASIS ON:
MORPHOLOGICAL BLOOD SLIDES
SKIN EXAM
VISION TEST
PULMONARY FUNCTIONS
URINALYSIS

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES, EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
METHEMOGLOBIN DETERMINATION

ELECTROCARDIOGRAM
CONVULSIONS - BLOOD ANALYSIS FOR GLUCOSE, CALCIUM, UREA NITROGEN AND CARBON DIOXIDE

LEAKS AND SPILL PROCEDURES
A REPORTABLE QUANTITY OF ONE THOUSAND POUNDS APPLIES TO THIS SUBSTANCE ESTABLISHED BY SECTIONS 101(14) AND 102(B) OR ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA). SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONCE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN

AREA (202) 426-2675
50FR13456 04/04/85

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

ORM-E

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

NONE

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INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 6.1-POISONOUS (TOXIC) SUBSTANCE

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

POISON

****

FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DO NOT EXTINGUISH FIRE UNLESS FLOW CAN BE STOPPED
* USE WATER IN FLOODING QUANTITIES AS FOG

* COOL ALL AFFECTED CONTAINERS WITH FLOODING QUANTITIES OF WATER
* APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE

* SOLID STREAMS OF WATER MAY BE INEFFECTIVE
* USE ALCOHOL FOAM OR CO2 OR DRY CHEMICAL EXTINGUISHERS

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
* BUILD DIKES TO CONTAIN FLOW AS NECESSARY

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS MATERIAL

LAND SPILL:

* DIG A PIT, POND, LAGOON OR HOLDING AREA TO CONTAIN LIQUID OR SOLID MATERIAL
* COVER SOLIDS WITH A PLASTIC SHEET TO PREVENT DISSOLVING IN RAIN OR FIREFIGHTING WATER

WATER SPILL:
* USE NATURAL DEEP WATER POCKETS, EXCAVATED LAGOONS, OR SAND BAG BARRIERS TO TRAP MATERIAL AT BOTTOM
* IF DISSOLVED, APPLY ACTIVATED CARBON AT 10 TIMES SPILLED AMOUNT AT 10PPM OR GREATER CONCENTRATION

* USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

****
EPA HAZARDOUS WASTE NUMBER U105
2,4-DINITROTOLUENE

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION

3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88
(52FR35898 9/23/87)

CAS NUMBER
121-14-2

REGISTRY TOXIC CHEMICALS NUMBER
XT1575000

Date: 8 March 1991
Revision No.: 1

2,6-DINITROTOLUENE

CHEMICAL NAME
2,6-DINITROTOLUENE

FORMULA
C7H6N2O4

SYNONYMS
2,6-DNT
2-METHYL-1,3-DINITROBENZENE

UN 2038
TOLUENE, 2,6-DINITRO-
BENZENE, 2-METHYL-1,3-DINITRO-
1-METHYL-2,6-DINITROBENZENE
BENZENE, 1-METHYL-2,6-DINITRO-
OHS29010

PERMISSIBLE EXPOSURE LIMIT
1.5 MG/M3 OSHA TWA (SKIN NOTATION)
MUTAGENIC DATA (RTEC)

CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 0 - REACTIVITY 3 -
PERSISTENCE 2

TOXICOLOGY: SEE DINITROTOLUENE.
ORL-RAT LD50:177 MG/KG
ORL-MUS LD50:621 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION
YELLOW CRYSTALS

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 182.15
BOILING POINT AT 1 ATM, F: 482 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.03 G
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): 404 F
VAPOR PRESSURE @ 20 C, MMHG: 1 MM HG
MELTING POINT, F: 157 F

UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLODES
LOWER EXPLOSIVE-LIMIT IN AIR, % BY VOLUME: EXPLODES
SPECIFIC GRAVITY: 1.2883 AT 232 F

INCOMPATIBILITIES
STRONG OXIDIZERS
CAUSTICS
ACTIVE METALS
TIN
ZINC

PEROXIDES

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH MOLTEN DINITROTOLUENE;
PREVENT SKIN CONTACT WITH DINITROTOLUENE OR LIQUIDS CONTAINING DINITRO-TOLUENE, WHERE SKIN CONTACT MAY OCCUR
WEAR IMPERVIOUS CLOTHING

WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS

COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION. (THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY; BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.)
UNSUBSTITUTED NITRO COMPOUNDS:
EXCELLENT/GOOD:
POLYVINYL ALCOHOL

FAIR/POOR:
NATURAL RUBBER

NITRILE RUBBER

FAIR/GOOD:
CHLORINATED POLYETHYLENE
POLYURETHANE
POLYVINYL CHLORIDE
VITON

A WIDE VARIATION IN RATINGS IS INDICATED FOR THE FOLLOWING MATERIALS:
BUTYL RUBBER

NEOPRENE

GOGGLES
PREVENT ANY POSSIBILITY OF EYE CONTACT

WASHING CHEMICALS FROM THE SKIN
IMMEDIATELY WHEN SKIN BECOMES CONTAMINATED AND AT THE END OF WORK SHIFT

ROUTINE CHANGING OF WORK CLOTHING
IF THERE IS ANY POSSIBILITY THAT CLOTHING MAY BE CONTAMINATED

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
IMMEDIATELY IF IT IS CONTAMINATED

SPECIFIC EMERGENCY PROVISIONS
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

15 MG/M3
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

75 MG/M3
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE, HELMENT, OR HOOD

- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE

200 MG/M3
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE, HELMENT, OR HOOD
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ESCAPE
- GAS MASK
  WITH AN ORGANIC VAPOR CANISTER
  WITH A FULL FACE-PIECE
  WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION

SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS
METHEMOGLOBINEMIA
CYANOSIS
ASPHYXIA
RESPIRATORY DISTRESS
DYSPNEA

NAUSEA
VOMITING
HEADACHE
DIZZINESS
CONFUSION
WEAKNESS
IRRITABILITY
WEIGHT LOSS
HYPOTENSION
HEMOLYTIC ANEMIA

CENTRAL NERVOUS SYSTEM DEPRESSION
DROWSINESS
STUPOR
CONVULSIONS
TACHYCARDIA
COMATOSE
BLADDER ULCERATION
KIDNEY DAMAGE
JAUNDICE
LIVER DAMAGE

INSOMNIA
ARTHRALGIA
SKIN IRRITATION

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH

SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF THIS CHEMICAL GETS ON SKIN, IMMEDIATELY FLUSH CONTAMINATED SKIN WITH WATER. IF THIS CHEMICAL PENETRATES CLOTHING, IMMEDIATELY REMOVE THE CLOTHING AND FLUSH THE SKIN WITH WATER. GET MEDICAL ATTENTION PROMPTLY.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

INGESTED NITRO/AMINO COMPOUNDS:
EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE OR EMESIS USING ACTIVATED CHARCOAL. GIVE OXYGEN IF RESPIRATION IS SHALLOW OR IF ANOXIA IS PRESENT.
ANTIDOTE - FOR SEVERE METHEMOGLOBINEMIA, GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG (1 MG/KG) SLOWLY INTRAVENOUSLY.

(ALL ANTIDOTES MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
FURTHER TREATMENT - IF METHEMOGLOBINEMIA DOES NOT RESPOND TO METHYLENE BLUE, HEMODIALYSIS OR EXCHANGE TRANSFUSION IS USEFUL.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

METHEMOGLOBINEMIA - GIVE 100% OXYGEN BY MASK IF PATIENT SHOWS SIGNS OF DYSPNEA OR AIR HUNGER. REMOVE POISON BY GASTRIC LAVAGE OR EMESIS FOLLOWED BY CATHARSIS. WASH SKIN THOROUGHLY WITH SOAP AND WATER.

GIVE METHYLENE BLUE, 1% SOLUTION, 0.1 ML/KG INTRAVENOUSLY OVER A 10 MINUTE PERIOD. ADMINISTRATION OF METHYLENE BLUE MAY CAUSE HYPERTENSION, NAUSEA, AND DIZZINESS. LARGER DOSES (>500 MG) WILL CAUSE VOMITING, DIARRHEA, CHEST PAIN, MENTAL CONFUSION, CYANOSIS, AND SWEATING. HEMOLYTIC ANEMIA HAS OCCURED SEVERAL DAYS AFTER ADMINISTRATION.

IF METHYLENE BLUE IS NOT AVAILABLE, GIVE ASCORBIC ACID, 1 G SLOWLY INTRAVENOUSLY.

(ANTIDOTE MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

LIVER DAMAGE - REMOVE FROM EXPOSURE TO ALL CHEMICALS AND DRUGS. MAINTAIN COMPLETE BED REST. AVOID ANESTHESIA OR SURGICAL PROCEDURES. AVOID DEHYDRATION OR OVERHYDRATION. IF VOMITING SEVERE AND ORAL FLUIDS NOT RETAINED, REPLACE VOMITUS WITH AN EQUAL QUANTITY OF 100% DEXTROSE IN NORMAL SALINE. IN RENAL FUNCTION ADEQUATE, GIVE 1 LITER OF 5% DEXTROSE OR INVERT SUGAR IN NORMAL SALINE PLUS 1-3 LITERS OF 10% DEXTROSE OR INVERT SUGAR IN DISTILLED WATER INTRAVENOUSLY EVERY TWENTY-FOUR HOURS.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS
BLOOD
CENTRAL NERVOUS SYSTEM

CARDIOVASCULAR SYSTEM

KIDNEYS
LIVER
EYES
SKIN

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS-
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

SUBSTANCE LISTED AS TOXIC POLLUTANT UNDER CLEAN WATER ACT (CWA) SECTION 307(A)

40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR27533 06/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

40CFR122, APPENDIX D - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATION TESTING REQUIREMENTS

TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GS/MS)
48FR14153 04/01/83

REGULATION PROMULGATED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA) SECTION 4(E)

ANALYTICAL METHODS DEVELOPMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

RISK DOCUMENTATION/ASSESSMENT IN DEVELOPMENT/PROGRESS CLEAN AIR ACT (CAA)

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR260

REGULATION PROPOSED TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(A)

ANALYTICAL METHODS DEVELOPMENT IN DEVELOPMENT/PROGRESS CLEAN WATER ACT (CWA)

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

SUBSTANCES LISTED APPENDIX A - CONSENT DECREE LIST OF INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7, 1976. SITE 8ERC2120, DDC 1976. MODIFIED MARCH 9, 1979, SITE 12ERC1833, DDC 1979 AND AGAIN ON OCTOBER 26, 1982.

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER RE-

QUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

SUBSTANCE LISTED ANNUAL LIST OF EXPLOSIVE MATERIALS SUBJECT TO REGULATION UNDER 18 U.S.C. CHAPTER 40, IMPORTATION, MANUFACTURE, DISTRIBUTION AND STORAGE OF EXPLOSIVE MATERIALS.
48FR55061 12/08/83

SEE PUBLICATION 'ATF: EXPLOSIVES LAW AND REGULATIONS', BY BUREAU OF ALCOHOL, TOBACCO AND FIREARMS, DEPARTMENT OF THE TREASURY. OBTAIN FROM SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402

SUBSTANCE LISTED COMMONWEALTH OF VIRGINIA STATE BOARD OF HEALTH HAZARDOUS WASTE MANAGEMENT REGULATIONS UNDER AUTHORITY OF THE CODE OF VIRGINIA, AS AMENDED, CHAPTER 6, TITLE 32.1, ARTICLE 3, SOLID WASTE MANAGEMENT

SECTION 313 OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 REQUIRES THAT THE OWNER OR OPERATOR OF A FACILITY SUBJECT TO THE THE REQUIREMENTS OF THIS SECTION SHALL COMPLETE A TOXIC CHEMICAL RELEASE FORM FOR THIS SUBSTANCE ON OR BEFORE JULY 1, 1988, AND ANNUALLY

THEREAFTER ON OR BEFORE JULY 1 AND SHALL CONTAIN DATA REFLECTING RELEASES DURING THE PRECEDING CALENDAR YEAR. COVERED FACILITIES: A FACILITY THAT HAS 10 OR MORE FULL TIME EMPLOYEES; A FACILITY THAT IS IN STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES 20 THROUGH 39; A FACILITY THAT MANUFACTURED, IMPORTED OR PROCESSED THIS SUBSTANCE IN AMOUNTS THAT EXCEED THE FOLLOWING THRESHOLD QUANTITIES FOR THE CALENDAR YEARS:
1987 - 75,000 POUNDS PER YEAR
1988 - 50,000 POUNDS PER YEAR
1989 - AND THEREAFTER 25, 000 POUNDS PER YEAR
FOR A USE OTHER THAN MANUFACTURING, IMPORTING OR PROCESSING THE

QUANTITY IS 10,000 POUNDS FOR THE APPLICABLE CALENDAR YEAR.
FOR FURTHER INFORMATION CONTACT:
EDWARD A KLEIN, DIRECTOR, TSCA ASSISTANCE OFFICE (TS-799), OFFICE OF TOXIC SUBSTANCES, ENVIRONMENTAL PROTECTION AGENCY, RM. E-543, 401 M ST.,

SW., WASHINGTON, DC 20460, (202)554-1411.

SUBSTANCE LISTED BY THE NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 1983, CHAPTER 315, N.J.S.A. 34: A-1. EMPLOYERS COVERED: SIC CODES 20-39, 46-49, 51, 75, 76, 80, 82, AND 84.

SUBSTANCE LISTED UNDER THE STATE OF CALIFORNIA HAZARDOUS SUBSTANCES INFORMATION AND TRAINING ACT, CALIFORNIA LABOR CODE, DIVISION 5, CHAPTER 2.5

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

THE ENVIRONMENTAL PROTECTION AGENCY HAS ISSUED A FINAL RULE UNDER SECTION 4(A) OF THE TOXIC SUBSTANCES CONTROL ACT (TSCA) REQUIRING AND/OR RECOMMENDING THAT MANUFACTURERS AND PROCESSORS OF CHEMICALS PERFORM

TESTING FOR HUMAN HEALTH EFFECTS AND FOR CHEMICAL FATE IN SUPPORT OF EPA'S HAZARDOUS WASTE REGULATORY PROGRAM UNDER THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA). EPA IS REQUIRING SUBCHRONIC HEALTH EFFECTSAND CHEMICAL FATE TESTING AND IS RECOMMENDING, BUT NOT REQUIRING, ANAEROBIC BIODEGRADATION RATE TESTING FOR THIS CHEMICAL.
EFFECTIVE DATE: 7/29/88
53FR22300 6/15/88

MEDICAL SURVEILLANCE REQUIRED
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS
48FR38187 08/22/83

48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
RESPIRATORY HISTORY
BLOOD CHEMISTRY
GGTP
LDH
SGOT

SGPT
COMPLETE BLOOD COUNT
RENAL AND LIVER FUNCTIONS
WITH EMPHASIS ON:
MORPHOLOGICAL BLOOD SLIDES
SKIN EXAM
VISION TEST
PULMONARY FUNCTIONS
URINALYSIS

CERTIFICATIONS

HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES, EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
METHEMOGLOBIN DETERMINATION
ELECTROCARDIOGRAM
CONVULSIONS - BLOOD ANALYSIS FOR GLUCOSE, CALCIUM, UREA NITROGEN AND CARBON DIOXIDE

LEAKS AND SPILL PROCEDURES
A REPORTABLE QUANTITY OF ONE THOUSAND POUNDS APPLIES TO THIS SUBSTANCE ESTABLISHED BY SECTIONS 101(14) AND 102(B) OR ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA). SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONCE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

ORM-E

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

NONE

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INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

POISONOUS SOLID, N.O.S.
POISONOUS (TOXIC) SUBSTANCE
UN 2811

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR
DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

ST. ANDREWS CROSS

****

FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF
HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:

* DO NOT EXTINGUISH FIRE UNLESS FLOW CAN BE STOPPED
* USE WATER IN FLOODING QUANTITIES AS FOG
* SOLID STREAMS OF WATER MAY BE INEFFECTIVE
* COOL ALL AFFECTED CONTAINERS WITH FLOODING QUANTITIES OF WATER
* APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE
* USE ALCOHOL FOAM OR CO2 OR DRY CHEMICAL EXTINGUISHERS

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS

* BUILD DIKES TO CONTAIN FLOW AS NECESSARY

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS MATERIAL

LAND SPILL:
* DIG A PIT, POND, LAGOON OR HOLDING AREA TO CONTAIN LIQUID OR SOLID MATERIAL
* COVER SOLIDS WITH A PLASTIC SHEET TO PREVENT DISSOLVING IN RAIN OR FIREFIGHTING WATER

WATER SPILL:
* USE NATURAL DEEP WATER POCKETS, EXCAVATED LAGOONS, OR SAND BAG BARRIERS TO TRAP MATERIAL AT BOTTOM

* REMOVE TRAPPED MATERIAL WITH SUCTION HOSES
* IF DISSOLVED, APPLY ACTIVATED CARBON AT 10 TIMES SPILLED

AMOUNT AT 10PPM OR GREATER CONCENTRATION
* USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

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EPA HAZARDOUS WASTE NUMBER U106
2,6-DINITROTOLUENE

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS

WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88
(52FR35898 9/23/87)

THIS SUBSTANCE IS A HAZARDOUS WASTE CONSTITUENT SUBJECT TO HUMAN HEALTH TESTING AND/OR CHEMICAL FATE TESTING UNDER SECTION 4(A) OF THE TOXIC SUBSTANCES CONTROL ACT (TSCA) IN SUPPORT OF EPA'S HAZARDOUS WASTE REGULATORY PROGRAM UNDER THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA). CHEMICAL FATE TESTING INCLUDES TESTS TO DETERMINE ABSORPTION CHARACTERISTICS AND HYDROLYSIS RATES. EPA IS RECOMMENDING, BUT NOT REQUIRING, ANAEROBIC BIODEGRADATION RATE TESING FOR THIS CHEMICAL.

CAS NUMBER
606-20-2

REGISTRY TOXIC CHEMICALS NUMBER
XT1925000

Date: 8 March 1991
Revision No.: 1

TETRYL

CHEMICAL NAME
TETRYL

FORMULA
C7H5N5O8

SYNONYMS
NITRAMINE
TETRALIT

TETRALITE
2,4,6-TETRYL
2,4,6-TRINITROPHENYLMETHYLNITRAMINE
TRINITROPHENYLMETHYLNITRAMINE
PICRYLNITROMETHYLAMINE
CE
ANILINE, N-METHYL-N,2,4,6-TETRANITRO-
N-METHYL-N,2,4,6-TETRANITROANILINE
BENZENAMINE, N-METHYL-N,2,4,6-TETRANITRO-
PICRYLMETHYLNITRAMINE

TETRIL
2,4,6-TRINITROPHENYL-N-METHYLNITRAMINE
OHS23160

PERMISSIBLE EXPOSURE LIMIT
1.5 MG/M3 OSHA TWA (SKIN NOTATION)
1.5 MG/M3 ACGIH TWA
MUTAGENIC DATA (RTEC)
CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 0 - REACTIVITY 3 - PERSISTENCE 2

TOXICOLOGY: TETRYL IS AN UPPER RESPIRATORY IRRITANT AND SKIN SENSITIZER.

SKIN CONTACT WITH TETRYL CAUSES SENSITIZATION DERMATITIS, PRODUCING ITCHING, ERYTHEMA, AND FACIAL AND NECK EDEMA. EYE CONTACT RESULTS IN KERATITIS, IRIDOCYCLITIS, AND CORNEAL DAMAGE. INHALATION IRRITATES THE UPPER RESPIRATORY TRACT, PRODUCING COUGHING, SNEEZING, NOSEBLEED AND CORYZA.

CHRONIC EXPOSURE BY ALL ROUTES AFFECTS THE NERVOUS SYSTEM. ANEMIA AND JAUNDICE MAY OCCUR.

THE THRESHOLD LIMIT VALUE APPEARS TO BE LOW ENOUGH TO PREVENT SYSTEMIC POISONING, BUT MAY NOT PREVENT SENSITIZATION.
SCU-DOG LDLO:5000 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NOT APPLICABLE

PHYSICAL DESCRIPTION
COLORLESS OR YELLOW, ODORLESS CRYSTALS.

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 287
BOILING POINT AT 1 ATM, F: 369 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.02%
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): EXPLODES
VAPOR PRESSURE @ 20 C, MMHG: <1MM
MELTING POINT, F: 264 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE
AUTOIGNITION TEMPERATURE: 495 F

SPECIFIC GRAVITY: 1.57

INCOMPATIBILITIES
OXIDIZERS
HEAT

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

EMPLOYERS SHALL ENSURE THAT CLOTHING CONTAMINATED WITH THIS SUBSTANCE IS PLACED IN CLOSED CONTAINERS FOR STORAGE UNTIL IT CAN BE DISCARDED OR UNTIL THE EMPLOYER PROVIDES FOR THE REMOVAL OF THE CONTAMINANT FROM THE CLOTHING. IF THE CLOTHING IS TO BE LAUNDERED OR OTHERWISE CLEANED TO REMOVE THE CONTAMINANT, THE EMPLOYER SHALL INFORM THE PERSON PERFORMING

THE CLEANING OF THE HAZARDOUS PROPERTIES OF THE SUBSTANCE.

GOGGLES
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE SPLASH-PROOF SAFETY GOGGLES WHICH COMPLY WITH 29CFR1910.133(A)(2)-(A)(6) WHERE THIS LIQUID MAY CONTACT THE EYES.

WASHING CHEMICALS FROM THE SKIN
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT ALL EMPOLYEES SUBJECT TO SKIN CONTACT WITH THIS SUBSTANCE WASH ANY AREAS OF THE BODY WHICH MAY HAVE CONTACTED THE SUBSTANCE AT THE END OF EACH WORK DAY.
EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE SKIN BECOMES CONTAMINATED WITH THIS SUBSTANCE PROMPTLY WASH OR SHOWER WITH SOAP OR MILD DETERGENT AND WATER TO REMOVE ANY CONTAMINANT FROM THE SKIN.

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHO HANDLE THIS SUBSTANCE WASH THEIR HANDS THOROUGHLY WITH SOAP OR MILD DETERGENT AND WATER BEFORE EATING, SMOKING, OR USING TOILET FACILITIES.

ROUTINE CHANGING OF WORK CLOTHING
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE CLOTHING MAY HAVE BECOME CONTAMINATED WITH THIS SUBSTANCE CHANGE INTO UNCONTAMINATED CLOTHING BEFORE LEAVING THE WORK PREMISES.

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT NON-IMPERVIOUS CLOTHING WHICH BECOMES CONTAMINATED WITH THIS SUBSTANCE BE REMOVED PROMPTLY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

SPECIFIC EMERGENCY PROVISIONS
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES DO NOT EAT OR SMOKE IN AREAS WHERE THIS SUBSTANCE IS HANDLED, PROCESSED OR STORED.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

7.5 PPM
- DUST AND MIST RESPIRATOR EXCEPT SINGLE-USE RESPIRATORS

15 MG/M3
- DUST AND MIST RESPIRATOR EXCEPT SINGLE-USE RESPIRATORS AND QUARTER-MASK RESPIRATORS
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

37.5 MG/M3
- POWERED AIR-PURIFYING RESPIRATOR WITH A DUST AND MIST FILTER
- SUPPLIED-AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE

75 MG/M3
- AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR WITH A FULL FACE-PIECE

3000 MG/M3
- SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE

ESCAPE
- AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION
SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS
NASAL IRRITATION

THIRST
DERMATITIS
HEADACHE
EYE IRRITATION
COUGHING
INSOMNIA
NAUSEA
VOMITING
IRRITABILITY
ITCH

SKIN PIGMENTATION
CORNEAL DAMAGE
CONJUNCTIVITIS
NERVOUSNESS
ANGINA
JAUNDICE
LIVER DAMAGE
NASAL ULCERATION
EPISTAXIS
ERYTHEMA

ANOREXIA
ABDOMINAL CRAMPS
DIARRHEA
SKIN SENSITIZATION
RESPIRATORY IRRITATION
KERATITIS
EYE INFLAMMATION
SNEEZING
CORYZA
FATIGUE

MALAISE
LASSITUDE
HEMOLYSIS
APLASTIC ANEMIA
IRIDOCYCLITIS

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES

SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF THIS CHEMICAL GETS ON SKIN, IMMEDIATELY FLUSH CONTAMINATED SKIN WITH WATER. IF THIS CHEMICAL PENETRATES CLOTHING, IMMEDIATELY REMOVE THE CLOTHING AND FLUSH THE SKIN WITH WATER.

GET MEDICAL ATTENTION PROMPTLY.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

ORGANS
EYES
SKIN

RESPIRATORY SYSTEM
BLOOD
CENTRAL NERVOUS SYSTEM
GASTROINTESTINAL
LIVER

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING

WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT

REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE (UNDER N.O.S. CATEGORY) WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS.
41FR15996 04/15/81
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

SUBSTANCE LISTED WEST VIRGINIA DEPARTMENT OF LABOR LISTING OF HAZARDOUS SUBSTANCES

SUBSTANCE LISTED UNDER THE STATE OF FLORIDA TOXIC SUBSTANCES IN THE WORKPLACE RIGHT TO KNOW LAW, CHAPTER 442 OF THE FLORIDA STATUTES.

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16, ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF CALIFORNIA HAZARDOUS SUBSTANCES INFORMATION AND TRAINING ACT, CALIFORNIA LABOR CODE, DIVISION 5, CHAPTER 2.5

SUBSTANCE LISTED UNDER THE STATE OF ILLINOIS TOXIC SUBSTANCES DISCLOSURE TO EMPLOYEES ACT, TITLE 56, CHAPTER I, SUBCHAPTER B, SECTION 205.

MEDICAL SURVEILLANCE REQUIRED
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES

MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS
48FR38187 08/22/83
48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY
CHRONIC RESPIRATORY DISEASE
PULMONARY FUNCTIONS
RESPIRATORY HISTORY

14 BY 17 CHEST P.A. X-RAY
VISION TEST
EYE DISEASE
LIVER FUNCTION
BLOOD CHEMISTRY
RENAL AND LIVER FUNCTIONS
CENTRAL NERVOUS SYSTEM EXAMINATION
KIDNEY FUNCTION
SKIN EXAM
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR

BLOOD DISEASE
COMPLETE BLOOD COUNT
DIFFERENTIAL BLOOD CELL MORPHOLOGY
HEMATOLOGY
SGOT
SGPT

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT

ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,
EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED
BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
LIVER PROFILE BLOOD TESTS

LEAKS AND SPILL PROCEDURES

A REPORTABLE QUANTITY OF ONE HUNDRED POUNDS APPLIES TO THIS SUBSTANCE ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA) BY EXHIBITING ONE OR MORE OF THE CHARACTERISTICS OF IGNITABILITY, CORROSIVITY, OR REACTIVITY IDENTIFIED IN 40CFR261.21 THROUGH 261.23. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

CLASS A EXPLOSIVE

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

EXPLOSIVE A

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INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 1-EXPLOSIVE
DIVISION 1.1
COMPATIBILITY GROUP D

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

EXPLOSIVE
(WITH APPROPRIATE DIVISION NUMBER AND COMPATIBILITY GROUP LETTER)

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FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DANGEROUSLY EXPLOSIVE
* DO NOT FIGHT FIRE IN A CARGO OF EXPLOSIVES
* EVACUATE AREA AND LET BURN

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:

* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL WET
* DO NOT ATTEMPT TO SWEEP UP DRY MATERIAL

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER

* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS MATERIAL

EVACUATION PROCEDURE:
* IF MATERIAL ON FIRE, EVACUATE AREA FOR RADIUS 5000 FEET

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

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EPA HAZARDOUS WASTE NUMBER D003
WASTE WHICH EXHIBITS THE CHARACTERISTIC OF REACTIVITY 40CFR261.23

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS

SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003

OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE

REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88
(52FR35898 9/23/87)

CAS NUMBER
479-45-8

REGISTRY TOXIC CHEMICALS NUMBER
BY6300000

Date: 8 March 1991
Revision No.: 1

CYCLOTRIMETHYLENETRINITRAMINE (RDX)

CHEMICAL NAME
CYCLOTRIMETHYLENETRINITRAMINE

FORMULA
C3H6N6O6

SYNONYMS
UN 0072
CYCLOTRIMETHYLENENITRAMINE

HEXOLITE
UN 0118
CYCLONITE
HEXOGEN
RDX

S-TRIAZINE, HEXAHYDRO-1,3,5-TRINITRO-
HEXAHYDRO-1,3,5-TRINITRO-S-TRIAZINE
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE
HEXOGEN (EXPLOSIVE)
HEXOGEN 5W

PBX(AF) 108
T4
TRIMETHYLENETRINITRAMINE
SYM-TRIMETHYLENETRINITRAMINE
TRINITROCYCLOTRIMETHYLENE TRIAMINE
1,3,5-TRINITRO-1,3,5-TRIAZACYCLOHEXANE
OHS05990

PERMISSIBLE EXPOSURE LIMIT
1.5 MG/M3 ACGIH TWA (SKIN NOTATION)

CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 0 - REACTIVITY 3 - PERSISTENCE 0

TOXICOLOGY: TRINITROTRIAZINE IS TOXIC TO THE NERVOUS SYSTEM, LIVER AND KIDNEYS. POISONING WILL RESULT IN NAUSEA, VOMITING, CONVULSIONS, UNCONSCIOUSNESS, ANEMIA, LIVER AND KIDNEY DAMAGE.
THE THRESHOLD LIMIT VALUE WAS SET BY ANALOGY WITH TRINITROTOLUENE TO PREVENT SYSTEMIC INJURY.
ORL-RAT LD50:100 MG/KG
ORL-MUS LD50: 59 MG/KG

ORL-CAT LDLO:100 MG/KG
ORL-RBT LDLO:500 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION
COLORLESS OR WHITE CRYSTALLINE POWDER

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 222.15
BOILING POINT AT 1 ATM, F: EXPLOSIVE
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): EXPLODES
VAPOR PRESSURE @ 20 C, MMHG: 0.0004 MM AT 230 F
MELTING POINT, F: 399 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE
SPECIFIC GRAVITY: 1.82

INCOMPATIBILITIES
EXPLOSIVE HAZARD AT HIGH TEMPERATURES
SHOCK MAY DETONATE OR EXPLODE
THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC
REDUCING AGENTS
ALUMINUM POWDER
CYANIDES
ESTERS
PHOSPHOROUS
THIOCYANATES

KETONES
CAUSTICS
AMMONIA
AMINES

PERSONAL PROTECTIVE EQUIPMENT
NO NIOSH/OSHA DATA; RECOMMEND
PREVENT ANY POSSIBILITY OF SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES

WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

GOGGLES
NO STANDARD REQUIREMENT, BUT ADVISE EYE PROTECTION TO PREVENT ANY POSSIBILITY OF EYE CONTACT

WEAR FACE SHIELD OR VENTED GOGGLES

WASHING CHEMICALS FROM THE SKIN
NO STANDARD REQUIREMENT, BUT ADVISE WASHING IMMEDIATELY WHEN SKIN BECOMES CONTAMINATED

ROUTINE CHANGING OF WORK CLOTHING
NO STANDARD REQUIREMENT, BUT ADVISE CHANGING
IF THERE IS ANY POSSIBILITY THAT CLOTHING MAY BE CONTAMINATED
LEAVE CLOTHING & EQUIPMENT FOR DECONTAMINATION & DISPOSAL

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
NO STANDARD REQUIREMENT, BUT ADVISE REMOVING IMMEDIATELY IF IT IS CONTAMINATED

SPECIFIC EMERGENCY PROVISIONS
NO NIOSH/OSHA DATA, ADVISE:
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES

MAY BE EXPOSED TO SUBSTANCE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

HIGH LEVELS
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE, HELMENT, OR HOOD

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INGESTION
SKIN ABSORPTION
SKIN OR EYE CONTACT
INHALATION

SYMPTOMS
EYE IRRITATION
RESPIRATORY IRRITATION

MUCOUS MEMBRANE ULCERATION
DERMATITIS
CENTRAL NERVOUS SYSTEM DEPRESSION
NAUSEA
INSOMNIA
VOMITING
HEADACHE
SALIVATION
IRRITABILITY
UNCONSCIOUSNESS

CONVULSIONS
ANOREXIA
ASTHENIA
ANEMIA
KIDNEY DAMAGE
LIVER DAMAGE
REPRODUCTIVE EFFECTS IN EXPERIMENTAL ANIMALS

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES

WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE

EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED AND PERSON IS CONSCIOUS, IMMEDIATELY GIVE PERSON LARGE QUANTITIES OF WATER. AFTER WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

ORGANS
EYES
RESPIRATORY SYSTEM
SKIN
MUCOUS MEMBRANES
CENTRAL NERVOUS SYSTEM
KIDNEYS
LIVER

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS

48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)

45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)

46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76

46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

SUBSTANCE LISTED UNDER THE STATE OF FLORIDA TOXIC SUBSTANCES IN THE WORKPLACE RIGHT TO KNOW LAW, CHAPTER 442 OF THE FLORIDA STATUTES.

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16,

ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF CALIFORNIA HAZARDOUS SUBSTANCES INFORMATION AND TRAINING ACT, CALIFORNIA LABOR CODE, DIVISION 5, CHAPTER 2.5

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

MEDICAL SURVEILLANCE REQUIRED
NO NIOSH/OSHA DATA; ADVISE:
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR

30 YEARS
48FR38187 08/22/83
48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
CENTRAL NERVOUS SYSTEM EXAMINATION
CONVULSIVE DISORDER
GASTROINTESTINAL

CERTIFICATIONS
NO FEDERAL AGENCY REQUIREMENT, BUT DUE TO HAZARDOUS NATURE OF

SUBSTANCE, ADVISE FOLLOWING:

HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,

EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS

IF SYMPTOMS OF CENTRAL NERVOUS SYSTEM OCCUR, OBTAIN BLOOD GLUCOSE AND RECTAL TEMPERATURE. PERFORM COMPLETE NEUROLOGIC EXAMINATION AND ANY

OTHER SPECIFIC NEUROLOGIC TESTS AS APPLICABLE

CONVULSIONS - BLOOD ANALYSIS FOR GLUCOSE, CALCIUM, UREA NITROGEN AND CARBON DIOXIDE

LEAKS AND SPILL PROCEDURES

A REPORTABLE QUANTITY OF ONE HUNDRED POUNDS APPLIES TO THIS SUBSTANCE ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA) BY EXHIBITING ONE OR MORE OF THE CHARACTERISTICS OF IGNITABILITY, CORROSIVITY, OR

REACTIVITY IDENTIFIED IN 40CFR261.21 THROUGH 261.23. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8802; IN THE WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS

49CFR172.101 HAZARDOUS MATERIALS TABLE

FORBIDDEN
EXPLOSIVE

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INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS

49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS A EXPLOSIVE

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

EXPLOSIVE

****

FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DANGEROUSLY EXPLOSIVE
* DO NOT FIGHT FIRE IN A CARGO OF EXPLOSIVES
* EVACUATE AREA AND LET BURN

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL WET
* DO NOT ATTEMPT TO SWEEP UP DRY MATERIAL
* WET SPILLED MATERIAL BEFORE PICKING IT UP

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT

* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING THIS MATERIAL

EVACUATION PROCEDURE:
* IF FIRE UNCONTROLLABLE OR CONTAINER EXPOSED TO DIRECT FLAME EVACUATE FOR RADIUS OF 5000 FEET

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

****

EPA HAZARDOUS WASTE NUMBER D003
WASTE WHICH EXHIBITS THE CHARACTERISTIC OF REACTIVITY 40CFR261.23

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER

SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88
(52FR35898 9/23/87)

CAS NUMBER
121-82-4

REGISTRY TOXIC CHEMICALS NUMBER
XY9450000

Date: 8 March 1991
Revision No.: 1

CYCLOTETRAMETHYLENETETRANITRAMINE (HMX)

CHEMICAL NAME
CYCLOTETRAMETHYLENETETRANITRAMINE

FORMULA
C4H8N8O8

SYNONYMS
CYCLOTETRAMETHYLENE TETRANITROAMINE
HMX

UN 0226
OCTOGEN
1,3,5,7-TETRAZOCINE, OCTAHYDRO-1,3,5,7-TETRANITRO-
BETA-HMY
HW 4

LX 14-0
OKTOGEN
TETRAMETHYLENENITRAMINE
OHS06100

PERMISSIBLE EXPOSURE LIMIT
NONE ESTABLISHED
CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 0 - REACTIVITY 3 - PERSISTENCE 0

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION

COLORLESS CRYSTALS

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 296.20
BOILING POINT AT 1 ATM, F: EXPLODES
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): EXPLODES
VAPOR PRESSURE @ 20 C, MMHG: 0.00 MM
MELTING POINT, F: 527 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE

LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: EXPLOSIVE
AUTOIGNITION TEMPERATURE: 549 F
SPECIFIC GRAVITY: 1.78-1.96

INCOMPATIBILITIES
EXPLOSIVE HAZARD AT HIGH TEMPERATURES

PERSONAL PROTECTIVE EQUIPMENT
NO NIOSH/OSHA DATA; RECOMMEND
PREVENT ANY POSSIBILITY OF SKIN CONTACT

WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

GOGGLES

NO STANDARD REQUIREMENT, BUT ADVISE EYE PROTECTION TO PREVENT ANY POSSIBILITY OF EYE CONTACT
WEAR FACE SHIELD OR VENTED GOGGLES

WASHING CHEMICALS FROM THE SKIN
NO STANDARD REQUIREMENT, BUT ADVISE WASHING IMMEDIATELY WHEN SKIN BECOMES CONTAMINATED

ROUTINE CHANGING OF WORK CLOTHING
NO STANDARD REQUIREMENT, BUT ADVISE CHANGING

IF THERE IS ANY POSSIBILITY THAT CLOTHING MAY BE CONTAMINATED

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
NO STANDARD REQUIREMENT, BUT ADVISE REMOVING IMMEDIATELY IF IT BECOMES WET

SPECIFIC EMERGENCY PROVISIONS
NO NIOSH/OSHA DATA, ADVISE:
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE

QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

HIGH LEVELS
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE, HELMENT, OR HOOD

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS
HEADACHE
DIZZINESS

WEAKNESS
ABDOMINAL CRAMPS
VOMITING

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM

AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED AND PERSON IS CONSCIOUS, IMMEDIATELY GIVE PERSON LARGE QUANTITIES OF WATER. AFTER WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

ORGANS
EYES

SKIN
GASTROINTESTINAL
CENTRAL NERVOUS SYSTEM

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION,

PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)

45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

MEDICAL SURVEILLANCE REQUIRED
NO NIOSH/OSHA DATA; ADVISE:
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS

48FR38187 08/22/83
48FR39225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
SKIN EXAM
VISION TEST
GASTROINTESTINAL

CERTIFICATIONS
NO FEDERAL AGENCY REQUIREMENT, BUT DUE TO HAZARDOUS NATURE OF SUBSTANCE, ADVISE FOLLOWING:

HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES, EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS

NONE IN COMMON USE

LEAKS AND SPILL PROCEDURES

A REPORTABLE QUANTITY OF ONE HUNDRED POUNDS APPLIES TO THIS SUBSTANCE ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA) BY EXHIBITING ONE OR MORE OF THE CHARACTERISTICS OF IGNITABILITY, CORROSIVITY, OR REACTIVITY IDENTIFIED IN 40CFR261.21 THROUGH 261.23. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUAGDHTY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8802; IN THE WASHINGTON,

D.C. METROPOLITAN AREA (202) 426-2675
50FR13456 04/04/85

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

(DESENSITIZED)
CLASS A EXPLOSIVE

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

EXPLOSIVE A

****

INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS

49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

(DESENSITIZED)
CLASS 1-EXPLOSIVE
DIVISION 1.1
COMPATIBILITY GROUP D

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR
DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

EXPLOSIVE
(WITH APPROPRIATE DIVISION NUMBER AND COMPATIBILITY GROUP LETTER)

****

FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF
HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DANGEROUSLY EXPLOSIVE
* DO NOT FIGHT FIRE IN A CARGO OF EXPLOSIVES
* EVACUATE AREA AND LET BURN

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL WET
* WET SPILLED MATERIAL BEFORE PICKING IT UP
* DO NOT ATTEMPT TO SWEEP UP DRY MATERIAL

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH
COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING
THIS MATERIAL

EVACUATION PROCEDURE:
* IF MATERIAL ON FIRE, EVACUATE AREA FOR RADIUS 5000 FEET

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR
DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL
AUTHORITIES TO INSURE PROPER COMPLIANCE.

****
EPA HAZARDOUS WASTE NUMBER D003
WASTE WHICH EXHIBITS THE CHARACTERISTIC OF REACTIVITY 40CFR261.23

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY
THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS
SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE

PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

GENERATORS OF HAZARDOUS WASTES ARE SUBJECT TO THE FOLLOWING STANDARDS:

1). A GENERATOR OF GREATER THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A CALENDAR MONTH MUST SUBMIT AN "EXCEPTION REPORT" TO THE ENVIRONMENTAL PROTECTION AGENCY REGIONAL ADMINISTRATOR (FOR THE REGION IN WHICH THE GENERATION IS LOCATED) IF HE HAS NOT RECEIVED A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 45 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER.

2). A GENERATOR OF GREATER THAN 100 KILOGRAMS BUT LESS THAN 1000 KILOGRAMS OF HAZARDOUS WASTE IN A MONTH WHO DOES NOT RECEIVE A COPY OF THE MANIFEST WITH THE HANDWRITTEN SIGNATURE OF THE OWNER OR OPERATOR OF THE DESIGNATED FACILITY WITHIN 60 DAYS OF THE DATE THE WASTE WAS ACCEPTED BY THE INITIAL TRANSPORTER MUST SUBMIT A LEGIBLE COPY OF THE MANIFEST, WITH SOME INDICATION THAT THE GENERATOR HAS NOT RECEIVED CONFIRMATION OF DELIVERY, TO THE EPA REGIONAL ADMINISTRATOR FOR THE REGION IN WHICH THE GENERATOR IS LOCATED.

EFFECTIVE DATE: 3/23/88
(52FR35898 9/23/87)

CAS NUMBER
2691-41-0

REGISTRY TOXIC CHEMICALS NUMBER
XF7450000

Date: 8 March 1991
Revision No.: 1

LEAD

CHEMICAL NAME
LEAD

FORMULA
PB

SYNONYMS
C.I. PIGMENT METAL 4
C.I. 77575
LEAD FLAKE
KS-4
LEAD S2
SI
SO
S 1
PLUMBUM
PB-S 100
LEAD ELEMENT
L-18
L-24
L-29
L-27
T-134
OHS12510

PERMISSIBLE EXPOSURE LIMIT
50 UG(PB)/M3 OSHA TWA; 30 UG(PB)/M3 OSHA TWA ACTION LEVEL
IF AN EMPLOYEE IS EXPOSED TO LEAD FOR MORE THAN 8 HOURS PER DAY THE FOLLOWING FORMULA IS USED:
MAXIMUM PERMISSIBLE LIMIT (IN UG/M3)= 400 DIVIDED BY HOURS WORKED
0.15 MG(PB)/M3 ACGIH TWA
<0.10 MG(PB)/M3 NIOSH RECOMMENDED 10 HOUR TWA
HUMAN INADEQUATE EVIDENCE FOR CARCINOGENICITY (IARC GROUP-2B)
ANIMAL SUFFICIENT EVIDENCE FOR CARCINOGENICITY (IARC GROUP-2B)
REPRODUCTIVE EFFECTS DATA (RTECS); MUTAGENIC DATA (RTECS)
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 0 - REACTIVITY 0 - PERSISTENCE 3

TOXICOLOGY: LEAD MAY BE IRRITATING TO THE EYES AND SKIN. THERE IS INSUFFICIENT DATA TO QUANTIFY THE TOXICITY. IT IS A NEUROTOXIN, NEPHROTOXIN AND TERATOGEN. POISONING MAY ALSO AFFECT THE BLOOD, HEART, ENDOCRINE AND IMMUNE SYSTEMS. THE FATAL DOSE OF ABSORBED LEAD IS APPROXIMATELY 0.5 GRAMS. ACUTE EXPOSURES MAY RESULT IN METAL FUME FEVER WHILE CHRONIC EXPOSURE MAY RESULT IN "PLUMBISM" AND AN ACCUMULATION IN BODY TISSUES. REPRODUCTIVE EFFECTS HAVE BEEN EXHIBITED IN BOTH MALES AND FEMALES. PATERNAL EFFECTS MAY INCLUDE DECREASED SEX DRIVE, IMPOTENCE, STERILITY AND ADVERSE EFFECTS ON THE SPERM WHICH MAY INCREASE THE RISK OF BIRTH DEFECTS. MATERNAL EFFECTS MAY INCLUDE MISCARRIAGE AND STILLBIRTHS IN EXPOSED WOMEN OR WOMEN WHOSE HUSBANDS WERE EXPOSED, ABORTION, STERILITY OR DECREASED FERTILITY, AND ABNORMAL MENSTRUAL CYCLES. RENAL TUMORS WERE PRODUCED IN ANIMALS BY LEAD ACETATE, SUBACETATE AND PHOSPHATE WHEN GIVEN ORALLY. NO EVALUATION COULD BE MADE OF THE CARCINOGENICITY OF POWDERED LEAD.

DUE TO THE LACK OF INFORMATION ON ODOR THRESHOLD AND EYE IRRITATION LEVELS, INORGANIC LEAD IS TREATED AS A MATERIAL WITH POOR WARNING PROPERTIES. THE THRESHOLD LIMIT VALUE WAS ESTABLISHED BASED ON SYSTEMIC EFFECTS.

PERSONS WITH NERVOUS SYSTEM OR GASTROINTESINAL DISRODERS, ANEMIA OR CHRONIC BRONCHITIS MAY BE AT AN INCREASED RISK FROM EXPOSURE. LEAD MAY CROSS THE PLACENTA AND AFFECT THE FETUS CAUSING BIRTH DEFECTS.

ORL-WMN TDLO: 450 MG/KG/6 Y IHL-HMN TDLO: 10 UG/M3

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION
BLUISH-WHITE, SILVERY GRAY, HEAVY MALLEABLE METAL.

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 207.19
BOILING POINT AT 1 ATM, F: 3164 F (1740 C)
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): NONCOMBUSTIBLE SOLID
VAPOR PRESSURE @ 20 C, MMHG: 1.3 MMHG @ 970 C
MELTING POINT, F: 622 F (328 C)
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NOT AVAILABLE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NOT AVAILABLE
SPECIFIC GRAVITY: 11.3

INCOMPATIBILITIES
LEAD:
AMMONIUM NITRATE: VIOLENT OR EXPLOSIVE REACTION.
CHLORINE TRIFLUORIDE: VIOLENT REACTION.
DISODIUM ACETYLIDE: TRITURATION IN MORTAR MAY BE VIOLENT AND LIBERATE CARBON.
HYDROGEN PEROXIDE (52% OR GREATER): VIOLENT DECOMPOSITION.
HYDROGEN PEROXIDE (60% SOLUTION) AND TRIOXIANE: SPONTANEOUSLY DETONABLE.
METALS (ACTIVE): INCOMPATIBLE.
NITRIC ACID: LEAD-CONTAINING RUBBER MAY IGNITE.
OXIDIZERS (STRONG): INCOMPATIBLE.
SODIUM AZIDE: FORMS LEAD AZIDE AND COPPER AZIDE IN COPPER PIPE.
SODIUM CARBIDE: VIGOROUS REACTION.
SULFURIC ACID (HOT): REACTS.
ZIRCONIUM-LEAD ALLOYS: IGNITION ON IMPACT.

PERSONAL PROTECTIVE EQUIPMENT
29CFR1910.1025 LEAD
THE EMPLOYERS SHALL ASSURE THAT EMPLOYEES WHO ARE EXPOSED TO LEAD ABOVE THE PERMISSIBLE EXPOSURE LEVEL, WITHOUT REGARD TO THE USE OF RESPIRATORS OR WHERE THE POSSIBILITTY OF SKIN OR EYE IRRITATION EXISTS, BE PROVIDED WITH COVERALLS OR SIMILAR FULL-BODY WORK CLOTHING, GLOVES, HATS AND SHOES OR DISPOSABLE SHOE COVERLETS, FACESHIELDS, VENTED GOGGLES OR OTHER APPROPRIATE PROTECTIVE EQUIPMENT.

GOGGLES
29CFR1910.1025 LEAD
THE EMPLOYERS SHALL ASSURE THAT EMPLOYEES WEAR FACESHIELDS, VENTED GOGGLES OR OTHER APPROPRIATE PROTECTIVE EQUIPEMENT WHICH COMPLIES WITH 29CFR1910.133.

WASHING CHEMICALS FROM THE SKIN
29CFR1910.1025 LEAD
THE EMPLOYER SHALL ASSURE THAT EMPLOYEES WHO WORK IN AREAS WHERE THEIR AIRBORNE EXPOSURE TO LEAD IS ABOVE THE PERMISSIBLE EXPOSURE LEVEL, WITHOUT REGARD TO THE USE OF A RESPIRATOR, WASH THEIR HANDS AND FACE PRIOR TO EATING, DRINKIND OR APPLYING COSMETICS AND SHOWER AT THE END OF THE WORKSHIFT.

ROUTINE CHANGING OF WORK CLOTHING

29CFR1910.1025 LEAD
THE EMPLOYER SHALL ASSURE THAT ALL PROTECTIVE CLOTHING IS REMOVED AT THE COMPLETION OF A WORKSHIFT ONLY IN CHANGE ROOMS PROVIDED FOR THAT PURPOSE.

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
NO SPECIFIC REGULATIONS UNDER 29CFR1910.
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT NON-IMPERVIOUS CLOTHING WHICH BECOMES CONTAMINATED WITH THIS SUBSTANCE BE REMOVED PROMPTLY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

SPECIFIC EMERGENCY PROVISIONS
NO SPECIFIC REQUIREMENT. IF INDICATED BY THE NATURE OF THE SUBSTANCE AND THE PROBABILITY OF EXPOSURE, PROVIDE AN EYE WASH AND FACILITIES FOR QUICK DRENCHING OF THE BODY WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

LEAD

THE FOLLOWING RESPIRATORS ARE THE MINIMUM LEGAL REQUIREMENTS AS SET FORTH BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FOUND IN 29CFR1910, SUBPART Z.

NOT IN EXCESS OF 0.5 MG/M3 (10X PEL)
- HALF-MASK, AIR-PURIFYING RESPIRATOR EQUIPPED WITH HIGH-EFFICIENCY FILTERS

NOT IN EXCESS OF 2.5 MG/M3 (50X PEL)
- FULL FACEPIECE, AIR-PURIFYING RESPIRATOR WITH HIGH-EFFICIENCY FILTERS

NOT IN EXCESS OF 50 MG/M3
- ANY POWERED AIR-PURIFYING RESPIRATOR WITH HIGH-EFFICIENCY FILTERS
- HALF-MASK SUPPLIED-AIR RESPIRATOR OPERATED IN POSITIVE PRESSURE MODE

NOT IN EXCESS OF 100 MG/MG (2000X PEL)
- SUPPLIED-AIR RESPIRATORS WITH FULL FACEPIECE, HOOD OR HELMET OR SUIT, OPERATED IN POSITIVE PRESSURE MODE

GREATER THAN 100 MG/M3, UNKNOWN CONCENTRATIONS OR FIREFIGHTING
- FULL FACEPIECE, SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSUE MODE

(RESPIRATORS SPECIFIED FOR HIGHER CONCENTRATIONS CAN BE USED A LOWER CONCENTRATIONS OF LEAD).
(FULL FACEPIECE IS REQUIRED IF THE LEAD AEROSOLS CAUSE EYE AND SKIN IRRITATION AT THE USE CONCENTRATIONS.)
(A HIGH EFFICIENCY PARTICULATE FILTER MEANS 99.97% EFFICIENT AGAINST 0.3 MICRON PARTICLES)

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS.

0.5 MG(PB)/M3
- SUPPLIED-AIR RESPIRATOR
- AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- SELF-CONTAINED BREATHING APPARATUS

1.25 MG(PB)/M3
- POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FACEPIECE AND HIGH-EFFICIENCY PARTICULATE FILTER
- SUPPLIED-AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE

2.5 MG(PB)/M3
- AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FACEPIECE AND HIGH-EFFICIENCY PARTICULATE FILTER
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR WITH A TIGHT-FITTING FACEPIECE OPERATED IN A CONTINUOUS FLOW MODE

50 MG(PB)/M3
- SUPPLIED-AIR RESPIRATOR WITH HALF-MASK OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE

100 MG(PB)/M3
- SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE

ESCAPE
- AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS
SKIN IRRITATION
EYE IRRITATION
SALIVATION
VOMITING
DIARRHEA
CONSTIPATION
FATIGUE
SLEEP DISORDERS
IRRITABILITY

MEMORY DEFECTS
INABILITY TO CONCENTRATE
DELIRIUM
PARESTHESIA
MUSCLE PAIN
WEAKNESS
LIVER EFFECTS
THIRST
LETHARGY
HEADACHE
SWEATING
EXCESSIVE URINATION
PROSTRATION
FEVER
CHILLS
PALLOR
FATIGUE
WEIGHT LOSS
APATHY
GINGIVAL BLACK LINE
ANEMIA
MYALGIA
ABDOMINAL PAIN
ATAXIA
STUPOR
VISUAL DISTURBANCE
ENCEPHALOPATHY
DELIRIUM
MENTAL DISORDER
SEIZURE
HYPERTENSION
CRANIAL NERVE PARALYSIS
KIDNEY DAMAGE
CONVULSIONS
REPRODUCTIVE EFFECTS
KIDNEY TUMORS

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IF THIS CHEMICAL GETS INTO THE EYES, WASH THE EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

IF THIS CHEMICAL GETS ON THE SKIN, REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

IF THIS CHEMICAL HAS BEEN INHALED, REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTED LEAD COMPOUNDS:
REMOVE INGESTED POISON BY GASTRIC LAVAGE WITH DILUTE MAGNESIUM SULFATE OR SODIUM SULFATE SOLUTION OR BY EMESIS. TREAT CEREBRAL EDEMA WITH MANNITOL AND PREDNISOLONE OR OTHER CORTICOSTEROID. GET MEDICAL ATTENTION IMMEDIATELY.
ANTIDOTE: INITIATE URINE FLOW. GIVE 10% DEXTROSE IN WATER INTRAVENOUSLY, 10-20 ML/KG, FOR ONE TO TWO HOURS. IF URINE FLOW DOES NOT START,

GIVE 20% SOLUTION OF MANNITOL, 5-10 ML/KG INTRAVENOUSLY, OVER TWENTY MINUTES. LIMIT FLUID TO REQUIREMENTS, AND CATHETERIZATION MAY BE NECESSARY IN COMA. DAILY URINE OUTPUT SHOULD BE 350-500 ML/M2/24 HOURS. EXCESSIVE FLUIDS FURTHER INCREASE CEREBRAL EDEMA.
FOR ADULTS WITH ACUTE ENCEPHALOPATHY, GIVE DIMERCAPROL, 4 MG/KG, INTRAMUSCULARLY EVERY 4 HOURS FOR 30 DOSES. BEGINNING 4 HOURS LATER, GIVE CALCIUM DISODIUM EDETATE AT A SEPERATE INJECTION SITE, 12.5 MG/KG INTRAMUSCULARLY EVERY 4 HOURS AS A 20% SOLUTION, WITH 0.5% PROCAINE ADDED, FOR A TOTAL OF 30 DOSES. IF SIGNIFICANT IMPROVEMENT HAS NOT OCCURRED BY THE FOURTH DAY, INCREASE THE NUMBER OF INJECTIONS BY 10 FOR EACH DRUG. FOR SYMPTOMATIC ADULTS, THE COURSE OF DIMERCAPROL AND CALCIUM DISODIUM EDETATE CAN BE SHORTENED OR CALCIUM DISODIUM EDETATE ONLY CAN BE GIVIN IN A DOSAGE OF 50 MG/KG INTRAVENOUSLY AS 0.5% SOLUTION IN 5% DEXTROSE IN WATER OR NORMAL SAILINE BY INFUSION OVER NOT LESS THAN 8 HOURS FOR NOT MORE THAN 5 DAYS. FOLLOW WITH PENICILLAMINE, 500-750 MG/DAY, ORALLY FOR 1-2 MONTHS OR UNTIL URINE LEAD LEVELS DROPS BELOW 0.3 MG/24 HOURS. (DREISBACH, HANDBOOK OF POISONING, 12TH EDITION.) PROCEDURE MUST BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

GASTRIC LAVAGE - GIVE PATIENT GLASS OF WATER PRIOR TO PASSING OF STOMACH TUBE. LAY PATIENT ON ONE SIDE, WITH HEAD LOWER THAN WAIST. IMMOBILIZE A STRUGGLING PATIENT WITH A SHEET OR BLANKET. MEASURE DISTANCE ON TUBE FROM MOUTH TO EPIGASTRIUM, MARK TUBE WITH INDELIBLE MARKING OR TAPE. REMOVE DENTURES AND OTHER FOREIGN OBJECTS FROM THE MOUTH. OPEN MOUTH, USE GAG IF NECESSARY. EXTEND HEAD BY LIFTING CHIN. PASS TUBE OVER TONGUE AND TOWARD BACK OF THROAT WITHOUT EXTENDING HEAD OR NECK. IF OBSTRUCTION IS MET BEFORE THE MARK ON TUBE REACHES LEVELS OF THE TEETH, DO NOT FORCE, BUT REMOVE TUBE AND REPEAT PROCEDURE UNTIL TUBE PASSES TO MARK. PLACE END OF TUBE IN GLASS OF WATER. IF TUBE IS OBSTRUCTED WHEN INTRODUCED ABOUT HALFWAY TO THE MARK, IT MAY HAVE ENTERED TRACHEA.

AFTER TUBE IS PLACED IN STOMACH, ASPIRATE FIRST TO REMOVE STOMACH CONTENTS BY IRRIGATION SYRINGE. SAVE STOMACH CONTENTS FOR EXAMINATION, AND REPEAT INTRODUCTION AND WITHDRAWL OF 100-300 ML WARM WATER UNTIL AT LEAST 3 LITERS OF CLEAR RETURN ARE OBTAINED. USE ACTIVATED CHARCOAL AT BEGINNING OF LAVAGE TO AID IN POISON INACTIVATION. LEAVE 50 GRAMS OF CHARCOAL SUSPENDED IN WATER IN THE STOMACH. IF INTRODUCTION AND REMOVAL OF LAVAGE FLUID BY GRAVITY REQUIRES MORE THAN FIVE MINUTES, ASSIST WITH ASEPTO SYRINGE. PREVENT ASPIRATION WITH CUFFED ENDOTRACHEAL TUBE. AVOID GIVING LARGE QUANTITIES OF WATER.

IF PATIENT COMATOSE, INTUBATE TRACHEA WITH CUFFED ENDOTRACHEAL TUBE. SUCCINYLCHLORINE MAY BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL TO EASE INSERTION OF TRACHEAL CATHETER PRIOR TO PASSAGE OF STOMACH TUBE. PROCEDURE MUST BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. (DREISBACH, HANDBOOK OF POISONING, 12TH ED.).

ORGANS
CENTRAL NERVOUS SYSTEM
CARDIOVASCULAR SYSTEM
GASTROINTESTINAL
KIDNEYS
REPRODUCTIVE SYSTEM
GINGIVAL TISSUE
BLOOD

STATUS OF REGULATORY ENFORCEMENT
****

FEDERAL REGULATIONS

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OSHA STANDARD 1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF A HAZARDOUS COMMUNICATION PROGRAM, LABELS AND OTHER FORMS OF WARNING, MATERIAL SAFETY DATA SHEETS, AND INFORMATION AND TRAINING. REQUIRES DISTRIBUTORS TO TRANSMIT REQUIRED INFORMATION TO EMPLOYERS.

OSHA STANDARD 29CFR1910.1025 LEAD

OSHA STANDARD 29CFR1910.252 WELDING, CUTTING, AND BRAZING

29CFR1910.1450 SUBJECT TO OSHA STANDARD REGULATING OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES.
EFFECTIVE DATE: 5/1/90
55FR3300 1/31/90

40CFR50.12 NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARD FOR LEAD
MAXIMUM ARITHMETIC MEAN AVERAGED OVER A CALENDAR QUARTER - 1.5 UG/M3

40CFR401.15 GENERAL PROVISIONS
SUBCHAPTER N - EFFLUENT GUIDELINES AND STANDARDS
THIS SUBSTANCE LISTED AS A TOXIC POLLUTANT DESIGNATED PURSUANT TO SECTION 307(A)(1) OF THE CLEAN WATER ACT

40CFR122 EPA ADMINISTERED PERMIT PROGRAMS: THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
APPENDIX D - NPDES PERMIT APPLICATION TESTING REQUIREMENTS
TABLE III - OTHER TOXIC POLLUTANTS (METALS AND CYANIDE) AND TOTAL PHENOL

40CFR141.11 NATIONAL PRIMARY DRINKING WATER REGULATIONS
MAXIMUM CONTAMINANT LEVEL FOR LEAD: 0.05 MG/L
40FR59570 12/24/75
45FR57342 08/27/80
47FR10998 03/12/82

40CFR141.34 NATIONAL PRIMARY DRINKING WATER REGULATIONS
PUBLIC NOTICE REQUIREMENTS PERTAINING TO LEAD

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTES

40CFR268 LAND DISPOSAL RESTRICTIONS

40CFR148 HAZARDOUS WASTE INJECTION RESTRICTIONS.
53FR28118 7/26/88
53FR30908 8/16/88
54FR25416 6/14/89
54FR26594 6/23/89

40CFR370 SARA TITLE III SECTION 311 HAZARDOUS CHEMICAL REPORTING: COMMUNITY RIGHT-TO-KNOW
SUBPART B - REPORTING REQUIREMENTS

REPORTING THRESHOLD: 10,000 LBS. (4540 KG)

HAZARD CATEGORIES:

ACUTE HAZARD

CHRONIC HAZARD

40CFR370 SARA TITLE III SECTION 312 HAZARDOUS CHEMICAL REPORTING: COMMUNITY RIGHT-TO-KNOW
SUBPART D - INVENTORY FORMS

40CFR372 SARA TITLE III SECTION 313 TOXIC CHEMICAL RELEASE REPORTING: COMMUNITY RIGHT-TO-KNOW

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
SECTION 8(C) OF THE TOXIC SUBSTANCES CONTROL ACT (TSCA) REQUIRES MANUFACTURERS, PROCESSORS, AND DISTRIBUTORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY THE SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.

16CFR1303 BAN OF LEAD-CONTAINING PAINT AND CERTAIN CONSUMER PRODUCTS BEARING LEAD-CONTAINING PAINT

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STATE REGULATIONS
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THIS SUBSTANCE LISTED IN CALIFORNIA AS A REPRODUCTIVE TOXIN UNDER PROPOSITION 65, THE SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986. REGULATION REQUIRES EMPLOYERS BEGINNING FEBRUARY 27, 1988, TO WARN WORKERS, CONSUMERS AND THE PUBLIC WHEN THEY ARE EXPOSED TO A LISTED CHEMICAL AT A LEVEL DEEMED BY THE STATE TO POSE A SIGNIFICANT RISK. WARNING METHODS MAY INCLUDE PRODUCT OR SHELF LABELS, SIGNS, OR MEDIA ANNOUNCEMENTS. BEGINNING OCTOBER 27, 1988, LISTED CHEMICALS CANNOT BE DISCHARGED OR RELEASED INTO ANY KNOWN SOURCE OF DRINKING WATER.

UNDER THE CALIFORNIA AIR TOXICS HOT SPOTS INFORMATION AND ASSESSMENT ACT OF 1987, OPERATORS OF FACILITIES WHICH RELEASE, OR HAVE THE POTENTIAL TO RELEASE, SPECIFIED QUANTITIES OF THIS SUBSTANCE MUST SUBMIT TO THE APPROPRIATE LOCAL AIR POLLUTION CONTROL DISTRICTS, OR AIR QUALITY MANAGEMENT DISTRICTS, COMPREHENSIVE EMISSIONS INVENTORY PLANS AND HEALTH RISK ASSESSMENTS ADOPTED BY THE CALIFORNIA AIR RESOURCES BOARD (ARB).
EFFECTIVE DATE: 1/1/88
AB 2588, CHAPTER 1252

SUBSTANCE LISTED UNDER THE STATE OF CALIFORNIA HAZARDOUS SUBSTANCES INFORMATION AND TRAINING ACT, CALIFORNIA LABOR CODE, DIVISION 5, CHAPTER 2.5

SUBSTANCE LISTED BY THE NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 1983, CHAPTER 315, N.J.S.A. 34: A-1. EMPLOYERS COVERED: SIC CODES 20-39, 46-49, 51, 75, 76, 80, 82, AND 84.

SUBSTANCE LISTED UNDER THE STATE OF FLORIDA TOXIC SUBSTANCES IN THE WORKPLACE RIGHT TO KNOW LAW, CHAPTER 442 OF THE FLORIDA STATUTES.

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16, ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

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INTERNATIONAL REGULATIONS
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CANADA: THIS SUBSTANCE SUBJECT TO REQUIREMENTS OF CANADA'S WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS). THE REGULATIONS REQUIRE SUPPLIERS OF HAZARDOUS MATERIALS TO PROVIDE ADEQUATE LABELS AND MATERIAL SAFETY DATA SHEETS (MSDS'S) AS CONDITIONS OF SALE AND IMPORTATION. EMPLOYERS MUST PROVIDE LABELS, MSDS'S AND WORKER EDUCATION PROGRAMS IN THE WORKPLACE.

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ADDITIONAL INFORMATION
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CERCLA SECTION 104(I) PRIORITY LIST OF HAZARDOUS SUBSTANCES FOUND AT SUPERFUND SITES.
52FR12866 4/17/87
53FR41280 10/20/88
54FR43615 10/26/89
55FR42067 10/17/90

THIS SUBSTANCE TESTED FOR CLINICAL TOXICOLOGY/EPIDEMIOLOGY BY THE NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT (NICHHD)

THIS SUBSTANCE TESTED FOR NEUROLOGIC/BEHAVIORAL TOXICITY BY THE NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT (NICHHD)

LEAD WITH METHYL MERCURY IS BEING TESTED FOR NEUROLOGIC/BEHAVIORAL TOXICITY BY THE NATIONAL INSTITUTE OF NEUROLOGICAL AND COMMUNICATIVE DISORDERS AND STROKE (NINCDS).

LEAD WITH ARSENIC COMPOUNDS IS BEING TESTED FOR NEUROLOGIC/BEHAVIORAL TOXICITY BY THE NATIONAL INSTITUTE OF NEUROLOGICAL AND COMMUNICATIVE DISORDERS AND STROKE (NINCDS).

LEAD WITH DOPAMINE IS BEING TESTED FOR NEUROLOGIC/BEHAVIORAL TOXICITY BY THE NATIONAL INSTITUTE OF NEUROLOGICAL AND COMMUNICATIVE DISORDERS AND STROKE (NINCDS).

LEAD WITH HEAVY METALS IS BEING TESTED FOR NEUROLOGIC/BEHAVIORAL TOXICITY BY THE NATIONAL INSTITUTE OF NEUROLOGICAL AND COMMUNICATIVE DISORDERS AND STROKE (NINCDS).

LEAD WITH NEUROTOXINS IS BEING TESTED FOR NEUROLOGIC/BEHAVIORAL TOXICITY BY THE NATIONAL INSTITUTE OF NEUROLOGICAL AND COMMUNICATIVE DISORDERS AND STROKE (NINCDS).

THIS SUBSTANCE TESTED FOR NEUROLOGIC/BEHAVIORAL TOXICITY BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA)

THIS SUBSTANCE TESTED FOR MUTAGENESIS/GENETIC TOXICITY BY THE

ENVIRONMENTAL PROTECTION AGENCY (EPA)

THIS SUBSTANCE TESTED FOR BIOCHEMICAL/CELLULAR/TISSUE EFFECTS BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA)

THIS SUBSTANCE TESTED FOR BIOCHEMICAL/CELLULAR/TISSUE EFFECTS BY THE NATIONAL EYE INSTITUTE (NEI)

MEDICAL SURVEILLANCE REQUIRED

29CFR1910.1025
THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REQUIRES EMPLOYERS TO PROVIDE A MEDICAL SURVEILLANCE PROGRAM FOR ALL EMPLOYEES WHO ARE OR MAY BE EXPOSED TO LEAD ABOVE THE ACTION LEVEL FOR MORE THAN 30 DAYS PER YEAR THIS MEDICAL SURVEILLANCE PROGRAM SHALL CONSIST OF:

(1) INITIAL MEDICAL EXAMINATION INCLUDING:
- (A) WORK HISTORY
- (B) MEDICAL HISTORY WITH PARTICULAR ATTENTION TO:
  - (1) PAST LEAD EXPOSURE (OCCUPATIONAL AND NON-OCCUPATIONAL)
  - (2) PERSONAL HABITS (SMOKING, HYGIENE)
  - (3) PAST GASTROINTESTINAL, HEMATOLOGIC, RENAL, REPRODUCITVE, CARDIOVASCULAR AND NEUROLOGIC PROBLEMS
- (C) PHYSICAL EXAMINATION
  - (1) WITH PARTICULAR ATTENTION TO:
    - (A) TEETH AND GUMS
    - (B) HEMATOLOGIC SYSTEM
    - (C) GASTROINTESTINAL SYSTEM
    - (D) KIDNEYS
    - (E) CARDIOVASCULAR SYSTEM
    - (F) NEUROLOGICAL SYSTEM
    - (G) PULMONARY STATUS IF RESPIRATORY PROTECTION WILL BE USED
  - (2) BLOOD PRESSURE MEASUREMENT
  - (3) BLOOD SAMPLE AND ANALYSIS DETERMINING:
    - (A) BLOOD LEAD LEVEL
    - (B) HEMOGLOBIN AND HEMATOCRIT DETERMINATIONS, RED CELL INDICES, EXAM OF PERIPHERAL SMEAR MORPHOLOGY
    - (C) ZINC PROTOPORPHYRIN
    - (D) BLOOD UREA NITROGEN
    - (E) SERUM CREATININE
  - (4) URINALYSIS WITH MICROSCOPIC EXAM
  - (5) ANY LABORATORY OR OTHER TEST DEEMED NECESSARY BY THE PHYSICIAN

(2) PERIODIC EXAMINATIONS
- (A) BLOOD LEAD AND ZPP LEVEL TESTS AND ANALYSIS:
  - (1) EVERY 6 MONTHS FOR EACH EMPLOYEE EXPOSED ABOVE THE ACTION LEVEL FOR MOR THAN 30 DAYS PER YEAR
  - (2) AT LEAST EVERY 2 MONTHS FOR EACH EMPLOYEE WHOSE LAST BLOOD SAMPLING AND ANALYSIS INDICATED A BLOOD LEVEL AT OR ABOVE 40 UG/100 G OF WHOLE BLOOD. THIS FREQUENCY SHALL CONTINUE UNTIL 2 CONSECUTIVE BLOOD SAMPLES AND ANALYSES INDICATE A BLOOD LEAD LEVEL BELOW 40 UG/100 G OF WHOLE BLOOD
  - (3) AT LEAST MONTHLY DURING THE REMOVAL PERIOD OF EACH EMPLOYEE REMOVED FROM EXPOSURE TO LEAD DUE TO AN ELEVATED BLOOD LEAD LEVEL
- (B) ALL TESTS CONDUCTED IN INITIAL EXAMINATION:
  - (1) AT LEAST ANNUALLY FOR EACH EMPLOYEE FOR WHOM A BLOOD

SAMPLING TEST CONDUCTED AT ANY TIME DURING THE PRECEDING 12 MONTHS INDICATED A BLOOD LEAD LEVEL AT OR ABOVE 400 UG/100 G

(2) PRIOR TO ASSIGNMENT FOR EACH EMPLOYEE BEING ASSIGNED FOR THE FIRST TIME TO AN AREA IN WHICH AIRBORNE CONCENTRATIONS OF LEAD ARE AT OR ABOVE THE ACTION LEVEL

(3) AS SOON AS POSSIBLE, UPON NOTIFICATION BY AN EMPLOYEE HAS DEVELOPED SIGNS OR SYMPTOMS ASSOCIATED WITH LEAD INTOXICATION, THAT THE EMPLOYEE DESIRES MEDICAL ADVICE CONCERNING THE EFFECTS OF CURRENT OR PAST EXPOSURE TO LEAD ON THE EMPLOYEES ABILITY TO PROVIDE A HEALTHY CHILD, OR THAT EMPLOYEE HAS DEMONSTRATED DIFFICULTY IN BREATHING DURING A RESPIRATORY FITTING TEST OR DURING USE

(4) AS MEDICALLY APPROPRIATE FOR EACH EMPLOYEE EITHER REMOVED FROM EXPOSURE TO LEAD DUE TO A RISK OF SUSTAINING MATERIAL IMPAIRMENT TO HEALTH, OR OTHERWISE LIMITED PURSUANT TO A FINAL MEDICAL DETERMINATION

29CFR1910.20 OSHA STANDARD
SUBPART C - GENERAL SAFETY AND HEALTH PROVISIONS
PROVIDES FOR EMPLOYEE, DESIGNATED REPRESENTATIVE, AND OSHA ACCESS TO EMPLOYER-MAINTAINED EXPOSURE AND MEDICAL RECORDS RELEVANT TO EMPLOYEES EXPOSED TO TOXIC SUBSTANCES AND HARMFUL PHYSICAL AGENTS.
53FR38140 9/29/88 (AMENDED)

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.

OTHER MEDICAL SURVEILLANCE RECOMMENDED:

ACGIH BIOLOGICAL EXPOSURE INDICES FOR LEAD:
50 UG/100 ML LEAD IN BLOOD / TIMING -- NOT CRITICAL
150 UG/G CREATINE LEAD IN URINE / TIMING -- NOT CRITICAL
250 UG/100 ML ERYTHROCYTES OF 100 UG/100 ML BLOOD ZINC PROTOPORPHYRIN IN BLOOD / TIMING -- AFTER ONE MONTH EXPOSURE

ERTIFICATIONS
NO FEDERAL AGENCY REQUIREMENT, BUT DUE TO HAZARDOUS NATURE OF SUBSTANCE, ADVISE FOLLOWING:

HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO

EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: CHARLES L. ELKINS, OFFICE OF TOXIC SUBSTANCES, EPA (202) 382-3813.

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
COMPLETE BLOOD COUNT
URINALYSIS
BLOOD LEAD
URINE LEAD AS EXPOSURE INDEX
BLOOD ERYTHROCYTE PROTOPORPHYRIN
BLOOD ERYTHOCYTE GAMMA-AMINOLEVULINIC ACID DEHYDRATASE
URINE LEAD EXCRETION >0.08 MG/DAY
URINE COPROPORPHYRIN >0.8 MG/L
URINE GAMMA-AMINOLEVULINIC ACID >6 MG/L

LEAKS AND SPILL PROCEDURES
REPORTABLE QUANTITY (RQ): 1 LB. (0.454 KG)
A REPORTABLE QUANTITY OF ONE POUND APPLIES TO THIS SUBSTANCE ESTABLISHED BY SECTIONS 101(14) AND 102(B) OR ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF 1980 (CERCLA). SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THAT SUBSTANCE IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8820; IN THE WASHINGTON, D.C.METROPOLITAN AREA (202)426-2675.
40CFR302

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

NOT LISTED

****

INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

NOT LISTED

THIS SUBSTANCE LISTED IN CALIFORNIA AS A REPRODUCTIVE TOXIN UNDER PROPOSITION 65, THE SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986. LISTED CHEMICALS CANNOT BE DISCHARGED OR RELEASED INTO WATER OR ONTO OR INTO LAND WHERE THERE IS ANY POSSIBILITY OF PASSING INTO ANY SOURCE OF DRINKING WATER.

OCCUPATIONAL SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA

AND DENY ENTRY.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

ASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

****

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

THIS COMPOUND, DEPENDING ON THE CHARACTERISTIC, CONCENTRATION
AND/OR SOURCE OF THE WASTE, MAY BE REGULATED UNDER THE FOLLOWING WASTE NUMBER(S) AND, IN TURN, SUBJECT TO THE CORRESPONDING REPORTABLE QUANTITY (RQ) (IF APPLICABLE):

40CFR261.24 TOXICITY CHARACTERISTIC
EPA HAZARDOUS WASTE NUMBER D008
LEAD
MAXIMUM CONCENTRATION 5 MG/L

40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARODUS WASTE NO. K002: WASTEWATER TREATMENT SLUDGE FROM THE PRODUCTION OF CHROME YELLOW AND ORANGE PIGMENTS. (T)
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K003: WASTEWATER TREATMENT SLUDGE FROM THE PRODUCTION OF MOLYBDATE ORANGE PIGMENTS. (T)
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K005: WASTEWATER TREATMENT SLUDGE FROM THE PRODUCTION OF CHROM GREEN PIGMENTS. (T)
40CFR261.32 HAZARDOUS WASTE FROM SPECIFIC SOURCES

EPA HAZARDOUS WASTE NO. K048: DISSOLVED AIR FLOTATION (DAF) FLOAT FROM PETROLEUM REFINING INDUSTRY. (T)
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K049: SLOP OIL EMULSION SOLIDS FROM PETROLEUM REFINING INDUSTRY. (T)
40CFR261.32 HAZARDOUS WASTE FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K051: API SEPARATOR SLUDGE FROM THE PETROLEUM REFINING INDUSTRY. (T)
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K061: EMISSION CONTROL DUST/SLUDGE FROM THE ELECTRIC FURNACE PRODUCTION OF STEEL. (T)
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K062: SPENT PICKLE LIQUOR FROM STEEL FINISHING OPERATIONS.
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K086: SOLVENT WASHES AND SLUDGES, CAUSTIC WASHES AND SLUDGES, OR WATER WASHES AND SLUDGES FROM CLEANING TUBS AND EQUIPMENT USED IN THE FORMULATION OF INK FROM PIGMENTS, DRIERS, SOAPS AND STABILIZERS CONTAINING CHROMIUM AND LEAD. (T)
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K100: WASTE LEACHING SOLUTION FROM ACID LEACHING OF EMISSION CONTROL DUST/SLUDGE FROM SECONDARY LEAD SMELTING.
40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K069: EMISSION CONTROL DUST/SLUDGE FROM SECONDARY LEAD SMELTING. (T)

40CFR261.32 HAZARDOUS WASTES FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K052: TANK BOTTOMS (LEADED) FROM THE PETROLEUM REFINING INDUSTRY. (T)
REPORTABLE QUANTITY (RQ) : 10 LBS.
A REPORTABLE QUANTITY OF 10 LBS. APPLIES TO THIS HAZARDOUS WASTE FROM SPECIFIC SOURCES ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) OF 1980 IDENTIFIED IN 40CFR261.32. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER AT (800) 424-8802; OR IN THE METROPOLITAN WASHINGTON, D.C. AREA (202) 426-2675.

40CFR261.32 HAZARDOUS WASTE FROM SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. K046: WASTEWATER TREATMENT SLUDGES FROM THE MANUFACTURING, FORMULATION, AND LOADING OF LEAD-BASED INITIATING COMPOUNDS. (T)
REPORTABLE QUANTITY (RQ) : 100 LBS.
A REPORTABLE QUANTITY OF 100 LBS. APPLIES TO THIS HAZARDOUS WASTE FROM SPECIFIC SOURCES ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) OF 1980 IDENTIFIED IN 40CFR261.32. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER AT (800) 424-8802; OR IN THE METROPOLITAN WASHINGTON, D.C. AREA (200) 426-2675.

40CFR261.31 HAZARDOUS WASTES FROM NO-SPECIFIC SOURCES
EPA HAZARDOUS WASTE NO. F035: WASTEWATERS, PROCESS RESIDUALS, PRESERVATIVE DRIPPAGE, AND SPENT FORMULATIONS FROM WOOD PRESERVING PROCESSES GENERATED AT PLANTS THAT USE INORGANIC PRESERVATIVES

CONTAINING ARSENIC OR CHROMIUM. THIS LISTING DOES NOT INCLUDE K001 BOTTOM SEDIMENT SLUDGE FROM THE TREATMENT OF WASTEWATER FROM WOOD PRESERVING PROCESSES THAT USE CREOSOTE AND/OR PENTACHLOROPHENOL.
REPORTABLE QUANTITY (RQ) : 1 LB.
A REPORTABLE QUANTITY OF 1 LB. APPLIES TO THIS HAZARDOUS WASTE FROM NON-SPECIFIC SOURCES ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) OF 1980 IDENTIFIED IN 40CFR261.31. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER AT (800) 424-8802; OR IN THE METROPOLITAN WASHINGTON, D.C. AREA (202) 426-2675.

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR268 LAND DISPOSAL RESTRICTIONS

IDENTIFIES HAZARDOUS WASTES THAT ARE RESTRICTED FROM LAND DISPOSAL AND DEFINES THOSE LIMITED CIRCUMSTANCES UNDER WHICH AN OTHERWISE PROHIBITED WASTE MAY CONTINUE TO BE LAND DISPOSED.

40CFR268.32 WASTE-SPECIFIC PROHIBITIONS - CALIFORNIA LIST WASTES
LIQUID HAZARDOUS WASTES CONTAINING LEAD COMPOUNDS (AS PB), ARE PROHIBITED FROM LAND DISPOSAL AT CONCENTRATIONS GREATER THAN OR EQUAL TO 500 MG/L.
52FR25760 7/8/87

40CFR268.33 WASTE SPECIFIC PROHIBITIONS - FIRST THIRD WASTES
53FR31138 8/8/88

40CFR268.34 WASTE SPECIFIC PROHIBITIONS - SECOND THIRD WASTES
54FR26594 6/23/89

40CFR268.35 WASTE SPECIFIC PROHIBITIONS - THIRD THIRD WASTES
55FR22520 6/1/90

40CFR148 HAZARDOUS WASTE INJECTION RESTRICTIONS

IDENTIFIES HAZARDOUS WASTES THAT ARE RESTRICTED FROM DISPOSAL INTO CLASS I HAZARDOUS WASTE INJECTION WELLS AND DEFINES THOSE CIRCUMSTANCES UNDER WHICH A WASTE, OTHERWISE PROHIBITED FROM INJECTION, MAY BE INJECTED.
53FR28118 7/26/88
53FR30908 8/16/88
54FR25416 6/14/89
54FR26594 6/23/89

40CFR148.12 WASTE SPECIFIC PROHIBITIONS - CALIFORNIA LIST WASTES

40CFR148.14 WASTE SPECIFIC PROHIBITIONS - FIRST THIRD WASTES

40CFR148.15 WASTE SPECIFIC PROHIBITIONS - SECOND THIRD WASTES

40CFR148.16 WASTE SPECIFIC PROHIBITIONS - THIRD THIRD WASTES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

CAS NUMBER
7439-92-1

REGISTRY TOXIC CHEMICALS NUMBER
OF7525000

BULLETINS

Date: 8 March 1991
Revision No.: 1

C-25 SHIELDING GAS
(25% Carbon Dioxide - 75% Argon Mixture)

MATERIAL SAFETY DATA SHEET

An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional or area offices
(Essentially similar to U.S. Department of Labor Form OMB No 1218-0072 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

I. PRODUCT IDENTIFICATION

PRODUCT	25% Carbon Dioxide - 75% Argon Mixture		
CHEMICAL NAME	Carbon Dioxide - Argon mixture	**SYNONYMS**	C-25 Shielding gas
FORMULA	Mixture of CO_2 and Ar	**CHEMICAL FAMILY**	Not Applicable
		MOLECULAR WEIGHT	Not Applicable

TRADE NAME C-25 Shielding Gas (This product is intended for electric welding use.)

II. HAZARDOUS INGREDIENTS

This section covers the materials from which this product is manufactured. The fumes and gases produced during cutting with the normal use of this product are covered by Section VI. The term "hazardous" should be interpreted as a term required and defined in OSHA 29 CFR 1910.1200 and does not necessarily imply the existence of any hazard.

MATERIAL (CAS NO.)	Vol (%)	1987-1988 ACGIH TLV-TWA (OSHA-PEL)	
Argon (7440-37-1)	75	Simple asphyxiant	(None currently established)
Carbon Dioxide (124-38-9)	25	5000 ppm	(5000 ppm)

III. PHYSICAL DATA

BOILING POINT, 760 mm. Hg	Not Applicable	**FREEZING POINT**	Not Applicable
SPECIFIC GRAVITY (H_2O = 1)	Gas	**VAPOR PRESSURE AT 20°C.**	Gas
VAPOR DENSITY (air = 1)	1.42	**SOLUBILITY IN WATER, % by wt.**	Negligible
PERCENT VOLATILES BY VOLUME	100	**EVAPORATION RATE (Butyl Acetate = 1)**	Not Applicable

APPEARANCE AND ODOR Colorless, odorless gas at normal temperature and pressure.

EMERGENCY PHONE NUMBER

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514 — 640-6400
For routine information contact your local supplier

Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

UNION CARBIDE CORPORATION ☐ LINDE DIVISION
UNION CARBIDE CANADA LIMITED ☐ LINDE DIVISION

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IV. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
The ACGIH 1987-88 recommended limit for welding fume, not otherwise classified (NOC), is 5 mg/m³.
TLV-TWA's should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations. See Section VI for specific fume constituents which may modify this TLV-TWA. Carbon dioxide TLV 5000ppm, argon is classified as a simple asphyxiant (ACGIH 1987-88).

EFFECTS OF SINGLE (ACUTE) OVEREXPOSURE:

SWALLOWING—This product is a gas at normal temperatures and pressures.

SKIN ABSORPTION—No evidence of adverse effects from available information.

INHALATION—Asphyxiant. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing, increased heart rate, excess salivation, vomiting, and unconsciousness.

SKIN CONTACT—No evidence of adverse effects from available information.

EYE CONTACT—No evidence of adverse effects from available information.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE: Damage to retinal ganglion cells and central nervous system may occur.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: A knowledge of the available toxicology information and of the physical and chemical properties of the material suggest that overexposure is unlikely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: One published study has reported an increased incidence of cardiac malformations in offspring of female rats exposed for a single 24 hour interval to 6% carbon dioxide. Although the study suffers from design and reporting flaws, the results must still be considered significant. There is no information available to confirm or refute the effects reported. The relevance of this information to humans is unknown.

EMERGENCY AND FIRST-AID PROCEDURES:

SWALLOWING—This product is a gas at normal temperatures and pressures.

SKIN CONTACT—No emergency care anticipated.

INHALATION—Remove to fresh air. Give artificial respiration if not breathing. Qualified personnel may give oxygen if breathing is difficult. Obtain medical attention.

EYE CONTACT—Flush with water. Obtain medical attention if discomfort persists.

NOTES TO PHYSICIAN: *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.*

WORKING WITH WELDING AND CUTTING MAY CREATE ADDITIONAL HEALTH HAZARDS

FUMES AND GASES can be dangerous to your health and may cause serious lung disease.*

Keep your head out of the fumes. Do not breathe fumes and gases caused by the process. Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. The type and amount of fumes and gases depend on the equipment and supplies used. Possibly dangerous materials may be found in fluxes, coatings, gases, metals etc. Get a Material Safety Data Sheet (MSDS) for every material used. Air samples can be used to find out what respiratory protection is needed.

Short term overexposure to fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes.

***NOTES TO PHYSICIAN:**

Acute — *Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose, and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty breathing, frequent coughing, or chest pains.*

Chronic — *Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest X-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on X-rays may be caused by non-work related factors such as smoking, etc.*

A detailed description of the Health Hazards and their consequences may be found in Linde's free publication "Precautions and Safe Practices for Electric Welding and Cutting," L52-529. You may obtain copies from your local supplier, or by writing to Union Carbide Corporation, Linde Division, Communications Department, 39 Old Ridgebury Road, Danbury, Connecticut, 06817-0001.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

V. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method)	Not Applicable	**AUTOIGNITION TEMPERATURE**	Not Applicable
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** Not Applicable	**UPPER**	Not Applicable

EXTINGUISHING MEDIA

Gas mixture cannot catch fire. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES

Evacuate all personnel from danger area. Immediately cool cylinders with water spray from maximum distance until cool then move containers away from fire area if without risk. Shut off leak if without risk.

Arcs and sparks can ignite combustibles. Refer to American National Standard Z49.1 "Safety in welding and cutting" for fire prevention information during the use of welding and allied procedures.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Gas mixture cannot catch fire. Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature.

VI. REACTIVITY DATA

STABILITY	
UNSTABLE	**STABLE**
	X

CONDITIONS TO AVOID
High pressure gas. Close valve when not in use and when empty. Use with equipment rated to adequately withstand pressures to be encountered. Do not strike arc on cylinder. Do not ground cylinder. See Section IX.

INCOMPATIBILITY (materials to avoid)

Titanium burns in Carbon Dioxide above 550°C.
Magnesium burns in Carbon Dioxide above 775°C.

HAZARDOUS DECOMPOSITION PRODUCTS

The arc process may form gaseous reaction products such as Carbon Monoxide and Carbon Dioxide. Ozone and Nitrogen Oxides may be formed by the radiation from the arc. See Section IV. Other decomposition products of normal operation originate from the volatilization, reaction or oxidation of the material being worked.

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	**Will not Occur**	
	X	None currently known.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

This gas mixture is an asphyxiant. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off cylinder if without risk. Ventilate area of leak or move cylinder to well-ventilated area. Test area, especially confined areas, for sufficient oxygen content prior to permitting re-entry of personnel.

WASTE DISPOSAL METHOD: Slowly release into atmosphere. Discard any product, residue, disposable container or liner in an environmentally acceptable manner in full compliance with Federal, State and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type) — Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select as per OSHA29 CFR1910.134.

VENTILATION	**LOCAL EXHAUST** — Use enough ventilation, local exhaust or both, to keep the fumes and gases below TLV's in the worker's breathing zone and the general area. Train the worker to keep his head out of the fumes.
	MECHANICAL (general) ALWAYS WORK WITH ENOUGH VENTILATION
	SPECIAL — Avoid using electric arcs in the presence of chlorinated hydrocarbon vapors — Highly toxic phosgene may be produced. Avoid arc operations on parts with phosphate residues (anti-rust, cleaning preparations) — Highly toxic phosphine may be produced.
	OTHER Depends on specific use conditions, and location. Use adequate ventilation or personal respiratory protection. See Section IX and OSHA29 CFR1910.252.
PROTECTIVE GLOVES	Welding gloves recommended

EYE PROTECTION — Wear a helmet or use a face shield with a filter lens selected as per ANSI Z49.1. Provide protective screens and flash goggles, if necessary, to protect others. Select as per OSHA29 CFR1910.133.

OTHER PROTECTIVE EQUIPMENT — As needed, wear hand, head, and body protection which help to prevent injury from radiation, sparks, and electrical shock. See ANSI Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Train the worker not to touch live electrical parts.

IX. SPECIAL PRECAUTIONS

Fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being worked, the process, procedure and electrodes used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being worked (such as paint, plating, or galvanizing), the number of workers and the volume of the work area, the quality and amount of ventilation, the position of the worker's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample from inside the worker's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1, available from the American Welding Society, 550 N.W. Le Jeune Rd., Miami, FL 33135.

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, "Safety In Welding And Cutting" published by the American Welding Society and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Washington, D.C. 20402 for more details. For further safety and health information refer to Linde's free safety booklet, "Precautions and Safe Practices for Electric Welding and Cutting," L52-529.

OTHER HANDLING AND STORAGE CONDITIONS

Arcs and sparks during use could be the source of ignition of combustible materials. Prevent fires.
Refer to NFPA 51B "Cutting and Welding Processes." High pressure gas mixture. Use piping and equipment adequately designed to withstand pressures to be encountered. Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Close valve when not in use and when empty. Do not strike arc on cylinder. The defect produced by an arc burn could lead to cylinder rupture. Do not ground cylinder. Never work on a pressurized system.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

LINDE
UNION CARBIDE

GENERAL OFFICES

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Other offices in principal cities all over the world.

Date: 8 March 1991
Revision No.: 1

736 HEAT RESISTANT SEALANT

No. 470

74515A32
1 33

MCMASTER-CARR SUPPLY CO
600 N COUNTY LINE ROAD
ELMHURST, IL 60126
AB-44820480

DOW CORNING CORPORATION
MATERIAL SAFETY DATA SHEET

MATL NAME: DOW CORNING(R) 736 HEAT RESISTANT SEALANT
EMERGENCY TELEPHONE NO. (517) 496-5900

SECTION I - GENERAL INFORMATION

MANUFACTURER'S NAME: DOW CORNING CORPORATION
ADDRESS: SOUTH SAGINAW ROAD, MIDLAND MI 48686

PROPER SHIPPING NAME(49CFR 172.101): NONE
D.O.T. HAZARD NAME(49CFR 172.101): NONE
D.O.T. ID NO(49CFR 172.101): NONE
D.O.T. HAZARD CLASS(49CFR 172.101): NONE
RCRA HAZARD CLASS(40CFR 261)(IF DISCARDED): NONE
E.P.A. PRIORITY POLLUTANTS(40CFR 122.53): NONE
NFPA = NATIONAL FIRE PROTECTION ASSOCIATION - 704
HEALTH (NFPA): 1 FLAMMABILITY (NFPA): 1 REACTIVITY (NFPA): 0
CAS NO: MIXTURE DOW CORNING WARNING CODE: 57
GENERIC DESCRIPTION: SILICONE

SECTION II - HAZARDOUS INGREDIENTS AS DEFINED IN 29 CFR 1910.1200
(CARCINOGENS IDENTIFIED WITH AN ASTERISK *)

CAS	INGREDIENTS	WT.%	EXPOSURE LIMITS
004253343	METHYLTRIACETOXYSILANE	2	OSHA PEL: TWA 10 PPM ACGIH TLV: TWA 10 PPM; STEL 15 PPM
017689779	ETHYLTRIACETOXYSILANE	3	OSHA PEL: TWA 10 PPM ACGIH TLV: TWA 10 PPM, STEL 15 PPM
007631869	AMORPHOUS SILICA	10	OSHA PEL: TWA 20 MPPCF ACGIH TLV: TWA 10 MG/M3
001309371	IRON OXIDE	1	OSHA PEL: TWA 10 MG/M3 ACGIH TLV: TWA 5 MG/M3

COMMENT: EXPOSURE LIMITS FOR ACETOXYSILANES BASED ON ACETIC ACID FORMED DURING CURING ON EXPOSURE TO WATER OR HUMID AIR.

NO. 245

DOW CORNING CORPORATION
MATERIAL SAFETY DATA SHEET

MATL NAME: DOW CORNING(R) 736 HEAT RESISTANT SEALANT

SECTION III - EFFECTS OF OVEREXPOSURE

EYE: DIRECT CONTACT IRRITATES SLIGHTLY WITH REDNESS AND SWELLING.

SKIN: A SINGLE RELATIVELY SHORT EXPOSURE CAUSES NO KNOWN ADVERSE EFFECT. SEVERAL REPEATED PROLONGED EXPOSURES (24 TO 48 HOURS) MAY IRRITATE.

INHALATION: VAPORS MAY IRRITATE NOSE AND THROAT.

ORAL: SMALL AMOUNTS TRANSFERRED TO THE MOUTH BY FINGERS DURING USE, ETC., SHOULD NOT INJURE. SWALLOWING LARGE AMOUNTS MAY CAUSE DIGESTIVE DISCOMFORT.

COMMENTS: NO KNOWN ADVERSE CHRONIC HEALTH EFFECTS, BUT UNNECESSARY EXPOSURE TO AHY CHEMICAL SHOULD BE AVOIDED.
THIS PRODUCT, AS WITH ANY CHEMICAL, MAY ENHANCE ALLERGIC CONDITIONS ON CERTAIN PEOPLE. WE DO NOT KNOW OF ANY MEDICAL CONDITIONS THAT MIGHT BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT. NO INJURY FROM DUSTS OF IRON OXIDE OR SILICA SHOULD OCCUR DURING NORMAL, REASONABLE USE. IF USE GENERATES RESPIRABLE PARTICLES, SOME RESPIRATORY SYSTEM INJURY MAY OCCUR.

SECTION IV - EMERGENCY AND FIRST AID PROCEDURES

EYES: IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES. GET MEDICAL ATTENTION.

SKIN: REMOVE FROM SKIN AND FLUSH WITH WATER.

INHALATION: REMOVE TO FRESH AIR. GET MEDICAL ATTENTION IF ILL EFFECTS PERSIST.

ORAL: NO FIRST AID SHOULD BE NEEDED.

COMMENT: NONE.

SECTION V - FIRE AND EXPLOSION DATA

FLASH POINT (METHOD USED): OPEN CUP ABOVE 250F/120C
AUTOIGNITION: NOT DETERMINED
FLAMMABILITY LIMITS IN AIR : LOWER:N.D. UPPER: N.D.

EXTINGUISHING MEDIA: WATER WATER FOG X CO2 X DRY CHEMICAL X FOAM X OTHER

SPECIAL FIRE FIGHTING PROCEDURES: SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING SHOULD BE WORN IN FIGHTING FIRES INVOLVING CHEMICALS

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE KNOWN TO DOW CORNING.

COMMENTS: N.D.=NOT DETERMINED.

SECTION VI - PHYSICAL DATA

BOILING POINT(@ 760 MM HG): NOT APPLICABLE.
SPECIFIC GRAVITY (AT 77 DEG F/25 DEG C): 1.05
MELTING POINT: NOT APPLICABLE
VAPOR PRESSURE (AT 77 DEG F/25 DEG C): LESS THAN 5 MM
VAPOR DENSITY (AIR = 1 AT 77 DEG F/25 DEG C): NOT APPLICABLE
PERCENT VOLATILE BY WEIGHT (%): LESS THAN 5%
EVAPORATION RATE (ETHER = 1): NOT APPLICABLE.
SOLUBILITY IN WATER(%): LESS THAN 0.1%
ODOR, APPEARANCE, COLOR: ACETIC ACID-LIKE, PASTE, RED.

NOTE: THE ABOVE INFORMATION IS NOT INTENDED FOR USE IN PREPARING PRODUCT SPECIFICATIONS. CONTACT DOW CORNING BEFORE WRITING SPECIFICATIONS

100.470

DOW CORNING CORPORATION
MATERIAL SAFETY DATA SHEET

MATL NAME: DOW CORNING(R) 736 HEAT RESISTANT SEALANT

SECTION VII - REACTIVITY DATA

STABILITY: STABLE

INCOMPATABILITY(MATERIAL TO AVOID): OXIDIZING MATERIAL CAN CAUSE A REACTION.

CONDITIONS TO AVOID: AIR OR MOISTURE CAUSES CURING AND ACETIC ACID VAPORS FORM. AVOID EXPOSURE UNTIL READY TO USE.

HAZARDOUS DECOMPOSITION PRODUCTS: SILICON DIOXIDE, CARBON DIOXIDE, AND TRACES OF INCOMPLETELY BURNED CARBON PRODUCTS.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NOT APPLICABLE

COMMENTS: NONE

SECTION VIII - SPILL, LEAK, MAINTENANCE/REPAIR AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: COLLECT AND CONTAIN FOR SALVAGE OR DISPOSAL.

PROTECTIVE EQUIPMENT:
EYES: USE PROPER PROTECTION -- SAFETY GLASSES, AS A MINIMUM.

SKIN: WASHING AT MEALTIME AND END OF SHIFT IS ADEQUATE.

INHALATION: USE RESPIRATORY PROTECTION UNLESS LOCAL EXHAUST VENTILATION IS ADEQUATE OR AIR SAMPLING DATA SHOW EXPOSURES ARE WITHIN TLV AND PEL GUIDELINES.

WASTE DISPOSAL METHOD: DOW CORNING SUGGESTS THAT ALL LOCAL,STATE AND FEDERAL REGULATIONS CONCERNING HEALTH AND POLLUTION BE REVIEWED TO DETERMINE APPROVED DISPOSAL PROCEDURES. CONTACT DOW CORNING IF THERE ARE ANY DISPOSAL QUESTIONS.

D.O.T. (49CFR 171.8)/E.P.A. (40CFR 117) SPILL REPORTING INFORMATION
HAZARDOUS SUBSTANCE: NONE REPORTABLE QUANTITY: NOT APPLICABLE
CONCENTRATION OF HAZARDOUS SUBSTANCE: NOT APPLICABLE
REPORTABLE QUANTITY OF PRODUCT: NOT APPLICABLE

COMMENTS: NONE

SECTION IX - ROUTINE HANDLING PRECAUTIONS

PROTECTIVE EQUIPMENT:
EYES: USE PROPER PROTECTION -- SAFETY GLASSES, AS A MINIMUM.

SKIN *: WASHING AT MEALTIME AND END OF SHIFT IS ADEQUATE.

INHALATION: USE RESPIRATORY PROTECTION UNLESS LOCAL EXHAUST VENTILATION IS ADEQUATE OR AIR SAMPLING DATA SHOW EXPOSURES ARE WITHIN TLV AND PEL GUIDELINES.

VENTILATION:
LOCAL EXHAUST: MAY BE NEEDED
MECHANICAL (GENERAL): RECOMMENDED

SUITABLE RESPIRATOR: ACID GAS/ORGANIC VAPOR TYPE.

THESE PRECAUTIONS ARE FOR ROOM TEMPERATURE HANDLING, USE AT ELEVATED TEMPERATURES, OR AEROSOL/SPRAY APPLICATIONS, MAY REQUIRE ADDED PRECAUTIONS.
* GOOD PRACTICE REQUIRES THAT GROSS AMOUNT OF ANY CHEMICAL BE REMOVED FROM THE SKIN AS SOON AS PRACTICAL, ESPECIALLY BEFORE EATING OR SMOKING.
COMMENTS: AVOID BREATHING VAPORS AND EYE AND SKIN CONTACT. USE ONLY WITH ADEQUATE VENTILATION. DO NOT TAKE INTERNALLY.

Date: 8 March 1991
Revision No.: 1

ABC DRY CHEMICAL

Material Safety Data Sheet

ABC DRY CHEMICAL

~~QUICK IDENTIFIER~~
Common Name: (used on label and list)

May be used to comply with OSHA's Hazard Communication Standard, 29CFR 1910. 1200. Standard must be consulted for specific requirements.

SECTION 1 -

Manufacturer's name: AMEREX CORPORATION

Address: P. O. Box 81.

Emergency Telephone No. 205/655-3271

City, State, and ZIP: TRUSSVILLE, AL 35173-0081

Other Information Calls: 205/655-3271

Name of Person Responsible for Preparation (Optional): D. H. Ellison

Date Prepared: November 1985

SECTION 2 – HAZARDOUS INGREDIENTS/IDENTITY

Hazardous Component(s) (chemical & common name(s))	OSHA PEL	ACGIH TLV	Other Exposure Limits	% (optional)

None reported to us by any suppliers of chemical ingredients included in this product.

NO. 28
SP2 ABC 70-131
SP5 ABC 70-135
SP6 ABC 70-132
SP7 ABC 70-137
SP7 ABC 70-138
SP10 ABC 70-140
SP10 ABC 70-141
SP20 ABC 70-142
EAMP5A 70-80

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS

Boiling Point: N.A.

Specific Gravity (H,O=1)

Vapor Density (Air = 1): N.A.

Solubility in Water: N.A.

Reactivity in Water: N.A.

Appearance and Odor: Yellow powder. No characteristic odor.

Melting Point: N.A.

SECTION 4 – FIRE & EXPLOSION DATA

Flash Point: N.A. F. C. Method Used: N.A.

Flammable Limits in Air % by Volume LEL Lower: N.A. UEL Upper: N.A.

Auto-Ignition Temperature: N.A.

Extinguisher Media: N.A.

Special Fire Fighting Procedures: N.A. This material is a fire fighting agent.

Unusual Fire and Explosion Hazards: N.A.

ON 5 – PHYSICAL HAZARDS (REACTIVITY DATA)

Unstable ☐ Conditions
Stable ☒ to Avoid N.A.

bility
o Avoid) Material is stable under most conditions.

tion Products Ammonia, carbon monoxide and oxides of nitrogen

May Occur ☐ Conditions
tion Will Not Occur ☒ to Avoid N.A.

ON 6 – HEALTH HAZARDS

2. Chronic

rritation of eyes and respiratory tract. None known.

f Exposure None known.

litions Generally
by Exposure None known.

ted as Carcinogen — National Toxicology Program: Yes ☐ No ☒ — I.A.R.C. Monographs: Yes ☐ No ☒ — OSHA: Yes ☐ No ☒
Carcinogen

nd
cedures See below

1. Inhalation
Unknown

2. Eyes
Flush with water for 15 minutes and seek medical attention.

3. Skin
Wash with soap and water.

4. Ingestion
Unknown

N 7 – SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

o be Taken
nd Storage Store in closed, moisture free containers in a cool, dry location. Avoid

ecessary dustiness.

Do not cross contaminate with other extinguisher agents.

ken in Case
leased or Spilled Sweep up.

al
sult federal, state, and local regulations) Dry landfill.

N 8 – SPECIAL PROTECTION INFORMATION/CONTROL MEASURES

rotection
Dust respirator when TLV is exceeded (nuisance dust 30 MPPCF)

Local Exhaust	Mechanical (General)	Special	Other
Yes	Yes	No	No

Date: 8 March 1991
Revision No.: 1

ACETONE (DIMETHYL KETONE)

Baxter Healthcare Corporation
Burdick & Jackson Division
1953 South Harvey Street
Muskegon, MI 49442 USA

information/emergency telephone no. 616.726.3171
chemtrec telephone no. 800.424.9300
canadian emergency telephone no. 613.996.6666

MATERIAL SAFETY DATA SHEET

ACETONE

I. Identification

chemical name Acetone — molecular weight 58.08
chemical family Ketone — formula C_3H_6O
synonyms Dimethyl Ketone
DOT proper shipping name Acetone
DOT hazard class Flammable Liquid
DOT identification no. UN1090 — CAS no. 67-64-1

II. Physical and Chemical Data

boiling point, 760mm Hg. 56.29°C — freezing point -94.7°C — evaporation rate (BuAc=1) ca 12
vapor pressure at 20°C 184.5 mm Hg — vapor density (air=1) 2.0 — solubility in water @ 20°C complete
% volatiles by volume ca 100 — specific gravity (H_2O=1) @ 20°C 0.79 — stability Stable
hazardous polymerization Not expected to occur.
appearance and odor Clear, colorless liquid with a penetrating, sweet odor.
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents and strong acids and bases.

hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors.

III. Fire and Explosion Hazard Data

flash point, (test method) -18°C (Tag closed cup) — auto ignition temperature 465°C
flammable limits in air % by volume: lower limit 2.6 — upper limit 12.8
unusual fire and explosion hazards Very volatile and extremely flammable. Mixtures with water can be flammable.

extinguishing media Carbon dioxide, dry chemical, alcohol foam, water mist or fog.

special fire fighting procedures Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

IV. Hazardous Components

	%	TLV	CAS no.
Acetone	ca 100	750 ppm	67-64-1

Burdick & Jackson's Disclaimer: The information and recommendations presented in this Material Safety Data Sheet are based on sources believed to be reliable on the date hereof. Burdick & Jackson makes no representation on its completeness or accuracy. It is the user's responsibility to determine the product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties, either express or implied, of merchantability or fitness for a particular purpose or of any other nature are made with respect to the information provided in this Material Safety Data Sheet or to the product to which such information refers. Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or additional liability or responsibility resulting from the use of, or reliance upon, this information.

V. Health Hazards

Occupational Exposure Limits

OSHA	TWA	-	750 ppm
	STEL	-	1000 ppm
	Ceiling	-	not listed
ACGIH	TLV-TWA	-	750 ppm
	TLV-STEL	-	1000 ppm
NIOSH	10 hour TWA	-	250 ppm

Concentration Immediately Dangerous to Health

OSHA/NIOSH	20,000 ppm

Odor Threshold

NSC	2 ppm
NIOSH	not listed

Carcinogenic Data

Acetone is not listed as a carcinogen by IARC, NTP, OSHA or ACGIH.

Primary Routes of Entry

Acetone may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause eye, nose, and throat irritation, headache, nausea, dizziness and narcosis.

Eye Contact: Liquid and high vapor concentration can cause irritation.

Skin Contact: Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.

Ingestion: Symptom information is inadequate/unknown.

Effects of Overexposure

Acetone is a mild eye and mucous membrane irritant, primary skin irritant, and central nervous system depressant. Acute exposure irritates the eyes and upper respiratory tract. Direct skin contact produces dermatitis, characterized by dryness and erythema. High concentrations produce narcosis and hypoglycemia.

Medical Condition Aggravated by Exposure

Preclude from exposure those individuals susceptible to dermatitis.

Emergency First Aid

Inhalation: Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact: Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact: Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion: Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

VI. Safety Measures and Equipment

Ventilation: Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory: Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes: Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin: Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or rubber offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to acetone may require additional protective equipment.

Storage: Acetone should be protected from temperature extremes and direct sunlight. Proper storage of acetone must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, acetone should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.
CERCLA Reportable Quantity: 5,000 lbs.

Waste Disposal: Dispose of acetone as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste numbers: U002(Ignitable); F003(Ignitable).

VIII. SARA/Title III Data

Hazard Classification		Chemical Listings	
Immediate Health	Yes (Irritant)	Extremely Hazardous Substances	No
Delayed Health	No	CERCLA Hazardous Substances	Yes
Fire	Yes	Toxic Chemicals	Yes
Sudden Release	No		
Reactive	No		

Acetone is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

Revision Date: July, 1989

KEY

ca	Approximately	STEL	Short Term Exposure Level (15 minutes)
na	Not applicable	TLV	Threshold Limit Value
C	Ceiling	TWA	Time Weighted Average
		BuAc	Butyl Acetate

CERCLA Comprehensive Environmental Response, Compensation and Liability Act of 1980
NSC National Safety Council ("Fundamentals of Industrial Hygiene," 3rd Ed., 1988)

Date: 8 March 1991
Revision No.: 1

ACETYLENE

MATERIAL SAFETY DATA SHEET

An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional or area offices.
(Similar to U.S. Department of Labor Form OMB No. 1218-0072 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

PRODUCT Acetylene

CHEMICAL NAME	Acetylene	**SYNONYMS**	Acetylen, Ethine, Ethyne, Narcylene
FORMULA	C_2H_2	**CHEMICAL FAMILY**	Alkyne
		MOLECULAR WEIGHT	26.038

TRADE NAME Acetylene (This product is intended for welding and cutting use.)

This section covers the materials from which this product is manufactured. The fumes and gases produced during welding and cutting with the normal use of this product are covered by Section VI. The term "hazardous" should be interpreted as a term required and defined in OSHA 29 CFR 1910.1200 and does not necessarily imply the existence of any hazard.

MATERIAL (CAS NO.)	Vol (%)	1986-1987 ACGIH TLV-TWA (OSHA-PEL)
Acetylene (74-86-2)	100	Simple asphyxiant (None currently established) Acetylene cylinders are filled with a porous material containing acetone into which the acetylene is dissolved. ACGIH has established a TLV-TWA of 750 ppm for acetone and a STEL of 1000 ppm.

BOILING POINT, 760 mm. Hg	Not Applicable	**SUBLIMATION POINT**	-84°C (-119.2°F) @ 760mm Hg
SPECIFIC GRAVITY (H_2O = 1)	Not Applicable	**VAPOR PRESSURE AT 21°C.**	635 psig
VAPOR DENSITY (air = 1)	0.91	**SOLUBILITY IN WATER, % by wt.**	Slight
PERCENT VOLATILES BY VOLUME	100	**EVAPORATION RATE (Butyl Acetate = 1)**	Not Applicable

APPEARANCE AND ODOR Colorless gas at normal temperature and pressure; garlic-like odor.

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514-640-6400
For routine information contact your local supplier

Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

UNION CARBIDE CORPORATION ☐ LINDE DIVISION
UNION CARBIDE CANADA LIMITED ☐ LINDE DIVISION

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THRESHOLD LIMIT VALUE: Acetylene - Simple asphyxiant ACGIH 1986-87; Acetone, 750ppm ACGIH 1986-87

EFFECTS OF SINGLE (ACUTE) OVEREXPOSURE

SWALLOWING — An unlikely route of exposure, but frostbite of the lips and mouth may result from contact with the liquid. If the liquid is swallowed, may cause nausea.

SKIN ABSORPTION — No evidence of adverse effects from available information.

INHALATION — Asphyxiant. Moderate concentrations of vapor may cause headache, drowsiness, dizziness, nausea, vomiting, excitation, excess salivation, and unconsciousness.

SKIN CONTACT — No harmful effects expected from vapor. Liquid may cause frostbite.

EYE CONTACT — Vapor may cause irritation. Liquid may cause irritation and frostbite.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE: None currently known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: A knowledge of the available toxicology information and of the physical and chemical properties of the material suggest that overexposure is unlikely to aggravate existing medical conditions.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING — If liquid is swallowed, do not induce vomiting. Call a physician.

SKIN — For exposure to liquid, flush with water and warm frostbite area with warm water (not to exceed 105°F). In case of massive exposure, remove clothing while showering with warm water. Call a physician.

INHALATION — Remove to fresh air. If breathing has stopped, give artificial respiration; if breathing is difficult, oxygen may be given; call a physician.

EYES — In case of splash contamination, immediately flush eyes thoroughly with water for at least 15 minutes. Seek the advice of a physician, preferably an ophthalmologist, urgently.

NOTES TO PHYSICIAN: *Aspirated acetone may cause severe lung damage. If a large quantity of material has been swallowed, stomach contents should be evacuated quickly in a manner which avoids aspiration. Otherwise, treatment should be directed at the control of symptoms and the clinical condition. No specific antidote is known.*

WORKING WITH WELDING AND CUTTING MAY CREATE ADDITIONAL HEALTH HAZARDS.

FUMES AND GASES can be dangerous to your health and may cause serious lung disease.*

Keep your head out of the fumes. Do not breathe fumes and gases caused by the process. Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. The type and amount of fumes and gases depend on the equipment and supplies used. Possibly dangerous materials may be found in fluxes, coatings, gases, metals etc. Get a Material Safety Data Sheet (MSDS) for every material used. Air samples can be used to find out what respiratory protection is needed.

Short term overexposure to fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes.

***NOTES TO PHYSICIAN:**

Acute —Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose, and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty breathing, frequent coughing, or chest pains.

Chronic —Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest x-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on x-rays may be caused by non-work related factors such as smoking, etc.

A detailed description of the Health Hazards and their consequences may be found in Linde's free publication "Precautions and Safe Practices for Electric Welding and Cutting," L52-529. You may obtain copies from your local supplier, or by writing to Union Carbide Corporation, Linde Division, Communications Department, 39 Old Ridgebury Road, Danbury, Connecticut, 06817-0001.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

V. FIRE AND EXPLOSION DATA

FLASH POINT (test method)	−17.8°C (0°F) T.C.C.	**AUTOIGNITION TEMPERATURE**	299°C (571°F)
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** 2.3%	**UPPER**	100%

EXTINGUISHING MEDIA

See paragraphs below.

SPECIAL FIRE FIGHTING PROCEDURES

Refer to CGA pamphlet SB-4, "Handling Acetylene Cylinders in Fire Situations."

Evacuate all personnel from danger area. Immediately cool containers with water spray from maximum distance taking care not to extinguish flames. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive re-ignition may occur. Use self-contained breathing apparatus. Stop flow of gas if without risk while contining cooling water spray. Remove all containers from area of fire if without risk. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Extremely flammable gas. Forms explosive mixtures with air and oxidizing agents. Container may rupture due to heat of fire. Do not extinguish flames due to possibility of explosive re-ignition. Flammable vapors may spread from leak. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with approved explosion meter. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). All containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature. Contact with copper, silver, or mercury or their alloys or halogens can cause explosion and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge or other ignition sources at locations distant from product handling point.

VI. REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
UNSTABLE	STABLE	Stable as shipped. Avoid use at pressures above 15 psig.
X		

INCOMPATIBILITY (materials to avoid)
Copper, silver, mercury or their alloys, oxidizing agents, acids, halogens, moisture.

HAZARDOUS DECOMPOSITION PRODUCTS
Thermal decomposition or burning may produce CO/CO_2H_2. The welding and cutting process may form reaction products such as carbon monoxide and carbon dioxide. Other decomposition products of normal operation originate from the volatilization, reaction or oxidation of the material being worked.

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	Will not Occur	Elevated temperature and pressure and/or the presence of a catalyst.
X		

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Forms explosive mixtures with air (See Section V). Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off leak if without risk. Ventilate area of leak or move leaking container to well-ventilated area. Flammable gas may spread from leak. Before entering area, especially confined areas, check atmosphere with appropriate device.

WASTE DISPOSAL METHOD: Prevent waste from contaminating surrounding environment. Keep personnel away. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, State and local regulations.

RESPIRATORY PROTECTION (specify type) — Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select as per OSHA29 CFR1910.134.

VENTILATION	**LOCAL EXHAUST** — Use enough ventilation, local exhaust or both, to keep the fumes and gases below TLV's in the worker's breathing zone and the general area. Train the worker to keep his head out of the fumes.	
	MECHANICAL (general)	ALWAYS WORK WITH ENOUGH VENTILATION
	SPECIAL	Not applicable
	OTHER Depends on specific use conditions, and location. Use adequate ventilation or personal respiratory protection. See Section IX and OSHA29 CFR1910.252.	
PROTECTIVE GLOVES		Welding gloves recommended

EYE PROTECTION — Wear goggles with filter lens selected as per ANSI Z49.1. Provide protective screens and goggles, if necessary, to protect others. Select as per OSHA29 CFR1910.133.

OTHER PROTECTIVE EQUIPMENT — As needed, wear hand, head, and body protection which help to prevent injury from radiation and sparks. See ANSI Z49.1. At a minimum this includes welder's gloves and protective goggles, and may include arm protectors, aprons, hats, shoulder protection, as well as substantial clothing. Train the worker not to touch live electrical parts.

Fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being worked, the process, procedure and electrodes used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being worked (such as paint, plating, or galvanizing), the number of workers and the volume of the work area, the quality and amount of ventilation, the position of the worker's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample from inside the worker's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1, available from the American Welding Society, 550 N.W. Le Jeune Rd., Miami, FL 33126.

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, "Safety In Welding And Cutting" published by the American Welding Society and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Washington, D.C. 20402 for more details. For further safety and health information refer to Linde's free safety booklet L-2035.

OTHER HANDLING AND STORAGE CONDITIONS

Heat and sparks during use could be the source of ignition of combustible materials. Prevent fires.
Refer to NFPA 51B "Cutting and Welding Processes" and NFPA 50 "Oxygen-Fuel Gas Systems." Use piping and equipment adequately designed to withstand pressures to be encountered. Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Close valve when not in use and when empty. Never work on a pressurized system. Do not strike arc on cylinder. The defect produced by an arc burn could lead to cylinder rupture. Do not ground cylinder. Store in cool, dry, well ventilated area. Do not store near open flames. Electrical equipment should be explosion proof. Do not store with oxygen or other oxidizers. Protect cylinders from physical damage. Store cylinders in upright position secured to prevent falling over. Refer to CGA Pamphlets P-1 and G-1 for recommendations.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

LINDE
UNION CARBIDE

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Other offices in principal cities all over the world.

Date: 8 March 1991
Revision No.: 1

AIR

MATERIAL SAFETY DATA SHEET

An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional area offices
(Essentially similar to U.S. Department of Labor Form OSHA-20 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original

I. PRODUCT IDENTIFICATION

PRODUCT	Air		
CHEMICAL NAME	Air	SYNONYMS	Synthetic air, reconstituted air
FORMULA	Mixture of N_2 and O_2	CHEMICAL FAMILY	Not applicable
		MOLECULAR WEIGHT	Not applicable
TRADE NAME	Air		

II. HAZARDOUS INGREDIENTS

For mixtures of this product request the respective component Material Safety Data Sheets. See Section IX

MATERIAL (CAS NO.)	Vol (%)	1984–1985 ACGIH TLV-TWA (OSHA-PEL)
Air:		
Oxygen (7782-44-7)	21	None currently established (None currently established)
Nitrogen (7727-37-9)	79	Simple asphyxiant (None currently established)

III. PHYSICAL DATA

BOILING POINT, 760 mm. Hg	– 194.3°C (– 317.8°F)	FREEZING POINT	– 216.2 to – 191.3°C (– 357.2 to – 312.4°F)
SPECIFIC GRAVITY (H_2O = 1)	Gas	VAPOR PRESSURE AT 20°C	Gas
VAPOR DENSITY (air = 1)	1.00	SOLUBILITY IN WATER, % by wt.	Negligible
PERCENT VOLATILES BY VOLUME	100	EVAPORATION RATE (Butyl Acetate = 1)	Not applicable

APPEARANCE AND ODOR Colorless gas at normal temperature and pressure; odorless

IV. EMERGENCY PHONE NUMBER

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 304—744-3487 In Canada 514—645-5311
For routine information contact your local supplier

Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

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[redacted]

THRESHOLD LIMIT VALUE: See Section II.

EFFECTS OF SINGLE (ACUTE) OR REPEATED (CHRONIC) OVEREXPOSURE: None expected.

EMERGENCY AND FIRST-AID PROCEDURES: No emergency care anticipated.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method)	Not applicable	**AUTOIGNITION TEMPERATURE**	Not applicable
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** Not applicable	**UPPER**	Not applicable

EXTINGUISHING MEDIA:
Oxidizing agent. May accelerate combustion. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES:
Evacuate all personnel from danger area. Immediately cool containers with water spray from maximum distance until cool then move containers away from fire area if without risk. Shut off leak if without risk.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Oxidizing agent, may accelerate combustion. Contact with flammable materials may cause fire or explosion Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Most containers are provided with a pressure-relief device designed to vent contents when they are exposed to elevated temperature.

REACTIVITY DATA

STABILITY	
UNSTABLE	STABLE
	X

CONDITIONS TO AVOID: See Section IX.

INCOMPATIBILITY (materials to avoid): Flammable and combustible materials.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION	
May Occur	Will not Occur
	X

CONDITIONS TO AVOID: None currently known.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Shut off cylinder, if without risk.

WASTE DISPOSAL METHOD:
Slowly release into atmosphere. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, state and local regulations.

INFORMATION

RESPIRATORY PROTECTION (specify type): Not required.

VENTILATION	**LOCAL EXHAUST**—Not applicable.
	MECHANICAL (general)—Adequate.
	SPECIAL—Not applicable.
	OTHER—Not applicable.

PROTECTIVE GLOVES: Preferred for cylinder handling

EYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

PRECAUTIONS

WARNING: High pressure gas. May accelerate combustion. Keep oil and grease away. Close valve when not in use and when empty. Use piping and equipment adequately designed to withstand pressures to be encountered.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Be sure to read and understand all labels and other instructions supplied with all containers of this product.

Suitability for use in underwater breathing is to be determined by or under the supervision of personnel experienced in the use of underwater breathing gas mixtures and familiar with the effect, methods, frequency and duration of use, hazards, side effects, and precautions to be taken.

For safety information on general handling of compressed gas cylinders, obtain a copy of pamphlet P-1, "Safe Handling of Compressed Gases in Containers" from the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202.

OTHER HANDLING AND STORAGE CONDITIONS: Never work on a pressurized system. If there is a leak, close the cylinder valve, blow down the system by venting to a safe place, then repair the leak. Store and use away from flammable materials. Never lubricate air valves, regulators, etc. with any combustible substance.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

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Lithographed in U.S.A.

Date: 8 March 1991
Revision No.: 1

WELDING CONSUMABLES AND RELATED PRODUCTS

MATERIAL SAFETY DATA SHEET

For U.S. Manufactured Welding Consumables and Related Products.
May be used to comply with OSHA's Hazard Communication Standard 29 CFR 1910.120.
Standard must be consulted for specific requirements.

SECTION 1 - IDENTIFICATION

Manufacturer Name: HOBART BROTHERS COMPANY Telephone # 1-513-339-6000
Address: 600 W. MAIN STREET, TROY, OHIO 45373 Emergency # 1-513-339-6000
Trade Name:18,418,718,718LMP,718MC,18AC,418SR Classific. AWS A5.1 E7018
S-718,S-8AC
Product Type: SHIELDED METAL ARC WELDING(SMAW)LOW HYDROGEN MILD STEEL

SECTION 2 - HAZARDOUS MATERIALS

IMPORTANT

This section covers the materials from which this product is manufactured. The fumes and gases produced during welding with normal use of this product are covered by Section 5.
The term "Hazardous Materials" should be interpreted as a term required and defined in OSHA Hazard Communication Standard(29 CFR Part 1910.1200).

		Exposure Limit (mg/m3)	
Ingredient	CAS No.	OSHA PEL	ACGIH TLV
IRON	7439-89-6	5	Not Reported
MANGANESE	7439-96-5	5 CL*	1 CL*
TITANIUM	13463-67-7	15	10,20 STEL**
FLUORSPAR	7789-75-5	2.5 (as F)	2.5 (as F)
POTASSIUM SILICATE	1312-76-1	Nothing Found	Nothing Found
SODIUM SILICATE	1344-09-8	Nothing Found	Nothing Found

*CL - Ceiling Limit **STEL - Short Term Exposure Limit

SECTION 3 - PHYSICAL/CHEMICAL CHARACTERISTICS

Not Applicable

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

Non Flammable: Welding arc and sparks can ignite combustibles.

SECTION 5 - REACTIVITY DATA

Hazardous Decomposition Products

Welding fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being welded, the process, procedures, and electrodes used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coating on the metal being welded(such as paint,plating,or galvanizing), the number of welders and the volume of the work area, the quality and amount of ventilation, the position of the welder's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere(such as chlorinated hydrocarbon vapors from cleaning and

Cont. Section 5

degreasing activities).
When the electrode is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 2. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 2, plus those from the base metal and coating,etc.,as noted above.
It is understood, however, that the elements and/or oxides to be mentioned are virtually always present as complex oxides and not as metals.(Characterization of Arc Welding Fume:American Welding Society). The elements or oxides listed below correspond to the ACGIH categories located in (TLV threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment).
Reasonably expected constituents of the fume would include: complex oxides of iron, manganese, ~~si~~licon, titanium. Fluorides would also be present.

		Exposure Limit (mg/m3)	
Substance	CAS No.	OSHA PEL	ACGIH PLV
IRON OXIDE	1309-38-2	5	10 (as Fe2O3)
MANGANESE	7439-96-5	5 CL*	1 CL* (Fume)
SILICON OXIDE	7631-86-9	5	3
TITANIUM OXIDE	13463-67-7	15	10,20 STEL**
FLUORIDES		2.5(as F)	2.5 (as F)

*CL - Ceiling Limit **STEL - Short Term Exposure Limit

Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from the arc.
One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample inside the welder's helmet if worn or in the worker's breathing zone. (See ANSI/AWS F1.1, available from the "American Welding Society," P.O. Box 351040, Miami, FL 33135. Also, from AWS is F1.3 "Evaluating Contaminants in the Welding Environment - A Sampling Strategy Guide," which gives additional advice on sampling). At a minimum, materials listed in this section should be analyzed.

SECTION 6 - HEALTH HAZARD DATA

The ACGIH recommended general limit for Welding Fume NOC9Not Otherwise Classified) is 5 mg/m3. ACGIH-1985 of latest date) preface states "The TLV-TWA should be used as guides in the control of health hazards and should not be used as fine lines between safe and dangerous concentrations."See Section 5 for specific fume constituents which may modify this TLV.

Effects of Overexposure

Electric arc welding may create one or more of the following health hazards:
FUMES AND GASES can be dangerous to your health.
SHORT - TERM (ACUTE) OVEREXPOSURE to welding fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat or eyes.
LONG-TERM (CHRONIC) OVEREXPOSURE may lead to siderosis (iron deposits in lungs) and is believed by some investigators to affect pulmonary functions.
ARC RAYS can injure eyes and burn skin.

cont. Section 6

ELECTRIC SHOCK can kill.

Emergency and First Aid Procedures

Call for medical aid. Employ first aid techniques recommended by the American Red Cross.
Eyes & Skin: If irritation or flash burns develop after exposure, consult a physician.

Carcinogenicity

These products do not contain ingredients that are defined as carcinogenic per 29CFR 1910.1200 - Hazard Communication Standard.

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE/APPLICABLE CONTROL MEASURES

Read and understand the manufacturer's instruction and the precautionary label on the product. (See American National Standard Z49.1 Safety in Welding and Cutting published by the American Welding Society, P.O. Box 351040, Miami, FL 33135 and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Washington, D.C. 20402.
VENTILATION: Use enough ventilation, local exhaust at the arc, or both, to keep the fumes and gases below TLV's in the worker's breathing zone and the general area. Train the welder to keep his head out of the fumes.

RESPIRATORY PROTECTION: Use NIOSH approved or equivalent fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below TLV.

EYE PROTECTION: Wear helmet or use face shield with filter lens. As a rule of thumb begin with Shade Number 14. Adjust if needed by selecting the next lighter and/or darker shade number. Provide protective screens and flash goggles, if necessary, to shield others.

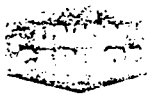
PROTECTIVE CLOTHING: Wear hand, head, and body protection which help to prevent injury from radiation, sparks, and electrical shock. See ANSI Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Train the welder not to touch live electrical parts and to insulate himself from work and ground.

WASTE DISPOSAL: Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations.
SPECIAL PRECAUTIONS: IMPORTANT: Maintain exposure below the PEL/TLV. Use industrial hygiene monitoring to ensure that you use of this material does not create exposures which exceed PEL/TLV. Always use exhaust ventilation.
Refer to the following sources for important additional information.
ANSI Z49.1 The American Welding Society, P.O. Box 351040, Miami, FL 33135 - OSHA(29CFR1910) U.S. Dept. of Labor, Washington, D.C. 20210.

Date: 8 March 1991
Revision No.: 1

ARGON

MATERIAL SAFETY DATA SHEET



An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional or area offices.
(Essentially similar to U.S. Department of Labor Form OSHA-20 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

PRODUCT	Argon

CHEMICAL NAME	Argon	**SYNONYMS**	Shielding Gas, Argon-40
FORMULA	Ar	**CHEMICAL FAMILY**	(Rare Gas) Noble Gas
		MOLECULAR WEIGHT	39.948

TRADE NAME Argon (This product is usually intended for electric welding use.)

This section covers the materials from which this product is manufactured. The fumes and gases produced during cutting with the normal use of this product are covered by Section VI. The term "hazardous" in "Hazardous Materials" should be interpreted as a term required and defined in OSHA 29 CFR 1910.1200 and does not necessarily imply the existance of any hazard.

MATERIAL (CAS NO.)	Vol (%)	1986-1987 ACGIH TLV-TWA (OSHA-PEL)
Argon (7440-37-1)	100	Simple asphyxiant (None currently established)

BOILING POINT, 760 mm. Hg	−185.9°C (−302.6°F)	**FREEZING POINT**	−189.2°C (−308.6°F)
SPECIFIC GRAVITY (H_2O = 1)	Gas	**VAPOR PRESSURE AT 20°C.**	Gas
VAPOR DENSITY (air = 1)	1.378 @ 21.2°C (70°F)	**SOLUBILITY IN WATER, % by wt.**	Neglible
PERCENT VOLATILES BY VOLUME	100	**EVAPORATION RATE (Butyl Acetate = 1)**	Not Applicable

APPEARANCE AND ODOR Colorless, odorless gas at normal temperature and pressure.

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514–640-6400
For routine information contact your local supplier

Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

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THRESHOLD LIMIT VALUE: Simple asphyxiant — ACGIH (1986-1987)

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

SWALLOWING — This product is a gas at normal temperature and pressure.

SKIN ABSORPTION — No evidence of adverse effects from available information.

INHALATION — Asphyxiant. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness.

SKIN CONTACT — No harmful effect expected from vapor.

EYE CONTACT — No harmful effect expected form vapor.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE: Argon is an asphyxiant. Lack of oxygen can cause death.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: A knowledge of the available toxicology information and of the physical and chemical properties of the material suggest that overexposure is unlikely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAXARD EVALUATION: None currently known.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING — This product is a gas at normal temperature and pressure.

SKIN CONTACT — Flush with water.

INHALATION — Remove to fresh air. Give artificial respiration if not breathing. Give oxygen if breathing is difficult. Call a physician.

EYE CONTACT — Flush with water.

NOTES TO PHYSICIAN:

This product is inert. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.

WORKING WITH WELDING AND CUTTING MAY CREATE ADDITIONAL HEALTH HAZARDS.

FUMES AND GASES can be dangerous to your health and may cause serious lung disease.*

Keep your head out of the fumes. Do not breathe fumes and gases caused by the process. Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. The type and amount of fumes and gases depend on the equipment and supplies used. Possible dangerous materials may be found in fluxes, coatings, gases, metals etc. Get a Material Safety Data Sheet (MSDS) for every material used. Air samples can be used to find out what respiratory protection is needed.

Short term overexposure to fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes.

***NOTES TO PHYSICIAN:**

Acute — *Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose, and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty breathing, frequent coughing, or chest pains.*

Chronic — *Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest x-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on x-rays may be caused by non-work related factors such as smoking, etc.*

A detailed description of the Health Hazards and their consequences may be found in Linde's free publication "Precautions and Safe Practices for Electric Welding and Cutting," L52-529. You may obtain copies from your local supplier, or by writing to Union Carbide Corporation, Linde Division, Communications Department, 39 Old Ridgebury Road, Danbury, Connecticut, 06817-0001.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

FLASH POINT (test method)	Not Applicable	**AUTOIGNITION TEMPERATURE**	Not Applicable
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** Not Applicable	**UPPER**	Not Applicable

EXTINGUISHING MEDIA

Argon cannot catch fire. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES

Evacuate all personnel from danger area. Immediately cool cylinders with water spray from maximum distance until cool then move containers away from fire area if without risk. Shut off leak if without risk.

Arcs and sparks can ignite combustibles. Refer to American National Standard Z49.1 "Safety in Welding and Cutting" for fire prevention information during the use of welding and allied procedures.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Argon cannot catch fire. Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature.

VI. REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
UNSTABLE	STABLE	High pressure gas. Close valve when not in use and when empty. Use with equipment rated to adequately withstand pressures to be encountered. Do not strike arc on cylinder. Do not ground cylinder. See Section IX.
	X	

INCOMPATIBILITY (materials to avoid)
None currently known. Argon is chemically inert.

HAZARDOUS DECOMPOSITION PRODUCTS
Ozone and Nitrogen Oxides may be formed by the radiation from the arc. See Section IV. Other decomposition products of normal operation originate from the volatilization, reaction or oxidation of the material being worked.

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	Will not Occur	None currently known.
	X	

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Argon is an asphyxiant. Evacuate all personnel from danger area. Use self contained breathing apparatus where needed. Shut off cylinder if without risk. Ventilate area of leak or move cylinder to well ventilated area. Test area, especially confined areas, for sufficient oxygen content prior to permitting re-entry of personnel.

WASTE DISPOSAL METHOD: Slowly release into atmosphere. Discard any product, residue, disposable container or liner in an environmentally acceptable manner in full compliance with Federal, State and local regulations.

RESPIRATORY PROTECTION (specify type) — Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select as per OSHA29 CFR1910.134.

VENTILATION	**LOCAL EXHAUST** — Use enough ventilation, local exhaust or both, to keep the fumes and gases below TLV's in the worker's breathing zone and the general area. Train the worker to keep his head out of the fumes.
	MECHANICAL (general) ALWAYS WORK WITH ENOUGH VENTILATION
	SPECIAL — Avoid using electric arcs in the presence of chlorinated hydrocarbon vapors — highly toxic phosgene may be produced. Avoid arc operations on parts with phosphate residues (anti-rust, cleaning preparations) — highly toxic phosphine may be produced.
	OTHER Depends on specific use conditions, and location. Use adequate ventilation or personal respiratory protection. See Section IX and OSHA29 CFR1910.252.
PROTECTIVE GLOVES	Welding gloves recommended

EYE PROTECTION — Wear a helmet or use a face shield with a filter lens selected as per ANSI Z49.1. Provide protective screens and flash goggles, if necessary, to protect others. Select as per OSHA29 CFR1910.133.

OTHER PROTECTIVE EQUIPMENT — As needed, wear hand, head, and body protection which help to prevent injury from radiation, sparks and electrical shock. See ANSI Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Train the worker not to touch live electrical parts.

Fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being worked, the process, procedure and electrodes used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being worked (such as paint, plating, or galvanizing), the number of workers and the volume of the work area, the quality and amount of ventilation, the position of the worker's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample from inside the worker's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1, available from the American Welding Society, 550 N.W. Le Jeune Rd., Miami, FL 33126.

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, "Safety In Welding And Cutting" published by the American Welding Society and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Washington, D.C. 20402 for more details. For further safety and health information refer to Linde's free publication "Precautions and Safe Practices for Electric Welding and Cutting" L52-529.

OTHER HANDLING AND STORAGE CONDITIONS

Arcs and sparks during use could be the source of ignition of combustible materials. Prevent fires.
Refer to NFPA 51B "Cutting and Welding Processes." High pressure gas mixture. Use piping and equipment adequately designed to withstand pressures to be encountered. Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Close valve when not in use and when empty. Do not strike arc on cylinder. The defect produced by an arc burn could lead to cylinder rupture. Do not ground cylinder. Never work on a pressurized system.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

LINDE
UNION CARBIDE

GENERAL OFFICES

IN THE USA:
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Linde Division
39 Old Ridgebury Road
Danbury, CT 06817-0001

IN CANADA:
Union Carbide Canada Limited
Linde Division
123 Eglinton Avenue East
Toronto, Ontario M4P IJ3

Other offices in principal cities all over the world.

Date: 8 March 1991
Revision No.: 1

A-1025 HELIUM MIXTURE

MATERIAL SAFETY DATA SHEET

An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional or area offices.
(Essentially similar to U.S. Department of Labor Form OMB No. 1218-0072 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

PRODUCT A-1025 Helium Mixture

CHEMICAL NAME	Argon-Helium-Carbon Dioxide mixture	**SYNONYMS**	Not Applicable
FORMULA	Ar, Co_2 & He	**CHEMICAL FAMILY**	Not Applicable
		MOLECULAR WEIGHT	Not Applicable

TRADE NAME A-1025 Helium Mixture (This product is intended for electric welding use.)

This section covers the materials from which this product is manufactured. The fumes and gases produced during cutting with the normal use of this product are covered by Section VI. The term "hazardous" should be interpreted as a term required and defined in OSHA 29 CFR 1910.1200 and does not necessarily imply the existence of any hazard.

MATERIAL (CAS NO.)	Vol (%)	1987-1988 ACGIH TLV-TWA (OSHA-PEL)	
Helium (7440-59-7)	90	Simple asphyxiant	(None currently established)
Argon (7440-37-1)	7.5	Simple asphyxiant	(None currently established)
Carbon Dioxide (124-38-9)	2.5	5000 ppm	(5000 ppm)

BOILING POINT, 760 mm. Hg	Not Applicable	**FREEZING POINT**	Not Applicable
SPECIFIC GRAVITY (H_2O = 1)	Gas	**VAPOR PRESSURE AT 20°C.**	Gas
VAPOR DENSITY (air = 1)	0.266	**SOLUBILITY IN WATER, % by wt.**	Negligible
PERCENT VOLATILES BY VOLUME	100	**EVAPORATION RATE (Butyl Acetate = 1)**	Not Applicable

APPEARANCE AND ODOR Colorless, odorless gas at normal temperature and pressure.

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514 — 640-6400
For routine information contact your local supplier

Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

UNION CARBIDE CORPORATION ☐ LINDE DIVISION
UNION CARBIDE CANADA LIMITED ☐ LINDE DIVISION

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THRESHOLD LIMIT VALUE
The ACGIH 1987-88 recommended limit for welding fume, not otherwise classified (NOC), is 5 mg/m³. TLV-TWA's should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations. See Section VI for specific fume constituents which may modify this TLV-TWA. Carbon dioxide TLV 5000ppm, argon and helium are classified as simple asphyxiants (ACGIH 1987-88).

EFFECTS OF SINGLE (ACUTE) OVEREXPOSURE:

SWALLOWING — This product is a gas at normal temperatures and pressures.

SKIN ABSORPTION — No evidence of adverse effects from available information.

INHALATION — Asphyxiant. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing, excess salivation, vomiting, and unconsciousness.

SKIN CONTACT — No evidence of adverse effects from available information.

EYE CONTACT — No evidence of adverse effects from available information.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE: Damage to retinal ganglion cells and central nervous system may occur.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: A knowledge of the available toxicology information and of the physical and chemical properties of the material suggest that overexposure is unlikely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: One published study has reported an increased incidence of cardiac malformations in offspring of female rats exposed for a single 24 hour interval to 6% carbon dioxide. Although the study suffers from design and reporting flaws, the results must still be considered significant. There is no information available to confirm or refute the effects reported. The relevance of this information to humans is unknown.

EMERGENCY AND FIRST-AID PROCEDURES:

SWALLOWING — This product is a gas at normal temperatures and pressures.

SKIN CONTACT — No emergency care anticipated.

INHALATION — Remove to fresh air. Give artificial respiration if not breathing. Qualified personnel may give oxygen if breathing is difficult. Obtain medical attention.

EYE CONTACT — Flush with water. Obtain medical attention if discomfort persists

NOTES TO PHYSICIAN: *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.*

WORKING WITH WELDING AND CUTTING MAY CREATE ADDITIONAL HEALTH HAZARDS

FUMES AND GASES can be dangerous to your health and may cause serious lung disease.*

Keep your head out of the fumes. Do not breathe fumes and gases caused by the process. Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. The type and amount of fumes and gases depend on the equipment and supplies used. Possibly dangerous materials may be found in fluxes, coatings, gases, metals etc. Get a Material Safety Data Sheet (MSDS) for every material used. Air samples can be used to find out what respiratory protection is needed.

Short term overexposure to fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes.

NOTES TO PHYSICIAN:

Acute — *Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose, and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty breathing, frequent coughing, or chest pains.*

Chronic — *Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest X-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on X-rays may be caused by non-work related factors such as smoking, etc.*

A detailed description of the Health Hazards and their consequences may be found in Linde's free publication "Precautions and Safe Practices for Electric Welding and Cutting," L52-529. You may obtain copies from your local supplier, or by writing to Union Carbide Corporation, Linde Division, Communications Department, 39 Old Ridgebury Road, Danbury, Connecticut, 06817-0001.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

FLASH POINT (test method)	Not Applicable	**AUTOIGNITION TEMPERATURE**	Not Applicable
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** Not Applicable	**UPPER**	Not Applicable

EXTINGUISHING MEDIA

Gas mixture cannot catch fire. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES

Evacuate all personnel from danger area. Immediately cool cylinders with water spray from maximum distance until cool then move containers away from fire area if without risk. Shut off leak if without risk.

Arcs and sparks can ignite combustibles. Refer to American National Standard Z49.1 "Safety in welding and cutting" for fire prevention information during the use of welding and allied procedures.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Gas mixture cannot catch fire. Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature.

STABILITY	
UNSTABLE	**STABLE**
	X

CONDITIONS TO AVOID
High pressure gas. Close valve when not in use and when empty. Use with equipment rated to adequately withstand pressures to be encountered. Do not strike arc on cylinder. Do not ground cylinder. See Section IX.

INCOMPATIBILITY (materials to avoid)
None currently known.

HAZARDOUS DECOMPOSITION PRODUCTS
The arc process may form gaseous reaction products such as Carbon Monoxide and Carbon Dioxide. Ozone and Nitrogen Oxides may be formed by the radiation from the arc. See Section IV. Other decomposition products of normal operation originate from the volatilization, reaction or oxidation of the material being worked.

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur	**Will not Occur**	None currently known.
	X	

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

This gas mixture is an asphyxiant. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off cylinder if without risk. Ventilate area of leak or move cylinder to well-ventilated area. Test area, especially confined areas, for sufficient oxygen content prior to permitting re-entry of personnel.

WASTE DISPOSAL METHOD: Slowly release into atmosphere. Discard any product, residue, disposable container or liner in an environmentally acceptable manner in full compliance with Federal, State and local regulations.

RESPIRATORY PROTECTION (specify type) — Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select as per OSHA29 CFR1910.134.

VENTILATION	**LOCAL EXHAUST** — Use enough ventilation, local exhaust or both, to keep the fumes and gases below TLV's in the worker's breathing zone and the general area. Train the worker to keep his head out of the fumes.
	MECHANICAL (general) ALWAYS WORK WITH ENOUGH VENTILATION
	SPECIAL — Avoid using electric arcs in the presence of chlorinated hydrocarbon vapors — Highly toxic phosgene may be produced. Avoid arc operations on parts with phosphate residues (anti-rust, cleaning preparations) — Highly toxic phosphine may be produced.
	OTHER Depends on specific use conditions, and location. Use adequate ventilation or personal respiratory protection. See Section IX and OSHA29 CFR1910.252.

PROTECTIVE GLOVES Welding gloves recommended

EYE PROTECTION — Wear a helmet or use a face shield with a filter lens selected as per ANSI Z49.1. Provide protective screens and flash goggles, if necessary, to protect others. Select as per OSHA29 CFR1910.133.

OTHER PROTECTIVE EQUIPMENT — As needed, wear hand, head, and body protection which help to prevent injury from radiation, sparks, and electrical shock. See ANSI Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Train the worker not to touch live electrical parts.

Fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being worked, the process, procedure and electrodes used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being worked (such as paint, plating, or galvanizing), the number of workers and the volume of the work area, the quality and amount of ventilation, the position of the worker's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample from inside the worker's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1, available from the American Welding Society, 550 N.W. Le Jeune Rd., Miami, FL 33135.

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, "Safety In Welding And Cutting" published by the American Welding Society and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Washington, D.C. 20402 for more details. For further safety and health information refer to Linde's free safety booklet, "Precautions and Safe Practices for Electric Welding and Cutting," L52-529.

OTHER HANDLING AND STORAGE CONDITIONS

Arcs and sparks during use could be the source of ignition of combustible materials. Prevent fires.
Refer to NFPA 51B "Cutting and Welding Processes." High pressure gas mixture. Use piping and equipment adequately designed to withstand pressures to be encountered. Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Close valve when not in use and when empty. Do not strike arc on cylinder. The defect produced by an arc burn could lead to cylinder rupture. Do not ground cylinder. Never work on a pressurized system.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

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IN CANADA:
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123 Eglinton Avenue East
Toronto, Ontario M4P IJ3

Other offices in principal cities all over the world.

Date: 8 March 1991
Revision No.: 1

CARBON DIOXIDE

Material Safety Data Sheet

CARBON DIOXIDE
QUICK IDENTIFIER
Common Name: (used on label and list)

May be used to comply with OSHA's Hazard Communication Standard, 29CFR 1910. 1200. Standard must be consulted for specific requirements.

SECTION 1 -

Manufacturer's Name: AMEREX CORPORATION

Address: P. O. Box 81

Emergency Telephone No.: 205/655-3271

City, State, and ZIP: TRUSSVILLE, AL 35173-0081

Other Information Calls: 205/655-3271

Signature of Person Responsible for Preparation (Optional): D. H. Ellison

Date Prepared: November 1985

SECTION 2 – HAZARDOUS INGREDIENTS/IDENTITY

Hazardous Component(s) (chemical & common name(s))	OSHA PEL	ACGIH TLV	Other Exposure Limits	% (optional)	CAS NO.
Carbon Dioxide	Unknown	5000 ppm	Unknown	100	124-38-9

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS

Boiling Point: At 1 ATM -109°F

Specific Gravity (H,O=1): N.A.

Vapor Pressure (mm Hg): At 70°F GAS

Vapor Density (Air = 1): 1.52

Solubility in Water: At 70°F 1 ATM 0.8 V/V H_2O

Reactivity in Water: N.A.

Appearance and Odor: N.A.

Melting Point: N.A.

SECTION 4 – FIRE & EXPLOSION DATA

Flash Point: N.A. F. C.

Method Used: N.A.

Flammable Limits in Air % by Volume: LEL Lower: N.A. UEL Upper: N.A.

Auto-Ignition Temperature: N.A.

Extinguisher Media: N.A.

Special Fire Fighting Procedures: N.A. This material is a fire fighting agent.

Unusual Fire and Explosion Hazards: N.A.

SECTION 5- PHYSICAL HAZARDS (REACTIVITY DATA)

Stability: Unstable ☐ Conditions to Avoid; Stable ☒ — N.A.

Incompatability (Materials to Avoid): N.A.

Hazardous Decomposition Products: None

Hazardous Polymerization: May Occur ☐ Will Not Occur ☒ Conditions to Avoid — N.A.

SECTION 6 – HEALTH HAZARDS

1. Acute: N.A.

2. Chronic: High concentrations can paralyze respiratory center.

Signs and Symptoms of Exposure: Increased inhalation will cause increased breathing rate. Unconsciousness and death may result.

Medical Conditions Generally Aggravated by Exposure: N.A.

Chemical Listed as Carcinogen or Potential Carcinogen — National Toxicology Program: Yes ☐ No ☒; I.A.R.C. Monographs: Yes ☐ No ☒; OSHA: Yes ☐ No ☒

Emergency and First Aid Procedures: See below.

ROUTES OF ENTRY

1. Inhalation: Remove to uncontaminated area. Apply cardiopulmonary resuscitation as needed. Obtain medical assistance.
2. Eyes: N.A.
3. Skin: N.A.
4. Ingestion: N.A.

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: Storage in ventilated area recommended.

Other Precautions: N.A.

Steps to be Taken in Case Material is Released or Spilled: N.A.

Waste Disposal Methods (Consult federal, state, and local regulations): N.A.

SECTION 8 – SPECIAL PROTECTION INFORMATION/CONTROL MEASURES

Respiratory Protection (Specify Type): Self contained

Ventilation: Yes — Local Exhaust: Yes — Mechanical (General): Yes — Special: No — Other: No

Protective Gloves: Optional — Eye Protection: Safety glasses

Other Protective Clothing or Equipment: N.A.

Work/Hygienic Practices: N.A.

Date: 8 March 1991
Revision No.: 1

CAUSTIC SODA

002175

CAUSTIC SODA LIQUID 50% INDUST

THIS MSDS COMPLIES WITH 29 CFR 1910.1200 (THE HAZARD COMMUNICATION STANDARD)

****

Product Name: CAUSTIC SODA LIQUID 50% INDUST
CAS NUMBER: 1310-73-2

Data Sheet No: 0000721-006
Prepared: 05/31/89
Supersedes: 02/08/89

05 50 021 9638600-

WESTON SERVICES
ATTEN: CLAY BOWEN
WESTCHESTER PA 19380

PRODUCT: 3150000
INVOICE: 814670
INVOICE DATE: 01/09/90
TO: WESTON SERVICES
12201 S OGLESBY AVE
CHICAGO IL 60633

ATTN: PLANT MGR./SAFETY DIR.

SECTION I—PRODUCT IDENTIFICATION

General or Generic ID: ALKALI

DOT Hazard Classification: CORROSIVE MATERIAL (173.240)

SECTION II—COMPONENTS

IF PRESENT, IARC, NTP AND OSHA CARCINOGENS AND CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III SECTION 313 ARE IDENTIFIED IN THIS SECTION.
SEE DEFINITION PAGE FOR CLARIFICATION

INGREDIENT	% (by WT)	PEL	TLV	Note
SODIUM HYDROXIDE CAS #: 1310-73-2	50	2 MG/M3 - CEILING	2 MG/M3 - CEILING	(1)

Notes:

(1) THIS CHEMICAL IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF SARA TITLE III.

SECTION III—PHYSICAL DATA

Boiling Point	for PRODUCT	288.00 Deg F (142.22 Deg C) @ 760.00 mm Hg
Vapor Pressure	for PRODUCT	3.00 mm Hg @ 100.00 Deg F (37.77 Deg C)
Specific Vapor Density		HEAVIER THAN AIR
Specific Gravity		1.525 @ 68.00 Deg F (20.00 Deg C)
Percent Volatiles		50.00%
Evaporation Rate		SLOWER THAN ETHER
pH		14.0
Appearance		CLEAR & COLORLESS
State		LIQUID
Form		HOMOG SOLN

SECTION IV—FIRE AND EXPLOSION INFORMATION

FLASH POINT NOT APPLICABLE

EXPLOSIVE LIMIT NOT APPLICABLE

EXTINGUISHING MEDIA:

HAZARDOUS DECOMPOSITION PRODUCTS: NOT APPLICABLE

FIREFIGHTING PROCEDURES: WEAR SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN THE POSITIVE PRESSURE DEMAND MODE AND FULL BODY PROTECTION WHEN FIGHTING FIRES.

SPECIAL FIRE & EXPLOSION HAZARDS: CAN REACT WITH CHEMICALLY REACTIVE METALS SUCH AS ALUMINUM, ZINC, MAGNESIUM, COPPER ETC. TO RELEASE HYDROGEN GAS WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR.

NFPA CODES: HEALTH- 3 FLAMMABILITY- 0 REACTIVITY- 1

SECTION V—HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE LEVEL 2 MG/M3 - CEILING

THRESHOLD LIMIT VALUE 2 MG/M3 - CEILING

EFFECTS OF ACUTE OVEREXPOSURE: FOR PRODUCT

EYES - CAUSES SEVERE DAMAGE AND EVEN BLINDNESS VERY RAPIDLY.
SKIN - CAUSES BURNS, POSSIBLE DEEP ULCERATION.
BREATHING - MIST CAN CAUSE DAMAGE TO NASAL AND RESPIRATORY PASSAGES.
SWALLOWING - RESULTS IN SEVERE DAMAGE TO MUCOUS MEMBRANES AND DEEP TISSUES.

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CONTINUED ON PAGE: 2

SECTION V-HEALTH HAZARD DATA (Continued)

FIRST AID:

IF ON SKIN: IMMEDIATELY FLUSH EXPOSED AREA WITH WATER FOR AT LEAST 15 MINUTES, GET MEDICAL ATTENTION. REMOVE CONTAMINATED CLOTHING. LAUNDER CONTAMINATED CLOTHING BEFORE RE-USE.

REMOVE CONTAMINATED SHOES PROMPTLY. DISCARD SHOES SATURATED WITH THIS PRODUCT.

IF IN EYES: IMMEDIATELY FLUSH WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER AND LOWER LIDS OCCASIONALLY. GET IMMEDIATE MEDICAL ATTENTION.

IF PHYSICIAN IS NOT IMMEDIATELY AVAILABLE, CONTINUE FLUSHING WITH WATER.

DO NOT USE CHEMICAL ANTIDOTE.

IF SWALLOWED: DO NOT INDUCE VOMITING. VOMITING WILL CAUSE FURTHER DAMAGE TO THE THROAT. DILUTE BY GIVING WATER. GIVE MILK OF MAGNESIA. KEEP WARM, QUIET. GET MEDICAL ATTENTION IMMEDIATELY.

IF BREATHED: IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING HAS STOPPED GIVE ARTIFICIAL RESPIRATION. KEEP PERSON WARM, QUIET AND GET MEDICAL ATTENTION.

PRIMARY ROUTE(S) OF ENTRY:

SKIN CONTACT, INHALATION

SECTION VI-REACTIVITY DATA

HAZARDOUS POLYMERIZATION: CANNOT OCCUR

STABILITY: STABLE

INCOMPATIBILITY: AVOID CONTACT WITH:, STRONG MINERAL ACIDS., REACTIVE METALS SUCH AS ALUMINUM AND MAGNESIUM, ORGANIC MATERIALS, WATER, STRONG ORGANIC ACIDS, COPPER

SECTION VII-SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

SMALL SPILL: NEUTRALIZE AND MOP UP SOLUTION.

LARGE SPILL: COLLECT AND ADD SLOWLY TO LARGE VOLUME OF WATER.

PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM AREA OF SPILL UNTIL CLEAN-UP IS COMPLETED. STOP SPILL AT SOURCE. DIKE TO PREVENT SPREADING. PUMP TO SALVAGE TANK.

WASTE DISPOSAL METHOD:

SMALL SPILL: DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.

LARGE SPILL: POUR INTO A LARGE TANK OF WATER AND NEUTRALIZE. FLUSH TO DRAIN WITH LARGE EXCESS OF WATER IN ACCORDANCE WITH APPLICABLE REGULATIONS.

SECTION VIII-PROTECTIVE EQUIPMENT TO BE USED

RESPIRATORY PROTECTION: IF WORKPLACE EXPOSURE LIMIT(S) OF PRODUCT OR ANY COMPONENT IS EXCEEDED (SEE SECTION II), A NIOSH/MSHA APPROVED AIR SUPPLIED RESPIRATOR IS ADVISED IN ABSENCE OF PROPER ENVIRONMENTAL CONTROL. OSHA REGULATIONS ALSO PERMIT OTHER NIOSH/MSHA RESPIRATORS (NEGATIVE PRESSURE TYPE) UNDER SPECIFIED CONDITIONS (SEE YOUR SAFETY EQUIPMENT SUPPLIER). ENGINEERING OR ADMINISTRATIVE CONTROLS SHOULD BE IMPLEMENTED TO REDUCE EXPOSURE.

VENTILATION: PROVIDE SUFFICIENT MECHANICAL (GENERAL AND/OR LOCAL EXHAUST) VENTILATION TO MAINTAIN EXPOSURE BELOW TLV(S).

PROTECTIVE GLOVES: WEAR RESISTANT GLOVES SUCH AS:, NEOPRENE, NITRILE RUBBER, POLYVINYL CHLORIDE, POLYETHYLENE

EYE PROTECTION: CHEMICAL SPLASH GOGGLES AND FACE SHIELD (8" MIN.) IN COMPLIANCE WITH OSHA REGULATIONS ARE ADVISED; HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER TYPE SAFETY GLASSES. (CONSULT YOUR SAFETY EQUIPMENT SUPPLIER)

OTHER PROTECTIVE EQUIPMENT: TO PREVENT SKIN CONTACT, WEAR IMPERVIOUS CLOTHING AND BOOTS.

EYEWASH STATION, EMERGENCY SHOWER.

SECTION IX-SPECIAL PRECAUTIONS OR OTHER COMMENTS

CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED.SINCE EMPTIED CONTAINERS RETAIN PRODUCT RESIDUES (VAPOR, LIQUID, AND/OR SOLID), ALL HAZARD PRECAUTIONS GIVEN IN THE DATA SHEET MUST BE OBSERVED.

THE INFORMATION ACCUMULATED HEREIN IS BELIEVED TO BE ACCURATE BUT IS NOT WARRANTED TO BE WHETHER ORIGINATING WITH THE COMPANY OR NOT. RECIPIENTS ARE ADVISED TO CONFIRM IN ADVANCE OF NEED THAT THE INFORMATION IS CURRENT, APPLICABLE, AND SUITABLE TO THEIR CIRCUMSTANCES.

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1 (800) 274-5263 or
1-8[illegible]-ASHLAND

DEFINITIONS

This definition page is intended for use with Material Safety Data Sheets supplied by the Ashland Chemical Company. Recipients of these data sheets should consult the OSHA Safety and Health Standards (29 CFR 1910), particularly subpart G - Occupational Health and Environmental Control, and subpart I - Personal Protective Equipment, for general guidance on control of potential Occupational Health and Safety Hazards.

SECTION I
PRODUCT IDENTIFICATION

GENERAL OR GENERIC ID: Chemical family or product description.

DOT HAZARD CLASSIFICATION: Product meets DOT criteria for hazards listed.

SECTION II
COMPONENTS

Components are listed in this section if they present a physical or health hazard and are present at or above 1% in the mixture. If a component is identified as a CARCINOGEN by NTP, IARC or OSHA as of the date on the MSDS, it will be listed and footnoted in this section when present at or above 0.1% in the product. Negative conclusions concerning carcinogenicity are not reported. Additional health information may be found in Section V. Components subject to the reporting requirements of Section 313 of SARA Title III are identified in the footnotes in this section, along with typical percentages. Other components may be listed if deemed appropriate.

Exposure recommendations are for components. OSHA Permissible Exposure Limits (PELs) and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) appear on the line with the component identification. Other recommendations appear as footnotes.

SECTION III
PHYSICAL DATA

BOILING POINT: Of product if known. The lowest value of the components is listed for mixtures.

VAPOR PRESSURE: Of product if known. The highest value of the components is listed for mixtures.

SPECIFIC VAPOR DENSITY: Compared to AIR = 1. If Specific Vapor Density of product is not known, the value is expressed as lighter or heavier than air.

SPECIFIC GRAVITY: Compared to WATER = 1. If Specific Gravity of product is not known, the value is expressed as less than or greater than water.

pH: If applicable.

PERCENT VOLATILES: Percentage of material with initial boiling point below 425 degrees Fahrenheit.

EVAPORATION RATE: Indicated as faster or slower than ETHYL ETHER, unless otherwise stated.

SECTION IV
FIRE AND EXPLOSION DATA

FLASH POINT: Method identified.

EXPLOSION LIMITS: For product if known. The lowest value of the components is listed for mixtures.

HAZARDOUS DECOMPOSITION PRODUCTS: Known or expected hazardous products resulting from heating, burning or other reactions.

SECTION IV (cont.)

EXTINGUISHING MEDIA: Following National Fire Protection Association criteria.

FIREFIGHTING PROCEDURES: Minimum equipment to protect firefighters from toxic products of vaporization, combustion or decomposition in fire situations. Other firefighting hazards may also be indicated.

SPECIAL FIRE AND EXPLOSION HAZARDS: States hazards not covered by other sections.

NFPA CODES: Hazard ratings assigned by the National Fire Protection Association.

SECTION V
HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE LIMIT: For product.

THRESHOLD LIMIT VALUE: For product.

EFFECTS OF ACUTE OVEREXPOSURE: Potential local and systemic effects due to single or short term overexposure to the eyes and skin or through inhalation or ingestion.

EFFECTS OF CHRONIC OVEREXPOSURE: Potential local and systemic effects due to repeated or long term overexposure to the eyes and skin or through inhalation or ingestion.

FIRST AID: Procedures to be followed when dealing with accidental overexposure.

PRIMARY ROUTE OF ENTRY: Based on properties and expected use.

SECTION VI
REACTIVITY DATA

HAZARDOUS POLYMERIZATION: Conditions to avoid to prevent hazardous polymerization resulting in a large release of energy.

STABILITY: Conditions to avoid to prevent hazardous or violent decomposition.

INCOMPATIBILITY: Materials and conditions to avoid to prevent hazardous reactions.

SECTION VII
SPILL OR LEAK PROCEDURES

Reasonable precautions to be taken and methods of containment, clean-up and disposal. Consult federal, state and local regulations for accepted procedures and any reporting or notification requirements.

SECTION VIII
PROTECTIVE EQUIPMENT TO BE USED

Protective equipment which may be needed when handling the product.

SECTION IX
SPECIAL PRECAUTIONS OR OTHER COMMENTS

Covers any relevant points not previously mentioned.

ADDITIONAL COMMENTS

Containers should be either reconditioned by CERTIFIED firms or properly disposed of by APPROVED firms. Disposal of containers should be in accordance with applicable laws and regulations. "EMPTY" drums should not be given to individuals. Serious accidents have resulted from the misuse of "EMPTIED" containers (drums, pails, etc.). Refer to Sections IV and IX.

Date: 8 March 1991
Revision No.: 1

COMPRESSED AIR

LIQUID AIR CORPORATION
INDUSTRIAL GASES DIVISION

ADDITIONAL DATA

TRADE NAME AND SYNONYMS: (Continued)

Air; Compressed Air; Compressed Air, Breathing Quality

NOTE: Atmospheric air which is compressed is composed of the following concentrations of gases:

Gas	Molar %
Nitrogen	78.09
Oxygen	20.94
Argon	0.93
Carbon Dioxide	0.033*
Neon	18.18×10^{-4}
Helium	5.239×10^{-4}
Krypton	1.139×10^{-4}
Hydrogen	0.5×10^{-4}
Xenon	0.086×10^{-4}
Radon	6×10^{-18}
Water vapor	Varying concentrations

* Concentrations may have slight variations.

Compressed air is also produced by reconstitution using only oxygen and nitrogen. This product contains 79 molar percent nitrogen and 21 molar percent oxygen plus trace amounts of other atmospheric gases which are present in the oxygen and nitrogen.

LIQUID AIR CORPORATION
INDUSTRIAL GASES DIVISION

Material Safety Data Sheet

PRODUCT NAME: Compressed Air

TELEPHONE (415) 977-8500
EMERGENCY RESPONSE INFORMATION ON PAGE 2

LIQUID AIR CORPORATION
INDUSTRIAL GASES DIVISION
One California Plaza, Suite 350
2121 N. California Blvd.
Walnut Creek, California 94596

ISSUE DATE AND REVISIONS: OCTOBER 1, 1985 CORPORATE SAFETY DEPT.

TRADE NAME AND SYNONYMS: See last page.

CAS NUMBER: N/A

CHEMICAL NAME AND SYNONYMS: Air

FORMULA: See note on last page. MOLECULAR WEIGHT: 28.966

CHEMICAL FAMILY: N/A

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

None listed (ACGIH, 1984-85).

SYMPTOMS OF EXPOSURE

Air is nontoxic and necessary to support life. Inhalation of air in a high pressure environment such as underwater diving, caissons or hyperbaric chambers can result in symptoms similar to overexposure to pure oxygen. These include tingling of fingers and toes, abnormal sensations, impaired coordination and confusion. Decompression sickness pains or "bends" are possible following rapid decompression.

TOXICOLOGICAL PROPERTIES

High pressure effects (greater than two atmospheres of oxygen) are on the central nervous system. Improper decompression results in the accumulation of nitrogen in the blood.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	I.A.R.C. Monographs	OSHA
	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

RECOMMENDED FIRST AID TREATMENT

Facilities or practices at which air is breathed in a high pressure environment should be prepared to deal with illnesses associated with decompression (Bends or Caisson Disease). Decompression equipment may be required.

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Liquid Air Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or consequences of its use. Since Liquid Air Corporation has no control over the use of this product, it assumes no liability for damage or loss of product resulting from proper (or improper) use or application of the product. Data Sheets may be changed from time to time. Be sure to consult the latest edition.

LAC 69 M2

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

N/A

PHYSICAL DATA

BOILING POINT: -317.9°F (-194.4°C)	LIQUID DENSITY AT BOILING POINT: 54.70 lb/ft^3 (876.21 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C) above the critical temperature of -220.4°F (-140.2°C)	GAS DENSITY AT 70°F 1 atm: .0749 lb/ft^3 (1.200 kg/m^3)
SOLUBILITY IN WATER @ 68°F (20°C) Bunsen coefficient = .0185	FREEZING POINT: N/A; Bubble Point @ 1 Atm. = -317.8°F (-194.35°C)
APPEARANCE AND ODOR: Colorless, odorless gas. Specific gravity @70°F (Air = 1.0) is 1.0.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): N/A	AUTO IGNITION TEMPERATURE: N/A	FLAMMABLE LIMITS % BY VOLUME: N/A
EXTINGUISHING MEDIA: Nonflammable gas		ELECTRICAL CLASSIFICATION: Nonhazardous

SPECIAL FIRE FIGHTING PROCEDURES

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

Compressec air at high pressures will accelerate the burning of materials to a greater rate thar. tney burn at atmospheric pressure.

REACTIVITY DATA

STABILITY: Unstable		CONDITIONS TO AVOID
Stable	X	

INCOMPATIBILITY (Materials to avoid): None

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION: May Occur		CONDITIONS TO AVOID
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

N/A

WASTE DISPOSAL METHOD

N/A

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type): N/A

VENTILATION: N/A	LOCAL EXHAUST: N/A	SPECIAL
	MECHANICAL (Gen.): N/A	OTHER

PROTECTIVE GLOVES: Any material

EYE PROTECTION: Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT: Safety shoes

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Air, compressed DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1002

SPECIAL HANDLING RECOMMENDATIONS

Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1

SPECIAL PACKAGING RECOMMENDATIONS

Dry air is noncorrosive and may be used with all materials of construction. Moisture causes metal oxides which are formed with air to be hydrated so that they increase in volume and lose their protective role (rust formation). Concentrations of SO_2, Cl_2, salt, etc. in the moisture ennances the rusting of metals in air.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies e.g., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

Date: 8 March 1991
Revision No.: 1

CORAL PLASTIC

MATERIAL SAFETY DATA SHEET

HARBISON-WALKER REFRACTORIES
Dresser Industries, Inc.
One Gateway Center, Pittsburgh, Pennsylvania 15222

TELEPHONE: 412-562-6200

DISCLAIMER

11-17-88

This data sheet is based on OSHA FORM 174 but modified to more adequately suit refractory products. All data are subject to reasonable variation. This information is supplied in good faith by Harbison-Walker and is applicable to the product as shipped. Your application of the product may change its characteristics. THE DATA PROVIDED HEREIN ARE BELIEVED CORRECT OR ARE OBTAINED FROM SOURCES BELIEVED TO BE GENERALLY RELIABLE. HARBISON-WALKER SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THIS PRODUCT, AND HARBISON-WALKER ASSUMES NO OBLIGATION OR LIABILITY FOR RELIANCE OF THE INFORMATION CONTAINED IN THIS DATA SHEET. This data is not part of any contract or condition of sale. It is solely supplied as an accomodation to the buyer.

SECTION I - PRODUCT IDENTIFICATION

Product Tradename:	Type of Refractory:
CORAL PLASTIC & CORAL PLASTIC FINE	Phosphate Bonded High Alumina Plastic

SECTION II - HAZARDOUS INGREDIENTS

SEE CHECKED BLOCKS INGREDIENT	GEN. CHEM. FORMULA	C.A.S. NUMBER	PERCENTAGE RANGE	OSHA P.E.L.	ACGIH TLV *	NIOSH CRITERIA DOCUMENT NO.
☒ Quartz	SiO_2	14808-607	0 - 1	$\frac{10\ mg/m^3}{\%\ Respirable\ Quartz + 2}$	0.1 mg/m^3	75-120
☐ Cristobalite	SiO_2	14464-46-1		½ Quartz Value	0.05 mg/m^3	75-120
☐ Tridymite	SiO_2	15468-32-3		½ Quartz Value	0.05 mg/m^3	75-120
☐ Fused Silica	SiO_2	60676-86-0		20 mppcf	Use Quartz TLV	75-120
☐ Coal Tar Products	N/A	65996-93-2		0.2mg/m^3	0.2 mg/m^3	78-107
☐ Petroleum Pitch	N/A	8052-42-4		NONE	0.2 mg/m^3	78-106
☒ Phosphoric Acid*	H_3PO_4	7664-38-2	6 - 7	1.0 mg/m^3 (mist)	1.0 mg/m^3	NONE
☐ Magnesia	MgO	1309-48-4		10 mg/m^3	10 mg/m^3	NONE
☒ Free Alumina*	Al_2O_3	1344-28-1	64 - 66	10 mg/m^3	10 mg/m^3	NONE
☐ Lime	CaO	1305-78-8		5.0 mg/m^3	2.0 mg/m^3	NONE
☐ Chrome III Oxide*	Cr_2O_3	1308-38-9		1.0 mg/m^3	0.5mg/m^3	NONE
☐						
☐						
☐						

* Subject to reporting under Section 313, Sara Title III

SECTION III - PHYSICAL DATA

Appearance and Odor: Gray Color; Acid Odor

Specific Gravity: 2.76 pH: ND

Solubility in Water: Slight Phosphoric Acid

Other:

FORM:

___ Brick

___ Granular

___ Paste

SECTION IV - FIRE AND EXPLOSION DATA

UNLESS OTHERWISE NOTED, NONE Product is a refractory, and will not burn.

SECTION V - HEALTH HAZARD DATA*

*SEE CHECKED BLOCKS		EXPOSURE REQUIRED	
INGREDIENT	EFFECTS OF OVEREXPOSURE	PROLONGED	SHORT TERM
☒ Free Crystalline Silica	Delayed lung fibrosis - silicosis	✓	
☐ Coal Tar Products	Skin, lung mucous membrane carcinogen	✓	
	Skin irritation; photosensitization		
☐ Petroleum Pitch	(Same as Coal Tar Products)	✓	✓
☐ Magnesia	Irritant to skin, eyes, mucous membranes, etc.		✓
☐ Lime	Irritant to skin, eyes, mucous membranes, etc.		✓
☒ Free Alumina	Irritant to skin, eyes, mucous membranes, etc		✓
☐ Fused Silica	Delayed lung fibrosis-silicosis	✓	
☒ Phosphoric Acid	Primary irritant - skin, eyes, etc.		✓
☐ Chrome III Oxide	Irritant to skin, eyes, mucous membranes, etc.		✓
☐	—		
☐			

EMERGENCY OR FIRST AID PROCEDURES:

☒ Irritants: Wash from skin or flush from eyes using copious amounts of water.

☐ Coal Tar Products: Remove from skin by washing with soap and water. DO NOT use solvents. Same for Petroleum Pitch.

☐ Other:

SECTION VI - REACTIVITY DATA

STABILITY: ☒ STABLE ☐ UNSTABLE

Hazardous decomposition products:

Hazardous Polymerization: ☐ may occur ☒ will not occur

COMMENTS: Incompatability (material to avoid)

Store in cool area prior to use

SECTION VII - SPILL AND LEAK PROCEDURES

Most refractory products may be landfilled. However, since your application of this product may change its chemical characteristics, and since disposal procedures may vary with locale and are subject to change, you should consult the governmental authority having jurisdiction for disposal information.

COMMENTS:

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (CHECK ONE): ☒ Approved Dust ☐ Other (Specify):

VENTILATION: Local exhaust ventilation should be provided if routine operation generates dust in excess of allowable limits

PROTECTIVE GLOVES (CHECK TYPE): ☐ Acid Resistant ☐ Impermeable ☒ Abrasion Resistant ☐ Other (Specify):

EYE PROTECTION: Approved safety glasses, goggles or faceshields should be used when handling refractory products.

FOOT PROTECTION (CHECK TYPE): ☒ Metatarsal safety ☐ Impermeable

PROTECTIVE CLOTHING (SPECIFY):

SECTION IX - SPECIAL PRECAUTIONS

☐ If block is checked, product contains coal tar pitch, petroleum pitch or creosote. Over-exposure to dust/ volatiles may cause cancer and/ or irritation to eyes, skin and respiratory tract.
Do not breathe dust/ fumes; use with proper ventilation. NIOSH approved respirators and protective clothing should be worn while handling this product.

☐ If block is checked, this resin bonded product contains free formaldehyde and phenol. Exposure to dust and vapor may cause irritation of skin, eyes, nose, and throat. Allergic skin reaction may also occur. Avoid prolonged or repeated contact with eyes or skin; avoid breathing dust or vapor. Wash thoroughly after handling. Wear rubber gloves and approved NIOSH respirator.

☒ If block is checked, the product contains crystalline silica for which there is limited evidence of a possible association with the incidence of cancer in humans.

Prepared By: C. D. Jamison

Emergency Phone: 412-562-8437

Date: 8 March 1991
Revision No.: 1

EZ WELD MULTIPURPOSE SOLVENT CEMENT

MATERIAL SAFETY DATA SHEET

P.C.I. INDUSTRIES, INC.
P.O. BOX 9845
1661 OLD DIXIE HIGHWAY
RIVIERA BEACH, FL 33419
407-844-0241 EMERGENCY & INFORMATION

Issue Date: 1-1-89
Supersedes: 2-20-86
Prepared by Harry Austin

This MSDS complies with OSHA 29 CFR 1910.1200 (The Hazard Communication Standard)

SECTION I - PRODUCT IDENTIFICATION

PRODUCT IDENTITY (Trade Name) : Master Plumber EZ WELD MULTIPURPOSE SOLVENT CEMENT
DOT HAZARD CLASSIFICATION : Flammable liquid, 3.1

SECTION II - HAZARDOUS INGREDIENTS

SPECIFIC CHEMICAL NAME	CAS#	OSHA PEL	ACGIH TLV	STEL	%WT
Tetrahydrofuran (THF)	109-99-9	200ppm	200ppm	250ppm	35
Methyl Ethyl Ketone (MEK)	78-93-3	200ppm	200ppm	300ppm	42
Cyclohexanone	108-94-1	50ppm	25ppm	100ppm	8

Carcinogenicity - None of the above hazardous ingredients are considered to be carcinogenic by NTP, IARC, or OSHA, thus there is no reason to assume the mixture would be carcinogenic as no new compounds are being formed thru chemical reaction.

HMIS / NFPA HAZARD CODE Health -1 Flammability - 3 Reactivity - 0

SECTION IIA- NON-HAZARDOUS INGREDIENTS

	CAS#	%WT
Chlorinated Poly (Vinyl Chloride) Resin (Chlorothene)	686-48-82-8	15

SECTION 313 - SUPPLIER NOTIFICATION

This product contains toxic chemicals (* See Above) subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-to-Know Act of 1986 and of 40CFR37.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point - 150°F
Auto Ignition - 610°F
Percent Volatiles - 85%
Solubility in Water - 60%
Specific Gravity (H_2O=1) - 0.9
Vapor Pressure - 114mm Hg @ 63°F
Vapor Density (Air=1) - 2.5
Evaporation Rate (N-Butyl Acetate=1) -4
Appearance and Odor - Light yellow colored liquid with strong solvent odor.

SECTION IV - FIRE & EXPLOSION HAZARD DATA

Flash Point (TCC) - 6°F
Flammable Limits in Air - Lower - 2% Upper - 12%
Extinguishing Media - Alcohol resistant foam, carbon dioxide or dry chemicals.
Firefighting Procedures: Wear self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode when fighting fires.

Special Fire & Explosion Hazards: Vapors are heavier than air and may travel along the ground or may be moved by ventilation and ignited by pilot lights, other flames, sparks, heater, smoking, electric motors, static discharge, or other ignition sources at locations distant from material handling point.

Hazardous Decomposition Products : May form toxic materials: carbon dioxide, carbon monoxide and various hydrocarbons.

P.C.I. INDUSTRIES, INC.
P.O. BOX 9845
1661 OLD DIXIE HIGHWAY
RIVIERA BEACH, FLORIDA 33404
305-844-0241 EMERGENCY & INFORMATION

SECTION V - REACTIVITY DATA

Stability : Stable

Hazardous Decomposition : None

Hazardous Polymerization : Cannot Occur

Incompatibility : Avoid contact with strong oxidizing agents

SECTION VI - HEALTH HAZARD DATA

Primary routes of Entry: Inhalation and skin contact.

Effects of Acute Overexposure: Potential local and systemic effects due to single or short term overexposure to the eyes and skin or through inhalation or ingestion.

Eye Contact: Causes irritation, redness, tearing, blurred vision.

Skin Contact: Can cause slight to moderate irritation and defatting (dryness).

Inhalation: Can cause nasal and respiratory irritation and headache.

Swallowing: Can cause gastrointestinal irritation, nausea, dizziness, vomiting and diarrhea.

Effects of chronic overexposure:
Potential local and systemic effects due to repeated or long term overexposure to th eyes and skin or through inhalation or ingestion.

Eye Contact: Marked irritation (burn), possible transient corneal or conjunctival injury.

Skin Contact: Severe irritation and defatting. Can cause a rash. LD50 (Rabbit): 1000 mg/kg

Inhalation: Can cause respiratory irritation, vomiting and incoordination. TCL_o (Human): 75 p

Swallowing: Causes nausea, vomiting, headache, dizziness, stupor, diarrhea.LD50 (Rat):1620mg/

Emergency First Aid Procedures:

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Skin Contact: Remove contaminated clothing prior to flushing with water. Launder contaminated clothing before re-use. Wash skin thoroughly with mild soap and water.

Inhalation: Seek Fresh air. If person is affected, remove to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Keep person warm, quiet and get medical attention.

Swallowing: Do not induce vomiting. If person is conscious, dilute by giving two glasses of water. Call a physician. Keep person warm and quiet.

P.C.I. INDUSTRIES, INC.
P.O. BOX 9845
1661 OLD DIXIE HIGHWAY
RIVIERA BEACH, FLORIDA 33404

305-844-0241 EMERGENCY & INFORMATION

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SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Accidental Release or Spill : Extinguish and do not turn on any ignition source until area is determined to be free from explosion or fire hazards.

Small Spill: Absorb with earth, sand or similar inert material and dispose of with solid waste according to federal, state and local regulations. Flush spill area with water.

Large Spill: Erect temporary (or permanent) dike to contain spill. Collect and destroy by liquid incineration. Otherwise, dilute with water and using inert absorbent materi shovel into containers to be disposed of as solid waste according to federal, state and local regulations.

Waste Disposal: Comply with federal, state and local regulations. If permits and regulations allow, may be incinerated, allowed to evaporate or solidified with inert material and disposed of.

Precautions to be taken in Handling and Storage:
Keep away from heat, sparks, and flame. Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Keep container closed. Use with adequate ventilation. Wash thoroughly after using.

Other Precautions: Containers of this material may be hazardous when emptied since emptied containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given in data sheet above must be observed.

SECTION VIII - CONTROL MEASURES

Respiratory Protection: If the TLV of the product or any component of it is exceeded, a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSA/MSHA respirators under specified conditions.

Ventilation: If the product is used in a confined area, provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV (s). Explosion-proof equipment is advised.

Protective Gloves: Rubber, butyl or other impervious gloves.

Eye Protection: Chemical safety splash glasses.

Other Protective Clothing or Equipment: Eye bath, safety shower, face shield, rubber safety boots.

The information accumulated herein is believed to be accurate but is not warranted to be, whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

Date: 8 March 1991
Revision No.: 1

FERROQUEST

Material Safety Data Sheet

Emergency Phone
312-438-8241

Section 1 Product Identification

TRADE NAME: FERROQUEST

PRODUCT TYPE: Cooling water treatment

CODE IDENT.: 11-037

DOT SHIPPING NAME: Alkaline Corrosive Liquid, NOS Corrosive Material NA 1719

Section 2 Hazardous Ingredients

	CAS NUMBER	%	EXPOSURE CRITERIA
Sodium hydroxide	1310-73-2	< 2.0	Ceiling limit - 2 mg/m3
Trisodium nitrilotriacetate	5064-31-3	< 1.2	See section 6

HMIS 2-0-0

EPA REGISTRATION NO. NA

Section 3 Physical Data

BOILING POINT, 760 mm Hg	ND	MELTING POINT	NA
FREEZING POINT	ND	VAPOR PRESSURE	ND
SPECIFIC GRAVITY (H_2O = 1)	1.19	SOLUBILITY IN H_2O	Appreciable
VAPOR DENSITY (AIR = 1)	ND	EVAPORATION RATE, (Bu Ac = 1)	< 1
% VOLATILES BY VOLUME	ND	pH	12.0

APPEARANCE & ODOR

Brown liquid, mild odor

Section 4 Fire & Explosion Hazard Data

FLASH POINT (& METHOD USED)	FLAMMABLE LIMITS IN AIR % BY VOLUME LOWER	UPPER	AUTO IGNITION TEMPERATURE
NA, water-based product	NA	NA	NA

EXTINGUISHING MEDIA: FOAM CO2 DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES:

Alkaline product - keep drums cool and intact.
Firefighters should wear full protective gear including self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARD:

None known

Section 5 Reactivity Data

STABILITY (NORMAL CONDITIONS): Stable

CONDITIONS TO AVOID: Extreme heat

INCOMPATIBILITY (MATERIALS TO AVOID)

Strong oxidizing agents, acids

HAZARDOUS DECOMPOSITION PRODUCTS

CO, CO2, oxides of nitrogen

HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID: Not applicable

Section 6 Health Hazard Information

TOXICITY INFORMATION:
Based on tests with laboratory rats and mice, NTP has listed NTA as a suspect carcinogen. According to ACGIH guidelines, NTA would not "be considered an occupational carcinogen of any practical significance." *

EFFECTS OF OVEREXPOSURE:
*There is no evidence that NTA is a human carcinogen.

INHALATION: Alkaline liquid, avoid breathing vapors or mist which may irritate respiratory passages.

INGESTION: Harmful if swallowed.

SKIN OR EYE CONTACT: Prolonged or frequent skin contact may cause irritation.

EMERGENCY AND FIRST AID PROCEDURES

INHALATION: Remove affected persons to fresh air amd treat symptoms.

INGESTION: If conscious, feed large quantities of water or citrus juice. Contact physician.

SKIN CONTACT: Flush skin with water then wash with soap and water. Remove contaminated clothing and wash before reuse.

EYE CONTACT: Flush eyes with water and seek medical attention.

Section 7 Special Protection Info

VENTILATION REQUIREMENTS
Use adequate mechanical ventilation.

RESPIRATORY PROTECTION (SPECIFY TYPE)
None special

EYE PROTECTION
Chemical goggles or face shield

GLOVES
Alkali resistant

OTHER PROTECTIVE CLOTHING AND EQUIPMENT

Alkali resistant clothing - rubber apron, boots.

Section 8 Spill or Leak Procedures

STEPS TO TAKE IF MATERIAL IS RELEASED OR SPILLED

Wear protective clothing. Soak up on an inert absorbent material or flush into an approved disposal system. Flush area of spill with water.

WASTE DISPOSAL METHOD

Dispose of in accordance with applicable federal, state and local regulations.

This product IS an EPA Hazardous Waste (Corrosive D002)

Section 9 Special Precautions

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Store drums closed and away from extreme temperatures.
Handle with care - highly alkaline liquid.

OTHER PRECAUTIONS

For industrial use only. Keep out of reach of children.

PREPARED BY: S. Morss DATE: 7/27/88

The data included herein are presented according to W. R. Grace & Co.'s practices current at the time of preparation hereof, are made available solely for the consideration, investigation and verification of the original recipients hereof and do not constitute a representation or warranty for which Grace assumes legal responsibility. It is the responsibility of a recipient of this data to remain currently informed on chemical hazard information, to design and update its own safety program and to comply with all national, federal, state, and local laws and regulations applicable to safety, occupational health, right to know and enviromental protection.

GRACE Dearborn
Dearborn Division W. R. Grace & Co., 300 Genesee Street, Lake Zurich, IL 60047 (312) 438-8241

Date: 8 March 1991
Revision No.: 1

FIBER GLASS REINFORCEMENTS

Material Safety Data Sheet

CertainTeed

CertainTeed Corporation
P.O. Box 860
Valley Forge, PA 19482
(215) 341-7000

Prepared 3/27/87

Product Identification (Label Name) Fiber Glass Reinforcements

Chemical Name N/A

CAS No. N/A

Common Name(s) Fiber Glass Reinforcer

INGREDIENTS

Chemical Name (CAS No.)	Common Name	Exposure Limits	%
Fiber Glass (CAS: None)	Fiber Glass	OSHA Nuisance Dust PEL Total Dust 15 mg/m^3 or 50 mppcf Respirable Dust 5 mg/m^3 or 15 mppcf ACGIH Fibrous Glass Dust 10 mg/m^3	app 9

PHYSICAL DATA

Boiling Point N/A

% Volatile By Volume None

Melt Point approx. 1275°C

Density (Air = 1) N/A

% Solubility (H_2O) Negligible

Specific Gravity 2.6

Pressure N/A

Appearance Fibers assembled into rovings, mats, yarns, fabrics chopped strands

Odor None

3. FIRE AND EXPLOSION HAZARD DATA

Flash Point & Method N/A

Flammable Limits

LEL N/A UEL N/A

Extinguishing Media Use that which is applicable to surrounding fire.

Special Fire Fighting Procedures Firefighters must wear full protective gear including eye protection and self-contained breathing apparatus.

Unusual Fire and Explosion Hazard Size materials may thermally decompose or burn emitting toxic fumes or smoke.

4. HEALTH EFFECTS

Primary Routes of Entry Inhalation, skin and eye contact

Carcinogens	No	IARC	No	NTP	No	OSHA	No

Acute Effects: Exposure to fiber glass may cause temporary skin, eye and upper respirato irritation.

Medical Conditions Aggravated by Exposure: None known.

Chronic Effects: Current animal inhalation studies indicate that glass fibers do not present a health hazard.

However, some recent epidemiological studies indicate that industrial workers first employed more than 30 years ago in the manufacture of fiber glass wool and mineral wool have a slightly higher rate of lung cancer than the general population. The cause of this higher rate has not been determined. No relationship was found between intensity of exposure to fibers and length of time employed. Factors such as style of living, smoking habits, exposure to known carcinogens and other occupational exposures need to be investigated. Researchers agree that further study is necessary to determine those factors associated with the reported increased rate.

Similar findings were not reported regarding employees in textile/glass reinforcements manufacturing plants.

5. EMERGENCY AND FIRST AID PROCEDURES

Eye Contact: Flush well with running water for at least 15 minutes. Get medical attention if irritation persists.

Skin Contact: Cleanse with soap and warm water. Get medical attention if irritation persists.

Upper Respiratory Irritation: Remove from exposure. Get medical attention if irritation persists.

6. PHYSICAL HAZARDS

None.

7. SPECIAL PROTECTION INFORMATION

Ventilation: Use local exhaust ventilation to avoid dispersal of dust.

Respiratory: Where dust is not controlled, use a respirator approved for nuisance type dusts.

Eye Protection: Wear eye protection when handling and applying.

Other: Protect the skin with cap and loose fitting, long-sleeved outerwear. Barrier creams may also provide additional protection. Caution workers to wash clothes separately and to rinse the washer. Fibers can be deposited in wash on clothing of other family members. Establish good housekeeping practices to prevent accumulation of fiber glass dust. Keep wastes in covered containers.

When glass fiber is used as a reinforcement in plastic materials, caution must also be exercised with the resin and curing catalysts employed and the mixing process used to disperse the fiber in the resin. When the glass fiber reinforced material is abraded or machined, control of the released dust must be established.

REACTIVITY

This is a stable material.

e size materials may thermally decompose or burn at high temperature and emit toxic fumes and/or smoke containing carbon dioxide, carbon monoxide.

STORAGE INFORMATION

Store, handle and use fiber glass products in a manner that will minimize dust generati

9. SPILL, LEAK, AND DISPOSAL INFORMATION

Prevent spread of fiber glass particulates and avoid dust-generating conditions. Colle by vacuum or wet methods. Those involved in cleanup must use protection against skin a eye contact and inhalation of particulates.

Waste Disposal Method

Scrap material should be disposed of in a sanitary landfill in accordance with federal, state and local regulations.

ADDITIONAL COMMENTS

Acronyms used in this MSDS:

N/A: Not applicable
CAS No.: Chemical Abstracts Service Number
OSHA: Occupational Safety and Health Administration
PEL: Permissible exposure limit
mg/m^3: Milligrams per cubic meter
mppcf: Millions of particles per cubic foot
ACGIH: American Conference of Governmental Industrial Hygienists
LEL: Lower explosive limit
UEL: Upper explosive limit
IARC: International Agency for Research on Cancer
NTP: National Toxicology Program

Date: 8 March 1991
Revision No.: 1

FILTRASORB 200 ACTIVATED CARBON

MATERIAL SAFETY DATA SHEET

DATE August 1985

PRODUCT NAME FILTRASORB 200 ACTIVATED CARBON

CALGON
CALGON CARBON CORPORATION

SECTION I

MANUFACTURER'S NAME	Calgon Carbon Corporation	EMERGENCY TELEPHONE NO.	412-787-6700
ADDRESS	P.O. Box 717 Pittsburgh, PA 15230-0717		
CHEMICAL NAME AND SYNONYMS	Carbon	FORMULA	C

SECTION II HAZARDOUS INGREDIENTS

PRINCIPAL HAZARDOUS COMPONENT (S)	CAS #	% BY WEIGHT	ORAL LD_{50}	DERMAL LD_{50}	TLV (Units) ACGIH	OSHA	OTHER
Chemical Name Carbon / Common Name Activated Carbon	7440-44-0	100%	>10g/Kg* (rat)	--	N/A	N/A	N/A
Chemical Name / Common Name							
Chemical Name / Common Name							
Chemical Name / Common Name							
Chemical Name / Common Name							

*No animal mortalities during course of 14-day study.

CAUTION!! Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state, and federal regulations.

This product is non-hazardous according to the definitions for "health hazard" and "physical hazard" provided in the OSHA Hazard Communication Law (29 CFR part 1910).

SECTION III PHYSICAL DATA

BOILING POINT (° F)	N/A	SPECIFIC GRAVITY (H_2O=1)	2.3g/cc real density
VAPOR PRESSURE (mmHg.)	N/A	PERCENT VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	pH	N/A
SOLUBILITY IN WATER	insoluble	OTHER packing density	0.4 to 0.7g/cc

APPEARANCE AND ODOR black particulate solid

While this information and recommendations set forth herein are believed to be accurate as of the date hereof, CALGON CARBON CORPORATION MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used) N/A

EXTINGUISHING MEDIA If involved in fire, flood with plenty of water.

SPECIAL FIRE FIGHTING PROCEDURES None

UNUSUAL FIRE AND EXPLOSION HAZARDS Contact with strong oxidizers such as ozone, liquid oxygen, chlorine, permanganate, etc. may result in fire.

SECTION V HEALTH HAZARD DATA

EFFECT OF OVEREXPOSURE

A. ACUTE

1. INGESTION

The product is non-toxic through ingestion. The acute oral LD_{50} (rat) is >10g/Kg.

2. INHALATION

The acute inhalation LC_{50} (rat) is >64.4 mg/ℓ (nominal concentration) for activated carbon.

3. DERMAL EXPOSURE

a. TOXIC

Non-toxic

b. IRRITATION

The product is not a primary skin irritant. The primary skin irritation index (rabbit) is 0.

c. SENSITIZATION

None

4. EYE IRRITATION

The physical nature of the product may produce eye irritation.

B. SUBCHRONIC, CHRONIC, OTHER

The effects of long-term, low-level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the avoidance of all effects from repetitive acute exposures.

FIRST AID

A. EYE

Flush with plenty of water for at least 15 minutes.

B. SKIN

Wash with soap and water.

C. INGESTION

D. INHALATION

SECTION VI REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	STABLE	X	None
	UNSTABLE		

INCOMPATABILITY (Materials to Avoid): Strong oxidizers such as ozone, liquid oxygen, chlorine, permanganate, etc.

HAZARDOUS DECOMPOSITION PRODUCTS:

Carbon monoxide may be generated in the event of fire.

SECTION VII SPILL OR LEAK PROCEDURES

REPORTABLE QUANTITIES (RQ) IN LBS OF EPA HAZARDOUS SUBSTANCES IN PRODUCT

1. N/A
2.
3.

NOTIFY EPA OF PRODUCT SPILLS EQUAL TO OR EXCEEDING N/A LBS.

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Sweep up unused carbon and discard in refuse container or repackage.

WASTE DISPOSAL METHOD

Dispose of unused carbon in refuse container. Dispose of in accordance with local, state, and federal regulations.

SECTION VIII HANDLING & STORAGE

PROTECTIVE GLOVES	EYE PROTECTION
Rubber gloves recommended	Safety glasses or goggles recommended

OTHER PROTECTIVE CLOTHING: Not required

RESPIRATORY PROTECTION: A NIOSH approved particulate filter respirator is recommended if excessive dust is generated.

VENTILATION	LOCAL EXHAUST	OTHER
	Recommended	
	MECHANICAL (General) Recommended	

STORAGE & HANDLING

CAUTION!! Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state, and federal regulations.

OTHER PRECAUTIONS

Wash thoroughly after handling. Exercise caution in the storage and handling of all chemical substances.

PREPARED BY S. D. Cifrulak

Date: 8 March 1991
Revision No.: 1

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON)

J. T. Baker Inc.
222 Red School Lane Phillipsburg, N.J. 08865
24-Hour Emergency Telephone - (201) 859-2151
Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT IDENTIFICATION

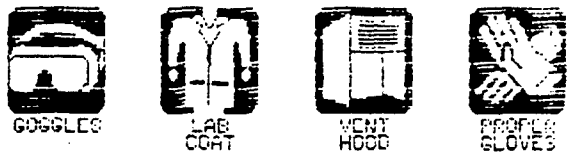
Product Name: 1,1,2-Trichloro-1,2,2-trifluoroethane
Formula: Cl_2FCCF_2Cl
Formula Wt: 187.38
CAS No.: 76-13-1
NIOSH/RTECS No.: KJ4000000
Common Synonyms: Freon 113; Fluorocarbon 113; 1,1,2-Trichlorotrifluoroethane
Product Codes: 9053,9343,9337,9445,W591

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA™ System

HEALTH	FLAMMABILITY	REACTIVITY	CONTACT
2	1	0	2
MODERATE	SLIGHT	NONE	MODERATE

Laboratory Protective Equipment



Precautionary Label Statements

WARNING!
CAUSES IRRITATION
HARMFUL IF INHALED
Avoid contact with eyes, skin, clothing.
Keep in tightly closed container. Wash thoroughly after handling.

SECTION II - HAZARDOUS COMPONENTS

Component	%	CAS No.
1,1,2-Trichloro-1,2,2-trifluoroethane	90-100	76-13-1

SECTION III - PHYSICAL DATA

Boiling Point: 48°C (118°F) Vapor Pressure(mmHg): 285
Melting Point: -35°C (-31°F) Vapor Density(air=1): 6.5

Continued on Page: 2

SECTION III - PHYSICAL DATA (Continued)

Specific Gravity: N/A (H_2O=1)

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

Solubility(H_2O): Negligible (less than 0.1 %)

% Volatiles by Volume: 100

Appearance & Odor: Clear, colorless liquid with slight etheral odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A

Flammable Limits: Upper - N/A % Lower - N/A %

Fire Extinguishing Media

Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures

Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode.

Toxic Gases Produced

halogen acids, carbon monoxide, carbon dioxide phosgene, halogens

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 7600 mg/m^3 (1000 ppm)

Short-Term Exposure Limit (STEL): 9500 mg/m^3 (1250 ppm)

Permissible Exposure Limit (PEL): 7600 mg/m^3 (1000 ppm)

Toxicity: LD_{50} (oral-rat)(g/kg) - 43

Carcinogenicity: NTP: No IARC: No Z List: No OSHA reg: No

Effects of Overexposure

Inhalation of vapors may cause headache, nausea, vomiting, dizziness, drowsiness, irritation of respiratory tract, and loss of consciousness.
Inhalation of vapors may cause narcosis.
Contact can cause eye irritation.
Skin contact may cause dermatitis.
Ingestion may cause gastrointestinal irritation.

Continued on Page: 3

SECTION V - HEALTH HAZARD DATA (Continued)

Medical Conditions Generally Aggravated By Exposure

None Identified

Routes Of Entry

inhalation, ingestion, eye contact, skin contact

Emergency and First Aid Procedures

CALL A PHYSICIAN.
If swallowed, do NOT induce vomiting.
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Flush skin with water.

SECTION VI - REACTIVITY DATA

Stability: Stable Hazardous Polymerization: Will not occur

Conditions to Avoid: heat, flame, other sources of ignition

Incompatibles: alkali metals, chemically active metals, zinc, aluminum, magnesium

Decomposition Products: halogen acids, carbon monoxide, carbon dioxide, phosgene, halogens

SECTION VII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Use water spray to reduce vapors. Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection: Respiratory protection required if airborne concentration exceeds TLV. At concentrations above 1000 ppm, a self-contained breathing apparatus is advised.

Continued on Page: 4

Date: 8 March 1991
Revision No.: 1

GLID-GUARD - HEAT RESISTANT COATINGS

Glidden

PROTECTIVE MAINTENANCE COATINGS DATA

For Industrial Use and Professional Application Only

GLID-GUARD® Silicone Acrylic & Silicone Alkyd Intermediate Heat Resistant Coatings No. 5544, 5545, 5546, 5547

For Interior-Exterior Metal

WARNING! FLAMMABLE. VAPOR HARMFUL. MAY IGNITE EXPLOSIVELY. CAN CAUSE IRRITATION OF EYES, SKIN AND RESPIRATORY TRACT. NOS. 5544 & 5545 CONTAIN PETROLEUM DISTILLATE ESTER, TOLUENE AND XYLENE. NOS. 5546 & 5547 CONTAIN PETROLEUM DISTILLATE.

See Other Cautions On Last Page.

PRODUCT DESCRIPTION

GLID-GUARD® Intermediate Heat Resistant Coatings are based on special silicone acrylic and silicone alkyd resins, providing tough, heat resistant finishes that protect metal surfaces under elevated temperatures from 350°F up to 450°F. These durable coatings resist weather extremes and thermal shock on large metal surfaces. They protect against moisture fumes and mildly corrosive atmospheres.

PRODUCTS AVAILABLE

No. 5544 GLID-GUARD Silicone Acrylic Primer, Green
No. 5545 GLID-GUARD Silicone Acrylic Enamel, Gray
No. 5546 GLID-GUARD Silicone Alkyd Primer, Tan
No. 5547 GLID-GUARD Silicone Alkyd Enamel, Medium Gray
NOTE: Special colors available upon request.

SPECIFICATIONS — Metal Surfaces

		*Recommended (Calculated) Applied Film Thickness – Mils
Silicone Acrylic Finish – up to 350°F.		
1st Coat: GLID GUARD Silicone Acrylic Primer No. 5544	Wet 5.7	Dry 1.5-2.0
2nd Coat: GLID-GUARD Silicone Acrylic Enamel No. 5545	Wet 5.7	Dry 1.5-2.0
	Total Mils	3.0-4.0
Silicone Alkyd Finish – up to 450°F.		
1st Coat: GLID-GUARD Silicone Alkyd Primer No. 5546	Wet 3.0	Dry 1.4
2nd Coat: GLID-GUARD Silicone Alkyd Enamel No. 5547	Wet 4.0	Dry 1.5
	Total Mils	2.9

Do not attempt to build film by applying heavy coats. Excessive film thickness will result in mudcracking and checking due to high temperature and thermal shock. Once the checking and cracking occur, rust will develop in cracks.

TYPICAL USES

Recommended for the requirements of intermediate heat exposures in the chemical and petroleum industry. Applications include boiler jackets, smoke stacks, towers, reactors, heat exchangers, catalytic crackers, piping and components in processing equipment.

PRODUCT ADVANTAGES

- Protects metal surfaces under continuous heat exposure from 350°F. up to 450°F.
- Resists weather extremes and thermal shock.
- Resists discoloration.
- No. 5544/5545 Silicone Acrylic system dries to touch in 20 min.; recoat in 2 hrs. Continuous heat resistance up to 350°F.
- No. 5546/5547 Silicone Alkyd system dries to touch in 4 hours; recoat in 24 hrs. Continuous heat resistance up to 450°F.

SERVICE CONDITIONS

- For continuous service from 350°F. up to 450°F.
- Do not use over conventional finishes.
- Heavy or multiple initial coatings are not recommended.

*As measured over the peaks of any blast profile or surface projections.

GLID-GUARD® Silicone Coatings (Continued)

MATERIAL PREPARATION

Mix thoroughly before using. Ready for use without thinning. Do not add oils, driers or mix with other paints.

SURFACE PREPARATION

Metal surfaces must be dry, clean and free of all contaminants. Remove dust and dirt with stiff bristle or wire brushes and compressed air. Remove oil or grease with mineral spirits or xylene. Remove chemical contamination by washing with water or other materials. Remove mill scale or rust by sandblasting or other mechanical abrasive methods. Best results are obtained on surfaces blasted to white metal. Never apply over other paints.

APPLICATION

Apply primers with Glidden Bronze Knight™ brushes (nylon or bristle), rollers (dynel) or airless spray. May be reduced up to 10% with xylene for conventional spray. Deposit only a thin film on the surface; heavy or multiple priming coatings are not recommended. DO NOT USE OVER CONVENTIONAL FINISHES.

Apply No. 5545 Silicone Acrylic Enamel over No. 5544 Silicone Acrylic Primer by spray ONLY. Brush application will lift the primer. No. 5547 Silicone Alkyd Enamel can be applied by brush, roller, or spray, over No. 5546 Silicone Alkyd Primer.

COVERAGE (Calculated)

No. 5544 Silicone Acrylic Primer—240 sq. ft./gal. (1.5-2.0 mils DFT)
No. 5545 Silicone Acrylic Enamel—280 sq. ft./gal. (1.5-2.0 mils DFT)
No. 5546 Silicone Alkyd Primer—525 sq. ft./gal. (1.4 mils DFT)
No. 5547 Silicone Alkyd Enamel—400 sq. ft./gal. (1.5 mils DFT)

When computing working coverage, allow for application losses, surface irregularities, etc.

DRYING

(77°F @ 50% R.H.)

No. 5544/5545 Silicone Acrylic system dries to touch in 20 min.; recoat in 2 hrs.
No. 5546/5547 Silicone Alkyd system dries to touch in 4 hrs.; recoat in 24 hrs.

Allow longer drying time under cooler, more moist conditions.

CLEAN-UP

Clean equipment with Xylene, Toluene or Mineral Spirits as indicated on Technical Data Chart.

TECHNICAL DATA	GLID-GUARD No. 5544	GLID-GUARD No. 5545	GLID-GUARD No. 5546	GLID-GUARD No. 5547
Product No.	5544	5545	5546	5547
Generic Type	Silicone-Acrylic Primer	Silicone Acrylic Enamel	Modified Silicone Alkyd Primer	Silicone Alkyd
Color	Green	Medium Gray	Tan	Medium Gray
Sheen or Gloss	Approx. 10@60°	Approx. 45 ± 5@60°	Approx. 5-10@60°	Approx. 90@60°
Percent Solids by Weight	50%	37.5 ± 1%	68%	50 ± 1%
Percent Solids by Volume	22.4%	26%	46%	37.6%
Theoretical Coverage per One Mil Dry (_____ Mils Wet)– _____Sq. Ft./Gal.	4.5 356	3.8 420	2.20 700	2.7 590
Recommended Coverage (Calculated) ____ Mils Dry (____Mils Wet)– ____Sq. Ft./Gal. When computing working coverage, allow for application losses, surface irregularities, etc.	1.5-2.0 (6.7) 240	1.5-2.0 (5.7) 280	1.4 (3.0) 525	1.5 (4.00) 400
Percent Vehicle (Solids) by Weight	25%	24%	21%	42.5%
Percent Pigment by Weight	25%	13%	47%	7.5%
Percent Solvent by Weight	50%	62.5%	32%	50%
Viscosity, No. 4 Ford Cup	25-30 secs	18-25 secs	25-30 secs	50-60 secs
Weight per Gallon	9.5 ± .2 lbs.	8.67 lbs.	11.0 ± .2 lbs.	8.2 ± .2 lbs.
Flash Point–Closed Cup	60°F.	63°F.	90°F.	85°F.
Drying Time–* (Normal 77°F., 50% R.H.) Touch Handle Recoat Full Cure, 100°F. Full Cure, 77°F.	 20 min. 1 hr. 2 hrs. 10 hrs. 2 Days	 20 min. 1 hr. 2 hrs. 10 hrs. 2 Days	 4 hrs. 8 hrs. 24 hrs. 48 hrs. 4 Days	 4 hrs. 8 hrs. 24 hrs. 48 hrs. 4 Days
Reduction Solvent	Xylene, Toluene (May be thinned up to 10% for conventional spray)	Xylene, Toluene (May be thinned up to 10% for conventional spray)	Mineral Spirits	Mineral Spirits
Clean-Up Solvent	Xylene, Toluene	Xylene, Toluene	Mineral Spirits	Mineral Spirits, Xylene, Toluene
Type of Cure	Air Dry	Air Dry	Air Dry	Air Dry

Date: 8 March 1991
Revision No.: 1

HALON 1211

Material Safety Data Sh t

HALON 1211
QUICK IDENTIFIER
Common Name: (used on label and list)

May be used to comply with OSHA's Hazard Communication Standard, 29CFR 1910. 1200. Standard must be consulted for specific requirements.

SECTION 1 –

Manufacturer's Name: AMEREX CORPORATION

Address: P. O. Box 81

City, State, and ZIP: TRUSSVILLE, AL 35173-0081

Emergency Telephone No.: 205/655-3271

Other Information Calls: 205/655-3271

Signature of Person Responsible for Preparation (Optional): D. H. Ellison

Date Prepared: November 1985

SECTION 2 – HAZARDOUS INGREDIENTS/IDENTITY

Hazardous Component(s) (chemical & common name(s))	OSHA PEL	ACGIH TLV	Other Exposure Limits	% (optional)	CA. NO
Bromochlorodifluoromethane	Unknown	Not Listed	1000 ppm on 8 HR TWA	100	353-59-3

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS

Boiling Point: 26°F

Specific Gravity ($H_2O=1$): 1.83(liquid)

Vapor Pressure (mm Hg): at 68°F 1770

Vapor Density (Air = 1): 5.8 at 68°F

Solubility in Water: Insoluble

Reactivity in Water: N.A.

Appearance and Odor: Colorless gas and liquid with very faint, sweet odor.

Melting Point: N.A.

SECTION 4 – FIRE & EXPLOSION DATA

Flash Point: N.A. F. C. Method Used: N.A.

Flammable Limits in Air % by Volume: LEL Lower: N.A. UEL Upper: N.A.

Auto-Ignition Temperature: N.A.

Extinguisher Media: N.A.

Special Fire Fighting Procedures: At flame temperatures, Halon 1211 may release hydrogen halides and halogens in trace amounts.

Unusual Fire and Explosion Hazards: When BCF is discharged into a fire, it decomposes above 900°F, releasing bromide ions. Halongen acids and small amounts of carbonyl halides are also formed. These by-products, although harmful if inhaled, are easily detected. Only a few PPM create an unpleasant, acrid odor which serves as a warning to the user. After the extinguisher is discharged the area should be vacated until ventilation clears the atmosphere.

SECTION 5- PHYSICAL HAZARDS (REACTIVITY DATA)

Stability: Unstable ☐ Conditions to Avoid; Stable ☒ — Stable under normal conditions.

Incompatability (Materials to Avoid): Active metals such as powdered alumina and magnesium and fires of metal hydrides.

Hazardous Decomposition Products: Halon begins decomposing at temperatures above 900°F to give free halogens, halogen acids, and small amounts of carbonyl halides.

Hazardous Polymerization: May Occur ☐ Will Not Occur ☒ Conditions to Avoid — None

SECTION 6 – HEALTH HAZARDS

1. Acute: Unknown

2. Chronic: Prolonged exposure can cause dizziness, headache, nausea, impaired coordination, progressing to unconsciousness.

Signs and Symptoms of Exposure: As above.

Medical Conditions Generally Aggravated by Exposure: In susceptible individuals, cardiac sensitization to circulating epinephrine compounds can result in sudden, fatal heart arrhythmias.

Chemical Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	I.A.R.C. Monographs	OSHA
	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

Emergency and First Aid Procedures: See below.

ROUTES OF ENTRY

1. Inhalation	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
2. Eyes	The liquid form of this material can produce chilling sensation and discomfort. Flush with copious amounts of water for at least 15 minutes.
3. Skin	Evaporation of liquid from the skin can produce chilling sensations. Skin injury does not result. Wash skin with soap and water.
4. Ingestion	Do not induce vomiting. Give 1 or 2 glasses of warm water to drink and get medical attention.

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage: Store in cool area with good ventilation. Enforce "NO SMOKING" rules in area of use.

Other Precautions: None

Steps to be Taken in Case Material is Released or Spilled: Ventilate spill area and recover any liquid.

Waste Disposal Methods (Consult federal, state, and local regulations): Not applicable.

SECTION 8 – SPECIAL PROTECTION INFORMATION/CONTROL MEASURES

Respiratory Protection (Specify Type): Not normally needed. If needed, use MSHA/NIOSH approved respirator for organic vapors.

Ventilation	Local Exhaust	Mechanical (General)	Special	Other
Yes	Yes	Yes	No	No

Protective Gloves: Impervious for liquid exposure.

Eye Protection: Safety glasses

Other Protective Clothing or Equipment: Eye wash station and safety shower in work area when working with liquified product.

Work/Hygienic Practices: N.A.

Date: 8 March 1991
Revision No.: 1

HAYNES CORROSION RESISTANT ALLOYS

HAYNES
International

SAFETY DEPARTMENT
1020 WEST PARK AVENUE
KOKOMO, INDIANA 46904-9013
INFORMATION: 317-456-6625

MATERIAL SAFETY DATA SHEET

HAYNES INTERNATIONAL, INC.
Corrosion Resistant Alloys

MSDS IDENTIFICATION NUMBER	DATE ISSUED	ISSUED BY	EMERGENCY PHONE NUMBERS
H2071-0	11/1/85		HAYNES: 317-456-6894
This replaces C100b, N100b & S100b	DATE REVISED 2/1/89	SAFETY DEPARTMENT	CHEMTREC: 800-424-9300

This Material Safety Data Sheet (MSDS) Provides information on a specific group of manufactured metal products. Since these metal products share a common physical nature and constituents, the data presented are applicable to all alloys identifed. The following high performance - corrosion resistant alloys are described in this MSDS:

C100b ALLOYS	N100b ALLOYS	S100b ALLOYS
HASTELLOY® alloy B-2	HAYNES® alloy No. 200	FERRALIUM alloy 255
HASTELLOY alloy C-4	HAYNES alloy No. 201	RA® 330
HASTELLOY alloy C-22	HAYNES alloy No. 400	RA 330TX
HASTELLOY alloyC-276	HAYNES alloy No. 404	HAYNES alloy 904L
HASTELLOY alloyG	HAYNES alloy No. R-405	FM-259
HASTELLOY alloy G-3	HAYNES alloy No. K-500	
HASTELLOY alloy G-30	HAYNES alloy No. 600	
HASTELLOY alloy N	HAYNES alloy No. 800	
HAYNES alloy No. 625	HAYNES alloy No. 800H	
HASTELLOY alloy No. H-9M	HAYNES alloy No. 825	
HASTELLOY alloy G-50		

HASTELLOY and HAYNES are registered trademarks of Haynes International, Inc.
RA is a registered trademark of Rolled Alloys, Inc.
FERRALIUM is a registered trademark of Bonar Langley Alloys Ltd.

I. PRODUCT IDENTIFICATION

CHEMICAL NAME: See Section II for Alloy Designations	CHEMICAL FAMILY: Alloy
TRADE NAME: See Alloys listed in Section II	FORMULA: Alloys Composed of varying concentrations of elements listed in section II.

Constituents(s))	NOMINAL PERCENT OF ELEMENTAL CONSTITUENTS FOR THE ALLOYS SHOWN (HAYNES METAL NUMBER, IF APPLICABLE, SHOWN IN PARENTHESIS)										CAS NUMBER	NIOSH RTECS NUMBER	EXPOSURE LIMITS (as Mg/m³)*	
	Alloy B-2 (2665)	Alloy C-4 (2455)	C-22 ™ (8277)	Alloy C-276 (2760)	Alloy G (2340)	Alloy G-3 (2985)	Alloy G-30 (8130)	Alloy N (2840)	Alloy 625 (2650)	Alloy H-9M (8762)			OSHA LIMITS FOR AIR CONTAMINATION - TWA	ACGIH TLV-TWA
Aluminum (Al)	-	-	-	-	-	-	-	0.5 Max	0.4 Max	-	7429-90-5	BD0330000	Total Dust: 15, Respirable Dust: 5, Welding Fume: 5	Dust: 10 Welding Fume: 5
Aluminum (Al) + Titanium (Ti)	-	-	-	-	-	-	-	0.5	-	-	see Al & Ti	see Al & Ti	See Al & Ti	See Al & Ti
Boron (B)	-	-	-	-	-	-	-	0.01 Max	-	-	7440-42-8	ED3750000	Metal: None Oxide Dust Total: 15	Metal: None Oxide: 10
Columbium (Cb)	-	-	-	-	-	-	0.8 Max	-	-	-	7440-03-1	None	None	None
Columbium (Cb) +Tantalum (Ta)	-	-	-	-	2.0	0.5	-	-	3.7	-	see Cb & Ta	see Cb & Ta	See Cb & Ta	See Cb & Ta
Cobalt (Co)	1.0 Max	2.0 Max	2.5 Max	2.5 Max	2.5 Max	5.0 Max	2.0 Max	0.2 Max	1.0 Max	5.0 Max	7440-48-4	GF8750000	Metal Dust & Fume as Co: 0.05	Metal Dust & Fume as Co: 0.05
Chromium (Cr)	1.0 Max	16	22	15.5	22	22	29.5	7.0	21.5	22	7440-47-3	GB4200000	Metal as Cr: 1.0 (II & III) Compounds as Cr: 0.5	Metal: 0.5, (II & III) Compounds asCr: 0.5
Copper (Cu)	-	-	-	-	2.0	2.0	2.0	0.35 Max	-	-	7440-50-8	GL5325000	Dust as Cu: 1.0 Fume as Cu: 0.1	Dust: 1.0 Fume: 0.2
Iron (Fe)	2.0 Max	3.0 Max	3.0	5.5	19.5	19.5	15	5.0 Max	5.0 Max	18.5	1309-37-1	NO7400000	Oxide, Dust & Fume as Fe: 10	Oxide Fume: 5
Manganese (Mn)	1.0 Max	1.0 Max	0.5 Max	1.0 Max	1.5	1.0 Max	1.0 Max	0.8 Max	0.5 Max	1.0 Max	7439-96-5	OO9275000	Compounds as Mn: 5 Fume as Mn: 1.0(STEL: 3)	Dust & Compounds: 5 Fume: 1.0(STEL: 3)
Molybdenum (Mo)	28	15.5	13	16	6.5	7.0	5.5	16.5	9.0	9.0	7439-98-7	QA4680000	Insoluble Compounds as Mo: Total Dust: 10, Respirable Dust: 5	Insoluble Compounds as Mo: 10
Nickel (Ni)	69	65	56	57	43	44	43	71	62	45	7440-02-0	QR5950000	Insoluble Compounds as Ni: 1.0	Insoluble Compounds as Ni: 1.0
Silcon (Si)	0.1 Max	0.08 Max	0.08 Max	0.08 Max	1.0 Max	1.0 Max	1.0 Max	1.0 Max	0.5 Max	1.0 Max	7440-21-3	VW0400000	Total Dust: 10 Respirable Dust: 5	10
Tantalum (Ta)	-	-	-		-	-	-	-	-	-	7440-25-7		Metal & Oxide Dust: 5	Metal & Oxide Dust: 5
Titanium (Ti)	-	0.7 Max	-				-	-	0.4 Max		7440-32-6		Total Oxide Dust: 10 Respirable Oxide Dust: 5	Oxide: 10
Vanadium (V)		-	0.35 Max	0.35 Max	-	-	-		-	-	1314-62-1	YW1355000	Respirable Dust & Fume: 0.05 as V_2O_5	Respirable Dust & Fume: 0.05
Tungsten (W)		-	3.0	4.0	1.0 Max	1.5 Max	2.5	0.5 Max	-	3.0 Max	7440-32-6	Y07175000	Insoluble Compounds: 5(STEL: 10) as W	Insoluble Compounds: 5(STEL: 10) as W
Density (lb/cu in)	0.330	0.311	0.302	0.324	0.291	0.319	0.302	0.317	0.305	0.301				
Melting Point (°F)	~2425	~2445	~2480	~2375	~2450	~2375	~2370	~2300	~2350	~2325				

*Many substances do not have a unique exposure limit. The absence of an exposure limit does not lessen consideration for exposure risk. In the absence of specific information, professional judgment may be required.

II. HAZARDOUS CONSTITUENTS

Constituents(s))	NOMINAL PERCENT OF ELEMENTAL CONSTITUENTS FOR THE ALLOYS SHOWN (HAYNES METAL NUMBER, IF APPLICABLE, SHOWN IN PARENTHESIS)										CAS NUMBER	NIOSH RTECS NUMBER	EXPOSURE LIMITS (as Mg/m³)*	
	Alloy G-50 (8511)												OSHA LIMITS FOR AIR CONTAMINATION - TWA	ACGIH TLV-TWA
Aluminum (Al)	-										7429-90-5	BD0330000	Total Dust: 15, Respirable Dust: 5, Welding Fume: 5	Dust: 10 Welding Fume: 5
Aluminum (Al) + Titanium (Ti)	-										see Al & Ti	see Al & Ti	See Al & Ti	See Al & Ti
Boron (B)	-										7440-42-8	ED3750000	Metal: None Oxide Dust Total: 15	Metal: None Oxide: 10
Columbium (Cb)	0.5 Max										7440-03-1	None	None	None
Columbium (Cb) +Tantalum (Ta)	-										see Cb & Ta	see Cb & Ta	See Cb & Ta	See Cb & Ta
Cobalt (Co)	2.5 Max										7440-48-4	GF8750000	Metal Dust & Fume as Co: 0.05	Metal Dust & Fume as Co: 0.05
Chromium (Cr)	20										7440-47-3	GB4200000	Metal as Cr: 1.0 (II & III) Compounds as Cr: 0.5	Metal: 0.5, (II & III) Compounds asCr: 0.5
Copper (Cu)	0.5 Max										7440-50-8	GL5325000	Dust as Cu: 1.0 Fume as Cu: 0.1	Dust: 1.0 Fume: 0.2
Iron (Fe)	15										1309-37-1	NO7400000	Oxide, Dust & Fume as Fe: 10	Oxide Fume: 5
Manganese (Mn)	.75 Max										7439-96-5	OO9275000	Compounds as Mn: 5 Fume as Mn: 1.0(STEL: 3)	Dust & Compounds: 5 Fume: 1.0(STEL: 3)
Molybdenum (Mo)	9										7439-98-7	QA4680000	Insoluble Compounds as Mo: Total Dust: 10, Respirable Dust: 5	Insoluble Compounds as Mo 10
Nickel (Ni)	Bal										7440-02-0	QR5950000	Insoluble Compounds as Ni: 1.0	Insoluble Compounds as Ni: 1.0
Silcon (Si)	0.5 Max										7440-21-3	VW0400000	Total Dust 10 Respirable Dust: 5	10
Tantalum (Ta)	-										7440-25-7		Metal & Oxide Dust: 5	Metal & Oxide Dust: 5
Titanium (Ti)											7440-32-6		Total Oxide Dust: 10 Respirable Oxide Dust: 5	Oxide: 10
Vanadium (V)	-										1314-62-1	YW1355000	Respirable Dust & Fume: 0.05 as V_2O_5	Respirable Dust & Fume: 0.05
Tungsten (W)	1.0 Max										7440-32-6	Y07175000	Insoluble Compounds: 5(STEL. 10) as W	Insoluble Compounds: 5(STEL: 10) as W
Nickel (Ni) + Cobalt (Co)	50 Max										See Ni & Co	See Ni & Co	See Ni & Co	See Ni & Co
Density (lb/cu in)	0.301													
Melting Point (°F)	~2325													

*Many substances do not have a unique exposure limit. The absence of an exposure limit does not lessen consideration for exposure risk. In the absence of specific information, professional judgment may be required.

II. HAZARDOUS CONSTITUENTS

Constituents(s))	NOMINAL PERCENT OF ELEMENTAL CONSTITUENTS FOR THE ALLOYS SHOWN (HAYNES METAL NUMBER, IF APPLICABLE, SHOWN IN PARENTHESIS)										CAS NUMBER	NIOSH RTECS NUMBER	EXPOSURE LIMITS (as Mg/m³)*	
	200 (2022)	201 (2023)	400 (7777)	404 (8776)	R-405 (8701)	K-500 (8779)	600 (2155)	800 (5805)	800H (5806)	825 (8825)			OSHA LIMITS FOR AIR CONTAMINATION - TWA	ACGIH TLV-TWA
Aluminum (Al)	-	-	0.50 Max	0.05 Max	-	2.7	0.35 Max	0.38 Max	0.38	0.20 Max	7429-90-5	BD0330000	Total Dust: 15, Respirable Dust: 5, Welding Fume: 5	Dust: 10 Welding Fume: 5
Cobalt (Co)	-	-	1.0 Max	-	1.0 Max	1.0 Max	2.0 Max	1.0 Max	2.0 Max	2.0 Max	7440-48-4	GF8750000	Metal Dust & Fume as Co: 0.05	Metal Dust & Fume as Co: 0.05
Chromium (Cr)	-	-	-	-	-	-	15.5	21	21	21.5	7440-47-3	GB4200000	Metal as Cr: 1.0 (II & III) Compounds as Cr: 0.5	Metal: 0.5, (II & III) Compounds as Cr: 0.5
Copper (Cu)	0.25 Max	0.25 Max	31	45	31	29	0.50 Max	0.75 Max	0.75 Max	2.0	7440-50-8	GL5325000	Dust as Cu: 1.0 Fume as Cu: 0.1	Dust: 1.0 Fume: 0.2
Iron (Fe)	0.40 Max	0.40 Max	1.5	0.50 Max	2.5 Max	2.0 Max	8.0	44	44	29	1309-37-1	NO7400000	Oxide, Dust & Fume as Fe: 10	Oxide Fume: 5
Manganese (Mn)	0.35 Max	0.35 Max	1.25 Max	0.10 Max	1.5 Max	1.5 Max	1.0 Max	1.5 Max	1.5 Max	1.0 Max	7439-96-5	OO9275000	Compounds as Mn: 5 Fume as Mn: 1.0 (STEL: 3)	Dust & Compounds: 5 Fume: 1.0 (STEL: 3)
Molybdenum (Mo)	-	-	-	-	-	-	-	-	-	3.0	7439-98-7	QA4680000	Insoluble Compounds as Mo: Total Dust: 10, Respirable Dust: 5	Insoluble Compounds as Mo: 10
Nickel (Ni)	99.2	99	66.5	54.5	66.5	63	32.5	72	32.5	42	7440-02-0	QR5950000	Insoluble Compounds as Ni: 1.0	Insoluble Compounds as Ni: 1.0
Silcon (Si)	0.15 Max	0.15 Max	0.50 Max	0.10 Max	0.50 Max	0.50 Max	1.0 Max	0.50 Max	1.0 Max	0.50 Max	7440-21-3	VW04000000	Total Dust: 10 Respirable Dust: 5	10
Titanium (Ti)	0.10 Max	0.10 Max	-	-	-	0.60	0.30 Max	0.38	0.38	1.0	7440-32-6	XR1700000	Total Oxide Dust: 10 Respirable Oxide Dust: 5	Oxide: 10
Density (lb/cu in)	0.321	0.321	0.319	0.320	0.319	0.305	0.304	0.287	0.287	0.294				
Melting Point (°F)	~2615	~2615	~2370	~2290	~2370	~2400	~2470	~2475	~2475	~2500				

*Many substances do not have a unique exposure limit. The absence of an exposure limit does not lessen consideration for exposure risk. In the absence of specific information, professional judgment may be required.

II. HAZARDOUS CONSTITUENTS

Constituents(s))	NOMINAL PERCENT OF ELEMENTAL CONSTITUENTS FOR THE ALLOYS SHOWN (HAYNES METAL NUMBER, IF APPLICABLE, SHOWN IN PARENTHESIS)										CAS NUMBER	NIOSH RTECS NUMBER	EXPOSURE LIMITS (as Mg/m³)*	
	255 (3255)	330 (8432)	330TX (8433)	904L (8905)	FM259 (8536)								OSHA LIMITS FOR AIR CONTAMINATION - TWA	ACGIH TLV-TWA
Aluminum (Al)	-	-	0.4	-	-						7429-90-5	BD0330000	Total Dust: 15, Respirable Dust: 5, Welding Fume: 5	Dust: 10 Welding Fume: 5
Columbium (Cb)	-	-	0.20 Max	-	-						7440-03-1	None	None	None
Chromium (Cr)	26	19	19	22	25						7440-47-3	GB4200000	Metal as Cr: 1.0 (II & III) Compounds as Cr: 0.5	Metal: 0.5, (II & III) Compounds as Cr: 0.5
Copper (Cu)	1.7	0.5 Max	0.5 Max	1.5	1.8						7440-50-8	GL5325000	Dust as Cu: 1.0 Fume as Cu: 0.1	Dust: 1.0 Fume: 0.2
Iron (Fe)	62	40	39	42	59						1309-37-1	NO7400000	Oxide, Dust & Fume as Fe: 10	Oxide Fume: 5
Manganese (Mn)	1.5 Max	2.0 Max	2.0 Max	2.0 Max	1.0						7439-96-5	OO9275000	Compounds as Mn: 5 Fume as Mn: 1.0 (STEL: 3)	Dust & Compounds: 5 Fume: 1.0 (STEL: 3)
Molybdenum (Mo)	3.3	0.5 Max	-	4.5	3.1						7439-98-7	QA4680000	Insoluble Compounds as Mo; Total Dust: 10, Respirable Dust: 5	Insoluble Compounds as Mo: 10
Nickel (Ni)	5.5	36	36	25.5	9.0						7440-02-0	QR5950000	Insoluble Compounds as Ni: 1.0	Insoluble Compounds as Ni: 1.0
Silcon (Si)	1.0 Max	1.3	1.3	1.0 Max	0.5						7440-21-3	VW04000000	Total Dust: 10 Respirable Dust: 5	10
Titanium (Ti)	-	-	0.5	-	-						7440-32-6	XR1700000	Total Oxide Dust: 10 Respirable Oxide Dust: 5	Oxide: 10
Density (lb/cu in)	0.282	0.290	0.290	0.291	0.282									
Melting Point (°F)	~2600	~2550	~2550	~2550	~2600									

*Many substances do not have a unique exposure limit. The absence of an exposure limit does not lessen consideration for exposure risk. In the absence of specific information, professional judgment may be required.

III. PHYSICAL PROPERTIES

FREEZING POINT: Not Applicable	VAPOR PRESSURE (mmHg): Not Applicable
MELTING POINT: See Section II	VAPOR DENSITY (AIR=1): Not Applicable
SUBLIMES @: Not Applicable	SPECIFIC GRAVITY (H2O=1): See Section II
BOILING POINT: Not Applicable	SOLUBILITY IN WATER = None
EVAPORATION RATE: Not Applicable	% VOLATILES BY VOLUME: None
APPEARANCE AND COLOR: Solid - Silver Gray Color - No Color	

IV. FIRE, EXPLOSION AND REACTIVITY INFORMATION

FLASH POINT (WITH TEST METHOD) None	FLAMMABLE (EXPLOSIVE) LIMITS V/V% LEL: None UEL: None
EXTINGUISHING MEDIA	These alloys are noncombustible. Use extinguishing media appropriate to the surrounding fire.
SPECIAL FIREFIGHTING PROCEDURES	If these materials are reduced to powder form, caution must be used to prevent fire or explosion. To extinguisn a metal powder fire use dry sand, dry graphite or other class "D" fire extinguishing powder.
UNUSUAL FIRE AND EXPLOSION HAZARDS	No unusual fire or explosion hazaras are associated with these materials.
GENERAL REACTIVITY	These alloys are stable materials.
INCOMPATIBILITY (MATERIALS TO AVOID)	Avoid contact with mineral acids and oxidizing agents which may generate hydrogen gas; the evolution of hydrogen may be an explosion hazard.
HAZARDOUS DECOMPOSITION PRODUCTS	Various elemental metals and metal oxides may be generated from welding, cutting, grinding, melting or dross handling operations. Refer to Section II for permissible exposure limits. The permissible exposure limits given in MSDS H-1072 for welding products also apply.

V. HEALTH HAZARD INFORMATION

THE HEALTH HAZARDS INFORMATION GIVEN IN MSDS H-1072 FOR WELDING PRODUCTS ALSO APPLY.

PRIMARY ROUTE(S) OF EXPOSURE	INHALATION: Inhalation of metal dust, fume or powder may result from melting, dross handling, casting, welding, thermal cutting, grinding, crushing or similar operations which generate airborne metal particulate during use of these materials.
	INGESTION: Hand, clothing, food and drink contact with metal dust, fume or powder can cause ingestion of particulate during hand to mouth activities such as drinking, smoking, nail biting, etc.
	SKIN: Skin contact with these materials may cause, in some sensitive individuals an allergic response if elements such as chrome, cobalt, copper and nickel are present. In the form of metal dust or powder, skin contact or abrasion may also cause irritation or dermatitis.
	EYES: Particulate metal (dust, fume or powder) may be dangerous to the eye and surrounding tissue. Airborne particulate (chips, dust or powder) is always a potential problem as well as inserting fingers into the eye socket if the hand or clothing is contaminated with metal particulate.

V. HEALTH HAZARD INFORMATION (CONTINUED)

TOXICITY	There is no information on the toxicity of these alloys. Under normal handling and use of the solid form of these materials there are few health hazards. Cutting, welding, melting, grinding, etc. of these materials will produce dust, fume or particulate containing the component elements of these materials. Exposure to the dust, fume or particulate may present significant health hazards which are referable to the elemental constituents in Section II.
EFFECTS OF OVEREXPOSURE	ACUTE: The metal dust and fumes of those elements in Section II can cause irritation to the skin, eye and mucous membranes. Contact with chromium, cobalt, copper and nickel may cause allergic skin reactions. As dust, powders or fume, exposure which abrades the skin can cause irritation and dermatitis. Injury to the eyes is generally a result of particulate irritation or mechanical injury to the cornea or conjunctiva by dust or particulate. Excessive inhalation of aluminum, cobalt, copper, manganese and nickel can cause respiratory irritation, cough, bronchitis, chills, "fume fever" and asthma-like symptoms. CHRONIC: Respiratory disease with symptoms ranging from shortness of breath and cough to permanent disability due to loss of lung function, fibrosis or subsequent effects on the heart may be caused by excessive exposure to dust or fumes containing cobalt, nickel, titanium and tungsten. Central nervous system depression has been identified with excessive manganese exposure. Nickel and chromium metal and certain compounds have been linked to nasal, bronchial and lung cancers. Aluminum and iron have been indicated to cause gastro-intestinal disorders and non-significant changes in the lung. Chronic health effects specific to an element(s) may be difficult to detect due to the numerous elemental constituents in these alloys.
CARCINOGENIC REFERENCES	Nickel, chromium and some of their compounds are listed in the 3rd Annual Report on Carcinogens as prepared by the National Toxicology Program (NTP) as well as the International Agency for Research on Cancer (IARC) Monograph Series. Detailed information from these sources may be obtained from the following: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man; Geneva, WHO, IARC 1972-1977 (Multivolume work) 49 Sheridan Street, Albany, NY 12219. Third Annual Report on Carcinogens, Summary, September, 1983 NTP 82-330 NTP Public Information Office, MD B2-04 Box 12233, Research Triange Park, NC 27709. Welding, thermal cutting, grinding and melting these products may produce chemicals which are known to the State of California to cause cancer. State of California, Health and Welfare Agency, 1600 Ninth Street Room 450, Sacramento, CA 95914. Telephone (916) 445-6955
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE	Individuals who may have had allergic reaction or sensitivity to metals such as chromium, copper, cobalt and nickel may encounter skin rash or dermatitis if skin contact with this product occurs. Persons with impaired pulmonary function, airway diseases and conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further disability if excessive concentrations of dust or fume are inhaled. If prior damage or disease to the Neurologic (nervous), Circulatory, Hematologic (blood) or Renal (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk if handling and use of these materials cause excessive exposure.

VI. EMERGENCY AND FIRST AID PROCEDURES

INHALATION	Breathing difficulty caused by inhalation of dust or fume requires removal to fresh air. If breathing has stopped, perform artificial respiration and obtain medical assistance at once.
INGESTION	Swallowing metal powder or dust can be treated by having the affected person swallow large quantities of water and attempting to induce vomiting if conscious. Obtain medical assistance at once.
SKIN	Skin cuts and abrasions can be treated by standard first aid. Skin contamination with dust or powder can be removed by washing with soap and water. If irritation persists obtain medical assistance.
EYES	Dust or powder should be flushed from the eyes with copious amounts of clean water. If irritation persists obtain medical assistance. Contact lenses should not be worn if working with metal dusts and powders.

VII. INDUSTRIAL HYGIENE CONTROL MEASURES

THE INDUSTRIAL HYGIENE CONTROL MEASURES GIVEN IN MSDS H-1072 FOR WELDING PRODUCTS ALSO APPLY.

VENTILATION	Local exhaust ventilation should be used to control exposure to airborne dust and fume whenever possible.
RESPIRATORY PROTECTION	Use NIOSH approved respirators as specified by an Industrial Hygienist or qualified Safety Professional. Lung function tests are recommended for users of negative pressure devices. Use a fume respirator or an air supplied respirator where local exhaust or ventilation does not keep exposure below the OSHA limits for air contamination.
PROTECTIVE GLOVES	Wear gloves to prevent metal cuts and skin abrasions particularly during handling of wrought forms, solid metal sheet, strip to tube.
EYE PROTECTION	Wear safety glasses when risk of eye injury is present particularly during machining, grinding, welding, powder handling, etc.
OTHER PROTECTIVE EQUIPMENT	Protective clothing such as uniforms, disposable coveralls, safety shoes, etc. may be required during metal handling operations as appropriate to the circumstances of exposure.
RECOMMENDED MONITORING PROCEDURES	ENVIRONMENTAL SURVEILLANCE: Exposure to the elements identified in Section II can be best determined by testing of samples taken in the employee breathing zone, work area or department. MEDICAL SURVEILLANCE: Lung function tests, chest x-rays and routine physical examinations may be used to determine effects of dust or fume exposure.

VIII. ENVIRONMENTAL PROTECTION INFORMATION

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	In solid form these materials pose no special clean-up problems. If these materials are in powder or dust form, clean-up should be conducted with a vacuum system utilizing a high efficiency particulate air filtration system. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air and water. Properly label all materials collected in waste container.
WASTE DISPOSAL METHOD	Dispose of waste material in accordance with state, federal or regulations. For specific labeling, packing, storage, transportation and disposal procedures consult an Environmental Engineer or consultant familiar with waste disposal regulations.
ENVIRONMENTAL HAZARDS	In solid form these materials pose no special environmental problems. Metal powders or dusts may have significant impact on air and water quality. Airborne emissions, spills and releases to the environment (discharge to streams, sewer systems, ground water, surface soil, etc.) should be controlled immediately. If such potential for a spill or release exists it is advisable to develop an emergency spill response plan.

IX. SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS	These products must be handled according to the size, shape and quantity of materials involved. Solid metal may require use of hoists, cranes, etc. Powders should be moved or transported to minimize spill or release potential.

STORAGE PRECAUTIONS	In solid form these materials pose no special problems. Store metal and metal powder in a dry area. Do not store adjacent to mineral acids. Fine metal powder should be kept away from flames and sources of ignition.

X. DOT SHIPPING REQUIREMENTS

SHIPPING NAME	Not Applicable
IDENTIFICATION NUMBER	Not Applicable
HAZARD CLASS	Not Applicable
LABEL(S) REQUIRED	Not Applicable

ADDITIONAL INFORMATION

The following is the label text which accompanies these Haynes International, Inc. corrosion-resistant products during shipment:

DANGER! INHALATION OF DUST OR FUME MAY CAUSE SERIOUS LUNG INJURY. SKIN, EYE AND MUCOUS MEMBRANE IRRITATION MAY OCCUR.

- The heat resistant alloy products identified above may contain, in varying concentrations, the following elemental constituents: aluminum, cobalt, chromium, copper, iron, manganese, molybdenum, nickel and tungsten. For specific concentrations of these and other elements present, refer to the Material Safety Data Sheet (MSDS) for this product.
- Inhalation of metal dust or fume generated from welding, cutting, grinding, melting, or dross handling of these alloys may cause adverse health effects such as reduced lung function, nasal and mucous membrane irritation. Exposure to dust or fume generated by the use of these alloys may also cause eye irritation, skin rash and effects on other organ systems.
- Chromium, nickel and some of their compounds are listed in the 3rd Annual Report on Carcinogens as prepared by the National Toxicology Program (NTP) as well as the International Agency for Research on Cancer (IARC) Monograph Series.
- Avoid breathing dust or fume. If the use of this material produces dust or fume, use appropriate ventilation controls, personal protective equipment or both. For additional information refer to the Material Safety Data Sheets (MSDS H2071 and H1072) for this product.

SECTION V - HEALTH HAZARD INFORMATION

Primary Route(s) Of Exposure:
Inhalation: The breathing in of a gas, dust, fume, vapor, or mist as a contribution to exposure.
Ingestion: The swallowing of a substance as a contribution to exposure.
Skin: The contribution to exposure by the cutaneous route, either skin absorption or skin contact.
Eyes: The effect of chemical exposure on the eye.
Toxicity: The available toxicological data usually expressed as lethal dose or lethal concentration of the material or its components. Most toxicity test results are from exposure tests conducted on animals such as rats or mice and caution is recommended in making direct comparison to human beings.
Effect of Overexposure:
Acute: Rapid effects of exposure with severe symptoms.
Chronic: Effects due to exposure that develop slowly over a long period of time or which recur frequently.
Carcinogenic References: Available references which indicate the potential for a material to cause cancer in man or animals.
Medical Conditions Aggravated By Exposure: Medical conditions that warrant consideration regarding exposure to a toxic substance.

SECTION VI - EMERGENCY & FIRST AID PROCEDURES

Inhalation: Emergency action to address adverse effects due to inhalation of a hazardous material.
Ingestion: Emergency action to address adverse effects due to ingestion of a hazardous material.
Skin: Emergency action to address adverse effects due to skin contact or absorption of a hazardous material.
Eyes: Emergency action to address adverse effects or injury to the eye due to contact with a hazardous material.

SECTION VII - INDUSTRIAL HYGIENE CONTROL MEASURES

Ventilation: Recommended type of ventilation for control of gases or particulate.
Respiratory Protection: General information on the type of respiratory protection recommended.
Protective Gloves: Recommendation for protection to prevent hand contact with the material.
Eye Protection: Recommendation to protect against eye injury.
Other Protective Equipment: Other personal protective equipment (PPE) such as clothing, safety shoes, etc. that may be appropriate to protect against injury or exposure. **Recommended Monitoring Procedures:**
Environmental Surveillance: Personal air sampling or related procedures to evaluate exposure of an individual.
Medical Surveillance: Biological monitoring or related tests/examinations to evaluate the effects of exposure to an individual.

SECTION VIII - ENVIRONMENTAL PROTECTION INFORMATION

Steps To Be Taken If Material Is Released Or Spilled: Specifically refers to containment, cleanup and control.
Waste Disposal Method: Refers to recommended disposal practices ro applicable regulatory requirements when known.
Environmental Hazards: Refers to information such as aquatic or vegetative toxicity, ambient air pollution concerns, etc. which are available from regulatory or published technical services.

SECTION IX - SPECIAL PRECAUTIONS

Handling Precautions: Safe movement of the product may require specific handling procedures.
Storage Precautions: Safe storage of the product may require specific storage procedures.

SECTION X - DOT SHIPPING REQUIREMENTS

Shipping Name: The approved Department of Transportation (DOT) Shipping Name where applicable.
Hazard Class: The approved DOT Hazard Class where applicable.
Identification Number: Either the United Nations or North American approved Identification number referenced by DOT.
Label(s) Required: The required DOT shipping label where applicable.

ADDITIONAL INFORMATION

This section is reserved for remarks which may not be specifically addressed in preceding sections such as Product Hazard Warnings & Label Information.

Date: 8 March 1991
Revision No.: 1

H-W ES CASTABLE LI

MATERIAL SAFETY DATA SHEET

HARBISON-WALKER REFRACTORIES
Dresser Industries, Inc.
One Gateway Center, Pittsburgh, Pennsylvania 15222

TELEPHONE: 412-562-6200

DISCLAIMER

11-18-88

This data sheet is based on OSHA FORM 174 but modified to more adequately suit refractory products. All data are subject to reasonable variation. This information is supplied in good faith by Harbison-Walker and is applicable to the product as shipped. Your application of the product may change its characteristics. THE DATA PROVIDED HEREIN ARE BELIEVED CORRECT OR ARE OBTAINED FROM SOURCES BELIEVED TO BE GENERALLY RELIABLE. HARBISON-WALKER SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THIS PRODUCT, AND HARBISON-WALKER ASSUMES NO OBLIGATION OR LIABILITY FOR RELIANCE OF THE INFORMATION CONTAINED IN THIS DATA SHEET. This data is not part of any contract or condition of sale. It is solely supplied as an accomodation to the buyer.

SECTION I - PRODUCT IDENTIFICATION

Product Tradename: ES H-W Castable LI

Type of Refractory: Fireclay Castable

SECTION II - HAZARDOUS INGREDIENTS

SEE CHECKED BLOCKS INGREDIENT	GEN. CHEM. FORMULA	C.A.S. NUMBER	PERCENTAGE RANGE	OSHA P.E.L.	ACGIH TLV*	NIOSH CRITERIA DOCUMENT NO.
☐ Quartz	SiO_2	14808-607		$\frac{10\ mg/m^3}{\%\ Respirable\ Quartz + 2}$	0.1 mg/m³	75-120
☒ Cristobalite	SiO_2	14464-46-1	10 - 15	½ Quartz Value	0.05 mg/m³	75-120
☐ Tridymite	SiO_2	15468-32-3		½ Quartz Value	0.05 mg/m³	75-120
☐ Fused Silica	SiO_2	60676-86-0		20 mppcf	Use Quartz TLV	75-120
☐ Coal Tar Products	N/A	65996-93-2		0.2mg/m³	0.2 mg/m³	78-107
☐ Petroleum Pitch	N/A	8052-42-4		NONE	0.2 mg/m³	78-106
☐ Phosphoric Acid*	H_3PO_4	7664-38-2		1.0 mg/m³ (mist)	1.0 mg/m³	NONE
☐ Magnesia	MgO	1309-48-4		10 mg/m³	10 mg/m³	NONE
☐ Free Alumina*	Al_2O_3	1344-28-1		10 mg/m³	10 mg/m³	NONE
☒ Lime	CaO	1305-78-8	8 - 9	5.0 mg/m³	2.0 mg/m³	NONE
☐ Chrome III Oxide*	Cr_2O_3	1308-38-9		1.0 mg/m³	0.5mg/m³	NONE
☐						
☐						
☐						

* Subject to reporting under Section 313, Sara Title III

SECTION III - PHYSICAL DATA

Appearance and Odor: Gray to tan color; earthy odor

Specific Gravity: 2.08 pH: ND

Solubility in Water: Slight Calcium Aluminate Cement

Other:

FORM:

___ Brick

_X_ Granular

___ Paste

SECTION IV - FIRE AND EXPLOSION DATA

UNLESS OTHERWISE NOTED, NONE Product is a refractory, and will not burn.

NOTES:

SECTION V - HEALTH HAZARD DATA*

*SEE CHECKED BLOCKS		EXPOSURE REQUIRED	
INGREDIENT	EFFECTS OF OVEREXPOSURE	PROLONGED	SHORT TERM
☒ Free Crystalline Silica	Delayed lung fibrosis - silicosis	✓	
☐ Coal Tar Products	Skin, lung mucous membrane carcinogen	✓	
	Skin irritation; photosensitization		✓
☐ Petroleum Pitch	(Same as Coal Tar Products)	✓	✓
☐ Magnesia	Irritant to skin, eyes, mucous membranes, etc.		✓
☒ Lime	Irritant to skin, eyes, mucous membranes, etc.		✓
☐ Free Alumina	Irritant to skin, eyes, mucous membranes, etc		✓
☐ Fused Silica	Delayed lung fibrosis-silicosis	✓	
☐ Phosphoric Acid	Primary Irritant - skin, eyes, etc.		✓
☐ Chrome III Oxide	Irritant to skin, eyes, mucous membranes, etc.		✓
☐			
☐	—		

EMERGENCY OR FIRST AID PROCEDURES:

☒ Irritants: Wash from skin or flush from eyes using copious amounts of water.

☐ Coal Tar Products: Remove from skin by washing with soap and water. DO NOT use solvents. Same for Petroleum Pitch.

☐ Other:

SECTION VI - REACTIVITY DATA

STABILITY: ☒ STABLE ☐ UNSTABLE

COMMENTS: Incompatability (material to avoid)

Store in dry area prior to use

Hazardous decomposition products:

Hazardous Polymerization: ☐ may occur ☒ will not occur

SECTION VII - SPILL AND LEAK PROCEDURES

Most refractory products may be landfilled. However, since your application of this product may change its chemical characteristics, and since disposal procedures may vary with locale and are subject to change, you should consult the governmental authority having jurisdiction for disposal information.

COMMENTS:

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (CHECK ONE): ☒ Approved Dust ☐ Other (Specify):

VENTILATION: Local exhaust ventilation should be provided if routine operation generates dust in excess of allowable limits

PROTECTIVE GLOVES (CHECK TYPE): ☐ Acid Resistant ☐ Impermeable ☒ Abrasion Resistant ☐ Other (Specify):

EYE PROTECTION: Approved safety glasses, goggles or faceshields should be used when handling refractory products.

FOOT PROTECTION (CHECK TYPE): ☐ Metatarsal safety ☐ Impermeable

PROTECTIVE CLOTHING (SPECIFY):

SECTION IX - SPECIAL PRECAUTIONS

☐ If block is checked, product contains coal tar pitch, petroleum pitch or creosote. Over-exposure to dust/volatiles may cause cancer and/or irritation to eyes, skin and respiratory tract.
Do not breathe dust/fumes; use with proper ventilation. NIOSH approved respirators and protective clothing should be worn while handling this product.

☐ If block is checked, this resin bonded product contains free formaldehyde and phenol. Exposure to dust and vapor may cause irritation of skin, eyes, nose, and throat. Allergic skin reaction may also occur. Avoid prolonged or repeated contact with eyes or skin; avoid breathing dust or vapor. Wash thoroughly after handling. Wear rubber gloves and approved NIOSH respirator.

☒ If block is checked, the product contains crystalline silica for which there is limited evidence of a possible association with the incidence of cancer in humans.

Prepared By: C. D. Jamison

Emergency Phone: 412-562-6437

Date: 8 March 1991
Revision No.: 1

HI HEAT RESISTING ALUMINUM

MATERIAL SAFETY DATA SHEET

NPCA 1-7

FOR COATINGS, RESINS AND RELATED MATERIALS

(Approved by U S Department of Labor Essentially Similar to Form OSHA-20)

DATE OF PREP 8/12/81

Section I

MANUFACTURER'S NAME MAB Paints Inc.

STREET ADDRESS 630 N.3rd Street. CITY STATE AND ZIP CODE Terre Haute, Indiana 47808

EMERGENCY TELEPHONE NO. 812-234-6625

INFORMATION TELEPHONE NO 812-234-6625

PRODUCT CLASS Heat Resisting Aluminum MANUFACTURERS CODE IDENTIFICATION 947-422

TRADE NAME Hi Heat Resisting Aluminum

Section II — HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV PPM	TLV mg/M	LEL	VAPOR PRESSURE
Aromatic Hydrocarbons	60.0%	100		1.0%	2.0 mm. at 68°F.
Aliphatic Hydrocarbons	8.8%	200		0.7%	2.0 mm at 68°F.

Section III — PHYSICAL DATA

BOILING RANGE 280-315°F VAPOR DENSITY [X] HEAVIER [ ] LIGHTER THAN AIR

EVAPORATION RATE [ ] FASTER [X] SLOWER THAN ETHER PERCENT VOLATILE BY VOLUME 72.4% WEIGHT PER GALLON 8.13 Lb.

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION Flammable Liquid Class IC FLASH POINT 81°F T.C.C. LEL 0.7

EXTINGUISHING MEDIA Mechanical Foam, Dry Chemical, Water Fog, Carbon Dioxide.

UNUSUAL FIRE AND EXPLOSION HAZARDS Vapor accumulation may flash or explode if ignited.

SPECIAL FIRE FIGHTING PROCEDURES Straight water stream would spread oil fires.

Section V — HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE 100 ppm.

EFFECTS OF OVEREXPOSURE

ACUTE Too much vapor may affect central nervous system and cause respiratory irritation. Pale and nauseous, dizzy feeling,weak, irritation, severe eye irritation, drying of skin.

CHRONIC Repeated skin contact may cause dermatitis.

EMERGENCY AND FIRST AID PROCEDURES

Skin contact- Wash with soap and water, apply skin cream.
Eye contact- Wash with water for 15 minutes.
Inhalation- Provide fresh air and rest.

Section VI — REACTIVITY DATA

STABILITY ☐ UNSTABLE ☒ STABLE CONDITIONS TO AVOID Avoid strong oxidizing agents.

INCOMPATABILITY (*Materials to avoid*)

HAZARDOUS DECOMPOSITION PRODUCTS Carbon Monoxide if burned with insufficient air.

HAZARDOUS POLYMERIZATION ☐ MAY OCCUR ☒ WILL NOT OCCUR

CONDITIONS TO AVOID

Section VII — SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Avoid open flame. Provide adequate ventilation. Collect and dispose of all spilled liquid. Contain and remove with inert absorbent and non-sparking tools.

WASTE DISPOSAL METHOD Dispose in accordance with local, state, and federal regulations. Incinerate in approved facility.

Section VIII — SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION In poorly ventilated areas use self contained breathing appartus. When spraying use approved chemical mechanical filters designed to remove particulates and vapor.

VENTILATION Ventilate in accordance with OSHA regulation 29 CFR Part 1910.

PROTECTIVE GLOVES Recommended.

EYE PROTECTION Recommended.

OTHER PROTECTIVE EQUIPMENT As required.

Section IX — SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Handle as Flammable Liquid Class IC.

DOL STORAGE CATEGORY Store large quantities in building designed to comply with OSHA 1910.106.

OTHER PRECAUTIONS Donot incinerate closed cans.

Date: 8 March 1991
Revision No.: 1

FG-2 LIQUEFIED GAS

THRESHOLD LIMIT VALUE
The ACGIH 1987-88 recommended limit for welding fume, not otherwise classified (NOC), is 5 mg/m³.
TLV-TWA's should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations. See Section VI for specific fume constituents which may modify this TLV-TWA.

EFFECTS OF OVEREXPOSURE AND EMERGENCY AND FIRST AID PROCEDURES:
Working with welding and cutting may create one or more of the following health hazards:
FUMES AND GASES can be dangerous to your health and may cause serious lung disease.*
HEAT RAYS *(INFRARED RADIATION* from the flame or hot metal) can injure eyes.
NOISE can damage hearing.
This gas is an asphyxiant. Moderate concentrations may cause headache, drowsiness, dizziness and unconsciousness. Lack of oxygen can cause death. Keep your head out of the fumes. Do not breathe fumes and gases caused by the process. Use enough ventilation, local exhaust, or both, to keep fumes and gases from your breathing zone and the general area. The type and amount of fumes and gases depend on the equipment and supplies used. Possibly dangerous materials may be found in fluxes, coatings, gases, and metals. Get a Material Safety Data Sheet (MSDS) for every material used. Air samples can be used to find out what respiratory protection is needed. Wear correct ear, eye, and body protection. Short-term overexposure to fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes.
MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death. A detailed description of the Health Hazards and their consequences may be found in Linde's free safety booklet "Precautions and Safe Practices for Gas Welding, Cutting and Heating," L-2035. You may obtain copies from your local supplier, or by writing to Union Carbide Corporation, Linde Division, Communications Department, 39 Old Ridgebury Road, Danbury, Connecticut, 06817-0001.
FIRST AID IN CASE OF EMERGENCY: Call for medical aid. Employ First Aid techniques recommended by the American Red Cross. IF BREATHING IS DIFFICULT give oxygen. Call a physician. IF NOT BREATHING, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin external heart massage. Immediately call a physician. IN CASE OF EYE BURN call a physician.
NOTES TO PHYSICIAN:
Acute *— Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose, and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty breathing, frequent coughing, or chest pains.*
Chronic *— Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest X-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on X-rays may be caused by non-work related factors such as smoking, etc.*

HEALTH HAZARD DATA FOR THE GAS:

EFFECTS OF SINGLE (ACUTE) OVEREXPOSURE:
SWALLOWING: This product is a gas at normal temperature and pressure.
SKIN ABSORPTION: No evidence of adverse effects from available information.
INHALATION: Asphyxiant. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness.
SKIN CONTACT: No harmful effect expected from vapor. Liquid may cause frostbite.
EYE CONTACT: No harmful effect expected from vapor. Liquid may cause frostbite.
EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:
Repeated exposures have produced liver damage.
OTHER EFFECTS OF OVEREXPOSURE:
At very high concentrations overexposure may produce cardiac arrhythmias or arrest due to sensitization of the heart to adrenalin and nor-adrenalin.
MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:
A knowledge of the available toxicology information and of the physical and chemical properties of the material suggest that overexposure is unlikely to aggravate existing medical conditions.
SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:
None currently known.
EMERGENCY AND FIRST AID PROCEDURES:
SWALLOWING: This product is a gas at normal temperature and pressure.
SKIN CONTACT: For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 105°F). In case of massive exposure, remove clothing while showering with warm water. Call a physician.
INHALATION: Remove to fresh air. Give artificial respiration if not breathing. Give oxygen if breathing is difficult. Call a physician.
EYE CONTACT: In case of splash contamination, immediately flush eyes thoroughly with water for at least 15 minutes. See a physician, preferably an ophthalmologist, immediately.
NOTES TO PHYSICIAN: *Do not administer adrenalin due to the sensitizing effect of propene on the myocardium. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.*

Industry experience has shown that propylene may contain small amounts of radon, a naturally occuring radioactive gas, and its particulate decay products, some of which may be retained in process equipment. Gamma radiation above background levels, emitted from short half-life decay products, may be detected externally at that equipment during operations but will decay to background levels within 4 hours after cessation of gas flow. Equipment emitting gamma radiation should be presumed to be internally contaminated with the longer-life decay products that emit alpha radiation, which may be a hazard if inhaled.

If your assessment indicates the presence of gamma radiation, employee exposure potential should be minimized by limiting access near that equipment. Prior to maintenance on those equipment internals, stop gas flow and allow a 4 hour delay prior to opening. Maintenance personnel should wear appropriate protective equipment to prevent skin contamination or inhalation of any residue containing alpha radiation.

FLASH POINT (test method)	-107.8°C (-162°F) T.C.C.	**AUTOIGNITION TEMPERATURE**	860°F (460°C)
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** 2.0%	**UPPER**	11.1%

EXTINGUISHING MEDIA

CO_2, dry chemical, water spray or fog.

SPECIAL FIRE FIGHTING PROCEDURES

Evacuate all personnel from danger area. Immediately cool containers with water spray from maximum distance taking care not to extinguish flames. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive re-ignition may occur. Appropriate measures should be taken; e.g., total evacuation. Reapproach with extreme caution. Use self-contained breathing apparatus. Stop flow of gas if without risk while continuing cooling water spray. Remove all containers from area of fire if without risk. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Flammable gas. Forms explosive mixtures with air and oxidizing agents. Container may rupture due to heat of fire. Do not extinguish flames due to possibility of explosive re-ignition. Flammable vapors may spread from spill. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with approved device. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Vapors form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, spark heaters, electrical equipment, static discharge or other ignition sources at locations distant from product handling point.

Most containers are provided with a pressure-relief device designed to vent contents when they are exposed to elevated temperature.

STABILITY		**CONDITIONS TO AVOID**
UNSTABLE	**STABLE**	See Section IX.
	X	

INCOMPATIBILITY (materials to avoid)
Oxidizing agents, halogens, acids.

HAZARDOUS DECOMPOSITION PRODUCTS
Thermal decomposition or burning may produce CO/CO_2. The welding/cutting process may form reaction products such as carbon monoxide and carbon dioxide. Other decomposition products of normal operation originate from the volatilization, reaction or oxidation of the material being worked.

HAZARDOUS POLYMERIZATION		**CONDITIONS TO AVOID**
May Occur	**Will not Occur**	Elevated temperatures and pressures and/or the presence of a catalyst.
X		

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

DANGER: Forms explosive mixtures with air (see Section IV). Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off leak if without risk. Ventilate area of leak or move leaking container to well-ventilated area.

DANGER: Flammable vapors may spread from spill. Before entering area, especially confined areas, check atmosphere with appropriate device.

WASTE DISPOSAL METHOD: Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, state and local regulations.

RESPIRATORY PROTECTION (specify type) — Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select as per OSHA29 CFR1910.134 and ANSI Z88.2-1980. Wear a self-contained breathing apparatus operated in the pressure-demand mode for fire fighting or entry in an oxygen deficient atmosphere.

VENTILATION	**LOCAL EXHAUST** — Use enough ventilation, local exhaust or both, to keep the fumes and gases below TLV's in the worker's breathing zone and the general area. Train the worker to keep his head out of the fumes.
	MECHANICAL (general) — ALWAYS WORK WITH ENOUGH VENTILATION
	SPECIAL — Not applicable
	OTHER — Depends on specific use conditions, and location. Use adequate ventilation or personal respiratory protection. See Section IX and OSHA29 CFR1910.252.

PROTECTIVE GLOVES: Preferred for cylinder handling. Welding gloves recommended for welding and cutting.

EYE PROTECTION: Wear goggles with filter lens selected as per ANSI Z49.1. Provide protective screens and goggles, if necessary, to protect others. Select as per OSHA29 CFR1910.133.

OTHER PROTECTIVE EQUIPMENT — As needed, wear hand, head, and body protection which help to prevent injury from radiation, and sparks. See ANSI Z49.1. At a minimum this includes welder's gloves and protective goggles, and may include arm protectors, aprons, hats, shoulder protection, as well as substantial clothing.

DANGER: Flammable, liquefied gas under pressure. May form explosive mixtures with air.
Fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the metal being worked, the process, procedure and electrodes used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being worked (such as paint, plating, or galvanizing), the number of workers and the volume of the work area, the quality and amount of ventilation, the position of the worker's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample from inside the worker's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1, available from the American Welding Society, 550 N.W. Le Jeune Rd., Miami, FL 33126.

Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, "Safety In Welding And Cutting" published by the American Welding Society and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Washington, D.C. 20402 for more details. For further safety and health information refer to Linde's free safety booklet L-2035, "Precautions and Safe Practices for Gas Welding, Cutting and Heating."

OTHER HANDLING AND STORAGE CONDITIONS:
Heat and sparks during use could be the source of ignition of combustible materials. Prevent fires.
Refer to NFPA 51B "Cutting and Welding Processes" and NFPA 50 "Oxygen-Fuel Gas Systems." Use piping and equipment adequately designed to withstand pressures to be encountered. Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Close valve when not in use and when empty. Never work on a pressurized system. Use metatarsal shoes for cylinder handling. Protective clothing where needed. Select in accordance with OSHA29 CFR1910.132 and 1910.133. Do not strike arc on cylinder. The defect produced by an arc burn could lead to cylinder rupture. Do not ground cylinder. Do not store above 52°C (125°F).

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

LINDE
UNION CARBIDE

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-4617C 87-0928 11/87 5M

Lithographed in U.S.A.

Date: 8 March 1991
Revision No.: 1

METHANOL

METHANOL
METHANOL
METHANOL

MATERIAL SAFETY DATA SHEET

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CHEMICAL DIVISION
1 REAGENT LANE
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SUBSTANCE IDENTIFICATION

CAS-NUMBER 67-56-1

SUBSTANCE: **METHANOL**

TRADE NAMES/SYNONYMS:
METHYL ALCOHOL; WOOD ALCOHOL; METHYL HYDROXIDE; CARBINOL; MONOHYDROXYMETHANE; WOOD SPIRIT; WOOD NAPHTHA; U154; UN 1230; ACC14280

CHEMICAL FAMILY:
HYDROXYL, ALIPHATIC

MOLECULAR FORMULA: C-H4-O MOL WT: 32.04

CERCLA RATINGS (SCALE 0-3): HEALTH=1 FIRE=3 REACTIVITY=0 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=3 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: METHYL ALCOHOL PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
200 PPM OSHA TWA
200 PPM NIOSH RECOMMENDED TWA
200 PPM ACGIH TWA (SKIN); 250 PPM ACGIH STEL

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS LIQUID; CHARACTERISTIC ALCOHOL ODOR.

BOILING POINT: 147 F (64 C) MELTING POINT: -144 F (-98 C)

SPECIFIC GRAVITY: 0.8 VAPOR PRESSURE: 97 MMHG @ 20 C

EVAPORATION RATE: (ETHER=1) 5.9 (TTE) SOLUBILITY IN WATER: SOLUBLE

ODOR THRESHOLD: 100 PPM VAPOR DENSITY: 1.1

SOLVENT SOLUBILITY: ETHER, BENZENE, ALCOHOL, KETONES, ORG SOLVENTS

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
DANGEROUS FIRE/NEGLIGIBLE EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME.
FIRE AND EXPLOSION HAZARD BY REACTION WITH STRONG OXIDIZERS.
VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO A SOURCE OF IGNITION AND FLASH BACK.

EVAPORATION RATE: (ETHER=1) 5.9 (TTE) SOLUBILITY IN WATER: SOLUBLE

ODOR THRESHOLD: 100 PPM VAPOR DENSITY: 1.1

SOLVENT SOLUBILITY: ETHER, BENZENE, ALCOHOL, KETONES, ORG SOLVENTS

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
DANGEROUS FIRE/NEGLIGIBLE EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME.
FIRE AND EXPLOSION HAZARD BY REACTION WITH STRONG OXIDIZERS.
VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO A SOURCE OF IGNITION AND FLASH BACK.
VAPOR-AIR MIXTURES ARE EXPLOSIVE.

FLASH POINT: 52 F (11 C) (CC) UPPER EXPLOSIVE LIMIT: 36.5%

LOWER EXPLOSIVE LIMIT: 6.0% AUTOIGNITION TEMP.: 725 F (385 C)

FLAMMABILITY CLASS(OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FOR LARGER FIRES, USE WATER SPRAY OR FOAM: FOAM IS PREFERRABLE.

FIREFIGHTING:
FLAMMABLE LIQUID (POISONOUS)- WEAR RESPIRATORY EQUIPMENT. DO NOT ATTEMPT TO EXTINGUISH FIRE UNLESS SPILL FLOW CAN BE STOPPED. USE FLOODING QUANTITIES OF WATER AS A FOG AND TO COOL ALL CONTAINERS INVOLVED IN FIRE. APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE. APPLICATION OF SOLID STREAMS OF WATER MAY SPREAD FIRE.

TOXICITY

5 PPM EYE-HUMAN IRRITATION; 500 MG/24 HOURS SKIN-RABBIT MODERATE IRRITATION; 40 MG EYE-RABBIT MODERATE IRRITATION; 340 MG/KG ORAL-HUMAN LDLO; 868 MG/KG UNKNOWN-HUMAN LDLO; 5628 MG/KG ORAL RAT LD50; 64,000 PPM/4 HOURS INHALATION-RAT LC50; 1000 PPM INHALATION-MONKEY LCLO; 500 MG/KG SKIN-MONKEY LDLO; 20 GM/KG SKIN-RABBIT LD50; 8600 MG/M3 INHALATION-HUMAN TCLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); CARCINOGEN STATUS: NONE.

METHYL ALCOHOL IS A EYE, SKIN, AND MUCOUS MEMBRANE IRRITANT AND A CENTRAL NERVOUS SYSTEM DEPRESSANT.

HEALTH EFFECTS AND FIRST AID

INHALATION:
NARCOTIC. 25,000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- INTOXICATION BEGINS WITH A STATE OF INEBRIATION. WITHIN 12-18 HOURS, HEADACHE, ANOREXIA, WEAKNESS, FATIGUE, LEG CRAMPS, VERTIGO AND RESTLESSNESS OCCUR, FOLLOWED BY NAUSEA, VOMITING, DIARRHEA, DIZZINESS, AND OTHER SIGNS OF NARCOSIS, THEN SEVERE ABDOMINAL, BACK AND LEG PAIN, MUSCULAR INCOORDINATION, SWEATING, TRACHEITIS AND BRONCHITIS. APATHY OR

DELIRIUM MAY PROGRESS TO COMA. EXCITEMENT, MANIA AND CONVULSIONS OCCUR RARELY. BLURRED OR DIMMED VISION HAS OCCURRED WITH OPTIC NEURITIS, EYE PAIN AND ATROPHY, CONCENTRIC VISUAL FIELDS AND PHOTOPHOBIA, FOLLOWED BY TRANSIENT OR PERMANENT BLINDNESS. ACIDOSIS MAY RESULT IN RAPID, SHALLOW RESPIRATION, CYANOSIS, COMA AND HYPOTENSTION. MILD TACHYCARDIA, CARDIAC DEPRESSION AND PERIPHERAL NEURITIS ARE POSSIBLE AS WELL AS LIVER AND KIDNEY DAMAGE AND CEREBRAL FAILURE OR CIRCULATORY COLLAPSE. PROLONGED ASTHENIA AND PARTIAL OR COMPLETE LOSS OF VISION IN 2-6 DAYS, AND PERMANENT RENAL DYSFUNCTION MAY FOLLOW NON-FATAL INTOXICATION. BLINDNESS IS CAUSED AT 800 TO 1000 PPM. 50,000 PPM WILL PROBABLY CAUSE DEATH IN 1 TO 2 HOURS.

CHRONIC EXPOSURE- PROLONGED OR REPEATED EXPOSURE MAY CAUSE SYMPTOMS SUCH AS BLURRED VISION, CONTRACTION OF VISUAL FIELDS AND SOMETIMES, COMPLETE BLINDNESS. SEE MUTAGENIC DATA AND ANIMAL REPRODUCTIVE EFFECTS DATA

DELIRIUM MAY PROGRESS TO COMA. EXCITEMENT, MANIA AND CONVULSIONS OCCUR RARELY. BLURRED OR DIMMED VISION HAS OCCURRED WITH OPTIC NEURITIS, EYE PAIN AND ATROPHY, CONCENTRIC VISUAL FIELDS AND PHOTOPHOBIA, FOLLOWED BY TRANSIENT OR PERMANENT BLINDNESS. ACIDOSIS MAY RESULT IN RAPID, SHALLOW RESPIRATION, CYANOSIS, COMA AND HYPOTENSTION. MILD TACHYCARDIA, CARDIAC DEPRESSION AND PERIPHERAL NEURITIS ARE POSSIBLE AS WELL AS LIVER AND KIDNEY DAMAGE AND CEREBRAL FAILURE OR CIRCULATORY COLLAPSE. PROLONGED ASTHENIA AND PARTIAL OR COMPLETE LOSS OF VISION IN 2-6 DAYS, AND PERMANENT RENAL DYSFUNCTION MAY FOLLOW NON-FATAL INTOXICATION. BLINDNESS IS CAUSED AT 800 TO 1000 PPM. 50,000 PPM WILL PROBABLY CAUSE DEATH IN 1 TO 2 HOURS.

CHRONIC EXPOSURE- PROLONGED OR REPEATED EXPOSURE MAY CAUSE SYMPTOMS SUCH AS BLURRED VISION, CONTRACTION OF VISUAL FIELDS AND SOMETIMES, COMPLETE BLINDNESS. SEE MUTAGENIC DATA AND ANIMAL REPRODUCTIVE EFFECTS DATA REFERENCES IN TOXICITY SECTION.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
IRRITANT/NARCOTIC.
ACUTE EXPOSURE- CONTACT WITH LIQUID CAN PRODUCE DEFATTING AND A MILD DERMATITIS. READILY ABSORBED THROUGH INTACT SKIN TO CAUSE NARCOSIS, OPTIC NEURITIS AND ACIDOSIS.

CHRONIC EXPOSURE- PROLONGED OR REPEATED SKIN CONTACT PRODUCES ECZEMA, REDNESS AND SCALING. CHRONIC ABSORPTION MAY RESULT IN VISUAL IMPAIRMENT AND OPTIC NEURITIS. SEE MUTAGENIC DATA AND ANIMAL REPRODUCTIVE EFFECTS DATA REFERENCES IN TOXICITY SECTION.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
IRRITANT.
ACUTE EXPOSURE- EYE CONTACT WITH METHANOL HAS CAUSED SUPERFICIAL CORNEAL LESIONS. INGESTION, INHALATION OR SKIN ABSORPTION MAY RESULT IN BLURRED OR DIMMED VISION FOLLOWED BY TRANSIENT OR PERMANENT BLINDNESS, WITH OPTIC NEURITIS, EYE PAIN, ATROPHY, CONCENTRIC VISUAL FIELDS AND PHOTOPHOBIA. 5 PPM AND 40 MG CAUSE MODERATE IRRITATION IN EYES OF HUMANS AND RABBITS RESPECTIVELY.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS. VISUAL IMPAIRMENT AS DESCRIBED ABOVE MAY INDICATE CHRONIC EXPOSURE BY INGESTION, INHALATION OR SKIN ABSORPTION.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
NARCOTIC.
ACUTE EXPOSURE- MAY CAUSE DELAYED SYMPTOMS OF HEADACHE, ANOREXIA, WEAKNESS, FATIGUE, LEG CRAMPS, VERTIGO AND RESTLESSNESS, FOLLOWED BY NAUSEA,

VOMITING, DIARRHEA, DIZZINESS, AND OTHER SIGNS OF NARCOSIS. SEVERE ABDOMINAL, BACK AND LEG PAIN, MUSCULAR INCOORDINATION, SWEATING, TRACHEITIS AND BRONCHITIS MAY OCCUR. APATHY OR DELIRIUM MAY PROGRESS TO COMA. EXCITEMENT, MANIA AND CONVULSIONS HAVE OCCURRED RARELY. BLURRED OR DIMMED VISION FOLLOWED BY TRANSIENT OR PERMANENT BLINDNESS WITH OPTIC NEURITIS, EYE PAIN, ATROPHY, CONCENTRIC VISUAL FIELDS AND PHOTOPHOBIA MAY OCCUR. ACIDOSIS MAY RESULT IN RAPID, SHALLOW RESPIRATION, CYANOSIS, COMA AND HYPOTENSION. MILD TACHYCARDIA, CARDIAC DEPRESSION AND PERIPHERAL NEURITIS ARE POSSIBLE, AS WELL AS LIVER AND KIDNEY DAMAGE AND CEREBRAL AND PULMONARY EDEMA. DEATH IS POSSIBLE FROM RESPIRATORY FAILURE OR CIRCULATORY COLLAPSE. PROLONGED ASTHENIA AND PARTIAL OR COMPLETE LOSS OF VISION IN 2-6 DAYS, AND PERMANENT RENAL DYSFUNCTION MAY FOLLOW NON-FATAL INTOXICATION.

VOMITING, DIARRHEA, DIZZINESS, AND OTHER SIGNS OF NARCOSIS. SEVERE ABDOMINAL, BACK AND LEG PAIN, MUSCULAR INCOORDINATION, SWEATING; TRACHEITIS AND BRONCHITIS MAY OCCUR. APATHY OR DELIRIUM MAY PROGRESS TO COMA. EXCITEMENT, MANIA AND CONVULSIONS HAVE OCCURRED RARELY. BLURRED OR DIMMED VISION FOLLOWED BY TRANSIENT OR PERMANENT BLINDNESS WITH OPTIC NEURITIS, EYE PAIN, ATROPHY, CONCENTRIC VISUAL FIELDS AND PHOTOPHOBIA MAY OCCUR. ACIDOSIS MAY RESULT IN RAPID, SHALLOW RESPIRATION, CYANOSIS, COMA AND HYPOTENSION. MILD TACHYCARDIA, CARDIAC DEPRESSION AND PERIPHERAL NEURITIS ARE POSSIBLE, AS WELL AS LIVER AND KIDNEY DAMAGE AND CEREBRAL AND PULMONARY EDEMA. DEATH IS POSSIBLE FROM RESPIRATORY FAILURE OR CIRCULATORY COLLAPSE. PROLONGED ASTHENIA AND PARTIAL OR COMPLETE LOSS OF VISION IN 2-6 DAYS, AND PERMANENT RENAL DYSFUNCTION MAY FOLLOW NON-FATAL INTOXICATION.

FIRST AID- GET MEDICAL ATTENTION IMMEDIATELY. IF MEDICAL ATTENTION IS NOT IMMEDIATELY AVAILABLE, AND IF VICTIM IS CONSCIOUS, ATTEMPT TO INDUCE VOMITING BY TOUCHING FINGER TO BACK OF THROAT. ALSO GIVE SODIUM BICARBONATE (BAKING SODA), 2 TEASPOONFULS IN WATER.

REACTIVITY

REACTIVITY:
STABLE AT ORDINARY PRESSURES UP THE BOILING POINT, 64 C.

INCOMPATIBILITIES:
OXIDIZERS AND OTHER MATERIALS, EXAMPLES FOLLOW:

METHANOL:
- CHLOROFORM AND SODIUM HYDROXIDE: EXPLOSIVE REACTION.
- CALCIUM CARBIDE: VIOLENT REACTION.
- MAGNESIUM: VIOLENT REACTION.
- CYANURIC CHLORIDE: VIOLENT REACTION.
- BERYLLIUM HYDRIDE: INTENSE REACTION AT 200 C.
- BROMINE: INTENSE EXOTHERMIC REACTION.
- CHROMIC ANHYDRIDE: POSSIBLE EXPLOSIVE REACTION.
- NICKEL: POSSIBLE IGNITION IN THE PRESENCE OF CATALYTIC AMOUNTS.

DECOMPOSITION:
COMBUSTION PRODUCTS INCLUDE TOXIC/HAZARDOUS GASES OF FORMALDEHYDE, CARBON MONOXIDE AND CARBON DIOXIDE.

POLYMERIZATION:
WILL NOT OCCUR.

****

CONDITIONS TO AVOID

MAY BE IGNITED BY HEAT, SPARKS OR FLAMES. CONTAINER MAY EXPLODE IN HEAT OF FIRE. VAPOR EXPLOSION AND POISON HAZARD INDOORS, OUTDOORS OR IN SEWERS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

AVOID CONTACT WITH OR STORAGE WITH INCOMPATIBLE MATERIALS, INCLUDING THOSE LISTED IN THE REACTIVITY SECTION.

****

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES. PROVIDE VENTILATION. WEAR RESPIRATORY PROTECTION. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER NON COMBUSTIBLE, ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL, CLOSE TIGHTLY AND LABEL 'FLAMMABLE'. FOR LARGER SPILLS, DIKE AS CLOSE TO SPILL AS PRACTICAL TO MINIMIZE ENVIRONMENTAL CONTAMINATION. NO SMOKING, FLAMES OR FLARES IN HAZARD ARES. KEEP OUT OF SEWERS AND WATER SOURCES.

WHEN MATERIAL IS INVOLVED IN FIRE:

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES. PROVIDE VENTILATION. WEAR RESPIRATORY PROTECTION. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER NON COMBUSTIBLE, ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL, CLOSE TIGHTLY AND LABEL 'FLAMMABLE'. FOR LARGER SPILLS, DIKE AS CLOSE TO SPILL AS PRACTICAL TO MINIMIZE ENVIRONMENTAL CONTAMINATION. NO SMOKING, FLAMES OR FLARES IN HAZARD ARES. KEEP OUT OF SEWERS AND WATER SOURCES.

WHEN MATERIAL IS INVOLVED IN FIRE:
DO NOT ATTEMPT TO EXTINGUISH FIRE UNLESS SPILL OR LEAK FLOW CAN BE STOPPED.
USE FLOODING QUANTITIES OF WATER AS A FOG.
APPLICATION OF SOLID STREAMS OF WATER MAY SPREAD FIRE.
USE FLOODING QUANTITIES OF WATER TO COOL ALL CONTAINERS INVOLVED IN FIRE.
APPLY WATER TO MATERIAL FROM AS FAR A DISTANCE AS POSSIBLE.
EXTINGUISH WITH DRY CHEMICAL, ALCOHOL FOAM OR CARBON DIOXIDE.
DO NOT ALLOW RUN-OFF WATER TO CONTAMINATE SEWERS OR WATER SOURCES.

WHEN MATERIAL NOT INVOLVED IN FIRE:
KEEP OPEN FLAMES, SPARKS OR OTHR IGNITION SOURCES AWAY.
DO NOT ALLOW MATERIAL TO CONTAMINATE SEWERS OR WATER SOURCES.
BUILD DIKES FOR CONTAINMENT OF SPILL FLOW.
STOP LEAK IF YOU CAN DO IT WITHOUT RISK.
KNOCK DOWN VAPORS WITH WATER SPRAY.

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION OR GENERAL DILUTION VENTILATION TO MEET PERMISSIBLE EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:
2000 PPM- SUPPLIED-AIR RESPIRATOR.
SELF-CONTAINED BREATHING APPARATUS.

10,000 PPM- SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE, HELMET, OR HOOD.
SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

> 10,000 PPM, INCLUDING THE IDLH LEVEL, 25,000 PPM (2.5%)-
TYPE C SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE, HELMET, OR HOOD OPERATED IN POSITIVE PRESSURE MODE OR IN CONTINUOUS-FLOW MODE.

FIREFIGHTING- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR IMPERVIOUS CLOTHING AS NECESSARY TO AVOID ANY POSSIBILITY OF CONTACT WITH SOLUTIONS OR MISTS.

GLOVES:
WEAR PROTECTIVE GLOVES AS NECESSARY TO AVOID REPEATED OR PROLONGED CONTACT

WITH SOLUTION OR MIST. PREFERRED MATERIALS: BUTYL, NEOPRENE AND NITRILE RUBBER GLOVES.

EYE PROTECTION:
WEAR FACESHIELD (8 INCH MINIMUM) OR SPLASH-PROOF SAFETY GOGGLES WHERE THERE IS REASONABLE PROBABILITY OF CONTACT WITH LIQUID OR MIST. DO NOT WEAR CONTACT LENSES WHEN WORKING WITH CHEMICALS.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 10/25/85 REVISION DATE: 03/19/86

-ADDITIONAL INFORMATION-

THE INFORMATION BELOW IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST

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EYE PROTECTION:
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AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
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-ADDITIONAL INFORMATION-
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Date: 8 March 1991
Revision No.: 1

METHYLENE CHLORIDE

J. T. Baker Inc.
222 Red School Lane Phillipsburg, N.J. 08865
24-Hour Emergency Telephone -- (201) 859-2151
Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

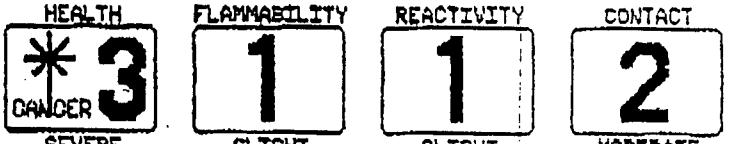
MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT IDENTIFICATION

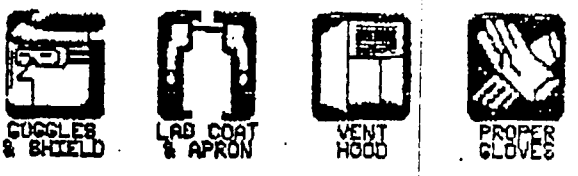
Product Name:	Methylene Chloride
Formula:	CH_2Cl_2
Formula Wt:	84.93
CAS No.:	75-09-2
NIOSH/RTECS No.:	PA8050000
Common Synonyms:	Dichloromethane; Methylene Dichloride; Methane Dichloride
Product Codes:	9329,9313,5378,9264,9324,9128,9330,9341,Q480,5531,9315

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA™ System



Laboratory Protective Equipment



Precautionary Label Statements

POISON! DANGER!
CAUSES IRRITATION
HARMFUL IF ABSORBED THROUGH SKIN.
MAY BE FATAL IF SWALLOWED OR INHALED
NOTE: REPORTED AS CAUSING CANCER IN LABORATORY ANIMALS. EXERCISE DUE CARE.
Avoid contact with eyes, skin, clothing.
Keep in tightly closed container. Wash thoroughly after handling.

SECTION II - HAZARDOUS COMPONENTS

Component	%	CAS No.
Methylene Chloride	90-100	75-09-2

SECTION III - PHYSICAL DATA

Boiling Point:	40°C (104°F)	Vapor Pressure(mmHg):	350
Melting Point:	-95°C (-139°F)	Vapor Density(air=1):	2.9

Continued on Page: 2

SECTION III - PHYSICAL DATA (Continued)

Specific Gravity (H_2O=1): 1.32

Evaporation Rate: 27.5
(Butyl Acetate=1)

Solubility(H_2O): Moderate (1 to 10 %)

% Volatiles by Volume: 100

Appearance & Odor: Colorless,volatile liquid with penetrating,ether-like odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A

NFPA 704M Rating: 2-1-0

Flammable Limits: Upper - 19 % Lower - 12 %

Fire Extinguishing Media
Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool.

Unusual Fire & Explosion Hazards
Closed containers exposed to heat may explode.

Toxic Gases Produced
hydrogen chloride, phosgene, carbon monoxide, carbon dioxide

SECTION V - HEALTH HAZARD DATA

This substance is listed as an ACGIH suspected human carcinogen.

Threshold Limit Value (TLV/TWA): 350 mg/m^3 (100 ppm)

Short-Term Exposure Limit (STEL): 1740 mg/m^3 (500 ppm)

Permissible Exposure Limit (PEL): mg/m^3 (500 ppm)

Toxicity: LD_{50} (oral-rat)(mg/kg) - 2524
LD_{50} (ipr-mouse)(mg/kg) - 1500
LD_{50} (scu-mouse)(mg/kg) - 6460
LC_{50} (inhal-rat-)(g/m^3) - 88

Continued on Page: 3

SECTION V - HEALTH HAZARD DATA (Continued)

Carcinogenicity: NTP: No IARC: No Z List: No OSHA reg: No

Effects of Overexposure

Inhalation and ingestion are harmful and may be fatal.
Inhalation may cause headache, nausea, vomiting, dizziness, narcosis, suffocation, lower blood pressure, central nervous system depression.
Inhalation of vapors may cause severe irritation of the respiratory system
Contact with skin or eyes may cause irritation. Prolonged skin contact may result in dermatitis. Eye contact may result in temporary corneal damage.
Ingestion may cause nausea, vomiting, gastrointestinal irritation, and burns to mouth and throat.

Medical Conditions Generally Aggravated By Exposure

None Identified

Routes Of Entry

inhalation, ingestion, skin contact, eye contact

Emergency and First Aid Procedures

CALL A PHYSICIAN.
If swallowed, do NOT induce vomiting.
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Flush skin with water.

Acceptable maximum peak above the acceptance ceiling concentration for an 8 hour shift = 2000 ppm for 5 minutes in any 2hours. (PEL) Ceiling = 1000 ppm

SECTION VI - REACTIVITY DATA

Stability: Stable Hazardous Polymerization: Will not occur

Conditions to Avoid: heat, flame, other sources of ignition, moisture

Incompatibles: alkali metals, strong oxidizing agents, strong bases, oxides of nitrogen, zinc, aluminum, water, magnesium, amines

Decomposition Products: hydrogen chloride, phosgene, carbon monoxide, carbon dioxide

SECTION VII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge

Wear self-contained breathing apparatus and full protective clothing.
Stop leak if you can do so without risk. Use water spray to reduce vapors.

Continued on Page 2

SECTION VII - SPILL AND DISPOSAL PROCEDURES (Continued)

Take up with sand or other non-combustible absorbent material and place into container for later disposal. Flush spill area with water.

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

EPA Hazardous Waste Number: U080 (Toxic Waste)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation:	Use general or local exhaust ventilation to meet TLV requirements.
Respiratory Protection:	Respiratory protection required if airborne concentration exceeds TLV. At concentrations above 100 ppm, a self-contained breathing apparatus is advised.
Eye/Skin Protection:	Safety goggles and face shield, uniform, protective suit, polyvinyl alcohol gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA™ Storage Color Code: Blue (health)

Special Precautions

Keep container tightly closed. Store in secure poison area.
Keep containers out of sun and away from heat.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

Proper Shipping Name	Dichloromethane (air only)
Hazard Class	ORM-A
UN/NA	UN1593
Labels	NONE
Reportable Quantity	1000 LBS.

INTERNATIONAL (I.M.O.)

Proper Shipping Name	Dichloromethane
Hazard Class	6.1
UN/NA	UN1593
Labels	HARMFUL - STOW AWAY FROM FOOD STUFFS

Continued on Page: 5

J. T. Baker Inc.
222 Red School Lane Phillipsburg, N.J. 08865
24-Hour Emergency Telephone -- (201) 859-2151
Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

MATERIAL SAFETY DAT SHEET

N/A = Not Applicable or Not Available

The information published in this Material Safety Data Sheet has been compiled from our experience and data presented in various technical publications. It is the user's responsibility to determine the suitability of this information for the adoption of necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available. J. T. Baker makes no warranty or representation about the accuracy or completeness nor fitness for purpose of the information contained herein.

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Date: 8 March 1991
Revision No.: 1

PROPANE

..EMICAL NAME
PROPANE

RMULA
C3H8

NONYMS
DIMETHYLMETHANE
PROPYL HYDRIDE
PROPYLHYDRIDE
N-PROPANE
R-290
UN 1978
STCC 4905781
LIQUEFIED PETROLEUM GAS
-LPG
OHS19690

PERMISSIBLE EXPOSURE LIMIT
1000 PPM OSHA TWA
AQUATIC TOXICITY RATING 0 (TLM96 >1000 PPM)
NO DATA LOCATED - RATED BY UNITED NATIONS GESAMP
CERCLA HAZARD RATINGS - TOXICITY 1 - IGNITABILITY 3 - REACTIVITY 0 -
PERSISTENCE 0

TOXICOLOGY: PROPANE MAY CAUSE FROSTBITE DUE TO THE RAPID EVAPORATION OF THE LIQUID. IT IS A SIMPLE ASPHYXIANT AND A CENTRAL NERVOUS SYSTEM DEPRESSANT. THERE IS INSUFFICIENT DATA TO QUANTIFY THE TOXICITY.
SINCE THE ODOR THRESHOLD IS 20 TIMES THE PERMISSIBLE EXPOSURE LIMIT, AND NO IRRITATION IS PRODUCED AT A CONCENTRATION 100 TIMES THE PERMISSIBLE EXPOSURE LIMIT, PROPANE IS CONSIDERED TO HAVE POOR WARNNING PROPERTIES.

MEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
20,000 PPM
OSHA/NIOSH

...YSICAL DESCRIPTION
COLORLESS GAS WITH A CHARACTERISTIC NATURAL GAS ODOR.

EMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 44.0
BOILING POINT AT 1 ATM, F: -44 F (-42 C)
SOLUBILITY IN WATER, G/100 G WATER AT 20C: VERY SLIGHTLY
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): -157 F (-105 C)
VAPOR PRESSURE @ 20 C, MMHG: 6536 MMHG
MELTING POINT, F: -310 F (-190 C)
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 9.5%
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 2.1%
AUTOIGNITION TEMPERATURE: 842 F (450 C)
SPECIFIC GRAVITY: 0.585 @ -45 C
VAPOR DENSITY (AIR=1): 1.55
ODOR THRESHOLD: 5000-20000 PPM

...COMPATIBILITIES
CHLORINE DIOXIDE
PLASTICS
RUBBER
STRONG OXIDIZERS
PEROXIDES

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT THE SKIN FROM BECOMING FROZEN FROM CONTACT WITH THIS LIQUID OR FROM CONTACT WITH VESSELS CONTAINING THIS LIQUID.

-- --- --

ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATED THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION. (THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY; BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.) (A "+" DESIGNATES A BLEND OF MATERIALS, WHILE A "/" DESIGNATES A COATED OR LAMINATED MATERIAL.)

-- --- --

PROPANE:

EXCELLENT/GOOD:

- NEOPRENE
- NITRILE+POLYVINYL CHLORIDE
- POLYURETHANE

GOOD/FAIR:

- POLYETHYLENE
- POLYVINYL CHLORIDE
- VITON

POOR/FAIR:

- NITRILE
- NEOPRENE+STYRENE-BUTADIENE RUBBER
- STYRENE-BUTADIENE RUBBER
- STYRENE-BUTADIENE RUBBER/NEOPRENE

POOR:

- BUTYL
- NATURAL RUBBER

GOGGLES

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE SPLASH-PROOF SAFETY GOGGLES WHICH COMPLY WITH 29CFR1910.133(A)(2)-(A)(6) WHERE THIS LIQUID MAY CONTACT THE EYES.

WASHING CHEMICALS FROM THE SKIN

NO SPECIFIC REQUIREMENT. WASH APPROPRIATELY AS INDICATED BY THE NATURE OF THE CONTAMINANT AND THE CONDITIONS OF EXPOSURE.

ROUTINE CHANGING OF WORK CLOTHING

NO SPECIFIC REQUIREMENT. IF INDICATED BY THE NATURE OF THE CONTAMINANT AND THE EXTENT OF EXPOSURE, CHANGE INTO UNCONTAMINATED CLOTHING BEFORE LEAVING THE WORK PREMISES.

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT ANY CLOTHING WHICH BECOMES WET WITH THIS FLAMMABLE LIQUID BE REMOVED IMMEDIATELY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

SPECIFIC EMERGENCY PROVISIONS

NO SPECIFIC REQUIREMENT. IF INDICATED BY THE NATURE OF THE SUBSTANCE AND THE PROBABILITY OF EXPOSURE, PROVIDE AN EYE WASH AND FACILITIES FOR QUICK DRENCHING OF THE BODY WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

,000 PPM
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

20,000 PPM
- SUPPLIED-AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE
- SUPPLIED-AIR RESPIRATOR WITH A FULL FACE-PIECE
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE

ESCAPE
- APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS

REFIGHTING
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY

INHALATION
SKIN OR EYE CONTACT

SYMPTOMS

SKIN IRRITATION
EYE IRRITATION
FROSTBITE
DIZZINESS
RESPIRATORY DEPRESSION
MYOCARDIAL EFFECTS
DISORIENTATION
EXCITATION
EXCESSIVE SALIVATION
HEADACHE
VOMITING
ASPHYXIA
DYSPNEA
MENTAL DISORDER
PROSTRATION
INCOORDINATION
UNCONSCIOUSNESS

COMA

FIRST AID PROCEDURES FOLLOWING EXPOSURE
IT IS UNLIKELY THAT CONTACT WITH THE EYES WITH THIS GAS FORM WILL REQUIRE EMERGENCY TREATMENT. IF CONTACT WITH LIQUIFIED OR COMPRESSED GAS OCCURS, WASH WITH LARGE AMOUNTS OF WARM WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

IF THIS CHEMICAL GETS ON THE SKIN, REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF THE CHEMICAL REMAINS. IN CASE OF FROSTBITE, WARM AFFECTED AREA IN WARM WATER AT A TEMPERATURE OF 107 F. IF WARM WATER IS NOT AVAILABLE OR IMPRACTICAL TO USE, GENTLY WRAP AFFECTED PART IN BLANKETS. ENCOURAGE VICTIM TO EXERCISE AFFECTED PART WHILE IT IS BEING WARMED. ALLOW CIRCULATION TO RETURN NATURALLY. (MATHESON GAS, 6TH ED.). GET MEDICAL ATTENTION IMMEDIATELY.

IF THIS CHEMICAL HAS BEEN INHALED, REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

IF INGESTED, IT IS UNLIKELY THAT EMERGENCY TREATMENT WILL BE REQUIRED. IF ADVERSE EFFECTS OCCUR, TREAT SYMPTOMATICALLY AND SUPPORTIVELY AND GET MEDICAL ATTENTION.

ORGANS
CENTRAL NERVOUS SYSTEM

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF A HAZARDOUS COMMUNICATION PROGRAM, LABELS AND OTHER FORMS OF WARNING, MATERIAL SAFETY DATA SHEETS, AND INFORMATION AND TRAINING. REQUIRES DISTRIBUTORS TO TRANSMIT REQUIRED INFORMATION TO EMPLOYERS.

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.110 STORAGE AND HANDLING OF LIQUIFIED PETROLEUM GASES

OSHA STANDARD 29CFR1910.101 COMPRESSED GASES (GENERAL REQUIREMENTS)

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
SECTION 8(C) OF THE TOXIC SUBSTANCES CONTROL ACT (TSCA) REQUIRES MANUFACTURERS, PROCESSORS, AND DISTRIBUTORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY THE SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLES AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12.

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

MONITORING/LEVELS MEASUREMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

SUBSTANCE LISTED UNDER THE STATE OF WEST VIRGINIA DIRECTOR OF HEALTH LEGISLATIVE RULES FOR HAZARDOUS SUBSTANCES, CHAPTER16, ARTICLE 31, SECTION 4(A).

SUBSTANCE LISTED UNDER THE STATE OF PENNSYLVANIA WORKER AND COMMUNITY RIGHT TO KNOW ACT, P.L. 734, NO. 159.

SUBSTANCE LISTED UNDER THE STATE OF ILLINOIS TOXIC SUBSTANCES DISCLOSURE TO EMPLOYEES ACT, TITLE 56, CHAPTER I, SUBCHAPTER B, SECTION 205.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA) - TABLE 4.2 - DANGEROUS GOODS LIST: THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING AND OTHER REQUIREMENTS.
DESIGNATED AS A DANGEROUS GOOD FOR THE PURPOSE OF AIR TRANSPORTATION.

29CFR1910.1450 SUBJECT TO OSHA STANDARD REGULATING OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES.
EFFECTIVE DATE: 5/1/90
55FR3300 1/31/90

46CFR151.50 SPECIAL REQUIREMENTS FOR CERTAIN CARGOES AS REGULATED BY THE COAST GUARD

46CFR30.25 COMMODITIES REGULATED BY THE COAST GUARD
SUBSTANCE LISTED UNDER FLAMMABLE AND COMBUSTIBLE BULK LIQUID CARGOES

33CFR160.211 AND 213 U.S. COAST GUARD REQUIRES 24 HOURS ADVANCE NOTICE

TO CAPTAIN OF THE PORT WHEN THIS SUBSTANCE IS SCHEDULED TO ARRIVE AT OR DEPART FROM PORT.

40CFR268 LAND DISPOSAL RESTRICTIONS

40CFR60 STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES
SUBPART NNN - STANDARDS OF PERFORMANCE FOR VOLATILE ORGANIC COMPOUND EMISSIONS FROM SYNTHETIC ORGANIC CHEMICAL MANUFACTURING INDUSTRY DISTILLATION OPERATIONS
55FR26912 6/29/90

MEDICAL SURVEILLANCE REQUIRED
GENERAL MEDICAL HISTORY
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
PHYSICIAN PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
29CFR1910.20 OSHA STANDARD
SUBPART C - GENERAL SAFETY AND HEALTH PROVISIONS
PROVIDES FOR EMPLOYEE, DESIGNATED REPRESENTATIVE, AND OSHA ACCESS TO EMPLOYER-MAINTAINED EXPOSURE AND MEDICAL RECORDS RELEVANT TO EMPLOYEES EXPOSED TO TOXIC SUBSTANCES AND HARMFUL PHYSICAL AGENTS.
53FR38140 9/29/88 (AMENDED)

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS. CONTACT: CHARLES L. ELKINS, OFFICE OF TOXIC SUBSTANCES, EPA (202) 382-3813.

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
NONE IN COMMON USE

__AKS AND SPILL PROCEDURES

****

DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

FLAMMABLE GAS

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 AND 49CFR172 SUBPART E:

FLAMMABLE GAS

****

INTERNATIONAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 2.1-INFLAMMABLE GASES

INTERNATIONAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR
DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

FLAMMABLE GAS

****

FOLLOWING INFORMATION RECOMMENDED FOR THE EMERGENCY HANDLING OF
HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* EXTINGUISH FIRE ONLY IF FLOW CAN BE STOPPED
* APPLY FLOODING QUANTITIES OF WATER AS FOG
* USE FLOODING QUANTITIES OF WATER TO COOL ALL AFFECTED CONTAINERS
* WATER SHOULD BE APPLIED FROM AS FAR A DISTANCE AS POSSIBLE

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP AWAY FROM SPARKS, FLAMES AND OTHER SOURCES OF IGNITION
* DO NOT ALLOW MATERIAL TO CONTAMINATE WATER SOURCES AND SEWERS
* ATTEMPT TO STOP LEAK IF WITHOUT HAZARD
* CONTROL VAPORS WITH WATER SPRAY

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* KEEP UPWIND
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* USE CAUTION WHEN APPROACHING FIRE

EVACUATION PROCEDURE:
* IF FIRE UNCONTROLLABLE OR CONTAINER EXPOSED TO DIRECT FLAME, EVACUATE FOR A RADIUS OF 2500 FEET
* EVACUATION DOWNWIND OF SPILLED MATERIAL MUST BE CONSIDERED IF MATERIAL LEAKING (NOT ON FIRE)

****

FOLLWING INFORMATION FROM DEPARTMENT OF TRANSPORTATION/U.S. COAST GUARD "CHEMICAL RESPONSE INFORMATION SYSTEM", REGARDING WATER SPILLS:

* U.S. COAST GUARD REQUIRES 24 HOUR ADVANCE NOTICE TO CAPTAIN OF THE PORT WHEN THIS SUBSTANCE IS SCHEDULED TO ARRIVE AT PORT WHEN TRANSPORTED IN BULK QUANTITY
* RESTRICT ACCESS OF GENERAL PUBLIC WHEN APPRECIABLE DANGER ARISES FROM SPILL
* RESTRICT IGNITION SOURCES WHEN SUBSTANCE INVOLVED
* EVACUATE WHEN THERE IS A VERY REAL DANGER OF SPILL SPREADING OR DEVELOPING A DANGEROUS REACTION WITH WATER
* HIGHLY VOLATILE, AVOID INHALATION, VAPORS OR DUST ARE IRRITATING OR TOXIC
* BURNING MAY BE PROHIBITED BY ANTI-POLLUTION LAWS AND REGULATIONS
* FLAMMABLE OR EXPLOSIVE GAS OR VAPOR DANGER, SUBSTANCE IS HIGHLY VOLATILE
* SUBSTANCE SHIPPED AS GAS OR LIQUEFIED COMPRESSED GAS, DEPENDING ON ATMOSPHERIC CONDITIONS, A LARGE PORTION OF THE HAZARD WILL BE DISSIPATED WITH NO ACTION NECESSARY

MAXIMUM DOWNWIND DISTANCE OVER WHICH GAS MAY IGNITE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 0.1 TON: 600-3000 FEET
MAXIMUM WIDTH OF CLOUD THAT IS FLAMMABLE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 0.1 TON: 0-100 FEET
MAXIMUM DOWNWIND DISTANCE OVER WHICH GAS MAY IGNITE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 1 TON: 600-3000 FEET
MAXIMUM WIDTH OF CLOUD THAT IS FLAMMABLE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 1 TON: 0-100 FEET
MAXIMUM WIDTH OF CLOUD WHICH MAY BE HARMFUL UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 10 TONS: 25,000-50,000 FEET
MAXIMUM WIDTH OF CLOUD THAT IS FLAMMABLE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 10 TONS: 100-500 FEET
MAXIMUM DOWNWIND DISTANCE OVER WHICH GAS MAY IGNITE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 100 TONS: 6000-30,000 FEET
MAXIMUM WIDTH OF CLOUD THAT IS FLAMMABLE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 100 TONS: 500-1000 FEET
MAXIMUM DOWNWIND DISTANCE OVER WHICH GAS MAY IGNITE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 1000 TONS: 6000-30,000 FEET
MAXIMUM WIDTH OF CLOUD THAT IS FLAMMABLE UNDER WORST CASE WEATHER CONDITIONS FOLLOWING INSTANTANEOUS DISCHARGE OF 1000 TONS: 1000-2000 FEET

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OF FLAMES IN HAZARD AREA. DO NOT TOUCH SPILLED MATERIAL; STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS; ISOLATE AREA UNTIL GAS HAS DISPERSED. KEEP UNNECESSARY PEOPLE AWAY; DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

WASTE

****

OBSERVE ALL FEDERAL, STATE OR LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. CONTACT LOCAL AND/OR STATE ENVIRONMENTAL AUTHORITIES TO INSURE PROPER COMPLIANCE.

****

REPORTABLE QUANTITY (RQ) : 100 LBS.
A REPORTABLE QUANTITY OF 100 LBS. APPLIES TO THIS WASTE ADJUSTED UNDER SECTION 102(A) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF 1980 (CERCLA) BY EXHIBITING ONE OR MORE OF THE CHARACTERISTICS OF IGNITABILITY, CORROSIVITY OR REACTIVITY IDENTIFIED IN 40CFR261.21 THROUGH 261.23. SECTIONS 103(A) AND 103(B) REQUIRE THAT PERSONS IN CHARGE OF A VESSEL OR FACILITY FROM WHICH A HAZARDOUS SUBSTANCE HAS BEEN RELEASED IN A QUANTITY EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (800) 424-8802; IN WASHINGTON, D.C. METROPOLITAN AREA (202) 426-2675.
50FR13456 4/4/85

SUBSTANCE IS GAS AT NORMAL PRESSURE AND TEMPERATURE BELOW 95 F. CLASSIFIED AS SOLID AND/OR HAZARDOUS WASTE ONLY IF CONTAINED.

40CFR261.21 CHARACTERISTIC OF IGNITABILITY
EPA HAZARDOUS WASTE NUMBER D001

THIS SUBSTANCE MEETS THE DEFINITION OF A HAZARDOUS WASTE AS DEFINED BY THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40CFR260) AND IS SUBJECT TO THE FOLLOWING CONSIDERATIONS:

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR268 LAND DISPOSAL RESTRICTIONS

IDENTIFIES HAZARDOUS WASTES THAT ARE RESTRICTED FROM LAND DISPOSAL AND DEFINES THOSE LIMITED CIRCUMSTANCES UNDER WHICH AN OTHERWISE PROHIBITED WASTE MAY CONTINUE TO BE LAND DISPOSED.

40CFR268.35 WASTE SPECIFIC PROHIBITIONS - THIRD THIRD WASTES
55FR22520 6/1/90

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

40CFR148 HAZARDOUS WASTE INJECTION RESTRICTIONS

IDENTIFIES HAZARDOUS WASTES THAT ARE RESTRICTED FROM DISPOSAL INTO CLASS I HAZARDOUS WASTE INJECTION WELLS AND DEFINES THOSE CIRCUMSTANCES UNDER WHICH A WASTE, OTHERWISE PROHIBITED FROM INJECTION, MAY BE INJECTED.
53FR28118 7/26/88
53FR30908 8/16/88
54FR25416 6/14/89
54FR26594 6/23/89

40CFR148.16 WASTE SPECIFIC PROHIBITIONS - THIRD THIRD WASTES

S NUMBER
74-98-6

GISTRY TOXIC CHEMICALS NUMBER
TX2275000

LLETINS

SPECIAL INFORMATION

Date: 8 March 1991
Revision No.: 1

NITROGEN

MATERIAL SAFETY DATA SHEET

An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional or area offices.
(Similar to U.S. Department of Labor Form OMB No. 1218-0072 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

I. PRODUCT IDENTIFICATION

PRODUCT	Nitrogen		
CHEMICAL NAME	Nitrogen	**SYNONYMS**	Not applicable
FORMULA	N_2	**CHEMICAL FAMILY**	Not applicable
		MOLECULAR WEIGHT	28.01
TRADE NAME	Nitrogen		

II. HAZARDOUS INGREDIENTS

For mixtures of this product request the respective component Material Safety Data Sheets. See Section IX.

MATERIAL (CAS NO.)	Wt (%)	1984-1985 ACGIH TLV-TWA (OSHA-PEL)
Nitrogen (7727-37-9)	100	Simple asphyxiant (None currently established)

III. PHYSICAL DATA

BOILING POINT, 760 mm. Hg	−195.8°C (−320.46°F)	**FREEZING POINT**	−210°C (−345.8°F)
SPECIFIC GRAVITY (H_2O = 1)	Gas	**VAPOR PRESSURE AT 20°C**	Gas
VAPOR DENSITY (air = 1)	0.967	**SOLUBILITY IN WATER, % by wt.**	Negligible
PERCENT VOLATILES BY VOLUME	100	**EVAPORATION RATE (Butyl Acetate = 1)**	Not applicable

APPEARANCE AND ODOR Colorless, odorless gas at normal temperature and pressure.

EMERGENCY PHONE NUMBER

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514-640-6400
For routine information contact your local supplier

Union Carbide Industrial Gases Inc. requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

UNION CARBIDE INDUSTRIAL GASES INC.
LINDE DIVISION

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IV. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II.

EFFECTS OF SINGLE (ACUTE) OVEREXPOSURE:

SWALLOWING—This product is a gas at normal temperature and pressure.

SKIN ABSORPTION—No evidence of adverse effects from available information.

INHALATION—Asphyxiant. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can cause death.

SKIN CONTACT—No harmful effect expected from vapor. Liquid may cause frostbite.

EYE CONTACT—No harmful effect expected from vapor.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE: Contact with liquid may cause frostbite.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The toxicology and the physical and chemical properties of the material do not suggest that overexposure is likely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None currently known.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING—This product is a gas at normal temperature and pressure.

SKIN CONTACT—For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 105°F). In case of massive exposure, remove clothing while showering with warm water. Call a physician.

INHALATION—Remove to fresh air. Give artificial respiration if not breathing. Give oxygen if breathing is difficult. Call a physician.

EYE CONTACT—In case of splash contamination, immediately flush eyes thoroughly with water for at least 15 minutes. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *There is no specific antidote. Treatment should be directed at the control of symptoms and the clinical condition.*

NOTE: *Suitability for use as a component in underwater breathing gas mixtures is to be determined by or under the supervision of personnel experienced in the use of underwater breathing gas mixtures and familiar with the effects, methods, frequency and duration of use, hazards, side effects and precautions to be taken.*

V. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method)	Not applicable	**AUTOIGNITION TEMPERATURE**	Not applicable
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** Not applicable	**UPPER**	Not applicable

EXTINGUISHING MEDIA: Nitrogen cannot catch fire. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES: Evacuate all personnel from danger area. Immediately deluge containers with water spray from maximum distance until cool, then move containers away from fire area if without risk.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Gas cannot catch fire. Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Most containers are designed to vent contents when they are exposed to elevated temperature.

VI. REACTIVITY DATA

STABILITY	
UNSTABLE	STABLE
	X

CONDITIONS TO AVOID: See Section IX.

INCOMPATIBILITY (materials to avoid): Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium, ozone.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION	
May Occur	Will not Occur
	X

CONDITIONS TO AVOID: None currently known.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak if without risk. Ventilate area of leak or move leaking container to well-ventilated area. Test area, especially confined areas, for sufficient oxygen content prior to permitting re-entry of personnel.

WASTE DISPOSAL METHOD: Slowly release into atmosphere. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, state and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type): Select in accordance with OSHA 29 CFR 1910.134. Respirators shall be acceptable to MSHA and NIOSH.

VENTILATION	**LOCAL EXHAUST** — Preferred.
	MECHANICAL (general) — Acceptable.
	SPECIAL — Not applicable.
	OTHER — Not applicable.

PROTECTIVE GLOVES: Preferred for cylinder handling.

EYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

IX. SPECIAL PRECAUTIONS

CAUTION: High pressure gas. Use piping and equipment adequately designed to withstand pressures to be encountered. Can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Close valve when not in use and when empty.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death. Be sure to read and understand all labels and other instructions supplied with all containers of this product. For safety information of general handling of compressed gas cylinders, it is recommended that a copy of pamphlet P-1, "Safe Handling of Compressed Gases in Containers," be obtained from the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202.

OTHER HANDLING AND STORAGE CONDITIONS: Never work on a pressurized system. If there is a leak, close the cylinder valve, blow down the system by venting to a safe place, then repair the leak.

The opinions expressed herein are those of qualified experts within Union Carbide Industrial Gases Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide Industrial Gases Inc., it is the user's obligation to determine the conditions of safe use of the product.

UNION CARBIDE INDUSTRIAL GASES INC.
LINDE DIVISION

IN THE USA: 39 Old Ridgebury Rd.
Danbury, CT 06817-0001

IN CANADA: 123 Eglinton Avenue East
Toronto, Ontario M4P IJ3

Other offices in principal cities all over the world.

L-4631-B 85-0928 8/85 35M

Lithographed in U.S.A.

Date: 8 March 1991
Revision No.: 1

NITROUS OXIDE

MATERIAL SAFETY DATA SHEET

L-4636-A
April 1986

UNION CARBIDE

An explanation of the terms used herein may be found in OSHA 29 CFR 1910 1200, available from OSHA regional or area offices.
(Essentially similar to U.S. Department of Labor Form OSHA-20 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

I. PRODUCT IDENTIFICATION

PRODUCT	Nitrous Oxide		
CHEMICAL NAME	Nitrogen Oxide	**SYNONYMS**	Dinitrogen Monoxide, Nitrogen (1) Oxide, Factitious Air, Hyponitrous Acid Anhydride, Laughing Gas
FORMULA	N_2O	**CHEMICAL FAMILY**	Nitrogen Oxides
		MOLECULAR WEIGHT	44.013
TRADE NAME	Nitrous Oxide		

II. HAZARDOUS INGREDIENTS

For mixtures of this product request the respective component Material Safety Data Sheets. See Section IX.

MATERIAL (CAS NO.)	Wt (%)	1985–1986 ACGIH TLV-TWA (OSHA-PEL)
Nitrogen Oxide (10024-97-2)	100	None currently established (None currently established) Union Carbide Corporation has established its own Internal Exposure limit as 25 ppm

III. PHYSICAL DATA

BOILING POINT, 760 mm. Hg	–88.5°C (–127.3°F)	**FREEZING POINT**	–90.8°C (–131.5°F)
SPECIFIC GRAVITY (H_2O = 1)	1.226 @ –89°C	**VAPOR PRESSURE AT 21°C**	745 psig
VAPOR DENSITY (air = 1)	1.53 @ 20°C	**SOLUBILITY IN WATER, % by wt.**	Slight
PERCENT VOLATILES BY VOLUME	100	**EVAPORATION RATE (Butyl Acetate = 1)**	High

APPEARANCE AND ODOR Colorless gas at normal temperature and pressure; sweet odor.

IV. EMERGENCY AND FIRST AID PROCEDURES

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514 – 640-6400
For routine information contact your local supplier

Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

UNION CARBIDE CORPORATION ☐ LINDE DIVISION
UNION CARBIDE CANADA LIMITED ☐ LINDE DIVISION

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HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II.

EFFECTS OF SINGLE (ACUTE) OVEREXPOSURE:

SWALLOWING—An unlikely route of exposure. This product is a gas at normal temperature and pressure, but frostbite of the lips and mouth may occur.

SKIN ABSORPTION—No evidence of adverse effects from available information.

INHALATION—May cause excitation, euphoria, dizziness, drowsiness, incoordination, and narcosis. Exposure to concentrations of 50% and greater will produce clinical anesthesia. High concentrations may cause asphyxia and death. Lack of oxygen can cause death.

SKIN CONTACT—Cryogenic burns (similar to severe frostbite) may occur as a result of the rapid evaporation of the liquefied gas.

EYE CONTACT—Cryogenic burns to the eyes may occur as a result of contact with the liquefied gas.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Metabolic injury to the nervous system has resulted from frequent exposure to anesthetic concentrations of Nitrous Oxide. Complaints include numbness, tingling of hands and legs, loss of feeling in fingers, poor balance, and muscular weakness.

OTHER EFFECTS OF OVEREXPOSURE: Exposure to Nitrous Oxide has produced embryofetal toxicity in laboratory animals as evidenced by reduced fetal weight, delayed ossification, and increased incidence of visceral and skeletal variations. Exposure to Nitrous Oxide may be associated with an increased incidence of abortion in humans. Single prolonged exposure to high concentrations of Nitrous Oxide has resulted in bone marrow injury and adverse effects on the blood.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Anesthetic gases in general, and Nitrous Oxide in particular, may suppress immunological function when administered for anesthetic purposes. This may reduce the resistance to infection and other immuno-dependent disease processes.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING—This product is a gas at normal temperature and pressure.

SKIN CONTACT—For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 105°F). In case of massive exposure, remove clothing while showering with warm water. Call a physician.

INHALATION—Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be administered when necessary. Call a physician.

EYE CONTACT—For contact with the liquid, immediately flush eyes thoroughly with water for at least 15 minutes. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *Nitrous Oxide may cause vitamin B_{12} deficiency. Megaloblastic anemia and nervous system disorders can occur as a result of this chemically induced deficiency.*

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method)	Not applicable	**AUTOIGNITION TEMPERATURE**	Not Applicable
FLAMMABLE LIMITS IN AIR, % by volume	**LOWER** Not Applicable	**UPPER**	Not Applicable

EXTINGUISHING MEDIA: Oxidizing agent. May accelerate combustion. Use media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES: Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool containers with water spray from maximum distance until cool then move containers away from fire area if without risk. If containers are leaking reduce vapors with water spray or fog. Shut off leak if without risk. Move containers away from fire area if without risk.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Oxidizing agent, may accelerate combustion. Contact with flammable materials may cause fire or explosion. Container may rupture due to heat of fire. Decomposes explosively at high temperature. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Vapors form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point. Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature.

REACTIVITY DATA

STABILITY	
UNSTABLE	**STABLE**
	X

CONDITIONS TO AVOID: See Section IX.

INCOMPATIBILITY (materials to avoid): Oils, greases, flammable materials, alkali metals, aluminum, boron, tungsten carbide.

HAZARDOUS DECOMPOSITION PRODUCTS: This compound decomposes explosively at high temperature forming a mixture of Nitrogen and Oxygen in a 2:1 ratio respectively. This reaction will occur at lower temperatures in the presence of catalytic surfaces such as silver, platinum, cobalt, copper oxides or nickel oxides.

HAZARDOUS POLYMERIZATION	
May Occur	**Will not Occur**
	X

CONDITIONS TO AVOID: None currently known.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Contact with flammable materials may cause fire or explosion (see Section V). Reduce vapors with fog or fine water spray. Shut off leak if without risk. Ventilate area of leak or move leaking container to well ventilated area. Vapors may spread from spill. Before entering area, especially confined areas, check atmosphere with appropriate device. See Section V: Unusual Fire and Explosion Hazards.

WASTE DISPOSAL METHOD: Prevent waste from contaminating surrounding environment. Keep personnel away. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with Federal, state and local regulations.

RESPIRATORY PROTECTION (specify type): Select in accordance with OSHA 29 CFR 1910.134. Respirators shall be acceptable to MSHA and NIOSH.

VENTILATION	**LOCAL EXHAUST**—Acceptable. See SPECIAL.
	MECHANICAL (general)—Inadequate. See SPECIAL.
	SPECIAL—Use only in a closed system conditioned for Nitrous Oxide service.
	OTHER—See SPECIAL.

PROTECTIVE GLOVES: Preferred for cylinder handling & liquid exposure.

EYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

WARNING: Liquefied oxidizing gas under pressure. Vigorously accelerates combustion. Use piping and equipment adequately designed to withstand pressures to be encountered. Store and use with adequate ventilation at all times. Use only in closed system conditioned for Nitrous Oxide service. Close valve when not in use and when empty. Store away from flammable materials.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death. Be sure to read and understand all labels and other instructions supplied with all containers of this product.

NOTE: Compatibility with plastics should be confirmed prior to use. For safety information on general handling of compressed gas cylinders obtain a copy of pamphlet P-1, "Safe Handling of Compressed Gases in Containers" from the Compressed Gas Association, Inc. 1235 Jefferson Davis Highway, Arlington, VA 22202.

OTHER HANDLING AND STORAGE CONDITIONS: Never work on a pressurized system. If there is a leak, close the cylinder valve, blow down the system by venting to a safe place, then repair the leak.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

LINDE
UNION CARBIDE

GENERAL OFFICES

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Linde Division
39 Old Ridgebury Road
Danbury, CT 06817-0001

IN CANADA:
Union Carbide Canada Limited
Linde Division
123 Eglinton Avenue East
Toronto, Ontario M4P 1J3

Other offices in principal cities all over the world.

Lithographed in U.S.A.

Date: 8 March 1991
Revision No.: 1

FUEL OILS

OILS, FUEL: 2

OTW

Common Synonyms	Oily liquid	Yellow-brown	Lube or fuel oil odor
Home-heating oil	Floats on water.		

Stop discharge if possible.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemical, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: Not applicable
3.3 IMO/UN Designation: 3.3/1223
3.4 DOT ID No.: 1223
3.5 CAS Registry No.: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Light brown
4.3 Odor: Like kerosine; characteristic

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
5.2 Symptoms Following Exposure: INHALATION causes headache and slight giddiness. INGESTION causes nausea, vomiting, and cramping; depression of central nervous system ranging from mild headache to anesthesia, coma, and death; pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.
5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. ASPIRATION: enforce bed rest; administer oxygen; seek medical attention. EYES: wash with copious quantity of water. SKIN: remove solvent by wiping and wash with soap and water.
5.4 Threshold Limit Value: No single value applicable.
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 1; LD_{50} = 5-15 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Slight smarting of eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: 136°F C.C.
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 494°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 33

8. WATER POLLUTION

8.1 Aquatic Toxicity:
200 ppm/24 hr/juvenile American shad/TL_m/fresh water
20 ppm/96 hr/rainbow trout eggs/TL_m/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Commercial
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Combustible liquid
11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: 540—640°F = 282—338°C = 555—611°K
12.4 Freezing Point: —20°F = —29°C = 244°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.879 at 20°C (liquid)
12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: Not pertinent
12.13 Heat of Combustion: —19,440 Btu/lb = —10,800 cal/g = —452.17 X 10^3 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

Date: 8 March 1991
Revision No.: 1

OXYGEN

MATERIAL SAFETY DATA SHEET

An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional or area offices.
(Essentially similar to U.S. Department of Labor Form OSHA-20 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

I. PRODUCT IDENTIFICATION

PRODUCT	Oxygen		
CHEMICAL NAME	Oxygen	**SYNONYMS**	Not applicable
FORMULA	O_2	**CHEMICAL FAMILY**	Not applicable
		MOLECULAR WEIGHT	32.00

TRADE NAME Oxygen

II. HAZARDOUS INGREDIENTS

For mixtures of this product request the respective component Material Safety Data Sheets. See Section IX.

MATERIAL (CAS NO.)	Wt (%)	1984-1985 ACGIH TLV-TWA (OSHA-PEL)
Oxygen (7782-44-7)	100	None currently established (None currently established)

III. PHYSICAL DATA

BOILING POINT, 760 mm. Hg	−183°C (−297.4°F)	**FREEZING POINT**	−218.4°C (−361.1°F)
SPECIFIC GRAVITY (H_2O = 1)	Gas	**VAPOR PRESSURE AT 20°C.**	Gas
VAPOR DENSITY (air = 1)	1.105 @ 25°C	**SOLUBILITY IN WATER, % by wt.**	Negligible
PERCENT VOLATILES BY VOLUME	100	**EVAPORATION RATE (Butyl Acetate = 1)**	Not applicable

APPEARANCE AND ODOR Colorless, odorless gas at normal temperature and pressure.

EMERGENCY PHONE NUMBER

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514 — 640-6400
For routine information contact your local supplier

Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

UNION CARBIDE CORPORATION ☐ LINDE DIVISION
UNION CARBIDE CANADA LIMITED ☐ LINDE DIVISION

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IV. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: None currently established.

EFFECTS OF SINGLE (ACUTE) OVEREXPOSURE:

SWALLOWING — No evidence of adverse effects from available information.

SKIN ABSORPTION — No evidence of adverse effects from available information.

INHALATION — Breathing 80% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing oxygen at higher pressure increases the likelihood of adverse effects within a shorter time period. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects resulting in dizziness, poor coordination, tingling sensation, visual and hearing disturbances, muscular twitching, unconsciousness and convulsions. Breathing oxygen under pressure may cause prolongation of adaptation to darkness and reduced peripheral vision.

SKIN CONTACT — No evidence of adverse effects from available information.

EYE CONTACT — No evidence of adverse effects from available information.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE: See "Notes to Physician."

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: See "Notes to Physician."

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None currently known.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING — This product is a gas at normal temperature and pressure.

SKIN — No emergency care anticipated.

INHALATION — Remove to fresh air. Give artificial respiration if not breathing. Keep victim warm and at rest. Call a physician.

EYES — No emergency care anticipated.

NOTES TO PHYSICIAN: *Supportive treatment should include immediate sedation, anti-convulsive therapy if needed, and rest. Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increases the susceptibility to toxicity from oxygen at high concentrations or pressures. Animal studies also indicate that vitamin E deficiency may increase susceptibility to oxygen toxicity.*

Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce "vacuum-type" headache.

Newborn premature infants exposed to high oxygen concentrations may suffer delayed retinal damage which can progress to retinal detachment and blindness (retrolental fibroplasia). Retinal damage can also occur in adults exposed to 100% oxygen under greater than atmospheric pressure, particularly in individuals whose retinal circulation has been previously compromised.

All individuals exposed for long periods to oxygen at high pressure and all who exhibit overt oxygen toxicity should have ophthalmologic examinations.

WHEN USED IN WELDING AND CUTTING: Read and understand the manufacturer's instructions and the precautionary label on the product. See American Standard Z49.1 "Safety In Welding and Cutting" published by the American Welding Society, P.O. Box 351040, Miami, Florida 33135 and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, Washington, D.C. 20402 for more detail. For further SAFETY AND HEALTH information, refer to Linde's free publication, L-52-529, "Precautions and Safe Practices for Electric Welding and Cutting", as well as L-2035, "Precautions and Safe Practices for Gas Welding, Cutting, and Heating." You may obtain copies from your local supplier, or by writing to Union Carbide Corporation, Linde Division, Communications Department, 39 Old Ridgebury Road, Danbury, Connecticut, 06817-0001.

NOTE: *Suitability for use as a component in underwater breathing gas mixtures is to be determined by or under the supervision of personnel experienced in the use of underwater breathing gas mixtures and familiar with the effects, methods, frequency and duration of use, hazards, side effects and precautions to be taken.*

V. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method)	Not applicable	**AUTOIGNITION TEMPERATURE**	Not applicable

FLAMMABLE LIMITS IN AIR, % by volume	**LOWER**	Not applicable	**UPPER**	Not applicable

EXTINGUISHING MEDIA: Vigorously accelerates combustion. Use media appropriate for surrounding fire. Water (i.e. safety shower) is the preferred extinguishing media for clothing fires.

SPECIAL FIRE FIGHTING PROCEDURES: Evacuate all personnel from danger area. Immediately cool containers with water spray from maximum distance until cool, then move containers away from fire area if without risk.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Oxidizing agent, vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion. Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature. Smoking, flames and electric sparks in the presence of enriched oxygen atmospheres are potential explosion hazards.

VI. REACTIVITY DATA

STABILITY	
UNSTABLE	**STABLE**
	X

CONDITIONS TO AVOID: See Section IX.

INCOMPATIBILITY (materials to avoid): Combustible materials, asphalt, flammable materials, especially oils and greases.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION	
May Occur	**Will not Occur**
	X

CONDITIONS TO AVOID: None currently known.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Shut off leak if without risk. Ventilate area of leak or move leaking container to well-ventilated area. Remove all flammable materials from vicinity. Oxygen must never be permitted to strike an oily surface, greasy clothes, or other combustible material.

WASTE DISPOSAL METHOD: Slowly release into atmosphere, in an open, outdoors area. Remove all flammable materials from vicinity.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type): Not required.

VENTILATION	**LOCAL EXHAUST** — Not applicable.
	MECHANICAL (general) — Acceptable.
	SPECIAL — Not applicable.
	OTHER — Not applicable.

PROTECTIVE GLOVES: Preferred for cylinder handling.

EYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

IX. SPECIAL PRECAUTIONS

WARNING: High pressure gas. Vigorously accelerates combustion. Avoid contact with oils, greases and other flammable materials. Never use manifolds for oxygen cylinders unless specifically designed for such use. Use only with equipment conditioned for oxygen service. Use piping and equipment adequately designed to withstand pressures to be encountered. Protect container against physical damage. Isolate from combustible gas installations and combustible materials by adequate distance or by gas-tight, fire-resistive barriers. Protect against over-heating. Never use an oxygen jet for cleaning purposes of any sort, especially clothing, as it increases the likelihood of an engulfing fire. Note: Reverse flow into cylinder may cause rupture. Use a check valve or other protective apparatus in any line or piping from the cylinder to prevent reverse flow.

MIXTURES: When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death. Be sure to read and understand all labels and other instructions supplied with all containers of this product.

***NOTE:** Compatibility with plastics should be confirmed prior to use. For safety information on general handling of compressed gas cylinders, obtain a copy of pamphlet P-1, "Safe Handling of Compressed Gases in Containers" from the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202.*

OTHER HANDLING AND STORAGE CONDITIONS: Never work on a pressurized system. If there is a leak, close the cylinder valve, blow down the system by venting to a safe place, then repair the leak. Never lubricate oxygen valves, regulators, etc., with any combustible substance.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

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UNION CARBIDE

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Other offices in principal cities all over the world.

Lithographed in U.S.A.

Date: 8 March 1991
Revision No.: 1

PHOXBOND

MATERIAL SAFETY DATA SHEET

HARBISON-WALKER REFRACTORIES
Dresser Industries, Inc.
One Gateway Center, Pittsburgh, Pennsylvania 15222

TELEPHONE: 412-562-6200

DISCLAIMER

11-22-88

This data sheet is based on OSHA FORM 174 but modified to more adequately suit refractory products. All data are subject to reasonable variation. This information is supplied in good faith by Harbison-Walker and is applicable to the product as shipped. Your application of the product may change its characteristics. THE DATA PROVIDED HEREIN ARE BELIEVED CORRECT OR ARE OBTAINED FROM SOURCES BELIEVED TO BE GENERALLY RELIABLE. HARBISON-WALKER SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THIS PRODUCT, AND HARBISON-WALKER ASSUMES NO OBLIGATION OR LIABILITY FOR RELIANCE OF THE INFORMATION CONTAINED IN THIS DATA SHEET. This data is not part of any contract or condition of sale. It is solely supplied as an accomodation to the buyer.

SECTION I - PRODUCT IDENTIFICATION

Product Tradename: PHOXBOND

Type of Refractory: Phosphate Bonded High Alumina Mortar

SECTION II - HAZARDOUS INGREDIENTS

SEE CHECKED BLOCKS INGREDIENT	GEN. CHEM. FORMULA	C.A.S. NUMBER	PERCENTAGE RANGE	OSHA P.E.L.	ACGIH TLV *	NIOSH CRITERIA DOCUMENT NO.
☐ Quartz	SiO_2	14808-607		$\frac{10\ mg/m^3}{\%\ Respirable\ Quartz + 2}$	0.1 mg/m^3	75-120
☐ Cristobalite	SiO_2	14464-46-1		½ Quartz Value	0.05 mg/m^3	75-120
☐ Tridymite	SiO_2	15468-32-3		½ Quartz Value	0.05 mg/m^3	75-120
☐ Fused Silica	SiO_2	60676-86-0		20 mppcf	Use Quartz TLV	75-120
☐ Coal Tar Products	N/A	65996-93-2		0.2mg/m^3	0.2 mg/m^3	78-107
☐ Petroleum Pitch	N/A	8052-42-4		NONE	0.2 mg/m^3	78-106
☒ Phosphoric Acid*	H_3PO_4	7664-38-2	10 - 15	1.0 mg/m^3 (mist)	1.0 mg/m^3	NONE
☐ Magnesia	MgO	1309-48-4		10 mg/m^3	10 mg/m^3	NONE
☒ Free Alumina*	Al_2O_3	1344-28-1	58 - 60	10 mg/m^3	10 mg/m^3	NONE
☐ Lime	CaO	1305-78-8		5.0 mg/m^3	2.0 mg/m^3	NONE
☐ Chrome III Oxide*	Cr_2O_3	1308-38-9		1.0 mg/m^3	0.5mg/m^3	NONE
☒ Fume Silica	SiO_2	7631-86-9	6 - 7		0.1mg/m^3	None
☐						
☐						

* Subject to reporting under Section 313, Sara Title III

SECTION III - PHYSICAL DATA

Appearance and Odor: Gray color; acid odor

Specific Gravity: 2.58 **pH:** 2 - 3

Solubility in Water: Slight Phosphoric Acid

Other:

FORM:

___ Brick

___ Granular

_X_ Paste

SECTION IV - FIRE AND EXPLOSION DATA

UNLESS OTHERWISE NOTED, NONE Product is a refractory, and will not burn.

NOTES:

SECTION V - HEALTH HAZARD DATA

*SEE CHECKED BLOCKS		EXPOSURE REQUIRED	
INGREDIENT	EFFECTS OF OVEREXPOSURE	PROLONGED	SHORT TERM
☐ Free Crystalline Silica	Delayed lung fibrosis - silicosis	✓	
☐ Coal Tar Products	Skin, lung mucous membrane carcinogen	✓	
	Skin irritation; photosensitization		✓
☐ Petroleum Pitch	(Same as Coal Tar Products)	✓	✓
☐ Magnesia	Irritant to skin, eyes, mucous membranes, etc.		✓
☐ Lime	Irritant to skin, eyes, mucous membranes, etc.		✓
☒ Free Alumina	Irritant to skin, eyes, mucous membranes, etc		✓
☐ Fused Silica	Delayed lung fibrosis-silicosis	✓	
☒ Phosphoric Acid	Primary Irritant - skin, eyes, etc.		✓
☐ Chrome III Oxide	Irritant to skin, eyes, mucous membranes, etc.		✓
☒ Fume Silica	Irritant to skin, eyes, mucous membranes, etc.	x	x
☐	Delayed lung fibrosis		

EMERGENCY OR FIRST AID PROCEDURES:

☒ Irritants: Wash from skin or flush from eyes using copious amounts of water.

☐ Coal Tar Products: Remove from skin by washing with soap and water. DO NOT use solvents. Same for Petroleum Pitch.

☐ Other: - - —

SECTION VI - REACTIVITY DATA

STABILITY: ☒ STABLE ☐ UNSTABLE

Hazardous decomposition products:

Hazardous Polymerization: ☐ may occur ☒ will not occur

COMMENTS: Incompatability (material to avoid)

Store in cool location prior to use

SECTION VII - SPILL AND LEAK PROCEDURES

Most refractory products may be landfilled. However, since your application of this product may change its chemical characteristics, and since disposal procedures may vary with locale and are subject to change, you should consult the governmental authority having jurisdiction for disposal information.

COMMENTS:

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (CHECK ONE): ☒ Approved Dust ☐ Other (Specify):

VENTILATION: Local exhaust ventilation should be provided if routine operation generates dust in excess of allowable limits

PROTECTIVE GLOVES (CHECK TYPE): ☒ Acid Resistant ☐ Impermeable ☐ Abrasion Resistant ☐ Other (Specify):

EYE PROTECTION: Approved safety glasses, goggles or faceshields should be used when handling refractory products.

FOOT PROTECTION (CHECK TYPE): ☐ Metatarsal safety ☐ Impermeable

PROTECTIVE CLOTHING (SPECIFY):

Limit direct skin exposure

SECTION IX - SPECIAL PRECAUTIONS

☐ If block is checked, product contains coal tar pitch, petroleum pitch or creosote. Over-exposure to dust/volatiles may cause cancer and/or irritation to eyes, skin and respiratory tract.
Do not breathe dust/fumes; use with proper ventilation. NIOSH approved respirators and protective clothing should be worn while handling this product.

☐ If block is checked, this resin bonded product contains free formaldehyde and phenol. Exposure to dust and vapor may cause irritation of skin, eyes, nose, and throat. Allergic skin reaction may also occur. Avoid prolonged or repeated contact with eyes or skin; avoid breathing dust or vapor. Wash thoroughly after handling. Wear rubber gloves and approved NIOSH respirator.

☐ If block is checked, the product contains crystalline silica for which there is limited evidence of a possible association with the incidence of cancer in humans.

Prepared By: C. D. Jamison

Emergency Phone: 412-562-6437

Date: 8 March 1991
Revision No.: 1

REDI-MIX CONCRETE

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
REDI-MIX CONCRETE	

Section I

Manufacturer's Name	Emergency Telephone Number
MATERIAL SERVICE CORPORATION	(312) 372-3600
Address (Number, Street, City, State, and ZIP Code)	Telephone Number for Information
222 N. LA SALLE STREET	(312)372-3600
	Date Prepared
CHICAGO, ILLINOIS 60601	JUNE 6, 1989
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
FORMULA - MIXTURES OF PORTLAND OR BLENDED CEMENTS, CONCRETE AGGREGATES, GRAVEL, SAND OR CRUSHED STONE, CHEMICAL ADMIXTURES, AND WATER. ADMIXTURES MAY INCLUDE FLY ASH, GRANULATED SLAG AND VERY SMALL AMOUNTS OF ORGANIC OR INORGANIC MATERIALS WHICH ARE LESS THAN 1% AND HAVE NO EFFECT ON THE HAZARDS ASSOCIATED WITH THE USE OF THE PRODUCT.				
PORTLAND CEMENT CAS 65997-15-1 TOTAL DUST (ACGIH & OSHA) 10 mg/m^3 RESPIRABLE (ACGIH,OSHA) 5 mg/m^3				
NATURAL SAND CAS 14808-60-7 SEE LIMITS BELOW				
CRUSHED STONE CAS 1317-67-3 SEE LIMITS BELOW				

EXPOSURE LIMITS ARE EXPRESSED AS MILLIGRAMS OF SUBSTANCE PER CUBIC METER OF AIR (mg/m^3), 8-HOUR TIME WEIGHTED AVERAGES, RESPIRABLE DUST EXPOSURE LIMITS VARY WITH THE % QUARTZ IN DUST.

DUST < 1% QUARTZ TOTAL: ACGIH & MSHA = 10, OSHA=15; RESPIRABLE MSHA & OSHA = 5

DUST ≥ 1% QUARTZ TOTAL MSHA 30 ÷ (% QUARTZ +3), OSHA = 30 ÷ (% QUARTZ + 2), RESPIRABLE: MSHA & OSHA = 10 ÷ (% QUARTZ + 2) RESPIRABLE QUARTZ, ACGIH = 0.1 mg QUARTZ/m^3

Section III — Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H_2O = 1)	2.4
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
NEGLIGIBLE

Appearance and Odor
GRAY, PLASTIC FLOWABLE GRANULAR MUD. ODORLESS.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
NA	N/A	N/A	N/A

Extinguishing Media
NONE REQUIRED

Special Fire Fighting Procedures
NONCOMBUSTIBLE

Unusual Fire and Explosion Hazards
NONE KNOWN

(Reproduce locally)

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid N/A
	Stable	X	N/A

Incompatibility (*Materials to Avoid*)
NONE KNOWN

Hazardous Decomposition or Byproducts
NONE KNOWN

Hazardous Polymerization	May Occur		Conditions to Avoid N/A
	Will Not Occur	X	N/A

Section VI — Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	NO	YES	NO

Health Hazards (*Acute and Chronic*) ACUTE - WET PLASTIC, UNHARDENED CONCRETE, CAN DRY THE SKIN AND CAUSE ALKALI BURNS (CEMENT DERMATITIS).

CHRONIC - HYPERSENSITIVE INDIVIDUALS MAY DEVELOP AN ALLERGIC DERMATITIS. CEMENT MAY CONTAIN TRACE AMOUNTS OF CHROMIUM.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	NO	NO	NO

Signs and Symptoms of Exposure
IRRITATION OF SKIN AND BURNING SENSATION PARTICULARLY WHEN EXPOSURE IS IN AN AREA OF SKIN PREVIOUSLY SUBJECTED TO ABRASION OR IRRITATION.

Medical Conditions
Generally Aggravated by Exposure NONE KNOWN.

Emergency and First Aid Procedures
IRRIGATE EYES WITH WATER. WASH EXPOSED AREAS OF THE BODY WITH SOAP AND WATER. GET MEDICAL ATTENTION.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled
SPILL DOES NOT INCREASE HAZARD.

Waste Disposal Method
MATERIAL CAN BE RETAINED UNTIL IT HARDENS THEN IT MAY BE DISCARDED. THIS MATERIAL CAN BE DISPOSED IN A LANDFILL OR BY OTHER PROCEDURES WHICH ARE ACCEPTABLE UNDER FEDERAL, STATE OR LOCAL REGULATIONS.

Precautions to Be Taken in Handling and Storing
USE BARRIER CREAMS, GLOVES, BOOTS AND CLOTHING TO PROTECT THE SKIN FROM PROLONGED CONTACT WITH PLASTIC CONCRETE. PARTICULARLY AVOID ABRASION OF THE SKIN IN CONTACT WITH UNHARDENED PLASTIC CONCRETE. PRECAUTIONS MUST BE OBSERVED BECAUSE CEMENT BURNS OCCUR WITH LITTLE WARNING - LITTLE HEAT IS SENSED. EYE PROTECTION IS NOT GENERALLY REQUIRED EXCEPT WHEN PLACING METHODS CAUSE SPLASH THEN TIGHTFITTING SAFETY GOGGLES SHOULD BE WORN.

Section VIII — Control Measures

Respiratory Protection (*Specify Type*)
WET, NOT REQUIRED. DRY, USE NIOSH/MSHA APPROVED DUST RESPIRATOR IF DUST IS GENERATED

Ventilation		
Local Exhaust N/A		Special N/A
Mechanical (General) N/A		Other N/A

Protective Gloves	Eye Protection
SEE VII - PRECAUTIONS FOR SAFE HANDLING AND USE	SEE VII - PRECAUTIONS FOR SAFE HANDLING AND USE.

Other Protective Clothing or Equipment
SEE VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Work/Hygienic Practices
SEE VII - PRECAUTIONS FOR SAFE HANDLING AND USE

• USGPO 1988-491-529/45775

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
LIMESTONE - CRUSHED STONE	

Section I

Manufacturer's Name	Emergency Telephone Number
MATERIAL SERVICE CORPORATION	312-372-3600
Address (Number, Street, City, State, and ZIP Code)	**Telephone Number for Information**
222 N. LA SALLE STREET	312-372-3600
	Date Prepared
CHICAGO, ILLINOIS 60601	6/6/89
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
CALCIUM CARBONATE CAS: 1317-65-3	SEE LIMITS BELOW			
$CA\ CO_3$				
DUST MAY CONTAIN RESPIRABLE SILICA PARTICLES. CAS 14808-60-7				

EXPOSURE LIMITS ARE EXPRESSED AS MILLIGRAMS OF SUBSTANCE PER CUBIC METER OF AIR (mg/m^3), 8-HOUR TIME WEIGHTED AVERAGES. RESPIRABLE DUST EXPOSURE LIMITS VARY WITH THE % QUARTZ IN DUST

DUST $<$ 1% QUARTZ: TOTAL: ACGIH & MSHA = 10, OSHA = 15 RESPIRABLE: MSHA & OSHA = 5

DUST $\geq$ 1% QUARTZ TOTAL: MSHA = 30 ÷ (% QUARTZ + 3), OSHA = 30 ÷ (% QUARTZ + 2).

RESPIRABLE: MSHA & OSHA = 10 ÷ (% QUARTZ + 2).

RESPIRABLE QUARTZ: ACGIH = 0.1 mg QUARTZ/m^3.

Section III — Physical/Chemical Characteristics

Boiling Point		Specific Gravity (H_2O = 1)	
DECOMPOSES	1652°G		2.7-2.95
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
NEGLIGIBLE

Appearance and Odor
WHITE TO OFF WHITE IN COLOR - ODORLESS SOLID

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
N/A	N/A	N/A	N/A

Extinguishing Media
N/A

Special Fire Fighting Procedures
NONE REQUIRED

Unusual Fire and Explosion Hazards
NONE KNOWN

Stability			
	Unstable		Conditions to Avoid N/A
	Stable	X	N/A

Incompatibility (*Materials to Avoid*) AVOID CONTACT WITH STRONG ACIDS

Hazardous Decomposition or Byproducts NONE KNOWN

Hazardous Polymerization			
	May Occur		Conditions to Avoid N/A
	Will Not Occur	X	N/A

Section VI — Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	YES	NO	NO

Health Hazards (*Acute and Chronic*)

ACUTE: EXPOSURE TO DUST MAY IRRITATE RESPIRATORY SYSTEM, EYES AND SKIN. CHRONIC EXPOSURE TO RESPIRABLE LIMESTONE DUST IN EXCESS OF EXPOSURE LIMITS COULD CAUSE PNEUMOCONIOSIS (LUNG DISEASE). CHRONIC EXPOSURE TO RESPIRABLE QUARTZ - CONTAINING LIMESTONE DUST IN EXCESS OF EXPOSURE LIMITS COULD CAUSE SILICOSIS.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	NO	NO	NO

IARC HAS DETERMINED THAT THERE IS SUFFICIENT EVIDENCE FOR CARCINOGENICITY TO EXPERIMENTAL ANIMALS EXPOSED TO CRYSTALLINE SILICA (A COMPONENT OF THIS PRODUCT) AND LIMITED EVIDENCE FOR CARCINOGENICITY TO HUMANS. "LIMITED EVIDENCE" MEANS THAT A CAUSAL RELATIONSHIP IS POSSIBLE; HOWEVER, OTHER EXPLANATIONS SUCH AS CHANCE, BAIS OR CONFOUNDING FACTORS CANNOT ADEQUATELY BE EXCLUDED.

Signs and Symptoms of Exposure

SYMPTOMS OF SILICOSIS MAY INCLUDE SHORTNESS OF BREATH, DIFFICULTY BREATHING WITH/WITHOUT EXERTION, COUGHING, DIMINISHED WORK CAPACITY REDUCTION OF LUNG VOLUME AND RIGHT HEART ENLARGEMENT AND/OR FAILURE.

Medical Conditions Generally Aggravated by Exposure INHALING RESPIRABLE DUST MAY AGGRAVATE EXISTING RESPIRATORY SYSTEM DISEASE(s) AND/OR DYSFUNCTIONS. EXPOSURE TO DUST MAY AGGRAVATE EXISTING SKIN AND/OR EYE CONDITIONS.

Emergency and First Aid Procedures

INHALATION: REMOVE TO FRESH AIR. EYES: FLUSH WITH WATER, GET MEDICAL ATTENTION. SKIN: WASH WITH SOAP AND WATER.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

SPILLED MATERIALS, WHERE DUST CAN BE GENERATED MAY EXPOSE CLEAN-UP PERSONNEL TO RESPIRABLE DUST, WETTING OF SPILLED MATERIAL AND/OR USE OF RESPIRATORY EQUIPMENT MAY BE NECESSARY.

Waste Disposal Method

DISPOSE OF WASTE MATERIALS IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS

Precautions to Be Taken in Handling and Storing

RESPIRABLE DUST MAY BE GENERATED DURING HANDLING AND STORAGE. THE CONTROL MEASURES IDENTIFIED IN SECTION VIII OF THE MSDA SHOULD BE APPLIED

Other Precautions

Section VIII — Control Measures

Respiratory Protection (*Specify Type*) NIOSH-MSHA APPROVED DUST RESPIRATOR FOR CONDITIONS WHERE DUST LEVELS EXCEED APPLICABLE EXPOSURE LIMITS

Ventilation			
	Local Exhaust USE TO REDUCE DUST CONCENTRATIONS BELOW APPLICABLE EXPOSURE LIMITS	Special	N/A
	Mechanical (General) USE TO REDUCE DUST CONCENTRATIONS BELOW APPLICABLE EXPOSURE LIMITS	Other	N/A

Protective Gloves	Eye Protection
YES, USE TO PREVENT SKIN CONTACT	YES, SAFETY GLASSES AND/OR GOGGLES

Other Protective Clothing or Equipment

YES WEAR LONG SLEEVE SHIRT AND LONG PANTS TO PREVENT SKIN CONTACT

Work/Hygienic Practices

WASH EXPOSED SKIN WITH SOAP AND WATER, WASH WORK CLOTHES FREQUENTLY

• USGPO: 1988-491-529/45775

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
SAND, OR SAND & GRAVEL	

Section I

Manufacturer's Name MATERIAL SERVICE CORPORATION	Emergency Telephone Number 312-372-3600
Address (Number, Street, City, State, and ZIP Code) 222 NORTH LA SALLE STREET	Telephone Number for Information 312-372-3600
CHICAGO, ILLINOIS 60601	Date Prepared 6/6/89
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
NATURAL SAND OR SAND AND GRAVEL				
DUST MAY CONTAIN RESPIRABLE SILICA PARTICLES CAS 14808-60-7				

EXPOSURE LIMITS ARE EXPRESSED AS MILLIGRAMS OF SUBSTANCE PER CUBIC METER OF AIR (mg/m^3).
8-HOUR TIME WEIGHTED AVERAGES. RESPIRABLE DUST EXPOSURE LIMITS VARY WITH THE % QUARTZ IN DUST.

DUST $<$ 1% QUARTZ: TOTAL: ACGIH & MSHA = 10, OSHA 15' RESPIRABLE: MSHA & OSHA = 5

DUST $>$ 1% QUARTZ: TOTAL MSHA = $30 \div$ (% QUARTZ + 3), OSHA = $30 \div$ (% QUARTZ + 2)
RESPIRABLE: MSHA & OSHA = $10 \div$ (% QUARTZ + 2)
RESPIRABLE QUARTZ: ACGIH = 0.1 mg/m^3

Section III — Physical/Chemical Characteristics

Boiling Point	4046°F	Specific Gravity (H_2O = 1)	2.6
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
NEGLIGIBLE

Appearance and Odor
ANGULAR OR ROUND MULTICOLORED PARTICLES, ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
N/A	N/A	N/A	N/A

Extinguishing Media
NONE REQUIRED

Special Fire Fighting Procedures
NONCOMBUSTIBLE

Unusual Fire and Explosion Hazards
NONE KNOWN

Stability			
	Unstable		Conditions to Avoid N/A
	Stable	X	N/A

Incompatibility (*Materials to Avoid*)
CONTACT WITH POWERFUL OXIDIZING AGENTS SUCH AS FLUORINE, CHLORINE

Hazardous Decomposition or Byproducts
SILICA WILL DISSOLVE IN HYDROFLUORIC ACID AND PRODUCE A CORROSIVE GAS SILICON TETRAFLUORIDE

Hazardous Polymerization			
	May Occur		Conditions to Avoid N/A
	Will Not Occur	X	N/A

Section VI — Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	YES	NO	NO

Health Hazards (*Acute and Chronic*)
ACUTE EXPOSURE TO DUST MAY IRRITATE RESPIRATORY SYSTEM, EYES AND SKIN

CHRONIC EXPOSURE TO RESPIRABLE QUARTZ IN EXCESS OF EXPOSURE LIMITS COULD CAUSE SILICOSIS

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	NO	NO	NO

IARC HAS DETERMINED THAT THERE IS SUFFICIENT EVIDENCE FOR CARCINOGENICITY TO EXPERIMENTAL ANIMALS EXPOSED TO CRYSTALLINE SILICA (A COMPONENT OF THIS PRODUCT) AND LIMITED EVIDENCE FOR CARCINOGENICITY TO HUMANS "LIMITED EVIDENCE" MEANS THAT A CAUSAL RELATIONSHIP IS POSSIBLE; HOWEVER, OTHER EXPLANATIONS SUCH AS CHANCE, BAIS, OR CONFOUNDING FACTORS CANNOT ADEQUATELY BE EXCLUDED.

Signs and Symptoms of Exposure
SYMPTOMS OF SILICOSIS MAY INCLUDE SHORTNESS OF BREATH, DIFFICULTY BREATHING WITH/WITHOUT EXERTION, COUGHING, DIMINISHED WORK CAPACITY, REDUCTION OF LUNG VOLUME AND RIGHT HEART ENLARGEMENT

Medical Conditions
Generally Aggravated by Exposure INHALING RESPIRABLE DUST MAY AGGRAVATE EXISTING RESPIRATORY SYSTEM DISEASE(s) AND/OR DYFUNCTIONS. EXPOSURE TO DUST MAY AGGRAVATE EXISTING SKIN AND/OR EYE CONDITIONS.

Emergency and First Aid Procedures
INHALATION: REMOVE TO FRESH AIR. EYES: FLUSH WITH WATER, GET MEDICAL ATTENTION

SKIN: WASH WITH SOAP AND WATER

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled
SPILLED MATERIALS, WHERE DUST CAN BE GENERATED MAY EXPOSE CLEAN-UP PERSONNEL TO RESPIRABLE DUST. WETTING OF SPILLED MATERIAL AND/OR USE OF RESPIRATORY EQUIPMENT MAY BE NECESSARY

Waste Disposal Method
DISPOSE OF WASTE MATERIALS IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS

Precautions to Be Taken in Handling and Storing
RESPIRABLE DUST MAY BE GENERATED DURING HANDLING AND STORAGE. THE CONTROL MEASURES IDENTIFIED IN SECTION VIII OF THE MSDS SHOULD BE APPLIED

Other Precautions
NONE

Section VIII — Control Measures

Respiratory Protection (*Specify Type*) NIOSH-MSHA APPROVED DUST RESPIRATOR FOR CONDITIONS WHERE DUST LEVELS EXCEED APPLICABLE EXPOSURE LIMITS

Ventilation		
	Local Exhaust USE TO REDUCE DUST CONCENTRATIONS BELOW APPLICABLE EXPOSURE LIMITS	Special N/A
	Mechanical (General) USE TO REDUCE DUST CONCENTRATIONS BELOW APPLICABLE EXPOSURE LIMITS	Other N/A

Protective Gloves	Eye Protection
YES, USE TO PREVENT SKIN CONTACT	YES, SAFETY GLASSES AND/OR GOGGLES

Other Protective Clothing or Equipment
YES, WEAR LONG SLEEVE SHIRT AND LONG PANTS TO PREVENT SKIN CONTACT

Work/Hygienic Practices
WASH EXPOSED SKIN WITH SOAP AND WATER, WASH WORK CLOTHES FREQUENTLY

* USGPO: 1986-491-529/45775

Date: 8 March 1991
Revision No.: 1

REFRACTORY BRICKS OR SHAPES

A. P. GREEN INDUSTRIES, INC.

MEXICO, MISSOURI 65265 U.S.A.

July 12, 1989

MATERIAL SAFETY DATA SHEET

A. P. Green Industries, Inc.
Green Boulevard, Mexico, Missouri 65265
Telephone -- 314-473-3626

SECTION I

PRODUCT NAME: KRUZITE D, KRUZITE D AH, BRICK MIX 1003, R-5010; KRUZITE R, KRUZITE R AH, BRICK MIX 1006, R-8008; KRUZITE-70

PRODUCT TYPE: Refractory Bricks or Shapes

CHEMICAL FAMILY: SiO_2 = 24-28%, Al_2O_3 = 68-72%, Fe_2O_3 = 1-2%, $NaKO^3$ = 0.2-0.4%

FORMULA: Not Applicable

SECTION II

PRODUCT HAZARDOUS INGREDIENTS

Chemical	TWA	CAS #
Cristobalite * (SiO_2)	0.05 mg/m^3** respirable dust	14464-46-1
Quartz * (SiO_2)	0.1 mg/m^3** respirable dust	14808-60-7

* Not mechanically separate from each other or from other mineralogical phases in product as supplied.

**Source: American Conference of Governmental Industrial Hygienists, 1988-1989.

SECTION III

PHYSICAL DATA

SOLUBILITY IN WATER: None

VOLATILES BY VOLUME (%): None

SPECIFIC GRAVITY: 3.0-3.2

MELTING POINT: Not Applicable

APPEARANCE AND ODOR: Buff solid; no odor

SECTION IV

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: None

EXTINGUISHING MEDIA: Not Combustible

SPECIAL FIRE FIGHTING PROCEDURES: None

UNUSUAL FIRE AND EXPLOSION HAZARDS: None Known

SECTION V

HEALTH HAZARD DATA

EFFECT OF OVEREXPOSURE:

EYES	ACUTE:	Dust or chips can cause mechanical irritation.
	CHRONIC:	None known.
SKIN	ACUTE:	Can cause mechanical abrasion or cuts.
	CHRONIC:	None known.
INHALATION	ACUTE:	Dust, if present, may cause upper respiratory irritation.
	CHRONIC:	Dust may cause lung damage if inhaled on a long-term basis.
INGESTION	ACUTE:	Unknown
	CHRONIC:	Unknown

EMERGENCY AND FIRST AID PROCEDURES:

EYES	Immediately flush eyes with water for 15 minutes. Consult physician if irritation occurs.
SKIN	Treat abrasions or cuts using normal first aid procedures.
INHALATION	Remove to fresh air. Seek medical attention.
INGESTION	Contact physician immediately. Do not induce vomiting unless instructed to do so by physician. Product is not toxic as supplied, but its abrasive nature could damage internal organs.

SECTION VI

REACTIVITY DATA

STABILITY: Stable

INCOMPATIBILITY: None Known

HAZARD POLYMERIZATION: Will Not Occur

SECTION VII

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: For broken shapes or fragments, sweep, shovel up, or pick up.

WASTE DISPOSAL METHOD: Can be disposed of in an approved landfill, in accordance with local, state, and federal regulations.

SECTION VIII

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Use NIOSH approved respirator when cutting or removing this product after service.

VENTILATION: General mechanical ventilation is adequate.

EYE PROTECTION: Goggles or safety glasses with side shields should be worn. Entry of chips into the eyes is a serious hazard, and eye protection should be worn at all times.

OTHER PROTECTION: Wear gloves and long-sleeved and long-legged clothing to protect hands, arms, and legs from cuts, abrasion, or irritation. Wash clothing separately and rinse washing machine afterwards. Safety shoes should be worn to protect feet from accidentally dropped bricks or shapes.

SECTION IX

SPECIAL PRECAUTIONS

NIOSH approved respirators should be worn any time that refractories are torn out after service. While some respiratory hazard and/or nuisance dust may exist from the product itself, other foreign substances may warrant additional precautions during tearout and disposal.

Warning: This product contains crystalline silica. Prolonged exposure to dust may cause silicosis, a progressive pneumoniosis, or other respiratory diseases. International Agency for Research on Cancer (IARC) has classified crystalline silica as a Class 2A carcinogen. Their study concluded that sufficient evidence for carcinogenicity exists in experimental animals and that limited evidence for carcinogenicity exists in humans.

This material safety data sheet contains confidential proprietary information and is not to be disclosed to the general public or to competition. The information accumulated herein is believed to be accurate but is not warranted to be, whether originating with A. P. Green Industries, Inc. or not. This information is offered solely for use in your evaluation of this product in respect to safety, health, and environmental hazards.

Prepared By: Ellis J. Smith
Title: Senior Technical Consultant
Phone: (314) 473-3392

Date: 8 March 1991
Revision No.: 1

SODIUM HYDROXIDE

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Get victim to fresh air. Give artificial respiration if necessary. Seek medical attention.

Skin: Wash contaminated area with running water until the "soapy" feeling disappears. Seek medical attention, if necessary.

Eyes: Wash eyes with running water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Do not induce vomiting. Give large amounts of water or milk. Seek immediate medical attention. Note: Never force an unconscious person to drink.

Note to Physician: Dilute with water, milk or weak acid. Gastric lavage and emetics are contraindicated. As soon as pain and shock are controlled, presence or absence of esophageal injury should be determined.

FIRE AND EXPLOSION INFORMATION

General: Non-flammable or explosive

REACTIVITY

General: Extremely corrosive.

Materials to Avoid: Separate from acids, metals, explosives, organic peroxides and easily ignitible materials; contact may release heat and poisonous gases.

ditions to Avoid: When the solid comes in contact with moisture or water, it can generate enough heat to ignite combustible materials.

PROTECTIVE MEASURES

Storage and Handling: Store in a dry place. Protect container from water or moisture and against physical damage.

Engineering Controls: Use in an area that is dry or has a dehumidifier. Eyewash stations and showers should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): If contact is likely wear rubber gloves, aprons, boots and safety glasses.

otective Equipment: For levels up to 100 mg/m^3 use a high-efficiency particulate respirator with a full facepiece, a supplied-air respirator with a full facepiece, helmet or hood, or a self-contained breathing appartus with a full facepiece. For up to 200 mg/m^3 use a powered air-purifying respirator with a high-efficiency filter and full facepiece or a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode. For escape from a contaminated area use a dust and mist respirator or a self-contained breathing appartus with a full facepiece.

PROCEDURES FOR SPILLS AND LEAKS

r protective clothing. For the solid, sweep into large vessel containing a large ount of water. Neutralize with weak hydrochloric acid. For solution, neutralize with eak hydrochloric acid. Pick up with mop or water vacuum. For final disposal contact our regional office of the New York State Department of Environmental Conservation.

or more information: Contact the Industrial Hygienist or Safety Officer at your worksite r the New York State Department of Health, Bureau of Toxic Substance Assessment, Empire tate Plaza, Corning Tower Building, Albany, New York 12237.

Date: 8 March 1991
Revision No.: 1

STEEL (CARBON AND ALLOY)

METRON

METRON STEEL CORPORATION

Material Safety Data Sheet

Company	Issue Date	Identification
Metron Steel Corporation 12900 S. Metron Drive Chicago, Illinois 60633	12/21/85	Carbon & Alloy
Trade Name (Common Name of Synonym) Carbon, Alloy, Steels	**Phone Number** (312) 646-4000	
Chemical Name Steel	**Form** Bar, Sheet, Plate, Tubing, Structurals	

I. INGREDIENTS

Material or Component	CAS Number	% Weight	Exposure Limits	
			OSHA PEL (mg/m³)	ACGIH TLV (mg/m³)
Base Metal				
Iron (Fe)	7439-89-6	Balance	10 (Fe_2O_3 Fume)	5.0 (Fe_2O_3 Fume)
Alloying Elements				
Carbon (C)	7440-44-0	0.01 - 1.5	None Listed	None Listed
Chromium (Cr)	7440-47-3	0.01 - 12	1.0 as chrome	0.5 as chrome
Copper (Cu)	7440-50-8	0.04 - 0.7	0.2 as copper; 1.0 as dust	0.2 as fume; 1.0 as dust
Lead (Pb)	7439-92-1	0.15 - 0.35	0.05 as fume & dust	0.15 as dust and fume
Manganese (Mn)	7439-96-5	0.05 - 2.0	5 as manganese	5 as dust; 1 as fume
Molybdenum (Mo)	7439-98-7	0.01 - 1.10	15 as insoluble compds	10 as insoluble compds
Nickel (Ni)	7440-02-0	0.01 - 10	1.0 as Nickel	1.0 as Nickel
Phosphorous (P)	7723-14-0	0.15 Max	0.1 as Phosphorous	0.1 as Phosphorous
Silicon (Si)	7440-21-3	0.15 - 2.20	None Listed	10 total dust
Sulfur (S)	7704-34-9	0.001 - 0.35	13 sulfur dioxide	5 sulfur dioxide
Tungsten (W)	7440-33-7	0 - 18	None Listed	5 insoluble compds
Vanadium (V)	7440-62-2	0.01 - 1.0	0.5 dust; 0.1 fume	0.05 dust and fume
Zinc (Zn) coating	1314-13-2	10 Max	5.0 as fume	5.0 as fume

Note: The above listing is a summary of elements used in alloying steel. Various grades of steel will contain different combinations of these elements. Trace elements may also be present in minute amounts.

II. PHYSICAL DATA

Material is (At Normal Conditions):	Appearance and Odor
☐ Liquid ☒ Solid ☐ Gas ☐ Other	Gray-Black With Metallic Lustre — Odorless

Acidity/Alkalinity	Approx		Vapor Pressure (mm Hg at 20°C)
ph = NA	Melting Point 2750°F Boiling Point NA °F	Specific Gravity (H_2O = 1) — 7 Solubility in water (% by weight) — NA	NA

III. PERSONAL PROTECTIVE EQUIPMENT

Respiratory Protection	Hands, Arms, and Body
NIOSH approved dust/mist/fume respirator should be used during welding or burning if OSHA PEL or TLV is exceeded.	Use appropriate protective clothing such as welders aprons & gloves when welding or burning. Check local codes.
Eyes and Face	**Other Clothing and Equipment**
Safety glasses should always be worn when grinding or cutting; face shields should be worn when welding or burning.	As required

IV. EMERGENCY MEDICAL PROCEDURES

Inhalation:	Remove to fresh air; if condition continues, consult physician.
Eye Contact:	Immediately flush well with running water to remove particulate; get medical attention.
Skin Contact:	If irritation develops, remove clothing and wash well with soap and water. If condition persists, seek medical attention.
Ingestion:	If significant amounts of metal are ingested, seek medical attention.

V. HEALTH/SAFETY INFORMATION

HEALTH

Steel products in the natural state do not present an inhalation, ingestion, or contact health hazard. However, operations such as welding, burning, sawing, brazing, grinding, and possibly machining, which results in elevating the temperature of the product to or above its melting point or results in the generation of airborne particulates may present hazards. The above operations should be performed in well ventilated areas. The major exposure hazard is inhalation.

Effects of overexposure are as follows:

Acute: Excessive inhalation of metallic fumes and dusts may result in irritation of eyes, nose, and throat. Also high concentrations of fumes and dusts of iron-oxide, manganese, copper, zinc, & lead may result in metal fume fever. Typical symptoms consist of a metallic taste in the mouth, dryness and irritation of the throat, chills and fever, and usually last from 12 to 48 hours.

Chronic: Chronic and prolonged inhalation of high concentrations of fumes or dust of the following elements may lead to the conditions listed opposite the element:

Iron (iron-oxide) - Pulmonary effects, siderosis.

Manganese - Bronchitis, pneumonitis, lack of coordination.

Chromium - Various forms of dermatitis, inflammation and/or ulceration of upper respiratory tract; and, based on available information, certain forms of chromium (VI) have been found to cause increased respiratory cancer mortality among workers.

Nickel - Various forms of dermatitis, inflammation and/or ulceration of upper respiratory tract; and, based on available information, lung cancer and nasal cancer can result from inhalation of nickel. The average latency period for the induction of these cancers appears to be about 25 years (range 4-51 years).

Copper - Pulmonary effects.

Vanadium - No reported cases of exposure to vanadium.

Molybdenum - Pain in joints, hands, knees and feet.

Tungsten - Some evidence of pulmonary involvement such as cough.

Lead - Prolonged exposures can cause behavioral changes, kidney damage, periphery neuropathy characterized by decreased hand-grip strength and adverse reproductive effects.

Zinc - None reported.

Occupational Exposure Limits

See Section I.

FIRE AND EXPLOSION

Flash Point	Auto Ignition Temperature	Flammable Limits in Air	Extinguishing Media
NA °F	NA °F	Lower NA % Upper NA %	NA

Fire and Explosion Hazards

None

Extinguishing Media Not to be Used

NA

REACTIVITY

Stability

☐ Stable ☐ Unstable

Incompatibility (Materials to Avoid)

Reacts with strong acids to form hydrogen gas.

Conditions to Avoid

Keep Area Well Ventilated

Non-ventilated areas when cutting, welding, burning, or brazing; avoid generation of airborne dusts and fumes.

Hazardous Decomposition Products

Metallic oxides.

VI. ENVIRONMENTAL

Spill or leak procedures

NA

Special Precautions: Use good housekeeping practices to prevent accumulation of dust and to keep airborne dust to a minimum.

Waste Disposal Method

Dust, etc. — follow federal, state, and local regulations regarding disposal.

VII. ADDITIONAL INFORMATION

Disclaimer

The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any representation or warranty, expressed or implied regarding the accuracy or correctness.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product.

Back

Date: 8 March 1991
Revision No.: 1

UFALA (HIGH ALUMINA BRICK)

MATERIAL SAFETY DATA SHEET

HARBISON-WALKER REFRACTORIES
Dresser Industries, Inc.
One Gateway Center, Pittsburgh, Pennsylvania 15222

TELEPHONE: 412-562-6200

DISCLAIMER

11-22-88

This data sheet is based on OSHA FORM 174 but modified to more adequately suit refractory products. All data are subject to reasonable variation. This information is supplied in good faith by Harbison-Walker and is applicable to the product as shipped. Your application of the product may change its characteristics. THE DATA PROVIDED HEREIN ARE BELIEVED CORRECT OR ARE OBTAINED FROM SOURCES BELIEVED TO BE GENERALLY RELIABLE. HARBISON-WALKER SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THIS PRODUCT, AND HARBISON-WALKER ASSUMES NO OBLIGATION OR LIABILITY FOR RELIANCE OF THE INFORMATION CONTAINED IN THIS DATA SHEET. This data is not part of any contract or condition of sale. It is solely supplied as an accomodation to the buyer.

SECTION I - PRODUCT IDENTIFICATION

Product Tradename: UFALA

Type of Refractory: High Alumina Brick

SECTION II - HAZARDOUS INGREDIENTS

SEE CHECKED BLOCKS INGREDIENT	GEN. CHEM. FORMULA	C.A.S. NUMBER	PERCENTAGE RANGE	OSHA P.E.L.	ACGIH TLV *	NIOSH CRITERIA DOCUMENT NO.
☐ Quartz	SiO_2	14808-607		10 mg/m³ / % Respirable Quartz +2	0.1 mg/m³	75-120
☒ Cristobalite	SiO_2	14464-46-1	5 - 7	½ Quartz Value	0.05 mg/m³	75-120
☐ Tridymite	SiO_2	15468-32-3		½ Quartz Value	0.05 mg/m³	75-120
☐ Fused Silica	SiO_2	60676-86-0		20 mppcf	Use Quartz TLV	75-120
☐ Coal Tar Products	N/A	65996-93-2		0.2mg/m³	0.2 mg/m³	78-107
☐ Petroleum Pitch	N/A	8052-42-4		NONE	0.2 mg/m³	78-106
☐ Phosphoric Acid*	H_3PO_4	7664-38-2		1.0 mg/m³ (mist)	1.0 mg/m³	NONE
☐ Magnesia	MgO	1309-48-4		10 mg/m³	10 mg/m³	NONE
☒ Free Alumina*	Al_2O_3	1344-28-1	0 - 0.5	10 mg/m³	10 mg/m³	NONE
☐ Lime	CaO	1305-78-8		5.0 mg/m³	2.0 mg/m³	NONE
☐ Chrome III Oxide*	Cr_2O_3	1308-38-9		1.0 mg/m³	0.5mg/m³	NONE
☐						
☐						
☐						

* Subject to reporting under Section 313, Sara Title III

SECTION III - PHYSICAL DATA

Appearance and Odor: Buff color; no odor

Specific Gravity: 2.53 pH: ND

Solubility in Water: Insoluble

Other:

FORM:
X Brick
___ Granular
___ Paste

SECTION IV - FIRE AND EXPLOSION DATA

UNLESS OTHERWISE NOTED, NONE Product is a refractory, and will not burn.

NOTES:

SECTION V - HEALTH HAZARD DATA*

*SEE CHECKED BLOCKS		EXPOSURE REQUIRED	
INGREDIENT	EFFECTS OF OVEREXPOSURE	PROLONGED	SHORT TERM
☒ Free Crystalline Silica	Delayed lung fibrosis - silicosis	✓	
☐ Coal Tar Products	Skin, lung mucous membrane carcinogen	✓	
	Skin irritation; photosensitization		✓
☐ Petroleum Pitch	(Same as Coal Tar Products)	✓	✓
☐ Magnesia	Irritant to skin, eyes, mucous membranes, etc.		✓
☐ Lime	Irritant to skin, eyes, mucous membranes, etc.		✓
☒ Free Alumina	Irritant to skin, eyes, mucous membranes, etc		✓
☐ Fused Silica	Delayed lung fibrosis-silicosis	✓	
☐ Phosphoric Acid	Primary Irritant - skin, eyes, etc.		✓
☐ Chrome III Oxide	Irritant to skin, eyes, mucous membranes, etc.		✓
☐			
☐			

EMERGENCY OR FIRST AID PROCEDURES:

☒ Irritants: Wash from skin or flush from eyes using copious amounts of water.

☐ Coal Tar Products: Remove from skin by washing with soap and water. DO NOT use solvents. Same for Petroleum Pitch.

☐ Other:

SECTION VI - REACTIVITY DATA

STABILITY: ☒ STABLE ☐ UNSTABLE COMMENTS: Incompatability (material to avoid)

Hazardous decomposition products:

Hazardous Polymerization: ☐ may occur ☒ will not occur

SECTION VII - SPILL AND LEAK PROCEDURES

Most refractory products may be landfilled. However, since your application of this product may change its chemical characteristics, and since disposal procedures may vary with locale and are subject to change, you should consult the governmental authority having jurisdiction for disposal information.

COMMENTS:

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (CHECK ONE): ☒ Approved Dust ☐ Other (Specify):

VENTILATION: Local exhaust ventilation should be provided if routine operation generates dust in excess of allowable limits

PROTECTIVE GLOVES (CHECK TYPE): ☐ Acid Resistant ☐ Impermeable ☒ Abrasion Resistant ☐ Other (Specify):

EYE PROTECTION: Approved safety glasses, goggles or faceshields should be used when handling refractory products.

FOOT PROTECTION (CHECK TYPE): ☒ Metatarsal safety ☐ Impermeable

PROTECTIVE CLOTHING (SPECIFY):

SECTION IX - SPECIAL PRECAUTIONS

☐ If block is checked, product contains coal tar pitch, petroleum pitch or creosote. Over-exposure to dust/ volatiles may cause cancer and/ or irritation to eyes, skin and respiratory tract.
Do not breathe dust/ fumes: use with proper ventilation. NIOSH approved respirators and protective clothing should be worn while handling this product.

☐ If block is checked, this resin bonded product contains free formaldehyde and phenol. Exposure to dust and vapor may cause irritation of skin, eyes, nose, and throat. Allergic skin reaction may also occur. Avoid prolonged or repeated contact with eyes or skin; avoid breathing dust or vapor. Wash thoroughly after handling. Wear rubber gloves and approved NIOSH respirator.

☒ If block is checked, the product contains crystalline silica for which there is limited evidence of a possible association with the incidence of cancer in humans.

Prepared By: C. D. Jamison Emergency Phone: 412-562-6437

Date: 8 March 1991
Revision No.: 1

WEBCOL ALCOHOL PREP PADS

FEB 10 1989

KENDALL HEALTHCARE PRODUCTS COMPANY — MATERIAL SAFETY DATA SHEET

15 Hampshire Street
Mansfield, MA 02048
(617) 261-8000

PRODUCT NAME: Webcol Alcohol Prep Pads
PRODUCT CODE: 2323, 5033, 5110, 5126, 5130, 5403, 6818, 86703

---

1. D.O.T. INFORMATION: Not regulated.

DOT SHIPPING NAME: N/A
IDENTIFICATION NUMBER: N/A
TECHNICAL NAME: N/A
HAZARD CLASS: N/A

2. HAZARDOUS COMPONENTS:

	CAS NO.	WT.%	TLV
ISOPROPYL ALCOHOL	0067-63-0	64.8*	400 PPM

* 70% By Volume

3. PHYSICAL DATA (of solution):

APPEARANCE & ODOR: White non-woven cloth saturated with alcohol solution, mild alcohol odor.

ODOR THRESHOLD: Isopropyl Alcohol: 45-200 PPM; odor of rubbing alcohol

BOILING POINT: 80.2 deg. C
MELT/FREEZE POINT: -31.5 deg. C
VAPOR DENSITY (Air=1): 2.1
VAPOR PRESSURE (mm Hg): 33 @ 68 Deg F
VISCOSITY: 2.9 cps @ 25 deg. C
SPECIFIC GRAVITY (Water=1): 0.8405
SOLUBILITY IN WATER: Miscible
pH: N/A

4. FIRE & EXPLOSION DATA:

FLASH POINT (Method Used): 68 deg. F TOC
AUTOIGNITION TEMP: 750 F
LEL: 2%
UEL: 12%

EXTINGUISHING MEDIA: Water fog, foam, carbon dioxide, dry chemical
SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS: Dangerous hazard when exposed to heat, flame.

5. HEALTH HAZARD DATA:

THRESHOLD LIMIT VALUE: 400 PPM (for Isopropyl Alcohol)

ANY COMPONENT LISTED AS KNOWN OR POTENTIAL CARCINOGEN? / /YES /X/NO

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None known.

PRIMARY ROUTES OF ENTRY AND EFFECTS OF OVEREXPOSURE:
ACUTE:

INHALATION: Mild irritation of nose and throat, with further exposure leading to early to moderate CNS depression evidenced by giddiness.

SKIN CONTACT: Mild irritation possible.

EYE CONTACT: Irritating to eyes, producing severe stinging and burning sensation. NOTE: If not removed promptly from eyes, may cause eye damage.

INGESTION: Unlikely to occur with this product.

CHRONIC: None.

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: Move affected person to fresh air. Restore and/or support breathing as needed. Seek medical advice.

SKIN CONTACT: Flush exposed area with water while removing contaminated clothing. Seek medical advice if irritation persists.

EYE CONTACT: Flush eyes, including under eyelids, with running water for at least 15 minutes. Seek medical advice promptly.

6. REACTIVITY DATA:

STABILITY: /X/STABLE / /UNSTABLE

CONDITIONS TO AVOID: Avoid heat, sparks, and flame. Store below 120 degrees F.

HAZARDOUS POLYMERIZATION: / /MAY OCCUR /X/WILL NOT OCCUR

CONDITIONS TO AVOID: N/A

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon Monoxide and complex hazardous organic compounds may be formed during combustion.

7. DISPOSAL, SPILL OR LEAK PROCEDURES:

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Spills are unlikely with this product. Release of significant amounts of vapor requires removal of all ignition sources and adequate ventilation.

WASTE DISPOSAL: May be incinerated or landfilled in approved landfill.

8. SPECIAL PROTECTION INFORMATION:

VENTILATION REQUIREMENT: Local

RESPIRATORY PROTECTION: None

PROTECTIVE GLOVES: None EYE PROTECTION: Glasses

OTHER PROTECTIVE EQUIPMENT: None

9. STORAGE AND LABELLING: N/A

SPECIAL HANDLING AND STORAGE REQUIREMENTS: Store below 120 degrees F.

10. TOXICITY INFORMATION:

ISOPROPYL ALCOHOL: orl-hmn TDLo: 15,710 mg/Kg
ivn-mus LD50: 1863 mg/Kg

11. ADDITIONAL REGULATORY CONCERNS:

MARKETING AND USE REGULATED BY:

/X/ FDA / / EPA
/ / CPSC / / RCRA
/X/ TSCA /X/ OSHA
/ /OTHER (Specify)

DATE OF ISSUE: 1/28/88 SUPERCEDES: 7/13/87

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APPENDIX E

ACTIVITY HAZARD ANALYSIS FORM

Date: 8 March 1991
Revision No.: 1

APPENDIX E

ACTIVITY HAZARD ANALYSIS FORM

Contract Number _____ Project Name _____
Contractor _____ Subcontractor _____
Phase of Construction _____

Activity	Hazards	Precautionary Actions to be Taken by Contractor
Example:		
Excavation of nonenergetic material		

Signature: _____ Date: _____
Contractor

_____ _____
Const. Repr.

Date: 8 March 1991
Revision No.: 1

APPENDIX F

ON-SITE HEAT/COLD STRESS MANAGEMENT

APPENDIX F

ON-SITE HEAT/COLD STRESS MANAGEMENT

F.1 HEAT STRESS

The best approach is preventive heat stress management. In general:

- Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable 4-ounce cups, and water that is maintained at 50 - 60°F. Urge workers to drink 1 to 2 of these cups of water every 20 minutes for a total of 1 to 2 gallons per day. Provide a cool, preferably air conditioned, area for rest breaks. Discourage the use of alcohol during nonworking hours, and discourage the intake of coffee during working hours. Monitor the signs of heat stress.

- Acclimate workers to site work conditions by slowly increasing workloads; i.e., do not begin site work activities with extremely demanding activities.

- Provide cooling devices to aid natural body ventilation. An example of a cooling aid is long cotton underwear, which acts as a wick to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing. These devices, however, add weight and their use should be balanced against worker efficiency.

- Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.

- In hot weather, conduct field activities in the early morning and evening.

- Ensure that adequate shelter is available to protect personnel against heat as well as cold, rain, snow, etc., which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible, set up the command post in the shade.

- In hot weather, rotate shifts of workers wearing impervious clothing.

- Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

F.1.1 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat-regulating mechanisms of the body; i.e., the individual's temperature control system, which causes sweating, stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- Symptoms -- Red, hot, dry skin, even though the victim may have been sweating earlier; nausea; dizziness; confusion; extremely high body temperature; rapid respiratory and pulse rate; unconsciousness or coma.
- Treatment -- Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool, but not cold, water; sponge the body with cool water or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages.

F.1.2 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stroke, but it nonetheless must be treated.

- Symptoms -- Pale, clammy, moist skin; profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The victim may have a headache, may vomit, and may be dizzy.
- Treatment -- Remove the victim to a cool, air-conditioned place, loosen clothing, place in a head-low position and provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink 1 to 2 cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be about 1 to 2 gallons per day.

F.1.3 Heat Cramps

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- Symptoms -- Acute painful spasms of voluntary muscles; e.g., abdomen and extremities.
- Treatment -- Remove victim to a cool area and loosen clothing. Have patient drink 1 to 2 cups of water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be 1 to 2 gallons per day. Consult with physician.

F.1.4 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. The condition decreases ability to tolerate heat.

- Symptoms -- Mild red rash, especially in areas of the body in contact with protective gear.
- Treatment -- Decrease amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.

F.2 HEAT STRESS MONITORING AND WORK CYCLE MANAGEMENT

For strenuous field activities that are part of ongoing site work activities in hot weather, the following procedures will be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing. These procedures are to be instituted when the temperature exceeds 70°F.

- Measure heart rate -- Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The heart rate at the beginning of the rest period should not exceed 110 beats/minute. If the heart rate is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle

should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats/minute.

- Measure body temperature -- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. The oral temperature at the beginning of the rest period should not exceed 99.6°F. If it does, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the oral temperature exceeds 99.6°F at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the body temperature is maintained below 99.6°F.

- Manage work/rest schedule -- The following work/rest schedule will be used as a guideline:

Adjusted Temperature (°F)	Active Work Time Using Level B/C Protective Gear (min/hr)
75 or less	50
80	40
85	30
90	20
95	10
100	0

Calculate the adjusted temperature:

T (adjusted) = T (actual) + (13 x fraction sunshine)

Measure the air temperature with standard thermometer. Estimate the fraction of sunshine by judging what percent the sun is out.

100% sunshine = No cloud cover = 1.0
50% sunshine = 50% cloud cover = 0.5
0% sunshine = Full cloud cover = 0.0

Reduce or increase the work cycle according to the guidelines for measuring heart rate and body temperature in Subsection F.2.

F.3 FROSTBITE AND COLD EXPOSURE

The extent of injury caused by exposure to abnormally low temperature generally depends on factors such as: wind velocity, type and duration of exposure, temperature, and humidity.

Freezing is accelerated by wind and by humidity or a combination of the two factors.

F.3.1 Frostbite

F.3.1.1 Characteristics

Frostbite results when crystals form, either superficially or deeply, in the fluids and underlying soft tissues of the skin. The effects are more severe if the injured area is thawed and then refrozen. Frostbite is the most common injury resulting from exposure to cold elements. Usually, the frozen area is small. The nose, cheeks, ears, fingers, and toes are most commonly affected.

F.3.1.2 Signs and Symptoms

Just before frostbite occurs, the affected skin may be slightly flushed. As frostbite develops:

1. The skin changes to white or grayish-yellow in appearance.
2. Pain is sometimes felt early but subsides later (often there is no pain).
3. Blisters may appear later.
4. The affected part feels intensely cold and numb.
5. The victim frequently is not aware of frostbite until someone tells him or he observes the pale, glossy skin.

As time passes:

1. There is mental confusion and impairment of judgment.
2. The victim staggers.

3. Eyesight fails.

4. The victim falls and may become unconscious.

5. Shock is evident.

6. Breathing may cease.

7. Death, if it occurs, is usually due to heart failure.

F.3.1.3 First Aid

Objectives

The objectives of first aid are to protect the frozen area from further injury, to warm the affected area rapidly, and to maintain respiration.

Procedure

1. Cover the frozen part.

2. Provide extra clothing and blankets.

3. Bring the victim indoors as soon as possible.

4. Give the victim a warm drink.

5. Rewarm the frozen part quickly by immersing it in water that is warm, but not hot, when tested by pouring some of the water over the inner surface of your forearm. Place a thermometer in the water and carefully add warm water to maintain the temperature between 102° and 105°. Note: If the affected part has been thawed and refrozen, it should be warmed at room temperature (from 70° to 74°F).

6. If warm water is not available or practical to use, wrap the affected part gently in a sheet and warm blankets.

7. Do not rub the part; rubbing may cause gangrene (tissue death).

8. Do not apply a heat lamp or hot water bottles.

9. Do not let the victim bring the affected part near a hot stove.

10. Do not break the blisters.

11. Do not allow the victim to walk after the affected part thaws, if his feet are involved.

12. Since severe swelling develops very rapidly after thawing, discontinue warming the victim as soon as the affected part becomes flushed.

13. Once the affected part is rewarmed, have the victim exercise it.

14. If fingers or toes are involved, place dry, sterile gauze between them to keep them separated.

15. Do not apply other dressing unless the victim is to be transported for medical aid.

16. If travel is necessary, cover the affected parts with sterile or clean cloths and keep the injured parts elevated.

17. Elevate the frostbitten parts and protect them from contact with bedclothes.

18. Give fluids as described for burns, provided the victim is conscious and not vomiting.

19. Obtain medical assistance as soon as possible.

F.3.2 Cold Exposure

F.3.2.1 Manifestations

Prolonged exposure to extreme cold produces the following manifestations:

1. Shivering.

2. Numbness.

3. Low body temperature.

4. Drowsiness.

5. Marked muscular weakness.

F.3.2.2 First Aid

1. Give artificial respiration, if necessary.
2. Bring the victim into a warm room as quickly as possible.
3. Remove wet or frozen clothing and anything that is constricting.
4. Rewarm the victim rapidly by wrapping him in warm blankets, or by placing him in a tub of water that is warm but not hot to the hand or forearm.
5. If the victim is conscious, give him hot liquids by mouth (not alcohol).
6. Dry the victim thoroughly if water was used to rewarm him.
7. Carry out appropriate procedures as described for frostbite.

F.3.3 Prevention of Injuries from Extreme Cold

Frostbite occurs when skin tissue is subjected to extremely cold atmospheric conditions for a duration of time long enough to result in actual freezing of tissue fluids. Prevention involves limiting, if not avoiding, exposure to extreme cold, avoiding personal practices that may actually contribute to freezing of tissue, wearing proper protective covering, recognizing early symptoms of the onset of frostbite, and removal from such exposure.

If you must go outdoors into extremely cold air temperatures, particularly if high wind or humidity is also present, limit exposure time as much as possible. The danger of frostbite is increased if you are tired or if your body's normal resistance is low because of a recent illness. Do not drink alcoholic beverages, smoke, or bathe immediately prior to going out into extremely cold air. Keep moving about in cold air; exercise fingers and toes if necessary, but avoid overexertion.

The right kind of protective clothing is most important. Thermal-type woolen underclothing; outer garments that will repel wind and moisture; face helmet and head and ear coverings; an extra pair of socks; warm boots; and woolen-lined mittens or gloves made of wind- and water-repellent material are all basic items of protective clothing desirable for

use in extremely cold weather. Make certain that clothing, particularly footwear, is not so tight that circulation is apt to become restricted. Keep clothing dry.

Finally, learn to recognize the symptoms that indicate possible onset of frostbite. Rest, shelter from wind and moisture, hot drinks, and an opportunity to warm cold body parts or to change damp clothing should be sought quickly when these early symptoms are evidenced. Cold hands may be given some relief by placing them under dry clothing against the body, such as in the armpits.

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APPENDIX G

LEVELS OF PROTECTION

APPENDIX G

LEVELS OF PROTECTION

G.1 LEVEL D

Level D protection will consist of the following:

1. Cotton coveralls, or spun-bonded olefin or polypropylene coveralls.
2. Neoprene (or equivalent) steel toe/shank boots that meet or exceed American National Standards Institute (ANSI) standards.
3. Neoprene (or equivalent) outer gloves.
4. Safety glasses or goggles.
5. Hard hat.
6. Hearing protection.

G.2 LEVEL D - MODIFIED

Level D - Modified protection will consist of the following:

1. Spun-bonded olefin or polypropylene coveralls.
2. Neoprene (or equivalent) steel toe/shank boots that meet or exceed ANSI standards.
3. Neoprene (or equivalent) outer gloves.
4. Latex or polyvinylchloride (PVC) (surgical or examination) inner gloves.
5. Safety glasses or goggles.
6. Hard hat.
7. Hearing protection.

G.3 LEVEL C

Level C protection will consist of the following:

1. NIOSH/MSHA-approved full-facepiece air-purifying respirator equipped with combination high efficiency particulate air/organic vapor (HEPA/OV) filters.
2. Spun-bonded olefin or polypropylene coveralls.
3. Neoprene (or equivalent) steel toe/shank boots that meet or exceed ANSI standards.
4. Neoprene (or equivalent) outer gloves.
5. Latex or PVC (surgical or examination) inner gloves.
6. Safety glasses or goggles.
7. Hard hat.
8. Hearing protection (if applicable).

G.4 LEVEL B

Level B protection will consist of the following:

1. NIOSH/MSHA-approved full-facepiece supplied-air respirator operated in the pressure-demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus.
2. Spun-bonded olefin or polypropylene coveralls.
3. Neoprene (or equivalent) steel toe/shank boots that meet or exceed ANSI standards.
4. Neoprene (or equivalent) outer gloves.
5. Latex or PVC (surgical or examination) inner gloves.
6. Safety glasses or goggles.
7. Hard hat.
8. Hearing protection.

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APPENDIX H

SLAG INSPECTION/REMOVAL PROCEDURE AND CONFINED SPACE ENTRY PROTECTION PROTOCOL

APPENDIX H

SLAG INSPECTION/REMOVAL PROCEDURE AND CONFINED SPACE ENTRY PROTECTION PROTOCOL

SLAG INSPECTION AND REMOVAL PROCEDURE

H.1 INTRODUCTION

Slag is a residual material consisting of particulate carryover or treated soil that has fused (or melted) due to excessive operating temperatures. The processing temperatures may exceed the melting point of some of the constituents in the soil and result in a partially molten (sticky) material. Slag may deposit on the walls, floors, and ceilings of the process equipment as the treated soil is processed through the rotary kiln or as particulate is drawn through the transportable incineration system (TIS) in the exhaust gas stream. Since it is molten until cooled, the slag provides a tacky surface on which further buildup often occurs. As the slag builds up it may limit the air flow through the TIS, and therefore, must be removed.

As the slag cools it may become flaky or glassy. When the slag is of a flaky consistency, it may be removed using steel lances from the outside of the TIS. When the slag is of a glassy consistency, removal may include cooling the system down and entering the confined spaces of the TIS. It may be necessary to remove the glassy slag using air hammers and power tools. In this situation, entry into the chambers will be conducted following the WESTON-approved confined space entry procedure included in Subsection H.3.

The locations in the TIS that are predominantly susceptible to slag build up are the discharge hood, secondary combustion chamber (SCC), emergency damper, and crossover duct. Slag inspection and removal procedures have become part of the routine maintenance program during TIS operation. Normally, slag buildup is detected by a loss of temperature or draft in the rotary kiln or SCC. When this occurs, an inspection will be initiated to determine the cause of the temperature or draft loss. Routine inspections will also be

conducted at a frequency of once per month to determine if buildup is occurring at the susceptible locations in the TIS. If slag buildup is detected during the visual inspection, the Site Manager will be notified. At the discretion of the Site Manager, the TIS may be cooled down in preparation for the slag removal procedure.

Not less than two people will conduct the slag inspection and removal procedures. Radio contact will always be maintained between the personnel performing the slag inspection and removal and personnel in the control room.

H.2 SLAG INSPECTION

1. Slag inspections will be performed from the top of the TIS to the bottom to ensure that loose slag from the upper locations will not fall on anyone while opening access doors or ports.

2. Ensure that particulate will not blow out of the access door or port that will be opened. Check to be sure that the induced draft (ID) fan is operating and the pressure measurement is such that a draft is established (i.e., at least -0.05 inches water column (in. w.c.)) through the TIS (i.e., firing shield, discharge hood, SCC, spray tower, etc.)

3. Don protective gear approved by the Site Safety and Health Officer (SSHO) (minimally cotton coveralls, hard hat, face shield and heat resistance gloves).

4. Carefully open the access door or port that will allow a visual inspection of the area suspected of slag buildup. When opening the door or port, stand to the side to be sure that stray particulate does not blow out onto any personnel.

5. NEVER INSERT ANY PART OF YOUR BODY INTO THE CHAMBER DURING A SLAG INSPECTION. Move a gloved hand in front of the port to detect extreme heat or particulate blowing out.

6. If no heat or particulate is detected, slowly move to front of access door or port and look into chamber.

7. Quickly assess the slag buildup on the walls, ceiling, and floor of the chamber. Try to estimate the distance from the inspection port to the slag buildup and the depth and thickness of the slagged area. Visually inspect the chamber for any ports that may be closer to the slag buildup or that may be helpful in removing the slag.

8. If the slag can be reached from outside the chamber, poke the slag inside the chamber using a steel lance to determine the consistency of the built up slag material.

9. When a visual assessment has been completed, close and secure the access door or port used for inspection.

H.3 CONFINED SPACE ENTRY PROCEDURE

H.3.1 Definition

Confined spaces include, but are not limited to, those spaces having the following:

- A limited means of egress,
- Natural ventilation that is not adequate to provide sufficient oxygen to maintain life or to prevent the accumulation of toxic or flammable substances to hazardous levels,
- Capable of introducing such hazards as smothering, crushing, or admittance of process substances.

Confined spaces that may be encountered during slag removal procedures include, but are not limited to, process vessels (i.e., kiln, secondary combustion chamber (SCC), crossover duct), and exhaust ducts.

A planned emergency or rescue procedure will be developed prior to any confined space entry. The emergency procedure will be specific to the location and reason for entering the confined space.

H.3.2 Preparation for Entry

1. Notify the SSHO, Site Manager, and Contracting Officer's Representative that a confined space entry will be conducted.

2. Obtain a Confined Space Entry Permit. No tasks involving confined space entry will begin until an appropriate Confined Space Entry Permit is issued. A typical Confined Space Entry Permit is included as Attachment 1. The SSHO will be responsible for recognizing confined spaces and issuing the appropriate permit.

3. Empty the kiln of feed material. If possible, prior to entry into any section of the TIS, the kiln will be emptied by normal operations (i.e., rotating the kiln and operating the material discharge system). No material that is a higher depth than the discharge dam will be left in the kiln.

4. Drain the wetted drag conveyor trough until it is empty to prevent steam explosions resulting from hot slag falling into the water in the trough.

5. Lockout appropriate equipment using padlocks. The following equipment will be locked out (see Lockout Procedures included in Subsection H.5) during entry preparation:

   - Kiln burner.
   - SCC burner.
   - Main fuel valve.
   - Supplemental oxygen system.
   - Makeup water valve to wetted drag conveyor.
   - Kiln drive.
   - Wetted drag (discharge) conveyor.
   - Slinger belt (feed) conveyor.
   - Kiln combustion air fan.
   - SCC combustion air fan.

   No one will remove any padlock other than his/her own. No one will remove any padlock until the work is complete.

6. Restrict movement of the rotary kiln. Place a block of wood at each trunnion wheel of the kiln to restrict its rotation.

7. Cool all process equipment. All process equipment will be cooled to an ambient temperature less than 100°F.

   a. Operate the ID fan to draw hot gases from TIS.

   b. Open the emergency damper.

   c. Open all doors on the kiln discharge hood, SCC, crossover duct, and spray chamber. From the outside of the TIS, working from the top of the TIS to the bottom, remove all slag formed on and around the doors using a shovel, brush, lance, or air hammer.

   d. Secure all access doors open from the outside.

8. When TIS is cooled, turn off and lockout the following equipment:

   - ID fan.
   - Water sprays to the spray chamber and discharge hood.
   - Compressed air.

9. Make sure the work area is well lit. Position lights outside the appropriate area (i.e., discharge hood, SCC, crossover duct, emergency damper, etc.) to make sure it is well lit.

10. Perform a visual inspection of the confined space and a slag inspection as described in Subsection H.2.

11. Evaluate the slag removal procedures that will be necessary, and identify the potential hazards prior to entry. Obtain approval of the slag removal procedures from the SSHO.

12. Ensure that any hot work (i.e., welding, burning, open flames, or spark-producing operation) that is to be performed in the confined space has been approved by the SSHO and is indicated on the Confined Space Entry Permit.

13. Following appropriate procedures for using safety harnesses and safety lines, scrape loose slag from each area, working from the highest point first, i.e., emergency damper.

H.3.3 Work Space Entry General Provisions

1. When possible, confined spaces should be identified with a posted sign which reads: "Caution - Confined Space".

2. Only personnel trained and knowledgeable of the requirements of confined space entry procedures will be authorized to enter a confined space or be a confined space safety watch.

3. A Confined Space Entry Permit will be issued by the SSHO prior to the performance of any work within a confined space. The entry permit will become a part of the permanent record of the site. The Confined Space Entry Permit will be reissued by the SSHO at the start of each consecutive workshift for as long as the work on the specific task continues. One permit will not be used on subsequent workshifts or on unrelated tasks without a reevaluation by the SSHO.

4. Natural ventilation will be provided for the confined space prior to initial entry, and for the duration of the work. If the open doors and inspection ports in the vicinity of the confined space are not sufficient, natural ventilation may be provided using a portable fan.

5. Where air-moving equipment is used to provide ventilation, chemicals will be removed from the vicinity to prevent introduction of fugitive emissions into the confined space.

6. Although not anticipated, if flammable liquids, gases, or vapors may be contained within the confined space, explosion-proof equipment will be used. All equipment will be positively grounded.

7. All sources of ignition will be removed prior to entry. Smoking in confined spaces will be prohibited. Hand-held lights and other illumination utilized in confined

spaces will be equipped with guards to prevent contact with the bulb and will be explosion-proof.

8. Hand tools used in confined spaces will be in good repair, explosion-proof, and spark-proof, and selected according to the intended use. Where possible, pneumatic power tools will be used.

9. If a confined space requires respiratory equipment or presents obstacles whereby rescue may be difficult, safety belts, body harnesses, and lifelines will be used.

10. Compressed gas cylinders, except cylinders used for self-contained breathing apparatus (SCBA), will not be taken into confined spaces. Gas hoses will be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined area. Only SCBA or National Institute for Occupational Safety and Health (NIOSH)-approved airline respirators equipped with a 5-minute emergency air supply (egress bottle) will be used in untested confined spaces or in any confined space with conditions determined immediately dangerous to life and health (IDLH).

11. A ladder is required in all confined spaces that are deeper than the employees's shoulders. The ladder will be secured and will not be removed until all employees have exited the space.

12. Where personnel are working above open spaces or above equipment that may potentially be dangerous if tools or personnel contact that equipment (i.e., the entrance to the wetted drag conveyor contains drag flights that may trap personnel or be damaged if hand tools or equipment enter the conveyor), scaffolding and/or wood planking will be installed inside the chamber to provide a secure surface for working inside the confined space.

13. Vehicles will not be left running near confined space work or near the air-moving equipment being used for confined space ventilation.

14. No deviations from confined space entry procedures will be permitted without the prior approval to the Site Safety and Health Officer (SSHO).

H.3.4 Personnel

A minimum of 2 people will be involved in the work space entry procedures. The first person(s) will enter the confined space. The personal protective equipment (PPE) level will be determine prior to entering the confined area as described in Subsection H.3.5.

The second person will be the safety watch and will be stationed at the entrance to the confined space. He/she will be within audible range to the person(s) entering the confined area. The safety watch will be in the same PPE level of that person(s) entering the confined space, and at all times, he or she will be ready to assist the person working in the confined space. In the event that the safety watch must enter the confined space to assist the person(s) inside, he/she will never attempt to enter the space, even in an emergency, until help has arrived. The safety watch will have continuous radio contact with the control room operator in case of an emergency. The safety watch will secure aid to assist in the rescue, and with whatever assistance is necessary, will remove personnel from the space by means of a safety harness; where possible.

H.3.5 Level of Personal Protective Equipment

Level C-Modified PPE for dust protection is anticipated during all confined space work. If continuous monitoring of the confined space is not possible, Level B-Modified PPE will be worn during all work inside the confined space. The following ambient conditions inside the confined space will be monitored prior to entry and continuously during all work activities in the confined space to ensure Level C PPE is acceptable:

- Oxygen content between 19.5 and 22.0 percent.
- No detectible concentration of combustible gas anywhere in the space (specifically at the lowest point in the space).
- No detectible concentrations of other atmospheric contaminants that may have been present in the confined space (i.e., carbon monoxide).

Attachment 2 includes the calibration procedures for the air monitoring instruments that may be used inside the confined space.

Level C-Modified protection will consist of the following:

1. NIOSH/MSHA-approved full-facepiece air-purifying respirator equipped with combination high efficiency particulate air/organic vapor (HEPA/OV) filters.

2. Cotton coveralls to prevent melting if contact with hot surfaces occurs.
3. Steel toe/shank boots that meet or exceed ANSI standards.
4. Leather or cotton gloves.
5. Safety glasses or goggles.
6. Hard hat.
7. Hearing protection (if applicable).

Level B-Modified protection will consist of the following:

1. NIOSH/MSHA-approved full-facepiece supplied-air respirator operated in the pressure-demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus.
2. Cotton coveralls.
3. Steel toe/shank boots that meet or exceed ANSI standards.
4. Leather or cotton gloves.
5. Safety glasses or goggles.
6. Hard hat.
7. Hearing protection.

H.3.6 Equipment

The following equipment may be used during the slag removal procedures to facilitate removal:

- Steel lance.
- Air-operated hammer with steel lance (hearing protection will be worn by all personnel in the confined space during operation of the air hammer).
- Water hose.

- Flashlights (type of flashlights to be used will be authorized by the SSHO).
- Hand and power tools.

H.4 SLAG REMOVAL PROCEDURE

The slag removal procedure for TIS process equipment will be followed in the order of the equipment listed below. This order will ensure that the TIS is cleaned from the highest point first to avoid slag falling on personnel inside the work space. If, after a slag inspection, it is determined that an area does not need to be cleaned, and that there is no potential for slag to fall on employees below, the area will not be entered or cleaned.

1. Emergency damper cap. Using a safety harness and lifeline, personnel will scrape the inside of the emergency damper cap first to remove slag buildup. Based on past experience, the slag buildup on the inside of the emergency damper has a flaky consistency, and comes off easily.

2. Emergency damper throat. Personnel will then scrape the throat of the emergency damper from the outside of the chamber as much as possible. If necessary, personnel will be lowered inside the throat of the emergency damper to remove the slag.

3. The crossover duct. Planking will be placed inside and across the spray chamber to allow a secure surface on which the employees can access the crossover duct. Material from the crossover duct will be pushed into the SCC for removal by the wetted drag conveyor when the slag removal effort is complete. When the slag has been removed from the crossover duct, the planks will be removed.

4. SCC. Due to limited access, the SCC will be scraped clean from outside of the SCC. There are several access doors and ports that may be used for scraping the slag from the walls of the SCC. The existing platforms will be used for personnel to stand on and work from during the slag removal operations. All material will be scraped into the base of the SCC.

5. Discharge hood. The discharge hood will be the last area to be cleaned. Planking will be placed inside the discharge hood to cover the entrance to the wetted drag conveyor and provide a secure surface for personnel. The inside of the discharge hood and kiln nose ring (as necessary) will be scraped. The slag that is removed will be pushed into a corner of the planking. As the removed slag builds up on the planking, the personnel will exit the area, and pull out the planks to allow the material to drop into the wetted drag conveyor. The planks will be replaced and work will continue until the slag removal efforts are completed.

As appropriate throughout and at the completion of the slag removal effort, all employees will evacuate all confined spaces and will unlock the lockout on the wetted drag conveyor. The conveyor will be filled with water and will be operated to allow the slag removed from the TIS to be conveyed out of the system. When all the slag is discharged from the conveyor, the conveyor trough will be drained and the conveyor will be locked out again. Prior to reentering the confined space to continue slag removal procedures, the confined space entry procedure will again be performed, including checking all lockouts and measuring ambient conditions inside the confined space.

H.4.1 Slag Disposal

The slag will be discharged from the wetted drag conveyor (deslagger) and collected in treated soil storage bins. Slag built up inside the TIS is a result of material fusing due to high temperature and extended residence time. As such, the slag removed is not expected to contain detectable levels of explosives. However, initially slag material will be sampled to verify that the treatment criterion has been met. The sample will be crushed and analyzed for metals and explosives. When the slag sample is established to be less than the treatment criteria for metals and TNT (or explosives) it will be backfilled on-site, with the treated soil and fly ash. If the analytical results indicate that the treatment criterion for explosives has not been met, the slag will be recycled to the TIS for reprocessing and sampling will be continued. If the treatment criterion for metals has not been satisfied, the material will be staged for either on- or off-site disposal at a permitted facility at the authorization of the U.S. Army Corps of Engineers (USACE).

H.5 LOCKOUT PROCEDURE

For the protection and safety of employees, no maintenance, repair, or adjustment will be performed on any powered mechanical machinery or electrical equipment until lockout procedures have been followed. Lockout is to prevent unintentional or accidental starting or energizing of equipment. Operation of the equipment may not continue until all safeguards are again restored and all employees are free from possible points of danger.

To ensure that all such work is performed in a safe manner, the following rules will be followed:

1. No work will be attempted until authorized by the Site Manager.

2. Work will only be done by employees qualified and directed to do so.

3. All employees who are qualified to perform adjustments, repairs, etc., will be provided with a lockout device, a padlock, and one key for their padlock.

4. No two or more padlocks will be capable of being opened by the same key.

5. The Site Manager will maintain a master list of key numbers and an extra key for each lock.

6. A "Lockout" tag with the date and time the lockout is taking place will be given to the control room operator to be placed in a prominent location in the immediate area of the operator controls.

7. In no case will the Site Manager lend the master key, even though the employee's key seems to be lost. The Site Manager will use the key himself until the old lock and the extra key are destroyed and replaced by new ones.

8. Prior to the start of work, the regular operator of the equipment will be alerted to the shutdown.

9. A lockout device will be placed on the control switch, lever, valve, or other starting or energizing control. Every person working on the equipment will place his or her own padlock on the device (see Figure 1 and Figure 2).

10. When each person's work is completed, he or she will remove only his or her own padlock from the control. No one else will remove it for him or her.

11. If work is still in progress at the end of the day or shift, the locks will remain in place until the work is completed.

12. If there is occasion for the work to be continued by an oncoming shift, the retiring shift may remove their padlocks, but the Site Manager will ensure that the oncoming shift immediately installs their padlocks on the control device.

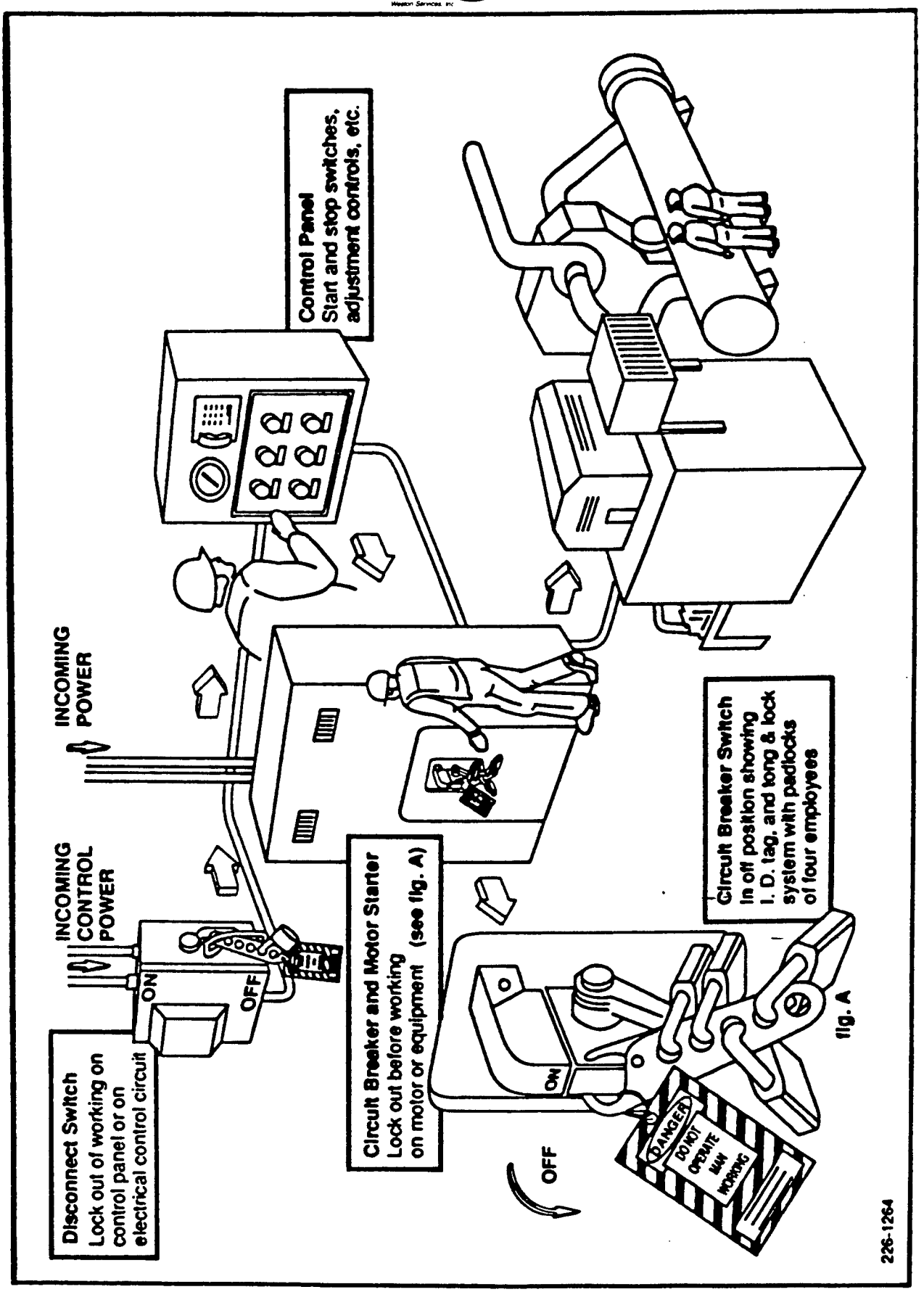

Control Panel
Start and stop switches, adjustment controls, etc.
INCOMING POWER
INCOMING CONTROL POWER
ON
OFF
Disconnect Switch
Lock out of working on control panel or on electrical control circuit
Circuit Breaker and Motor Starter
Lock out before working on motor or equipment (see fig. A)
Circuit Breaker Switch
In off position showing I. D. tag, and tong & lock system with padlocks of four employees
fig. A
ON
OFF
DANGER
DO NOT OPERATE MAN WORKING
226-1264

FIGURE 1

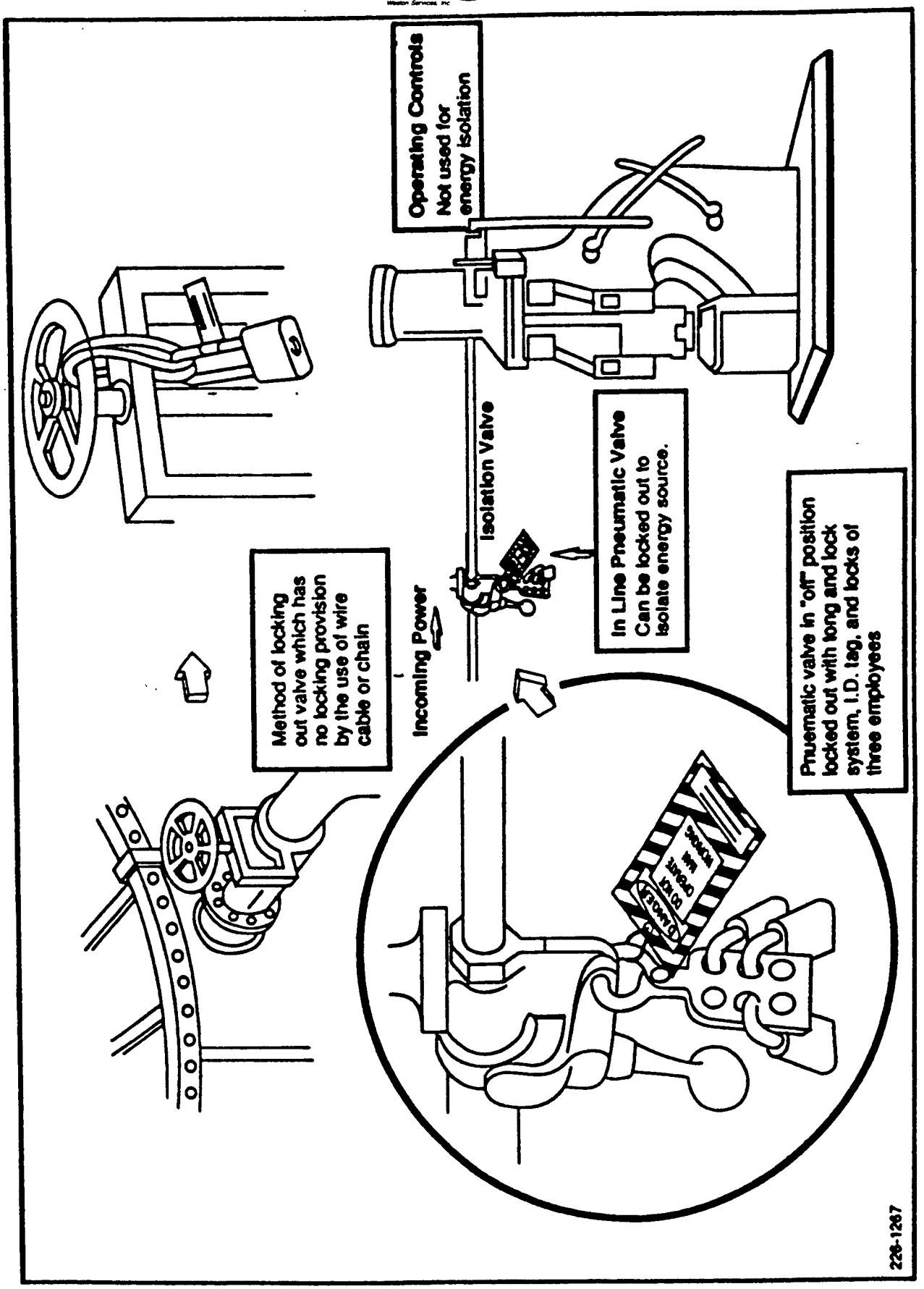

Operating Controls Not used for energy isolation
Isolation Valve
In Line Pneumatic Valve Can be locked out to isolate energy source.
Pnuematic valve in "off" position locked out with tong and lock system, I.D. tag, and locks of three employees
Method of locking out valve which has no locking provision by the use of wire cable or chain
Incoming Power
226-1267

FIGURE 2

Date: 8 March 1991
Revision No.: 1

ATTACHMENT 1

Date: 8 March 1991
Revision No.: 1

CONFINED SPACE ENTRY PERMIT FORM

PROCEDURE — A confined space entry permit form will be prepared and updated as needed for all entries to any confined space. It is the responsibility of the Site Safety and Health Officer (SSHO) to prepare and keep the permit current. Permits must be renewed as conditions require but no less frequently than the beginning of each day or shift.

DEFINITION — A confined space is any area which is so enclosed that natural ventilation will not maintain an adequate oxygen concentration (20%) or remove toxic or combustible gases or vapors sufficiently to remove risk of illness or explosion.

EXAMPLES — Examples of confined spaces are, but are not limited to, process vessels (i.e., rotary kiln, secondary combustion chamber, crossover duct), exhaust ducts, sewer system manholes, syphon chambers, pump station wet wells and underground levels, sewer lines, chlorine pits, treatment tanks, utility tunnels, vaults and storage rooms or other closed areas of chemical manufacturing or storage facilities.

ENTRY PERMIT

1. Qualified safety watch stationed outside? _____ Name _____

2. SCBA _____ or combination airline/SCBA worn by safety watch? _____

3. Respirator checked out? _____

4. Chemical and physical protective clothing required? _____
   Hard hat ____, eye and face protection ____, rain gear ____, Saran tyvek ____, acid suit ____, inner gloves ____, outer gloves ____, inner boots____, outer boots ____, other _____

5. Equipment indicated above available for safety watch _____, entering workers _____

6. PP/PD SCBA or combination and/or forced ventilation for entering workers _____

7. Ventilation (forced or natural) plus knowledge of contents and air monitoring will all entry without air supplying respirators _____

8. Safety line? ___ and safety harness appropriate? ___ and used? ____

9. Ladders, built in? ___ portable? ___ checked out as safe for use? ___

10. Communication, radios? ____, intrinsic safety signals? ____; checked out? ____.

11. Lighting explosionproof? ____

12. Explosionproof tools used? ____

13. Confined space requires continuous monitoring from outside? ____, by entry team? ____.

14. Safety watch has lock-out keys? ____

15. Feed lines blanked out? ____, electric lines/controls de-energized? ____, locked out? ____, tagged? ____, mechanical equipment locked out? ____, tagged? ____

Contaminants to be monitored for:

	O_2	Combust	CO	H_2S	Org. Vap.
Initial levels without vent					
Initial levels with vent					
Levels safe for entry					

This confined space _____
(Identify confined space specifically)

has been permitted with the stipulations stated herein by:

_____ Date ___/___/___ Time _____
(SSHO Signature)

Permit must be renewed _____

Further conditions for tank entry:

A. All sources of ignition (matches, open flames, smoking, gas engines, welding, exposed electrical wiring and equipment) removed from the vicinity of the tank? _____

B. Gases or vapors from tank cannot reach ignition sources or populated areas? _____

C. All product, steam, foam, or similar lines are disconnected and blanked? _____

D. All agitators and other mechanical devices locked out? _____

E. API ____ or NFPA ____ procedures will be used for all cutting on tanks and any other closed system including transport lines.

F. Steam ____ water wash lines bounded to tank? _____

G. Cutting on feed lines or other closed system that have not been steamed or otherwise shown to be clean will be in Level B protection. _____ A Hot Work Permit will be needed? _____

Entry team and safety watch sign-off:

I/We have read this confined space entry permit and understand the requirements.

_____ (Name)	_____ (Name)
_____ (Name)	_____ (Name)
_____ (Name)	_____ (Name)

This confined space entry permit must be posted at the site listed above. When a new permit is issued, this permit must be retained in the site files.

Date: 8 March 1991
Revision No.: 1

ATTACHMENT 2

Date: 8 March 1991
Revision No.: 1

MSA COMBUSTIBLE GAS AND OXYGEN ALARM
MODEL 260
INSTRUCTION MANUAL

VI. MAINTENANCE AND CALIBRATION

Battery Service

The primary maintenance item of the Model 260 is the rechargeable 2.4 volt nickel cadmium (Ni-Cd) battery (Figure 7). The battery is recharged by simply removing the screw cap covering receptacle and connecting one end of the charging cable to the instrument and the other end to a 115V ac outlet.

If desired, the battery can be recharged from a 12V dc source. An accessory battery charging cable is available, one end of which plugs into the Model 260 while the other end is fitted with an automobile cigarette lighter plug.

Recommended charging time is 16 hours. It may be left on charge for longer periods without damaging the battery.
CAUTION: RECHARGING MUST BE DONE IN A NON-HAZARDOUS LOCATION.

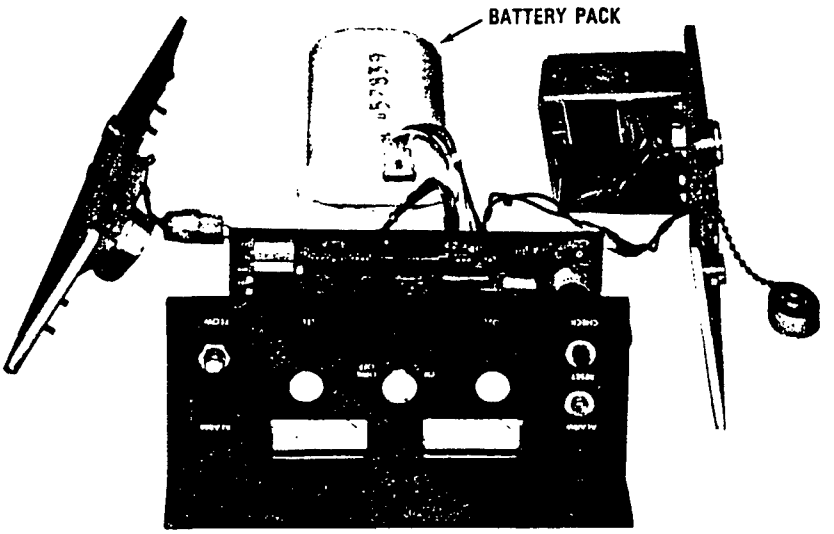


FIGURE 7 — DISASSEMBLY SHOWING BATTERY PACK

The batteries sometimes will not supply full power capacity after repeated partial use between chargings. For this reason, it is recommended that the batteries be "exercised" at least once monthly. Run the Model 260 for 8 to 10 hours and then recharge.

If the instrument has not been used for 30 days, the batteries should be charged prior to use.

Should the battery not respond to recharging or not "hold" a charge, the battery should be replaced. Replacement procedure is as follows:

1. Loosen the knurled screws holding the handle and remove the handle.
2. Looking at the front panel of the instrument, remove the right side (audible alarm side panel) by unscrewing the four side panel screws.
3. Gently pull the side panel loose and tilt the instrument to help the battery case slide out. Disconnect the molded nylon plug.
4. Install new battery in the reverse procedure outlined above.

Calibration

Before the calibration of the combustible gas indicator can be checked, the Model 260 must be in operating condition as described in the OPERATING PROCEDURE, Section V. Optional calibration equipment is shown in Figure 8. Calibration check-adjustment is made as follows:

1. Attach the flow control to the recommended calibration gas tank.
2. Connect the adapter-hose to the flow control.
3. Open flow control valve.
4. Connect the adapter-hose fitting to the inlet of the instrument; after about 15 seconds the L.E.L. meter pointer should be stable and within the range specified on the calibration sheet accompanying the calibration equipment. If the meter pointer is not in the correct range, stop the flow, remove the right hand side cover. Turn on the flow and adjust the "S" control with a small screwdriver to obtain a reading as specified on the calibration sheet.
5. Disconnect the adapter-hose fitting from the instrument.
6. Close the flow control valve.
7. Remove the adapter-hose from the flow control.
8. Remove the flow control from the calibration gas tank.
9. Replace the side cover on the Model 260.

CAUTION: Calibration gas tank contents are under pressure. Use no oil, grease or flammable solvents on the flow control or the calibration gas tank. Do not store calibration gas tank near heat or fire or in rooms used for habitation. Do not throw in fire, incinerate or puncture. Keep out of reach of children. It is illegal and hazardous to refill this tank. Do not attach the calibration gas tank to any other apparatus than described above. Do not attach any gas tank other than MSA calibration tanks to the regulator.

Printed Circuit Board Adjustments

The printed circuit board contains six adjustment pots as shown in Figure 9. These are identified as:

Oxygen Indicator Adjustment

O_2H — The oxygen high alarm point adjustment (factory set at 25%).

O_2L — The oxygen low alarm point adjustment (factory set at 19.5% oxygen).

Combustible Gas Indicator Adjustments

CGA — The combustible gas alarm point adjustment (factory set at 50% L.E.L.)

S — After zeroing, span is adjusted by sampling calibration gas and adjusting the read-out accordingly.

CZ — Coarse zero is adjusted by setting the ZERO L.E.L. control at mid-range; sampling fresh air and adjusting the % L.E.L. meter to read zero.

B-CHK This controls the battery charge indication and is factory set to read at "B" in the word BATTERY on the meter face when the battery voltage measured with a voltmeter is 2.25V.

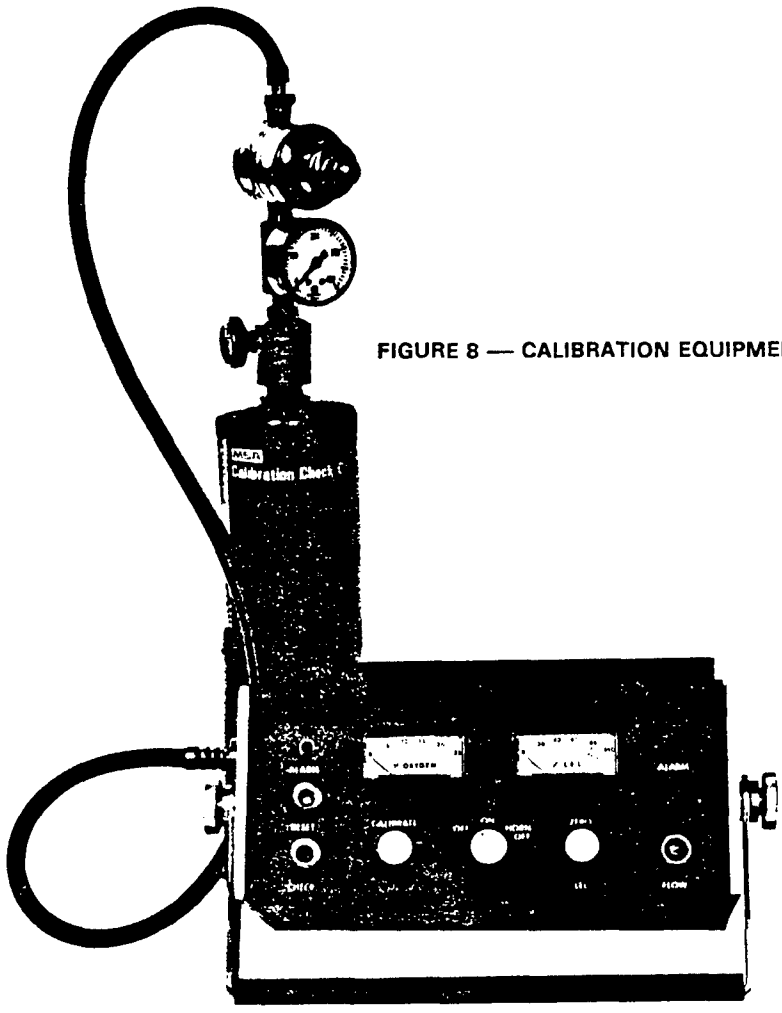


FIGURE 8 — CALIBRATION EQUIPMENT



FIGURE 9 — PRINTED CIRCUIT BOARD ADJUSTMENTS

Date: 8 March 1991
Revision No.: 1

GAS TECH GASTECHTOR
HYDROCARBON SUPER SURVEYOR
MODEL 1314
PPM/LEL GAS INDICATOR WITH
OXYGEN SECTION

V. CALIBRATION AND ADJUSTMENT

A. Combustibles Calibration

To check and adjust calibration on a known gas sample.

1. Turn instrument on and allow it to warm up and stabilize, preferably for 5 minutes. Be sure batteries are charged sufficiently to read above the check mark.

2. Open instrument case by loosening captive screw at front. Lift upper half of case slightly, move 1/4" to rear to disengage rear clamp; then separate the two halves. Locate COARSE ZERO potentiometer on underside of circuit board (marked "ZERO").

3. Turn external PPM/LEL ZERO control to center of its span. Then turn COARSE ZERO potentiometer to bring meter to zero reading.

4. To calibrate the LEL range, insert sample inlet tube into a vessel or other source of known calibrating gas. Watch meter and note highest reading. If it is incorrect, turn LEL SPAN potentiometer to give desired reading.

5. For PPM calibration, follow same procedure with range switch in PPM position, and use PPM SPAN potentiometer. Before making this adjustment, allow system to warm up and stabilize thoroughly, and zero carefully in the PPM range.

NOTE

In the sensitive ppm range it is important that the humidity of the sample be the same as that of the air used for zero adjustment. If they are different, a significant offset in zero reading may be observed. To overcome this, a humidifier may be used for both zero and calibration tests, providing the calibrating gas is one that will not be absorbed in water. The GasTech Calibration Kit is supplied complete with humidifier and accessories for this effect. See Appendix A.

6. If zero cannot be adjusted, or if reading cannot be set high enough, replace detector.

B. Combustibles Alarm Threshold

The reading at which the alarm is actuated in each range can be set by use of the corresponding ALARM Threshold potentiometer.

To Set:

1. With instrument in range to be set, turn PPM/LEL ZERO adjust to bring meter to desired alarm setting. It may be necessary to use the COARSE ZERO to reach this point, in LEL range.

2. Turn corresponding (LEL or PPM) ALARM Threshold potentiometer to the point where alarm just operates. Clockwise rotation will lower alarm setting. Verify setting by turning PPM/LEL ZERO control to bring meter indication into and out of alarm zone.

3. When the combustibles Alarm Threshold has been satisfactorily set, readjust the zero potentiometers to establish a zero meter reading as in A.3 above.

C. Oxygen Zero Adjustment

The following steps should be carried out with OXY-PPM/LEL switch on OXY (in) position. To check and adjust zero on a known oxygen-free sample:

1. While instrument case is open, identify ZERO potentiometer, which is located on oxygen (upper) circuit board and which can be reached through the rearmost of the two clearance holes in the main circuit board.

2. Allow instrument to sample a known oxygen-free sample, such as nitrogen, argon, or helium.

3. Watch meter carefully. If reading does not go exactly to zero, adjust it by turning ZERO potentiometer. Counterclockwise rotation will decrease reading.

4. If zero adjustment cannot be made, have oxygen cell reactivated.

5. After zero adjustment has been completed, return hose inlet to normal atmospheric air. Readjust OXY CAL control as necessary to bring meter reading to 21.

6. If reading cannot be set high enough, have oxygen cell reactivated.

D. Oxygen Alarm Threshold

The reading at which the oxygen alarm is actuated can be set by use of the ALARM Threshold potentiometer.

To Set:

1. Turn OXY CAL to bring meter to desired alarm setting.

2. Locate oxygen alarm threshold potentiometer, on oxygen circuit board, which is accessible through the hole adjacent to the LEL Alarm adjustment.

3. Turn ALARM Threshold potentiometer to the point where alarm just operates. Clockwise rotation will raise alarm setting. Verify setting by turning OXY CAL control to bring meter into and out of alarm zone.

4. When the oxygen Alarm Threshold has been satisfactorily set, readjust the OXY CAL potentiometer to bring the meter reading to 21% (O_2 CAL).

E. Oxygen High Alarm (25%)

This alarm point is factory set and generally need not be changed. It can be readjusted to some other level, by trial, but this can only be done when the main board is loosened and pulled aside (see Section VI.D. steps 1-6). The high alarm potentiometer is the one closest to the rear, without an access hole.

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FIELD MANUAL FOR THE OPERATION, CALIBRATION, AND TROUBLESHOOTING OF THE HNu PHOTOIONIZER

C.) CALIBRATION

The recommended and most accurate procedure for calibration of the HNU instrument is utilizing a pressurized gas cylinder containing a known ppm value at a specified span setting attached to a designated probe. The following procedure refers to Figure 2.

1.) Follow steps 1-7 in OPERATION section (above).

2.) Attach the tygon tubing to the 8" extension probe of the photoionization probe.

3.) Crack the valve of the pressurized cylinder until a slight flow of gas is being released from the cylinder.

The instrument should read ±10% of the gas value; if not, one of two things can be done:

a. Change span to get the gas value. NOTE: If span is changed more than ±10%, proceed to b.

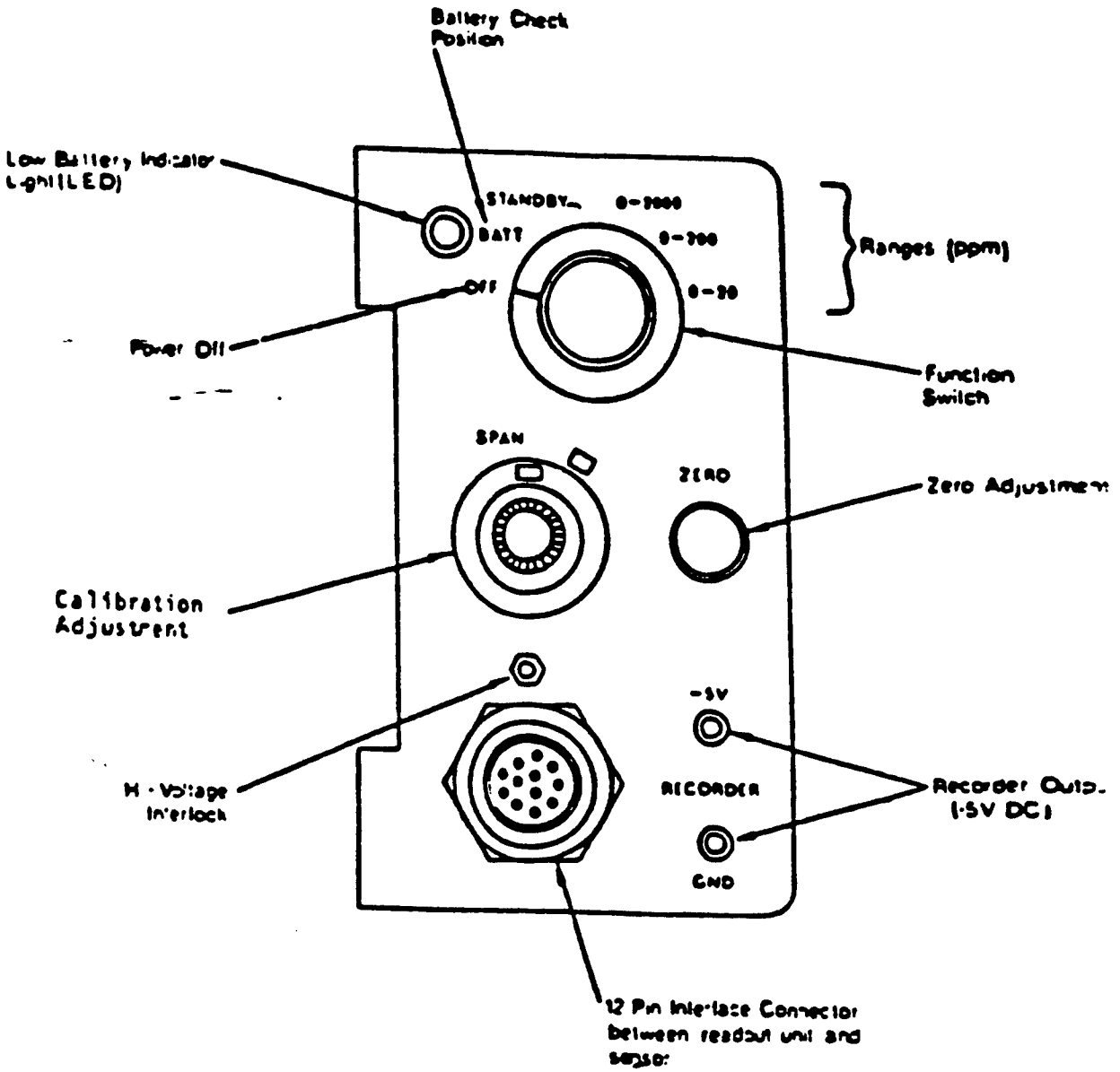


FIGURE 1
Control Panel Functions

b. Clean lamp and IP chamber. A dirty lamp will yield low readings, and a dirty chamber will yield high readings.

NOTE: If the instrument span setting is changed, the instrument should be turned back to the stand-by position and rezeroed, if necessary.

If using the 11.7 eV probe and the gas calibration cylinder showing a ppm value of 9.8 span with 10.2 eV probe, all steps above will be necessary. The final span setting using the 11.7 eV probe should be approximately the same value as indicated for the specific probe in Appendix 2.

The HNU instrument is now ready for field measurements.

Date: 8 March 1991
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USER'S MANUAL FOR THE PORTABLE ORGANIC VAPOR ANALYZER (OVA)

E. CALIBRATION OF THE OVA

The OVA is capable of detecting nearly all organic compounds. The instrument is factory-calibrated to a methane in air standard, but it can be easily calibrated to any of a variety of compounds for precise analyses.

A GAS SELECT control on the instrument panel is used to set the electronic gain to a particular organic compound. Internal electronic adjustments are provided to calibrate and align the electronic circuits (Figure 2). There are four adjustments on the electronics board, but one adjustment potentiometer, R-38, is used to set the power supply voltage and has a one-time factory adjustment. The other three adjustments, R-31, R-32, and R-33, are used for setting the electronic amplifier gain for each of the three calibration ranges. The instrument must be removed from its case to access these adjustments.

To calibrate the OVA to methane, follow the procedures for Gain Adjustment and Bias Adjustment.

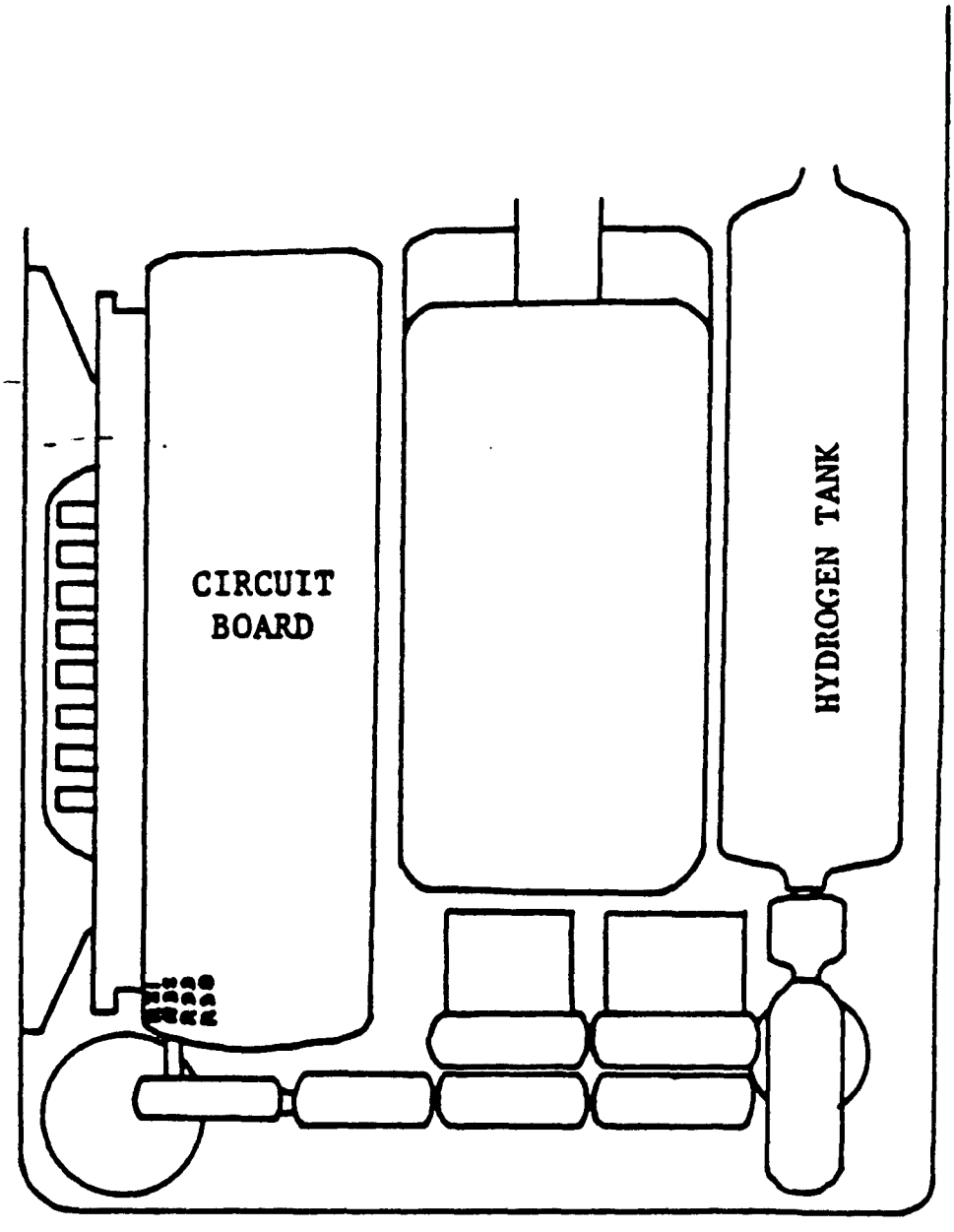


FIGURE 2. LOCATION OF ELECTRONIC ADJUSTMENTS.

Gain Adjustment

1. Turn on instrument as described in Section B. Set CALIBRATE switch to X10 and GAS SELECT control to 300.

2. Use the CALIBRATE ADJUST knob to adjust the meter reading to zero.

3. Introduce a methane sample of a known concentration (near 100 ppm and adjust trimpot R-32 on the circuit board so that the meter reads the concentration as equivalent to that of the known sample. This sets the instrument gain for methane with the gain adjustment on the panel (GAS SELECT knob) set at a reference of 300.

4. Turn off the H_2 SUPPLY VALVE to put out the flame.

Bias Adjustment

5. Leave the CALIBRATE switch on X10 position and use the CALIBRATE ADJUST knob to adjust the meter reading to 4 ppm.

6. Turn the CALIBRATE switch to X1. Using trimpot R-31 on the circuit board, adjust the meter reading to 4 ppm.

7. Set the CALIBRATE switch to X10 again and use the CALIBRATE ADJUST knob to set meter reading to 40 ppm.

8. Move the CALIBRATE switch to X100 position and use trimpot R-33 on the circuit board to adjust meter to 40 ppm.

9. Set the CALIBRATE switch to X10 position and use the CALIBRATE ADJUST knob to adjust meter to zero.

The unit is now balanced from range to range, calibrated to methane, and ready for use.

APPENDIX I

CONSTRUCTION SAFETY

- Scaffolding
- Slips, Trips, and Falls
- Hot Work
- Hoisting Equipment
- Ladder Safety (fixed and portable)
- Working at Elevation
- Aerial Lifts
- Ramps and Stairways
- Ropes, Slings, Chains, and Hooks

APPENDIX I

CONSTRUCTION SAFETY

I.1 SCAFFOLDING

I.1.1 Overview

Scaffolding is to be used according to the general standards established below and specified standards as prescribed by OSHA 29 CFR 1910.28 and 1910.29 and 1926.451 and 1926.452, whenever work cannot be done safely from the ground or solid construction. There are many different types of scaffolds with specific safety requirements for each. Specific requirements for other types of scaffolding will be established on a case-by-case basis. Listed below are the more general requirements that apply to wooden, single or double pole, tube and coupler, tubular welded frame steel, and manually propelled mobile type scaffolding.

Design, construction, or erection and inspection of scaffolding will be done by competent or qualified persons. As scaffolding becomes more complex, OSHA requires that professional engineers perform these functions. An appropriate competent or qualified person, as defined by OSHA, will be assigned these responsibilities when scaffolding is used.

I.1.2 General Scaffold Construction Criteria

General construction procedures are as follows:

1. Provide footing or anchorage that is sound, rigid, and capable of supporting the maximum intended load, plus the weight of the scaffolding without settling. Support poles must be plumb.

2. Install handrails on all open sides of platforms more than 4 feet high and handrails and toeboards on platforms 10 feet high or higher. Install wire screen (No. 18 gauge U.S. Standard 1/2 inch mesh) between the toeboard and guardrail if people will work or pass under scaffolding.

3. Scaffolds must be able to support 4 to 6 times the maximum intended load but never be loaded beyond the intended load rating.

4. Scaffolds must be erected and inspected before each use by competent persons. Any defects must be repaired before use.

5. Scaffolds must be maintained in safe condition and should never be altered or moved horizontally, except under specific, controlled situations, when occupied.

6. Nails and bolts must be of sufficient number and size at each connection. Nails must be driven full length and not subject to straight pull stress.

7. Scaffold planking must be scaffold grade and planks or platforms must overlap by at least 12 inches or be secured from moving. Planks that abut must have flush joints centered on a pole and supported by separate bearers for each plank end. Planking must extend over their end supports by 6 to 18 inches and be placed with edges close together so tools or fragments cannot fall through. When scaffolding extends around a corner, planking must be placed to avoid tipping.

8. Scaffolds must be secured to permanent structures by use of anchor bolts or equivalent but not window cleaners' anchor bolts.

9. Faces and ends of scaffolding must have cross-bracing to prevent lateral movement or buckling and to keep scaffold square and plumb. There must be cross bracing between inner and outer poles.

I.1.3 Scaffold Use Criteria

1. A ladder or other safe form of access must be provided for reaching platforms.

2. Use a tagline on materials being hoisted onto a scaffold.

3. Provide overhead protection for workers on scaffolds where overhead hazards exist.

4. Employees may not work on scaffolds in storm conditions, high winds, or when covered with ice or snow.

5. Keep walking surface of scaffolds free of tools, materials, or debris.

6. Prohibit hot work or cutting on scaffolding secured by rope, polyethylene, or nylon line. Protect rope or lines and scaffolding steel from effects of corrosive or chemical atmosphere.

I.1.4 Wood Pole Scaffolds

1. All load-bearing timbers for framing must be at least 1,500°F (stress grade) construction-grade lumber.

2. Weight limits, sizes, and dimensions of components of wood pole scaffolds are specified in Tables D-7 to D-12 of 29 CFR 1910.28 or L-4 to L-9 of 29 CFR 1926.451.

3. Scaffold planking must be scaffold-grade and planks or platforms must overlap by at least 12 inches or be secured from moving.

4. Planks that abut must have flush joints centered on a pole and supported by separate bearers for each plank end.

5. Planking must extend over their end supports by 6 to 18 inches and be placed with edges close together so tools or fragments cannot fall through.

6. When scaffolding extends around a corner, planking must be placed to avoid tipping.

7. Ends of wood poles to be spliced must be squared and the upper pole must rest.

8. Pole splices must be secured with two wood or equivalent splice plates placed on two adjacent sides of the poles, a minimum of 4 inches in length, overlapping the two ends equally and be the same width and same or greater breadth as the poles.

9. Double pole scaffolding must be set as close to the structure as practical.

10. Pole scaffolds more than 25 feet in height or length must be secured to the structure at no greater than 25-foot intervals.

11. Put logs or bearers must be set with their greatest dimension vertically and must be long enough to extend beyond the inner and outer ledgers by at least 3 inches.

12. All put logs or bearers on single pole scaffolds must be reinforced with 3/16 by 2-inch steel strips running the entire length of the bottom of the bearer.

13. Ledgers must be long enough to extend over two pole spaces, may not be spliced between poles, and must be supported by bearing blocks nailed to the poles.

14. Pole scaffolds more than 60 feet in height or outside the specifications of item 2 above must be designed by a professional engineer competent in this field and constructed according to the design.

I.1.5 Tube and Coupler

1. Weight limits, spacing, criteria, and dimensions for tube and coupler steel scaffolding must conform to Tables D-13 to D-15 of 29 CFR 1910.28 or Tables L-10 to L-12 of 29 CFR 1926.451. Vertical tube poles must be fastened with lock pins or other acceptable locking devices to ensure proper alignment.

2. Posts must be accurately spaced, maintained plumb, and erected on suitable bases.

3. Runners, which must connect poles along the length of the face and back of the scaffold, must be evenly spaced (no more than 6.5 feet apart vertically on centers), beginning as close to the base as possible, must be interlocked to form continuous lengths and be coupled to the posts.

4. Bearers, which must be installed from front to back posts, must be securely coupled to the posts at the runner coupler or coupled to the runner as close to the post as possible and must extend at least 4 inches but more than 12 inches beyond the post or runner spacing.

5. Cross bracing must be provided from front to back posts every third post horizontally and every fourth runner vertically.

6. Longitudinal face and back bracing must be provided every fifth post reaching from the base of the first post to the top of the fifth post, coupled to the posts and backward from the base of the fifth post to the top of the first post, secured to the posts or runners.

7. The entire scaffold must be secured to the building at intervals no more than 30 feet horizontally and 26 feet vertically.

8. The scaffold must be able to support four times the intended load. For capacities or dimensions outside those indicated in item 1. above, design and specifications must be established by a competent registered professional engineer and use and construction must be according to the design.

I.1.6 Tubular Welded Frame Scaffolds

1. Weight limits, spacing, criteria, and dimensions for tubular welded frame scaffolds must conform to Tables D-13 to D-15 of 29 CFR 1910.28 or Tables L-10 to L-12 of 29 CFR 1926.451.

2. Tubular welded frame scaffolds and accessories must be designed, constructed, and erected to support four times the maximum rated capacity.

3. Vertical tube poles must be fastened with lock pins or other acceptable locking devices to ensure proper alignment and must be cross- or diagonally-braced or both so the scaffold is plumb, square, and rigid. If lifting may occur, panels must be secured vertically by lock pins.

4. The scaffold must be secured at no greater than 30-foot intervals horizontally and 26 feet vertically.

5. Scaffolds more than 125 feet high or outside prescribed weight capacities or dimensions must be designed by a competent registered professional engineer and constructed and used according to the design.

I.1.7 Manually Propelled Mobile Scaffolds

1. When free-standing, the height must not exceed four times the minimum base dimension.

2. Casters must have positive locking devices and be of sufficient strength to bear four times the maximum rated capacity.

3. Proper cross or diagonal bracing or both must be used to keep scaffold plumb, square, and rigid.

4. Platforms must be secured in place and tightly planked for the full width except where access is necessary for entrance.

5. A ladder or stairway must be provided for proper access and exit, affixed or built into the scaffold and placed so use will not cause tipping.

6. When in use, the scaffold must rest on suitable footing, stand plumb, and have casters locked.

7. Scaffolds must be moved only on level floors after being stabilized with the force of movement being applied as close to the base as possible.

8. Workers may not ride on manually propelled scaffolds unless:

   a. Floor is within 3 degrees of level and free of pits, holes, or obstruction.

   b. The height is no more than twice the dimension of the base; if outriggers provide part of the base, they must extended on both sides.

   c. Wheels are resilient material.

   d. Tools and materials are secured or removed before moving.

9. Depending on materials of construction, scaffolds must meet appropriate criteria for use and construction for general safety, wood pole, tube and coupler, or tubular welded frame scaffolds.

I.2 SLIPS, TRIPS, AND FALLS

I.2.1 Overview

Excluding motor vehicle accidents, falls are the number one cause of occupational deaths in the United States. Statistics found in the National Safety Council's 1985 Accident Facts show that 11,600 people lost their lives due to falls in 1984. This accounted for nearly 80 percent of all accident-related deaths that year. Workers must walk cautiously at a site to avoid tripping. Abandoned wastes usually are not kept neat and tidy. Problems at a hazardous waste site and an accident scene can be compounded by uneven terrain and mud caused by rain or leaking chemicals. In addition to these rather obvious slip, trip, and fall hazards at a hazardous incident response, workers must also constantly police the work areas for accumulation of gear and material storage, which could insidiously contribute to a slip, trip, or fall accident.

Walking on drums or tanks of questionable structural integrity is dangerous and to be avoided. Not only can drums tip over, but these containers may be so corroded that they cannot support a person's weight. In some cases, a drum grappler can be used to move drums to a more accessible location.

At least 16 percent of construction fatalities are the result of falls. These are often not falls from great height. OSHA requires guardrails on platforms only 4 feet above the adjacent ground and on every flight of stairs having four or more risers. Handrails and toeboards may also be required if work areas are above dangerous machinery. A guardrail meets OSHA standards if it is constructed of 2-inch by 4-inch lumber, or an equivalent material, and has a top rail 42 inches above the platform, a midrail 21 inches above the platform, and a toeboard at least 4 inches high (if personnel will be working under the platform and there is a risk of falling objects). (If materials are used on the platform that a standard 4-inch toeboard would not contain, screens or other containment will be used.) A person should be able to press sideways with 200 pounds of force without moving the rail significantly. Lack of this sort of railing is one of OSHA's most frequently cited violations. OSHA can require a railing on a lower platform if there are hazardous materials such as broken glass

or raw sewage on the adjacent ground. The edge of a roof or a building is regulated as a platform.

I.2.2 Safety Belts, Harnesses, Lanyards, and Lifelines

Falls are more serious when they occur from heights. Extra precautions must be taken if guardrails or railings are absent. The precautions generally include the use of a safety belt with a lifeline. The OSHA reference may be found in 29 CFR 1926, Subpart M, Sections 104 and 107.

There are two types of safety belts:

- Emergency, which is designed to safely stop a person who is falling.
- Normal use, which supports a person who is working, e.g., a window washer's belt, or helps hoist or lower a worker.

There are several safety belt configurations including regular belts, waist-chest harnesses, and "parachute" harness types. The harness types better distribute the force of impact when arresting a fall. The impact force developed in arresting a fall depends chiefly on three elements:

- Weight of the person.
- Distance fallen, which can be regulated by permitting as little slack as possible in the lifeline.
- Suddenness of the stop, by far the most important of the three factors. Devices can be attached to lifelines or safety belts to reduce the suddenness of the stop.

These safety devices must be carefully inspected by qualified persons prior to use, and if found to be defective, they are to be taken out of service or repaired immediately. A safety line that has actually been used to arrest a fall must be taken out of service and replaced.

I.3 HOT WORK

I.3.1 General Requirements

No task(s) that produces heat, sparks, or energy sufficient to serve as an ignition source may begin in any location that could potentially have ignitable atmospheres, until a hot work protection procedure has been instituted and a hot work permit has been issued. Examples of hot work include welding, cutting, burning, soldering, grinding, and use of power tools and internal combustion engines.

The Site Safety and Health Officer (SSHO) is responsible for issuing hot work permits. Expired hot work permits must be retained as part of the site or project health and safety file. Permits must be reissued at the beginning of each day, each work shift, or if the area has not been monitored within 1/2 hour.

I.3.2 Hot Work Permit Procedures

Hot work procedures include the following:

1. The SSHO is responsible for inspecting each site and determining the need for a hot work permit procedure.

2. All WSI employees, WSI subcontractor employees, and any employees for whom WSI has safety oversight must be formerly notified and instructed of the requirement for, need for, and procedures for obtaining hot work permits.

3. A fire watch is required for every activity where hot work could result in other than a minor fire due to ignition of combustibles.

4. Fire extinguishing equipment commensurate with the ignitable matrix and training level of the fire watch must be immediately available at the hot work location.

5. A combustible gas meter must be used to survey the hot work location and then must be left to constantly monitor the air between the flammable material and the immediate vicinity of the hot work.

6. Welding or cutting on closed systems such as tanks and pipelines must be specifically approved by the Corporate Health and Safety Manager.

Date: 8 March 1991
Revision No.: 1

HOT WORK PERMIT PROGRAM

Procedure: A hot work permitting program will be required on all hazardous sites where sources of ignition may be introduced. The SSHO is responsible for all site hot work permitting programs.

Definition: Hot work is any process which, because of its design or function, can cause ignition of a gaseous or vaporous atmosphere due to direct or indirect contact.

Examples: Examples of hot work processes are welding, cutting, grinding, working with power tools, space heaters, unapproved electrical equipment.

HOT WORK PERMIT

1. The SSHO and Site Manager have surveyed the site and found the following hot work conditions do or may exist and will require permitting:

   Welding ___, Cutting ___, Grinding ___, Use of power tools ___, Space heaters ___
   Electrical equipment: Fixed ___, Portable ___, Hand-held ___, Other _____

2. No hot work situations could exist. _____
   (Signature - SSHO)
   _____
   (Signature - Site Manager)

3. Work area inspected by SSHO prior to hot work beginning? ___
4. Fire watch established? ___
5. Fire extinguisher appropriate for media at the hot work site? ___
6. All combustibles are isolated from the hot work? ___
7. All subcontractor, authorized client employees and visitors are aware of need for hot work permits? ___
8. Area in which hot work is to be performed has been monitored for combustible atmospheres? _ Combustible gas indicator(s) will be used constantly during hot work?_____
9. Welding or cutting on closed systems prohibited? _____ Closed system cutting procedure required? ___

CERTIFICATION OF SSHO THAT HOT WORK MAY COMMENCE _____

Date ___/___/___ Time _____ Expiration time _____ (No more than 15 minutes should elapse between time of issuance and beginning of work.)

A NEW HOT WORK PERMIT WILL BE REQUIRED FOR THIS LOCATION _____
at the beginning of each shift or after more than a one (1)-hour interval of no hot work procedure.

HOT WORK TEAM SIGN-OFF

I/we have read and understand the terms of this hot work permit:

_____
_____
_____

I.4 HOISTING EQUIPMENT

Cranes will be operated and inspected by qualified operators and operated in accordance with applicable OSHA regulations and the following general procedures for hoisting equipment:

1. All hoisting equipment must be capable of satisfactorily completing a performance (operating) test before being placed in service on a project. This test will consist of maneuvering a specified test load through maximum lift height, lift radius, and boom quadrant. Except for the test load, the anticipated load is the maximum load that can be lifted by the hoisting equipment. The test will be repeated prior to unusual or critical lifts, and after alteration, modification, repairs, or reassembly, and at least every 12 months. Test records will be made a part of the official project file. These test requirements do not apply to permanently installed cranes in powerhouses, pumping stations, boatyards, hopper dredges, locks, and dams. Such permanently installed equipment will be tested in accordance with the policy established by the designated authority. A thorough annual inspection of the hoisting machinery will be made by a competent person.

2. Load capacities, determined by the performance test, recommended operating speeds, and special hazard warnings or instructions will be posted where clearly visible to the operators of cranes and posted on hoist platforms.

3. At no time will a crane be loaded in excess of the manufacturer's rating except during performance tests. Test loads will not exceed those specified by the ANSI B30 series requirements for a particular crane type.

4. No modifications or additions that affect the capacity or safe operation of the equipment will be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals will be changed accordingly. In no case will the original safety factor of the equipment be reduced.

5. All load drums on load-hoisting equipment will be equipped with at least one positive holding device. This device should be applied directly to the motor shaft or some part of the train gear.

6. Braking equipment capable of stopping, lowering, and holding a load of at least the full test load will be provided.

7. There will be at least two full wraps of cable on the drums of hoisting equipment at all times.

8. Riding on loads, hooks, hammers, buckets, material hoists, or other hoisting equipment not meant for personnel handling is prohibited.

9. While hoisting equipment is in operation, the operator will not perform any other work and he/she will not leave his/her position at the controls until the load has been safely landed or returned to ground level.

10. A standard signal system will be used on all hoisting equipment (Appendix M).

11. Whenever a slack line condition occurs, prior to further operations, the proper seating of the rope in the sheaves and on the drum will be checked.

12. Crane booms will be lowered to ground level or secured against displacement by wind loads or other outside forces when not in use.

13. The manufacturer's specifications and limitations applicable to the operation of any and all cranes and hoists will be followed. Where manufacturer's specifications are not available, the limitations assigned to the equipment will be based on the determination of a qualified engineer competent in this field and such determinations will be documented and recorded. Attachments used with cranes will not exceed the capacity, rating, or scope recommended by the manufacturer.

14. All windows in crane cabs will be of distortion-free safety glass, or equivalent, that will not interfere with the safe operation of the machine.

15. The hoist rope will not be wrapped around the load.

16. Hoisting ropes will be installed in accordance with the wire rope manufacturer's recommendations.

17. Adequate clearance will be maintained between moving and rotating structures of the crane and fixed objects to allow the passage of employees without harm.

18. All mobile cranes with cable-supported booms (except draglines) will be equipped with boom stops to resist the boom falling backwards. At the angle specified by the crane manufacturer, the boom stop will limit the movement of that portion of the boom below the point at which the boom stop acts on the boom. The boom stop will provide energy withstanding resistance to the backward movement of the boom through an angular movement of approximately the last 5 degrees (over travel) about the boom foot pin.

19. The boom stop manufacturer will certify that the boom stop has been designed, functionally tested, and manufactured such that it will fulfill the requirement of SAE J220, Crane Boom Stops (May 1971). (Pre-1971 cranes will essentially meet the requirements of SAE J220, except for paragraph 4.1.) Also, a crane/boom stop field test will be conducted to verify the proper setup of the boom stops and functioning of the boom hoist disengaging device. This test will be conducted prior to initiating the load performance test

required by items 1 and 23. Deficiencies noted should be corrected prior to the load performance test.

20. All cranes with cable-supported booms (except draglines) will be equipped with a properly functioning boom hoist disengaging device, which will automatically and completely disengage the boom hoisting power from the boom hoist drum when the boom has reached its highest rated angle. When power is thus disengaged, the boom hoist drum will automatically be restrained from motion in the lowering direction under any rated condition.

21. All cranes will at all times have a current set of operator manuals (instructions) for the particular model/type/class crane. Operator manuals must be located in the crane cab prior to testing and must remain there. When the operator manuals are not in the language of the operator, basic operating instructions must accompany the manuals and be presented in a manner (language and/or diagrams, pictures, sketches, etc.) the operator can comprehend. If the manuals and/or basic operating instructions become unavailable due to unusual circumstances (stolen, lost, mutilated, destroyed, etc.), then a deadline for replacement will be established by the designated authority.

22. All new (trainee) hoisting operators will receive at least 40 hours of on-the-job training under direct supervision before being considered qualified to operate hoisting equipment as a licensed operator.

23. Performance tests of crawlers, trucks, and wheel-mounted cranes will demonstrate the strength, stability, capability, and adequacy of power, brakes, clutches, and controls to safely maneuver 125 percent of the anticipated load. The stability part of the test may not be required if:

    a. The manufacturer's load-rating chart is securely fixed to the operator's cab.

    b. There has been no change in the boom or other structural members.

    c. There has been no change in counterweight.

    Stability tests will be conducted in accordance with the SAE recommended Crane Load Stability Test Code, SAE J765.

24. Auxiliary load-handling devices such as buckets, magnets, load falls, slings, load blocks, hooks, and pile-driver leads will be included as part of the load.

25. A means will be provided for the crane operator to visually determine the levelness of the crane.

26. A boom angle or radius indicator will be provided within the operator's view.

27. All crawler, truck, or locomotive cranes in use will meet the requirements for design, inspection, construction, testing, maintenance, and operation in ANSI

B30.5, Safety Code for Crawler, Locomotive and Truck Cranes. All mobile hydraulic cranes in use will meet the applicable requirements of ANSI B30.15, Safety Standard for Mobile Hydraulic Cranes. (B30.15 is scheduled to be superseded by an updated B30.5.) Draglines will meet Power Crane and Shovel Association Standard No. 1.

28. All jibs will have positive stops to prevent their movement of more than 5 degrees above the straight line of the jib and boom on conventional crane booms.

29. Sideboom cranes mounted on wheel or crawler tractors will meet the requirements of SAE J743b.

30. Mobile cranes will not pick or swing loads over the side of the crane unless the outriggers (if so equipped) are down and fully extended.

31. Lattice and hydraulic crane equipment will be equipped with an upper limit device to stop the load hoisting function before the load block or load contacts the boom tip (see ANSI B30.2).

I.5 LADDER SAFETY (PORTABLE AND FIXED)

I.5.1 Portable Ladders

I.5.1.1 Standards

Portable ladders must be used for their designed purpose only and if purchased, used, maintained, and constructed according to ANSI Standards A-14.1 and A-14.2, OSHA 29 CFR 1910.25 and .26 and manufacturers' instructions.

I.5.1.2 Inspection

Portable ladders must be examined for defects prior to use. Examination will include but not be limited to:

1. Joints between steps or rungs are tight.
2. Hardware and fittings are secure, rivets are not sheared.
3. Metal bearings of locks, wheels, pulleys, etc. are lubricated.
4. Rope on extension ladders is in good condition.
5. Rungs are not loose, cracked, bent, dented, are free of slivers or splinters, and rungs are treated to prevent slipping.
6. Side rails are not cracked, bent, or dented, and are free of slivers.

Defective ladders must not be used. Ladders found to be defective should be clearly tagged to indicate "NO USE" if repairable or destroyed immediately if no repair is possible.

I.5.1.3 Use Requirements

Ladders must be set on a flat, firm surface with both handrails in contact with an upper support that is sufficiently strong and rigid.

Straight ladders must have secure footing provided by a combination of safety feet, top of ladder tie-offs and mud cills, or a person holding the ladder to prevent slipping.

When middle or top sections of sectional ladders are used as bottom sections, they must have safety feet.

The ratio of the distance to the foot of a ladder from the base of the vertical plane to the height from the base to the top of the vertical plane when the ladder rests on the top of the vertical plane must be no more than 1:4 and no less than 1:3; e.g., 1 foot out from a wall for every 4 feet up the wall to the point where the ladder rests against the wall.

The handrails of a straight ladder must extend at least 36 inches above the landing.

Straight ladders may not be lashed together to make sectional ladders.

Metal ladders must not be used near electrical conductors.

Workers must use both hands and face the ladder when ascending and descending.

No more than one person may use a straight portable ladder at a time.

Standing on the top rung/step or above the manufacturer's safe indication is prohibited.

Ladders should be positioned so workers do not have to lean so more than half of their body is beyond (outside of) either handrail.

Ladders must not be placed in front of doors that open toward the ladder unless the door is locked and the person(s) using the ladder has the key, the door is blocked open, and other persons are warned of the presence of the ladder, or a guard is posted at the door.

Ladders must be inspected after each use and if acceptable, stored in a manner not to damage or stress the ladder. Ideally, ladders should be hung from a side rail in an area where sunlight or extremes in temperature or humidity may not affect them.

Ladders must never be used as scaffolding or as storage racks or shelves.

I.5.1.4 Requirements for Construction of Portable Ladders

1. Construction of purchased portable ladders must conform to construction criteria of ANSI Standards A-14.1 and A-14.2.

2. Ladders must have at least 12 inches between side rails and should have 12 inches between rungs.

3. Single section ladders must not exceed 30 feet in length, two-section ladders more than 48 feet in length, and ladders with more than two sections more than 60 feet in length. The minimum overlap for extension ladders must be 36 inches for up to 36 feet, 48 inches for 36 to 48 feet, and 60 inches for up to 60 feet. There must be positive stops to ensure proper overlap.

4. Metal ladders must be of sufficient strength and corrosion resistant.

5. Steps or rungs of metal ladders must be treated to prevent feet from slipping.

I.5.2 Fixed Ladders

I.5.2.1 Standards

Fixed ladders will be constructed and used in accordance with OSHA Standards, 29 CFR 1910.27 and ANSI Standard A-14.3.

I.5.2.2 Loading Requirements

A minimum live load capacity of 200 pounds must be concentrated at the points of maximum stress. Capacity must be increased by 200-pound increments for each additional person based on the rate of use and potential for more than one person using a ladder or ladder section at the same time.

The weight of the ladder itself and appurtenances must be considered in designing the railings and fastenings.

Wooden ladders must meet design stress requirements of 29 CFR 1910.25.

I.5.2.3 Feature Requirements

Except where metal rungs of ladders are exposed to corrosive atmospheres and must be 1 inch in diameter or coated to prevent corrosion, metal rungs must be a minimum diameter of 3/4 inch. Wooden rungs must be a minimum of 1 inch in diameter.

The distance between rungs, cleats, or steps must be no more than 12 inches. Rungs, cleats, or steps must be uniformly spaced throughout the length of the ladder. The minimum clear width of rungs, cleats, or steps is 16 inches. Rungs, cleats, or steps and side rails that may be used for handholds when climbing must offer adequate gripping surface and be free of splinters, slivers or burrs, and substances that could cause slipping.

Ladders using different metals that could result in electrolytic action must incorporate electrolytic protection. Ladders in atmospheres that could affect the integrity of the ladder must be treated to prevent corrosion or deterioration.

Fixed ladders (unless of sufficient height to use caging or a well construction as fall protection) must have a minimum of 15 inches of clearance from the centerline of the rungs to each side, 30 to 36 inches from the rungs to any obstruction on the climbing side of the ladder, 7 inches between the rungs and any obstruction on the nonclimbing side of the ladder, have grab rails or extensions of side rails reaching a minimum of 40 inches above the landing, and be oriented so that it is not necessary to step across more than 12 inches to a point of landing through or to the side of the ladder.

I.5.2.4 Fall Protection and Cages

Ladders of greater than 20 feet must have cages or other approved fall protection devices.

Where cages or wells are used for fall protection, the cage must begin no lower than 7 feet from the "ground" landing, but no higher than 8 feet. If more than 30 feet, sections must be offset with side accessed landings (minimum dimensions 24 inches wide by 30 inches in length) located at least 4 feet below the top of a 30-foot (or fraction thereof) section. The distance from the rungs to the cage back on the climbing side must be between 27 and 28

inches and the width of the cage or well no less than 27 inches. There should be no projections through the cage. Projections in wells may reduce the space from rung to projection to no less than 24 inches and projections must have deflectors for head protection.

Where fall protection is provided by ladder safety systems (body belts or harness, lanyards and braking devices with safety lines or rails, systems must meet the requirements of and be compatible with the construction of the ladder system.

I.6 WORKING AT ELEVATION

I.6.1 General Requirements

I.6.1.1 When Fall Protection is Needed

Provisions for preventing falls are required when working at elevation, more than 4 feet above grade, on scaffolding, on ladders in activities where falls could result in injury, immersion in water, or contact with chemicals. Ideally, this prevention will be provided by engineering controls, safety railings and toe boards, etc. Certain ladder use and unusual circumstances in construction, at hazardous materials sites or environmental assessments require fall protection personal protective equipment in addition to or instead of engineering controls.

Personal fall protection devices and lifeline systems consist of body harnesses, fall shock absorbers, lanyards, and safety lines. A grabbing device may be used to connect the lanyard to the safety line and act as a brake. The choice of a lifeline system for each HASP will be based on the actual needs of the activity and must be approved by the Corporate Health and Safety Director or his approved delegate.

I.6.1.2 Training

Prior to use of fall protection equipment, personnel must be trained in use, maintenance, and inspection of the personal protective equipment. General safety training is to be supplemented with site-specific training.

I.6.1.3 Standards

A lifeline system must meet the standards and criteria of OSHA 1926.104 and ANSI A10.14, specifically:

1. The anchorage point must be able to support a dead weight of 5,400 pounds.

2. Lifelines must be of 3/4-inch manila or equivalent and have a minimum breaking strength of 5,400 pounds. Lifelines used for rock work or that may be subjected to abrasion must be 7/8-inch wire-core manila rope.

3. A safety belt lanyard must be a minimum of 1/2-inch nylon rope or equivalent, no longer than 6 feet, and have a minimum breaking strength of 5,400 pounds.

4. Bolts, shackles, D-rings, snap hooks, and metal links must be able to bear a tensile load of 4,000 pounds without cracking, breaking, or permanent distortion.

5. All lifeline system hardware must be drop forged or pressed steel, cadmium-plated in accordance with type 1 Class B plating specified in Federal specification QQ-P-416. Surfaces must be smooth and free of defects.

I.6.1.4 Inspection

An experienced person in lifeline systems use must inspect the entire system before and after each use and at regular (monthly) intervals between uses. Lifeline system elements showing any sign of stress or damage or that have been used to break a free fall must be taken out of service immediately and destroyed.

I.7 AERIAL LIFTS

I.7.1 General

Aerial lifts, including extensible boom platforms, aerial ladders, articulating boom platforms, vertical towers, or combinations thereof, must be manufactured and used in conformance with OSHA 29 CFR 1926.556, ANSI Standard A92.2, and the manufacturers' specifications and instructions.

1. Electrical systems must be tested according to Section 5 of A92.2.
2. Critical hydraulic lines and lines whose failure could result in free fall, must have bursting capacities four times the normal use pressure. Noncritical lines must have 2:1 bursting factors.
3. Aerial lifts must be equipped with backup safety devices to prevent free descent if power supply systems or primary suspension systems fail.
4. Secondary controls that can override the platform controls and emergency descent systems must also be provided in case of failure of primary systems.
5. Mechanical power transmission apparatus must be appropriately guarded and guards kept in place.

Aerial lifts may not be field-modified unless certified in writing by the manufacturer or a recognized testing laboratory to be in conformance with ANSI Standard A92.2 and 29 CFR 1926.556 and to be at least as safe as before the modification.

Aerial lifts must be maintained in safe operating condition at all times. Daily recorded inspections must be made to ensure:

1. Welds are not cracked.
2. Lifting cables or chains are sound.
3. Hydraulic lines are tight and not leaking.
4. Control lines and cables are sound.
5. Electrical connections are tight and tires are sound.

Required daily testing for safe operation of lift controls must be recorded.

Aerial lifts must be operated by trained persons who have completely familiarized themselves with the safety and operating instructions prior to use.

1. A manual of inspection and operation must be kept with the lift or be immediately available and must contain instructions for use as well as clearly indicating, capacity, height limits, restrictions, warnings, and cautions.

2. A statement of insulation must be prominently displayed on the unit.

3. Posted on the machine must be the name and address of manufacturer, listing of acceptable alterations or alternative operating procedures and a notice to operators to read and thoroughly understand the operating instructions before use.

Prior to moving over a highway or travel where overhead utility lines or obstructions may be present, ladders, platforms, or towers must be locked in the down position.

1. When moving with the boom up, an inspection must be made of the entire route of the move to ensure there are no obstructions, overhead utilities, underpasses, or ground/terrain conditions that would prohibit a safe move.

2. The operator/driver must have unobstructed view of his path of travel and a safe speed must be maintained.

3. A recorded inspection must be made to ensure proper cradling of ladders, booms, platforms, or towers and stowage of outriggers.

I.8 RAMPS AND STAIRWAYS

I.8.1 Ramps

1. Inclined ramps, runways, and platforms will be as flat as conditions will permit.

2. Where the incline exceeds 1 foot in a 5-foot run, traverse cleats will be applied to the working surface.

3. Substantial overhead protection will be provided to protect employees, the public, and property from falling objects.

4. The overhead protection will not be less than 7 feet or more than 9 feet above the working surface and of sufficient strength to withstand the load or impact likely to be encountered.

5. Vehicle trestles, ramps, and bridges on which foot traffic is permitted will be provided with a walkway and guardrail outside the roadway.

I.8.2 Stairways

1. On all structures 20 feet or more in height, stairways will be provided during the construction. Where permanent stairways are not installed concurrently with the construction of each floor, a temporary stairway will be provided to the work level.

2. Temporary stairways and handrails will be constructed of selected materials, free of imperfections, hazardous projections, and will be secured to the structure. Wooden treads will be nailed in place. Risers will be of a uniform height and treads of uniform width. No flight of temporary stairs will have an unbroken vertical rise of more than 12 feet without a landing not less than 30 inches in the direction of travel.

3. Every flight of stairs with four or more risers will have standard stair railings or standard handrails.

   a. On stairways less than 44 inches wide having both sides inclosed, install at least one handrail, preferably on the right side descending.

   b. On stairways less than 44 inches wide having one side open, at least one stair railing on the open side.

   c. Stairways less than 44 inches wide having both sides open, one stair railing on each side.

d. On stairways more than 44 inches wide, but less than 88 inches wide, one handrail on each enclosed side and one stair railing on each open side.

e. On stairways 88 or more inches wide, one handrail on each enclosed side, one stair rail on each side, and one intermediate stair rail located midway of the width.

4. Standard railing will be installed around all stair wells.

5. Spiral stairways will not be permitted except for special limited usage and secondary access where it is not practical to provide a conventional stairway.

6. Treads of stairs will be of equal width.

7. The rise (height of one step above another) will be the same for each step, including the rise from the ground to the first step.

8. Steps will be slip-resistant and will be kept clear of mud, ice, snow, etc.

9. Doors will not open directly onto stairs. An appropriate platform will be provided.

I.9 ROPES, SLINGS, CHAINS, AND HOOKS

I.9.1 General

1. The use of ropes, slings, and chains will be in accordance with the safe recommendations of their manufacturer and the equipment manufacturer when used in conjunction therewith. Rigging equipment will not be loaded in excess of its recommended safe working load. All hooks used to support human loads or loads that pass over personnel will be closed.

2. The use of open hooks is prohibited in rigging to lift any load where there is danger of relieving the tension on the hook due to the load or hook catching or fouling.

3. All eye splices will be made in an approved manner, and rope thimbles of proper size will be fitted in the eye, except that in slings the use of thimbles will be optional.

4. Hooks, shackles, rings, pad eyes, and other fittings that show excessive wear or that have been bent, twisted, or otherwise damaged will be removed from service.

5. Running lines located within 6 feet 6 inches of the ground or working level will be boxed off, guarded, or the area restricted.

6. Hoisting hooks rated at 10 tons or larger will be provided with means for safe handling.

7. Rigging equipment for material handling will be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment will be removed from service.

8. When not in use rigging equipment will be removed from the immediate work area and properly stored so as not to present a hazard.

9. Custom designed grabs, hooks, clamps, or other lifting accessories for units such as modular panels, prefabricated structures, and similar materials will be marked to indicate the safe working loads and will be proof-tested to 125 percent of their rated load prior to use.

I.9.2 Slings

1. Slings, their fittings and fastenings, will be inspected prior to use on each shift and as necessary during use by a competent craftperson for evidence of overloading, excessive wear, or damage.

2. Defective slings will be removed from service.

3. Protection will be provided between the sling and sharp unyielding surfaces of the load to be lifted.

4. Wire rope slings will have a minimum clear length of braided body equal to 40 times the diameter of component ropes between each end fitting or eye splice.

5. The use of slings will be such that the entire load is positively secured.

I.9.3 Wire Rope

1. Wire rope will be inspected by a competent person at the time of installation and at scheduled intervals thereafter. Wire rope will not be used if, in any length of eight diameters, the total number of visible broken wires exceeds 10 percent of the total number of wires, or if the rope shows other signs of excessive wear, corrosion, or defect.

2. Wire rope will be removed from hoisting and load-carrying service when one of the following conditions exists:

   a. In running ropes, there are six randomly distributed broken wires in one lay or three broken wires in one strand in one lay.

   b. Abrasion, scrubbing, or peening causing loss of more than one-third of the original diameter of the outside individual wires.

   c. Evidence of corrosion.

   d. Kinking, crushing, bird caging, or other damage resulting in distortion of the rope structure.

   e. Reductions from nominal diameter of more than 1/64 inch for diameters up to and including 5/16 inch, 1/32 inch for diameters 3/8 inch to and including 1/2 inch, 3/64 inch for diameters 9/16 inch to and including 3/4, 1/16 inch for diameters 7/8 inch to 1-1/8 inches inclusive, 3/32 inch for diameters 1-1/4 to 1-1/2 inches inclusive.

   f. Evidence of heat damage from any cause.

g. In standing ropes, there are more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

h. Wire rope safety factors will be in accordance with American National Standards Institute B 30.5 or SAE J959.

3. When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope will be removed from service or resocketed. Special attention will be given to the inspection of end fittings on boom supports, pendants, and guy ropes.

4. Wire rope removed from service due to defects will be cut up or plainly marked as being unfit for further use on cranes, hoists, or other load-carrying service.

5. The ratio between the rope diameter and the drum, block, sheave, or pulley thread diameter will be such that the rope will adjust itself to the bend without excessive wear, deformation, or injury.

6. In no case will the safe diameters of drums, blocks, sheaves, or pulleys be reduced in replacement of such items unless compensating changes are made for rope used and safe loading limits.

7. Drums, sheaves, and pulleys will be smooth and free of surface defects liable to damage ropes.

8. Drums, sheaves, or pulleys having eccentric bores, cracked hubs, spokes, or flanges will be removed from service.

9. Connections, fittings, fastenings, parts, etc., used in connection with ropes will be of good quality and of proper size and strength, and will be installed in accordance with the recommendations of the manufacturer.

10. Wire rope clips attached with U-bolts will have the U-bolts on the dead or short end of the rope. The clip nuts will be retightened immediately with the initial load-carrying use and at frequent intervals thereafter.

11. When a wedge socket fastening is used the dead or short end of the rope will have a clip attached to it or looped back and secured to itself by a clip. The clip will not be directly attached to the live end (see ANSI B30.5).

12. The safe working load of various sizes and classifications of improved plow steel wire rope and wire rope slings with various terminals will be determined by using the latest edition of ANSI B 30.9 tables. For sizes, classifications, and grades not included in these tables, the safe working load recommended by the manufacturer will be followed, provided a safety factor of not less than 5 is maintained.

13. Protruding ends of strands in splices on slings and bridles will be covered or blunted.

14. Wire rope will not be secured by knots, except on haul back lines on scrapers.

15. An eye splice made in any wire rope will have no less than three full tucks. However, this requirement will not preclude the use of another form of splice or connection that can be shown to be as efficient and that is not otherwise prohibited.

16. Except for eye splices in the ends of wires and for endless rope slings, each wire rope used in hoisting or lowering, or in pulling loads, will consist of one continuous piece without knot or splice.

17. Eyes in wire rope bridles, slings, or bull wires will not be formed by wire rope clips or knots.

18. Wire rope clips will not be used to splice rope.

I.9.4 Chains

1. Chains used in load-carrying service will be inspected before initial use and weekly thereafter.

2. Chains will be normalized or annealed periodically as recommended by the manufacturer.

3. Chains will be removed from service when showing cracks, nicks, lifting of any linkweld, more than 10 percent elongation of any link or section, or when wear of 20 percent of the diameter of any link has occurred.

4. Welded alloy steel chain slings will have affixed durable permanent identification stating size, grade, rated capacity, and ~~sling~~ manufacturer.

5. Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments, when used with alloy steel chains, will have a rated capacity at least equal to that of the chain.

6. Job or shop hooks and links, or makeshift fasteners formed from bolts, rods, etc., or other such attachments, will not be used.

7. The rated capacity (working load limit) for alloy steel chain slings will conform to the values in ANSI B 30.9.

I.9.5 Fiber Rope (Natural and Synthetic)

1. Frozen fiber rope will not be used.

2. Fiber rope that has been subjected to acids or excessive heat will not be used for load carrying.

3. Fiber rope will be protected from abrasion by padding where it is fastened or drawn over square corners or sharp or rough surfaces.

4. When using natural or synthetic fiber rope slings, ANSI B 309 will apply.

5. All splices in rope slings provided by the employer will be made in accordance with the fiber rope manufacturer's recommendations.

6. In manila rope, eye splices will contain at least three full tucks, and short splices will contain at least six full tucks (three on each side of the centerline of the splice).

7. In layered synthetic fiber rope, eye splices will contain at least four full tucks, and short splices will contain at least eight full tucks (four on each side of the centerline of the splice).

8. Strand end tails will not be trimmed short (flush with the surface of the rope) immediately adjacent to the full tucks. This applies to both eye and short splices and all types of fiber rope. For fiber ropes under 1 inch in diameter, the tails will project at least six rope diameters beyond the last full tuck. For fiber ropes 1 inch in diameter the tails will project at least six rope diameters beyond the last full tuck. For fiber ropes 1 inch in diameter and larger, the tails will project at least 6 inches beyond the last full tuck. In applications where the projecting tails may be objectionable, the tails will be tapered and spliced into the body of the rope using at least two additional tucks (which will require a tail length of approximately six rope diameters beyond the last full tuck).

9. For all eye splices, the eye will be large enough to provide an included angle of not greater than 600 at the splice when the eye is placed over the load or support.

10. Knots will not be used in lieu of splices.

11. The employer will have each synthetic web sling marked or coded to show:

    a. Name or trademark of manufacturer.
    b. Rated capacities for the type of hitch.
    c. Type of material.

I.9.6 Shackles and Hooks

I.9.6.1 Shackles

Table I.9-1 will be used to determine the safe working loads of various sizes of shackles, except that higher safe working loads are permissible when recommended by the manufacturer for specific identifiable products, provided a safety factor of not less than 5 is maintained.

I.9.6.2 Hooks

The manufacturer's recommendation will be followed in determining the safe working loads of the various sizes and types of specific and identifiable hooks. All hooks for which no manufacturer's recommendations are available will be tested to twice the intended safe working load before they are put into use. The employer will maintain a record of the dates and results of such tests.

Table I.9-1

Safe Working Loads for Shackles (Tons)

Material Size (inches)	Pin Diameter (inches)	Safe Working Load
1/2	5/8	1.4
5/8	3/4	2.2
3/4	7/8	3.2
7/8	1	4.3
1	1-1/8	5.6
1-1/8	1-1/4	6.7
1-1/4	1-3/8	8.2
1-3/8	1-1/2	10.0
1-1/2	1-5/8	11.9
1-3/4	2	16.2
2	2-1/4	21.2

APPENDIX J

NEW EMPLOYEE INDOCTRINATION CHECKLIST

Date: 8 March 1991
Revision No.: 1

APPENDIX J

NEW EMPLOYEE INDOCTRINATION CHECKLIST

Name _____ Trade _____

Vehicle License No. _____ State _____

Make _____ Model _____ Year _____

1. ( ) 100% hard hat project.
2. ( ) Limits of work area - protective wear. Construction shoes, no gym shoes. Use safety glasses.
3. ( ) No workmen authorized to enter other than buildings assigned.
4. ( ) Location of emergency phone number - medical facilities/treatment available.
5. ( ) Location of fire extinguishers - fire-fighting and other emergency procedures.
6. ( ) Report all accidents to the SSHO or safety monitor.
7. ( ) Property damage reports.
8. ( ) Location of personal comfort stations.
9. ( ) Phone location.
10. ( ) Location of bulletin board.
11. ( ) Intoxicants -- ammo -- guns -- weapons -- PROHIBITED.
12. ( ) "Horseplay" will not be permitted.
13. ( ) Company safety and accident prevention program.
14. ( ) Proper and adequate protective clothing. No shorts. Shirts/long pants at all times.
15. ( ) Good housekeeping.
16. ( ) Vehicle parking and regulations. Speed limit 25 mph, unless posted otherwise.
17. ( ) Observe and practice all government safety and health requirements.
18. ( ) Special contract requirements applicable.
19. ( ) Safe clearance procedures.
20. ( ) Phase safety plan review.
21. ( ) Review of approved Contractor/Government Accident Prevention Program.
22. ( ) Procedures for reporting/correcting unsafe conditions/practices.

23. ( ) Employee responsibility for property/safety of others. Security of ladders, tools, unused supplies/materials.
24. ( ) Temporary vehicle pass (driver's license, proof of insurance, state registration).
25. ( ) No smoking except in designated areas.
26. ( ) Medical surveillance requirements.
27. ( ) Safety training.
28. ( ) Site-specific training.
29. ( ) Respirator fit testing.
30. ( ) Site hazards identification.
31. ( ) Emergency evacuation procedures.
32. ( ) Contingency plans.
33. ( ) Location of first aid kits.

APPENDIX J
(continued)

Employee Signature _____ Date _____

Subcontractor Supervisor's Signature _____

General Contractor Supervisor's Signature _____

Company Name _____

Company Phone Number (___) _____

Please list below any known medical problems of which we should be aware in the event of an emergency.

_____

_____

Phone Number to Call in Case of Emergency: _____

APPENDIX K

EXAMPLE VISITOR SAFETY BRIEFING FORM

APPENDIX K

EXAMPLE VISITOR SAFETY BRIEFING FORM

The purpose of this form is to provide a checklist of topics that will be discussed to brief on-site visitors of the general safety information and precautions that are established during on-site activities. This form will not be used for people involved with brief deliveries or public tours for community relations activities. Further site-specific training and/or reviewing the SSHP will be at the discretion of the SSHO for visitors who may be performing on-site work activities.

	Discussed	Not Applicable
1. Hard hats, steel-toed shoes, and safety glasses must be worn in all work areas, excluding support trailers.	_____	_____
2. Description and boundaries of exclusion zones.	_____	_____
3. No person authorized to enter other than buildings or areas assigned.	_____	_____
4. Location of emergency phone numbers - medical facilities/treatment available.	_____	_____
5. Report all accidents to the SSHO or safety monitor.	_____	_____
6. Location of personal comfort stations.	_____	_____
7. Location of telephones.	_____	_____
8. Intoxicants -- ammo -- guns -- weapons -- PROHIBITED.	_____	_____
9. "Horseplay" will not be permitted.	_____	_____
10. Good housekeeping.	_____	_____
11. Vehicle parking and regulations. Speed limit 25 mph, unless posted otherwise.	_____	_____
12. Temporary vehicle pass (driver's license, proof of insurance, state registration).	_____	_____
13. No smoking, eating, or drinking, except in designated areas.	_____	_____

_____	_____	_____
Visitor's Name	Affiliation	Date
_____	_____	_____
Briefer's Name	Title	Date

APPENDIX L

INCIDENT/ACCIDENT REPORT

APPENDIX L

INCIDENT/ACCIDENT REPORT

Department Name _____ Work _____
Name of Employee _____ Occupation _____
Date of Accident: Month ___ Day ___ Year ___ A.M./P.M. _____
What Duties Were Being Performed at Time of Accident? _____

_____

_____

How Did the Accident Happen? _____

_____

Extent of the Injury or Illness and Part of Body Affected _____

_____

Was Medical Treatment Beyond First Aid Administered?
Yes ___ No ___ Unknown If yes, explain _____

_____

Lost Workdays
Yes ___ No ___ Unknown _____

SUPERVISOR'S EVALUATION

Indicate the principal reasons for the occurrence of the accident on line A and line B below. Indicate the measures you have taken to prevent a recurrence.

A. Unsafe Condition _____
Other _____
Preventive Measures Taken _____

B. Unsafe Act _____
Other _____
Preventive Measures Taken _____

IF YOU FEEL THERE WAS A CONTRIBUTORY CAUSE TO THE UNSAFE ACT, INDICATE BY MARKING THE APPROPRIATE ITEM.

1. The employee was not instructed to do the job properly.

2. Standard operating procedures regarding safety and health practices for employees were not developed, implemented, or enforced.

3. The employee was not placed in a job he could perform in a safe or healthful manner.

Additional Comments _____

_____

_____

OSHA No. 101 INCIDENT REPORT FORM Date: _____
Case or File No. _____

SUPPLEMENTARY RECORD OF OCCUPATIONAL INJURIES AND ILLNESSES

EMPLOYER (WESTON Or Subcontractor)

1. Name _____

2. Mail Address _____
City State ZIP

3. Location, if different from mail address _____

INJURED OR ILL EMPLOYEE

4. Name _____ S.S. No. ____/____/____
(First name) (Middle name) (Last name)

5. Home Address _____
No. and Street City or town State ZIP

6. Age _____ 7. Sex: Male ___ Female ___ Employee No. _____

8. Occupation _____ (Enter regular job title, not job title at time of injury or exposure)

9. Department (Name & No.) _____

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure _____

(Give address or describe place injury occurred as accurately as possible)

11. Was place of accident or exposure on employer's premises? ____ (Yes or No)

12. What was employee doing when injured ? _____

(Specify any tools/equipment/materials involved and what was being done)

13. How did the accident occur? _____

(Describe fully the events which resulted in the injury or illness)

14. List names of witnesses: _____

15. Was the injury due to an automobile accident? _____ (Yes or No) If so, attach automobile accident report.

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

16. Describe the injury or illness. _____

(Describe in detail and indicate the part of the body affected)

17. Name the object or substance which directly injured the employee.

18. Date of injury or initial diagnosis of occupational illness _____
Time of injury _____ Date of return to work _____

19. Date/Time reported to Corporate Health & Safety _____

20. Did the employee die? _____ (Yes or No)

Note: Completed Report to be submitted to Corporate Health and Safety and Human Resources within 5 days.

Incident Report Form
Case or File No. _____ Employee Name: _____

PROJECT/PROGRAM IDENTIFICATION

21. Work Order No. _____ or Program ID _____
22. Project Manager_____ Div/Reg OPs Manager _____
23. Div/Reg Operations Safety Officer_____
24. Site/project Health and Safety Coordinator _____

OTHER

25. List protective equipment and clothing used by employee _____
_____
26. Did limitations of protective equipment/clothing contribute to injury/ injury? If so, explain: _____
_____
27. Name and Address of treating physician (also attach medical consultants comments) _____
- Indicate length of stay _____
28. If hospitalized, name and address of hospital _____
_____
- Indicate length of stay _____

CORRECTIVE ACTION

29. Explain corrective actions taken/to be taken which will prevent similar occurances (attach additional pages if required):_____
_____
_____
_____
_____
_____
_____

DOCUMENTATION OF REVIEW

30. Employee involved

_____ _____ _____
(Name) (Signature) (Date)

31. Safety Management (Site Health and Safety Coordinator, and/or Regional or Divisional Operations Safety Officer)

_____ _____ _____

_____ _____ _____
(Name) (Signature) (Date)

32. Review by immediate supervisor and a minimum of one of the following:
- Project Manager, Project Director, Department/Office Manager, Division/Regional Operations Manager or Division/Region Manager

_____ _____ _____

_____ _____ _____
(Name) (Signature) (Date)

Incident Report Form
Case or File No. _____ Employee Name: _____

(FOR CORPORATE HEALTH AND SAFETY USE ONLY)

33. Initial Review by _____ _____
Name Date

- Review and Comments:

_____

_____

_____

_____

34. Are additional corrective actions required? (Yes or No) List:

_____

_____

_____

_____

_____

_____

(Date Due _____)

35. Date corrective actions accomplished: _____

36. Corporate Health and Safety Director

_____ _____ _____

(Name) (Signature) (Date)

INCIDENT ANALYSIS · First Aid Only ___. OSHA Recordable ___.

DATE	EMP. #	DEPT. #	OCCUPATION	DESCRIPTION	FATAL	1	2	3	4	5	6	A	B	C	D	E	F	FATAL	9	10	11	12	13

APPENDIX M

EMERGENCY HAND/HORN SIGNALS

APPENDIX M

EMERGENCY HAND/HORN SIGNALS

Hand Signals

Signal	Meaning
Hands on top of head.	Need assistance
Grip partner's wrist or place both hands around partner's arm.	Leave area immediately
Thumps up.	OK; I'm all right
Thumbs down.	No; negative
Hand gripping throat.	Cannot breathe; out of air
Pointed finger on extended arm	Look in that direction
Wave hands over hand from side-to-side	Attention; stand-by for the next signal
Swing hand from direction of person receiving signal to directly overhead and through in circle	Come here

Horn Signals

Signal	Meaning
Three (3) short blasts	Caution or look here
One (1) long blast followed by 1 or 2 short blasts	Evacuate the area to either the primary or secondary assembly area (as indicated by 1 or 2 short blasts)

Date: 8 March 1991
Revision No.: 1

APPENDIX N

EQUIPMENT INSPECTION CHECKLIST

APPENDIX N

EQUIPMENT INSPECTION CHECKLIST

GENERAL INSTRUCTIONS:

1. When: At the start of the work shift.
2. By whom: Someone who is familiar with the equipment.
3. Standard: Safe operating condition and free from apparent damage that could cause failure while in use.
4. Documentation: Complete this form; Site Manager is to keep it on file at the site.
5. What: Make/Description _____
   Model _____
   Serial Number _____

	OK	Not OK	Comments
Brakes	___	___	_____
Brake Lights:	___	___	_____
Reverse Signal	___	___	_____
Alarm:	___	___	_____
Horns:	___	___	_____
Tires:	___	___	_____
Steering:	___	___	_____
Seat Belts:	___	___	_____
Operating Controls:	___	___	_____
Fire Extinguisher:	___	___	_____
Lights:	___	___	_____
Coupling Devices:	___	___	_____
Windshield:	___	___	_____
Windshield Wiper:	___	___	_____
Guards:	___	___	_____
Free of Leaks:	___	___	_____
Brake/Hydraulic Lines:	___	___	_____
Brake Fluid Level:	___	___	_____
Hydraulic Fluid:	___	___	_____
Engine Oil Level:	___	___	_____
Other:	___	___	_____

Odometer: _____
Fuel Level: _____
Print Inspector's Name: _____
Signature of Inspector: _____
Date: _____ Time: ____:____ AM/PM

Date: 8 March 1991
Revision No.: 1

APPENDIX O

FIELD HEARING PRACTICE PROCEDURE

Date: 8 March 1991
Revision No.: 1

APPENDIX O

FIELD HEARING PRACTICE PROCEDURE

Noise is defined as unwanted sound. Noise can cause sudden traumatic hearing loss, long-term more slowly occurring sensory-neural hearing loss that is irreversible, disruption of communication and masking of warning devices and alarms, and increased stress levels and effects on the cardiovascular and nervous systems. These latter two effects may occur at levels below those which cause damage to hearing and in situations where the conditions are more or less constant and daily.

OSHA regulations generally apply to 8-hour exposures and consider 85 dBA as an action level for a hearing conservation program.

Where feasible, noise exposure will be controlled by engineering controls. Where high noise levels are encountered and where engineering controls are infeasible or until engineering controls can be accomplished, hearing portoection devices will be used for worker protection from noise-induced hearing loss.

Some of the sources of noise on hazardous materials, construction, and industrial sites of a magnitude to cause hearing damage are: compressor motors, compressed air, compressed water, and heavy equipment. This list is not all-inclusive.

Any sound level surveys indicating noise levels of 85 dBA or above, or, in the absence of sound level measuring instrumentation, any noise/sound preventing normal vocal discussion between two individuals at an arm's length distance will dictate the need for hearing protection.

Hearing protection will be afforded by either disposable ear plugs or ear muffs. Administrative time control is not an acceptable method for preventing noise exposure since extreme noise for a short duration can cause severe, permanent hearing loss.

In addition to these protocols, WESTON's hearing conservation program includes physical examination and audiometric testing during annual medical monitoring.

The selection, use, maintenance, and control of hearing protection is further defined in WESTON's personal protective equipment program.

Date: 8 March 1991
Revision No.: 1

APPENDIX P

SAFETY EXPOSURE REPORT

Date: 8 March 1991
Revision No.: 1

APPENDIX P

SAFETY EXPOSURE REPORT

MONTHLY SAFETY EXPOSURE REPORT
(To be used for safety statistics only)

Contractor _____ Contract Number _____ Period _____ 21st through ____ 20th 19 ____

Employee-hours worked, including overtime

Prime contractor	_____
Subcontractor	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
	_____
Total	_____

Instructions:

1. Reports are due starting with Notice to Proceed and ending with the Final Inspection unless otherwise specified by Resident Engineer.
2. Separate reports must be submitted for each contract number.
3. Negative reports are required for periods in which no employee-hours are worked.
4. Employee-hours are defined as the total number of hours worked by all employees, including those in operating, production, maintenance, transportation, clerical, administration, sales, and other activities.
5. Report period is from the 21st of one month through the 20th of the following month.

REPORTS ARE DUE IN USACE RESIDENT OFFICE 7 WORKING DAYS AFTER THE 20TH OF EACH MONTH.

Date: 8 March 1991
Revision No.: 1

APPENDIX Q

SAFETY PROCEDURE FOR EXCAVATION AND TRENCHING

APPENDIX Q

SAFETY PROCEDURE FOR EXCAVATIONS AND TRENCHING

(Reference: OSHA Regulation 29 CFR 1926.650)

Q.1 SOILS - MODE OF FAILURE

Stability is dependent on soil type, which can vary from rock to water-logged with intermediates such as hard, compact, soft, sandy, or filled. Although rock may be assumed stable, certain formations could prove otherwise when cut (e.g., shear failure could occur along bedding planes or due to vibration from plant and machinery).

Failure may include the following:

- Heaves may result from loading (normal or superimposed) on either side of the excavation.
- Boiling in high water table/loose condition.
- Tension cracks may result in slippage or toppling of sides of excavation.
- Stresses in unsupported soil could cause bulging followed by subsidence.

Q.2 HAZARDS

Potential hazards include the following:

- Workers may be buried by cave-in; suffocation or crushing may result and may be fatal.
- Materials, tools, rock, or soil may fall into an excavation if placed too near the edge. Materials should be placed no closer than 2 feet from the edge.
- Falls may occur during access/egress, mounting or dismounting equipment, or stumbling into an excavation.
- Toxic, irritating, or flammable atmospheres may result.

- Overexertion from handling material or equipment may occur.
- There may be insufficient working room for workers in the excavation. A separation of 12 feet is suggested to prevent injury from handling tools and material.

Q.3 CAUSES OF FAILURE

Failure may occur because of:

- Absence of shoring or adequate sloping to the sides of the excavation.
- Misjudgment of stability -- a decision may be made not to shore or the shoring may be inadequate for conditions.
- Defective shoring:
  - Poor material or construction.
  - Failure to adequately maintain the system after adverse weather and other conditions.
- Placing material or machinery too near the edge of an excavation.
- Undercut sides -- excavator may not have been level during operation.

Q.4 SHORING

OSHA regulation 29 CFR 1926.650 requires shoring at or below a depth of 5 feet (the regulation may be reduced to 4 feet). As an alternative, the sides of an excavation may be sloped according to soil conditions. Average conditions require 45°; extreme cases, such as loose sand, require approximately 26°.

Q.4.1 Constructing Shoring Systems

Standard shoring systems consist of the following:

- Vertical members - Poling or sheeting varying in size from 3 in. x 4 in., 2 in. x 6 in., or 3 in. x 6 in. placed at 4 ft 0 in. c/c or closer for unstable soil conditions. Interlocked sheet piles are also used.

- Horizontal members - Wales of stringers that bear against the sides of the excavation or sheeting. These vary in size from 4 in. x 6 in., 6 in. x 8 in. at 4 ft 0 in. c/c vertically and 6 ft 0 in. c/c horizontally.

- Struts or braces - Set against wales used together with cleats and hardwood wedges to keep the system in place. Depending on the width of the excavation, these may be 2 in. x 6 in., 4 in. x 4 in., 10 in. x 10 in., and placed at 4 ft 0 in. c/c vertically and 6 ft 0 in. c/c horizontally. Screw/hydraulic jacks may be used instead of timber struts.

Q.4.2 Dismantling Shoring Systems

Dismantling will be handled as follows:

- Dismantle from the bottom up.
- Backfill as close as possible.
- Use screw jacks, if possible, during removal of wedged timber members.

Q.5 UTILITY AND PUBLIC SERVICE LINES

Procedures to be followed when handling service lines are as follows:

- Care should be taken to avoid damage to service lines. If they are uncovered, they should be adequately protected including supports, as necessary.

- Relevant authorities of the utility and public service companies could be requested to identify locations prior to excavation.

Q.6 EXPOSURE TO TOXIC/FLAMMABLE/EXPLOSIVE CONDITIONS

Precautions should be taken to determine concentrations and adequate provisions made for ventilation. Avoid introduction of ignition sources. Internal combustion engines can also be a source of contamination; avoid accumulation of exhaust gases in the excavation.

Q.7 FIELD OPERATING PROCEDURE

1. A competent person must design and supervise construction of shoring, sheeting, and/or sloping.

2. No person may enter a trench or work at the foot of the face of an excavation until a competent person (the SSHO) has inspected and determined whether sloping or shoring is required to protect against cave-in or subsidence, and the appropriate protection has been installed.

3. Trenches and excavations must be inspected regularly by competent persons to ensure that changes in temperature, precipitation, shallow groundwater, overburden, or nearby building weight, vibration, or nearby equipment operation has caused weakening of sides, faces, and floors, and that protection is being maintained.

4. This assessment must be made, regardless of whether personnel will be working in the excavation, when heavy equipment must work nearby, prior to and during use, to ensure the trench or excavation will support the weight of the equipment without subsiding and possibly causing the equipment to tip.

5. Sufficient ramps or ladders must be provided to trenches or excavations to allow quick egress. Ladders may be placed no more than 25 feet apart, must be secured from shifting, and must extend at least 3 feet above the landing point. Use, construction, and maintenance of ladders must conform to ladder safety requirements.

6. Material removed from a trench or excavation must be placed far enough from the edge (at least 2 feet) to prevent its sliding into the excavation and/or from stressing the trench or excavation walls.

7. Access to trenching areas must be controlled, and limited to those persons who are authorized to enter the area. Prior to entering a trench or excavation, workers must notify the Site Manager, SSHO, and nearby equipment operators whose activities could affect the trench or excavation.

8. If trenches or excavations are near walkways or roadways, guards or warning barriers must be placed to alert pedestrians and drivers of the presence of the trench or excavation.

9. If possible, trenches or excavations should be covered or filled in when unattended. Otherwise, strong barriers must be placed around the trench or excavation, and lighting must be provided at night if the trench or excavation is near walkways or roadways.

Date: 8 March 1991
Revision No.: 1

APPENDIX R

SPILL RESPONSE TECHNIQUES

APPENDIX R

SPILL RESPONSE TECHNIQUES

Table R-1

Spills on Land

Technique	Application or Construction Method	Use	Advantages	Disadvantages
Isolation	Over pack or transfer contents of drums.	Leaking or damaged drums	Greatly reduces degree of soil contamination.	Manual lifting; hose handling; static charge buildup during pumping, therefore, pump requires grounding and bonding.
Earthen dikes	Create with bulldozer or earth-moving equipment to compact earth (height, earth type).	Flat or sloped surface	Material on-site. Construct with common equipment. Construct quickly.	Natural permeability of soil seepage through ground surface. Composition of soil not suitable in all cases.
Excavation	Bulldozer or earth-moving equipment; line if possible.	Soft ground Natural cavitation	Material on-site. Construct with common equipment.	Move large amounts of material. Natural permeability of soil. Surface of soil not suitable in all cases.
Excavation and dikes	Bulldozer or earth-moving equipment; line if possible.	Soft ground	Need less space than for separating material on-site. Construct with common equipment.	Move large amount of material. Natural permeability of soil. Surface of soil not suitable in all cases.

Table R-2

Spills in Water - Soluble or Miscible Spills

Technique	Application or Construction Method	Use	Advantages	Disadvantages
Sealed booms	Boom device to anchor.	Contain depth Limited volumes Leaking container	Contain entire depth of water.	Deployment difficult. Not used for large bodies. Difficult to get good seal.
Diversion of uncontaminated flow	Earth-moving equipment.	Special area where topography is right	Can put cleaned water into diverted stream. Used for flowing water.	Difficult to move large amounts of earth. Clear area needed. Impermeability of ground.
Diversion of contaminated flow	Block entrance with sandbags, sealed booms, or dikes.		Special area where topography is right. Used for flowing water.	Can put clean water back into stream. Impermeability of ground.
Filter fences	Filter device to anchor.	Contain depth Limited volumes Leaking container	Used on large area.	Easily clogged. Not used in rough water.

Table R-3

Spills in Water - Heavier than Water Spills

Technique	Application or Construction Method	Use	Advantages	Disadvantages
Natural excavation and dikes	None	Where a natural barrier exists.	No construction needed.	Cannot control area that contains the spill.
Construction of excavation and dikes	Dredges; hydraulic or vacuum pumps.	If bottom can be moved.	Material is on-site.	Hard to construct. Stirred up bottom may cause dispersion and increased turbidity.

Table R-4

Spills in Water - Floating Spills

Technique	Application or Construction Method	Use	Advantages	Disadvantages
Booms	Varies; need deployment device.	Not too much current	Used on large area. Many varieties not easily clogged. Provides containment.	Current speed less than 0.7 knot. Not used in fast water.

Table R-5

Spills in Air

Technique	Application or Construction Method	Use	Advantages	Disadvantages
Isolation	Bag, over pack, or transfer contents of damaged drums.	Lighter than air vapors.	Removes hazards from air.	None
Mist knock down	Spray fine mist into air.	Water-soluble, low-lying vapors.	Removes hazard from air.	Creates water pollution problem and must be contained in solution.
Fans or blowers	Disperse air by directing blower toward it.	Very calm and sheltered areas.	Can direct air away from populated areas.	Not at all effective if any wind. Need large capability blowers.
Cover and contain	Cover with a tarp, plastic sheeting, or soil	Spills on land that are vaporizing.	Removes hazard from air	Larger quantity of material for disposal.

Table R-6

In Situ Treatment of Contained Spills

Method	Application or Required Materials	Advantages
Neutralization	Acids/bases	On-site treatment reduces the potential for spills.
Precipitation	Bases/proprietary agents	Reduces potential for spills and reduces volumes for disposal.
Absorption	Proprietary agents	Sequesters the pollutant and reduces disposal volumes.
Adsorption	Activated carbon and resins	Sequesters the pollutant and reduces disposal volumes.
Oxidation	Hydrogen peroxide Chlorine	Destroys or converts pollutants to a less toxic compound.
Reduction	Sulfur dioxide Ferrous sulfate Sodium bisulfite	Converts the pollutant to a more treatable form.
Hydrolysis	Bases/acids	Destroys or converts the pollutant to less toxic compounds.
Recycle	NA	Utilize where possible the resources and needs of local industries.
Land treatment	NA	For certain organic wastes the use of natural soil microbes for biodegradation is the fastest, most environmentally sound method of treatment.
Detonation	Explosive materials	As a last resort shock-sensitive material can be destroyed on-site to reduce dangers to the public.

Date: 8 March 1991
Revision No.: 1

APPENDIX S

DATA SAMPLE COLLECTION AND LABORATORY ANALYSIS FORMS

Date: 8 March 1991
Revision No.: 1

APPENDIX S

DATA SAMPLE COLLECTION AND LABORATORY ANALYSIS FORM

All air sampling and monitoring results will be reviewed and approved by the HSM and transmitted in writing to the Contracting Officer weekly.

The following certification will accompany all air monitoring reports:

"I certify that I have reviewed the accompanying air monitoring/sampling results, and on the basis of this review and on-site audits, believe that the monitoring/sampling was performed in strict compliance with approved standards and regulations."

George Crawford, CIH Health and Safety Manager	Date	Certification No.

Date: 8 March 1991
Revision No.: 1

AIR SAMPLING/MONITORING REPORT

Date: _____

Monitoring Duration: _____

Work Location and Task: _____

Integrated Samples Collected:

Sample No.	Location/Person	Result

Direct Reading Monitoring Conducted:

Instrument	Time	Location	Measurement

Actual sample data sheets and calibration data sheets for the above summarized air sampling/monitoring are included as an attachment.

Meteorological Data:
Temperature °F: _____
Wind Direction/Speed: _____
Humidity: _____
Weather Condition: _____
(i.e., gusty, rainy, snow, etc.)

Comments: _____

"I certify that the above monitoring/sampling was performed in strict compliance with approved standards and regulations."

_____ SSHO

_____ Date

AIR SAMPLING DATA SHEET

CLIENT LOCATION WO# _____

SAMPLE # / DATE	LOCATION OR PERSON / COMMENTS	SAMPLING MEDIA: PERSONNEL	AREA	BULK	TOTAL	RESPIRABLE	BLANK	PUMP # / AVERAGE FLOW RATE	STOP TIME / START TIME	TOTAL MINUTES / LITERS SAMPLED	ANALYSIS

SAMPLED BY: _____ SIGNATURE _____ PAGE __ OF __ 9/88

DIRECT-READING AIR MONITORING FIELD DATA SHEET

CLIENT _____ DATE _____

INSTRUMENT 1 _____	INSTRUMENT 2 _____
MODEL _____ SERIAL NO._____	MODEL _____ SERIAL NO._____
CALIBRATION DATE _____ BY _____	CALIBRATION DATE _____ BY _____
CALIBRATION METHOD _____	CALIBRATION METHOD _____

LOCATION	TIME	I_1 = U_1 =	AL_1	I_2 = U_2 =	AL_2	ACTIVITY	RECOMMENDATIONS

SAMPLED BY: _____ SIGNATURE _____ DATE _____

U_1= UNITS OF MEASURE-INSTRUMENT I_1 ; U_2= UNITS OF MEASURE FOR INSTRUMENT I_2 AL: CHECK IF > ACTION LEVEL

AIR SAMPLING CALIBRATION SHEET

WO# ☐☐☐☐☐☐☐☐☐☐ CLIENT_____

PERFORMED BY:_____ CALIBRATOR TYPE:_____

PUMP #	DATE	TIMED TRIALS			AVE. PRE	TIMED TRIALS			AVE. POST	COMBINED AVERAGE	% CHANGE
		1ST	2ND	3RD		1ST	2ND	3RD			

9/88

Date: 8 March 1991
Revision No.: 1

Custody Transfer Record/Lab Work Request

WESTON Analytics Use Only

Client _____

Work Order _____

Date Rec'd. _____ Date Due _____

RFW Contact _____

Client Contact/Phone _____

WA Use Only Lab ID	Client ID/Description	Matrix	Date Collected	Refrigerator#	#/Type Container	Volume	Preservative	ANALYSES REQUESTED →

Matrix:
W - Water
DS - Drum Solids
X - Other
S - Soil
O - Oil
DL - Drum Liquids
SE - Sediment
A - Air
F - Fish
SO - Solid
WI - Wipe
L - EP/TCLP Leachate

Special Instructions:

Item/Reason	Relinquished by	Received by	Date	Time	Item/Reason	Relinquished by	Received by	Date	Time

WESTON Analytics Use Only

Samples Were:
1 Shipped or Hand-Delivered
NOTES:

2 Ambient or Chilled
NOTES:

3 Received Broken/Leaking (Improperly Sealed)
Y N
NOTES:

4 Properly Preserved
Y N
NOTES:

5 Received Within Holding Times
Y N
NOTES:

COC Tape Was:
1 Present on Outer Package Y N
2 Unbroken on Outer Package Y N
3 Present on Sample Y N
4 Unbroken on Sample Y N
NOTES:

COC Record Was:
1 Present Upon Receipt of Samples Y N

Discrepancies Between Sample Labels and COC Record? Y N
NOTES:

Date: 8 March 1991
Revision No.: 1

MAINTENANCE AND CALIBRATION FREQUENCIES

H = Hourly
D = Daily
W = Weekly
M = Monthly

Y = Yearly
NA = Not acceptable
AR = As required

Equipment	Function Checks				Calibration Checks					Service	
	Battery	Fuel Press	Fittings	Physical Condition	Zero	Flow Rate	Cal Gas Reaction	Internal Calibration Feature	Factory Service	Field Cleaning	Factory Service
Data Lynx PSD											
Portable weather station											
MIR-PDM-3 digital dust monitor	D	NA	NA	D	D	NA	NA	D	Y	DAR	YAR
Century OVA 128	D	D	D	D	D	H	AR	NA	Y	DAR	Y
MSA MiniGuard II	D	NA	D	D	D	D	D	NA	AR	D	AR
Gil-Air industrial hygiene pumps	D	NA	D	D	NA	D	NA	D	AR	D	YAR

Date: 8 March 1991
Revision No.: 1

SADA Meteorological Monitoring Results Table

Date/ Time	Location	Activity	Wind Speed Direction	Instrument	Results	Comments	Name

*Note any unusual conditions.

INORGANIC ANALYSIS PROTOCOLS
NUISANCE DUST

1.0 PURPOSE

To measure nuisance dust in air as total aerosol mass.

2.0 COMPOUND REFERENCE

OSHA: 15 mg/m^3
NIOSH: no standard
ACGIH: 10 mg/m^3, total dust less than 1% quartz
PROPERTIES: quartz less than 1% (13.1)

SYNONYMS: boron oxide (CAS #1303-86-2) and nuisance dusts (13.1) including alumina (CAS #1344-28-1), calcium carbonate (CAS #1317-65-3), cellulose (paper fiber; CAS #9004-34-6), glycerin mist (CAS #56-81-5), limestone (CAS #1317-65-3), etc.

3.0 METHOD SUMMARY

3.1 Sampling

SAMPLER: FILTER
(tared 37-mm, 5-μm PVC filter)

FLOW RATE: 1.5 to 2 L/min

VOL-MIN: 25 L @ 15 mg/m^3
-MAX: 133 L @ 15 mg/m^3

SHIPMENT: routine

SAMPLE STABILITY: indefinitely

BLANKS: 2 field blanks per 10 samples

BULK SAMPLE: none required

3.2 Measurement

TECHNIQUE: GRAVIMETRIC (FILTER WEIGHT)

ANALYTE: airborne particulate material

BALANCE: 0.01 mg sensitivity or better; use same balance before and after sample collection

CALIBRATION: National Bureau of Standards Class M weights

RANGE: 0.3 to 2 mg per sample

ESTIMATED LOD: 0.2 mg per sample

PRECISION: 0.08 mg per sample (13.3)

3.3 Accuracy

RANGE STUDIED: 8 to 28 mg/m^3

BIAS: not significant

OVERALL PRECISION (s_r): 0.056 (13.2)

3.4 Applicability

The working range is 3 to 20 mg/m^3 for a 100 L air sample. This method is nonspecific and determines the total dust concentration to which a worker is exposed. It may be applied, e.g., to gravimetric determination of fibrous glass (13.4) in addition to the other ACGIH nuisance dusts (13.1).

3.5 Interferences

Organic and volatile particulate matter may be removed by dry ashing (13.4).

3.6 Other Methods

This method is similar to the criteria document method for fibrous glass (13.4) and Method 5000 for carbon black. Impingers and direct-reading instruments may be used to collect total dust samples, but these have limitations for personal sampling.

4.0 EQUIPMENT

4.1 Environmental chamber at constant temperature and humidity (e.g., 20°C ± 0.3°C and 50% ± 5% RH).

4.2 Sampler: 37 mm PVC, 2- to 5 μm pore size membrane or equivalent hydrophobic filter and cellulose supporting pad in 37 μm cassette filter holder.

4.3 Personal sampling pump, 1.5 to 2 L/min, with flexible connecting tubing.

4.4 Microbalance, capable of weighing to 0.01 mg.

4.5 Vacuum desiccator.

4.6 Static neutralizer: e.g., Po-210; replace nine months after the production date.

5.0 SPECIAL PRECAUTIONS

None.

6.0 PREPARATION OF FILTERS BEFORE SAMPLING

6.1 Dry filters and backup pads under vacuum in the vacuum desiccator for at least 15 min.

6.2 Release the vacuum, remove the desiccator cover and equilibrate the filters in the environmental chamber for at least 1 hr.

6.3 Number the backup pads with a ballpoint pen and place them, numbered side down, in filter cassette bottom sections.

6.4 Weigh the filters in the environmental chamber. Record the filter tare weight, W_1 (mg).

6.4.1 Zero the balance before each weighing.

6.4.2 Handle the filter with forceps (nylon forceps if further analyses will be done).

6.4.3 Pass the filter over an antistatic radiation source. Repeat this step if filter does not release easily from the forceps or if filter attracts balance pan. Static electricity can cause erroneous weight readings.

6.5 Place the weighed filters on top of the backup pads in the filter cassette bottom sections and allow to stand an additional 8 to 16 hrs in the environmental chamber.

6.6 Reweigh the filters. If this tare weight differs by more than 0.01 mg from the first tare weight obtained in step 4 above, discard the filter. NOTE: Insert a rod through the outlet hole of the filter cassette bottom section to raise the backup pad and filter so that the filter can be grasped with forceps.

6.7 Assemble the filter in the filter cassettes and close firmly so that leakage around the filter will not occur. Place a plug in each opening of the filter cassette. Place a cellulose shrink band around the filter cassette, allow to dry and mark with the same number as the backup pad.

7.0 SAMPLING

7.1 Calibrate each personal sampling pump with a representative sampler in line.

7.2 Sample at 1.5 to 2 L/min. Do not exceed a total filter loading of approximately 2 mg total dust.

8.0 SAMPLE PREPARATION

8.1 Wipe dust form the external surface of the filter cassette with a moist paper towel to minimize contamination. Discard the paper towel.

8.2 Remove the top and bottom plugs from the filter cassette. Place the filter cassettes in a vacuum desiccator under vacuum for a least 15 min, followed by equilibration for at least 1 hr in the environmental chamber.

8.3 Remove the cassette band, pry open the cassette and remove the filter. Handle the filters very gently by the edge to avoid loss of dust.

NOTE: If the filter sticks to the underside of the cassette top, very gently lift away by using the dull side of a scalpel blade. This must be done carefully or the filter will tear.

9.0 CALIBRATION AND QUALITY CONTROL

9.1 Zero the microbalance before all weighing. Use the same microbalance for weighing filters before and after sample collection. Maintain and calibrate the balance with National bureau of Standards Class M weights.

9.2 Take two to four replicate samples for every batch of field samples for quality assurance on the sampling procedures. The set of replicate samples should be exposed to the same dust environment, either in a laboratory dust chamber (13.67) or in the field. The quality control samples must be taken with the same equipment, procedures and personnel used in the routine field samples. The relative standard deviation calculated from these replicates should be recorded on control charts and action taken when the precision is out of control.

10.0 MEASUREMENT

10.1 Weigh each filter, including field blanks. record this post-sampling weight, W_2 (mg), beside its corresponding tare weight. Record anything remarkable about a filter (e.g., overload, leakage, wet, torn, etc.)

11.0 CALCULATIONS

11.1 Calculate the concentration of total nuisance dust, C (mg/m^3), in the air volume sampled, V(L):

$$C = \frac{(W_2 - W_1) + B}{V} \times 10^3, \ mg/m^3$$

where: W_1=tare weight of filter before sampling (mg)
W2=post-sampling weight of sample-containing filter (mg)
B=mean change in field blank filter weights between tare and post-sampling (mg) (+ or -)

12.0 EVALUATION OF METHOD

Lab testing with blank filters and generated atmospheres of carbon black was done at 8 to 28 mg/m^3 (13.2, 13.6). Precision and accuracy data are given on page 1.

13.0 REFERENCES

13.1 TLVs - Threshold Limit Values for 1983-84, Appendix D, ACGIH, Cincinnati, OH (1983).

13.2 NIOSH Manual of Analytical Methods, 3rd ed., U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 84-100, Methods 5000, 0500.

13.3 Unpublished data from Non-textile Cotton Study, NIOSH/DRDS/EIB.

13.4 NIOSH Criteria for a Recommended Standard ... Occupational Exposure to Fibrous Glass, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-152, 119-142 (1977).

13.5 NIOSH Manual of Analytical Methods, 2nd ed., V. 3, S349, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-C (1977).

13.6 Documentation of the NIOSH Validation Tests, S262 and S349, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-185 (1977).

Eff. Date: 03/29/90 Initiated By: Dianne S. Therry Approved By: Jack R. Tuschall Authorized By: Marty J. Volant SP No. 21-15-0550.1

SAMPLING/ANALYTICAL METHOD FOR

2,4,6-TRINITROTOLUENE (TNT)

Method Number:	44 Modified for analysis by HPLC
Matrix:	Air
Target Concentration:	TNT 1.5 mg/m³ (OSHA PEL) (skin notations apply)
Procedure:	Samples are collected by drawing a known volume of air through a laboratory modified commercial Tenax-GC resin tube. The modification consists of the placement of an 8-mm glass-fiber filter disc inside the tube, ahead of the first resin bed. The samples are desorbed with acetone and analyzed by HPLC, UV detection.
Recommended air volume and sampling rate:	60 L at 1 L/min
Reliable quantitation limit, µg/m³: (Based on 60 L air volume)	21
Standard error of estimate at the target concentration, %:	8.2
Special requirements:	The air sampling pump must be certified by NIOSH and/or MSHA as intrinsically safe for use in coal mines.

1. GENERAL DISCUSSION

1.1 Background

1.1.1 History of Procedure

The fully validated NIOSH air sampling procedure for DNT recommends the use of a 37-mm diameter mixed cellulose ester filter connected in series with a midget bubbler containing ethylene glycol (Ref. 5.1.).

NIOSH has evaluated a collection procedure for TNT which resulted in a failure report. The failure report cited inadequate collection of TNT vapors. The test method utilized filter collection because initial data indicated that TNT would exist primarily as particulate. However, it was determined that generated test atmospheres contained a considerable vapor component which was not retained by the filter. The failure report also indicated poor storage stability of both generated and spiked samples. Volatilization and chemical decomposition were given as possible reasons for the low recoveries following storage. The failure report concluded that a particulate/vapor sampling train should definitely be used to collect TNT (Ref. 5.2.).

This work was undertaken because no adequate TNT sampling method was available and also because the DNT sampling method employs a bubbler which is inconvenient for field use. In addition, a common sampling procedure for DNT and TNT seems appropriate because the analytes may be present together.

This method recommends the use of a commercial, large size, two-section Tenax-GC sampling tube which has been modified by the addition of an 8-mm glass-fiber filter disc for the collection of DNT and/or TNT. The filter is placed inside the tube ahead of the first resin bed and is used to collect aerosols which may otherwise penetrate the sorbent. The 100-mg Tenax-GC adsorbent bed, located behind the filter, serves to collect vapors and also any analyte which may volatilize from the filter. The 50-mg Tenax-GC resin bed is used as a backup section.

Tenax-GC resin was selected for evaluation as a collection medium for DNT and TNT vapors because of published recommendations (Ref. 5.3.) and also because initial laboratory tests indicated that the material would prove to be adequate.

The air sampling device was evaluated by conducting experiments using a TSI Model 3050 Bergland-Liu Vibrating Orifice Monodisperse Aerosol Generator and a TSI Model 3076 Constant Output Atomizer sub-micrometer aerosol generator. A TSI Model 3200 Particle Mass

Monitor was used to detect the presence of an aerosol in the test atmospheres.

Glass fiber filters, midget bubblers containing toluene or acetone, Tenax-GC resin tubes and the recommended filter disc/Tenax-GC sampling device were evaluated as sampling media for DNT/TNT aerosol test atmospheres. Glass fiber filters proved ineffective because DNT was not well retained. Midget bubblers containing either toluene or acetone gave low results due to the breakthrough of both analytes. Sampling tubes containing Tenax-GC resin alone were not effective because sub-micrometer aerosols of both analytes penetrated the resin beds. Only the recommended sampling device provided consistent results without breakthrough of the analytes onto a backup section or device.

Several very adequate analytical techniques are available for DNT and TNT. These techniques include high performance liquid chromatography with ultraviolet detection (Ref. 5.1.), gas chromatography (GC) with electron capture detection (Ref. 5.3.), GC with flame ionization detection (Ref. 5.4.) and GC using a specialized chemiluminescent (TEA/EAP) detector (Ref. 5.5.). HPLC will be used by WESTON due to its sensitivity and accessibility to instrumentation.

1.1.2

Toxic effects (This section is for information only and should not be taken as the basis of OSHA policy).

TNT - Occupational exposure to TNT has been reported to occur by inhalation, ingestion and skin absorption. Symptoms of overexposure to TNT include liver damage, cyanosis, sneezing, cough, sore throat, peripheral neuritis, muscular pain, kidney damage, cataracts, sensitization dermatitis, leukoeytosis (large increase in the number of white cells in the blood) or leukopenia (abnormally low number of white cells in the blood) and aplastic anemia (Ref. 5.6.).

Toxic effects have been observed in humans at TNT levels well below the current OSHA PEL of 1.5 mg/m^3. The effects included upper respiratory and gastrointestinal complaints, anemia, liver function abnormalities and possibly aplastic anemia. A standard of 0.5 mg/m^3 (eight hour time-weighted exposure) was suggested for protection against adverse health effects due to TNT exposure (Ref. 5.10.).

TNT was reported to be mutagenic in the Ames Salmonella/microsome test (Ref. 5.11.).

A literature search resulted in no evidence for the carcinogenicity of TNT. Additional carcinogenicity testing of TNT is indicated because the agent is a bacterial mutagen and exposure has been shown to result in aplastic anemia. Aplastic anemia is a condition characterized by defective functioning of the blood-forming organs. Other chemicals which cause aplastic anemia have been identified as carcinogens (Ref. 5.10.).

1.1.3 Potential workplace exposure

TNT - The production of TNT was estimated to be 48 million pounds in 1976. TNT is used as a military explosive (Ref. 5.12.). It is also used as an intermediate in dyestuffs and in photographic chemicals (Ref. 5.13.).

1.1.4 Physical properties (Ref. 5.13. and 5.14)

	TNT
Molecular weight	227.13
Physical appearance	pale yellow solid
UV 1 maximum, nm	225
Melting point, °C	82
Boiling point, °C	240 (explodes)
Density, g/mL	1.654
Solubility:	
Water	insoluble
Alcohol	slightly soluble
Ether	soluble
Acetone	soluble
Benzene	soluble

Synonyms (Ref. 5.15.)

TNT CAS 118-96-7
benzene,2-methyl-1,3,5-trinitro; entsufon;
TNT; tolite; trinitrotoluene; s-trinitrotoluene;
2,4,6-trinitrotoluene; triton;
2,4,6-trinitrotoluol.

1.2 Limit Defining Parameters (The analyte air concentrations listed throughout this method are based on an air volume of 60 L and a desorption volume of 3 mL.)

1.2.1 Detection limits of the analytical procedure

The detection limits of the analytical procedures were 0.37 ng for TNT per injection. This was the amount of analyte which gave peaks

whose heights were about five times the height of the baseline noise.

1.2.2 Detection limits of the overall procedure

The detection limits of the overall procedure for TNT were 1.23 μg (21 μ/m³) per sample. These were the amounts of analytes spiked on the sampling device which allowed recoveries approximately equal to the detection limits of the analytical procedure.

1.2.3 Reliable quantitation limits

The reliable quantitation limits for TNT were 1.23 μ (21 μg/m³) per sample. These were the smallest amounts of the analytes which could be quantitated within the requirements of a recovery of at least 75% and a precision (1.96 SD) of ± 25% or better.
The reliable quantitation limits and detection limits reported in this method are based upon optimization of the instrumentation for the smallest possible amount of analytes. When the target concentration of an analyte is exceptionally higher than these limits, they many not be attainable at routine operating parameters.

1.2.4 Sensitivity

The sensitivity may vary with the particular instrument used in the analysis.

1.2.5 Recovery

The recoveries of TNT from samples used in the 19 day ambient temperature test were 93.7%, respectively, relative to control samples. These were recoveries at day 19, determined from the linear regression line of the storage data. The recovery of the analyte from the collection device following storage must be at least 75%.

1.2.6 Precision (analytical procedure only)

The pooled coefficient of variation obtained from replicate determinations of analytical standards at 0.5, 1 and 2 times the target concentration was 0.015 for TNT.

1.2.7 Precision (overall procedure)

The precisions at the 95% confidence level for the 19 day ambient temperature storage test were ± 16.1% for TNT. These values each include an additional 5% for sampling effort. The overall

procedure must provide results at the target concentrations that were ± 25% at the 95% confidence level.

1.2.8 Reproducibility

Six spiked samples and a draft copy of this procedure were given to a chemist associated with this evaluation. The samples were analyzed after 6 days of storage at ambient temperature. The average recoveries (corrected for desorption efficiencies) were 98.0% for TNT. The standard deviations were 9.3% for TNT.

1.3 Advantages

1.3.1 The sampling and analytical procedures are precise reliable and convenient.

1.3.2 Air samples are stable even when stored at ambient temperature for 19 days.

1.4 Disadvantages

1.4.1 This method has not been field tested.

1.4.2 The sampling device is not commercially available.

1.4.3 The HPLC method is non-selective.

2. SAMPLING PROCEDURE

2.1 Apparatus

2.1.1. Samples are collected by use of a personal sampling pump that can be calibrated to within ± 5% of the recommended flow rate with the sampling device in line. The sampling pump must be certified by NIOSH and/or MSHA as intrinsically safe for use in coal mines.

2.1.2 Samples

Samples are collected on laboratory modified, commercial, Tenax-GC resin sampling tubes. SKC, Inc. Tenax-GC resin tubes (catalog no. 226-35-03) were used to prepare the sampling device used in this evaluation. The SKC tube has two sections of 35/60 mesh resin separated by a glass wool plug. The front (sampling) section contains 100 mg of resin; the back section contains 50 mg. The sections are held in place by glass wool plugs in an 8 mm OD X 100 mm long glass tube.

The laboratory modification of the sampling tubes is performed as follows: Remove the flame sealed tip of the glass sampling tube nearest the 100-mg section of the resin. Leave about 2.5 cm of glass tubing in front of the 100-mg resin bed. Remove the steel lockspring wire. Prepare Teflon-support rings by cutting 6-mm OD, 4-mm ID along its 0.5-cm length to permit its easy insertion into the sampling tube. Place a Teflon-support ring on top of the exposed glass wool plug of the sampling tube. Be careful not to compress the glass wool. Severe compression of the glass wool will cause high back pressures when sampling. Prepare 8-mm glass fiber filter discs by using a number 4 cork borer to cut the discs from Gelman Type A glass fiber filters. Place an 8-mm filter disc inside the sampling tube by tamping the oversize filter on top of the Teflon-support ring with a glass rod or similar object. Place another Teflon-support ring on top of the filter so that the filter disc is sandwiched between the two support rings. Fire-polish the cut-end of the glass sampling tube for safety. Cap the modified device with one of the sealing caps that are included with the SKC Tenax-GC resin tubes.

2.2 Reagents

None required.

2.3 Technique

2.3.1 Break open the closed end of the laboratory modified Tenax-GC resin sampling tube. Remove and save the sealing cap on the front of the device. Connect the device to a NIOSH and/or MSHA certified sampling pump with flexible tubing. Position the tube so that sampled air first passes through the filter disc and then into the larger resin bed. Sampled air should not pass through any hose or tubing before entering the sampling tube.

2.3.2 Place the sampling tube vertically in the employee's breathing zone.

2.3.3 After sampling, seal the tube immediately with plastic caps and wrap it lengthwise with OSHA Form 21.

2.3.4 Submit at least one blank for each sample set. The blank should be handled in the same manner as samples, except that no air is drawn through it.

2.3.5 List any potential interferences on the sample data sheet.

2.3.6 Ship bulk material samples in a separate container to prevent contamination of the air samples. Shipping restrictions may apply to TNT bulk samples.

2.4 Breakthrough

Several studies were performed to investigate breakthrough and the collection efficiency of the air sampling device. No breakthrough from the 100-mg to the 50-mg resin bed was observed when the recommended air sampler was used.

2.5 Desorption efficiency

The average desorption efficiencies for TNT from samples spiked at 0.5, 1 and 2 times the OSHA PEL were 95.8%.

2.6 Recommended air volume and sampling rate

2.6.1 The recommended air volume is 60 L. The recommended air volume was not selected because of breakthrough problems but because the filter disc was found to be somewhat susceptible to plugging. It was observed that the filter could partially plug when TNT concentrations were significantly higher than the PEL.

When, however, the levels were near the PEL, filter plugging was not significant, even when the test was sampled for extended periods. The 60 L recommended air volume should provide an adequate safety margin to prevent filter plugging.

2.6.2 The recommended air sampling rate is 100 cc/min to 1 L/min.

2.7 Interferences (sampling)

2.7.1 Any compound that elutes by HPLC at the same retention time and responds to UV detection.

2.7.2 Suspected interferences should be reported to the laboratory on the sampling data sheets.

2.8 Safety precautions

2.8.1 The air sampling pump must be certified by NIOSH and/or MSHA as intrinsically safe for use in coal mines.

2.8.2 Exercise due caution when breaking open the sampling tubes. Take measures to prevent cuts from the sharp ends of the broken glass tubes.

2.8.3 Attach the sampling equipment to the worker in such a manner that it will not interfere with work performance or safety.

2.8.4 Follow all safety practices that apply to the work area being sampled.

3. ANALYTICAL PROCEDURE

APPARATUS

3.1 HPLC equipped with auto-sampler for 50 ml injection and a variable wavelength UV detector.

3.1.2 Dupont Zorbex ODS 250 mm x 4.6 mm - Standard Analytical Column.

3.1.3 Vials, 4-mL with Teflon-lined caps.

3.1.4 Volumetric flasks, pipets and syringes for preparing standards, making dilutions and making injections.

3.2 Reagents

3.2.1 HPLC grade acetone

3.2.2 HPLC grade acetonitrile

3.2.3 GC grade helium

3.2.4 TNT of known purity

3.2.5 HPLC grade water

3.2.6 HPLC grade methanol

3.3 Standard preparation

3.3.1 Prepare stock standards by diluting known amounts of TNT with acetonitrile.

3.3.2 Prepare an intermediate standard mixture using known volumes of the stock standards and diluting the mixture with acetonitrile.

3.3.3 Prepare a calibration curve daily covering the working range at the instrument in the method mobile phase.

3.3.4 Prepare standards at concentrations other than the OSHA PEL in order to generate calibration curves.

3.3.5 Store the standards in a freezer using well-sealed dark containers.

3.4 Sample preparation

3.4.1 Transfer both Teflon-support rings, the glass-fiber filter disc, the front glass wool plug, and the front Tenax-GC resin section to a 4-mL vial. Place the center glass wool plug and the Tenax-GC backup section in a separate vial. Discard the end glass wool plug.

3.4.2 Add 3 mL acetone to each vial.

3.4.3 Seal the vials with Teflon-lined caps and allow them to desorb for 1 hour. Shake the vials by hand with moderate force several times during the desorption time.

3.4.4 Wash the inside of the glass sampling tube into a separate vial with three 1-mL volumes of acetone.

3.4.5 Exchange each vial into 1 ml of acetonitrile, using nitrogen blowdown apparatus.

3.4.6 Dilute 200 ul of sample with 600 ul of 2:1 water/methanol on the day of analysis.

3.5 Analysis

3.5.1 HPLC Conditions
Injection Volume 50 ul
Flow Rate 1.5 ml/min
Mobile Phase: 50% water/34% methanol/16% acetonitrile

3.5.2 UV Detection Conditions

250 nm wavelength
0.005 AUFS

3.5.3 Detector response is measured with an electronic integrator.

3.5.4 Use an external standard method to prepare the calibration curve with at least 5 standard solutions of different concentrations. Prepare the calibration curve daily.

3.5.5 Bracket sample concentrations with standards.

3.6 Interferences

3.6.1 Any compound with the same general retention time as TNT and which also gives a detector response is a potential interference. Possible interferences should be reported to the laboratory with submitted samples by the industrial hygienist.

3.6.2 HPLC parameters mobile phase, may be changed to possibly circumvent interferences.

3.6.3 A useful means of structure designation is GC/MS. It is recommended this procedure be used to confirm samples whenever possible.

3.7 Calculations

3.7.1 Results are obtained by use of a calibration curve. The detector response, for each standard, is plotted against its concentration in ug/mL and the best straight line through the data points is determined by linear regression.

3.7.2 The concentration, in ug/mL, for a particular sample is determined by comparing its detector response to the calibration curve. If any TNT is found on the backup section or in the tubing wash, it is added to the amount found on the sampling section. This total amount is then blank corrected.

3.7.3 The TNT air concentration can be expressed using the following equation:

$$mg/m^3 \text{ TNT} = \frac{A \times B}{C \times D}$$

where A = ug/mL from 3.7.2
B = desorption volume
C = L of air sampled
D = desorption efficiency (decimal form)

3.8 Safety precautions (analytical)

3.8.1 Avoid skin contact and inhalation of all chemicals used.

3.8.2 Restrict the use of all chemicals to a fume hood whenever possible.

3.8.3 Check that the HPLC waste is connected to a fume hood.

3.8.4 Wear safety glasses and a lab coat in all laboratory areas.

4. BACKUP DATA

4.1 Detection limits of the analytical procedure.

The detection limits of the analytical procedure were -.37 ng for TNT per injection. These amounts produced peaks whose heights were about 5 times the height of the baseline noise.

4.2 Detection limits of the overall procedure

The detection limits of the overall procedure were 1.23 ug (21 ug/m^3) for TNT per sample. These were the amounts of analytes spiked on the sampling device which allow recoveries approximately equal to the detection limits of the analytical procedure.

4.3 Reliable quantitation limits

The reliable quantitation limits were determined by liquid spiking six air samplers with 1.23 ug TNT. These samples were desorbed with 3 mL acetone for one hour.

4.4 Desorption efficiency

The following data are the results of the analysis of modified Tenax-GC tubes spiked with TNT at 0.5 times, 1 times, and 2 times the OSHA PEL. The analytes were liquid spiked on the filter, the tubes were sealed and stored in a freezer to be analyzed the following day.

The difference between the means of the desorption efficiencies obtained by spiking different components of the sampling device at 2 times the OSHA PEL was tested using a two-tailed Student-t distribution. The computations showed that there was no statistical difference between the desorption efficiencies of the two media at the 0.05 level of significance. Therefore, the average desorption efficiencies reported following Table S-1 (95.8% for TNT) are those which should be used for this method.

Table S-1

Desorption Efficiency from Sampler When the Filter was Spiked

Times the OSHA PEL for TNT	0.5	1.0	2.0
ug/sample	46.2	92.4	185
	Desorption Efficiency, %		
	96.2	91.7	98.2
	94.5	95.6	93.0
	95.1	98.9	98.0
	94.6	94.2	96.4
	95.0	102	92.4
	95.0	97.7	96.4
	95.1	96.7	95.7

The average desorption efficiency for TNT was 95.8%.

To determine which of the desorption efficiencies were different for TNT spiked directly on Tenax-GC resin, six tubes were liquid spiked at 2 times the OSHA PEL. The tubes were sealed and stored overnight in a freezer.

Table S-2

Desorption Efficiency from Sampler When The Sorbent Bed was Spiked

Times the OSHA PEL for TNT	2.0
ug/sample	185

Desorption Efficiency, %
97.3
93.6
94.0
100.8
101.3
98.9
98.0