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Los Alamos Area Office
Albuquerque Operations Office
Los Alamos, New Mexico 87544

APR 08 1994



Mr. Joel Dougherty
Hazardous Waste Management Division
RCRA Enforcement Branch (ALONM)
Environmental Protection Agency, Region 6
1445 Ross Ave., Suite 1200
Dallas, TX 75202-2733

Dear Mr. Dougherty:

This letter transmits the final versions of the Los Alamos National Laboratory (LANL) deliverables and reports prepared in response to the following milestones:

- AR 100 Annual Report
- ATS 100 Program Management Plan for Generic Development, Design, Permitting, Construction, and Operation of Low-Level Mixed Waste (LLMW) Treatment Skids
- GAS 100 Gas Cylinder Work-Off Plan
- IFLL 100 Preconceptual Study to Identify Required LLMW Storage Upgrades
- HLL 100 Characterization Plan for Historical LLMW
- OSS 100 Feasibility of Diversified Scientific Services, Inc., Treatment
- WM 100 Waste Minimization Plan
- WM 200 Waste Minimization Annual Work Plan

The Department of Energy's (DOE) submittal of these documents to the Environmental Protection Agency (EPA) is required to ensure compliance with the Federal Facilities Compliance Agreement (FFCA). This FFCA has just been signed addressing hazardous and radioactive mixed wastes pursuant to the Resource Conservation and Recovery Act. The FFCA specified a due date for compliance with the referenced milestones within 30 days of the signature date (April 14, 1994).

We have prepared these documents to be consistent as possible in appearance and format. It is our expectation that this format would be used for all future deliverables, notices and reports prepared pursuant to the FFCA. Please advise us as to whether this format is acceptable or whether changes are desired.

An initial Annual Report was prepared and submitted herewith (AR 100). While it complies with the FFCA Appendix B requirements by providing information on the current status of implementation of waste minimization efforts (WM 100), treatment skid development, design, and construction (ATS 100), and the availability/applicability of off-site treatment capacity for low-level mixed wastes (OSS 100), it also provides discussion on

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Joel Dougherty

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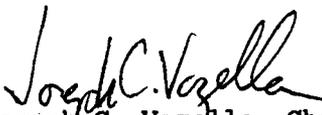
the status of all other FFCA milestones, as well as an explanation of the interrelationships among milestones. It is our expectation that this format would be used for all future annual reports.

Additionally, as you have discussed with my staff, changes and updates to the waste inventory information in the FFCA Appendix B enclosures which have occurred since their development will be included in the AR 100 report. Thereafter, the inventory information will be updated and reported to you annually in the AR 100 report, and modifications to the FFCA will be made, if necessary.

Notifications of the completion of milestones HW 100, HW 300, LD 100, and CAI 100 are being sent to you concurrently under separate cover.

Supporting documentation will be retained in DOE and LANL files to support the FFCA, and will be made available to EPA and the State of New Mexico upon request. If you have any questions regarding this activity, please contact Jon Mack of my staff at (505) 665-5026.

Sincerely,


Joseph C. Vozella, Chief
Environment, Safety, and Health
Branch

LESH:7JM-114

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~~SECRET~~
FFD

**GAS 100
GAS CYLINDER WORK-OFF PLAN**

Final

Submitted in partial fulfillment of the
requirements of the Federal Facility
Compliance Agreement addressing Hazardous
and mixed waste under the Resource
Conservation and Recovery Act

Los Alamos Area Office
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PREFACE

This Gas Cylinder Work-Off Plan (GAS-100) is being submitted to the United States Environmental Protection Agency (EPA) by the Department of Energy (DOE) and Los Alamos National Laboratory (LANL) in fulfillment of DOE's commitment to EPA under the Federal Facility Compliance Agreement (FFCA) developed pursuant to the Land Disposal Restrictions (LDR) requirements of the Resource Conservation and Recovery Act (RCRA), as promulgated in 40 CFR Part 268. This Gas Cylinder Work-Off Plan is provided as a deliverable in compliance with Milestone GAS-100 in Appendix B of the FFCA.

The FFCA Appendix B, outlines the actions necessary to ensure that gas cylinders shipped off site for treatment or disposal contain no added measurable radioactivity. A quality assurance (QA) procedure has been developed to ensure that cylinders originating from radiation control areas contain no added radioactivity. Using the QA procedure, the gas cylinders in waste categories listed in Table II, Attachment A of Appendix B of the FFCA, will be evaluated, and those cylinders found not to contain radioactive waste will be shipped off site for treatment. This work-off plan defines the approach and schedule that will be followed to treat these wastes. On 6 occasions, gas cylinders have already been shipped off site for treatment or disposal. Of the 678 original gas cylinders, reflection in Appendix B, Table II approximately 275 gas cylinders have been shipped off site. By June 1, 1994 all the gas cylinders addressed in this work-off plan will have been either shipped off site or added to one of the categories listed in Section 5.0 of this work-off plan and managed accordingly.

The following table discusses the LDR FFCA milestones that relate to GAS-100 and the nature of that interrelationship:

PRIMARY MILESTONE	RELATED MILESTONE	NATURE OF INTERRELATIONSHIP
GAS 100	HLL 100	The schedule and sequence for treatment of certain gas cylinders identified in the Gas Cylinder Work-Off Plan may need to be included in the Low-Level Mixed Waste (LLMW) work-off plan.
	HLL 200	The schedule and sequence for treatment of certain gas cylinders identified in the Gas Cylinder Work-Off Plan may need to be included in the LLMW prioritization plan.
	HW 600	Information developed from the implementation of the Gas Cylinder Work-Off Plan may need to be included in the LLMW work-off plan for the HWTF.

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LIST OF ACRONYMS

ACIS	Automated Chemical Inventory Systems
AET	Applied Environmental Technologies
ALARA	As Low As Reasonably Achievable
ATLAS	Advanced Testing for Actinide Separations
BAT	Best Available Technology
BDAT	Best Demonstrated Available Technology
BEJ	Best Engineering Judgment
BIF	Boiler and Industrial Furnace
CAI	Controlled-Air Incinerator
CAMs	Continuous Air Monitors
CFC	Chlorinated Solvents
CFR	Code of Federal Regulations
CLS	Analytical Chemistry Group
CWM	Chemical Waste Management, Inc.
CWDR	Chemical Waste Disposal Request
DOE	U.S. Department of Energy
DOE/AL	DOE Albuquerque Operations Office
DOT	Department of Transportation
DSSI	Diversified Scientific Services, Inc.
EPA	U.S. Environmental Protection Agency
ERC	Earth Resources Corporation
ES&H	Environment, Safety, and Health
FERC	Federal Energy Regulatory Commission
FFCA	Federal Facility Compliance Agreement
FY	Fiscal Year
GCP	Gas Cylinder Project
GSA	General Services Administration
HEPA	High Efficiency Particulate Air Filter
HSWA	Hazardous and Solid Waste Amendments
HWFP	Hazardous Waste Facility Permit
HWTF	Hazardous Waste Treatment Facility
ICP	Inductively Coupled Plasma
IPC	Industrial Partnership Center
JCI	Johnson Control Incorporated
KOP	Knowledge of Process
LAMPF	Los Alamos Meson Physics Facility
LANL	Los Alamos National Laboratory
LAO	LANL Assessment Office
LDR	Land Disposal Restriction
LLMW	Low-Level Mixed Waste
LLW	Low-Level Radioactive Waste
LP	LANL Procedures
MSDS	Material Safety Data Sheet
MWRSF	Mixed Waste Receiving and Storage Facility
NEPA	National Environmental Policy Act
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NMED	New Mexico Environmental Department
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission

LIST OF ACRONYMS
(Continued)

PPAC	Pollution Prevention Awareness Campaign
PRD	Program Required Document
PTS	Project Tracking System
PWA	Process Waste Assessments
QA	Quality Assurance
QAP	Quality Assurance Plan
RCRA	Resource Conservation and Recovery Act
R&D	Research and Development
R&M	Redistribution and Marketing Center
RES	Rollins Environmental Services
RMMA	Radioactive Material Management Area
RSWD	Radioactive Solid Waste Disposal Record
SOP	Standard Operating Procedure
SSP	Site Specific Plans
SWDA	Solid Waste Disposal Act
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
TRU	Transuranic
TSCA	Toxic Substance Control Act
TSDF	Treatment, Storage, or Disposal Facility
UBC	Uniform Building Code
UL	Underwriters Laboratories
ULISSES	Uranium Line for Special Separation Sciences
WAC	Waste Acceptance Criteria
WBS	Work Breakdown Structure
WIPP	Waste Isolation Pilot Plant
WMC	Waste Management Coordinator
WMPO	Waste Minimization Program Office
WPF	Waste Profile Form

GAS 100 GAS CYLINDER WORK-OFF PLAN

1.0 INTRODUCTION

In 1991, the Los Alamos National Laboratory (LANL) conducted a major campaign, the Gas Cylinder Project (GCP), in which waste gas cylinders were collected from generator sites around LANL and transported to permitted and interim status storage areas at Technical Area (TA) 54. The GCP collected 678 gas cylinders in the waste categories listed in Table II, Attachment A of the Appendix B. Table I lists the number of gas cylinders by Federal Facility Compliance Agreement (FFCA) waste category and by shipment. These cylinders were considered legacy waste (i.e., in some cases, their origin was unknown) and were analyzed for chemical constituents by Earth Resources Corporation (ERC) and for radioactive contamination by Chem-Nuclear, Inc. and LANL's Analytical Chemistry Group (CST-1, formerly CLS-1). At that time, LANL had made arrangements to ship most of the cylinders, found to contain no added radioactivity, to Rollins Environmental Services (RES) in Deer Park, Texas.

On May 17, 1991, the Department of Energy (DOE) issued a directive imposing a moratorium on the shipment of Resource Conservation and Recovery Act (RCRA) or Toxic Substances Control Act (TSCA) waste to commercial facilities not licensed by the Nuclear Regulatory Commission or an agreement state if the waste originated in a radiation area. The moratorium was established to review controls at each DOE facility, to prevent shipping radioactive waste off site to unlicensed facilities. A radiation control area is defined by DOE in 10 CFR 835.2(a) and the DOE Radiological Control Manual as "any area to which access is managed in order to protect individuals from exposure to radiation and/or radioactive materials."

Because many of these cylinders originated in radiation control areas, LANL must determine whether they have measurable, added radioactivity before their release to commercial Treatment, Storage, or Disposal Facilities (TSDFs). LANL developed a quality assurance procedure to ensure that cylinders contain no added radioactivity prior to shipments.

2.0 ACTIVITIES TO DATE

LANL has conducted a confirmatory radiation survey of a representative sample of the gas cylinders remaining in storage. LANL examined data from the survey and determined that none of these cylinders contained measurable, added radioactivity. Two-hundred seventy-five gas cylinders have been shipped off site since March 1993.

Cylinder storage and handling has been upgraded at TA-54, Area L. Upgrades include paving of the storage area, electrically grounding storage racks, replacing all wooden crates with steel baskets, and permanently covering the gas cylinder storage area. All related records and labels are periodically reviewed to assure accuracy and quality.

3.0 QUALITY ASSURANCE PROCEDURES FOR RELEASE AND SHIPMENT OF LEGACY CYLINDERS

A quality assurance checklist, Appendix A, has been developed, and will be completed for each cylinder to be released for off-site treatment or disposal. Six sets of checklists corresponding to the six shipments, have been completed. The checklist includes the following items:

- A validation of EPA waste codes. EPA waste codes are assigned based on ERC analysis reports.

FFCA GAS CYLINDERS - STATUS OF OFF-SITE SHIPMENTS

<u>Waste Category</u>	<u>Total</u>	<u>05-21-93</u>	<u>06-25-93</u>	<u>07-28-93</u>	<u>11-04-93</u>	<u>12-22-93</u>	<u>01-28-93</u>	Percent of Cylinders Shipped Off Site
		<u>Shipment</u>	<u>Shipment</u>	<u>Shipment</u>	<u>Shipment</u>	<u>Shipment</u>	<u>Shipment</u>	
Gas Cylinders D001 Hydrogen	28	11	2	0	0	0	0	46
Gas Cylinders D001 Ignitable gases	195	37	16	2	7	5	4	36
Gas Cylinders D002 Corrosive gases	143	10	17	1	4	20	6	41
Gas Cylinders P-Wastes								
P031	3	0	0	0	0	0	0	0
P056	140	0	0	0	0	19	9	20
P076	98	0	0	0	85	0	0	87
P078	22	0	0	0	14	0	0	64
P095	7	0	0	0	0	0	0	0
P096	3	0	0	0	0	0	0	0
Gas Cylinders U-Wastes								
U029	4	0	0	0	0	0	0	0
U075	15	2	0	0	2	0	0	27
U134	7	0	0	0	0	0	0	0
Gas Cylinders Chemical Products								
P095	7	0	0	0	0	0	0	0
U045	4	0	1	0	0	0	0	25
U075	-	-	See	U-Wastes	Above	-	-	-
U121	1	1	0	0	0	0	0	100
U226	1	0	0	0	0	0	0	0
Total Cylinders	678	61	36	3	112	44	19	41

LANL FFCA Deliverable GAS-100

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TABLE 1

- DOT shipping descriptions to meet requirements of Federal Docket HM-181. (Cylinders were shipped to their current storage location under the previous DOT regulations)
- A verification of radioactive analyses by Chem-Nuclear and LANL to ensure that cylinders released off site contain no added measurable radioactivity and pose no threat to the public and the environment.
- A verification of off-site TSDF approvals for acceptance of cylinders and their contents.
- A visual check of cylinders verifying that all labels, markings and cylinder condition comply with EPA and DOT regulations before shipment off site.

Additional activities include preparing of the Uniform Hazardous Waste Manifest or shipping paper for materials to be recycled and LDR notification forms (if necessary) at the time the waste shipment is prepared.

4.0 OFF-SITE TREATMENT OPTIONS

The following commercial TSDFs have been identified for treating or recycling compressed gases and disposing or salvaging empty cylinders. Use of these facilities is contingent on establishing contractual agreements and completing facility audits.

- *Rollins Environmental Services (RES), Deer Park, Texas.* This is a RCRA-permitted facility currently under contract to LANL. An audit of RES-Deer Park was conducted by LANL personnel before the first scheduled shipment. At this facility, contents of gas cylinders are aspirated into a permitted kiln. Of all commercial TSDF's currently accepting compressed gases in cylinders, RES-Deer Park offers the most extensive list (see Appendix B) of acceptable gases and cylinder types. Nevertheless, certain gases regulated under RCRA are not acceptable because of their incineration parameters or because they are excluded from RES's operating permits. Most of the waste gas cylinders characterized as containing LDR wastes will be shipped to RES-Deer Park. Others may be shipped to other commercial facilities.
- *MG Industries, Morrisville, Pennsylvania.* As a large manufacturer and distributor of industrial and specialty gases, MG Industries operates a cylinder reconditioning program. This facility was audited by LANL on September 17, 1992. Cylinders are received at the facility, analyzed twice for verification, and thermally or chemically treated to remove residual gases. The cylinders are then purged, hydrostatically tested, and placed back into useful service. Appendix C is a list of acceptable gases and cylinder types. Both the Pennsylvania Department of Environmental Resources and EPA have determined that cylinders received by MG Industries for reuse are not subject to RCRA, as demonstrated in Appendix D. Gas cylinders that are suitable for reuse will be shipped to MG Industries.
- *BDT, Inc., Clarence, New York.* This is a RCRA-permitted facility currently under contract to LANL. A Laboratory audit was completed at the facility. At this facility, gases are chemically treated (e.g., acid gases are neutralized via passage through a column of sodium hydroxide pellets.) The list of gases and cylinder types acceptable at BDT is limited, as demonstrated in Appendix E. Waste gas cylinders not accepted at BDT may be shipped to other commercial facilities.
- *Liquid Carbonic, Corunna, Ontario, Canada.* This is a gas recycling facility available to LANL through its contact with Chemical Waste Management, Inc. Use of this facility would be contingent on an audit by Laboratory personnel in accordance with DOE Orders and would require notice per compliance with 40 CFR 262, Subpart E. At this time, LANL believes that this facility may not be needed, however it will remain as a potential option. At this facility, gases and liquids are transferred to new bottles for reuse. Appendix F is a list of acceptable gases and cylinder types. This process was

determined by EPA to be compliant with 40 CFR 261.2, as demonstrated in Appendix G. Some gases that cannot be accepted at RES-Deer Park or BDT (e.g., nitrogen oxide compounds and hydrogen sulfide) may be acceptable at Liquid Carbonic.

5.0 LDR CYLINDERS WITH NO OFF-SITE TREATMENT OR DISPOSAL OPTION YET IDENTIFIED

Off-site options have not been identified for the following categories of cylinders:

- Cylinders characterized as radioactive during LANL's 1990-1991 GCP and subsequent analysis by LANL. These cylinders are listed in waste categories in Table II Attachment A of Appendix B of the FFCA. These cylinders are currently in storage as LLMW at TA-54, Area L. These cylinders will be subject to the reporting and work-off requirements that apply to other LLMW as specified in the FFCA, specifically as described in HLL 100 *LLMW Characterization Plan*, CAI 300 *LLMW Work-Off Plan for Incinerable Wastes*, and HW 600 *LLMW Work-Off-Plan for the Hazardous Waste Treatment Facility* treatment skids.
- Nonradioactive cylinders for which no treatment option could be identified before completing this work-off plan. LANL will continue to evaluate treatment and disposal options for gases in this category. These cylinders will be added to Table IV, Attachment A of Appendix B of the FFCA in the next annual report. As cylinders are determined to be nonradioactive, they will be added to the inventory in Table IV. Modifications to Table IV will be requested in the July 30, 1994 *Annual Report* and annually thereafter. They will also be reviewed as part of FFCA milestones HLL 100, CAI 300, or HW 600
- Nonradioactive cylinders determined not to be shippable under DOT regulations. LANL is pursuing the recontainerization of these gases on site. Once these cylinders are recontainerized, if they are treatable, they will be shipped to the appropriate off-site facility using the process described in Sections 3.0 and 4.0. If they are not treatable, they will be recontainerized, stored on site, and will be handled as nonradioactive cylinders for which no treatment option has been identified.

6.0 SCHEDULE FOR OFF-SITE SHIPMENT OF GAS CYLINDERS

All shippable cylinders from the GCP which have been characterized as nonradioactive, and for which there is available capacity, and which can be shipped for off-site treatment as described in Section 4.0, will be shipped offsite by June 1, 1994.

7.0 FUTURE TREATMENT AND DISPOSAL OF LEGACY WASTE GAS CYLINDERS

LANL continues to identify legacy waste cylinders which are not adequately characterized for treating and disposing in compliance with EPA regulations. These cylinders, which were not a part of the GCP or this work-off plan and will continue to be stored and characterized further to determine hazardous and radioactive components and suitability for off-site treatment. Tables II and IV, Attachment A of Appendix B of the FFCA and any applicable schedules will be updated as these cylinders are received and characterized. This information will be submitted in AR 100 as required by the Agreement. LANL is planning to manage these cylinders in a process similar to the GCP and this work-off plan QA procedures.

Appendix A
Chemical and Mixed Waste Operations Section Gas Cylinder Quality Assurance Checklist

**CHEMICAL AND MIXED WASTE OPERATIONS SECTION
GAS CYLINDER QUALITY ASSURANCE CHECKLIST**

Cylinder Number: _____

GCP Number: _____

CLS Number: _____

A. DATABASE

Information	Confirmed	Date	Comments
Matches BEC printout			

B. FILE

Information	Confirmed	Date	Comments
ANALYTICAL			
GCP Analytical Sheet			
CLS Analytical Report			
Generator Certification Form			
RADIOLOGICAL			
Background Analysis Reviewed			
Radiation Data Reviewed			
Cylinder Approved as Nonradioactive			

C. DATA FORM

Information	Confirmed	Date	Comments
EPA HW Code(s)			
DOT Shipping Description (HM-181)			
Proper Shipping Name			
Hazard Class			
Identification (UN) Number			
Technical Name			
Hazard Zone			
Poison Inhalation Hazard			

D. CYLINDER

Information	Confirmed	Date	Comments
Acceptable Condition			
Nonregulated Marking			
EPA HW Marking			
• EPA HW Code(s)			
• DOT Shipping Name			
• DOT Identification (UN) Number			
DOT Primary Hazard Class Label			
DOT Secondary Hazard Class Label (number obliterated)			
DOT Tertiary Hazard Class Label (number obliterated)			

=====

E. TSDF APPROVAL

This cylinder has been accepted for treatment or recycling offsite by:

Rollins Deer Park _____
 BDT _____
 Liquid Carbonics _____
 MG Industries _____
 Other: _____

Signature _____ Date _____
 John Kelly, Technical Services Manager
 Dan Oakley, Transportation Manager

=====

F. FINAL APPROVAL

THIS CYLINDER MEETS ALL QUALITY CONTROL ELEMENTS FOR BEING SHIPPED OFFSITE.

Signature _____ Date _____
 John Kelly, Acting Section Leader
 Andy Montoya, Deputy Section Leader

INSTRUCTIONS FOR GAS CYLINDER QUALITY ASSURANCE CHECKLIST

CONFIRMATION of any item indicates that the item is present and contains the correct information. Confirmation is indicated by the initials of the reviewer/inspector.

A. DATABASE

Compare the information in the EM-7 database with the validated information in the printout provided by Benchmark. The database must be consistent with the validated information.

B. FILE

At least one of the following must be present in the file:

- GCP Analytical Sheet,
- CLS Analytical Report, or
- Generator Certification Form.

The Generator Certification Form is an acceptable record only if it meets the following criteria:

- lists the cylinder's chemical content;
- indicates the cylinder to be nonradioactive;
- is signed & dated by generator; and
- is stamped "Approved," signed and dated by an EM-7 person.

The file must also contain the Radiological Data Information for the cylinder. This form is an acceptable record only if it has been stamped "Approved" and signed by a Health Physicist. The "Approved" stamp and signature indicate that the Health Physicist has reviewed the radiological data and designated the cylinder as being nonradioactive.

C. DATA FORM

The Data Form must contain the appropriate EPA HW code(s) and the correct DOT shipping description. The DOT shipping description must be based on HM-181 and must include the shipping name, hazard class and identification number. The technical name of the cylinder contents, the hazard zone, and the words "Poison Inhalation Hazard" must also be present when applicable. This information will be based on the validated information provided by Benchmark.

D. CYLINDER

The cylinder must be confirmed as being in acceptable condition by inspecting the cylinder and completing the "Cylinder Inspection Form." This inspection form must be signed and attached to the Cylinder QA Checklist.

The cylinder must have on it either a blue/white "Nonregulated Waste" marking or a yellow/black EPA "Hazardous Waste" marking. The EPA HW marking must contain the following information:

- EPA HW codes
- DOT shipping name
- DOT identification number

The primary DOT hazard class label must be present on the cylinder. All secondary, etc. hazard class labels must also be present; however, the hazard class number on these must be obliterated.

All of the information on the cylinder must correspond to the information on the printout provided by Benchmark.

E. TSDF APPROVAL

Only the Technical Services Manager or the Transportation Manager is authorized to designate a treatment/recycling firm to transport and receive the gas cylinder.

F. FINAL APPROVAL

Only the Section Leader or the Deputy Section Leader is authorized to approve the cylinder to be transported offsite. Without this final approval signature, the cylinder may not be included in an off-site shipment.

This final approval signature indicates that the cylinder has met each required quality control element to the satisfaction of the Section Leader or the Deputy Section Leader.

Appendix B
List of Acceptable Gases and Cylinder Types for Rollins Chempack Inc., August 1992

GAS CYLINDER REFERENCE TABLE **ROLLINS** ENVIRONMENTAL SERVICES

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
557-99-3	ACETYL FLUORIDE	D001	8
74-86-2	ACETYLENE (1)	D001	2
	AIR		1
463-49-0	ALLENE	D001	2
7664-41-7	AMMONIA	D002	3
7783-70-2	ANTIMONY PENTAFLUORIDE		8
10025-91-9	ANTIMONY TRICHLORIDE		0
7783-56-4	ANTIMONY TRIFLUORIDE		0
140-57-8	ARAMITE		8
	ARCAT-71 CATALYST	D001, D003	0
7440-37-1	ARGON		1
7784-36-3	ARSENIC PENTAFLUORIDE	D001, D003, D004	9
7784-42-1	ARSINE	D004	8
	BAYGON,PT-250	D001	8
100-53-8	BENZYL MERCAPTAN MIXTURES (2)	D003	8
102-54-5	BIS(CYCLOPENTADIENYL) IRON	D001	0
1284-72-6	BIS(CYCLOPENTADIENYL) MAGNESIUM	D001, D003	0
	BIS(TRIFLUOROMETHYL) PEROXIDE	D001	9
6569-51-3	BORAZINE	D001, D003	0
10294-34-5	BORON TRICHLORIDE	D003	8
	BORON TRIETHYL	D001, D003	7
7637-07-2	BORON TRIFLUORIDE	D002	8
13863-41-7	BROMINE CHLORIDE	D001, D002	9
7789-30-2	BROMINE PENTAFLUORIDE	D001	9
7787-71-5	BROMINE TRIFLUORIDE	D001	9
74-96-4	BROMOETHANE	D001	2
74-83-9	BROMOMETHANE	U029	8

Revised August 1992

GAS CYLINDER REFERENCE TABLE



CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
598-73-2	BROMOTRIFLUOROETHYLENE	D001	6
75-63-8	BROMOTRIFLUOROMETHANE		6
106-99-0	BUTADIENE	D001	3
106-97-8	BUTANE	D001	2
109-79-5	BUTANETHIOL MIXTURES (2)	D001, D003	8
25167-67-1	BUTENE	D001	2
62202-86-2	BUTYL ETHYL MAGNESIUM	D002, D003	7
109-72-8	BUTYL LITHIUM	D001	0
693-04-9	BUTYL MAGNESIUM CHLORIDE	D001	2
109-79-5	BUTYL MERCAPTAN MIXTURES (2)	D003	8
107-00-6	BUTYNE	D001	2
124-38-9	CARBON DIOXIDE		1
75-15-0	CARBON DISULFIDE MIXTURES (2)	P022, D001, D003	3
630-08-0	CARBON MONOXIDE	D001	2
56-23-5	CARBON TETRACHLORIDE	U211	8
75-73-0	CARBON TETRAFLUORIDE		6
75-44-5	CARBONYL CHLORIDE	P095	8
353-50-4	CARBONYL FLUORIDE		8
463-58-1	CARBONYL SULFIDE MIXTURES (2)	D003	8
7782-50-5	CHLORINE		9
7790-89-8	CHLORINE MONOFLUORIDE	D001	9
13637-63-3	CHLORINE PENTAFLUORIDE	D001, D002	9
7790-91-2	CHLORINE TRIFLUORIDE		9
421-05-6	CHLORODIFLUOROACETONITRILE		3
75-68-3	CHLORODIFLUOROETHANE	D001	6
74-97-5	CHLORODIFLUOROMETHANE		6
12180-6	CHLOROFLUOROETHYLENE		6

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GAS CYLINDER REFERENCE TABLE

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
593-70-4	CHLOROFLUOROMETHANE		6
67-66-3	CHLOROFORM	U044	3
74-87-3	CHLOROMETHANE	U045, D001	2
79-53-8	CHLOROPENTAFLUROACETONE		8
76-15-3	CHLOROPENTAFLUROETHANE		6
2804-50-4	CHLOROPENTAFLUROPROPENE		6
76-06-2	CHLOROPICRIN		8
75-88-7	CHLOROTRIFLUOROETHANE		6
79-38-9	CHLOROTRIFLUOROETHYLENE	D001	6
75-72-9	CHLOROTRIFLUOROMETHANE		6
13007-92-6	CHROMIUM (HEXA)CARBONYL	D007	0
460-19-5	CYANOGEN MIXTURES (2)	P031, D003	8
110-87-7	CYCLOHEXANE	D001	2
287-92-3	CYCLOPENTANE	D001	2
75-19-4	CYCLOPROPANE	D001	2
50-29-3	DDT (DICHLORODIPHENYL TRICHLOROETHANE)	U061	10
62-73-7	DDVP		8
7782-39-0	DEUTERIUM	D001	2
	DEUTERIUM BROMIDE	D002	8
	DEUTERIUM CHLORIDE	D002	4
14333-26-7	DEUTERIUM FLUORIDE	U134, D002	8
	DEUTERIUM IODIDE	D002	8
	DEUTERIUM SELENIDE	D001, D010	8
	DEUTERIUM SULFIDE MIXTURES (2)	D003	3
19287-45-7	DIBORANE (3)	D001, D003	10
75-61-6	DIBROMODIFLUOROMETHANE		0
27156-03-2	DICARBOXIMIDE		10

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GAS CYLINDER REFERENCE TABLE



CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
106-46-7	DICHLOROBENZENE	U072, D027	8
76-14-2	DICHLORODIFLUOROETHANE		6
27156-03-2	DICHLORODIFLUOROETHYLENE		6
75-71-8	DICHLORODIFLUOROMETHANE	U075	6
75-43-4	DICHLOROFLUOROMETHANE		6
4109-96-0	DICHLOROSILANE	D001	7
76-14-2	DICHLOROTETRAFLUOROETHANE		6
306-83-2	DICHLOROTRIFLUOROETHANE	D001	6
62-73-7	DICHLOROVINYL DIMETHYL PHOSPHATE		8
12001-89-7	DICUMENE CHROMIUM	D001, D007	7
96-10-6	DIETHYL ALUMINUM CHLORIDE	D001, D003	7
1586-92-1	DIETHYL ALUMINUM ETHOXIDE	D001	7
109-89-7	DIETHYL AMINE	D001, D002	3
592-02-9	DIETHYL CADMIUM	D003, D006	0
	DIETHYL SULFIDE BORANE MIXTURES (2)	D001, D003	10
557-20-0	DIETHYL ZINC	D001, D003	7
75-37-6	DIFLUOROETHANE	D001	6
75-38-7	DIFLUOROETHYLENE	D001	8
1779-25-5	DIISOBUTYL ALUMINUM CHLORIDE	D001, D003	7
1191-15-7	DIISOBUTYL ALUMINUM HYDRIDE	D001, D003	7
124-40-3	DIMETHYL AMINE	U092, D001	3
506-82-1	DIMETHYL CADMIUM	D001, D003, D006	0
353-66-2	DIMETHYL DIFLUOROSILANE	D001	7
115-10-6	DIMETHYL ETHER	D001	2
565-59-3	DIMETHYL PENTANE	D001	2
463-82-1	DIMETHYL PROPANE	D001	2
593-79-3	DIMETHYL SELENIDE (SELENIUM)	D001, D003, D010	10

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GAS CYLINDER REFERENCE TABLE

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
1111-64-6	DIMETHYL SILANE	D001	7
	DIMETHYL SULFIDE BORANE MIXTURES (2)	D001, D003	10
544-97-8	DIMETHYL ZINC	D001, D003	7
1590-87-0	DISILANE	D001, D003	7
112-55-0	DODECYL MERCAPTAN (DDM) MIXTURES (2)	D003	8
112-55-0	DODECYL MERCAPTAN MIXTURES (2)	D003	8
	DYMEL (SEE PAGE # 16)		
115-29-7	ENDOSULFAN	P050	10
74-84-0	ETHANE	D001	2
64-17-5	ETHANOL	D001	2
107-00-6	ETHYL ACETYLENE	D001	2
64-17-5	ETHYL ALCOHOL	D001	2
563-43-9	ETHYL ALUMINUM DICHLORIDE	D001, D003	10
12075-68-2	ETHYL ALUMINUM SESQUICHLORIDE	D002, D003	10
75-04-7	ETHYL AMINE	D001	3
74-96-4	ETHYL BROMIDE	D001	2
75-00-3	ETHYL CHLORIDE	D001	2
60-29-7	ETHYL ETHER	U117, D001	2
353-36-6	ETHYL FLUORIDE	D001	6
925-90-6	ETHYL MAGNESIUM BROMIDE	D001, D003	7
540-67-0	ETHYL METHYL ETHER	D001	2
78-10-4	ETHYL SILICATE	D001	3
74-85-1	ETHYLENE	D001	2
106-93-4	ETHYLENE DIBROMIDE/METHYL BROMIDE		8
75-21-8	ETHYLENE OXIDE	U115, D001	8
75-37-6	ETHYLIDENE FLUORIDE	D001	6
7782-41-4	FLUORINE	D001, D002	9
353-36-6	FLUOROETHANE	D001	6

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ROLLINS
ENVIRONMENTAL SERVICES

GAS CYLINDER REFERENCE TABLE

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
75-02-5	FLUROETHYLENE		8
74-46-7	FLUROFORM		6
593-53-3	FLUROMETHANE	D001	8
352-13-6	FLUOROPHENYL MAGNESIUM BROMIDE		10
818-92-8	FLUOROPROPENE	D001	2
64-18-6	FORMIC ACID	U123, D002	8
	FREON (SEE PAGES # 16 & 17)		
	GENETRON (SEE PAGE # 17)		
7782-65-2	GERMANE	D001	8
10038-98-9	GERMANIUM TETRACHLORIDE	D003	8
7783-58-6	GERMANIUM TETRAFLUORIDE		10
	HALON (SEE PAGE # 17)		
7440-59-7	HELIUM		1
375-00-8	HEPTAFLUROBUTYRONITRILE		8
142-82-5	HEPTANE	D001	2
407-250	HEXAFLUROACETIC ANHYDRIDE	D002, D003	8
648-16-2	HEXAFLUROACETONE		8
1522-22-1	HEXAFLUROACETYL ACETONE	D002	8
692-50-2	HEXAFLUROBUTYNE	D001	6
	HEXAFLUROBUTYRONITRILE		10
697-11-0	HEXAFLUROCYCLOBUTENE		6
76-16-4	HEXAFLUROETHANE		6
1522-22-1	HEXAFLUROPENTANE DIONE	D002	8
116-15-4	HEXAFLUROPROPENE		6
116-15-4	HEXAFLUROPROPYLENE		6
110-54-3	HEXANE	D001	2
111-31-9	HEXYL MERCAPTAN MIXTURES (2)	D003	8
302-01-2	HYDRAZINE	U133, D001	0

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GAS CYLINDER REFERENCE TABLE

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
1333-74-0	HYDROGEN	D001	2
10035-10-6	HYDROGEN BROMIDE	D002	8
7647-01-0	HYDROGEN CHLORIDE	D002	4
7664-39-3	HYDROGEN FLUORIDE	U134, D002	8
10034-85-2	HYDROGEN IODIDE	D002	8
7783-07-5	HYDROGEN SELENIDE	D001, D010	8
7783-06-4	HYDROGEN SULFIDE MIXTURES (2)	U135, D003	3
	INSTAFOAM PART-A	D003	8
	INSTAFOAM PART-B		1
7783-66-6	IODINE PENTAFLUORIDE	D001	9
75-28-5	ISOBUTANE	D001	2
115-11-7	ISOBUTENE	D001	2
	ISOBUTYL ALUMINUM DICHLORIDE	D001, D003	7
115-11-7	ISOBUTYLENE	D001	2
540-84-1	ISOOCTANE	D001	2
78-78-4	ISOPENTANE	D001	2
513-35-9	ISOPENTENE	D001	2
67-63-0	ISOPROPANOL	D001	2
	ISOTRON (SEE PAGE # 17)		
7439-90-9	KRYPTON		1
3689-24-5	LETHALAIRE	D001	8
112-56-1	LETHANE		8
58-89-9	LINDANE	U129	8
68476-85-7	LIQUIFIED PETROLEUM GAS (LPG)	D001	2
109-18-9	LITHUM DIISOPLOPYL AMIDE	D001	8
	MAGALA 0.5E CATALYST	D002, D003	10
	MAGALA 7.5E CATALYST	D002, D003	10
	MAPP GAS	D001	2

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GAS CYLINDER REFERENCE TABLE



CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
74-82-8	METHANE	D001	2
74-93-1	METHANE THIOL MIXTURES (2)	U153, D003	8
74-99-7	METHYL ACETYLENE	D001	2
12542-85-7	METHYL ALUMINUM SESQUICHLORIDE	D001, D003	10
74-89-5	METHYL AMINE		3
74-83-9	METHYL BROMIDE	U029	8
1679-09-0	METHYL BUTANE THIOL		10
513-35-9	METHYL BUTENE	D001	2
74-87-3	METHYL CHLORIDE	U045, D001	2
108-87-2	METHYL CYCLOHEXANE	D001	2
96-37-7	METHYL CYCLOPENTANE	D001	2
75-54-7	METHYL DICHLOROSILANE	D001, D002	7
115-10-6	METHYL ETHER	D001	2
593-53-3	METHYL FLUORIDE		8
60-34-4	METHYL HYDRAZINE	D001	10
74-88-4	METHYL IODIDE	U138	10
917-54-4	METHYL LITHIUM	D001, D003	7
75-16-1	METHYL MAGNESIUM BROMIDE	D001, D002, D003	8
676-58-4	METHYL MAGNESIUM CHLORIDE	D001, D003	4
917-64-6	METHYL MAGNESIUM IODIDE	D001, D003	7
74-93-1	METHYL MERCAPTAN MIXTURES (2)	U153, D003	8
691-38-3	METHYL PENTENE	D001	2
75-79-6	METHYL TRICHLOROSILANE	D001	7
373-74-0	METHYL TRIFLUOROSILANE	D001	10
107-25-5	METHYL VINYL ETHER	D001	2
75-10-5	METHYLENE FLUORIDE		6
7786-34-7	MEVINPHOS		8

GAS CYLINDER REFERENCE TABLE

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
7783-77-9	MOLYBDENUM HEXAFLUORIDE	D002	9
8030-30-6	NAPHTHA/PETROLEUM DISTILLATES	D001	2
7440-01-9	NEON		1
463-82-1	NEOPENTANE	D001	2
13463-39-3	NICKEL CARBONYL (3)	P073, D001	10
3236-82-6	NIOBIUM ETHOXIDE	D002, D003	8
102-43-9	NITRIC OXIDE	P076	0
7727-37-0	NITROGEN		1
10102-44-0	NITROGEN DIOXIDE (TETROXIDE)	P078	0
7783-54-2	NITROGEN TRIFLUORIDE		9
10544-73-7	NITROGEN TRIOXIDE		9
2696-92-6	NITROSYL CHLORIDE		9
10024-97-2	NITROUS OXIDE	D001	9
382-24-1	NONAFLUOROISOBUTANE	D002	8
360-89-4	OCTAFLUOROBUTENE		6
115-25-3	OCTAFLUOROCYCLOBUTANE		6
76-19-7	OCTAFLUOROPROPANE		6
113-48-4	OCTYL BICYCLOHEPTENE DICARBOXIMIDE		8
111-88-6	OCTYL MERCAPTAN MIXTURES (2)	D003	8
7782-44-7	OXYGEN	D001	9
7783-41-7	OXYGEN DIFLUORIDE	D001	9
4685-14-7	PARAQUAT		8
56-38-2	PARATHION	P089	8
1962-42-2	PENTABORANE	D003	0
374-27-6	PENTAFLUOROBUTENE	D001	6
79-53-8	PENTAFLUROCHLOROACETONE		8
354-33-6	PENTAFLUROETHANE		6
422-59-3	PENTAFLUROPROPIONILE CHLORIDE	D002	8

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GAS CYLINDER REFERENCE TABLE



CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
422-04-8	PENTAFLUOROPROPIONITRILE		8
109-66-0	PENTANE	D001	2
7616-94-6	PERCHLORYL FLUORIDE		9
354-32-5	PERFLUOROACETYL CHLORIDE		8
355-25-9	PERFLUOROBUTANE		6
360-89-4	PERFLUOROBUTENE		6
28677-00-1	PERFLUORODIMETHYL CYCLOBUTANE		6
76-16-4	PERFLUOROETHANE		6
382-21-8	PERFLUOROISOBUTENE		8
382-21-8	PERFLUOROISOBUTYLENE		8
76-19-7	PERFLUOROPROPANE		6
116-15-4	PERFLUOROPROPENE		6
116-15-4	PERFLUOROPROPYLENE		6
	PESTICIDES,INSECTICIDES,BIOCIDES (4)	D001	8
100-59-4	PHENYL MAGNESIUM CHLORIDE	D001, D003	7
75-44-5	PHOSGENE (5)	P095	8
7803-51-2	PHOSPHINE	P096	7
7647-19-0	PHOSPHOROUS PENTAFLUORIDE	D001, D002, D003	9
7789-60-8	PHOSPHOROUS TRIBROMIDE		4
7783-55-3	PHOSPHOROUS TRIFLUORIDE	D002	8
	PINANYL MERCAPTAN MIXTURES (2)	D003	4
7785-70-8	PINENE	D001	2
51-03-6	PIPERONYL BUTOXIDE		3
3478-94-2	PIPRON		3
463-49-0	PROPADIENE	D001	2
74-98-6	PROPANE	D001	2
115-07-1	PROPYLENE	D001	2

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GAS CYLINDER REFERENCE TABLE

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
74-99-7	PROPYNE	D001	2
8003-34-7	PYRETHRINS		8
8003-34-7	PYRETHRUM		8
	RACON 502		10
10453-86-8	RESMETHRIN		10
10453-86-8	RESMETHRIN	D001	3
10049-17-9	RHENIUM HEXAFLUORIDE	D002	0
7783-791	SELENIUM (HEXA)FLUORIDE	D001, D010	10
7783-79-1	SELENIUM (HEXA)FLUORIDE	D001, D010	9
7803-62-5	SILANE	D001	7
10026-04-7	SILICON TETRACHLORIDE		8
7783-61-1	SILICON TETRAFLUORIDE		8
17836-88-3	SODIUM ALUMINUM DIETHYL DIHYDRIDE	D001, D003	10
	SODIUM CHROMATE MIXTURES (6)	D002, D007	10
7646-78-8	STANNIC CHLORIDE		8
7772-99-8	STANNOUS CHLORIDE		8
10025-67-9	SULFUR CHLORIDE	D002, D003	10
13780-57-9	SULFUR CHLOROPENTAFLUORIDE		10
7446-09-5	SULFUR DIOXIDE		8
2551-62-4	SULFUR HEXAFLUORIDE		6
5714-22-7	SULFUR PENTAFLUORIDE		8
	SULFUR TETRACHLORIDE		10
7783-60-0	SULFUR TETRAFLUORIDE		8
7446-11-9	SULFUR TRIOXIDE		0
2699-79-8	SULFURYL FLUORIDE		8
2699-79-8	SULFURYL FLUORIDE		8
7783-80-4	TELLURIUM (HEXA)FLUORIDE		8
107-49-3	TEPP	P111	8

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GAS CYLINDER REFERENCE TABLE



CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
13463-39-3	TETRACARBONYL NICKEL (3)	P073, D001	10
27-18-4	TETRACHLOROETHYLENE	U210, D039	6
10026-04-7	TETRACHLOROSILANE		8
78-10-4	TETRAETHYL (ORTHO)SILICATE	D001	3
107-49-3	TETRAETHYL PYROPHOSPHATE	P111	8
811-97-2	TETRAFLUOROETHANE		6
116-14-3	TETRAFLUOROETHYLENE	D001	6
13847-65-9	TETRAFLUOROHYDRAZINE (3)	D001	10
75-73-0	TETRAFLUOROMETHANE		6
7783-61-1	TETRAFLUOROSILANE		8
463-82-1	TETRAMETHYL METHANE	D001	2
594-27-4	TETRAMETHYL TIN	D001	10
7772-99-8	TIN CHLORIDE		8
7646-78-8	TIN TETRACHLORIDE		8
7550-45-0	TITANIUM TETRACHLORIDE	D002, D003	8
108-88-3	TOLUENE	U220, D001	2
100-53-8	TOLUENE THIOL MIXTURES (2)	D003	8
6569-51-3	TRIBORON NITRIDE	D001, D003	0
75-69-4	TRICHLOROFLUOROMETHANE	U121	6
10025-78-2	TRICHLOROSILANE	D001, D003	7
76-13-1	TRICHLOROTRIFLUOROETHANE		6
	TRIDECYL ALUMINUM	D001, D003	7
97-93-8	TRIETHYL ALUMINUM	D001, D003	7
121-44-8	TRIETHYL AMINE	D001, D002	3
617-75-4	TRIETHYL ARSENIC	D001, D003, D004	7
97-94-9	TRIETHYL BORANE	D001, D003	7
1115-99-7	TRIETHYL GALLIUM	D001, D003	10

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GAS CYLINDER REFERENCE TABLE

CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
923-34-2	TRIETHYL INDIUM	D001, D003	7
386-39-8	TRIETHYL OXONIUM TETRAFLUOROBORATE	D002	4
554-70-1	TRIETHYL PHOSPHINE	D001, D002, D003	7
	TRIETHYL VANADATE		10
407-250	TRIFLUOROACETIC ANHYDRIDE	D002, D003	8
421-50-1	TRIFLUOROACETONE	D001	8
353-85-5	TRIFLUOROACETONITRILE		10
354-32-5	TRIFLUOROACETYL CHLORIDE		8
354-34-7	TRIFLUOROACETYL FLUORIDE	D002, D003	9
339-11-5	TRIFLUOROETHYLENE		6
75-46-7	TRIFLUOROMETHANE		6
382-24-1	TRIFLUOROMETHYL HEXAFLUOROPROPANE	D002	8
	TRIFLUOROMETHYL HYDROFLUORITE		10
373-91-1	TRIFLUOROMETHYL HYPOFLUORITE	D001	9
2314-97-8	TRIFLUOROMETHYL IODIDE		0
374-00-5	TRIFLUOROMETHYL PROPENE	D001	10
334-99-6	TRIFLUORONITROSOMETHANE		8
7783-55-3	TRIFLUOROPHOSPHINE	D002	8
677-21-4	TRIFLUOROPROPENE		8
100-99-2	TRIISOBUTYL ALUMINUM	D001, D003	7
1116-39-8	TRIISOBUTYL BORANE	D001, D003	10
75-24-1	TRIMETHYL ALUMINUM	D001, D003	7
75-50-3	TRIMETHYL AMINE	D001, D002	3
594-10-5	TRIMETHYL ANTIMONY	D001, D003	7
593-88-4	TRIMETHYL ARSENIC (ARSINE)	D001, D003, D004	7
593-90-8	TRIMETHYL BORON	D001, D003	10
420-56-4	TRIMETHYL FLUOROSILANE	D001, D003	7

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GAS CYLINDER REFERENCE TABLE



CAS NUMBER	DESCRIPTION	EPA CODE	TREATMENT GROUP
1445-79-0	TRIMETHYL GALLIUM	D001, D003	7
3385-78-2	TRIMETHYL INDIUM	D001, D003	0
540-84-1	TRIMETHYL PENTANE	D001	2
594-09-2	TRIMETHYL PHOSPHINE	D001, D003	10
993-07-7	TRIMETHYL SILANE	D001	10
	TRIZONE		8
7783-82-6	TUNGSTEN HEXAFLUORIDE		8
	UCAT-A CATALYST	D001, D003	10
	UCAT-E CATALYST	D001, D003	10
7727-18-6	VANADIUM OXYTRICHLORIDE	D002	10
	VANADIUM PENTAFLUORIDE		9
7632-51-1	VANADIUM TETRACHLORIDE		8
7718-98-1	VANADIUM TRICHLORIDE		0
2699-79-8	VIKANE		8
593-60-2	VINYL BROMIDE		8
75-01-4	VINYL CHLORIDE	U043	8
75-02-5	VINYL FLUORIDE		8
75-35-4	VINYLDENE CHLORIDE	D001	8
75-38-7	VINYLDENE FLUORIDE		8
81-81-2	WARFARIN		8
7440-63-3	XENON		1

GAS CYLINDER REFERENCE TABLE

TRADE NAME	CHEMICAL NAME
DYMEL 142	CHLORODIFLUOROETHANE
DYMEL 152	DIFLUOROETHANE
DYMEL 22	CHLORODIFLUOROMETHANE
FREON 11	TRICHLOROFUOROMETHANE
FREON 1112	DICHLORODIFLUOROETHYLENE
FREON 112	DICHLORODIFLUOROETHANE
FREON 1123	TRIFLUOROETHYLENE
FREON 113	TRICHLOROTRIFLUOROETHANE
FREON 114	DICHLOROTETRAFLUROETHANE
FREON 115	CHLOROPENTAFLUROETHANE
FREON 116	HEXAFLUROETHANE
FREON 12	DICHLORODIFLUOROMETHANE
FREON 123	DICHLOROTRIFLUOROETHANE
FREON 124	CHLOROTETRAFLUROETHANE
FREON 125	PENTAFLUROETHANE
FREON 12B2	DIBROMODIFLUOROMETHANE
FREON 13	CHLOROTRIFLUOROMETHANE
FREON 133A	CHLOROTRIFLUOROETHANE
FREON 134A	TETRAFLUROETHANE
FREON 13B1	BROMOTRIFLUOROMETHANE
FREON 14	CARBON TETRAFLUROIDE
FREON 142B	CHLORODIFLUOROETHANE
FREON 161	FLUROETHANE
FREON 21	DICHLOROFUOROMETHANE
FREON 22	CHLORODIFLUOROMETHANE
FREON 23	TRIFLUOROMETHANE
FREON 500	DIFLUOROETHANE/DICHLORODIFLUOROMETHANE AZEOTROPIC MIXTURE

GAS CYLINDER REFERENCE TABLE



TRADE NAME	CHEMICAL NAME
FREON 502	CHLORODIFLUOROMETHANE/CHLOROPENTAFLUOROETHANE AZEOTROPIC MIXTURE
FREON 503	CHLOROTRIFLUOROMETHANE/TRIFLUOROMETHANE AZEOTROPIC MIXTURE
GENETRON 11	TRICHLOROFLUOROMETHANE
GENETRON 1112	DICHLORODIFLUOROETHYLENE
GENETRON 1113	CHLOROTRIFLUOROETHYLENE
GENETRON 114	DICHLOROTETRAFLUOROETHANE
GENETRON 115	CHLOROPENTAFLUOROETHANE
GENETRON 12	DICHLORODIFLUOROMETHANE
GENETRON 13	CHLOROTRIFLUOROMETHANE
GENETRON 142B	CHLORODIFLUOROETHANE
GENETRON 152A	DIFLUOROETHANE
GENETRON 23	TRIFLUOROMETHANE
GENETRON 32	METHYLENE FLUORIDE
HALON 1211	BROMOCHLORODIFLUOROMETHANE
HALON 1301	BROMOTRIFLUOROMETHANE
HALON 2402	DIBROMOTETRAFLUOROETHANE
ISOTRON 114	DICHLOROTETRAFLUOROETHANE

Appendix C
List of Acceptable Gases and Cylinder Types for MG Industries October 8, 1993

MG  **Industries**
Gas Products

One Steel Road East • Morrisville, Pennsylvania 19067
Phone 215/738-5200 • Fax 215/738-5240

FAX

TO: GORDON HARRIS
BENCHMARK ENVIRONMENTAL

FROM: SCOT A. ADDIS
MG INDUSTRIES

SUBJ: COMPRESSED GAS CYLINDER ACCEPTANCE CRITERIA

DATE: 10/8/93

Cylinders must pass DOT visual inspection criteria. The cylinder must be in good condition, be properly labeled to accurately reflect the cylinder contents and the cylinder must possess a cylinder cap. Neither the cylinder, its valve, nor the cylinder content may show any indication of radioactive contamination.

The following two pages list the compounds MG Industries is currently accepting.

I hope this information is useful. Please contact me should you need further assistance.

Best regards,



S.A. Addis

MG Industries

LIST OF GASES APPROVED FOR PROCESSING
PERMIT #09-313-056

	<u>Categorized</u>
1. Nitric Oxide	2
2. Nitrogen Dioxide	2
3. Boron Trichloride	2
4. Boron Trifluoride	1
5. Phosgene	1
6. Hydrogen Sulfide	2
7. Hydrogen Bromide	2
8. Hydrogen Chloride	2
9. Silicon Tetrafluoride	1
10. Sulfur Dioxide	2
11. Diborane	1
12. Carbonyl Sulfide	1
13. Chlorine	2
14. Ammonia	2
15. Monomethylamine	2
16. Dimethylamine	2
17. Trimethylamine	2
18. Methyl Bromide	2

PERMIT #09-313-082

1. Arsine	1
2. Phosphine	1
3. Silane	1
4. Dichlorosilane	1
5. Silicon Tetrafluoride	1
6. Diborane	1
7. Germane	1
8. Hydrogen Selenide	1
9. Vinyl Chloride	1
10. Chloromethane	2
11. Cyanogen	1
12. Hydrogen Cyanide	1
13. Methyl Mercaptan	1
14. 1, 3 Butadiene	3
15. 3-Methyl-1-Butene	3
16. Butane	3
17. Butene	3
18. Ethyne	3
20. Propane	3
21. Propylene	3

LIST OF HYDROCARBONS AND OTHER GASES
FOR DISPOSAL THROUGH GUARDIAN

Extension to #09-
313-082

ITEM #	HYDROCARBONS AND OTHER GASES	FLAMMABLE LIMITS IN AIR % BY VOLUME	HEAT OF COMBUSTION KJ/MOL
1	I ACETYLENE	2.5 - 81%	1299.6
2	I BROMOMETHANE (METHYL BROMIDE)	10 - 16	
3	III ISO-BUTANE	1.8 - 8.4	2868.72
4	III ISOBUTYLENE	1.8 - 9.6	2700.48
5	II 2-CHLOROPENTAFLUOROPROPENE	NONFLAMMABLE	HIGHLY TOXIC
6	III CIS-2-BUTENE	1.6 - 9.7	2688.26
7	III TRANS-2-BUTENE	1.6 - 9.7	2684.7
8	II CHLOROPENTAFLUOROPROPENE	NONFLAMMABLE	TOXIC
9	II CARBON MONOXIDE	12.5 - 74.2	282.98
10	III CHLOROETHANE (ETHYLCHLORIDE)	3.8 - 15.4	
11	III CYCLOPROPANE	2.4 - 10.4	2091.37
12	III 2,2 DIMETHYLPROPANE	1.4 - 7.5	3494.3
13	III ETHYLACETYLENE	FLAMMABLE	2596.76
14	I ETHYLENE OXIDE	3.0 - 100	
15	III METHANE	5.0 - 15.4	890.36
16	III METHYLACETYLENE	1.7 - 11.7	1937.65
17	I MONOCHLOROSILANE	SPONTANEOUSLY FLAMMABLE	
18	II METHYLSILANE	1.3 - 89	
19	II HEXAFLUOROACETONE	NONFLAMMABLE TOXIC	HIGHLY REACTIVE
20	III PROPADIENE (ALLENE)	2.16-11.5	1944.35
21	I BROMOTRIFLUOROETHYLENE	SPONTANEOUSLY FLAMMABLE	
22	II CHLOROPENTAFLUOROACETONE	NONFLAMMABLE	HIGHLY TOXIC
23	II PERFLUOROISOBUTENE	NONFLAMMABLE	
24	I DIMETHYLDIFLUOROSILANE	FLAMMABLE	
25	II DIMETHYLSILANE	FLAMMABLE	
26	II METHYLTRIFLUOROSILANE	FLAMMABLE	
27	I SILICON TETRACHLORIDE	NONFLAMMABLE	
28	I TETRAFLUORSILANE (SILICONTETRAFLUORIDE)	NONFLAMMABLE	TOXIC
29	II TRIFLUORONITROSOMETHANE	NONFLAMMABLE	HIGHLY TOXIC
30	II TRIMETHYLFLUOROSILANE	FLAMMABLE	
31	II TRIMETHYLSILANE	FLAMMABLE	
32	II TUNGSTEN HEXAFLUORIDE	NONFLAMMABLE	OXIDIZER

Appendix D
MG Industries Letters



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

Lee Park, Suite 6010
555 North Lane
Conshohocken, PA 19428
215 832-6212

May 3, 1991

RECEIVED
MAY 14 1991

Mr. Herbert N. Rudolph
President
MG Industries
2460 Boulevard of the General
P.O. Box 945
Valley Forge, PA 19482

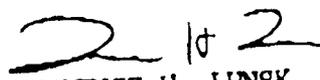
Dear Mr. Rudolph:

In response to your letter of April 17, 1991 approval is granted for you to accept compressed gas cylinders from off-site facilities for processing residual gas remaining in the cylinders before they are refilled with gas products at your cylinder fill facility located in Fairless Hills, Falls Township, Bucks County.

This must be done in accordance with your air quality permit No. 09-313-056.

This proposal does not require a hazardous waste permit.

Very truly yours,


LAWRENCE H. LUNSK
Facilities Manager

cc: Mr. McGinley
Ms. Kurtz
Mr. Lee - EPA Philadelphia
Re 30 (4)120.16



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202-1701

JUL - 1 1991

RECEIVED

JUL 1 1991

LEGAL DEPARTMENT

Mr. Ralph R. DeFeo
Corporate Counsel
M G Industries
P.O. Box 849
Morrisville, PA 19067

Dear Mr. DeFeo:

Reference is made to your letter of May 7, 1991, regarding your intention to purchase existing compressed gas cylinders from Los Alamos National Laboratory (LANL) and process the hazardous residues removed from these cylinders at your Pennsylvania facility.

From your letter, we understand your position to be that the cylinders containing gas residues, purchased and transported from LANL to your Pennsylvania processing facility for reuse, would not be subject to RCRA. We concur with that position.

You suggested that a meeting be held to discuss your process. If you believe a meeting is necessary, we would be available to meet with you.

Should you have any questions, or desire to arrange a meeting, please contact Mr. Joseph Schultzes, of my staff, at (214) 655-2192.

Sincerely yours,

Allyn M Davis

Allyn M. Davis
Director
Hazardous Waste Management Division (6H)

cc: Region 3

Appendix E
List of Acceptable Gases and Cylinder Types for BDT Inc., October 1992

List of Acceptable Cylinders at BDT, INC

Oct 1992

Material	Price Class	Hazard Class
Acetyl fluoride	A	flammable gas
Acetylene	C	flammable gas
Ammonia	B	nonflammable gas
Antimony pentachloride	A	corrosive material
Antimony pentafluoride	A	corrosive material
Antimony tribromide	A	corrosive material
Antimony trichloride	A	corrosive material
Antimony trifluoride	A	corrosive material
Antimony triiodide	A	ORM-E
Argon	B	nonflammable gas
Boron tribromide	A	corrosive material
Boron trichloride	A	corrosive material
Boron trifluoride	A	nonflammable gas
Bromine	B	corrosive material
Bromine chloride	A	oxidizer
1,3-Butadiene	C	flammable gas
Butadiene	C	flammable gas
Butane	C	flammable gas
1-Butene	C	flammable gas
2-Butene	C	flammable gas
Butene	C	flammable gas
1-Butyne	C	flammable gas
Carbon dioxide	B	nonflammable gas
Carbon monoxide	C	flammable gas
Chlorine	B	nonflammable gas
Cis-Butene	C	flammable gas
Cis-2-Butene	C	flammable gas
Cyanogen bromide	A	poison B
Cyanogen chloride	A	poison A
Cyclopropane	C	flammable gas
Deuterium	C	flammable gas
Deuterium bromide	B	nonflammable gas
Deuterium chloride	B	nonflammable gas
Deuterium fluoride	B	nonflammable gas
Deuterium iodide	B	nonflammable gas
Dimethyl Methane	C	flammable gas
Ethane	C	flammable gas
Ethene	C	flammable gas
Ethyl Acetylene	C	flammable gas
Ethyene	C	flammable gas
Ethyne	C	flammable gas
Helium	B	nonflammable gas
Hydriodic acid	B	corrosive material

All Flammable Gas Cylinders

List of Acceptable Cylinders at BDT, INC

Oct 1992

Material	Price Class	Hazard Class
Hydrogen	C	flammable gas
Hydrogen bromide	B	nonflammable gas
Hydrogen chloride	B	nonflammable gas
Hydrogen fluoride	B	corrosive material
Hydrogen iodide	B	corrosive material
Hydrogen sulfide	A	flammable gas
Isobutane	C	flammable gas
Isobutene	C	flammable gas
Isobutylene	C	flammable gas
Krypton	B	nonflammable gas
Liquified Petroleum Gas	C	flammable gas
Mapp gas	C	flammable gas
Methane	C	flammable gas
2-Methyl-1-Propene	C	flammable gas
Methyl acetylene	C	flammable gas
Methyl silane	A	flammable gas
Methylethene	C	flammable gas
Methylethylene	C	flammable gas
2-Methylpropane	C	flammable gas
Methylpropene	C	flammable gas
Methylpropylene	C	flammable gas
Molybdenum hexafluoride	B	corrosive
N-Butane	C	flammable gas
N-Propane	C	flammable gas
Natural Gas	C	flammable gas
Neon	B	nonflammable gas
Nitric oxide	A	poison A
Nitrogen	B	nonflammable gas
Nitrogen dioxide	A	poison A
Nitrogen oxide	A	poison A
Nitrogen trioxide	A	poison gas
Nitrous oxide	A	nonflammable
Oleum	B	corrosive material
Oxygen	B	nonflammable gas
Ozone	A	nonflammable gas
Phosphorus pentafluoride	A	nonflammable gas
Phosphorus trifluoride	A	nonflammable gas
Propane	C	flammable gas
1-Propene	C	flammable gas
Propene	C	flammable gas
1-Propylene	C	flammable gas
Propylene	C	flammable gas

All Flammable Gas Cylinders

Must Have An Operational Valve

List of Acceptable Cylinders at BDT, INC

Oct 1992

Material	Price Class	Hazard Class
Propyne	C	flammable gas
Silane	A	flammable gas
Silicon tetrabromide	B	corrosive liquid
Silicon tetrachloride	B	corrosive material
Silicon tetrafluoride	A	nonflammable gas
Sulfur dibromide	B	corrosive material
Sulfur dichloride	B	corrosive material
Sulfur dioxide	B	nonflammable gas
Sulfur monobromide	B	corrosive material
Sulfur monochloride	B	corrosive material
Sulfur oxide	A	corrosive material
Sulfur tetrafluoride	A	poison
Sulfur trioxide	A	corrosive material
Sulfuric acid	B	corrosive material
Sulfuryl chloride	B	corrosive material
Tetrachloro silane	B	corrosive material
Tetrafluoro silane	A	nonflammable gas
Tetramethyl silane	A	flammable gas
Tetraphenyl silane	A	combustible liquid
Thionyl bromide	B	corrosive material
Thionyl chloride	B	corrosive material
Titanium tetrabromide	B	corrosive material
Titanium tetrachloride	B	corrosive material
Trans-2-Butene	C	flammable gas
Trans-Butene	C	flammable gas
Trichloroacetyl chloride	B	corrosive material
Trichloromethane sulfonyl chloride	B	corrosive material
Trichlorophenyl silane	A	corrosive material
Trimethyl Methane	C	flammable gas
Trichloro n-decyl silane	A	corrosive material
Trichlorosilane	A	flammable liquid
Trifluoroacetyl fluoride	A	corrosive liquid
Trimethyl borane	A	flammable gas
Trimethyl chlorosilane	A	flammable liquid
Trimethyl ethoxy silane	A	flammable liquid
Trimethyl silane	A	flammable gas
Tungsten bromide	B	corrosive
Tungsten chloride	B	corrosive material
Tungsten fluoride	B	corrosive material
Tungsten hexafluoride	B	corrosive material
Vanadium oxytrichloride	A	corrosive material
Vanadium tetrachloride	A	corrosive material
Xenon	B	nonflammable gas

All Flammable Gas Cylinders

Must Have An Operational Valve

Appendix F
List of Acceptable Gases and Cylinder Types for Liquid Carbonic October 13, 1992

Acceptable Cylinders at Liquid Carbonic as of October 13, 1992

Acetyl fluoride (Ethanyl fluoride)

Air

Allene (Dimethylene methane)

Ammonia, anhydrous

Antimony pentafluoride

Argon

Benzene

Boron trichloride

Bromine trifluoride

Bromoacetone

Bromotrifluoro ethylene (Trifluoro vinyl bromide)

Bromotrifluoro methane (R-13B1)

Butadiene, 1,3

Butane

1-Butene

Cis-2-Butene

Trans-2-Butene

2-Butene

Carbon dioxide

Carbon monoxide

Chlorine

Chlorine pentafluoride

Chlorine trifluoride

Chloro difluoro acetyl fluoride

1-Chloro 1,1 Difluoroethane (R-142-B)

Chlorodifluoromethane (R-22)

Chloropentafluoroethane (R-115)

Chloro sulfonyl fluoride

Chlorotrifluoromethane (R-13)

Cyclopropane

Deuterated ammonia

Deuterium

Deuterium bromide

Deuterium chloride

Deuterium fluoride

Deuterium sulfide

Dibromo difluoro methane

Dichloro difluoro ethylene

1,2 Dichloro - 1,2 Difluoro ethylene

1,2 Dichloro - 2,2 Difluoro ethylene

Dichlorodifluoromethane (R-12)

Dichlorofluoromethane (R-21)

Dichloro methyl silane

Dichloro silane

Dichlorotetrafluoroethane (R-114)

Diethyl aluminum chloride

Diethyl zinc

Difluoro ethane (R152A)

Difluoromethane
Diisobutyl aluminum
Diisobutyl aluminum chloride
Diisobutyl aluminum hydride
Dimethyl aluminum chloride
Dimethyl aluminum hydride
Dimethyl amine
Dimethyl ether
2,2-Dimethyl propane
Dimethyl zinc
Di-normal butyl sulphide
Disilane
Di-tert butyl sulphide
Dodecal mercaptan

Ethane
Ethyl aluminum chloride
Ethyl aluminum dichloride
Ethyl amine (Monoethylamine)
Ethyl chloride (R-160)
Ethylene
Ethyl acetylene (1-Butyne)
Ethyl ether
Ethyl fluoride
Ethyl mercaptan

Fluorine
Fluoro methyl propane
Freon - 114A

Halocarbon - 142B
Halocarbon - 1113
Helium
Hexafluoro acetone
Hexafluoro 1,3-Butadiene
Hexafluorobutyne
Hexafluoro cyclobutene
Hexafluoroethane (R-116)
Hexafluoropropane
Hexafluoropropylene
Hydrogen
Hydrogen bromide, anhydrous
Hydrogen chloride, anhydrous
Hydrogen fluoride, anhydrous
Hydrogen sulfide

Iodo methane (Methyl iodide)
Iodo trifluoro methane (tribluoro methyl iodide)
Isobutane (2-Methyl propane)
Isobutene (2-Methyl propene or Isobutylene)
Isobutylene
Isopentane
Isopentene (2-Methyl-2-butene)
Isopentyne (3-Methyl-1-butyne)

Isoprenyl aluminum
Isopropyl aluminum

Krypton

LPG

Methane
Methane - D4
Methyl acetylene (Propyne)
Methyl acetylene propadiene (MAPP)
Methylamine (Monomethyl amine)
2-Methyl-2-butene
3-Methyl-1-butene
Methylchloride (Chloromethane) (R-40)
Methyl ether
Methyl iodide
Methyl mercaptan
Monofluoro ethylene

Neon
Neopentane
Nitric oxide
Nitrogen
Nitrogen dioxide
Nitrogen tetroxide
Nitrogen trifluoride
Nitrous oxide

Octafluoro-2-butene (Perfluoro-2-butene)
Octafluoro cyclobutane (Perfluoro cyclobutane or R-C318)
Oxalyl fluoride
Oxygen

Pentachloro propane
3,3,4,4,4-Pentafluoro propene
Perfluoro 2-butene
Perfluorocyclobutane
Perfluorocyclobutene
Perfluoro methoxy ethylene
Propane
Propene
Propylene

R502 Azeotrope mixture (R-502)

Silane
Silicon tetrachloride (Tetrachloro silane)
Silicon tetrafluoride (Tetrafluorosilane)
Sulfur dioxide
Sulfur hexafluoride

Tetrafluoroethylene with terpene inhibitor
Titanium tetrachloride

Trichlorosilane
Trichlorofluoromethane (R-11)
Triethylaluminum
Triethylamine
Triethyl borane
Triethyl gallium
Trifluoroacetyl chloride
Trifluoro bromo ethane
Trifluoro ethane
Trifluoro ethylene (Inhibited)
2-Trifluoro methylpropene
Triisobutyl aluminum
Trimethyl amine
Trimethyl arsine
Trimethyl chloro silane
Trimethyl gallium

Vanadium oxytrichloride
Vanadium tetrachloride
Vinyl bromide
Vinyl chloride
Vinyl fluoride with d-Limonene stabilizer
Vinyl methyl ether (Methyl vinyl ether)

Xenon

Appendix G
Liquid Carbonic Letter



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 16 1992

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Mr. Irv Kraut
Executive Vice-President
Emergency Technical Services Corporation
711 W. Morse Ave.
Schaumburg, Illinois 60193

Dear Mr. Kraut:

This is in response to your letter of February 17, 1992, requesting confirmation that Emergency Technical Services Corporation (ETSC) would be exempt from the export notification requirements for exports of cylinders of compressed gases and liquids sent to Liquid Carbonic Inc. in Canada for reclamation. In your letter, you indicated that you believed these cylinders of compressed gases and liquids were not wastes if sent for reclamation in Canada, and therefore were not subject to the export notification requirements under RCRA.

After your recent telephone conversation with my staff, it is our understanding that ETSC proposes to collect partially full or full cylinders containing compressed gas or liquid products, which may contain commercial chemical products listed on the 40 CFR 261.33 list or which may exhibit a hazardous characteristic. Once collected, ETSC will test the cylinders for leaking and proper DOT packaging and, if the contents are unknown, conduct an analysis (using a mass spectrometer) for chemical composition. The product gas and liquid cylinders will then be shipped to Liquid Carbonic, a large gas manufacturer in Canada, where the liquids and gases in the old cylinders will be transferred into new cylinders for resale. In some cases, new products will be added to completely fill the new cylinders.

Based on the scenario described, the cylinders containing hazardous liquids or gases, which are collected for export to Canada for reclamation, would not be regulated under RCRA because such commercial chemical products (or off-spec products) sent for reclamation are not classified as solid wastes under 40 CFR 261.2 and cannot, therefore, be defined as hazardous wastes under 40 CFR 261.3. Since the cylinders of compressed gases and liquids are products and not RCRA hazardous wastes, the export notification requirements for generators of hazardous wastes do not apply.