Department of Energy
Albuquerque Operations
Los Alamos Area Office
Los Alamos, New Mexico 87544

NOV 25 1987

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Michael Burkhart, Director
N. M. Environmental Improvement Division
P. O. Box 968
Santa Fe, New Mexico 87504-0968

Dear Mr. Burkhart:

Enclosed is a revised hazardous waste permit application (Parts A and B) as was discussed in a meeting between Mr. Kelley Crossman and Los Alamos National Laboratory's staff, on September 22, 1987. This revised application supersedes all previously submitted applications. The questions raised in your letter of September 9, 1987, regarding entries in the Part A (EPA Form 3510-1) are resolved in this submittal.

Changes in the Part B are indicated by a vertical line in the margin of the affected pages. These changes, as well as those made in the Part A are summarized below.

1. Modification of the Part A for increased storage/treatment.

   A. Correction of the Part A forms to reflect which wastes will be incinerated. As the result if the trial burn, it was demonstrated that a number of wastes could be incinerated that were not previously listed in the Part A of the November 1986 permit application. This revision adds those chemicals to the enclosed Part A in accordance with HWMR-3, 302.C.3.a.

   B. Modifications to Section III.C., Page 1 of 5, in accordance with HWMR-3, 302.C.3.b. EID and the Laboratory have discussed on several occasions the need for additional storage capacity over and above that currently allowed at TA-54, Area L. Efforts to comply are exacerbated by several related factors:

      - The Laboratory is continuing to make a concerted and successful effort to comply with current waste regulations. This effort has resulted in a large increase in the on-site shipment of waste to permitted storage areas (principally, Area L) and treatment locations. As an example of this increase in years past the movement of 200 drums a year was normal. Last year we moved about 2,200 drums to Area L.

- The effort in sampling and analysis of this waste has grown commensurately with the increase in waste volume and analytical requirements. To relieve this pressure, the Laboratory has been operating its analytical capability at capacity and contracting for the overload at expensive outside laboratories. Minimum turn-around time for proper sampling, packaging, radioactive and chemical analyses, and reporting is about four weeks.

- On-site treatment is possible for some waste forms, but a large volume must be sent off-site for disposal. This means that the Laboratory must identify qualified commercial treatment, storage or disposal facilities (TSDFs) and meet their waste acceptance criteria. To ensure that a TSDF is qualified, Laboratory personnel must inspect the operation of each bidder. TSDF waste acceptance criteria usually require specialized packaging, additional sampling for their analytical needs, and accumulation of minimum volumes of similar waste forms. It is taking several months to ensure that off-site operations are conducted in accordance with Federal, State, and TSDF regulations.

- Associated with the last item, delays have lately been caused by the TSDFs reaching their individual storage and throughput capacity. As an example, shipments to our current off-site contractor for incineration have been suspended until sometime in January because of a back-log caused by a nation-wide shortage in approved incineration capacity.

The net balance between increased input to on-site storage, a minimum hold-up for analyses and packaging, and a throttled output to TSDFs has been a stored volume that continues to exceed our current permit. It is clear that this situation reflects changes in regulations that are long-term. Therefore, the current shortage will continue to be a problem until input is reduced, storage is increased, or TSDF options are expanded. The most logical option for addressing the problem is to provide adequate overall Laboratory storage (including an increase at Laboratory treatment locations). The volumes we recommend are the following:

S01 (storage in containers) has been increased from 17880 gal to 237,990 gal. Two 250 gal. storage containers (tuff tanks) were included in the original 17880 figure. These two storage containers do not exist.

Nonliquid waste storage - 198,000 gal (3600 drums). This volume was discussed at a meeting with Mr. Kelley Crossman, on September 9, 1987, and agreed to as a legitimate and reasonable expansion. This involves a dirt-bermed area that is being used to store, on pallets, 55-gal. drums of nonliquid waste. Because no liquids are involved, a secondary containment structure is not needed.

TA-50 Storage Pad - 17,000 gal. See Item 6 below.

Batch Waste Treatment Plant Storage - 1980 gal. See Item 6 below.

TA-50 Incinerator Storage Unit - 3630 gal. See Item 5 below.

S02 (Storage in tanks) has been increased from 0 gal. to 6600 gal.

Area L Treatment Tanks - 4 tanks @ 1665 gal. These tanks have been used for nonhazardous and hazardous waste treatment. While their primary purpose will continue to be for treatment, there is a need to use these tanks for storage in the event the waste cannot be removed in a timely manner after treatment or in the event bulk storage is necessary.

S04 (Storage in a surface impoundment) is the inactive surface impoundment (SI) at Area L that the Laboratory intends to close in accordance with an EID/EPA approved closure plan. This SI is not now being used nor will it be used in the future.

T02 (Treatment in a surface impoundment) is the inactive surface impoundment at the TA-16 burning ground. Same explanation as under S04 above.

T03 (Treatment in an incinerator) has been increased from 0.15 to 0.56 tons per hour. This increase of 0.41 tons per hour is explained in Item 9. below.

T04 (Other treatment) has been increased by 2534 gal. per day because of the cementation processes planned at Area L and the TA-50 Batch Waste Treatment Facility. This process is intended to assure that no free liquids are left in the waste and to immobilize hazardous constituents. This process will render the waste less hazardous and in some cases render it nonhazardous in accordance with waste minimization requirements of the Hazardous and Solid Waste Amendments of 1984.

2. The system upgrade of the TA-50 Controlled Air Incinerator. The incinerator, in addition to disposing of hazardous waste, has burned transuranic (TRU) waste as a research and development operation. In converting to a production mode for TRU disposal it was decided the facility needed to be modified to accommodate an increased radioactivity. Because this impacts hazardous waste operations, the permit application is modified to reflect these changes. The Department of Energy (DOE) is making these changes in the application and requests the EID's approval under interim status in accordance with HWMR-3, 302.C.3.b. The trial burn results have also been added to Appendix J.

3. The system upgrade of the TA-50 Batch Waste Treatment Facility (BWTF). Before the system was put into operation it was determined that it had to be modified for safety and operational purposes. For example, the electrical components had to be made explosion proof. No wastes are intended to be treated that have not previously been identified nor has the design capacity been increased or the process changed. These modifications are detailed in this submittal.

4. The addition of hazardous waste treatment processes at TA-54, Area L. Since the previous application, Area L has been receiving barium-contaminated sand resulting from the burning of waste explosives. This sand is presently being stored at Area L in 55-gal. drums. Because of the potential of the sand being contaminated with explosives, the DOE and the Laboratory do not wish to send it off-site for treatment or disposal. The application is being modified to address the treatment of this sand. The DOE also requests that this additional treatment process be granted interim status under HWMR-3, 302.C.3.c.

Treatment at the Laboratory is necessary because, due to the source of this waste (i.e. explosive activity), it cannot be sent off-site for treatment or disposal.

5. The addition of a hazardous waste storage area for the TA-50 Controlled Air Incinerator. When the incinerator is operating it will run 24 hours per day for 7 days per week. A staging area will be constructed at the Incinerator (TA-50, Building 37) so a sufficient quantity can be accumulated to facilitate orderly processing of the waste for incineration.

6. Increase storage at TA-54, Area L and the TA-50 BWTF. Storage at Area L is increased to accommodate an area for storage of non-liquid hazardous waste. An additional storage pad, originally planned for Area L, will be placed at TA-50 instead. This pad is identical to the one at Area L and will combine some of the storage capability planned at both TA-50 and Area L. In addition, small storage modules will be located near the BWTF to support this unit. Interim status is also requested for this increased storage in accordance with HWMR-3, 302.C.3.b. The additional storage at Area L and TA-50 is necessary to house the waste that cannot be adequately handled at the present Area L storage pad. Because Area L storage and treatment is intended to be phased out in the next 5-6 years, the DOE and the Laboratory feel it more appropriate to place the new storage pad, as well as future expansions/replacements, at TA-50 to consolidate these activities near other on-site treatment and storage operations.

7. Relisting of the TA-14 Burn Cage. The reference to this burn cage that burns explosive contaminated combustibles was inadvertently deleted from a previous application. This submittal re-inserts this activity into the Part B.

8. Revisions of the Part B Contingency Plan, Waste Analysis Plan and Training Plan. These three sections of the application have been updated to reflect the current status at the Laboratory and to meet additional regulatory requirements. The contingency plan has been modified to be consistent with the DOE's Spill Prevention Control and Countermeasures Plan for the Laboratory and the Laboratory's Emergency Management Office Charter. The waste analysis plan has been revised to include the Toxicity Characteristic Leaching Procedure (TCLP) as required by the land ban regulations. The training section has been revised to address different personnel needing training, as well as different job descriptions for these people (Appendix S).

9. Addition of an incinerator at TA-16 Burning Ground. This incinerator will replace the burn cage at TA-16 and burn the same type of waste, i.e. potentially explosives contaminated burnable trash. The DOE is requesting interim status for this incinerator in accordance with HWMR-3, 302.C.3.c. The Laboratory intends to operate this incinerator in compliance with HWMR-3, 206.D.8.a (2). These hazardous wastes (i.e. ignitable and reactive) as well as nonhazardous, controlled solid waste are presently being open burned. The open burning permit issued by the EID (Air Quality Bureau) will expire in May 1988 with little likelihood of renewal. Because there is the possibility of explosives unintentionally entering this waste, it cannot leave the immediate site for disposal. This unit will be much more environmentally acceptable by greatly reducing particulate emissions into the environment.

I would appreciate it if you will return or destroy the previous copies of this document to avoid any confusion as to which one is the predominate issue.

If you have any questions regarding this revised application or need further information, please call Mr. Jim Phoenix of my staff at 667-5288.

Sincerely,

Original Signed by
H. E. Valencia

Harold E. Valencia
Area Manager

Enclosures

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INTERNATIONAL TECHNOLOGY CORPORATION

Project No. 301017.02
November 1987

Volume I - Text, Tables & Figures Rev. 4.0

RCRA Part B Permit Application

Los Alamos National Laboratory
Los Alamos, New Mexico

Los Alamos National Laboratory
Environmental Surveillance Group (HSE-8)
Los Alamos, New Mexico 87545

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

Volume I - Text, Tables & Figures Rev. 4.0

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9-10	Analytical Parameters and Methods for TA-54, Area L Facilities
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F	Physical and Hydrologic Characteristics of the Bandelier Tuff
F-1	Maps from "TA-3 Traffic Study" Depicting Vehicular Count Movements at Various Intersections
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O	Manual of Fire Protection Policies and Procedures
P	Operational Safety Requirements for the Controlled-Air Incineration Process
Q	Operating Instructions for Controlled-Air Incinerator Startup and Shutdown
R	Hazardous Waste Facilities Contingency Plan for the Los Alamos National Laboratory
S	Job Descriptions
T	Personnel Training Information
U	TA-16 Industrial Incinerator Specifications
V	Design Criteria for Combustible Chemical and Radioactive Waste Storage/Staging Facility, TA-50
W	Manufacturers Information on Safety Storage Containers
X	Procedure for Treatment of Barium Contaminated Sand

1.0 INTRODUCTION AND PART A APPLICATION

1.1 INTRODUCTION

This application was prepared for submittal to the Environmental Protection Agency (EPA) and the New Mexico Environmental Improvement Division (NMEID) in order to meet the requirements of the Resource Conservation and Recovery Act (RCRA) for a Part B Permit Application. The EPA authorization for Los Alamos to operate under interim status is included as Appendix A. The EPA formally requested the Part B permit application in a February 22, 1984 letter to the Los Alamos Laboratory Director. Subsequently, the New Mexico Environmental Improvement Division transmitted a joint call-in of the permit application to the Laboratory dated April 23, 1984. These two letters are given in Appendices B and C, respectively. More recently, in a letter of August 7, 1984, the EPA requested a Part B Permit Application from Los Alamos addressing radioactive/chemical mixed waste (Appendix D). This permit application addresses chemical waste only. As necessary, a separate permit application will be submitted to address radioactive/chemical mixed waste.

The format of the Part B application follows an outline provided in "A Guide for Preparing RCRA Permit Applications for Existing Storage Facilities", U.S. EPA, 1982. An outline of the permit application with citations of the regulations covered by each section is shown in Table 1-1.

Los Alamos National Laboratory (Los Alamos) is a multidisciplinary laboratory (RCRA No. NM0890010515). The principal mission of the Laboratory is the design and development of weapons for the nation's nuclear arsenal; however, considerable research and development (R&D) is directed toward the development of the peaceful uses of nuclear energy including research on controlled thermonuclear reactions, fission reactors, nuclear safeguards, laser fusion, and medium energy physics. Extensive basic research programs in physics, chemistry, metallurgy, mathematics and computers, earth sciences, and electronics support these efforts. Biomedical and environmental research includes programs in molecular biology, radiobiology, cancer therapy, radiology, and industrial hygiene. Expansion into nonnuclear areas is represented by applied technology development of solar and geothermal energy and superconducting power transmission lines.

Los Alamos is managed by the University of California for the U.S. Department of Energy (DOE) with substantial work performed for the Department of Defense and the Nuclear Regulatory Commission. The University is responsible to DOE's Los Alamos Area Office (LAAO) which reports to the DOE Albuquerque Operations Office (ALO). Although not a primary function, some hazardous waste management and storage occurs at Los Alamos. Los Alamos falls under Standard Industrial Classification (SIC) Code Number 9711, national defense organizations.

Much of this application was prepared from existing documentation at the Laboratory. In addition, new information was developed for this permit application.

1.2 REVISED PART A APPLICATION

The complete RCRA Part A Application Revision is included in the following pages. The original Part A Application was submitted to the EPA in November 1980.

TABLE 1-1 FORMAT OUTLINE AND REGULATION REFERENCES

REPORT SECTION	RCRA REGULATION REFERENCE[1]	NMHWMR REFERENCE
1.0 INTRODUCTION AND REVISED PART A APPLICATION		
1 1 INTRODUCTION		
1 2 REVISED PART A APPLICATION	270 13	302 A 4 a
2.0 FACILITY DESCRIPTION		
2 1 GENERAL DESCRIPTION	270 14(b)(1)	302 A 4 b(1)
2 2 LOCATION INFORMATION	270 14(b)(11) 270 14(b)(19) 264 18(a) (b)	302 A 4 b(1) 206 B 8 a & b
2 3 TRAFFIC PATTERNS	270 14(b)(10)	302 A 4 b(1)
3.0 WASTE CHARACTERISTICS AND ANALYSIS PLAN		
3 1 CHEMICAL AND PHYSICAL ANALYSES	270 14(b)(2) 264 13 264 73(b)(3)	302 A 4 b(1) 206 B 3 203 C 2 c
3 2 WASTE ANALYSIS PLAN	270 14(b)(3) 264 13 261 App I	302 A 4 b(1) 206 B 3
3 3 WASTE SEGREGATION	264 13	206 B 3
4.0 WASTE MANAGEMENT PRACTICES AND FACILITIES		
4 1 TA 50 BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA	270 15 264 171-173 264 175 264 191-192	302 A 4 b(2)(a) 206 D 4 b-d 206 D 4 f 206 D 5 b & c
4 2 TA 50 CHEMICAL WASTE INCINERATOR	270 19 264 340 345	302 A 4 b(2)(e) 206 D 8 a-f
4 3 TA-54 AREA L WASTE TRANSFER PACKAGING AND STORAGE FACILITIES	270 15 264 171-173 264 175	302 A 4 b(2)(a) 206 D 4 b-d 206 D 4 f
4 4 TA-54 AREA L TREATMENT TANKS	270 16 264 190-192	302 A 4 b(2)(b) 206 D 5 a-c
4 5 TA 54 AREA L LAND DISPOSAL SHAFTS	270 21 264 301 264 309 264 315-316	302 A 4 b(2)(g) 206 D 10 b 206 D 10 e 206 D 10 j & k
5.0 GROUNDWATER MONITORING	264 90(b)(4)	206 D 1 a(2)
6.0 PROCEDURES TO PREVENT HAZARDS		
6 1 SECURITY	270 14(b)(9) 264 14	302 A 4 b(1) 206 B 4
6 2 WARNING SIGNS	264 14(c)	206 B 4 b(3)
6 3 INSPECTION SCHEDULES AND REQUIREMENTS	270 14(b)(5) 264 15 264 33 264 174 264 194 264 303 264 347	302 A 4 b(1) 206 B 5 206 B 9 d 206 D 4 e 206 D 5 d 206 D 10 d 206 D 8 g
6 4 PREPAREDNESS AND PREVENTION REQUIREMENTS	264 34-35	206 B 9 e-g
6 5 PREVENTIVE PROCEDURES STRUCTURES AND EQUIPMENT	270 14(b)(8)	302 A 4 b(1)
6 6 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE REACTIVE OR INCOMPATIBLE WASTE	270 14(b)(9) 270 15(d) 264 17 264 176 264 198 264 312	302 A 4 b(1) 302 A 4 b(2)(a) 206 B 7 206 D 4 g 206 D 5 f 206 D 10 g
7.0 HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN		
7 1 INTRODUCTION		
7 2 HAZARDOUS WASTE EMERGENCY RESPONSE RESOURCES	264 37 264 52(c) 264 52(e)	206 B 9 h 206 B 10 h 206 B 10 f
7 3 NONSUDDEN RELEASES		
7 4 SUDDEN RELEASES	264 51 264 52(a)	206 B 10 b-d
7 5 SPECIFIC EMERGENCY RESPONSE PROCEDURES FOR HAZARDOUS WASTE FACILITIES	270 14(b)(7) 264 56	302 A 4 b(1) 206 B 10 m
7 6 EVACUATION	264 52(f)	206 B 10 i
7 7 SALVAGE AND CLEANUP	270 14(b)(7) 264 56	302 A 4 b(1) 206 B 10 m
7 8 POST EMERGENCY ASSESSMENT		
7 9 EMERGENCY RECORDS		
7 10 EMERGENCY REPORTS	270 14(b)(7) 264 56	302 A 4 b(1) 206 B 10 m
7 11 CONTINGENCY PLAN AMENDMENT	264 54	206 B 10 k
8.0 PERSONNEL TRAINING		
8 1 OUTLINE OF TRAINING PROGRAM	264 16(d)(2)	206 B 6 d
8 2 TRAINING CONTENT FREQUENCY AND TECHNIQUES	270 14(b)(12) 264 16	302 A 4 b(1) 206 B 6
8 3 EMERGENCY RESPONSE TRAINING	264 16(a)(3)	206 B 6 a
8 4 IMPLEMENTATION OF TRAINING PROGRAM	264 16(b) (c) & (e)	206 B 6 b c & e
9.0 CLOSURE AND POST CLOSURE PLAN	270 14(b)(13) 264 112	302 A 4 b(1) 206 D 2 c
9 1 GENERAL CLOSURE/POST-CLOSURE INFORMATION		
9 2 CLOSURE PLAN FOR THERMAL TREATMENT FACILITIES		
9 3 CLOSURE PLAN FOR TA 50 STORAGE BATCH TREATMENT AND INCINERATION FACILITIES		
9 4 CLOSURE PARTIAL CLOSURE AND POST-CLOSURE FOR TA-54 AREA L FACILITIES	270 14(b)(13) 270 21(e) 264 112 264 310(a) & (b) 264 197 264 117 & 118	302 A 4 b(1) 206 D 2 c & g 206 D 2 h 302 A 4 b(2)(g) 206 D 10 f(1)
9 5 SAMPLING AND ANALYTICAL PROCEDURES		
10.0 OTHER FEDERAL LAWS	270 3 270 14(b)(20)	302 A 4 b(1)
11.0 CERTIFICATION	270 11	302 B

[1] From Code of Federal Regulations 40

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Form Approved OMB No. 158-R0175

U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

GENERAL

EPA I.D. NUMBER

F NM0890010515 D

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area*(s)* below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

Department of Energy
Attn: Mr. Harold Valencia
Los Alamos Area Office
Los Alamos, N.M. 87544

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)		X	
B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X	
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)	X		NO
D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	X		YES
F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X	
H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4) Geothermal	X		NO
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	
J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP LOS ALAMOS NATIONAL LABORATORY

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2 HAROLD VALENCIA	505 667 5105

FTS 843-5105

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 LOS ALAMOS AREA OFFICE

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 LOS ALAMOS	NM	87544

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 LOS ALAMOS

B. COUNTY NAME

LOS ALAMOS

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6 LOS ALAMOS	NM	87544	

CONTINUE ON REVERSE

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VII. SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND	C. THIRD	D. FOURTH
(specify) NATIONAL SECURITY	7 (specify)	(specify)	7 (specify)

VIII. OPERATOR INFORMATION

A. NAME: LOS ALAMOS NATIONAL LABORATORY

B. Is the name listed in Item VIII-A also the owner? ☐ YES ☒ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)
F = FEDERAL, S = STATE, P = PRIVATE, M = PUBLIC (other than federal or state), O = OTHER (specify)
F (specify)

D. PHONE (area code & no.): A 505 667 5021

E. STREET OR P.O. BOX: PO BOX 1663 MS K490

F. CITY OR TOWN: LOS ALAMOS

G. STATE: NM

H. ZIP CODE: 87545

IX. INDIAN LAND
Is the facility located on Indian lands? ☐ YES ☒ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water): 9 N NM0028355	D. PSD (Air Emissions from Proposed Sources): 9 P
B. UIC (Underground Injection of Fluids): 9 U	E. OTHER (specify): 9 NM0028576 (specify) NPDES
C. RCRA (Hazardous Wastes): 9 R	E. OTHER (specify): 9 (specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

The mission of Los Alamos National Laboratory (LANL) is the application of science and technology to solve national problems including weapons development and energy supply and conservation programs, while basic science research complements and strengthens its fundamental technical capabilities. The LANL is owned by the US Department of Energy and operated under contract by the University of California.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Harold Valencia Los Alamos Area Manager	[signature]	11-23-87

COMMENTS FOR OFFICIAL USE ONLY

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Form Approved OMB No. 158-S80004

FORM 3 RCRA — **EPA**

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

F	N	M	0	8	9	0	0	1	0	5	1	5		1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

☐ 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

C	YR.	MO.	DAY
8			

☐ 2. NEW FACILITY *(Complete item below.)*

FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

YR.	MO.	DAY

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

☒ 1. FACILITY HAS INTERIM STATUS

☐ 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code*(s)* in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided: Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT	B. 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S02	600	G		5	T02	500	U	
X-2	T03	20	E		6	T03	0.56	D	
1	S01	237,990	G		7	T04	NA(See IIIC.)		
2	S02	6,600	G		8	T04	2,534	U	
3	S04	5,000	G		9				
4	T01	7,680	U		10				

CONTINUE ON REVERSE

Continued from the front.

III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

- Discrete pieces of High Explosives (HE) waste are collected, packaged, and burned at the TA-16 burning ground. Two burn pads (388, 399) are used to burn the discrete pieces of HE while pad 287 is used to flash HE-contaminated equipment. Two pressure vessels (401, 406) are used to burn HE sludge from various processing facilities located at the Laboratory. The sludge is collected at various sumps located throughout the HE processing areas and taken directly to the pressure vessels for treatment. The sumps are regulated under NPDES permits. The sludge is placed on layers of sand in the vessels, the water allowed to drain from the bottom into an evaporation pond and the residue on the sand burned. These vessels do not contain an accumulation of liquids; therefore, they are not considered tanks. Sand from burn pads 388 and 399 have been found to be EP toxic for Barium. This sand has in the past been disposed of at Area P. Engineering drawings and location of the sites are included under item V. Design capacities are not applicable because the treatment process is performed on an as-needed basis.

- Waste sludges from the TA-54, Area L treatment tanks and the TA-50 Batch Waste Treatment facility are mixed with portland cement and/or envirostone and placed in 55-gallon drums. The cement serves to bind any fluid remaining in the sludge. The process is performed at Area L waste handling facilities and has a design capacity of 2,534 gallons per day.

IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER – Enter the four–digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four–digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY – For each **listed waste** entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each **characteristic** or **toxic contaminant** entered in column A estimate the total annual quantity of all the non–listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE – For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
   For listed hazardous waste: For each **listed** hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   For non–listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate **all** the processes that will be used to store, treat, and/or dispose of all the non–listed hazardous wastes that possess that characteristic or toxic contaminant.
   Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.
2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER – Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* – A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non–listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO. *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*	D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
X-1	K 0 5 4	900	P	T 0 3 D 8 0	
X-2	D 0 0 2	400	P	T 0 3 D 8 0	
X-3	D 0 0 1	100	P	T 0 3 D 8 0	
X-4	D 0 0 2				*included with above*

CONTINUE ON PAGE 3

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

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EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M D 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D001	100,000	P	S01	T03			
2	D002	300,000	P	S01	T01			
3	D003	7,500	P	S01	T01	T04		Reacted at TA-16 (See III C.)
4	D003	5,000	P	S01	T03	T01		Lithium Hydride only
5	D004	2,000	P	S01				
6	D005	60,000	P	S01		T01		Sand from cleanout of explosives burn pads.
7	D006	1,000	P	S01	T01			
8	D007	1,500	P	S01	T01			
9	D008	50,000	P	S01			May	contain other metals (D004-D011)
10	D009	5,000	P	S01	T01			
11	D010	500*	P	S01				
12	D011	1,250	P	S01	T01			
13	D012	500*	P	S01	T03			
14	D016	1,000	P	S01	T03			
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Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W DUP — T/A C: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	F001	180,000	P	S01 S02 T03 T04	Solidified if treatment standards are met
2	F002	5,000	P	S01 S02 T03 T04	
3	F003	5,000	P	S01 S02 T03 T04	
4	F004	500*	P	S01 T03	
5	F005	5,000	P	S01 S02 T03 T04	
6	F006	500*	P	S01 T01	
7	F007	12,500	P	S01 T01	
8	F008	1,000	P	S01 T01	
9	F009	6,000	P	S01 T01	
10	F027	700	P	S01 T03	
11	F028	700	P	S01 T03	
12		END OF F DESIGNATOR			
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NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	K 0 4 4	50,000	P	S 0 1 T 0 4	Reacted at TA-16 (See III C.)
2	K 0 4 7	500*	P	S 0 1 T 0 4	
3		END OF K DESIGNATOR			
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CONTINUE ON REVERSE

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W DUP — T/A C: 2 — DUP

IV DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P001	500*	P	S01 T03	
2	P002	500*	P	S01 T03	
3	P003	500*	P	S01 T03	
4	P004	500*	P	S01 T03	
5	P005	500*	P	S01 T03	
6	P006	500*	P	S01 T04	
7	P007	500*	P	S01 T03	
8	P008	500*	P	S01 T03	
9	P009	500*	P	S01 T04	
10	P010	500*	P	S01	
11	P011	500*	P	S01	
12	P012	500*	P	S01	
13	P013	500*	P	S01 T01	
14	P014	500*	P	S01 T03	
15	P015	500*	P	S01	
16	P016	500*	P	S01 T03	
17	P017	500*	P	S01 T03	
18	P018	500*	P	S01 T03	
19	P020	500*	P	S01 T03	
20	P021	500*	P	S01 T01	
21	P022	500*	P	S01 T04	
22	P023	500*	P	S01 T03	
23	P024	500*	P	S01 T03	
24	P026	500*	P	S01 T03	
25	P027	500*	P	S01 T03	
26	P028	500*	P	S01 T03	

CONTINUE ON REVERSE

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W DUP — T/A C: 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P029	500*	P	S01	T01			
2	P030	500*	P	S01	T01			
3	P031	500*	P	S01	T04	T03		
4	P033	500*	P	S01	T04	T03		
5	P034	500*	P	S01	T03			
6	P036	500*	P	S01	T03			
7	P037	500*	P	S01	T03			
8	P038	500*	P	S01	T03			
9	P039	500*	P	S01	T03			
10	P040	500*	P	S01	T03			
11	P041	500*	P	S01	T03			
12	P042	500*	P	S01	T03			
13	P043	500*	P	S01				
14	P044	500*	P	S01	T03			
15	P045	500*	P	S01	T03			
16	P046	500*	P	S01	T03			
17	P047	500*	P	S01	T03			
18	P048	500*	P	S01	T03			
19	P049	500*	P	S01	T03			
20	P050	500*	P	S01	T03			
21	P051	500*	P	S01	T03			
22	P054	500*	P	S01	T01	T04		
23	P056	500*	P	S01				
24	P057	500*	P	S01	T03			
25	P058	500*	P	S01				
26	P059	500*	P	S01	T03			

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

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EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C 1	W DUP — T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P060	500*	P	S01 T03	
2	P062	500*	P	S01 T03	
3	P063	500*	P	S01 T03 T04	
4	P064	500*	P	S01 T03 T04	
5	P065	500*	P	S01 T04	
6	P066	500*	P	S01 T03	
7	P067	500*	P	S01 T03	
8	P068	500*	P	S01 T03	
9	P069	500*	P	S01 T03 T04	
10	P070	500*	P	S01 T03	
11	P071	500*	P	S01 T03 T04	
12	P072	500*	P	S01 T03	
13	P073	500*	P	S01 T01 T04	
14	P074	500*	P	S01 T01	
15	P075	500*	P	S01 T03	
16	P076	500*	P	S01 T01 T04	
17	P077	500*	P	S01 T03 T04	
18	P078	500*	P	S01 T01	
19	P081	500*	P	S01 T04	
20	P082	500*	P	S01 T03	
21	P084	500*	P	S01 T03	
22	P085	500*	P	S01 T03	
23	P087	500*	P	S01	
24	P088	500*	P	S01 T03	
25	P089	500*	P	S01 T03	
26	P092	500*	P	S01	

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

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EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P093	500*	P	S01	T03			
2	P094	500*	P	S01	T03			
3	P095	500*	P	S01	T03			
4	P096	500*	P	S01	T03	T04		
5	P097	500*	P	S01	T03			
6	P098	500*	P	S01	T01			
7	P099	500*	P	S01	T01			
8	P101	500*	P	S01	T03			
9	P102	500*	P	S01	T03			
10	P103	500*	P	S01	T03			
11	P104	500*	P	S01	T01			
12	P105	500*	P	S01				
13	P106	500*	P	S01	T01			
14	P107	500*	P	S01	T04			
15	P108	500*	P	S01	T03			
16	P109	500*	P	S01	T03			
17	P110	500*	P	S01	T03			
18	P111	500*	P	S01	T03			
19	P112	500*	P	S01	T03	T04		
20	P113	500*	P	S01				
21	P114	500*	P	S01				
22	P115	500*	P	S01				
23	P116	500*	P	S01	T03			
24	P118	500*	P	S01	T03			
25	P119	500*	P	S01				
26	P120	500*	P	S01				

Continued from page 2.

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EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A 1 C	W DUP T/A 2 C DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	P121	500*	P	S01 T01	
2	P122	500*	P	S01 T04	
3	P123	500*	P	S01 T03	
4		END OF P DESIGNATOR			
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CONTINUE ON REVERSE

(enter "A", "B", "C", etc. behind the "3" to identify photocopied pages)

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W DUP — T/A C: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U 0 0 1	500*	P	S 0 1	T 0 3			
2	U 0 0 2	1000	P	S 0 1	T 0 3			
3	U 0 0 3	500*	P	S 0 1	T 0 3			
4	U 0 0 4	500*	P	S 0 1	T 0 3			
5	U 0 0 5	500*	P	S 0 1				
6	U 0 0 6	500*	P	S 0 1	T 0 4			
7	U 0 0 7	500*	P	S 0 1	T 0 3			
8	U 0 0 8	500*	P	S 0 1	T 0 3	T 0 4		
9	U 0 0 9	500*	P	S 0 1	T 0 3			
10	U 0 1 0	500*	P	S 0 1	T 0 3			
11	U 0 1 1	500*	P	S 0 1	T 0 3			
12	U 0 1 2	500*	P	S 0 1	T 0 3			
13	U 0 1 4	500*	P	S 0 1	T 0 3			
14	U 0 1 5	500*	P	S 0 1	T 0 3			
15	U 0 1 6	500*	P	S 0 1	T 0 3			
16	U 0 1 7	500*	P	S 0 1	T 0 3			
17	U 0 1 8	500*	P	S 0 1	T 0 3			
18	U 0 1 9	500*	P	S 0 1	T 0 3			
19	U 0 2 0	500*	P	S 0 1	T 0 3	T 0 4		
20	U 0 2 1	500*	P	S 0 1	T 0 3			
21	U 0 2 2	500*	P	S 0 1	T 0 3			
22	U 0 2 3	500*	P	S 0 1	T 0 3	T 0 4		
23	U 0 2 4	500*	P	S 0 1	T 0 3			
24	U 0 2 5	500*	P	S 0 1	T 0 3			
25	U 0 2 6	500*	P	S 0 1	T 0 3			
26	U 0 2 7	500*	P	S 0 1	T 0 3			

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NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

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EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W DUP — T/A C: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U028	500*	P	S01	T03			
2	U029	500*	P	S01	T03			
3	U030	500*	P	S01	T03			
4	U031	500*	P	S01	T03			
5	U032	500*	P	S01	T01			
6	U033	500*	P	S01	T04			
7	U034	500*	P	S01	T03			
8	U035	500*	P	S01	T03			
9	U036	500*	P	S01	T03			
10	U037	500*	P	S01	T03			
11	U038	500*	P	S01	T03			
12	U039	500*	P	S01	T03			
13	U041	500*	P	S01	T03			
14	U042	500*	P	S01	T03	T04		
15	U043	500*	P	S01	T03	T04		
16	U044	1000	P	S01	T03			
17	U045	500*	P	S01	T03	T04		
18	U046	500*	P	S01	T03			
19	U047	500*	P	S01	T03			
20	U048	500*	P	S01	T03			
21	U049	500*	P	S01	T03			
22	U050	500*	P	S01	T03			
23	U051	500*	P	S01	T03			
24	U052	500*	P	S01	T03			
25	U053	500*	P	S01	T03			
26	U055	500*	P	S01	T03			

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NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

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EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A: 1	W DUP — T/A: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U056	500*	P	S01 T03	
2	U057	500*	P	S01 T03	
3	U058	500*	P	S01 T03	
4	U059	500*	P	S01 T03	
5	U060	500*	P	S01 T03	
6	U061	500*	P	S01 T03	
7	U062	500*	P	S01 T03	
8	U063	500*	P	S01 T03	
9	U064	500*	P	S01 T03	
10	U066	500*	P	S01 T03	
11	U067	500*	P	S01 T03	
12	U068	500*	P	S01 T03	
13	U069	500*	P	S01 T03	
14	U070	500*	P	S01 T03	
15	U071	500*	P	S01 T03	
16	U072	500*	P	S01 T03	
17	U073	500*	P	S01 T03	
18	U074	500*	P	S01 T03	
19	U075	500*	P	S01	
20	U076	500*	P	S01 T03	
21	U077	500*	P	S01 T03	
22	U078	500*	P	S01 T03	
23	U079	500*	P	S01 T03	
24	U080	500*	P	S01 T03	
25	U081	500*	P	S01 T03	
26	U082	500*	P	S01 T03	

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NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U083	500*	P	S01 T03	
2	U084	500*	P	S01 T03	
3	U085	500*	P	S01 T03	
4	U086	500*	P	S01 T03	
5	U087	500*	P	S01 T03	
6	U088	500*	P	S01 T03	
7	U089	500*	P	S01 T03	
8	U090	500*	P	S01 T03	
9	U091	500*	P	S01 T03	
10	U092	500*	P	S01 T04	
11	U093	500*	P	S01 T03	
12	U094	500*	P	S01 T03	
13	U095	500*	P	S01 T03	
14	U096	500*	P	S01 T03	
15	U097	500*	P	S01 T03	
16	U098	500*	P	S01 T03	
17	U099	500*	P	S01 T03	
18	U101	500*	P	S01 T03	
19	U102	500*	P	S01 T03	
20	U103	500*	P	S01 T03	
21	U105	500*	P	S01 T03	
22	U106	500*	P	S01 T03	
23	U107	500*	P	S01 T03	
24	U108	500*	P	S01 T03	
25	U109	500*	P	S01 T03	
26	U110	500*	P	S01 T03	

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U 1 1 1	500*	P	S 0 1 T 0 3	
2	U 1 1 2	500*	P	S 0 1 T 0 3 T 0 4	
3	U 1 1 3	500*	P	S 0 1 T 0 3 T 0 4	
4	U 1 1 4	500*	P	S 0 1 T 0 3	
5	U 1 1 5	500*	P	S 0 1 T 0 3 T 0 4	
6	U 1 1 6	500*	P	S 0 1 T 0 3	
7	U 1 1 7	500*	P	S 0 1 T 0 3 T 0 4	
8	U 1 1 8	500*	P	S 0 1 T 0 3 T 0 4	
9	U 1 1 9	500*	P	S 0 1 T 0 3	
10	U 1 2 0	500*	P	S 0 1 T 0 3	
11	U 1 2 1	500*	P	S 0 1	
12	U 1 2 2	500*	P	S 0 1 T 0 3	
13	U 1 2 3	500*	P	S 0 1	
14	U 1 2 4	500*	P	S 0 1 T 0 3	
15	U 1 2 5	500*	P	S 0 1 T 0 3	
16	U 1 2 6	500*	P	S 0 1 T 0 3	
17	U 1 2 7	500*	P	S 0 1 T 0 3	
18	U 1 2 8	500*	P	S 0 1 T 0 3	
19	U 1 2 9	500*	P	S 0 1 T 0 3	
20	U 1 3 0	500*	P	S 0 1 T 0 3	
21	U 1 3 1	500*	P	S 0 1 T 0 3	
22	U 1 3 2	500*	P	S 0 1 T 0 3	
23	U 1 3 3	500*	P	S 0 1 T 0 3 T 0 4	
24	U 1 3 4	10,000	P	S 0 1 T 0 1	
25	U 1 3 5	500*	P	S 0 1 T 0 4 T 0 3	
26	U 1 3 6	500*	P	S 0 1	

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W DUP — T/A C: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U137	500*	P	S01 T03	
2	U138	500*	P	S01 T03	
3	U139	500*	P	S01 T03	
4	U140	500*	P	S01 T03	
5	U141	500*	P	S01 T03	
6	U142	500*	P	S01 T03	
7	U143	500*	P	S01 T03	
8	U144	500*	P	S01	
9	U145	500*	P	S01	
10	U146	500*	P	S01	
11	U147	500*	P	S01 T03	
12	U148	500*	P	S01 T03	
13	U149	500*	P	S01 T03	
14	U150	500*	P	S01 T03	
15	U151	500*	P	S01	
16	U152	500*	P	S01 T03	
17	U153	500*	P	S01 T03	
18	U154	500*	P	S01 T03	
19	U155	500*	P	S01 T03	
20	U156	500*	P	S01 T03	
21	U157	1000	P	S01 T03	
22	U158	500*	P	S01 T03	
23	U159	1000	P	S01 T03	
24	U160	500*	P	S01 T03 T04	
25	U161	500*	P	S01 T03	
26	U162	500*	P	S01 T03	

CONTINUE ON REVERSE

Continued from page 2.

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Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A: 1	W DUP — T/A: 2 — DUP

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U163	500*	P	S01 T03	
2	U164	500*	P	S01 T03	
3	U165	500*	P	S01 T03	
4	U166	500*	P	S01 T03	
5	U167	500*	P	S01 T03	
6	U168	500*	P	S01 T03	
7	U169	500*	P	S01 T03	
8	U170	500*	P	S01 T03	
9	U171	500*	P	S01 T03	
10	U172	500*	P	S01 T03	
11	U173	500*	P	S01 T03	
12	U174	500*	P	S01 T03	
13	U176	500*	P	S01 T03	
14	U177	500*	P	S01 T03	
15	U178	500*	P	S01 T03	
16	U179	500*	P	S01 T03	
17	U180	500*	P	S01 T03	
18	U181	500*	P	S01 T93	
19	U182	500*	P	S01 T03	
20	U183	500*	P	S01 T03	
21	U184	500*	P	S01 T03	
22	U185	500*	P	S01 T03	
23	U186	500*	P	S01 T03	
24	U187	500*	P	S01 T03	
25	U188	500*	P	S01 T03	
26	U189	500*	P	S01 T04 T03	

Continued from page 2.
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Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 T/A C 1	W DUP T/A C 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U190	500*	P	S01	T03			
2	U191	500*	P	S01	T03			
3	U192	500*	P	S01	T03			
4	U193	500*	P	S01	T03			
5	U194	500*	P	S01	T03			
6	U196	500*	P	S01	T03			
7	U197	500*	P	S01	T03			
8	U200	500*	P	S01	T03			
9	U201	500*	P	S01	T03			
10	U202	500*	P	S01	T03			
11	U203	500*	P	S01	T03			
12	U204	500*	P	S01				
13	U205	500*	P	S01	T04			
14	U206	500*	P	S01	T03			
15	U207	500*	P	S01	T03			
16	U208	500*	P	S01	T03			
17	U209	500*	P	S01	T03			
18	U210	500*	P	S01	T03			
19	U211	500*	P	S01	T03			
20	U212	500*	P	S01	T03			
21	U213	500*	P	S01	T03	T04		
22	U214	500*	P	S01	T03			
23	U215	500*	P	S01				
24	U216	500*	P	S01				
25	U217	500*	P	S01	T04			
26	U218	500*	P	S01	T03			

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	FOR OFFICIAL USE ONLY
W N M 0 8 9 0 0 1 0 5 1 5 — T/A C: 1	W DUP — T/A C: 2 DUP

IV. DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	U219	500*	P	S01 T03	
2	U220	1000	P	S01 T03	
3	U221	500*	P	S01 T03	
4	U222	500*	P	S01 T03	
5	U223	1000	P	S01 T03	
6	U225	500*	P	S01	
7	U226	1500	P	S01 T03	
8	U227	500*	P	S01 T03	
9	U228	2000	P	S01 T03	
10	U230	500*	P	S01 T03	
11	U231	500*	P	S01 T03	
12	U232	500*	P	S01 T03	
13	U233	500*	P	S01 T03	
14	U234	500*	P	S01 T04	
15	U235	500*	P	S01 T03	
16	U236	500*	P	S01 T03	
17	U237	500*	P	S01 T03	
18	U238	500*	P	S01 T03	
19	U239	1000	P	S01 T03	
20	U240	500*	P	S01 T03	
21	U242	500*	P	S01 T03	
22	U243	500*	P	S01 T03	
23	U244	500*	P	S01 T03	
24	U246	500*	P	S01	
25	U247	500*	P	S01 T03	
26		END OF U DESIGNATOR			

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

*All entries with an asterisk in column IV B on page 3 are generated in small volumes only. If a new process or activity will cause more than the stated volume to be stored, treated, or disposed, a revised Part A will be submitted.

EPA I.D. NO. *(enter from page 1)*

F N M 0 8 9 0 0 1 0 5 1 5 T/A C 6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail)*.

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground—level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail)*.

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
3 5 4 9 0 5 1	1 0 6 1 4 0 1 5

VIII. FACILITY OWNER

A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. (area code & no.)
F United States Department of Energy	5 0 5 - 6 6 7 - 5 1 0 5

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F Los Alamos Area Office	G Los Alamos	N M	8 7 5 4 5

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Harold Valencia Los Alamos Area Office	HB Valencia	11-23-87

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Siegfried S. Hecker Director	Siegfried S. Hecker	11/18/87

CONTINUE ON PAGE 5

Continued from page 4

V. FACILITY DRAWING

The following drawings are attached to the revised Part A dated 10/31/84

ENG-R 5277 Sheets 2 & 5 - "S" Site showing location of burn pits area - also relationship of "S" Site to rest of Lab. TA-40 & TA-14 locations where HE waste may be destroyed.

TA-16 - Structure Location Plan - Structural designation of pressure vessels (401, 406) and burn pads (387, 388, 399).

ENG-C-27630 - Pressure Vessel (406)

ENG-C-25937 - Pressure Vessel (401)

ENG-C-5849 - Burn Pads (387, 388, 389)

LA-RV-1-13.1 and LA-RV-P-9 - Batch Waste Treatment System at TA-50-1.

Area L Chemical Storage Facility, TA-54.

Area L Chemical Storage Facility, shed.

ENG-R-5277 Shed 10 - TA-15 and TA-36 - firing points where HE waste may be destroyed.

ENG-R-5277 Sheet 11 - TA-39 firing points where HE waste may be destroyed.

ENG-R-5277 Sheet 5 - TA-14 and TA-40 firing points where HE waste may be destroyed.

1. The following drawings are attached to the revised Part A dated 7/26/84:

   Figure 1 - Technical Area Location Plan

   Figure 4 - TA-50 Structure Location Plan showing location of the Batch Waste Treatment Facility in Building 1 and the controlled air incinerator in Building 37.

   Figure 5 - TA-54 Structure Location Plan showing Area L.

2. The following drawings are attached to the revised Part A dated April 1, 1985:

   TDF (Fig. 4-3 of Part B)

   TDF (Fig. 4-4 of Part B)

   TA-54 Area L Storage Area (2 drawings)

3. The following drawings and photographs are attached to the revised Part A dated 3/19/86:

   TA-54 Area L Storage Area Drawings, Revised July 25, 1985 (2 drawings)

   Photographs:

   TA-3, SM-40 - Temporary chemical waste storage

   TA-3, SM-102 - South Side, LiH room

   TA-9-39 (2 photographs) - Structure and bilingual sign for storage

   TA-14-23 - Building with bilingual sign

3. (cont'd.)

TA-14-23 and 35 - Building 23 with firing pad 35

TA-15, Phermex - Firing pad

TA-16, Area P - Area with bilingual sign

TA-16-387 - Burn pad

TA-16-406 - Storage area (temp)

TA-16-394 - Burn Pad

TA-16-401 - Storage area (temp)

TA-16-389 -Building used as control point

TA-16-399 - Burn Pad

TA-16-388 - Burn Pad

TA-22, TD 96-3 - Temporary storage area with bilingual sign

TA-22, TD 96 - Structure used as storage area (temp)

TA-22, TD 24 - Structure used as storage area (temp)

TA-36-8, Kappa 8 - Firing pad

TA-39, AC-6 - Firing pad

TA-39, AC-57 - Firing pad

TA-40, DF-2 - Structure used as temporary storage area

TA-50-1 - West side of building with BWT

TA-50-1, Batch Waste Treatment - East doors to BWT (middle of photo, in background)

TA-50-37 - TDF facility (east side)

TA-54, Area L (5 photographs)

4. The following are new submittals:

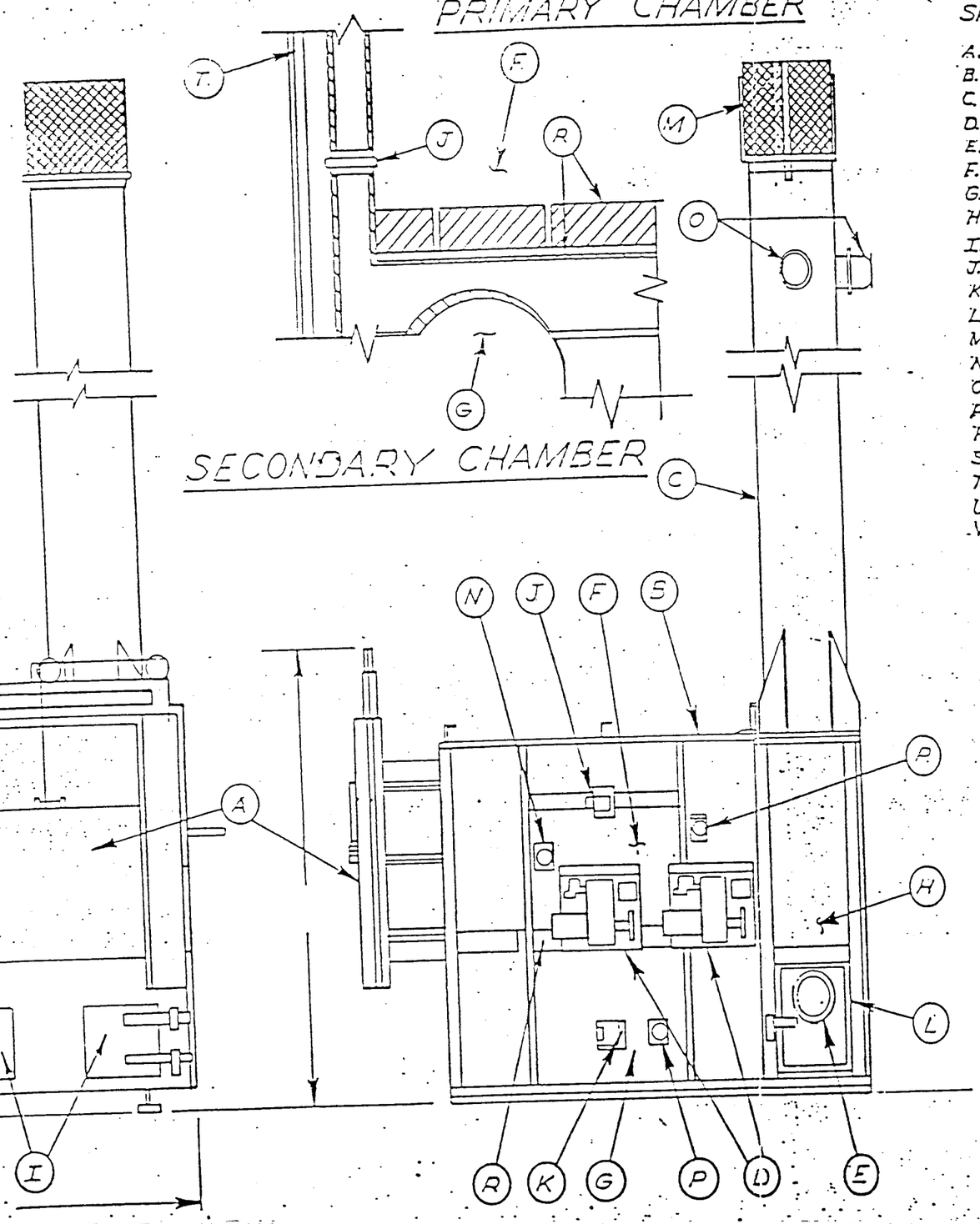
TA-16 Industrial Incinerator (location map)

TA-16 Spronz Industrial Incinerator

TA-50 Locations of TA-50 Chemical Waste Incinerator and Container Storage Facilities

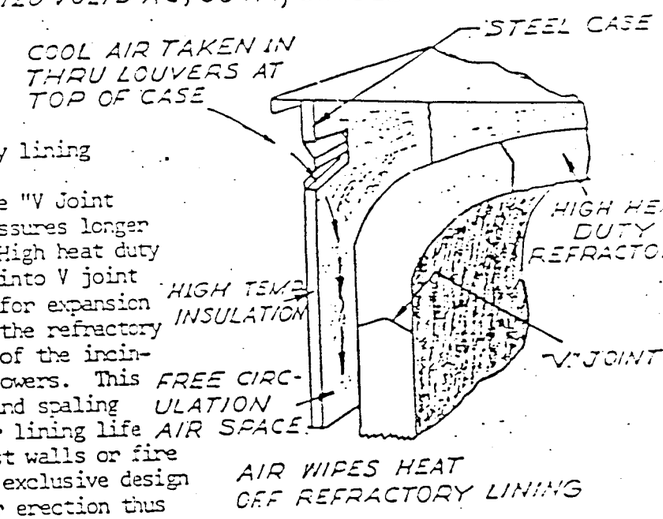
TA-50 Chemical Storage (Concrete Pad)

TA-50 Safety Storage Containers (Modular Storage Buildings)



SPECIFICATIONS:

A. GUILLOTINE CHARGING DOOR 42" x 30"
B. STEEL JACKET
C. SELF SUPPORTING STACK 22" I.D. 26" O.D.
D. BURNERS & WEATHERHOODS
E. BAROMETRIC DAMPER
F. PRIMARY CHAMBER
G. SECONDARY CHAMBER
H. SEDIMENT CHAMBER
I. ASH REMOVAL DOORS
J. AIR BLOWER/ PRIMARY CHAMBER
K. AIR BLOWER/ SECONDARY CHAMBER
L. CLEANOUT DOOR UNDER STACK
M. SPARK ARRESSTOR
N. SIGHT GLASS
O. STACK TEST PORTS
P. THERMOCOUPLES
R. HEARTH W/ FIREBRICK LINING
S. INCINERATOR DIMENSIONS: 166" L x 84" W x 78" H
T. 1" BLANKET INSULATION
U. BURNING CAPACITY 380 LBS/HR. 0-4 WASTE
V. ELEC. REQ. 115/120 VOLTS AC, 60 Hz, SINGLE PHASE

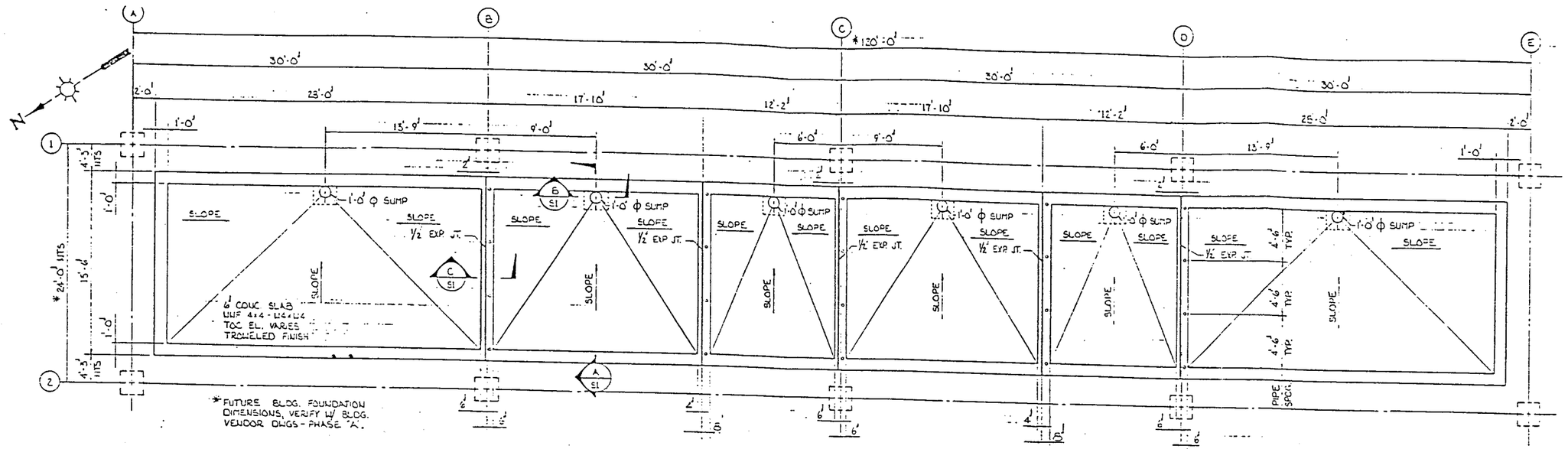


"V JOINT" refractory lining

The SPRONZ exclusive "V Joint refractory lining assures longer incinerator life. High heat duty refractory is cast into V joint blocks which allow for expansion and contraction of the refractory as the temperature of the incinerator raises and lowers. This prevents cracking and spaling assuring far longer lining life than monolithic cast walls or fire brick walls. This exclusive design also permits faster erection thus cutting on-the-job time.

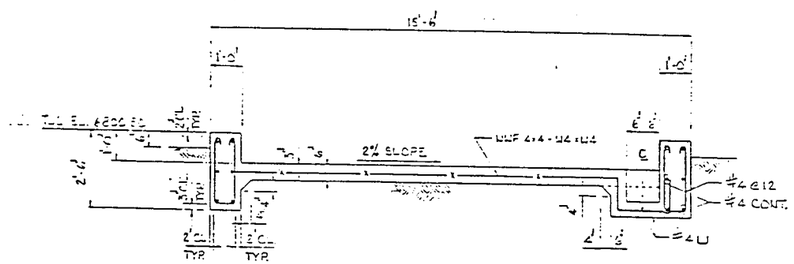
TOLERANCES (EXCEPT AS NOTED)	SPRONZ INCINERATOR CORP. ROCHESTER, NEW YORK 14611		
DECIMAL ±		SCALE NONE	DRAWN BY QMD / APPROVED BY
FRACTIONAL ±	TITLE INCINERATOR		
ANGULAR ±	DATE 8-22-85	DRAWING NUMBER RL-80-P	

RUNING 40:1



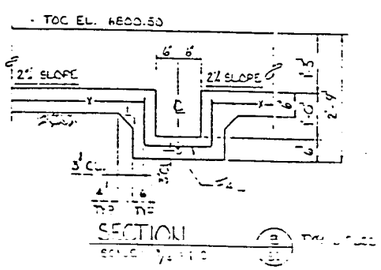
FOUNDATION PLAN

SCALE: 1/4" = 1'-0"



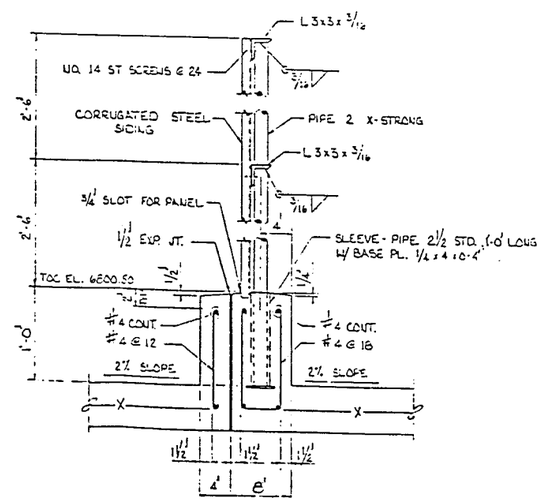
SECTION A / S1

SCALE: 1/2" = 1'-0"



SECTION B / S1

SCALE: 1/2" = 1'-0"



SECTION C / S1

SCALE: 1/2" = 1'-0"

STRUCTURAL NOTES

1. STRUCTURE EXCAVATION - EXCAVATE FOR WALLS & SLABS IN ACCORDANCE WITH ELEVATIONS & DIMENSIONS SHOWN ON THIS DRAWING. EXCAVATION SHALL EXTEND A SUFFICIENT DISTANCE FROM WALLS TO ALLOW FOR PLACING & REMOVAL OF FORMS. OVEREXCAVATION BELOW ELEVATIONS SHOWN SHALL BE RESTORED TO PROPER ELEVATION BY BACKFILLING WITH CONCRETE. THE EXCAVATION SHALL BE INSPECTED BY ENG-1 INSPECTOR PRIOR TO PLACING REINFORCING STEEL.

2. CONCRETE CONSTRUCTION SHALL BE IN CONFORMANCE WITH FACILITIES ENGINEERING DIVISION STANDARD SPECIFICATIONS:
   SECTION 03100 - CONCRETE FORMWORK, 3/4" CHAMFER
   SECTION 03200 - REINFORCING STEEL, GRADE 60
   SECTION 03300 - CAST-IN-PLACE CONCRETE, f'_c = 4000 PSI

   FINISH WALLS & SLABS WITH A PREMIXED, SINGLE APPLICATION SEALER & HARDENER FLOOR FINISH. THE FINISH SHALL BE DELIVERED TO THE JOB SITE IN UNBROKEN CONTAINERS & APPLIED IN ACCORDANCE WITH THE MANUFACTURERS DIRECTIONS.

3. MISCELLANEOUS STEEL - MATERIAL, FABRICATION, ERECTION & PAINTING OF STEEL SHALL COMPLY TO SITE ENGINEERING STANDARD SPECIFICATION SECTION 05120 - STRUCTURAL STEEL.

   BARRIER PANELS SHALL BE 26 GAUGE 2 1/2 x 1/2 CORRUGATED GALVANIZED STEEL CONFORMING TO ASTM A446 G-90. FASTEN WITH NO. 14 SELF-TAPPING SCREWS.

NO.	DATE	CLASS'N REV.	REVISIONS	DWN	DES	CHK	REQUIRED CONCURRENCE

FACILITIES ENGINEERING DIVISION

CHEMICAL STORAGE TA-50

STRUCT: FOUNDATION PLAN

STRUCTURE NO-32 TA-54

DRAWN E. SANCHEZ
DESIGN B. Smith
CHECKED E. SANCHEZ
RELEASED
DATE 2-9-95

SUBMITTED RECOMMENDED APPROVED

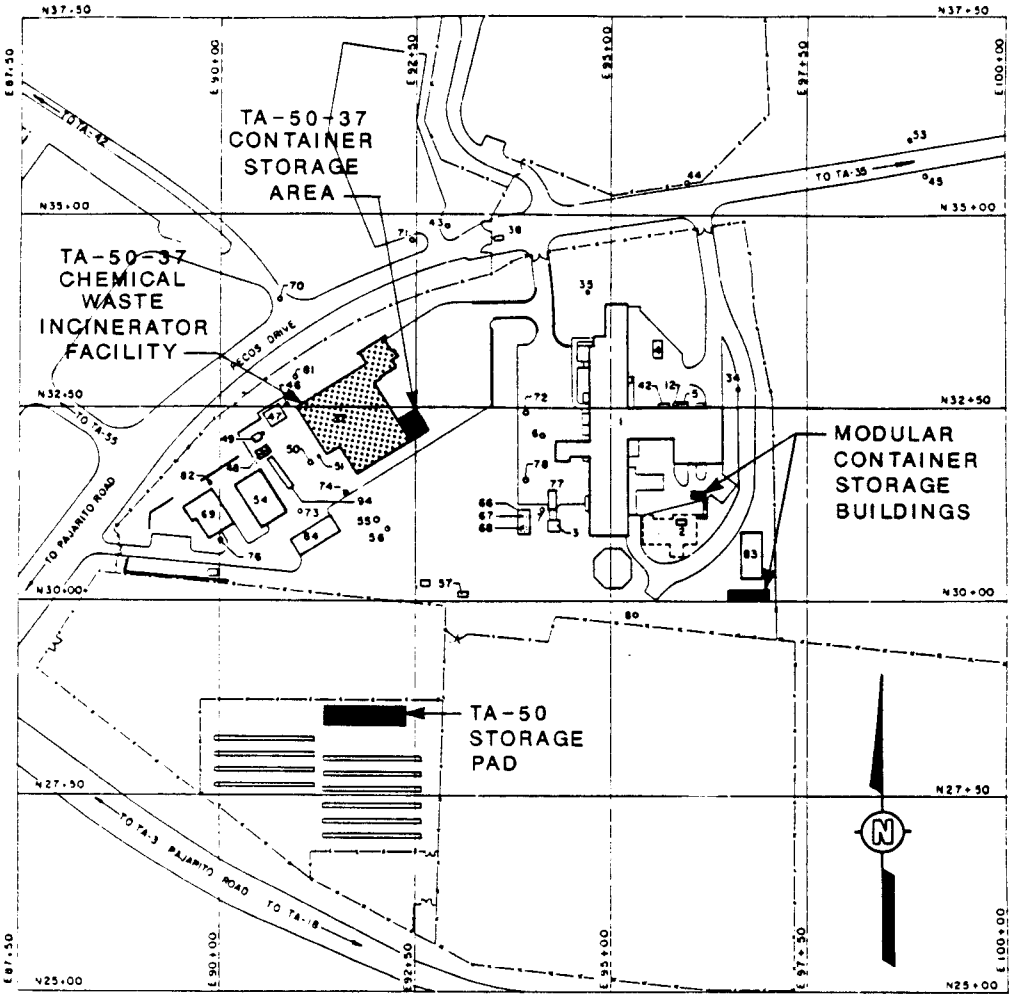
Los Alamos — Los Alamos National Laboratory, Los Alamos New Mexico 87545

SHEET S1 2 of 2

CLASSIFICATION REVIEWER DATE

REQUESTING DIVISION/LAB JOB NO. 8204-54
REQUESTING GROUP PHASE "C"
DRAWING NO. ENG-C 44856
REV.

11/16/87 A301017.02 - A138 DET 11/16/87

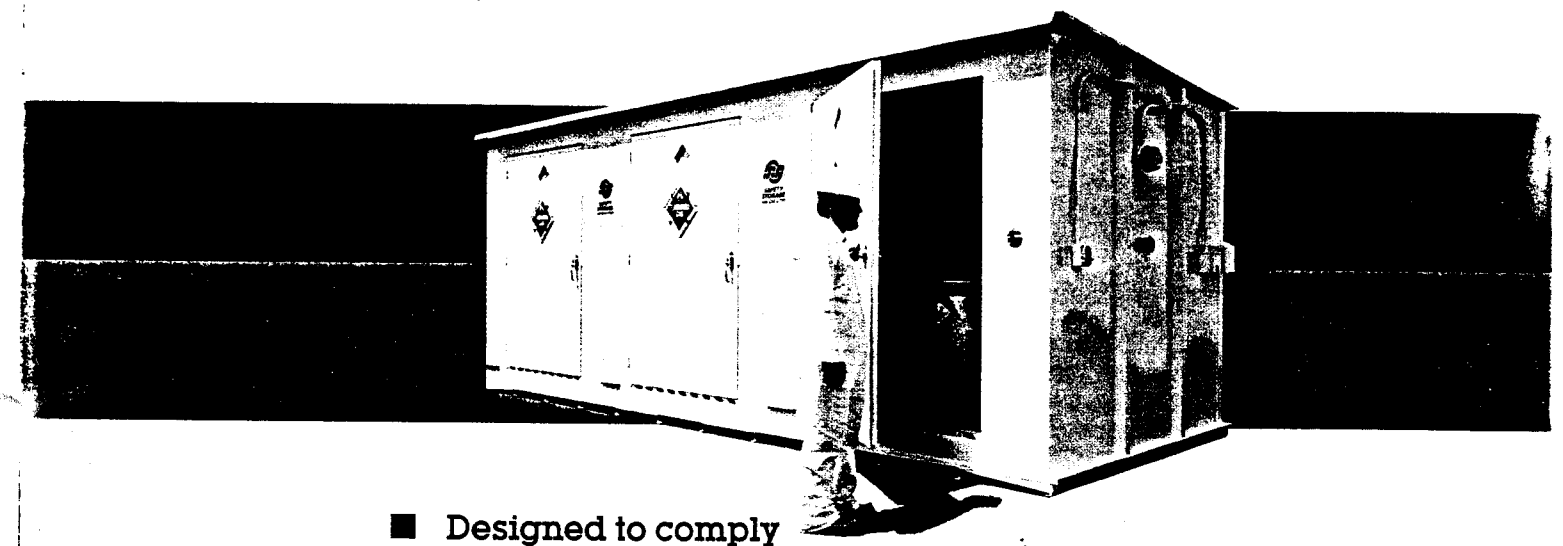


LOCATIONS OF TA-50
CHEMICAL WASTE INCINERATOR AND
CONTAINER STORAGE FACILITIES

13145/SAF
BuyLine 5195

Safety Storage Containers

for packaged chemicals and hazardous materials



- Designed to comply with regulatory standards for storing hazardous materials
- Factory-built to user requirements
- Four model sizes
- Readily available
- Relocatable

SAFETY STORAGE, INC.
18900 Stevens Creek Blvd.
Cupertino, CA 95014
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CARL HIME & ASSOCIATES
8220 La Mirada Road NE Suite 300
ALBUQUERQUE, NEW MEXICO 87109
(505) 292-3007

Safety Storage

Spill Containment, Fire Protection, Security

Safety Storage chemical and hazardous material containers are readily available for delivery throughout the United States. Four different size models can be used immediately upon delivery. They are turnkey units which require a minimum of site preparation. These high-quality units meet government standards and regulations for hazardous-materials storage. You can gain in many ways when you order:

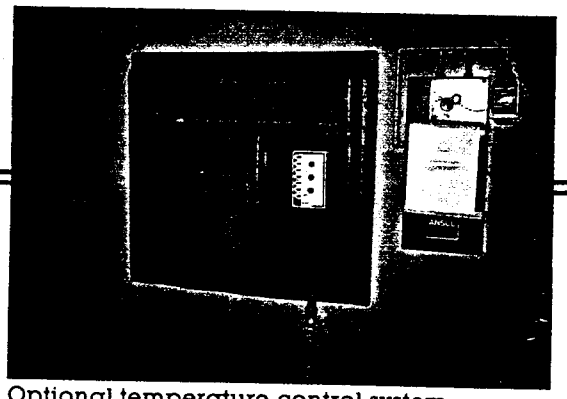
- More economical than comparable block or concrete structures.
- Can be tailored to fit your requirements.
- Avoid costly delays characteristic of on-site construction.
- Combine spill containment, security, fire protection and worker safety.
- Can be relocated on- or off-site.
- You pay only for the features you need.

Safety Storage container construction

Safety Storage containers are made of welded 10- and 12-gauge steel with supporting structural steel sections. Four models are available, the largest of which is the Model 22 with outside dimensions of 22'8" x 9' x 8'7". Three doors, each with three-point locking systems, provide access and security. The 500-gallon secondary spill-containment reservoir, the walls and the ceiling, all are covered with two coats of chemical-resistant epoxy. Maximum storage capacity is 10 tons of chemicals and hazardous materials (drums, boxes and cans). For example, thirty 55-gallon drums can be by conveniently accommodated. Loading can be by forklift or by hand. Standard floors are 1⅛" thick, epoxy-coated, fire-resistant plywood.

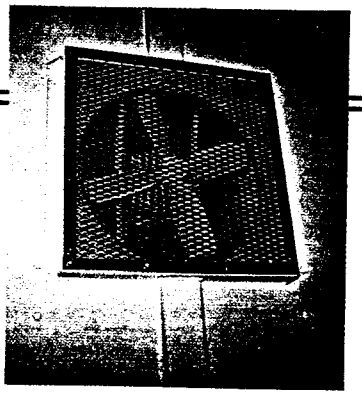
Safety features in this carefully engineered unit include a spill-containment sub-floor to prevent escape of hazardous liquids or solids. It is constructed of continuously welded 10-gauge steel which is epoxy coated to resist chemical attack. Blow-out panels are provided for pressure relief under explosive conditions. A static grounding connection helps to protect flammable materials from ignition by electrical discharge. And fire protection is supplied by three water sprinkler heads with a 2" NPT fitting located outside the container for sprinkler system hookup.

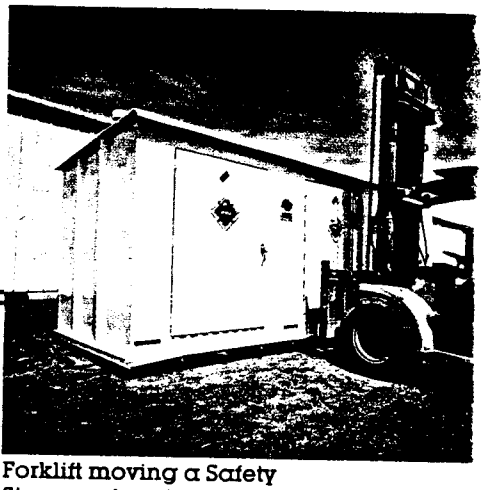
Permanent placards and NFC 704M rating signs are provided for flammable materials, corrosives, oxidizers, poisons and other hazardous materials stored within.



Optional temperature-control system for temperature-sensitive chemicals.

Non-sparking exhaust fan and protective aluminum shield (shown without louvered cover).





Forklift moving a Safety Storage chemical container to a new location.

Equipped to meet your needs

Optional features are determined by your specific storage requirements. For example: If you are going to store flammable liquids, we offer a dry chemical system to supplement or replace the standard sprinkler system. If you plan to store incompatible materials, we can install suitable separation walls. And, if you require shelf space for small containers, we can provide sturdy, epoxy-coated shelves of 15¼" depth.

Corrosives?...We offer a polypropylene spill-containment reservoir liner and fiberglass floor grating for additional protection. Do you want to monitor liquid spills continuously? Another option is a liquid-level detector that can either tie into your plant security system or an exterior audible alarm.

Worker safety?...We have selected only UL-approved equipment for lighting and explosion-proof electrical wiring systems—which also meet NEC, NFPA and NEMA requirements. The forced ventilation system is designed to provide one air change per minute and is powered by a Class I, Division I, totally enclosed explosion-proof motor. The fan has non-static aluminum blades, and the ductwork is epoxy-coated steel.

Safety Storage containers can be equipped with heating/cooling units to provide a moderated environment for stored chemicals. Double-wall insulated construction is also available.

Emergency eye/face wash units are still other worker-safety options.

How you can benefit from installing Safety Storage containers

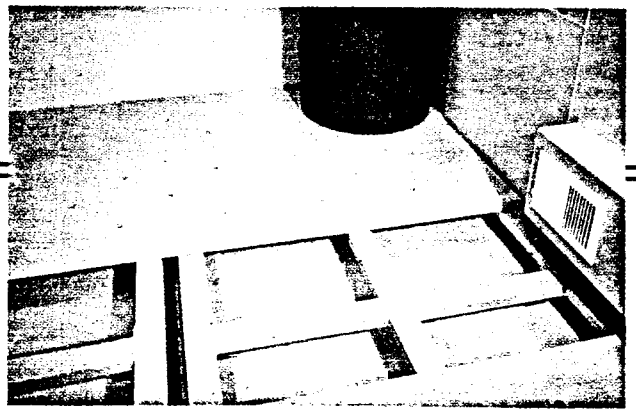
Regardless of how you equip your new Safety Storage chemical containers, you benefit in many ways:

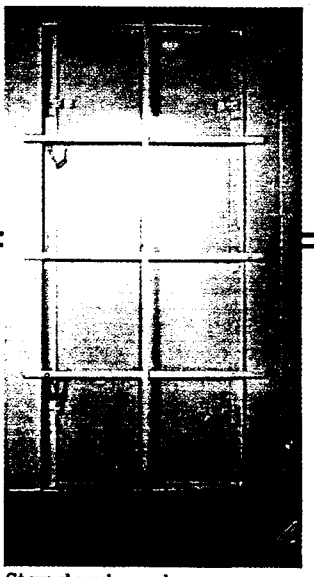
Spill containment. Soil and ground-water pollution from chemical leaks is of major concern throughout industry. Your company's possibility of liability can be reduced by using easily monitored Safety Storage containers with secondary containment for leaks and spills. We believe you will find them to be a safe, efficient solution to this potential environmental problem.

Fire protection. The risk of fire and/or explosion is always present when storing hazardous and flammable materials. Safety Storage design engineers have incorporated suggestions and recommendations from fire-protection specialists across the country to meet or exceed design and regulatory standards.

Security. Accountability and security are closely linked. It is essential in today's business climate to be

Spill-containment reservoir shown below standard plywood flooring.





Standard explosion vent panel is designed to relieve interior pressure.

A typical Model 22 plant-site installation.

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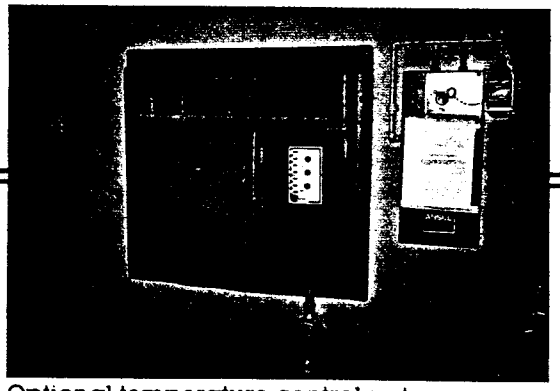
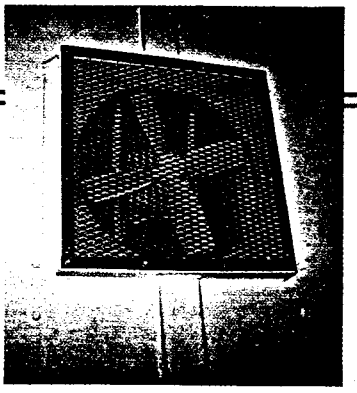
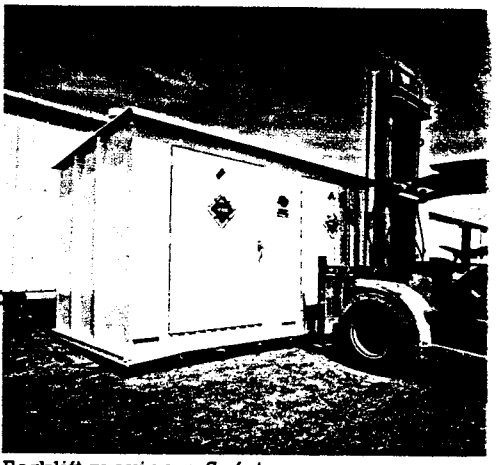


Optional temperature-control system for temperature-sensitive chemicals.

Non-sparking exhaust fan and protective aluminum shield (shown without louvered cover).





Forklift moving a Safety Storage chemical container to a new location.

able to document and account for the receipt, storage, handling, use and disposal of chemicals and hazardous materials. This includes tight control over access to Safety Storage containers with their three-point locking doors. Security is another Safety Storage cornerstone.

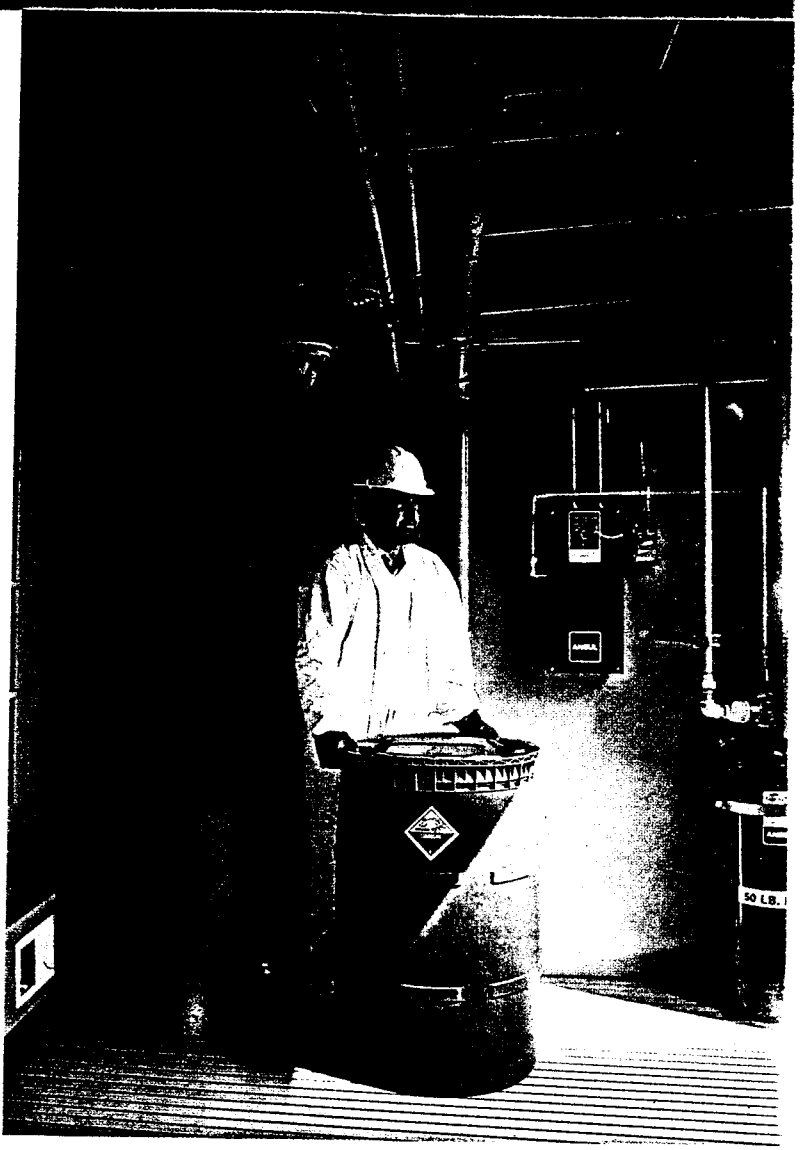
Worker safety. You can be assured that every effort has been made in the design and manufacture of these chemical storage containers to protect the safety of personnel. Safety features include warning placards, static grounding, alarms, security locks, fire and explosion protection, emergency washing facilities, ventilation, temperature control, exterior switches and sprinkler system hook-ups.

Ordering information

Features for containers manufactured by Safety Storage, Inc., can vary widely for each individual application. Therefore, design specifications are custom written to fit each model and usage. In addition, a leasing option is available to help serve your chemical-storage needs now, while conserving your capital.

Safety Storage Sales Representatives

Safety Storage sales representatives, located in most U.S. industrial communities, are trained to help you attain your safe chemical storage objectives. They will assess your chemical storage needs, prepare detailed storage-unit sketches and specifications, and provide written price quotations. Our manufacturing plants are strategically located to reduce delivery costs and shorten delivery times.



Models and basic statistics

Model	Outside Dimensions			Inside Dimensions			Weight (Lbs.)	Door Openings		Designed Storage Capacity			Sump Capacity (Gallons)
	Length	Width	Height	Length	Width	Height		Height	Width	Weight (Lbs.)	Sq. Ft.	Drums	
22	22'8"	9'0"	8'7½"	21'11¾"	8'0⅜"	7'0½"	8,600	6'9¾"	4'6"	20,000	176	24–40	570
15	15'3¾"	9'0"	8'7½"	14'7½"	8'0⅜"	7'0½"	6,000	6'9¾"	4'6"	14,000	117	16–28	380
7	8'0¼"	9'0"	8'7½"	7'3½"	8'0⅜"	7'0½"	3,400	6'9¾"	4'6"	7,000	58	8–12	190
4	6'0"	6'4½"	6'4½"	5'8½"	5'9"	4'11"	1,500	4'10"	4'7"	4,000	32½	4	85

SAFETY STORAGE, INC.
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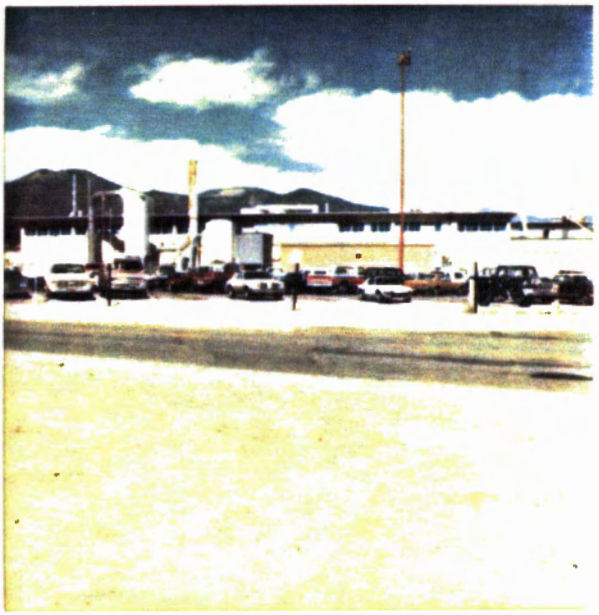
Cupertino, CA 95014
408/252-2750
1-800/621-0854 Ext. 926

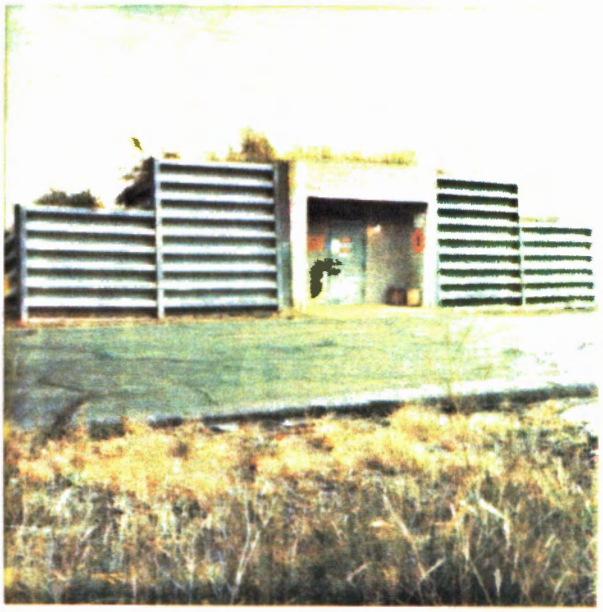
The contents of this brochure outline the general capabilities of Safety Storage, Inc., containers, and should be used only as guidelines for capabilities and applicability. No warranty is implied or intended by the contents of this brochure. Individual warranties are written for each customer's specifications.

SS-101 Printed in U.S.A.

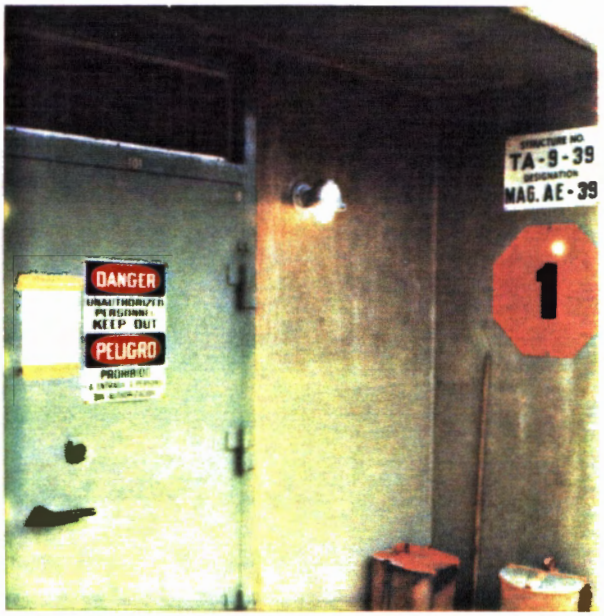
TA-3, SM-40



TA-3, SM-102

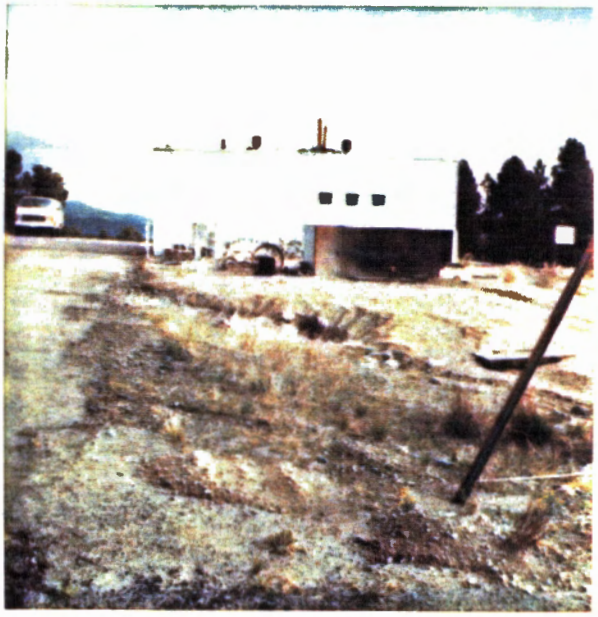


TA-9-39

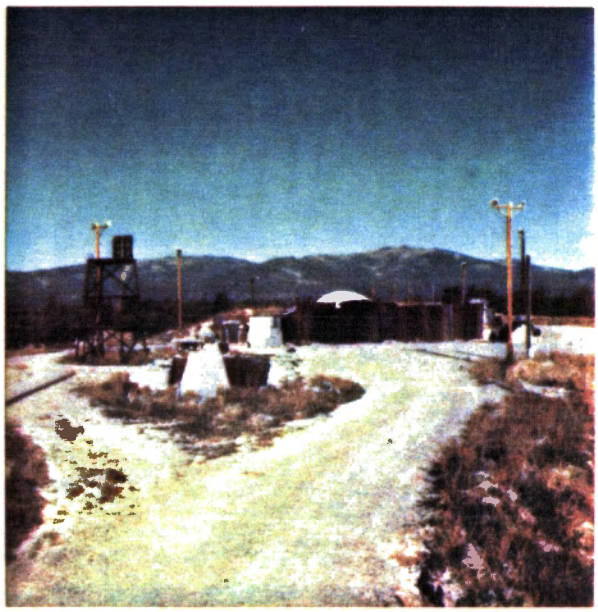


TA-9-39

TA-14-23



TA-14-23 and 35



TA-15, Phermex

TA-16, Area P

TA-16-387

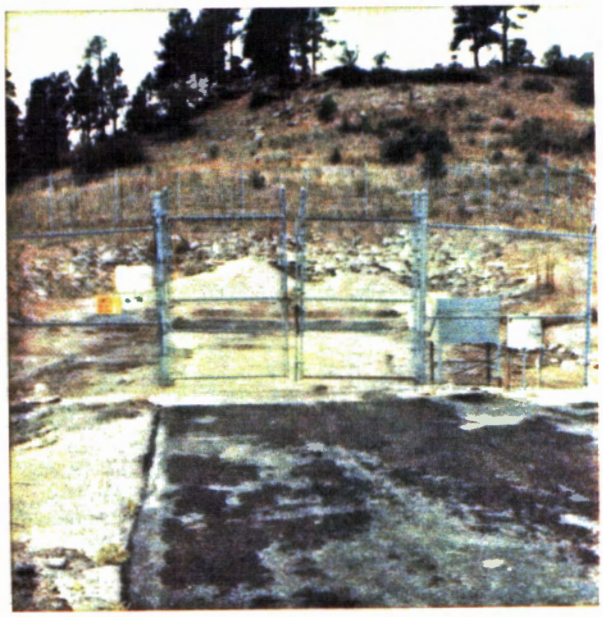
TA-16-406

TA-16-394

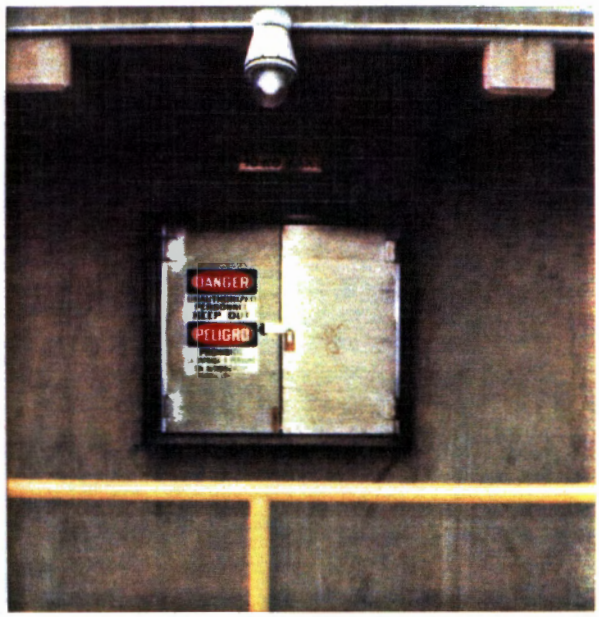
TA-16-401

TA-16-389

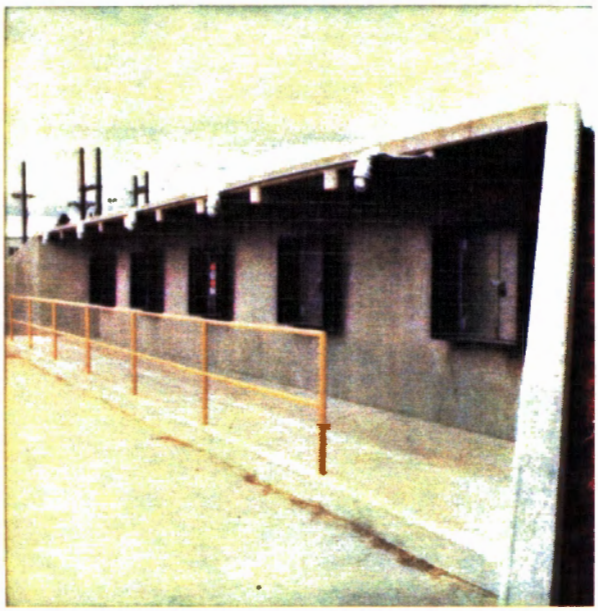
TA-16-399



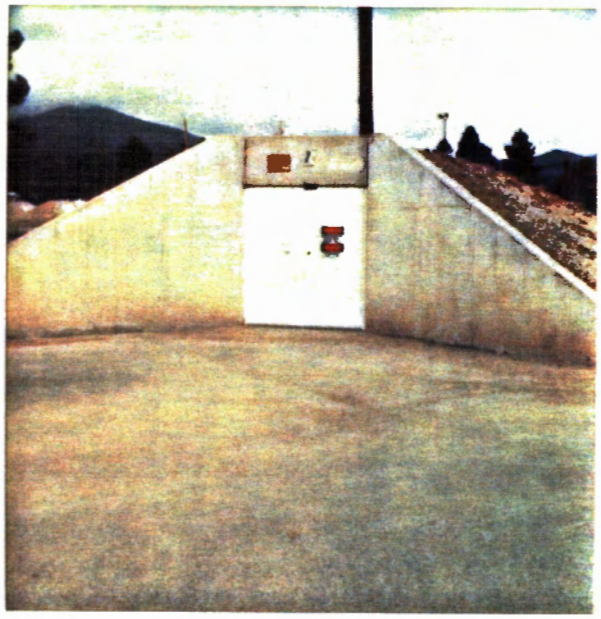
TA-16-388



TA-22, TD 96-3

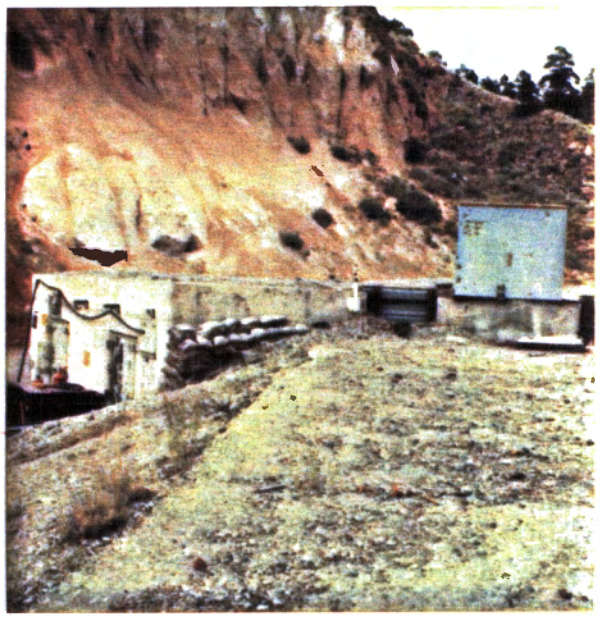


TA-22, TD 96

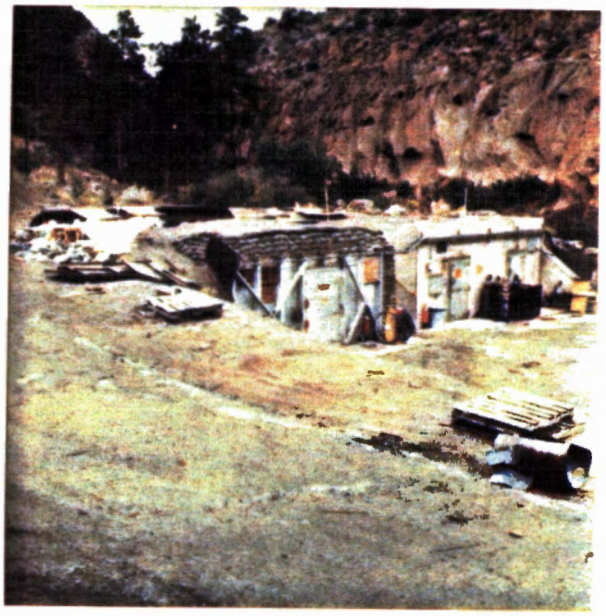


TA-22, TD 24

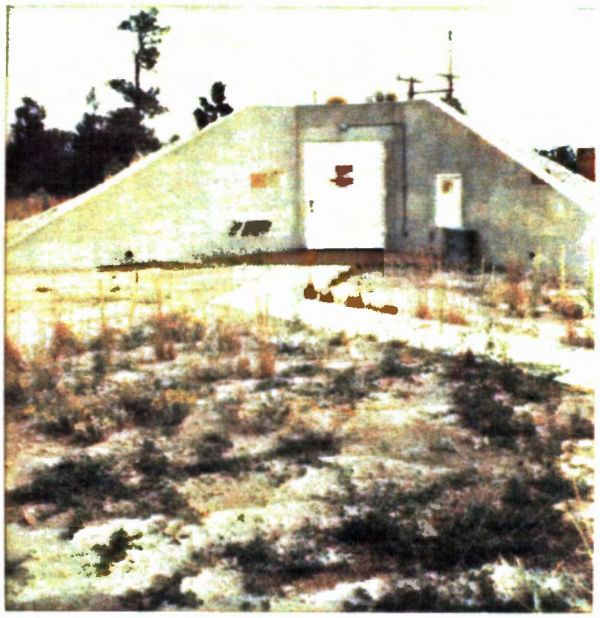
TA-36-8, Kappa 8



TA-39, AC-6

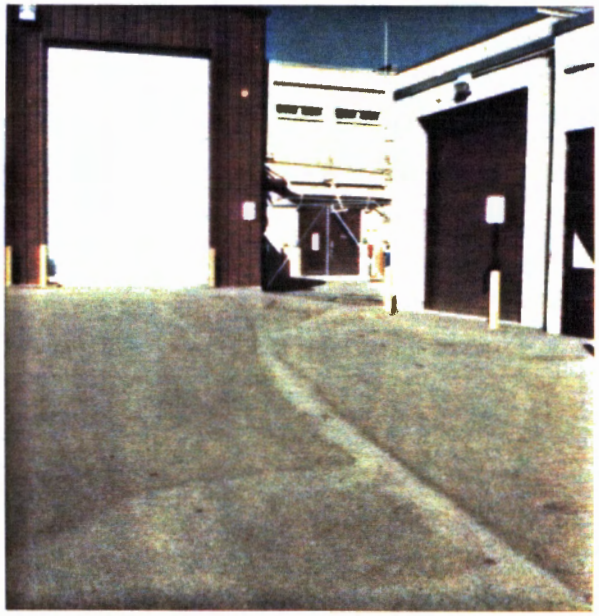


TA-39, AC-57



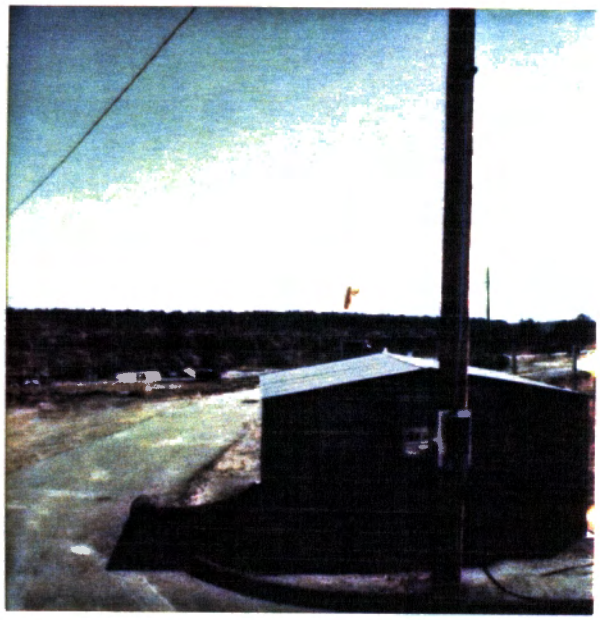
TA-40, DF-2

TA-50-1



TA-50-1, Batch Waste Treatment

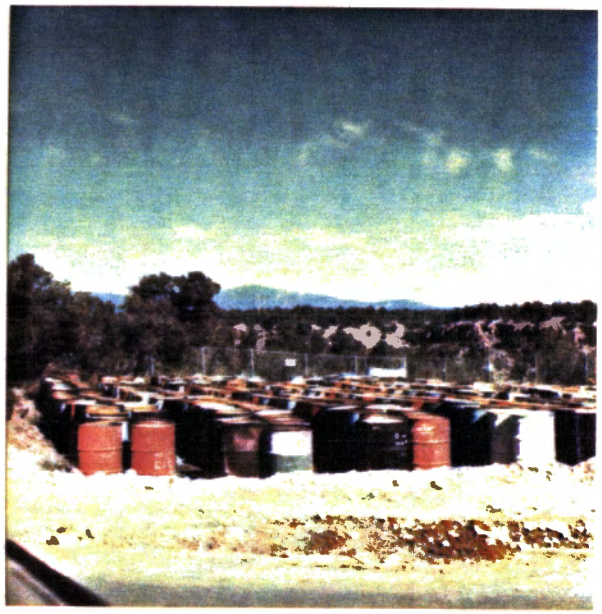
TA-50-37



TA-54, Area L

TA-54, Area L

TA-54, Area L



TA-54, Area L

TA-54, Area L

2.0 FACILITY DESCRIPTION

2.1 GENERAL DESCRIPTION

Los Alamos National Laboratory (Los Alamos) is located in Los Alamos County in north central New Mexico (Figure 2-1). The laboratory is approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. The laboratory, which occupies an area of 43 square miles, and the associated residential areas of Los Alamos and White Rock are situated on Pajarito Plateau. The Plateau consists of a series of finger-like mesas separated by deep east-west trending canyons. The mesa tops range in elevation from approximately 7800 feet at the flank of Jemez Mountain (located to the west of Los Alamos) to about 6200 feet at their eastern extent where they terminate above the Rio Grande Valley. Intermittent streams lie at the bottoms of the east-west trending canyons.

Los Alamos is divided into 32 active Technical Areas (TA's) (Figure 2-2). Hazardous chemical wastes can be generated in virtually all of these areas. Hazardous waste management facilities addressed in this permit application are located in Technical Areas 14, 15, 16, 36, 39, 50 and 54. Hazardous waste management activities occupy only a small portion of the Laboratory. The following waste management facilities located as noted are addressed in this permit application:

- Technical Areas 14, 15, 16, 36, and 39
  - thermal treatment facilities, used to burn or detonate waste high explosives, high explosives-contaminated material and reactives
- Technical Area 16
  - industrial incinerator, used to burn high explosives - contaminated trash and liquids
- Technical Area 50
  - batch treatment system and associated waste container storage units
  - chemical waste incinerator and associated waste container storage area
  - waste transfer, packaging and storage facilities, used for accumulation, packaging and storage of chemical wastes

- Technical Area 54, Area L
  - waste transfer, packaging and storage facilities, used for accumulation, packaging and storage of chemical wastes
  - treatment tanks, used for the neutralization, precipitation, oxidation and evaporation of various wastes.

Most of the above facilities have interim authority status. These facilities are described in the following sections.

2.1.1 Thermal Treatment Facilities

Facilities used for both the open burning and the detonation of waste high explosives (HE) are located at the Laboratory. Although these facilities are included in the Part A submission, they are not included in the Part B Permit Application because 40 CFR regulations for facilities of this nature have not been promulgated. This Part B Application will be amended when such regulations are in place. These facilities are described in the following sections.

2.1.1.1 Technical Area 16 (TA-16) Thermal Treatment Facilities

The thermal treatment facilities located at TA-16 include three general types. One type consists of a sand pad which is surrounded on at least two sides by a berm or a natural hillside. Waste explosives or explosives-contaminated equipment are placed on these pads and remotely burned using an "electric match" firing device. There are three facilities of this type at TA-16. A second type of thermal treatment facility present at TA-16 consists of a sand-filled metal pan on which five smaller shallow pans lined with fire brick are located. Waste HE fluids are poured into these pans and the HE is remotely ignited, with an "electric match". There is one facility of this type at the Laboratory. About 55 gallons of waste are burned approximately once a month. The third type of facility present at TA-16 is used to burn sludges containing waste HE. These facilities consist of steel cone-shaped vessels having a diameter of about five feet, buried with only the upper three to four feet of the vessel above ground. The steel vessels are filled with sand and gravel and an open fluids drain is located at the bottom of the cone. Sludge HE is gravity fed into the top of the cone, onto the sand and gravel bed. A heavy steel cap is then placed over the top of the cone and hot air is forced into the cone through air ducts. The hot air dries the waste

sludge and liquids from the sludge migrate downward through the sand and gravel bed and through the fluids drain. Effluent from these drains is regulated by NPDES permit (NM 0028355). When the remaining explosive material is relatively free of moisture, the steel cap is removed from the cone and the explosive is ignited remotely with an "electric match". There are two facilities of this type at Los Alamos; both of these are located in Technical Area 16. Explosives are burned at these two facilities at a rate of about one burn per week. Each burn consists of about 750 pounds of waste explosive sludge.

In some cases, the burn pad sand or surface is contaminated by barium (D005), which is a constituent of some HE, prior to flashing or burning. Since the burn pad sand contains EP Toxic barium (see Section 3.0), it is drummed, stored and disposed of as a hazardous waste.

2.1.1.2 Technical Areas 14, 15, 36, and 39 Thermal Treatment Facilities

Waste HE detonation sites are located at Los Alamos in Technical Areas 14, 15, 36, and 39. These sites are used routinely to detonate scrap HE, failed experimental detonations, unneeded classified explosives shapes, other HE determined to be excess, and small quantities of reactive chemicals. These sites consist of firing pads often located within a small canyon. Associated facilities at these sites include bunkers which are occupied by technical personnel during detonations. Prior to all firings, nearby roads are checked and kept clear.

2.1.2 Technical Area 16 Industrial Incinerator

A two-stage industrial incinerator, equipped for combustion of potentially HE-contaminated trash and machine oil, is located outdoors in the northeastern part of Technical Area 16 (Figure 2-22). The incinerator, which consists of primary and secondary combustion chambers and a settling chamber, is capable of burning 810 pounds of Type Zero trash (as defined by the Incinerator Institute of America) per hour. Because the incinerator will be loaded manually and only when cold, it is likely that only 810 pounds of trash (one charging) will be combusted per day. In addition to potentially HE-contaminated paper, cardboard, wood boxes, etc., a limited volume of potentially HE-contaminated machine oil will be burned in the incinerator from time to time. The industrial incinerator will not be used to burn wastes

other than those permitted by 40 CFR 264.340(b)(1)(i), (ii), (iii), or (iv) [NMHWMR 206.D.8.a(2)(a)(i), (ii), (iii) or (iv)]. Emissions from the incinerator conform to federal and state standards when operated at manufacturer-specified conditions.

2.1.3 Technical Area 50 (TA-50) Facilities

2.1.3.1 Batch Treatment System and Associated Container Storage Units

The Batch Treatment System is located in Building 1 at Technical Area 50 (Figure 2-3). The system consists of a totally enclosed, vented, 500-gallon pressure vessel equipped with a filtering system, condenser, and vacuum transfer lines. Total system washdown between batches allows for the treatment of incompatible wastes in the facility. Wastes treated in the Batch Treatment System include cyanide, chromate plating solutions, and solutions of acids, bases and heavy metals.

Three waste streams comprise the bulk of the waste treated in the Batch Treatment System, although the system is flexible enough to allow treatment of other wastes that may be generated through new Laboratory projects. These streams are an acid/base waste which contains copper, chromate plating waste, and waste cyanide plating solutions. Los Alamos wishes to obtain a permit to treat hazardous wastes in the Batch Treatment System.

A waste transfer and packaging area is also housed in the room in which the Batch Treatment System is located. This area consists of a small area which is covered with a ventilation hood. Small quantities of wastes are repackaged within this area, when necessary.

To facilitate usage of the Batch Treatment System, three modular hazardous waste storage buildings will be located at Technical area 50 (Figure 2-3). These pre-manufactured storage units will be used for the accumulation, packaging and storage of wastes intended for treatment in the Batch Treatment System. Each of the three identical units will have approximately 175 square feet of floor space (separated into two bays) and are enclosed by sheet steel supported by structural steel sections. The buildings are manufactured with secondary containment, static grounding connections and fire protection devices installed. Floors are designed to support a total load of 20,000

pounds, permitting storage of 30 55-gallon drums or similar volumes of wastes in other closed containers. The modular buildings will be set on concrete pads of sufficient load-bearing capacity to support the fully loaded building.

2.1.3.2 Chemical Waste Incinerator and Associated Storage Facilities

The waste incinerator is located in Building 37 at Technical Area 50 (Figure 2-3). The highly modified, controlled air incinerator is rated at a nominal 45 kilograms per hour waste feed throughput. The incinerator was developed as part of a continuing incinerator study and demonstration program being conducted by Los Alamos and is currently permitted to burn PCB-contaminated liquid materials. Modifications to the incinerator include additions of liquid and solid waste feed preparation lines, a gravity ash removal system, a high-efficiency off-gas cleanup system, and backup utility systems. Standard combustion equipment has been modified to permit effective incineration of waste in solid, liquid, slurry, or gaseous form. Particular attention has been given to engineering for proper waste containment, resulting in a system that is safe for evaluating the incineration of hazardous chemicals and certain radioactive waste forms. Los Alamos wishes to obtain a permit to burn RCRA-regulated wastes in this incinerator.

Prior to incineration, hazardous chemical waste will be accumulated and stored at a container storage area that will be constructed as an addition to Building 37 at Technical Area 50 (the building that houses the controlled air incinerator described in Section 2.1.3.2). Up to 34,600 pounds of containerized hazardous waste (about a two week supply of incinerator feed) will be stored in the 920 square-foot storage unit. Wastes will be stored in drums or other suitable containers, which will be placed on grates that are mounted above the secondary containment sump that forms the floor of this part of the building. Ventilation, fire sprinklers and alarms and catchment basins for fire sprinkler water will be integral to the building.

2.1.3.3 Waste Packaging, Transfer and Storage Facilities

A roofed concrete storage pad encompassing an area of 1,595 square feet will be located in Technical Area 50 (Figure 2-3). The facility will be used for the accumulation, packaging and storage of containerized waste generated throughout the Laboratory. The storage pad will be materially identical to

the existing roofed storage facility at Technical Area 54, Area L (Figure 2-7, sheets 1 and 2). The concrete floor of the storage pad will have a load-bearing capacity of 700 pounds per square foot or greater.

Containerized hazardous waste, generated at numerous locations throughout the Laboratory, is delivered to the waste packaging and storage facility at Technical Area 50 on a routine basis. Wastes are segregated into compatible types and placed within the appropriate cell on the roofed concrete pad. Wastes packaged in small containers are placed into lab packs (Figure 2-8) or consolidated into drums for incineration, treatment or recycling. Damaged or leaking drums delivered to the storage facility are repackaged into larger drums.

2.1.4 Technical Area 54 (TA-54), Area L Facilities

2.1.4.1 Waste Transfer, Packaging and Storage Facilities

A single-story metal building encompassing 196 square feet and a roofed concrete storage pad encompassing 1595 square feet are located in Area L of Technical Area 54. These facilities are used for the accumulation, packaging and storage of waste containers generated from throughout the Laboratory (Figure 2-4). In addition, containerized wastes which contain no liquids are stored on pallets or similar platforms in other portions of Area L. Area L of Technical Area 54 is an area of about three acres surrounded by an eight-feet-high chain-link and barbed-wire fence (Figure 2-5). Currently active waste management facilities located within this area include four waste treatment tanks, as well as the transfer, packaging and storage facilities. The metal building has a concrete floor having a design standard load-bearing capacity of 250 pounds per square foot. Three shallow sumps covered by fiberglass grates are located within the floor of the building (Figure 2-6). The storage pad has a concrete floor having a design standard load-bearing capacity of 700 pounds per square foot (Figure 2-7, sheets 1 and 2).

Hazardous waste containers generated at the various Los Alamos laboratories are delivered to the waste transfer, packaging and storage facilities on a routine basis. Wastes are segregated into compatible types and placed upon the three fiberglass grates located in the metal building, within one of the six storage cells on the roofed concrete pad or if no liquid is present in the

waste container, on a pallet or similar platform in Area L. Wastes packaged in small containers are placed into lab packs (Figure 2-8) and vermiculite is added to 55-gallon drums containing liquids. Also, wastes suitable for recycling are consolidated into drums and any damaged or leaking drums are repackaged into larger drums in these facilities. Los Alamos wishes to obtain a permit to operate the waste transfer, packaging and storage facilities.

2.1.4.2 Treatment Tanks

Four 1665-gallon ten-gauge carbon steel tanks are located at Area L of Technical Area 54. These tanks are used to neutralize, oxidize and evaporate wastes. Section 4.4 of this volume describes waste management practices and facilities for the TA-54 Area L tanks. The tanks are located on a bermed concrete pad as shown in Figure 2-9. The interior and exterior of each tank are coated with Carboline-Phenoline-373 film. Specifications for this material are presented in Appendix I-1. Phenoline-373 has excellent chemical resistance to alkalies, solvents, and salts, and very good resistance to acids. In addition to the Phenoline film, during treatment of non-reactive wastes, the tanks are lined with a 100-mil polymeric thermoplastic membrane (see Appendix I-1 for materials specifications). Prior to placement of a new waste into a tank, existing liners are removed and replaced. Existing liners may remain in service through treatment of several batches of the same waste. The liners facilitate removal of solids and slurries from tanks after treatment as well as preventing mixture of incompatible wastes in the tanks.

Lithium hydride is commonly oxidized in these tanks using water as the oxidant. Barium-contaminated sands (from the HE burn pads) are treated with sodium sulfate and sulfuric acid to produce barium compounds which are not EP toxic. Chrome-containing acid solutions are treated with sodium sulfite to produce chrome compounds which are not EP toxic. Ammonium bifluoride (a "non-RCRA" waste) is the waste most commonly evaporated in the tanks. Additionally, blowdown from the TA-50 chemical waste incinerator and post-treatment effluent from the TA-50 Batch Treatment System (both of which are very dilute solutions) are placed in the tanks if volume reduction by evaporation is desired. Replacement of liners and operating precautions specified in Section 4.4 prevents mixing of incompatible wastes and materials. Other tank-treated RCRA wastes (as noted in the Part A in Section 1.2 by disposal code T01) are processed in the TA-50 Batch Treatment System.

A 210-gallon stainless steel tank mounted on wheels used to mix treatment chemicals prior to addition to the treatment tanks is also located on the pad.

2.1.5 Topographic Maps

Topographic maps, as required by 40 CFR §270.14(b)(19) (NMHWMR 302.A.4.b.[1]), are presented in Figure 2-3 for the TA-50 facilities and Figure 2-4 for the TA-54 facilities. A topographic map with the legal boundaries of the hazardous waste management facility site is presented in Figure 2-21. In accordance with the note located at the end of 40 CFR §270.14(b)(19) (NMHWMR 302.A.4.b.[1]), maps at a scale of 1" = 400' are provided. Los Alamos requests that the regulatory agencies accept maps at this scale due to the large size of the various hazardous waste management facilities. Contour lines on these maps are at intervals of ten feet, reflecting the mountainous terrain present at Los Alamos. A second map of Area L at TA-54 at a scale of 1" = 20' and contour interval of two feet is provided (Figure 2-10). The potential for flooding of Laboratory waste management facilities is described in Section 2.2.2. There are no storm sewers in the vicinity of the hazardous waste management facilities; storm water runoff is diverted by ditches and culverts. Sanitary sewage lines in the vicinity of the incinerator are shown in Figure 2-11. No sanitary sewage is generated at Area L.

2.1.6 Wells

The municipal and industrial water supply for the Laboratory and community is from 17 deep wells in three well fields and one gallery. The wells are located on Pajarito Plateau and in canyons east of the Laboratory. Water is pumped from the main aquifer, which is about 850 to 1150 feet below the surface of the plateau. The gallery collects spring discharge from a perched water zone in the volcanics on the flanks of the mountains located west of Los Alamos.

There are no injection wells in the vicinity of Los Alamos. The location of supply wells and the gallery, as well as the locations of test wells, springs, observation holes and surface water sampling stations are shown on Figure 2-12. Surface, well, and spring waters are routinely sampled and analyzed for radionuclides as well as heavy metals, fluorides, nitrates, carbonates, bicarbonates, silica, sodium, magnesium and conductivity. Analytical results are

published annually by the Los Alamos Environmental Surveillance Group (HSE-8) and copies are submitted annually to the EPA Regional Administrator and the Director of the NMEID.

2.1.7 Wind Rose

An annual wind rose (1983 data) for Technical Area 59, which is located less than one mile northwest of Technical Area 50, is shown in Figure 2-13. The major wind component is from the west-northwest.

The mountainous terrain at Los Alamos produces a distinct daily wind pattern. At night, winds tend to flow downward from the Jemez Mountains generally out of the west-northwest and northwest. During the day, the pattern reverses and light up-slope winds come generally from the southeast and south-southeast. Los Alamos is a generally light wind site with an annual average wind speed of 2.3 meters per second. Only twelve percent of wind speeds in 1983 were greater than five meters per second and 38 percent were less than 2.5 meters per second (Los Alamos National Laboratory, 1983).

2.1.8 Land Use

The communities located closest to the Laboratory facilities are Los Alamos, which is located just north of the Laboratory, and White Rock, which is located a few miles to the east-southeast of the Laboratory (Figure 2-1). The total population of Los Alamos County is 19,000 to 20,000. Most of Los Alamos County, as well as adjoining portions of neighboring Sandoval, Rio Arriba, and Santa Fe Counties, is undeveloped. The only significant development in Los Alamos County are the Laboratory facilities and the associated residential communities. Large tracts of land in the Jemez Mountains which lie to the north, west, and south of Los Alamos are held by the U.S. Forest Service and the National Park Service. This land is largely occupied by pine, fir, and aspen forests. Agriculture in the vicinity of the Laboratory is limited to home gardens and some cattle grazing. In the river valleys to the east, agriculture is limited to the cultivation of relatively small, irrigated plots. Primary crops are corn, chili, tree fruits, and alfalfa.

2.2 LOCATION INFORMATION

2.2.1 Seismic Standard

Consistent with the definition presented in 40 CFR 270.2 (NMHWMR 102.A.29) and the criteria provided in §270.14(b)(11)(i) (NMHWMR 302.A.4.b.[1]) and §264.18 (NMHWMR 206.B.8.a), the TA-50 batch treatment and container storage and the TA-50 incinerator are existing facilities and thus seismic design standards are not applicable.

The Area L waste transfer, packaging, and storage facilities and the treatment tanks; the TA-50 container modular storage buildings; the TA-50 container storage area and the TA-16 industrial incinerator are not existing hazardous waste facilities according to the definitions given in 40 CFR §270.2 (NMHWMR 102.A.29). Additionally, these facilities are located in Los Alamos County, New Mexico, which is listed in Appendix VI of 40 CFR §264 (NMHWMR 206.B.8). Figure 2-14 shows the location of Los Alamos facilities and the locations of nearby fault traces. This information and that presented in Section 2.2.4 is provided to demonstrate compliance with §264.18(a) (NMHWMR 206.B.8.a). As can be noted from Figure 2-14, no faults or fault traces with Holocene (or other) displacements have been located within 200 feet of the locations of the pertinent waste management facilities.

2.2.2 Floodplain Standard

A floodplain map of Los Alamos National Laboratory is unavailable. However, personnel from the U.S. Department of the Army, Albuquerque District Corps of Engineers, Engineering and Planning Division, have evaluated the potential for flooding and have concluded that Los Alamos waste management facilities do not lie within the 100-year floodplain (see Appendix E).

2.2.3 Soils

An intensive soil survey of Los Alamos County, New Mexico has been prepared by the USDA, Soil Conservation Service, and Forest Service (1978). This soil survey was published in June 1978 under DOE Contract W-7405-ENG.36. It classifies the soils according to the soil series, soil type, and soil phase.

The principal parent materials of about 95 percent of the Los Alamos soils are Bandelier Tuff, volcanic rocks of the Tschicoma and Puye Formations, the

basaltic rocks of Chino Mesa, and the remnants of the El Cajete pumice. The remaining five percent of the soils were formed from colluvium, alluvium, andesitic rocks of the Paliza Canyon Formation, Cerro Rubio Quartz Latites, and tuffs associated with sediments of Cerro Toledo Rhyolite. Textures of these soils range from very fine sandy loams and clay loams to gravelly, sandy loams and stony, silty clay loams.

The soils in Area L (Technical Area 54) are classified as Hackroy sandy loam. These soils consist of shallow, well-drained soils that have formed in material weathered from volcanic tuff on mesa tops (see Figure 2-15).

The Bandelier Tuff is formed by a series of ash flows and ash falls which are described as nonwelded, moderately welded, and welded tuff. The nonwelded, moderately welded and welded tuff grade one into the other, both vertically and horizontally (see Appendix F, "Physical Characteristics of the Bandelier Tuff"; Purtymun, no date).

The following description of the Hackroy soil series is taken from the published soil survey report for Los Alamos County:

> The surface layer of the Hackroy soils is a brown sandy loam, about 10 cm thick. The subsoil is a reddish brown clay, gravelly clay, or clay loam, about 20 cm thick. The depth to tuff bedrock and the effective rooting depth are 20 to 50 cm. Both the Hackroy and the Hackroy-Rock outcrop mapping units exhibit slow permeability and low available water capacities. The Hackroy mapping unit has medium runoff and only moderate water erosion hazard, whereas the Hackroy-Rock outcrop unit has a moderate to severe water erosion hazard and medium to high runoff.
>
> A typical profile of Hackroy sandy loam (one to five percent slope) is described as follows:
>
> A1 0-8 cm, brown sandy loam, brown moist; weak fine subangular blocky structure; hard and friable moist; many fine roots; common fine tubular pores; milkily alkaline; abrupt smooth boundary.
>
> B2 8-25 cm, dark reddish brown clay, dark reddish brown moist; moderate fine prismatic structure; hard and firm moist, sticky and plastic wet; many fine roots; few very fine tubular pores; 3% gravel; continuous clay films on peds; mildly alkaline; abrupt smooth boundary.

B3 25-30 cm, yellowish red gravelly clay, yellowish red moist; moderate fine subangular blocky structure; slightly hard and firm moist, sticky and plastic wet; many fine roots; 25% gravel, slightly calcareous; neutral.

R 30+ cm, tuff bedrock.

The soils are classified in the Unified Soil Classification System as SM, SM-SC, ML, and CL-ML. The Hackroy soils range from a sandy loam (SM) in the top eight centimeters of depth to a clay loam (CL) in depths of from eight to 30 centimeters. Permeability rates range from five to 15 centimeters per hour in the top layers down to 0.5-0.15 centimeters per hour or less in the lower layers. The shrink-swell potential is low. The available water holding capacity is 0.11 to 0.21 centimeters per centimeter and the soil pH is 6.6 to 7.8.

2.2.4 Geology

2.2.4.1 Regional Geology

Los Alamos National Laboratory is located on the east-central edge of the Jemez Mountains. The Jemez Mountains are formed by a complex pile of volcanic rocks along the northwest margin of the Rio Grande rift in north-central New Mexico (Figure 2-16). The immense volume of Pliocene and Quaternary extrusive rocks that represents the Jemez volcanic field covers an area of over 30 miles east-to-west and 50 miles north-to-south and is over 4000 feet in thickness near the center.

The Jemez volcanic field unconformably overlies the eastern part of the Nacimiento uplift and the southern Chama basin. The Chama basin, the San Juan Basin and the Gallina-Archuleta arch are part of the Colorado Plateau, whereas the Brazos and Nacimiento uplifts (Figure 2-16) are generally included with the Southern Rocky Mountains (Woodward, 1974). These features attained their present structural outlines during the Laramide orogeny of Late Cretaceous and early Tertiary time. Superimposed on these Laramide structures is the Rio Grande rift that began to form during the Miocene. Volcanism in the Jemez area began in Pliocene time after initial development of the rift with extrusive rocks accumulating along the western margin of the rift contemporaneously with late stages of rifting (Woodward, 1974). Initial eruptions were

dominantly mafic to intermediate flows, which probably formed low, coalescing shields. Eruptive activity culminated in the early Pleistocene with explosive, caldera-forming eruptions of ash-flow tuffs, which covered most of the shields and formed two calderas, the largest and youngest of which is the Valles caldera located seven to ten miles west of Los Alamos, New Mexico (Kudo, 1974). Extensive studies of the Jemez volcanism have been performed by Ross et al. (1961), Bailey et al. (1969), Smith and Bailey (1966, 1968) and Smith et al. (1970).

Major tectonic features here are dominated by vertical movements. Minor horizontal shift and compressional features, however, occur in parts of the Colorado Plateau and Southern Rocky Mountain structures. The stratigraphy, structure and tectonics of the Jemez Mountains and surrounding area have been the topics of a large number of reconnaissance and detailed studies (c.f., Dane, 1948; Kelley, 1954, 1955; Griggs, 1964; Woodward et al., 1972, 1973, 1974).

2.2.4.2 Site-Specific Geology

The Los Alamos facilities are located on the western part of the Pajarito Plateau (Figure 2-17), which forms an apron of volcanic and sedimentary rocks around the eastern flanks of the Jemez Mountains. The plateau is aligned approximately north-south and is about 20 to 25 miles in length and five to ten miles wide. It is bounded on the east by White Rock Canyon (which contains the Rio Grande), on the north and northeast by the Puye Escarpment and on the west by Sierra de los Valles. The Pajarito Plateau slopes gently eastward from an elevation of about 7500 feet near the mountains toward the Rio Grande where it terminates at an elevation of about 5400 feet in steep slopes and cliffs formed by down cutting of the river. The plateau has been dissected into a number of narrow mesas by southeastward-trending intermittent streams. The stratigraphy and structural features of the Pajarito Plateau are described in the following sections.

Stratigraphy

The Pajarito Plateau is formed by a series of sediments and volcanic extrusive rocks and is typical of a terrain produced by concurrent sedimentation and volcanism (Figure 2-18). The base of the plateau is represented by the

Miocene Santa Fe Group, which in this area consists of friable to moderately well cemented siltstone and sandstones that contains lenses of conglomerate and clay (Purtymun and Johansen, 1974). Some basalt flows are interbedded with the sediments in the unit. The lower part of the Santa Fe is comprised of fine arkosic sand and the upper part is composed of very coarse arkosic sand, latitic gravels and volcanic detritus.

Overlying the Santa Fe Group are the volcanic extrusives of the Tschicoma Formation, which consist of latite, quartz-latite flows and pyroclastic rocks. The Tschicoma has been extruded through the Santa Fe west of Los Alamos, forming the lower part of the Jemez Volcanic Pile. The thickness of the Tschicoma is unknown as the base of the unit is not exposed in the Pajarito Plateau area.

Interfingering with the Tschicoma and overlying the Santa Fe Group are the conglomeratic and fanglomeratic rocks of the Puye Formation. The Puye contains a thin basal conglomerate composed of pebble through small boulder size clasts of quartzite, quartz, granite and volcanic debris in a matrix of coarse sand (Griggs, 1964). Overlying the conglomerate is a thicker fanglomerate comprised of debris that was washed eastward from the volcanic rocks of the Tschicoma Formation. The fanglomerate consists of a series of conglomerates and siltstones with up-to-boulder size clasts in a matrix of silt and sand. Beds of volcanic ash that were water-lain or possibly represent air fall materials are also present within the Puye Formation. The overall thickness of the Puye ranges from about 725 feet in the north-central part of the Pajarito Plateau to 220 to 270 feet along the east edge of the Puye Escarpment to 60 to 80 feet at the north end of White Rock Canyon (Griggs, 1964).

Overlying and interfingering with the conglomerates of the Puye Formation are the basaltic rocks of Chino Mesa. The basalt, which is over 1300 feet thick near the volcanic vents near Chino Mesa from which it originated (Figure 2-18), thickens southward along the river and thins westward (Griggs, 1964).

The Pajarito Plateau is capped for the most part by the Bandelier Tuff, which ranges in thickness from about 1050 feet along the western edge of the plateau to about 260 feet just west of White Rock, New Mexico. The Bandelier is

composed of a basal unit of pebble-size pumice, overlain by a poorly sorted rhyolite tuff breccia and capped by a cliff-forming welded rhyolite tuff.

Structure

The description of the geologic structure presented here was taken primarily from Griggs (1964). The geologic structure of surface rocks in the Los Alamos area is simple, although the structure of underlying rocks may be complex. The regional dip of surface rocks of the Pajarito Plateau is one to two degrees east. Beds of the Santa Fe Group in the easternmost part of the area dip gently to the west.

The rocks of the Pajarito Plateau are broken by several northward-trending normal faults (Figure 2-14). The Pajarito fault zone lies near the western edge of the plateau in the southern part of the area. The Bandelier Tuff at the southern edge of the area and on the east side of the Pajarito fault is downthrown about 300 feet in relation to the tuff on the west side of the fault. The fault farther north splits into two smaller subparallel faults, both downthrown to the east. Displacement decreases northward until both faults die out. The fault planes dip steeply to the east.

Two other normal faults, en echelon to the Pajarito zone, are located to the northeast. These faults are downthrown to the west and the fault planes dip to the west also. The northern-most of the faults extends southward for a short distance subparallel to the northern extension of the Pajarito zone. The Bandelier Tuff is displaced about 50 feet across the en echelon faults. The older Tschicoma Formation, however, may be displaced as much as 500 feet along the easternmost fault. This difference in displacement tends to indicate recurring movement along a pre-Bandelier fault.

2.2.5 Groundwater[1]

The only aquifer of the Pajarito Plateau capable of providing municipal and industrial water supply is in rocks of the Santa Fe Group and Puye Formation. The upper surface of this aquifer rises westward from the Rio

[1] The discussion of groundwater conditions in the Los Alamos area was extracted primarily from Purtymun and Johansen (1978) and Griggs (1964).

Grande through the Santa Fe and into the lower part of the Puye beneath the central and western parts of the plateau (Figure 2-18). The water in the aquifer moves from the major recharge area of the intermountain basins of the Valles Caldera (the apparent western boundary of the aquifer) eastward toward the Rio Grande where a part is discharged into the river through seeps and springs (Figure 2-19). The groundwater flow rate in the upper part of the aquifer is estimated to be about 100 feet per year. The intermountain basins are filled with deposits of clay, sand and gravels which are underlain by volcanic debris resulting from the collapse of the caldera. The sediments and volcanics in the basins are highly permeable and saturated and recharge the main aquifer in the Santa Fe Group.

Minor amounts of recharge may occur in the deep canyons containing perennial streams on the flanks of the mountains. The intermittent streams in canyons which are cut into the plateau add little if any recharge to the main aquifer. Water balance calculations for the area of the Los Alamos facilities indicate that the annual evapotranspiration rate exceeds the annual precipitation rate. Additionally, field investigations have shown that infiltration of precipitation into the Bandelier Tuff is essentially zero. Further, the moisture content of the tuff at the Los Alamos facilities is quite low, varying from about 0.2 to two percent by weight at depths below ten feet. Typically, moisture contents greater than four percent are required to permit migration of moisture in the Bandelier Tuff.

Figure 2-19 shows the locations of a number of wells completed in the Santa Fe and Puye Formations. Also shown are the contours drawn to depict the elevation of the top of the main aquifer and the depths at which water was encountered in the main aquifer at each well location. The gradient on the surface of the aquifer averages about 60 feet per mile beneath the plateau in the Puye Formation with the depth to water decreasing along with the gentle slope of the surface of the plateau from about 1200 feet to the west to about 600 feet to the east. The depth to the water table under the Los Alamos facilities ranges from about 900 to 1200 feet except in the deeper canyons. The gradient of the aquifer steepens to about 100 feet per mile along the eastern edge of plateau because of the lesser permeability of the Santa Fe Group sediments. The aquifer is under water table conditions in the western

margin of the plateau and is artesian along the eastern edge and along the Rio Grande.

As expected, wells completed into the high permeability sediments and volcanics of the Santa Fe Group and Puye Formation are very productive. Wells located in the eastern well field, which penetrate about 1600 feet of the fine grained sediments of the Santa Fe Group, yield an average of 500 gallons per minute with a specific capacity of eight gallons per minute per foot of drawdown. Wells in the central part of the plateau, which are completed in the Puye Formation and coarser sediments of the Santa Fe Group, are higher yielding and average 1000 gallons per minute with a specific capacity of about 35 gallons per minute per foot of drawdown.

The chemical quality of water varies among wells due to local conditions within the aquifer. In general, the quality of water is good; total dissolved solids (TDS) range from about 200 milligrams per liter to less than 500 milligrams per liter.

The Tschicoma Formation and the Bandelier Tuff, west of the Pajarito Plateau on the flank of the mountains, contain localized, small bodies of perched water. The Bandelier Tuff contains no perched water beneath the Pajarito Plateau. Additional information on Los Alamos groundwater and area vadose zone characteristics is presented in IT Corporation (1987).

2.3 TRAFFIC PATTERNS

2.3.1 General

The rugged topography of alternating mesas and canyons present at Los Alamos limits traffic circulation to only a few major arterial roads. This road system is shown in Figure 2-2. A total of 132 miles of paved roads are present at Los Alamos.

The main access route to Los Alamos is State Road 4. The majority of traffic to Los Alamos approaches on State Road 4 from the east, although an alternate access route, State Road 4 through the Jemez Mountains, is available.

The pattern of east-west trending canyons at Los Alamos prohibits north-south automobile travel in nearly all portions of the laboratory with the exception of Diamond Drive. Los Alamos Canyon is spanned at Diamond Drive by an 820-feet-long steel arch bridge which was completed in 1951 (Los Alamos National Laboratory, 1984). This bridge provides the main access between the Los Alamos facilities located on either side of Los Alamos Canyon.

Currently, over 9,000 people are employed at Los Alamos (including Los Alamos personnel and contractors). Roughly 3,500 people commute to the laboratory daily from communities other than Los Alamos and White Rock (Los Alamos National Laboratory, 1982).

2.3.2 Waste Collection Areas

The majority of the hazardous waste is generated at eight technical areas. The eight technical areas include four buildings in Technical Area (TA) Three (TA-3-29, TA-3-39, TA-3-40 and TA-3-66) and TA-16, TA-43, TA-46 and TA-48. Wastes from all eight of these locations will be collected routinely.

Chemical wastes can be generated at all of the 32 active Los Alamos technical areas. A schematic diagram of Los Alamos waste management activities is shown in Figure 2-20. Wastes are transported from the generating laboratories and shops to the various waste management facilities on an as-needed basis. The chemical wastes are generally received in small bottles (i.e., a gallon or less) or containers. These are packed in cardboard boxes or drums for transport. The volume of waste received in each instance varies considerably. Because wastes are generated at facilities dispersed throughout the laboratory, waste transport occurs (at least occasionally) on nearly all of the roads located within the Laboratory.

2.3.3 Routes of Travel

As detailed in Section 2.0, the majority of the wastes will be taken from the point of origin to TA-54, Area L Facilities (Waste Transfer, Packaging, and Storage Facility) and TA-50 (Batch Waste Treatment System, Chemical Waste Incinerator and storage facilities). As a result, traffic routes which will be used to transport hazardous cargo will be limited primarily to Pajarito

Road and Mesita del Buey, with occasional travel on State Road 4 and West Jemez Road.

2.3.4 Traffic Volumes

According to a report entitled "TA-3 Traffic Study", January 10, 1985, the peak traffic periods are between 7:15 and 8:15 in the morning and 4:15 and 5:30 in the afternoon. Although the report is limited to the TA-3 area, a few intersections outside the TA-3 area were examined. Approximately 5,100 people work in the TA-3 area. Consequently, the data presented in the study should reflect the existing traffic conditions at Los Alamos. However, the data for TA-3 will have higher vehicular volumes than the rest of Los Alamos. Maps depicting vehicular traffic count movements at various intersections in the vicinity of TA-3 from the cited document are included in Appendix F-1.

Based on 1984 traffic counts, the Diamond and Jemez intersection had a volume of 3,255 cars during the morning and 2,824 in the afternoon. At the intersection of Diamond and Pajarito, the 1984 afternoon volume was 1,284.

2.3.5 Traffic Control Signals

Traffic flow at the Laboratory is controlled by traffic lights, stop signs, and yield signs. Access to the high-security technical areas is controlled by security guards and is restricted to vehicles having specific identification. Only personnel having appropriate security clearance and identification, or escorted visitors are allowed access to the secured technical areas. Vehicles and personnel entering these technical areas are subject to periodic search by security personnel. Traffic signals and signs located in the vicinity of hazardous waste management facilities are shown in Figures 2-3 and 2-4.

Traffic lights are in place at all major intersections. Traffic signs are used at "T"s throughout Los Alamos.

2.3.6 Road Load-Bearing Capacity

Roads at Los Alamos carrying the greatest traffic volumes include Diamond Drive, Pajarito Road, and East and West Jemez Drive. These roads were constructed with a ten-inch-thick base overlain with a five-inch-thick asphaltic concrete surface. These roads were designed and built in conformance with

American Association of State Highway Transportation Officials (AASHTO) specification HS-20. This specification is intended to accommodate truck loading capacities of 32,000 pounds per axle.

2.3.7 Road Surfacing from Technical Areas to Transfer and Storage Facilities

The roads from the technical areas to the transfer and storage facilities are two-lane roads with an asphalt surface.

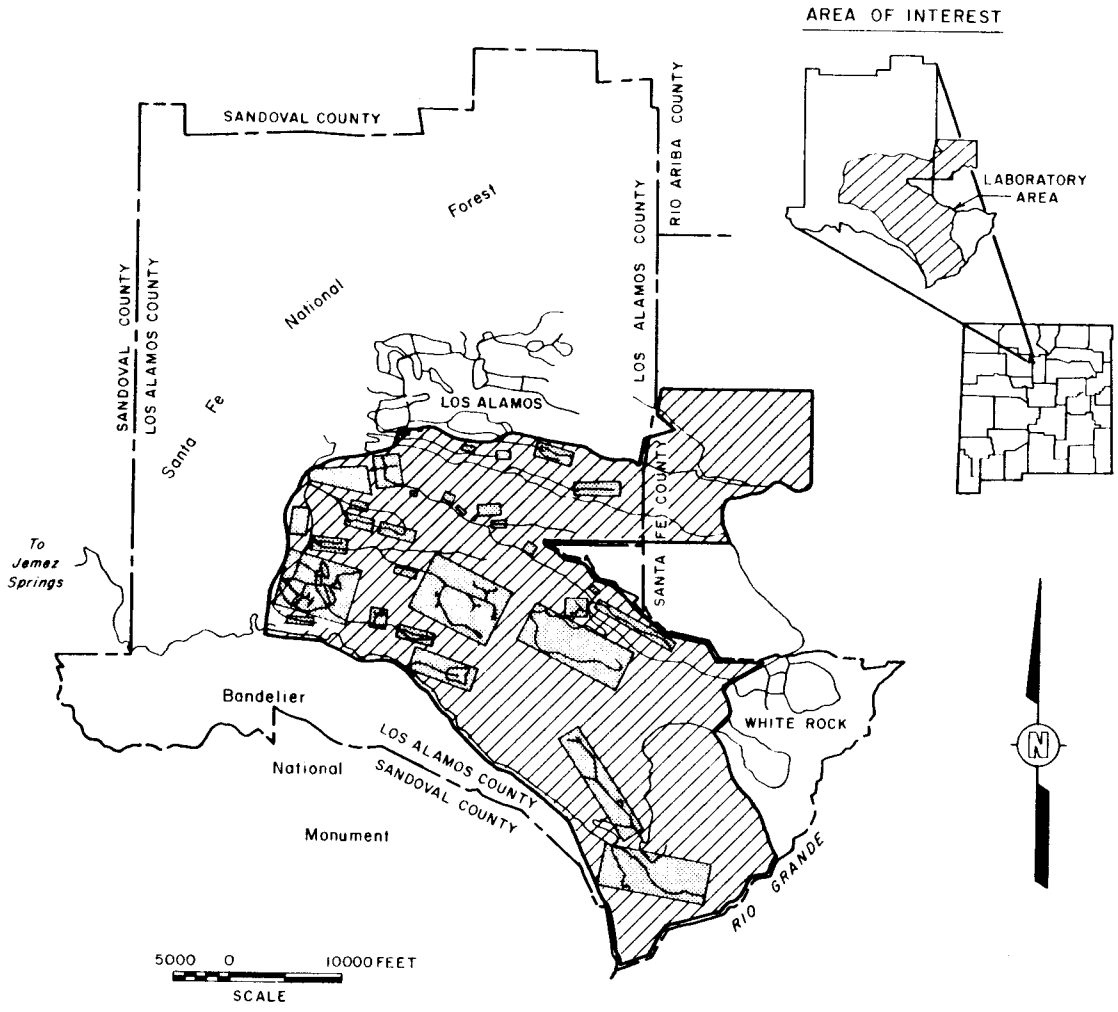


FIGURE 2-1

LOCATION MAP

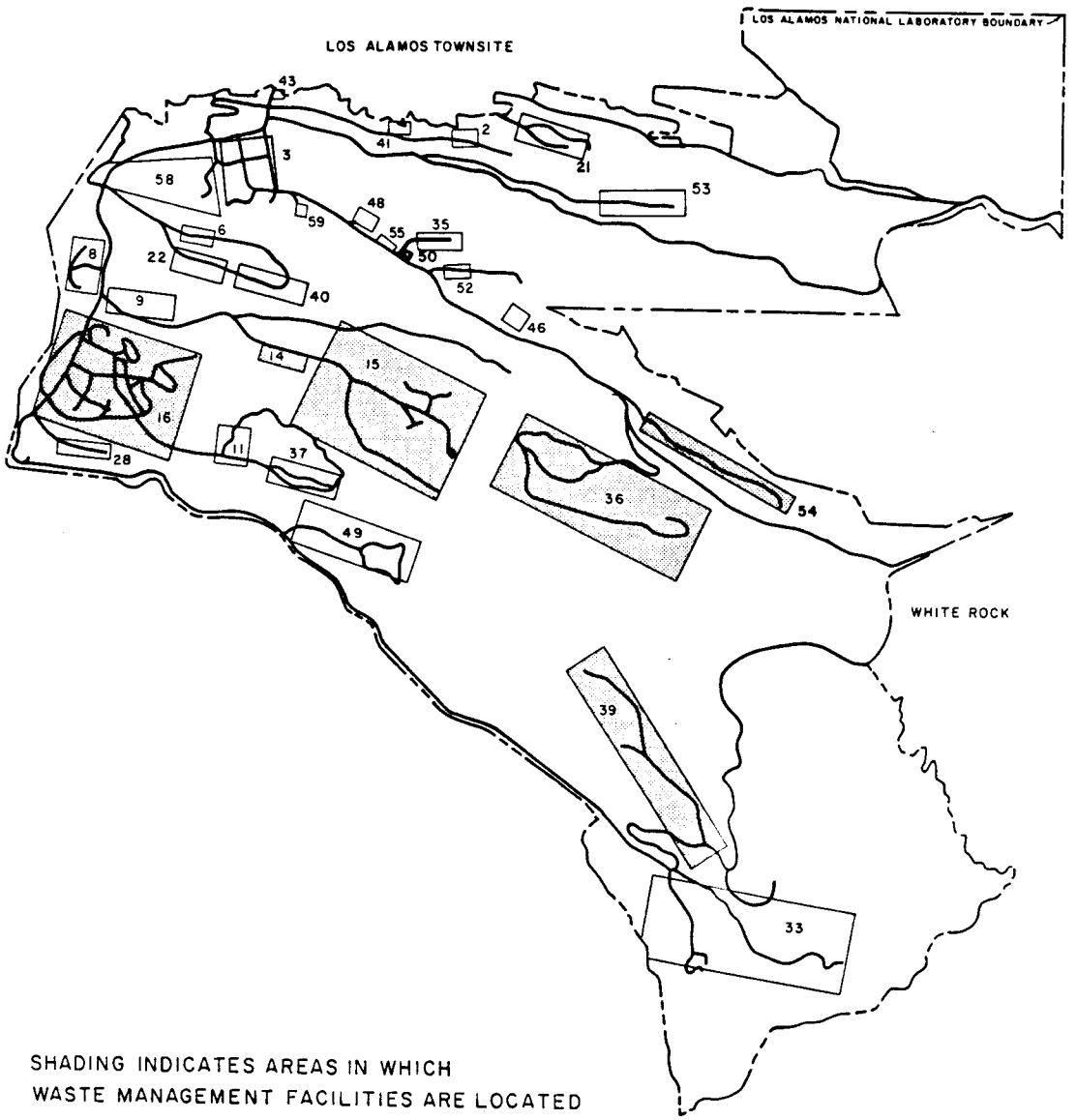
PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG	CHECKED BY		DRAWING NUMBER	301017-02 B25
	11/18/87	APPROVED BY			

19 1253 HERCULENE ABB SMITH CO. PGH. PA



SHADING INDICATES AREAS IN WHICH WASTE MANAGEMENT FACILITIES ARE LOCATED

N

4000 0 4000

SCALE

FIGURE 2-2

LOS ALAMOS
TECHNICAL AREAS

PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG	CHECKED BY		DRAWING NUMBER	301017-02 A102
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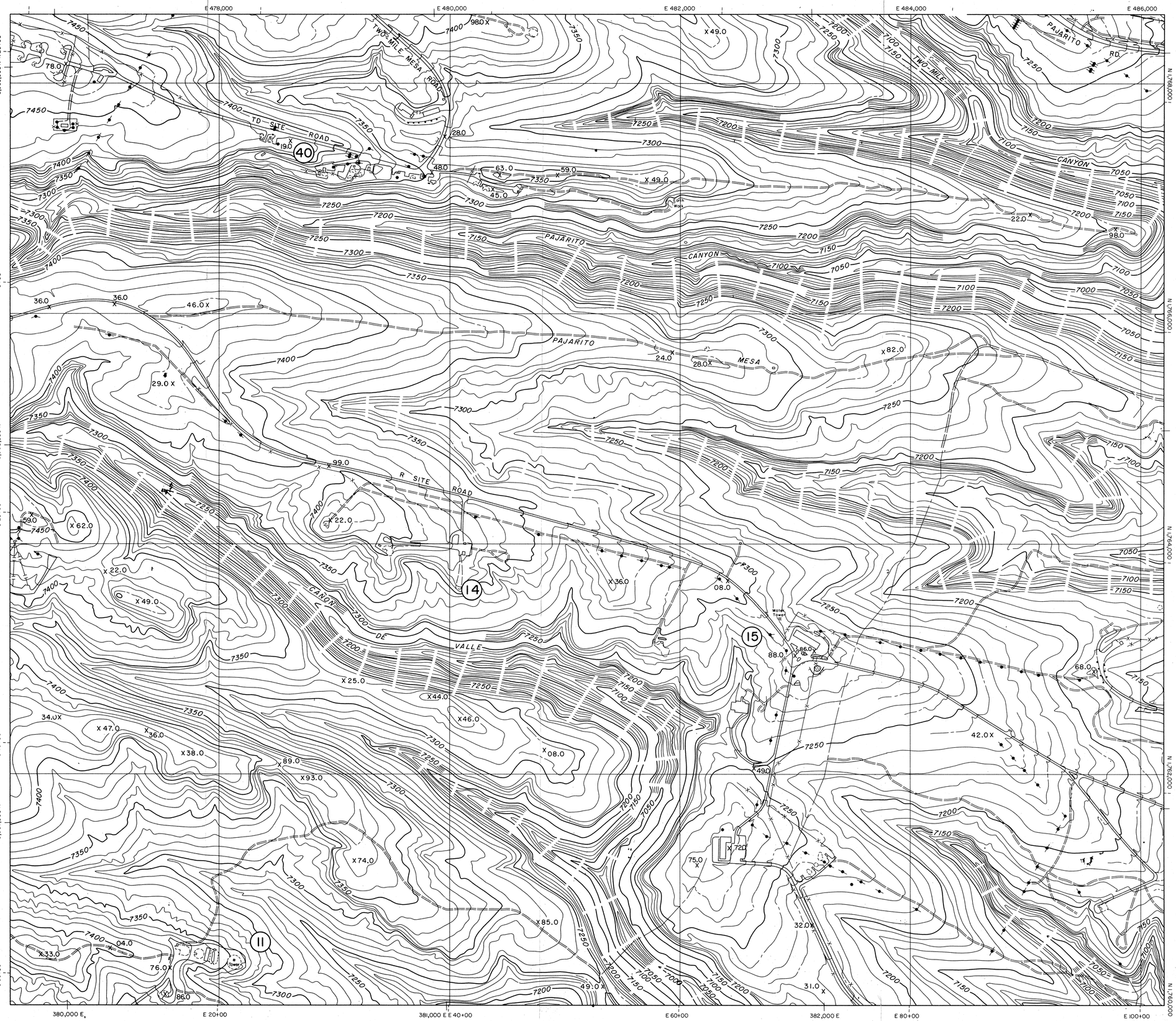
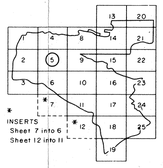


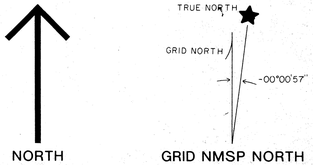
LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

11 K–SITE
14 Q–SITE
15 R–SITE
40 DF–SITE

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BOVAY ENGINEERS, INC.
LOS ALAMOS
AERIAL MAPPING DIVISION

FIGURE 2-3

CONTOUR MAP SHOWING THE LOCATIONS OF THE BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA AND THE WASTE INCINERATOR

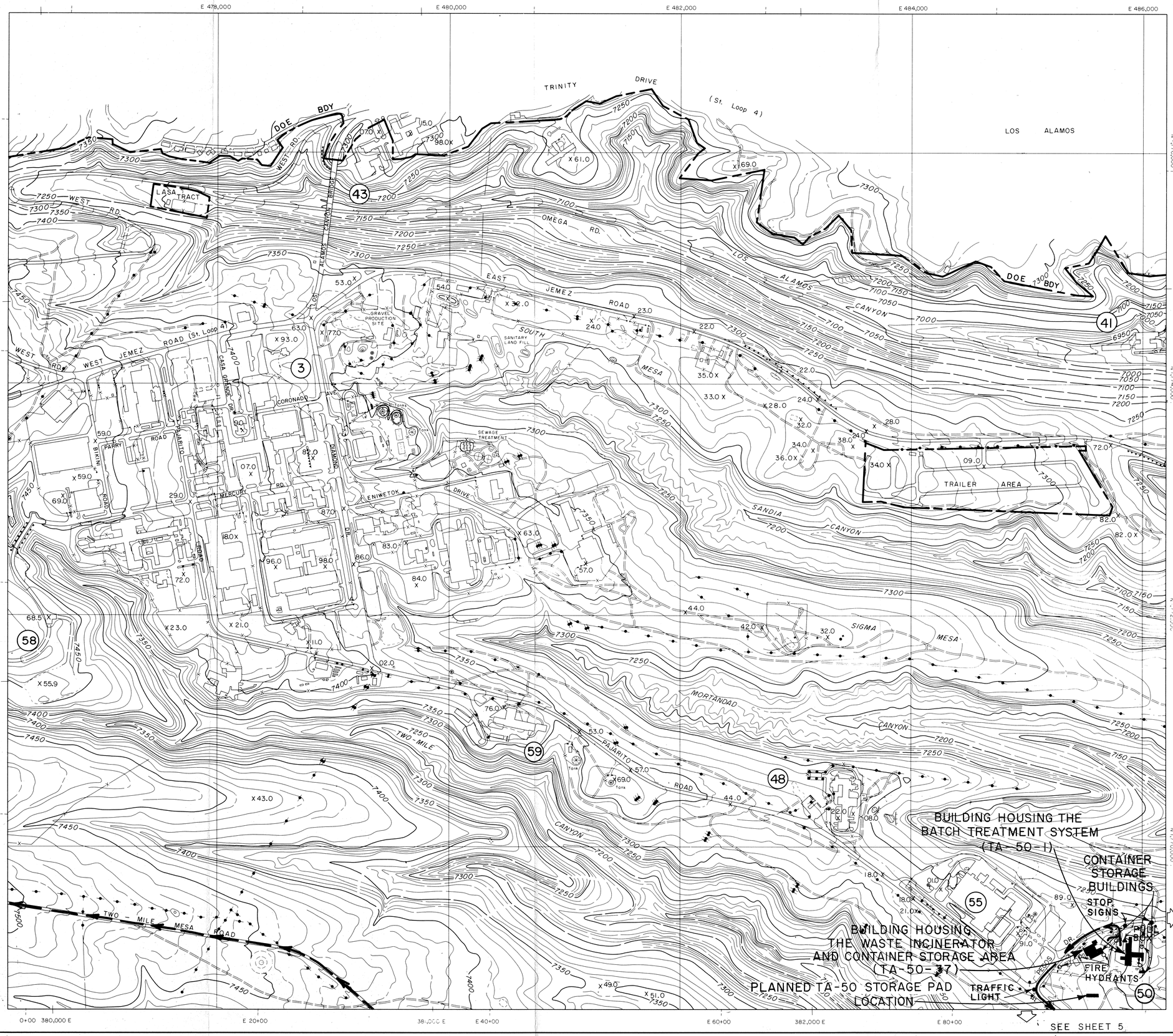
LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 5 OF 25

14932 M



LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

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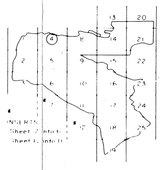
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT



NORTH

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

3 SM–SITE	41 W–SITE	50 WM–SITE
43 HRL–SITE	48 RC–SITE	
59 TWO MILE NORTH–SITE	55 PLUTONIUM FACILITY SITE	
59 OH–SITE		

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BOVAY ENGINEERS, INC.

FIGURE 2-3

CONTOUR MAP SHOWING THE LOCATIONS OF THE BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA AND THE WASTE INCINERATOR

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

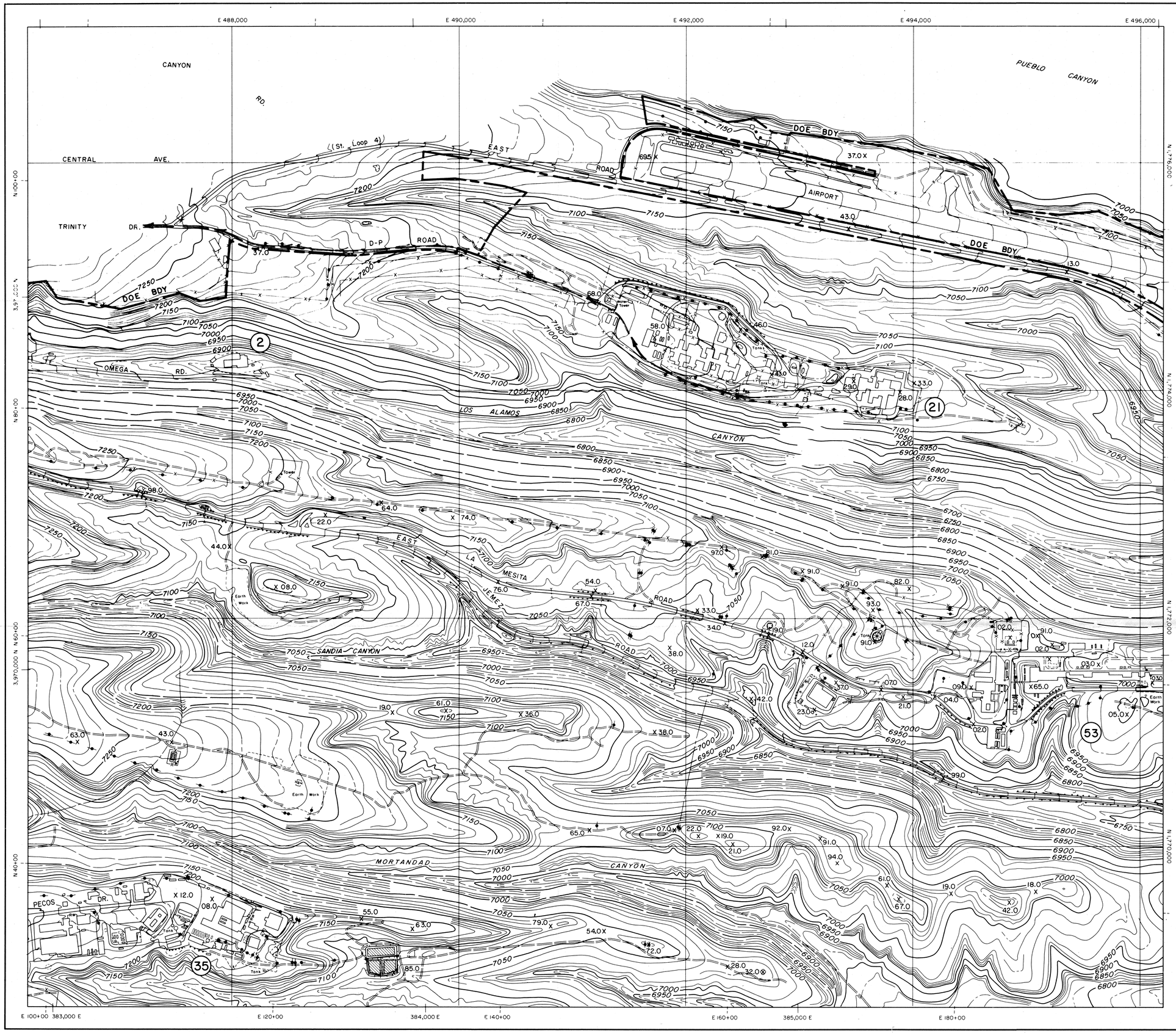
SHEET 4 OF 25

IT Corporation, General Revisions Nov. 1987

Checked by SWS 11/4/87

Approved by DES 11/11/87

14932-L



LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
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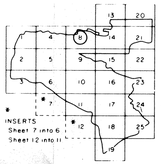
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		EVACUATION ROUTE

SHEET LAYOUT



NORTH

TRUE NORTH
GRID NORTH
-00°00'57"

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft.

CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

(2) OMEGA SITE
(21) DP–SITE
(35) TEN SITE
(53) MPF–SITE

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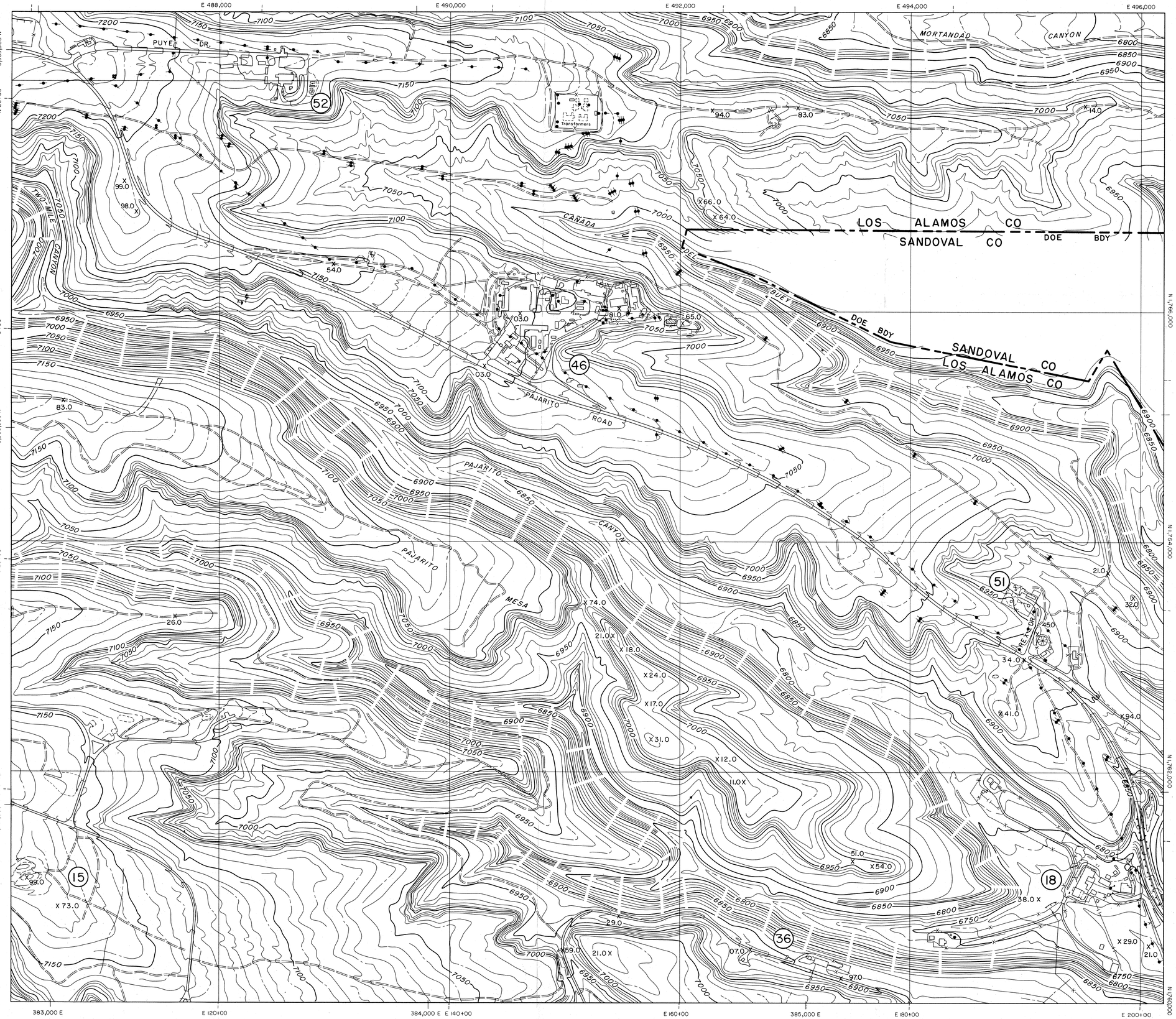
LABORATORY AERIAL MAPPING DIVISION

FIGURE 2-3

CONTOUR MAP SHOWING THE LOCATIONS OF THE BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA AND THE WASTE INCINERATOR

LAB JOB NO. 5682
1" =400' SCALE
PLAN / TOPO
SHEET 8 OF 25

14932-K

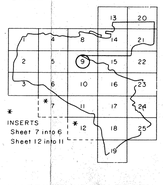


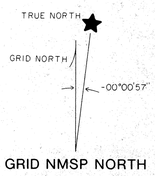
LEGEND

X 93.0	SPOT ELEVATION	N 1,768,000	NMSP GRID
6900	INDEX CONTOUR	3,989,000 N	UTM GRID
	INTERMEDIATE CONTOUR 10ft.	N 240+00	LASL GRID
	SUPPLEMENTARY CONTOUR 5ft.		
	CONTOURS THROUGH HEAVY VEGETATION		
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.		
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.		
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.		
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.		

35	TECHNICAL AREA NO.		TOWER
	BUILDING		PIPE LINE
	FENCE		CUT LINE OR POWER LINE CLEARANCE SCAR
	PAVED ROAD		WATER TOWER
	DIRT ROAD	Tank	TANK
	JEEP TRAIL		POND
	CULVERT	RW	RETAINING WALL
	GUARD RAIL		EARTH DIKES OR BLASTING SHIELDS
	TUNNEL	Earth Work	EARTH WORK OR GRADED AREAS
	EARTHEN BUNKERS		GATE
	POWER POLE		

SHEET LAYOUT





MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY, MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

400 200 0 400 800 1200 1600 FEET
100 50 0 100 200 300 400 500 METER

GRAPHIC SCALE: 1 in.=400 ft. CONTOUR INTERVAL 10 ft.

TECHNICAL AREAS

51 REF SITE	18 PL–SITE	46 WA–SITE
36 KAPPA SITE	52 RD–SITE	15 R–SITE

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FIGURE 2-3

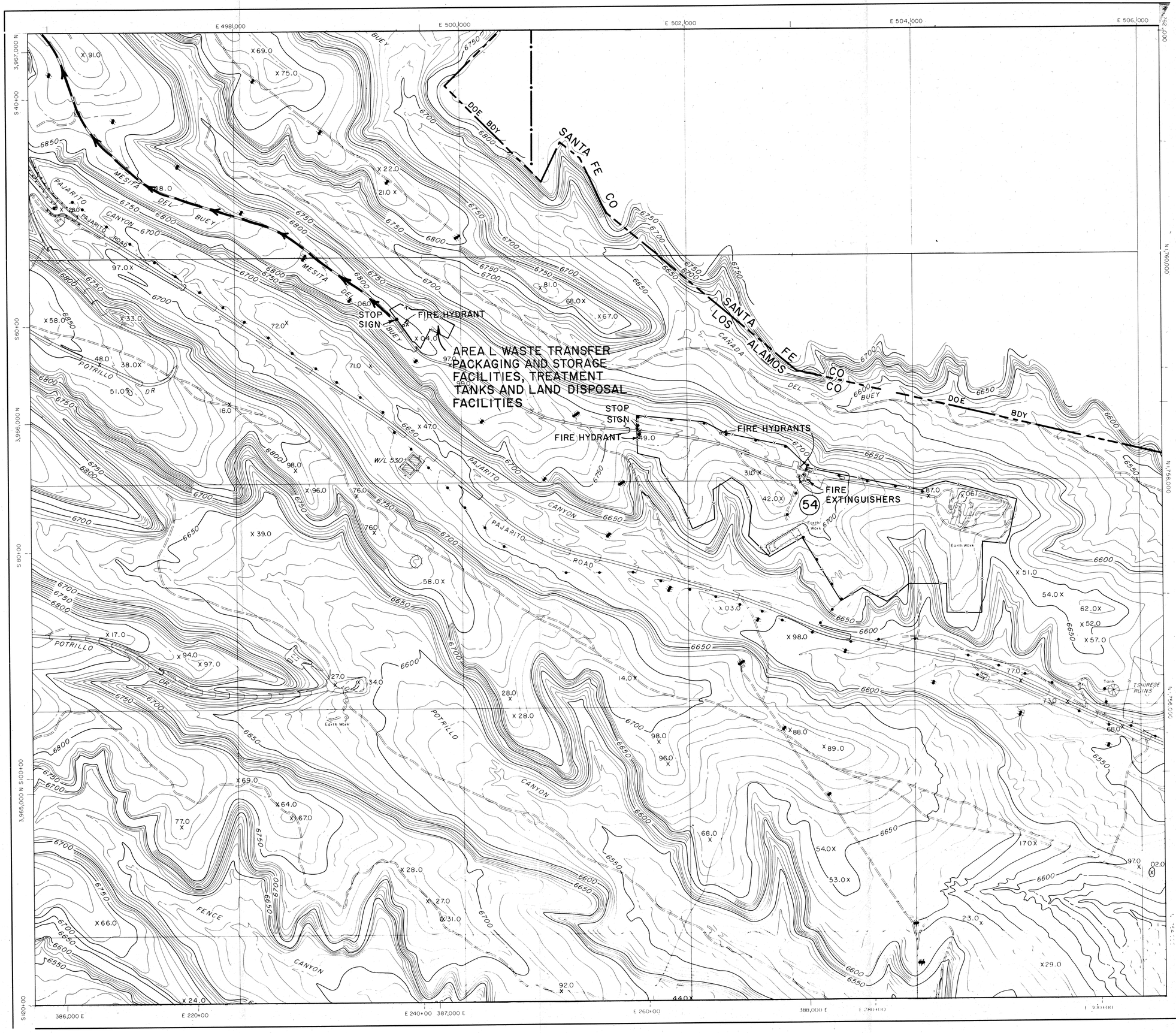
CONTOUR MAP SHOWING THE LOCATIONS OF THE BATCH TREATMENT SYSTEM AND CONTAINER STORAGE AREA AND THE WASTE INCINERATOR

LAB JOB NO. 5682

1"=400' SCALE

PLAN / TOPO

SHEET 9 OF 25



LEGEND

X 93.0	SPOT ELEVATION
6900	INDEX CONTOUR
	INTERMEDIATE CONTOUR 10ft.
	SUPPLEMENTARY CONTOUR 5ft.
	CONTOURS THROUGH HEAVY VEGETATION
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.
N 768,000	NMSP GRID
3,989,000 N	UTM GRID
N 240-00	LASL GRID
35	TECHNICAL AREA NO.
	BUILDING
	FENCE
	PAVED ROAD
	DIRT ROAD
	JEEP TRAIL
	CULVERT
	GUARD RAIL
	TUNNEL
	EARTHEN BUNKERS
	POWER POLE
	TOWER
	PIPE LINE
	CUT LINE OR POWER LINE CLEARANCE SCAR
	WATER TOWER
Tank	TANK
	POND
RW	RETAINING WALL
	EARTH DIKES OR BLASTING SHIELDS
Earth Work	EARTH WORK OR GRADED AREAS
	GATE
	EVACUATION ROUTE

SHEET LAYOUT

NORTH

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

GRAPHIC SCALE 1 in = 400 ft

CONTOUR INTERVAL 10 ft

TECHNICAL AREAS

(-4) MD–SITE

LOS ALAMOS SCIENTIFIC LABORATORY

FIGURE 2-4

CONTOUR MAP SHOWING THE LOCATION OF AREA L WASTE MANAGEMENT FACILITIES

14932-I

LAB JOB NO 5682
1" = 400' SCALE
PLAN / TOPO
SHEET 16 OF 25

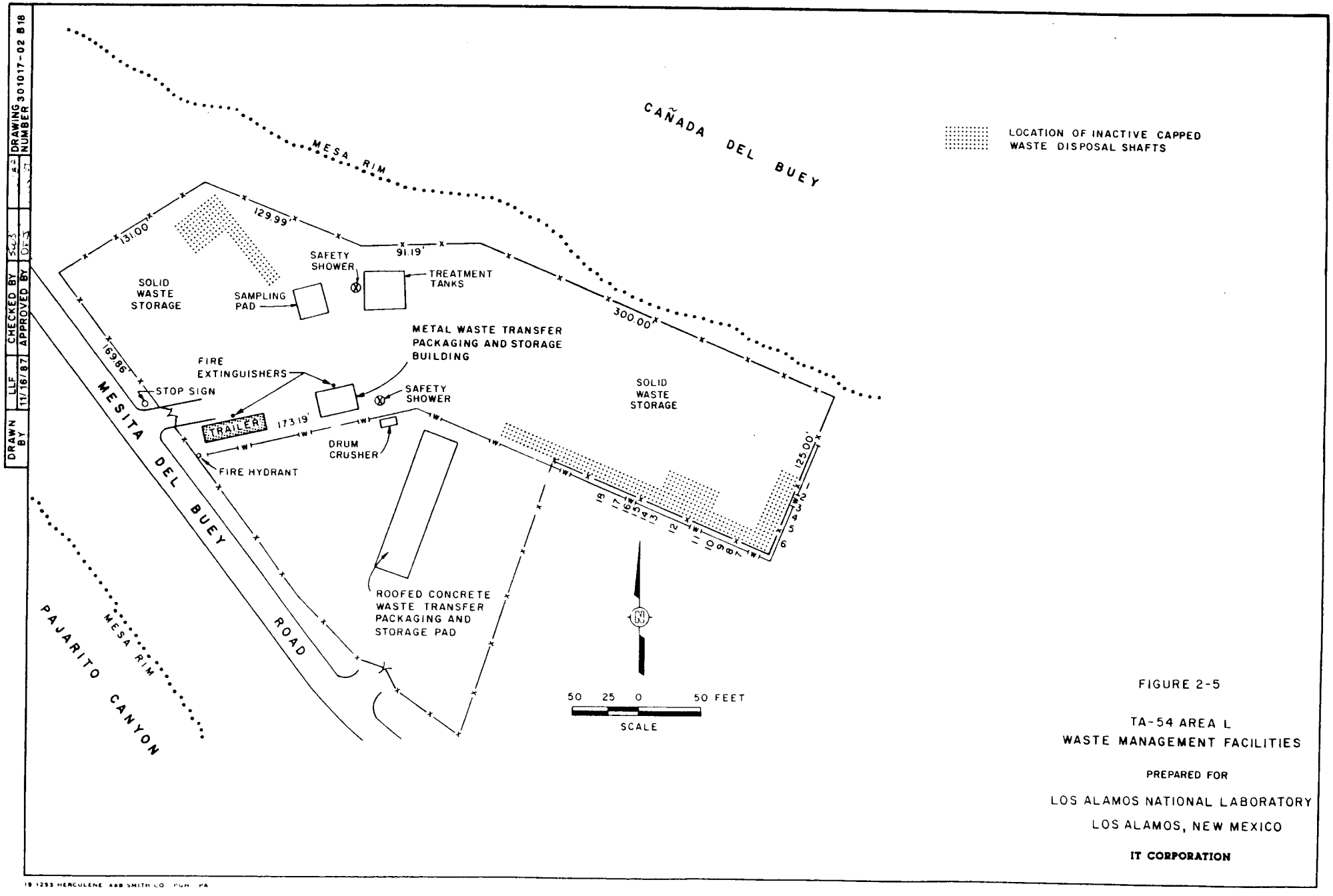


FIGURE 2-5

TA-54 AREA L
WASTE MANAGEMENT FACILITIES

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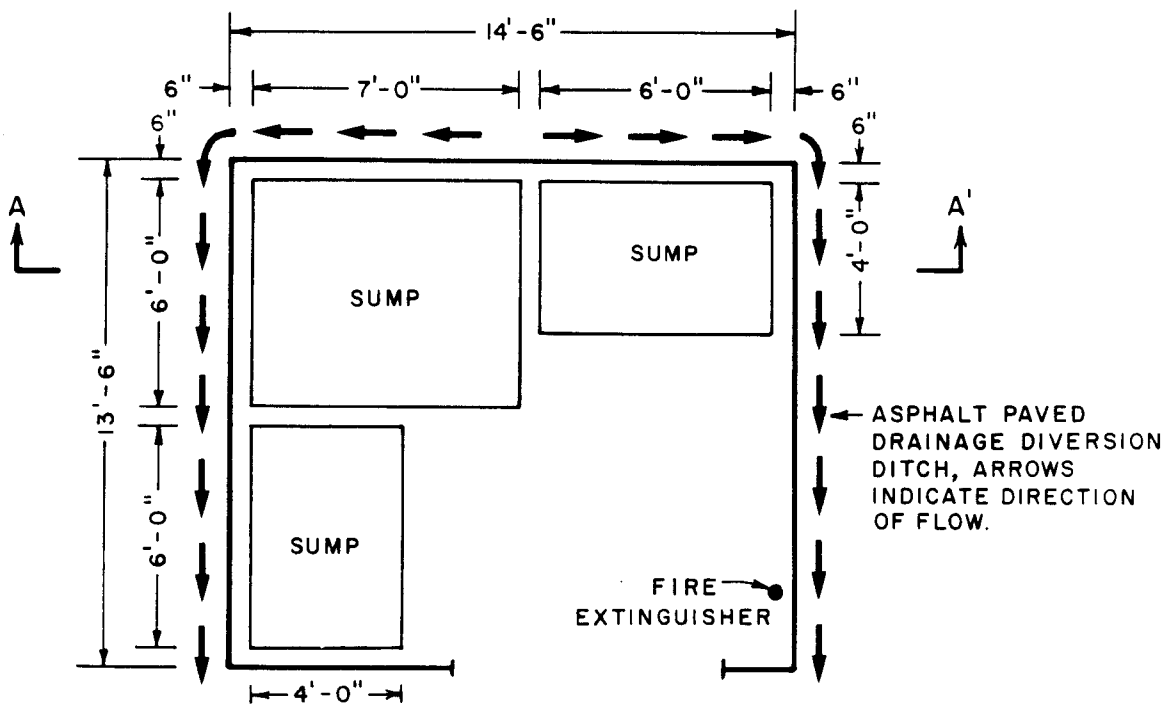
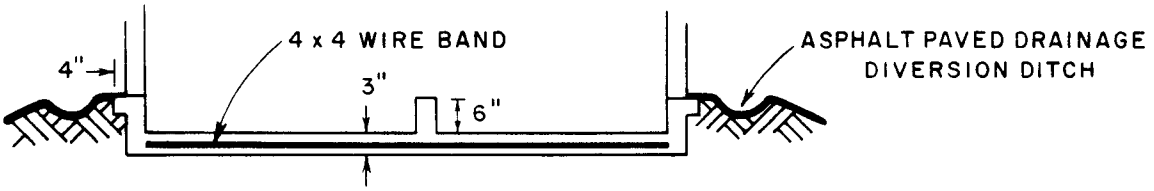
LOS ALAMOS, NEW MEXICO

IT CORPORATION

19 1253 HERCULENE A&B SMITH CO PGH PA



FLOOR PLAN



FOUNDATION AND SUMP

(Section A-A')

FIGURE 2-6

TA 54, AREA L WASTE TRANSFER, PACKAGING, AND STORAGE BUILDING

PREPARED FOR

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LOS ALAMOS, NEW MEXICO

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MJG 11/16/87

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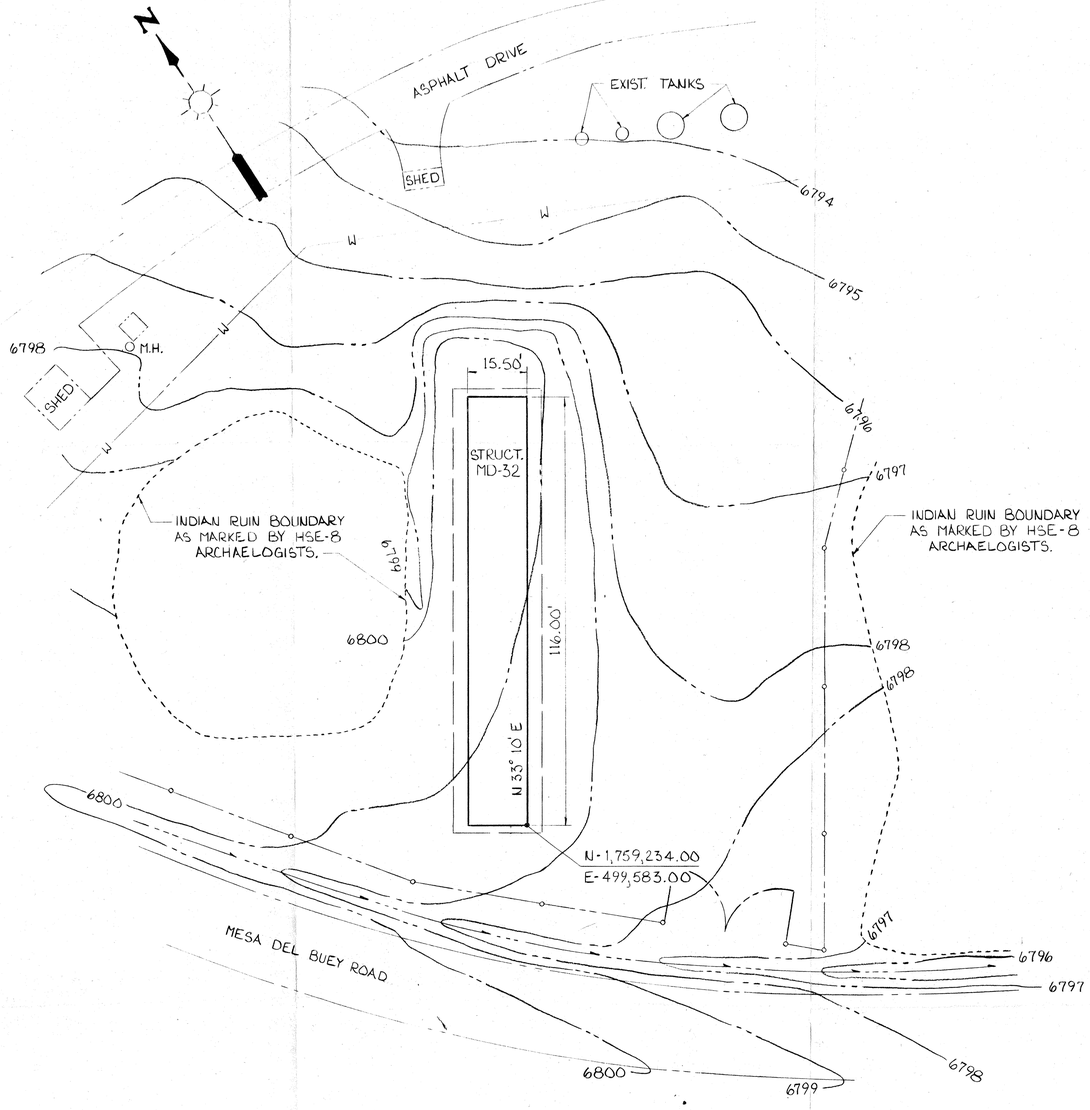
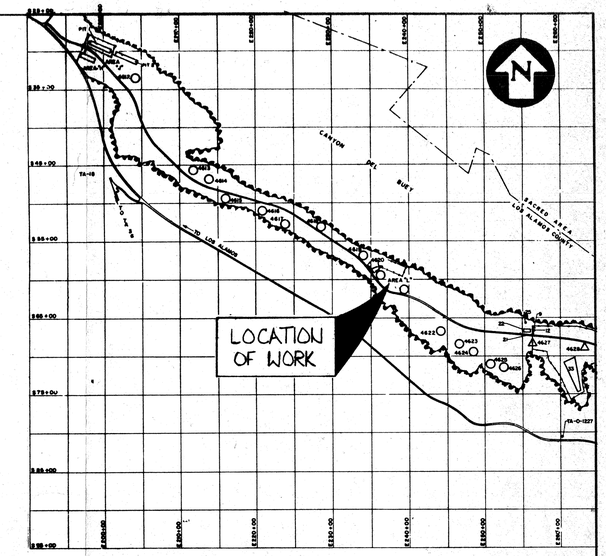


PLOT PLAN

SCALE: 1" = 20'-0"



STRUCTURE MD-32 TA-54

LOCATION PLAN

GENERAL NOTES

1. DO NOT SCALE DRAWINGS FOR CONSTRUCTION DIMENSIONS.
2. FIELD VERIFY DIMENSIONS PRIOR TO CONSTRUCTION.
3. REPAIR ALL AREAS DAMAGED DURING CONSTRUCTION TO MATCH EXISTING ADJACENT AREAS.
4. KEEP WORK SITE IN AN ORDERLY CONDITION AND AT PROJECT COMPLETION REMOVE ALL WASTE. LEAVE WORK SITE IN A CONDITION ACCEPTABLE TO THE ENG-1 INSPECTOR. DISPOSE OF REMOVED MATERIALS AS DIRECTED BY ENG-1, UNLESS NOTED.
5. PAINTING - PAINT CONC. CELL SURFACES WITH 1 COAT PRIMER: ANTI-CORROSIVE, "PLASITE", FOR 7100 COLD SET COATING SERIES, ZIA STOCK NO. 2605 76 0024; 2 FINISH COATS: COLD SET COATING MATERIAL "PLASITE", LT. GRAY, ZIA STOCK NO. 2605 72 0033.

   PAINT UNGALVANIZED BARRIER FENCE METAL WITH 1 COAT PRIMER PPG, WHITE 6-712; 2 FINISH COATS OF SPEEDHIDE WATER BASE ALKYD GLOSS ENAMEL, GRAY, MWF, 3-6 MILS.
6. COMPACT FILL MATERIAL IN 8" MAXIMUM LIFTS TO 95% DENSITY LABORATORY TEST MAX. DENSITY PER ASTM D1557 METHOD D & FIELD DENSITY PER ASTM D2922 OF ALL FILL MATERIAL.

LEGEND

- NEW CONSTRUCTION
- FUTURE CONSTRUCTION
- RUIN BOUNDARY
- EXISTING
- W — EXISTING WATER LINE

NOTE:
SURVEY-TOPOGRAPHIC INFORMATION WAS OBTAINED FROM SURVEY DRAWING NO. ENG. 54-42.

THIS JOB MUST BE INSPECTED AND ANY CHANGES APPROVED BY PAUL VIDRINE
ENG-1 PHONE 7-4656

AUTHORIZED BY D.R.R. FOR: MF
HSE-3
ENG-1
ENG-4
ENG-4

NO.	DATE	CLASS REV.	REVISIONS	DWN	DES	CHKD	REQ GRP	REQ D.O.	ENG GRP	ENG D.O.

FACILITIES ENGINEERING DIVISION

FIGURE 2-7
TA54, AREA L
WASTE STORAGE PAD

DRAWN	B. SANCHEZ
DESIGN	B Smeltz
CHECKED	C. SANCHEZ
RELEASED	R. Ferron
DATE	8-9-85

SUBMITTED C Sanchez | RECOMMENDED Bruce Ferron | APPROVED J Wertz

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET C1 1 OF 2

CLASSIFICATION U | REVIEWER Bruce Ferron | DATE 8-8-85

REQUESTING DIVISION HSE-DO | REQUESTING GROUP HSE-7 | LAB JOB NO. 8204-54 PHASE "C" | DRAWING NO. ENG-C 44856 | REV.

14932-H

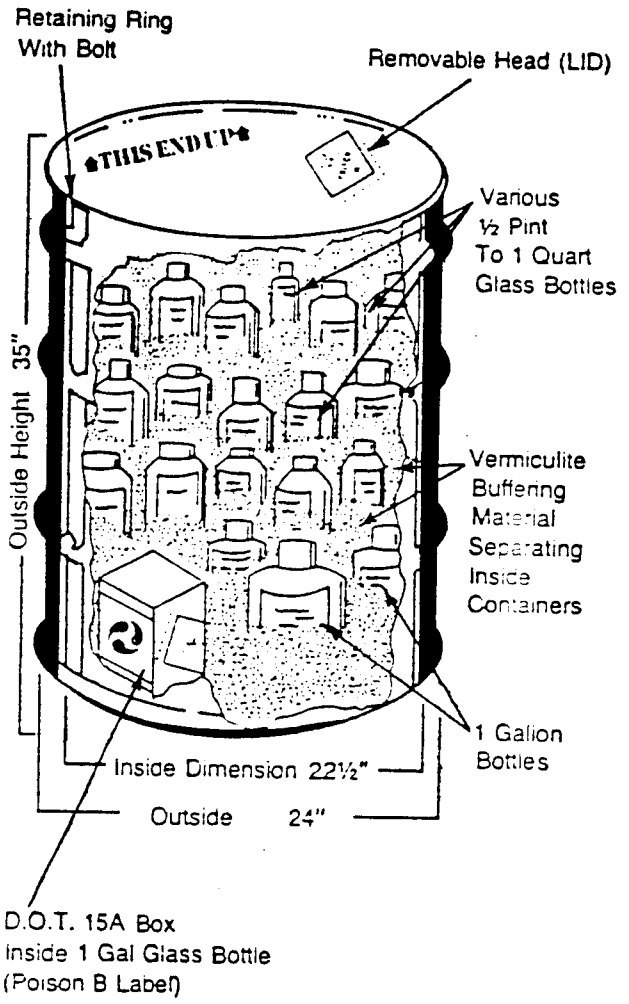


FIGURE 2-8

"LAB PACK" DRUM - TYPICAL
D.O.T. 17H STEEL WITH
REMOVABLE HEAD (LID)

PREPARED FOR

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LOS ALAMOS, NEW MEXICO

VN	LLF	CHECKED BY		DRAWING NUMBER 3	17-02 A108
	11/16/87	APPROVED BY			

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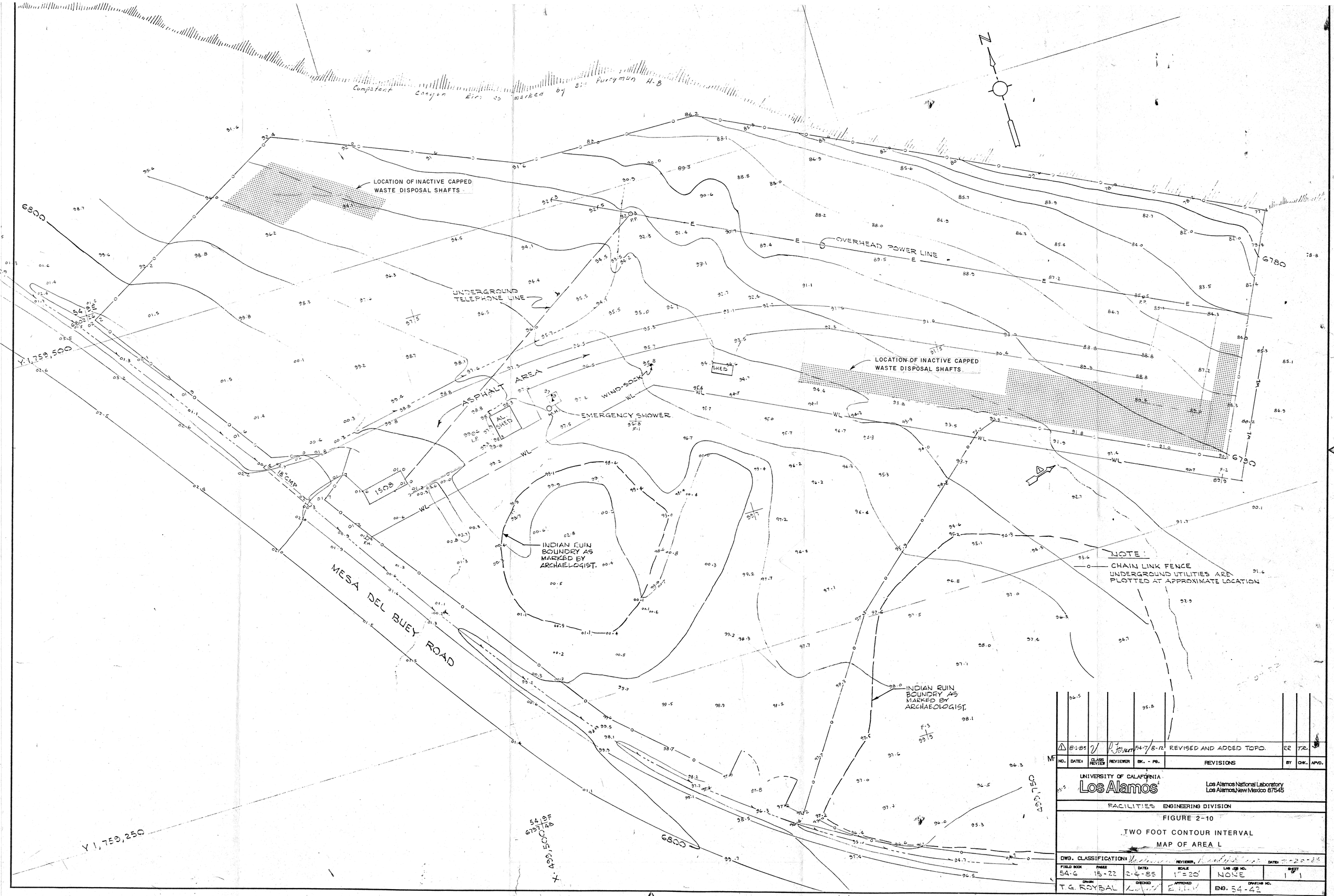


NO.	DATE:	CLASS REVIEW	REVIEWER	BK. - PG.	REVISIONS	BY	CHK.	APVD.
1	8-1-85	V	R. Jones	54-7/8-12	REVISED AND ADDED TOPO.	RR	TR	

UNIVERSITY OF CALAFORNIA
Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

FACILITIES ENGINEERING DIVISION

FIGURE 2-10

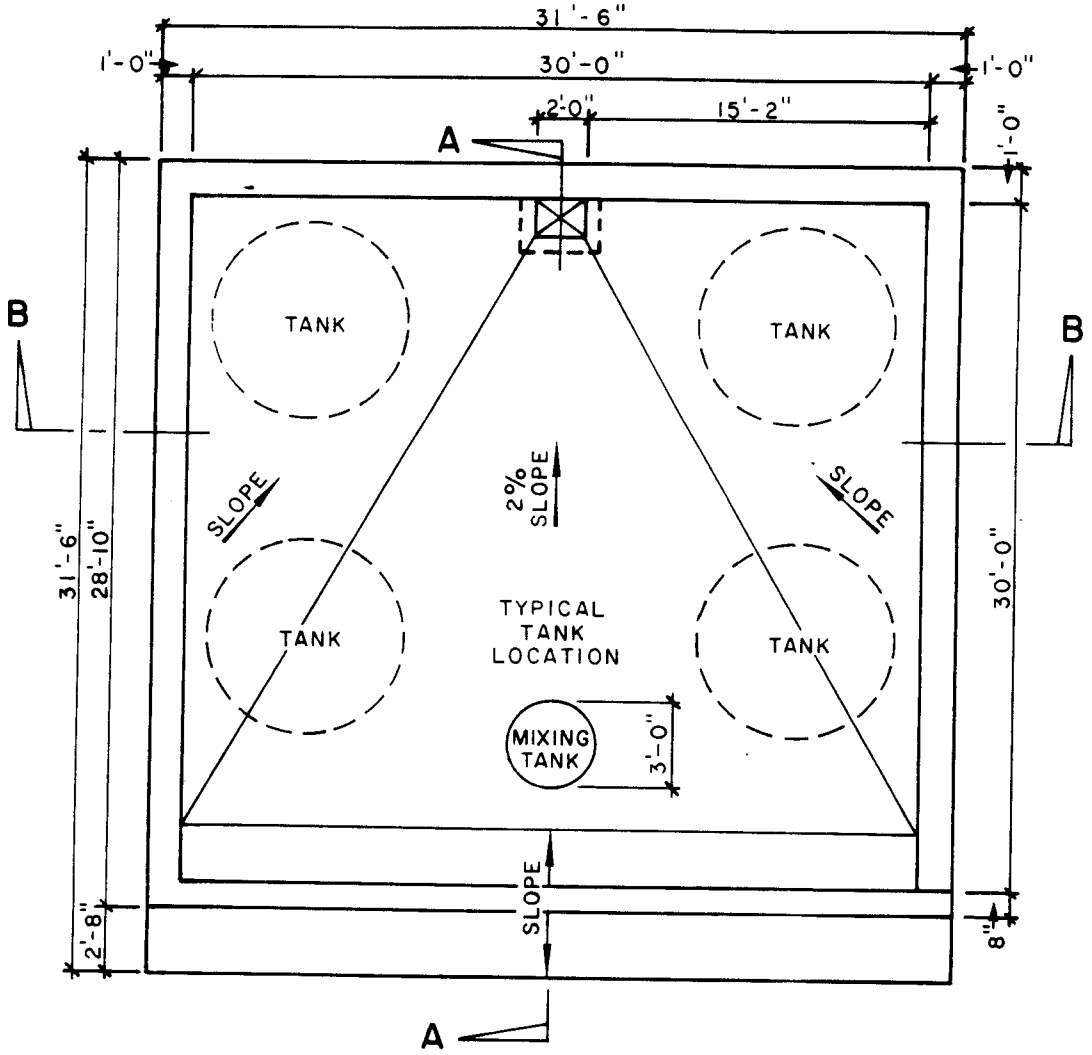
TWO FOOT CONTOUR INTERVAL

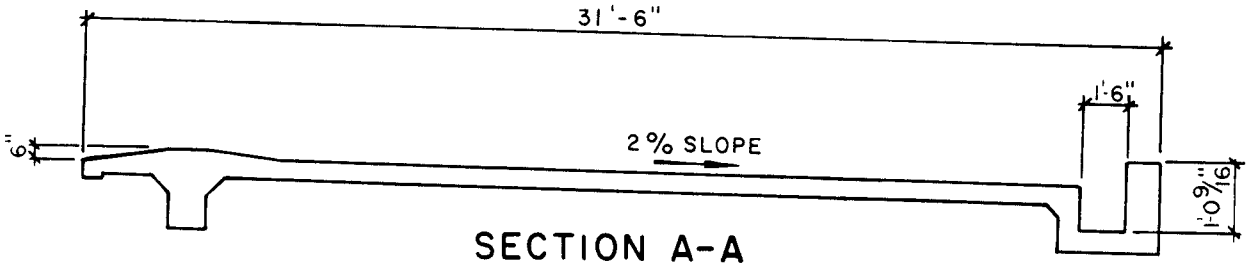
MAP OF AREA L

DWG. CLASSIFICATION: Unclassified — REVIEWER: [illegible] — DATE: 7-20-85

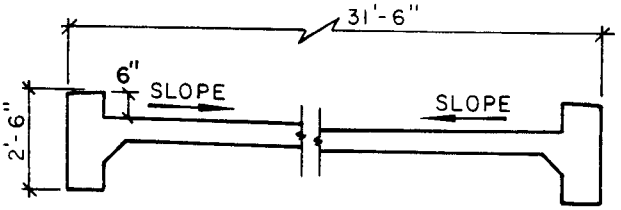
FIELD BOOK	PAGES	DATE:	SCALE	LAB JOB NO.	SHEET
54-6	15-22	2-6-85	1" = 20'	NONE	1 of 1

DRAWN	CHECKED	APPROVED	DRAWING NO.
T.G. ROYBAL	[illegible]	[illegible]	ENG. 54-42





SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE

FIGURE 2-9

TA 54, AREA L
TREATMENT TANKS
PLAN

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LOS ALAMOS, NEW MEXICO

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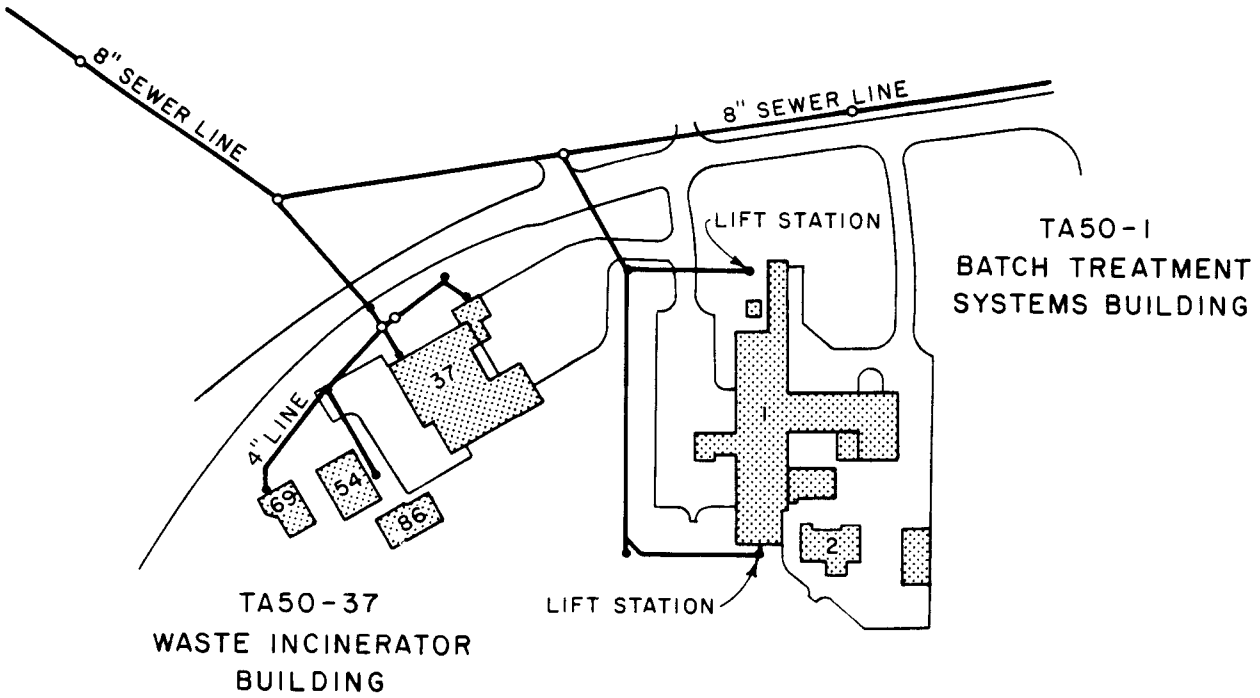

FIGURE 2-11

SANITARY SEWER LINES

AT TA-50

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LOS ALAMOS, NEW MEXICO

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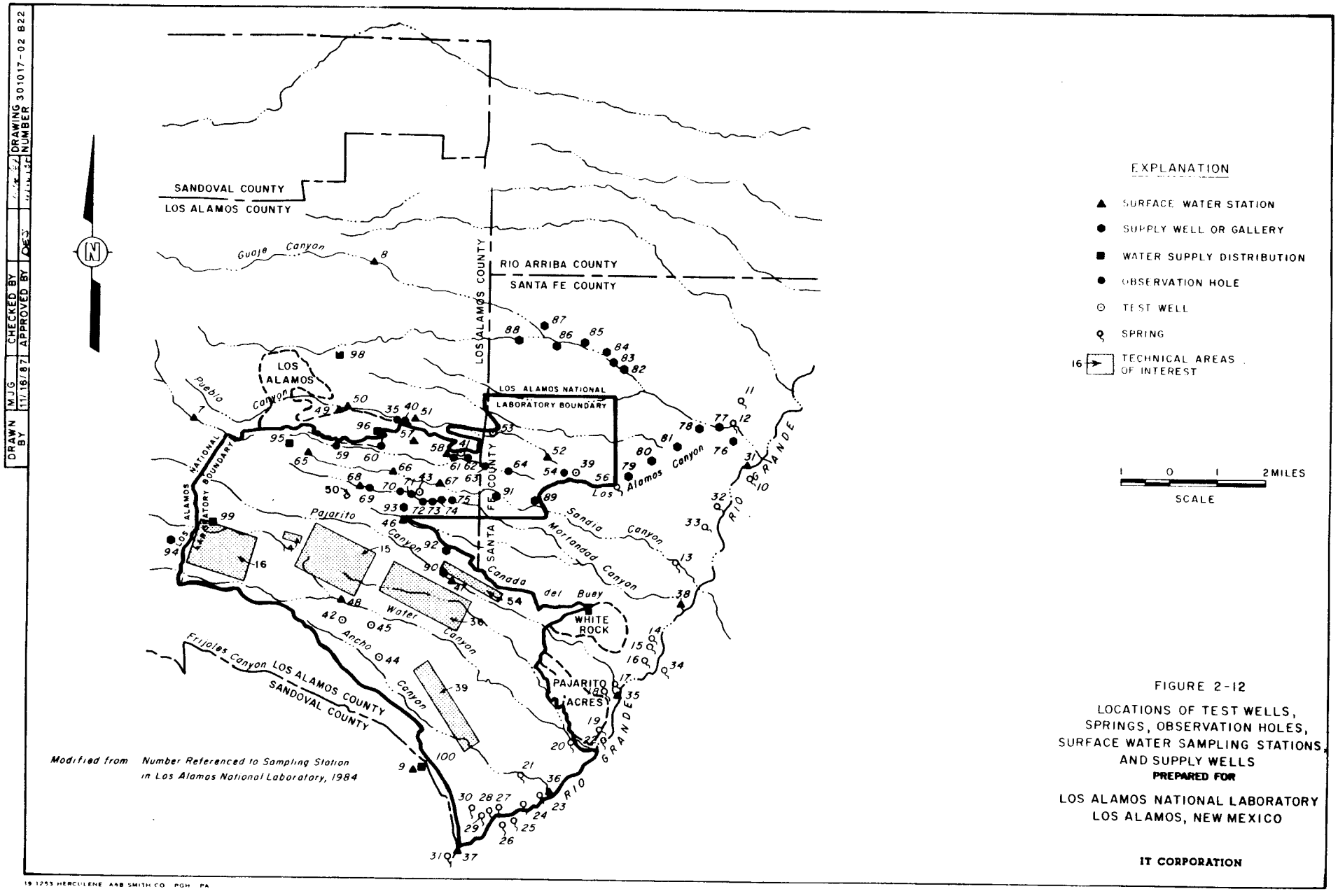

FIGURE 2-12

LOCATIONS OF TEST WELLS, SPRINGS, OBSERVATION HOLES, SURFACE WATER SAMPLING STATIONS, AND SUPPLY WELLS

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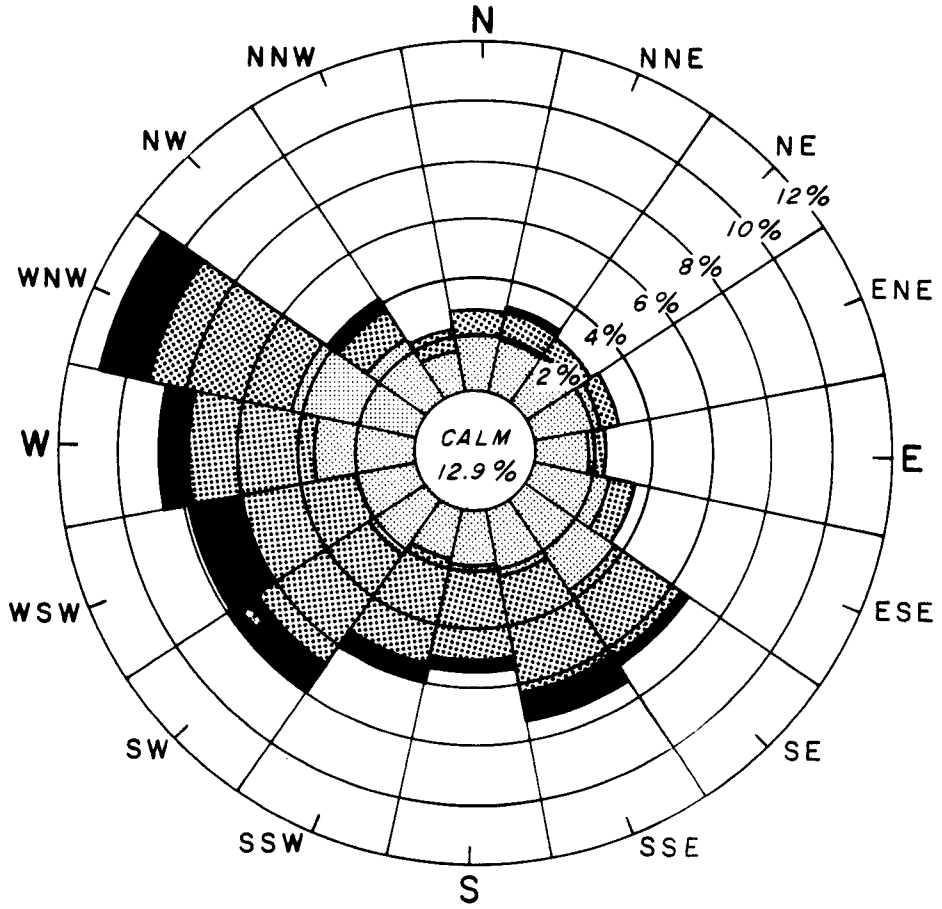

SPEED (m/sec)

- 1-2.5
- 2.5-5
- 5+

(AVG. SPEED = 2.8)

FIGURE 2-13
ANNUAL SURFACE WIND SPEED
AND DIRECTION, 1983,
TECHNICAL AREA 59
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Modified from. Los Alamos National Laboratory, 1984

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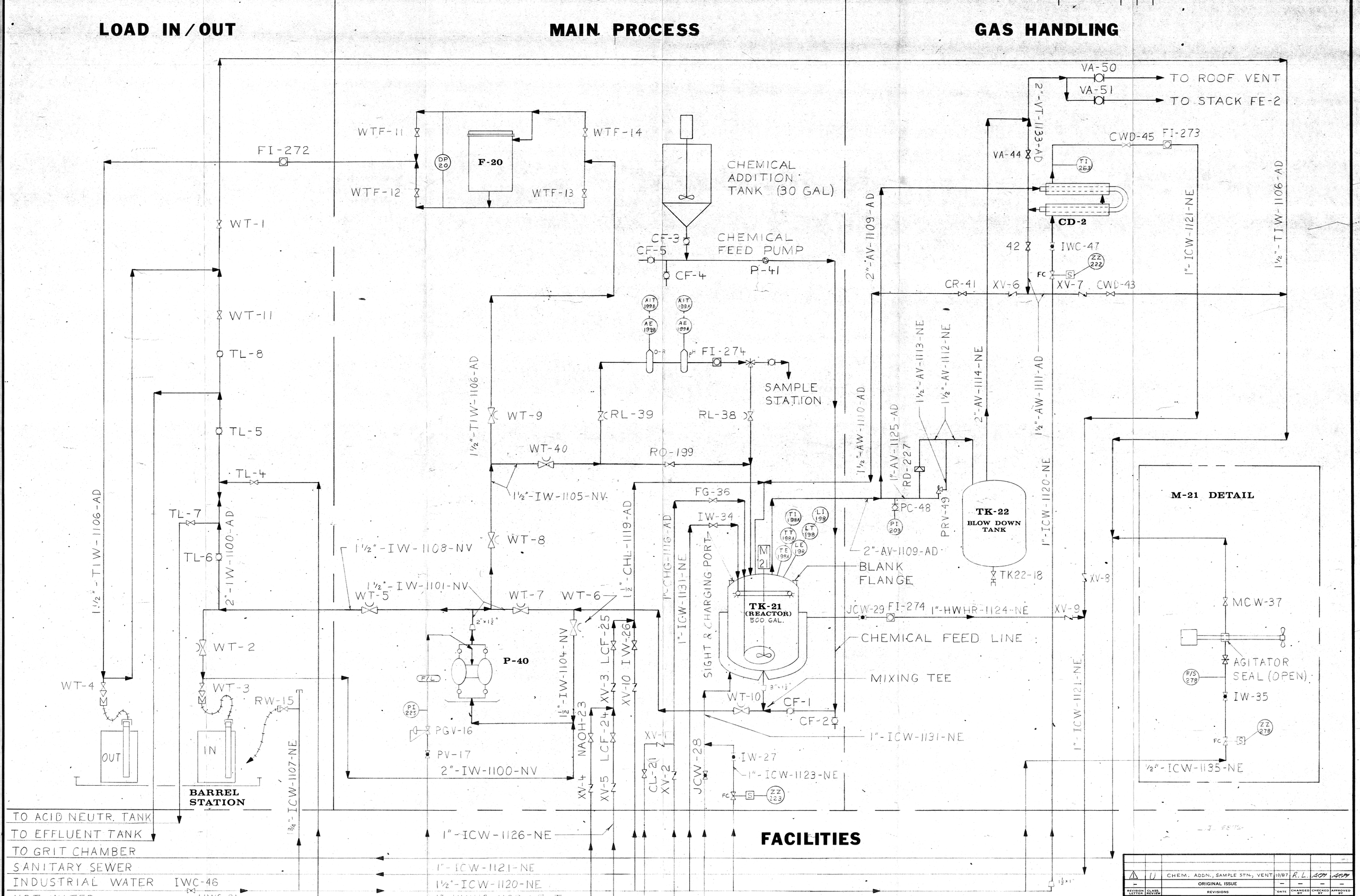
PREFIX NUMBER	ITEM NUMBER	NUMBER MOD	DESCRIPTION



REVISION LETTER	CLASS. REVIEW	REVISIONS	DATE	CHANGED BY	CHECKED BY	APPROVED BY
—		ORIGINAL ISSUE	—	—	—	—
U		CHEM. ADDN., SAMPLE STN., VENT	10/87	R.L.		

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CLASSIFICATION OF DRAWING:

PART: TITLE BLOCK:

TITLE

PROCESS PIPING & INSTRUMENTATIO CBWT SYSTEM

WM-1 TA-50

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APPROVED			
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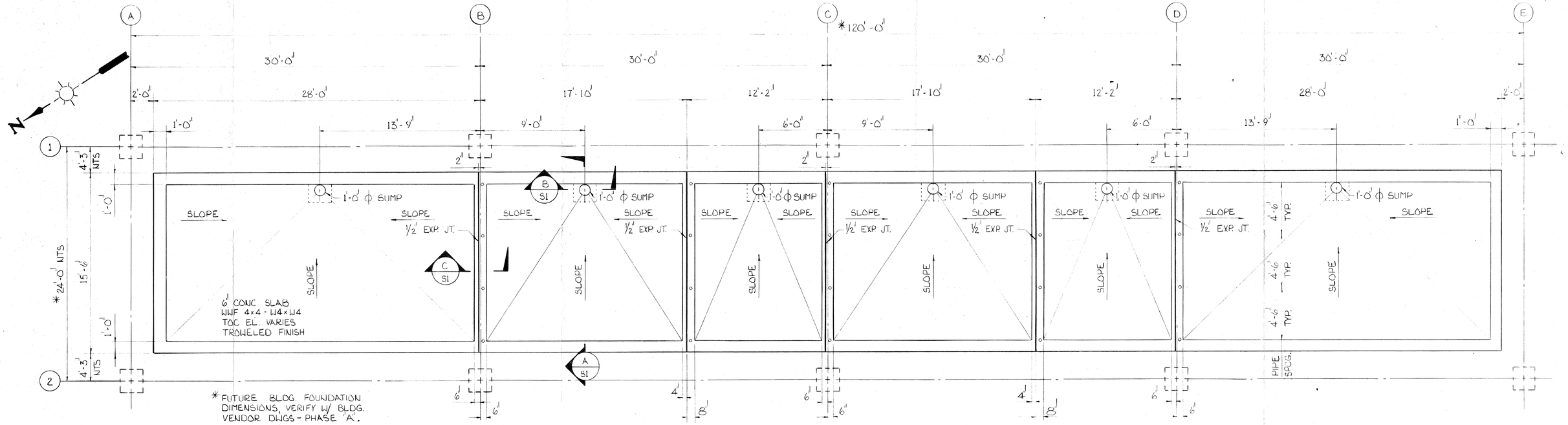
SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	SHEET NO.
N/A	1		E	1

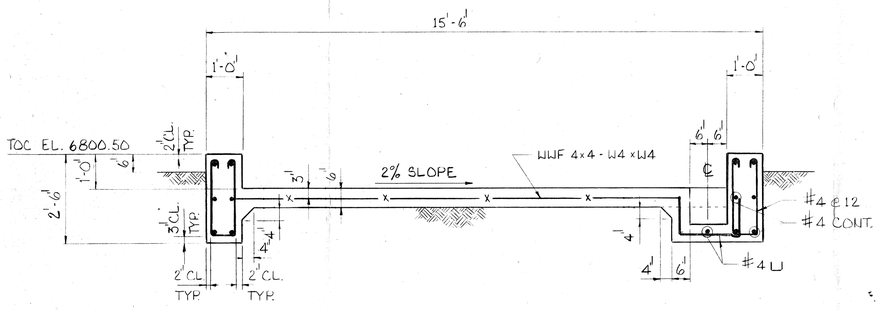
14932-D

ENG-C 45307 LAB JOB 5872-0



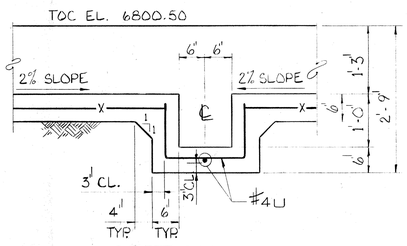
FOUNDATION PLAN

SCALE: 1/4" = 1'-0"



SECTION A / S1

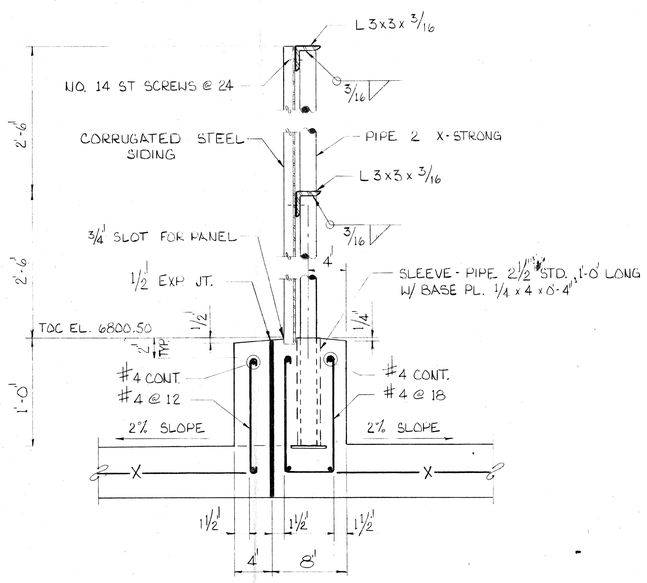
SCALE: 1/2" = 1'-0"



SECTION B / S1

TYP. 6 PLCS.

SCALE: 3/4" = 1'-0"



SECTION C / S1

SCALE: 1 1/2" = 1'-0"

STRUCTURAL NOTES

1. STRUCTURE EXCAVATION - EXCAVATE FOR WALLS & SLABS IN ACCORDANCE WITH ELEVATIONS & DIMENSIONS SHOWN ON THIS DRAWING. EXCAVATION SHALL EXTEND A SUFFICIENT DISTANCE FROM WALLS TO ALLOW FOR PLACING & REMOVAL OF FORMS. OVEREXCAVATION BELOW ELEVATIONS SHOWN SHALL BE RESTORED TO PROPER ELEVATION BY BACKFILLING WITH CONCRETE. THE EXCAVATION SHALL BE INSPECTED BY ENG-1 INSPECTOR PRIOR TO PLACING REINFORCING STEEL.

2. CONCRETE CONSTRUCTION SHALL BE IN CONFORMANCE WITH FACILITIES ENGINEERING DIVISION STANDARD SPECIFICATIONS:
   SECTION 03100 - CONCRETE FORMWORK, 3/4" CHAMFER
   SECTION 03200 - REINFORCING STEEL, GRADE 60
   SECTION 03300 - CAST-IN-PLACE CONCRETE, f'_c = 4000 PSI

   FINISH WALLS & SLABS WITH A PREMIXED, SINGLE APPLICATION, SEALER & HARDENER FLOOR FINISH. THE FINISH SHALL BE DELIVERED TO THE JOB SITE IN UNBROKEN CONTAINERS & APPLIED IN ACCORDANCE WITH THE MANUFACTURERS DIRECTIONS.

3. MISCELLANEOUS STEEL - MATERIAL, FABRICATION, ERECTION, & PAINTING OF STEEL SHALL CONFORM TO SITE ENGINEERING STANDARD SPECIFICATION SECTION 05120 - STRUCTURAL STEEL.

   BARRIER PANELS SHALL BE 26 GAUGE, 2 1/2" x 1/2" CORRUGATED GALVANIZED STEEL CONFORMING TO ASTM A446 G-90. FASTEN WITH NO. 14 SELF-TAPPING SCREWS.

NO.	DATE	CLASS REV.	REVISIONS	DWN	DES	CHKD	REQ GRP	REQ D.O.	ENG GRP	ENG D.O.

FACILITIES ENGINEERING DIVISION

FIGURE 2-7

TA54, AREA L

WASTE STORAGE PAD

DRAWN	B. SANCHEZ
DESIGN	B. Sanchez
CHECKED	C. SANCHEZ
RELEASED	Bruce Ferson
DATE	4-9-85

SUBMITTED [signature] RECOMMENDED Bruce Ferson APPROVED [signature]

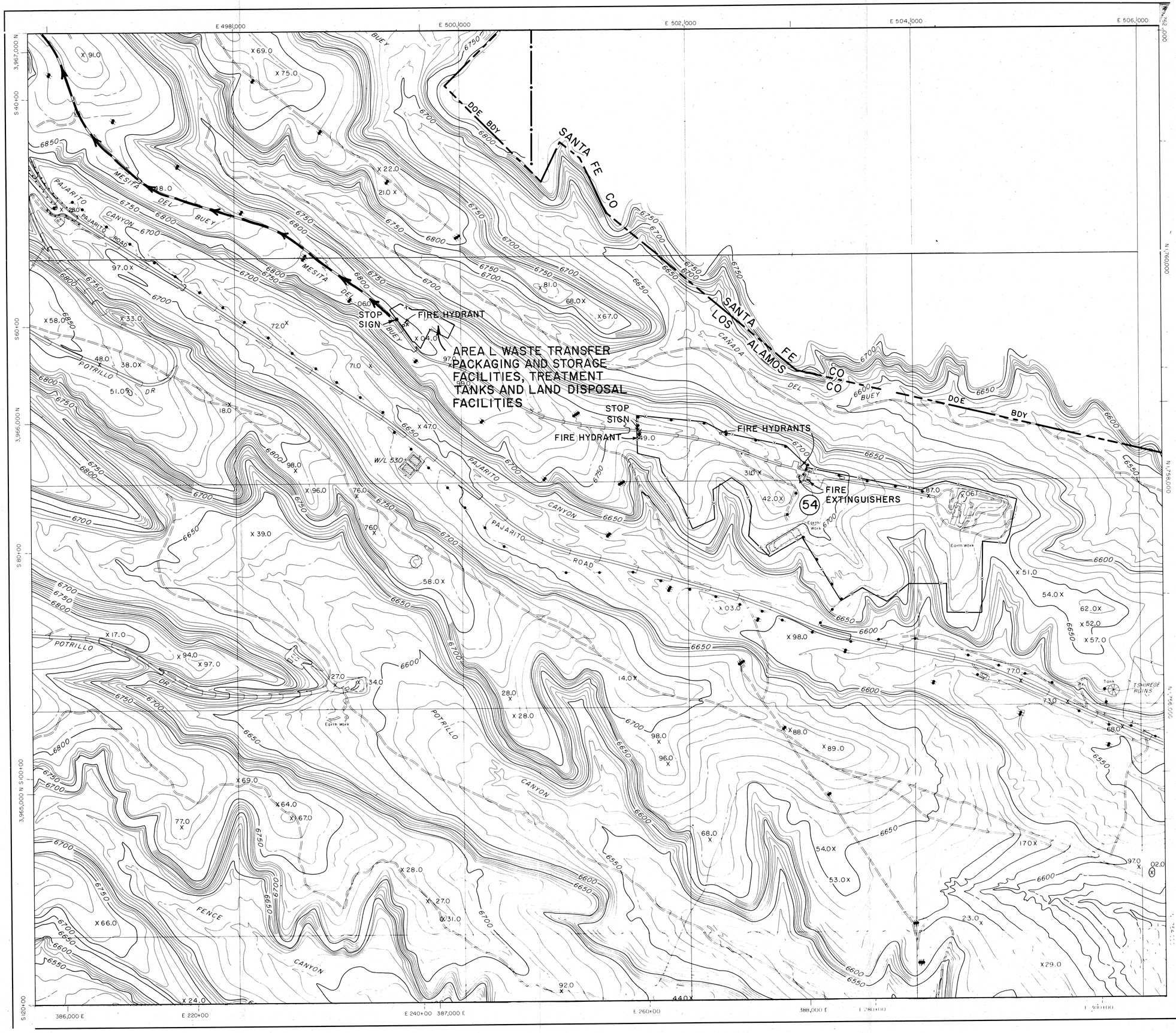
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET S1 2 OF 2

CLASSIFICATION U REVIEWER Bruce Ferson DATE 7-25-85

REQUESTING DIVISION HSE-DO REQUESTING GROUP HSE-7 LAB JOB NO. 8204-54 PHASE "C" DRAWING NO. ENG-C 44856 REV.

14932-G



LEGEND

X 93.0	SPOT ELEVATION
6900	INDEX CONTOUR
	INTERMEDIATE CONTOUR 10ft.
	SUPPLEMENTARY CONTOUR 5ft.
	CONTOURS THROUGH HEAVY VEGETATION
	COUNTY LINES – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES.
	DOE BOUNDARY – X & Y COORDINATE DATA PROVIDED BY LASL.
	DOE BOUNDARY – SURVEY DESCRIPTIONS OR RECORD PLATS PROVIDED BY LASL.
	DOE BOUNDARY – TRANSFERRED FROM USGS 1:24,000 QUADRANGLES BASED ON PROJECTED COUNTY LINES.
N 768,000	NMSP GRID
3,989,000 N	UTM GRID
N 240-00	LASL GRID
35	TECHNICAL AREA NO.
	BUILDING
	FENCE
	PAVED ROAD
	DIRT ROAD
	JEEP TRAIL
	CULVERT
	GUARD RAIL
	TUNNEL
	EARTHEN BUNKERS
	POWER POLE
	TOWER
	PIPE LINE
	CUT LINE OR POWER LINE CLEARANCE SCAR
	WATER TOWER
Tank	TANK
	POND
RW	RETAINING WALL
	EARTH DIKES OR BLASTING SHIELDS
Earth Work	EARTH WORK OR GRADED AREAS
	GATE
	EVACUATION ROUTE

SHEET LAYOUT

NORTH

GRID NMSP NORTH

MAPPING COMPLETED BY PHOTOGRAMMETRIC METHODS, UTILIZING 1:30,000, 1:12,000 & 1:13,200 PHOTOGRAPHY, OBTAINED IN NOV. 1976 & JUNE 1980 WITH ZEISS RMK A 15/23 CAMERAS OF 153.42 & 152.43mm C.F.L. RESPECTIVELY. MAPPING BASED ON CONTROL SURVEYS TIED TO THE NEW MEXICO STATE PLANE COORDINATE SYSTEM (CENTRAL ZONE). MAPPING COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY SPECIFICATIONS.

GRAPHIC SCALE 1 in = 400 ft

CONTOUR INTERVAL 10 ft

TECHNICAL AREAS

(-4) MD–SITE

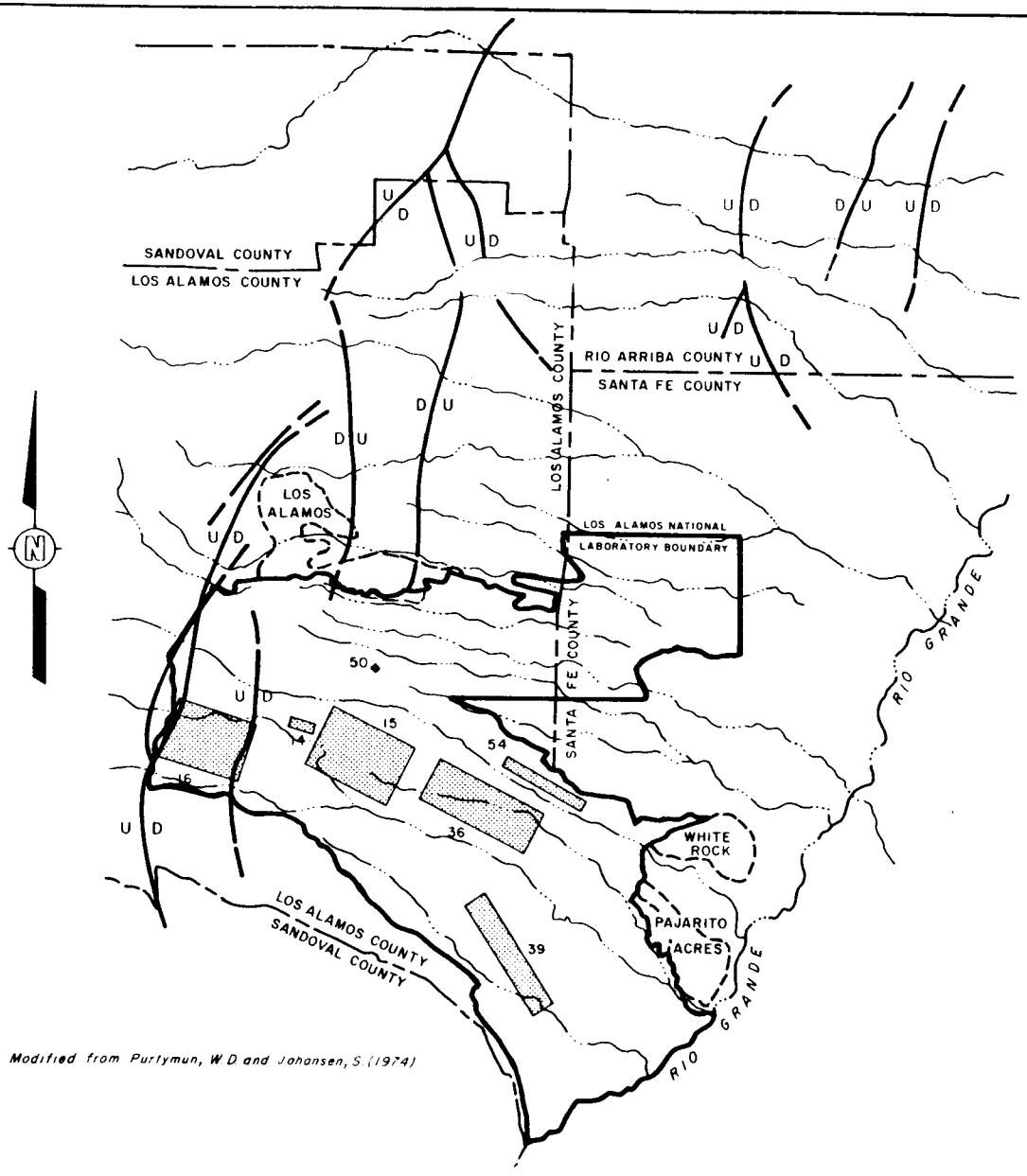
LOS ALAMOS SCIENTIFIC LABORATORY

FIGURE 2-4

CONTOUR MAP SHOWING THE LOCATION OF AREA L WASTE MANAGEMENT FACILITIES

14932-I

LAB JOB NO 5682
1" = 400' SCALE
PLAN / TOPO
SHEET 16 OF 25



Modified from Purlymun, W.D. and Johansen, S. (1974)

EXPLANATION

U/D MAJOR FAULTS, D INDICATES DOWNTHROWN SIDE, U INDICATES UPTHROWN SIDE

16 TECHNICAL AREAS OF INTEREST

1 0 1 2 MILES

SCALE

FIGURE 2-14

LOCATION OF LOS ALAMOS FACILITIES RELATIVE TO THE NEARBY FAULT TRACES

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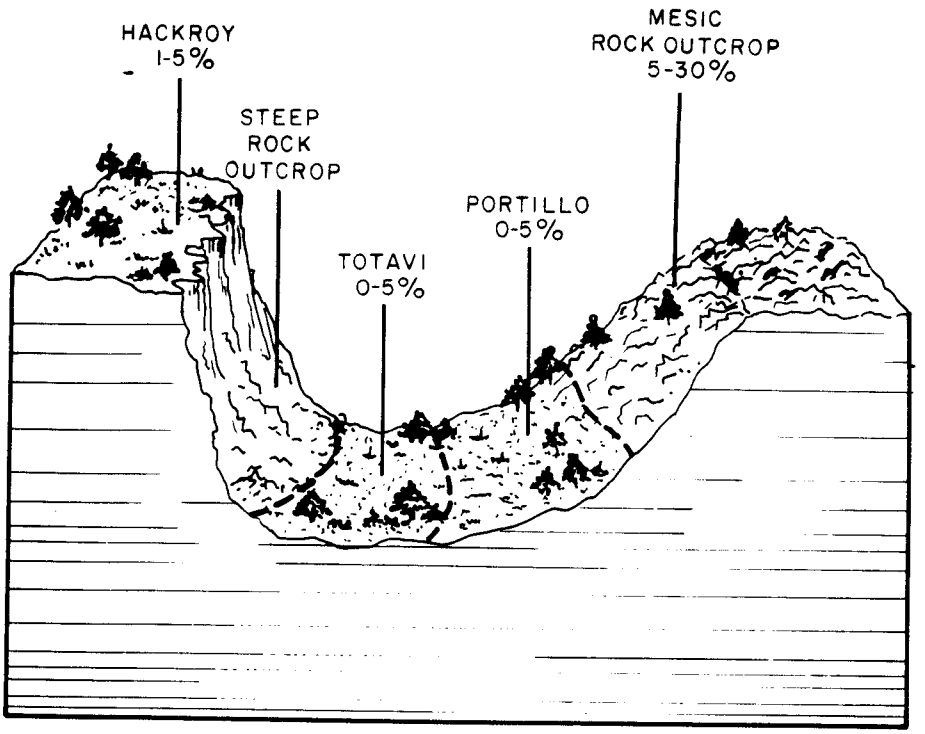

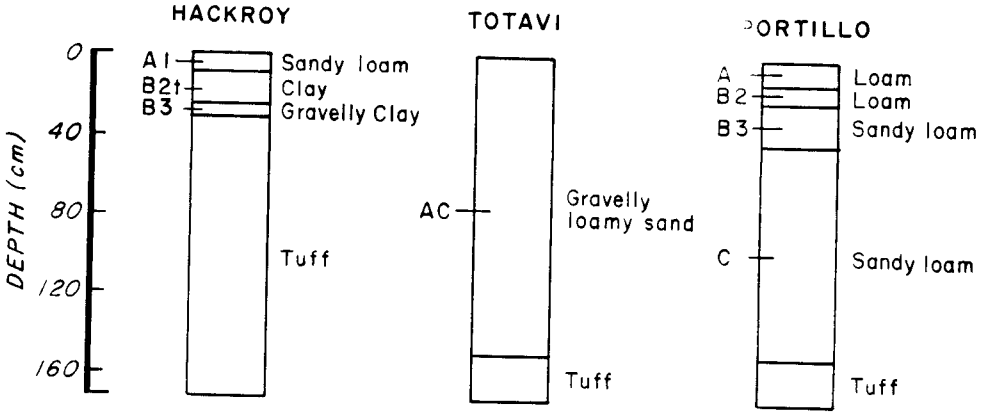

FIGURE 2-15
RELATIONSHIPS OF SLOPE, VEGETATION AND PARENT MATERIAL TO HACKROY, TOTAVI, AND PORTILLO SOILS

Reference; USDOE, 1978

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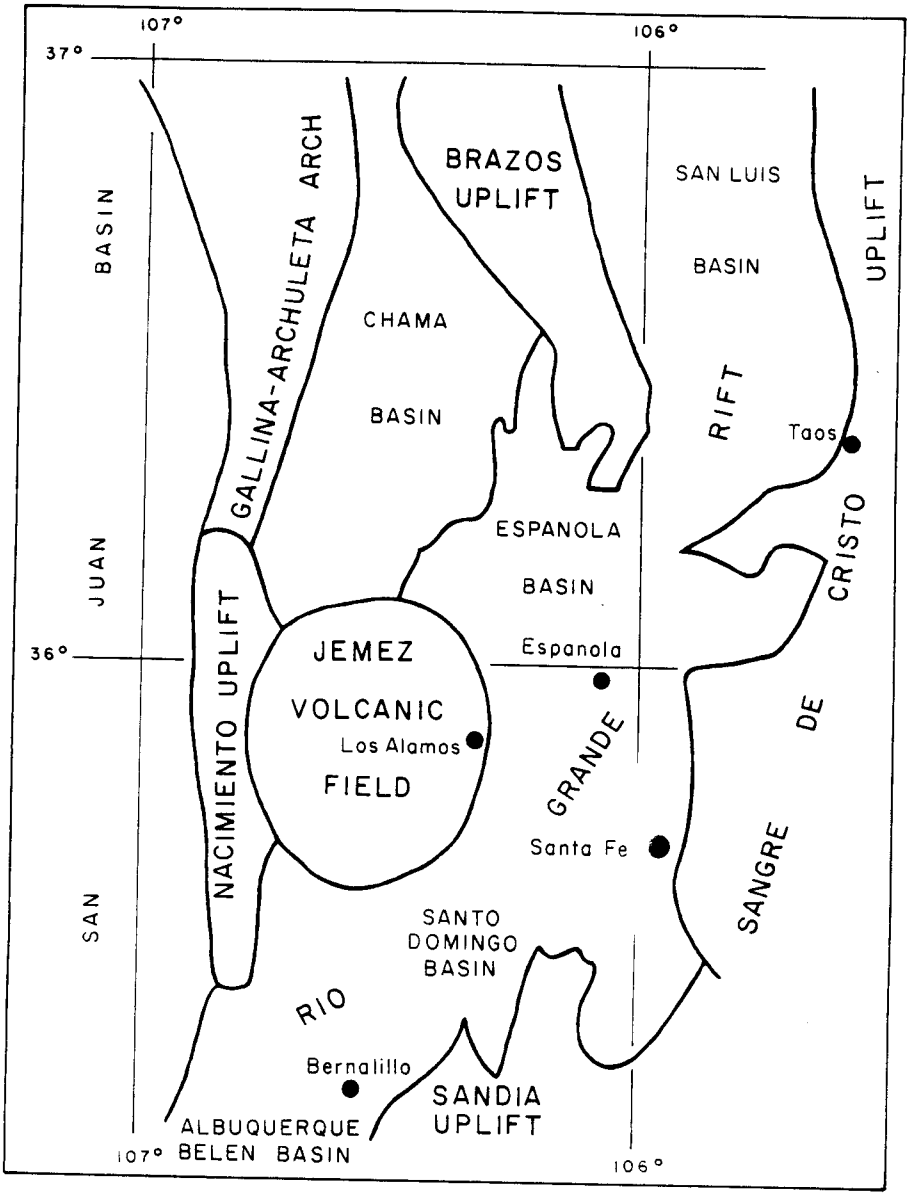

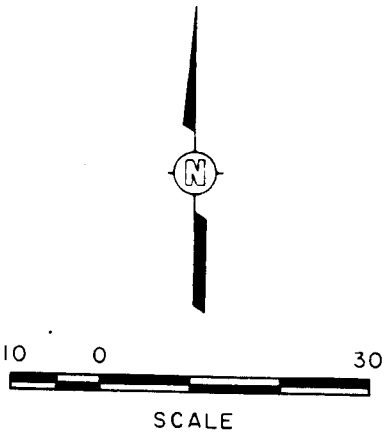

FIGURE 2-16
INDEX MAP SHOWING MAJOR
TECTONIC ELEMENTS OF
CENTRAL-NORTHERN NEW MEXICO
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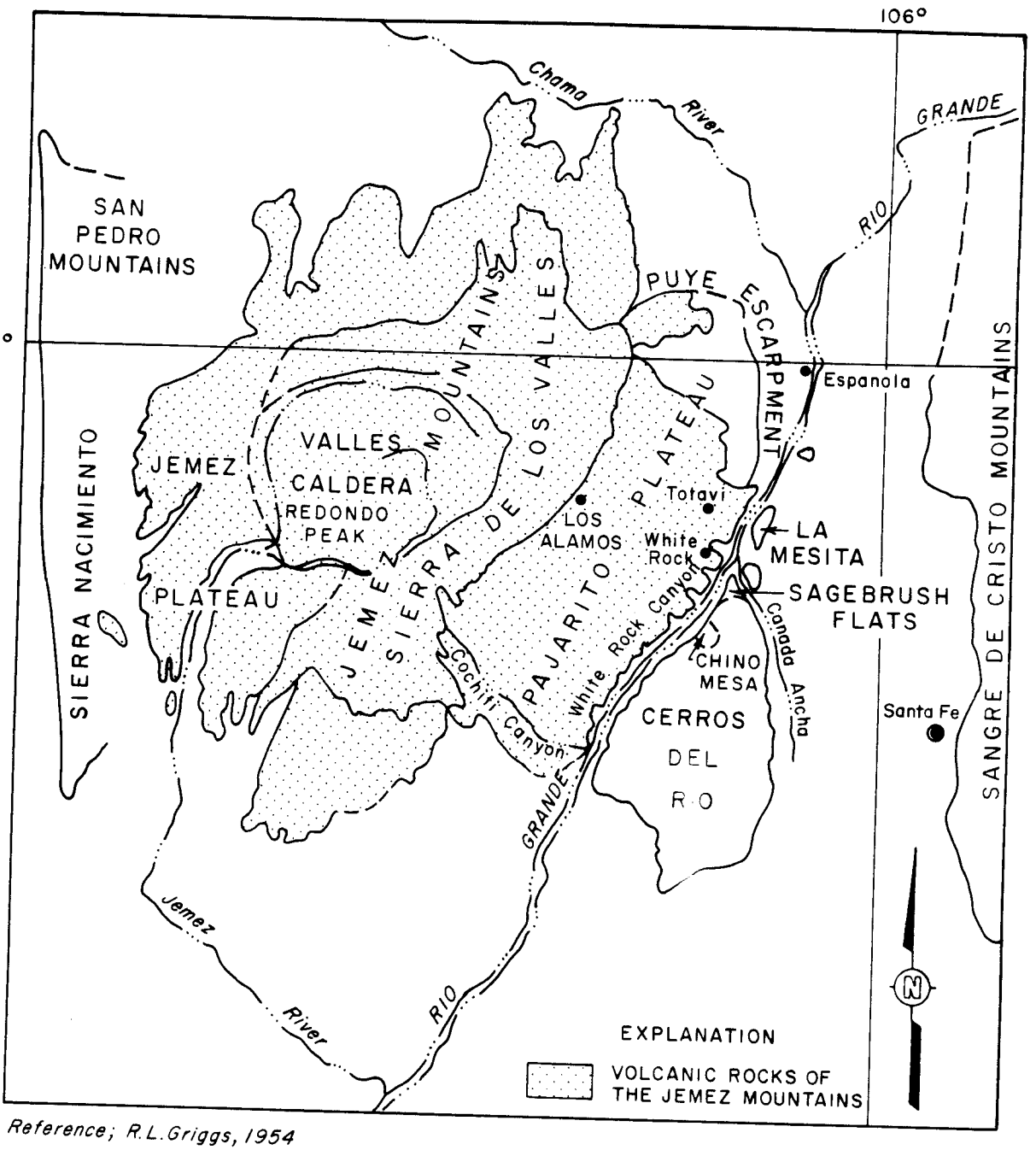

Reference; R.L.Griggs, 1954

5 0 5 10 MILES
SCALE

FIGURE 2-17

PHYSIOGRAPHIC FEATURES OF THE JEMEZ MOUNTAINS

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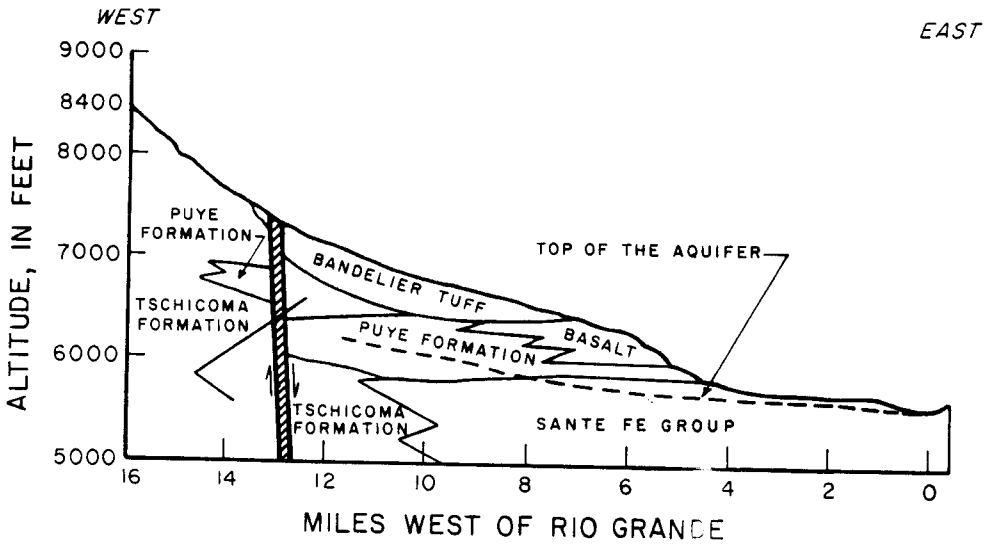

FIGURE 2-18

EAST-WEST GEOLOGIC SECTION
THROUGH THE PAJARITO PLATEAU
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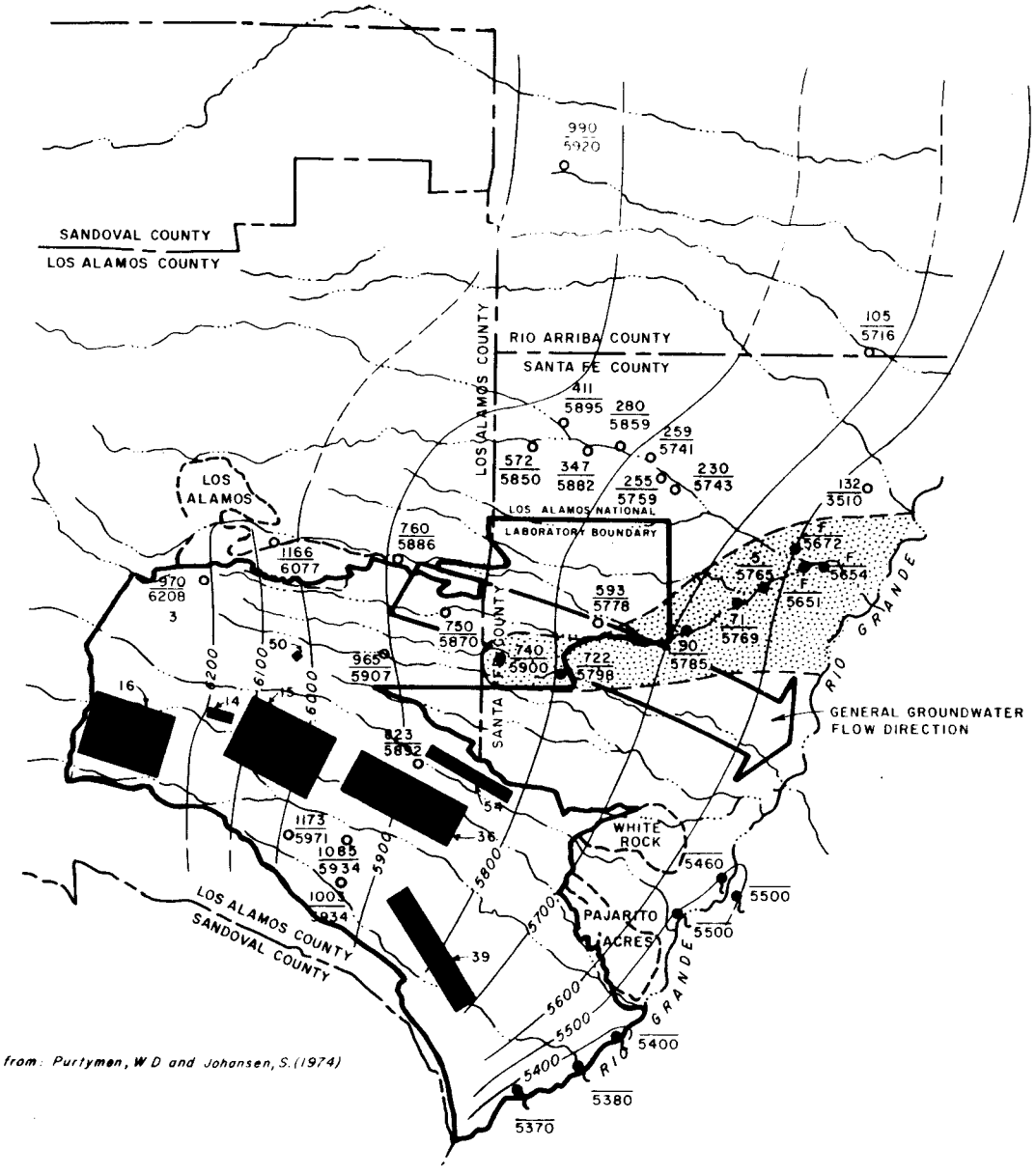

Modified from: Purtymun, W D and Johansen, S. (1974)

EXPLANATION

- WELL COMPLETED INTO AQUIFER UNDER WATER TABLE OR NEAR WATER TABLE CONDITIONS.
- WELL COMPLETED INTO AQUIFER UNDER ARTESIAN PRESSURE
- DEPTH TO WATER (FT.); F, FLOWING / ALTITUDE OF WATER SURFACE (FT.)
- SPRING / ALTITUDE OF WATER SURFACE
- 5900 — WATER-LEVEL CONTOUR ON AQUIFER UNDER WATER TABLE OR NEAR WATER TABLE CONDITIONS; IN FEET ABOVE MEAN SEA LEVEL; CONTOUR INTERVAL 100 FT.
- AREA OF DEEP WELLS COMPLETED INTO AQUIFER UNDER ARTESIAN PRESSURES
- 16 — TECHNICAL AREAS OF INTEREST

NOTE: DEPTH TO WATER AS REPORTED WHEN WELL DRILLED

1 0 1 2 MILES
SCALE

FIGURE 2-19

GENERALIZED CONTOURS ON TOP OF MAIN AQUIFER

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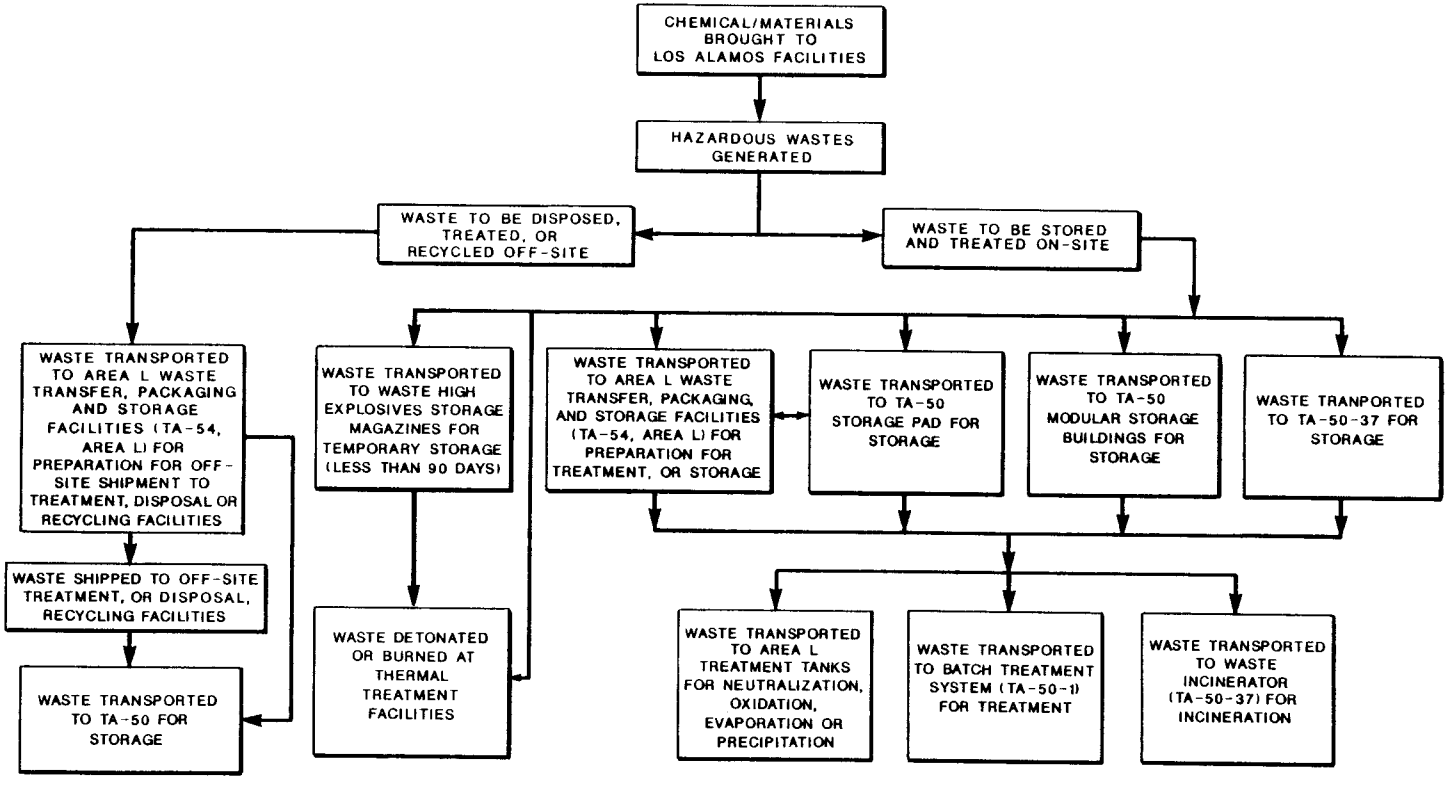

FIGURE 2-20

SCHEMATIC DIAGRAM OF LOS ALAMOS HAZARDOUS WASTE MANAGEMENT ACTIVITIES

PREPARED FOR

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LOS ALAMOS, NEW MEXICO

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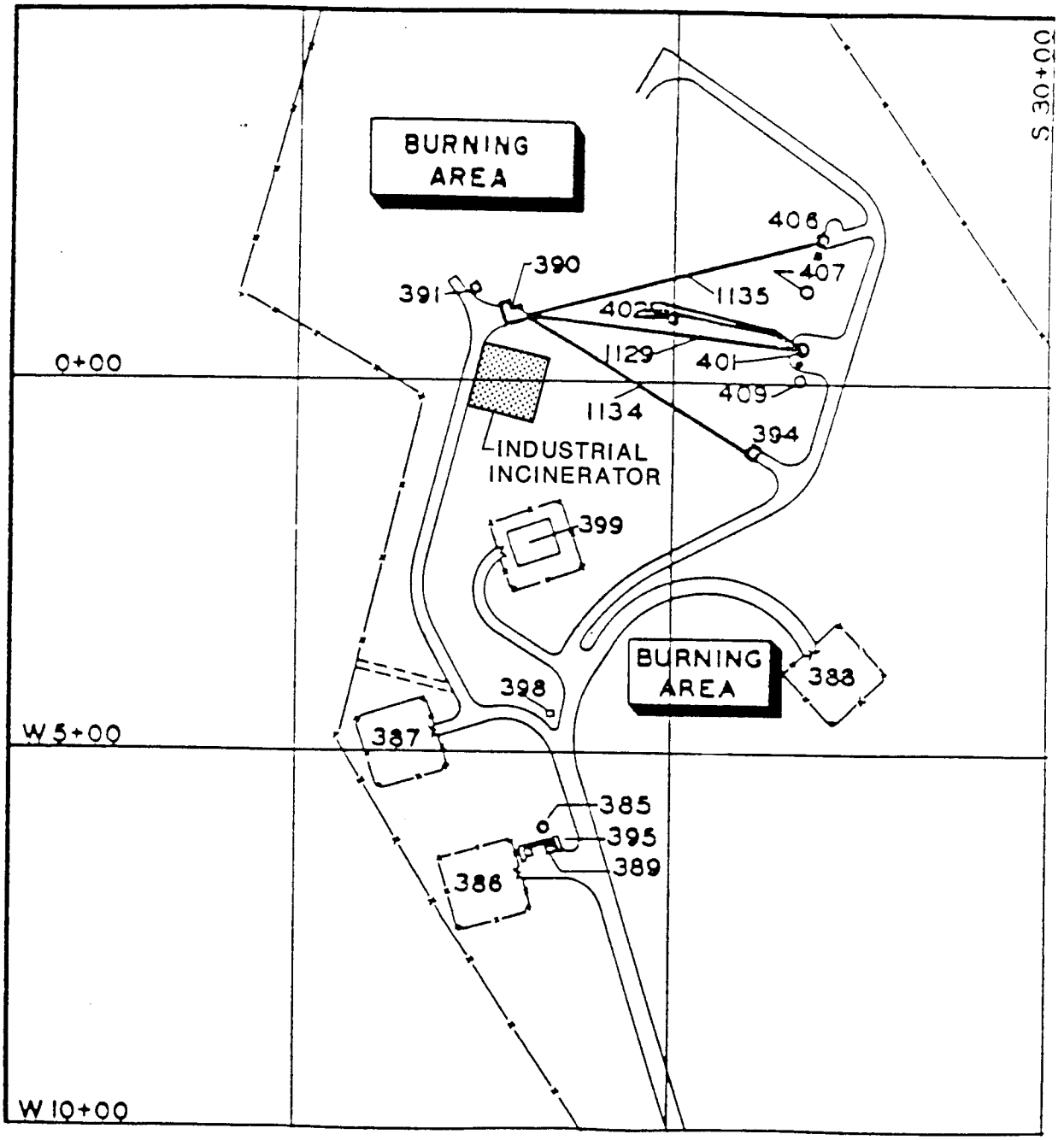

FIGURE 2-22

TA-16 INDUSTRIAL INCINERATOR

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TABLE 3-1
LOS ALAMOS WASTE INVENTORY IDENTIFIED BY GENERATION PROCESS AND WASTE CHARACTERIZATION

Process or Operation Generating Hazardous Waste and Waste Generated	Approx. Annual Volume (lbs)	Hazard	Basis for Hazard Designation
Basic and Applied Chemistry R&D Programs			
Chemistry and Metallurgy Research Building Radiochemistry Laboratory Health Research Laboratory - Numerous chemical wastes	Organic 100,000 Inorganic 80,000	Varies(1)	R&D wastes are comprised of numerous listed wastes(1)
Electrochemistry Processing			
Materials Technology Group - Chromate and cyanide plating solutions	2,000	Toxic, Reactive	Listed waste - D007, F007, F009 - toxic and reactive, could contain 10,000-20,000 ppm cyanide and chromium compounds
Print Circuit Board Shop - Acid/base copper etching/ plating solutions	40,000	Corrosive	D002 - pH can vary from less than 2 to about 11
Isotope Separation			
Isotope and Structural Chemistry Group - Concentrated nitric and sulfuric acid	80,000	Corrosive	D002 - pH is generally less than 2, concentrated nitric acid is also ignitable (D001) per 261.21(a)(4) (NMHWMR 201.B.2.a[4]) as an oxidizer
Shops Department			
Main Shops Department - Lithium hydride, lithium metal	3,500	Reactive	D003 - per 261.23(a)(2),(3), (NMHWMR 201.B.4.a[2],[3]) gas and heat upon rapid reaction with water
- Halogenated solvents	<1,000	Toxic	Listed waste - F001, F002 - toxic
- Non-halogenated solvents	<1,000	Ignitable	Listed waste - F003 - ignitable
Explosives			
Dynamics Testing and Design Engineering - High Explosives	50,000	Ignitable, Reactive	Listed waste - K044 - also D001, D003, may also contain D005 waste
- Contaminated burn pad sand	60,000	Toxic	D005 - sand contaminated and tests EP Toxic for barium per 261.24(a) (NMHWMR 201.B.5.a)
Chemically Contaminated Equipment			
Many LANL Facilities	12,000		Same characteristics as hazardous material contaminants

(1) See Appendix G for a representative list of wastes and hazard designations.

PTB:REV4-T3-1

TABLE 3-2
WASTE ANALYSIS PARAMETERS AND RATIONALE FOR THEIR SELECTION

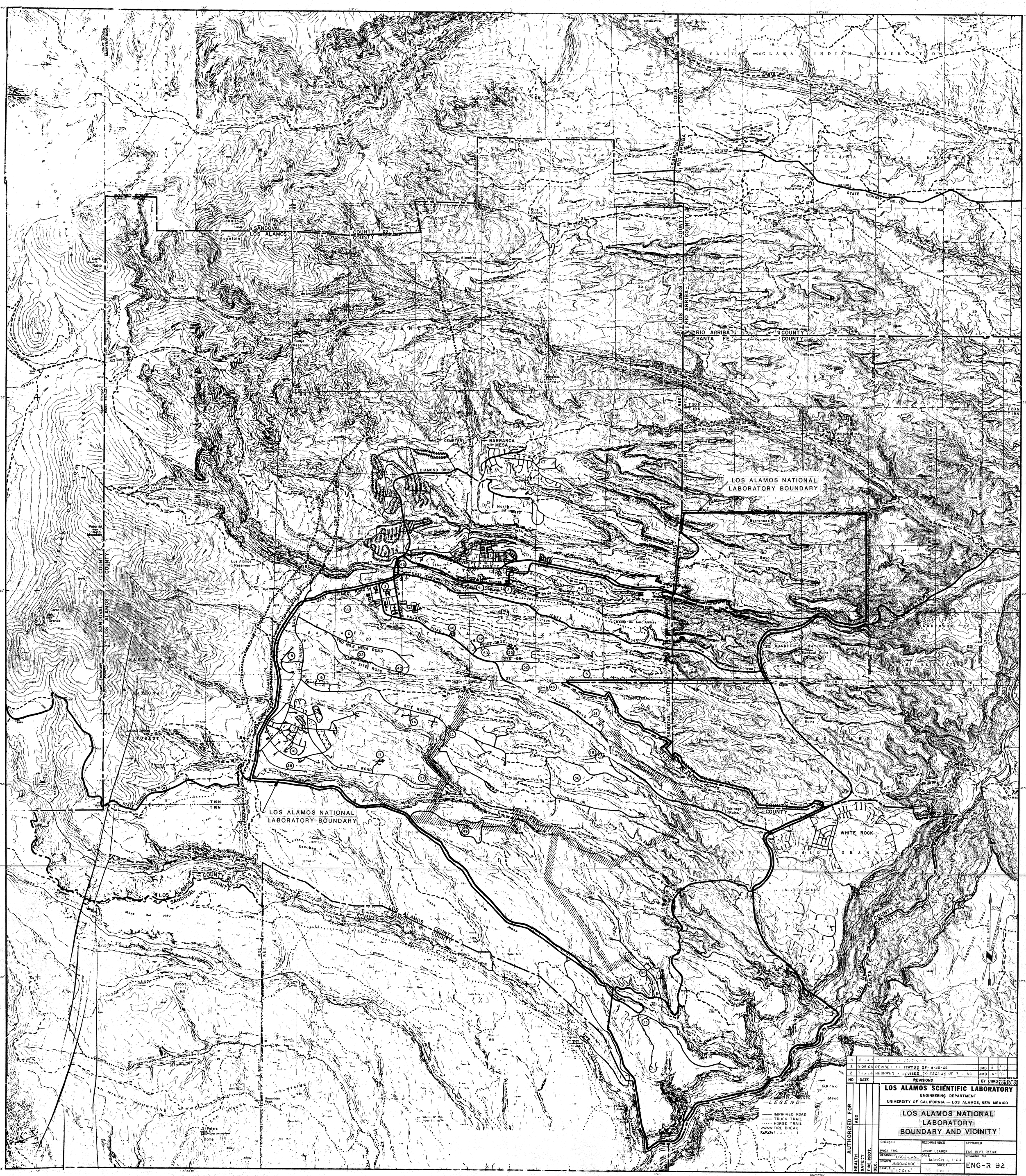
Hazardous Waste	Parameter(s)	Rationale
Basic and Applied Chemistry R&D Programs		
Laboratory waste (liquids)	Ignitability, Reactivity, pH, EP Toxicity, Chemical Composition, TCLP	Analyses for selected parameters will be performed only for wastes that are unknown from laboratory process knowledge. The diverse nature of laboratory waste precludes identification of all parameters for which each unknown waste will be analyzed; however, sufficient analysis will be performed on unknown wastes with volumes greater than one gallon to enable assignment of the appropriate EPA hazardous waste number.
	Heat Value, Organic Chlorine, Ash Content, Trichlorofluoromethane, Bromoform, Dichlorodifluoromethane	Laboratory wastes are intended for incineration, if possible; and thus, even if known from process knowledge, they will be analyzed individually or as composites for these incinerator parameters as part of the hazardous waste incinerator permit.
Laboratory waste (solids)	Ignitability, Reactivity, EP Toxicity, Chemical Composition, TCLP	Analyses for selected parameters will be performed only for wastes that are unknown from laboratory process knowledge. The diverse nature of laboratory wastes precludes identification of all parameters for which each unknown waste will be analyzed; however, sufficient analysis will be performed on unknown wastes with volumes greater than one gallon to enable assignment of the appropriate EPA hazardous waste number.
	Organic Chlorine, Trichlorofluoromethane, Bromoform, Dichlorodifluotomethane	Laboratory wastes are intended for incineration, if possible; and thus, they will be analyzed for this incinerator parameter as part of the hazardous waste incinerator permit if process knowledge suggests the potential presence of organic chlorine and if a representative sample can be obtained.

TABLE 3-2
WASTE ANALYSIS PARAMETERS AND RATIONALE FOR THEIR SELECTION (Continued)

Hazardous Waste	Parameter(s)	Rationale
Electrochemistry Processing		
Materials Technology Group		
- Cyanide and chromate solutions	Cyanide, Chromate	Toxic contaminant concentration can vary widely and proper treatment of waste is ensured by analysis.
Print Circuit Board Shop		
- Acid/base copper etching/ plating solutions	pH	This waste is corrosive (D002) due to its pH and proper treatment is ensured by analysis.
Isotope Separation		
Isotope and Structural Chemistry Group		
- Nitric and sulfuric acid	pH	This waste is hazardous (corrosive, D002) due to its pH. The composition of these wastes do not change significantly, and test is performed to ensure proper treatment. Additional analyses will be performed if a process change is instituted.
Shops Department		
Main Shops Department		
- Lithium hydride, lithium metal	None	Material properties well known and process knowledge allows identification of material analysis.
- Solvents, halogenated and non-halogenated	None	Material properties of solvents are well known and process knowledge allows identification of material without analysis.

TABLE 3-2
WASTE ANALYSIS PARAMETERS AND RATIONALE FOR THEIR SELECTION (Continued)

Hazardous Waste	Parameter(s)	Rationale
Explosives		
Dynamics Testing and Design Engin. Groups - High explosives	None	A portion of this waste is a listed hazardous waste (K044) due to its reactivity and ignitability; other portions are considered hazardous due to their reactivity (D003). This material will not be analyzed because of to safety considerations; however, process knowledge allows identification of the material.
- Contaminated burn pad sand	EP Toxicity for Metals	Sand has been found to contain EP Toxic barium; other high explosive chemicals are decomposed.
Chemically Contaminated Equipment		
Many LANL facilities - Empty drums, tanks, gas cylinders, etc.	None	Contaminants known and contaminated equipment treated with the same precautions as if it were were the actual material.



14932-E

FIGURE 21

TABLE 3-3
VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Basic and Applied Chemistry			
R & D Programs			
Laboratory wastes (liquids)	pH, total metals, volatile and semi-volatile organics, reactivity, ignitability	1% of Waste Containers(1)	Analyses are conducted to determine contamination of chemicals at levels requiring changes in handling practices.
Laboratory wastes (solids)	As for Laboratory Wastes (liquids), plus free liquids determination	1% of Waste Containers(1)	As for Laboratory Waste (liquid), plus the free liquids analysis to demonstrate suitability for landfill disposal.
Electrochemistry Processing			
Materials Technology Group			
- Cyanide and Chromate solutions	pH, total metals, volatile and semi-volatile organics cyanide, reactivity(2)	Annually, and if waste generation process changes	Analyses are performed to check for heavy metal and organic solvent contamination. Sulfide generation (reactivity) is determined to ensure safe treatment.
Printed Circuit Board Shop			
- Acid/base copper etching/ plating solutions	As for cyanide and chromate solutions	Annually, and if waste generation process changes	As for cyanide and chromate solutions.

TABLE 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (Continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Isotope and Structural			
Isotrope and Structural Chemistry Group			
- Nitric and Sulfuric Acid	pH, total metals, volatile and semi-volatile organics, cyanide, reactivity(2)	Annually, and if waste generation process changes	Analyses are performed to check for heavy metal and solvent contamination.
Shops Department			
Main Shops Department			
- Lithium hydride, lithium metal	None	None	This waste is hazardous due to the characteristic of reactivity. The material will not be analyzed because the composition is known through knowledge of the process by which it is generated which permits adequate identification for treatment.
- Halogenated solvents	Total metals, volatile and semi-volatile organics, ignitability	Annually, and if waste generation process changes	Analysis determines metals contamination and contamination by regulated organic constituents; ignitability is determined to ensure that handling practices are safe.

TABLE 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (Continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Shops Department (cont.)			
- Non-halogenated solvents	As for halogenated solvents	Annually, and if waste generation process changes	As for halogenated solvents. The semi-volatile and volatile organic analyses are adequate to determine the presence of halogenated solvents as well as most regulated organic constituents.
Explosives			
Dynamics Testing and Design Engineering Group			
- High explosives	None	None	A portion of this waste is a listed hazardous waste (K044) due to its reactivity and ignitability; other portions are considered hazardous due to their reactivity (D003). This material will not be analyzed because of safety considerations; process knowledge allows adequate identification for thermal treatment.

TABLE 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (Continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Explosives (cont.)			
- Contaminated burn pad sand	Total metals, volatile and semi-volatile organics, cyanides, free liquids	Annually, and if process changes	Total metal analysis is performed to determine contamination with regulated metals; organic and cyanide analyses are performed to determine if regulated constituents are formed by thermal treatment; free liquids are checked to confirm the adequacy of landfilling sand wastes.
Chemically Contaminated Equipment			
Many Los Alamos Facilities			
- Empty drums, tanks, gas cylinders, etc.	None	None	There are no sampling protocols for sampling contaminated equipment.

(1) One percent of laboratory waste containers excludes laboratory chemicals in their original bottles if bottles have not been opened as demonstrated by an unbroken cap seal. These chemicals are disposed of when their shelf life has been exceeded and there is no chance of contamination.

(2) Reactivity for these wastes is determined as cyanide and sulfide gas generation potential per NMHWMR 201.b.4.a.5.

TABLE 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (Continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Shops Department (cont.)			
- Non-halogenated solvents	Total metals, volatile and semi-volatile organics, ignitability	Annually, and if waste generation process changes	As for halogenated solvents. The semi-volatile and volatile organic analyses are adequate to determine the presence of halogenated solvents as well as most regulated organic constituents.
Explosives			
Dynamics Testing and Design Engineering Group			
- High explosives	None	None	A portion of this waste is a listed hazardous waste (K044, K045) due to its reactivity and ignitability; other portions are considered hazardous due to their reactivity (D003). This material will not be analyzed because of safety considerations; process knowledge allows adequate identification for thermal treatment.

TABLE 3-3

VERIFICATION WASTE ANALYSIS PARAMETERS, FREQUENCY OF ANALYSES AND RATIONALE (Continued)

Hazardous Waste	Analysis Parameters	Frequency	Rationale
Explosives (cont.)			
- Contaminated burn pad sand	Total metals	Annually, and if process changes	Total metal analysis is performed to determine contamination with regulated metals.
Chemically Contaminated Equipment			
Many Los Alamos Facilities			
- Empty drums, tanks, gas cylinders, etc.	None	None	There are no sampling protocols for sampling contaminated equipment.

(1) One percent of laboratory waste containers excludes laboratory chemicals in their original bottles if bottles have not been opened as demonstrated by an unbroken cap seal. These chemicals are disposed of when their shelf life has been exceeded and there is no chance of contamination.

(2) Reactivity for these wastes is determined as cyanide and sulfide gas generation potential per NMHWMR 201.b.4.a.5.

TABLE 3-4
WASTE ANALYSIS PARAMETERS AND TEST METHODS

Parameter	Test Method	Reference[1]
Ignitability	Pensky-Martens Closed-Cup Method	(L) SW1010 (L) ASTM D93-80
Reactivity	Numerous methods and tests[2]	(L,S) SW Section 2.1.3
pH	Electrometric	(L) SW9040
EP Toxicity	EP Toxicity Extraction[3] and Graphite Furnace Atomic Absorption Spectrophotometry	(L,S) SW1310
Arsenic		(L) SW7060
Barium		(L) SW7081
Beryllium		(L) SW7091
Cadmium		(L) SW7131
Chromium		(L) SW7191
Lead		(L) SW7421
Selenium		(L) SW7740
Silver		(L) SW7761
	EP Toxicity Extraction[3] and Manual Cold Vapor Technique	(L,S) SW1310
Mercury		(L) SW7470
EP Toxicity	EP Toxicity Extraction[3] and Gas Chromatography	
Organochlorine Pesticides		(L) SW8080
Chlorinated Herbicides		(L) SW8150
Mobility of Organic and Inorganic Waste Constituents	Toxicity Characteristic Leaching Procedure (TCLP)	(L,S) 40 CFR Part 268, Appendix I
Chemical Composition	Any of those methods in this Table plus the following:	
	Chemical analysis for volatile organic compounds using gas chromatography/ mass spectrometry	(L) SW8240

TABLE 3-4
WASTE ANALYSIS PARAMETERS AND TEST METHODS
(Continued)

Parameter	Test Method	Reference[1]
Chemical Composition (cont.)	Chemical analysis for semi-volatile organic compounds using gas chromatography/ mass spectrometry	
	- with packed column	(L) SW8250
	- with capillary column	(L) SW8270
Heat Value	Bomb calorimeter	(L) A006, ASTM D240
Organic Chlorine	Halide titration of combustion residue	(L,S) A004, ASTM D2361
Trichlorofluoromethane, Bromoform, Dichloro-difluoromethane	Chemical analysis for volatile organic compounds using gas chromatography/ mass spectrometry	(L) SW8240
Ash Content	Residue after combustion in muffle furnace	(L) A001, ASTM D482 (S) A001, ASTM D3174
Cyanide	Distillation and titration	(L) SW9010
Chrome	Colorimetric method for hexavalent chromium	(L) SW7196

TABLE 3-4
WASTE ANALYSIS PARAMETERS AND TEST METHODS
(Continued)

Parameter	Test Method	Reference[1]
Total Metals	Digestion and inductively coupled plasma method	SW3020
Arsenic		(L) SW6010
Barium		(L) SW6010
Beryllium		(L) SW6010
Cadmium		(L) SW6010
Chromium		(L) SW6010
Lead		(L) SW6010
Selenium		(L) SW6010
Silver		(L) SW6010
Thallium		(L) SW6010
Zinc		(L) SW6010
Mercury	Manual Cold Vapor Technique	(L) SW7470, (S) 7471
Free Liquids	Paint Filter Liquids Test	(S) 9095

(1) "A" refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, February 1984.

"ASTM" refers to American Society for Testing Material Standards.

"SW" refers to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition, EPA, July 1982.

"L" refers to liquid waste.

"S" refers to solid waste.

(2) Methods for cyanide and sulfide gas generation are pending. SW-846 methods will be used when they become available. Methods recommended by the EPA will be used in the interim.

(3) If EP Toxicity (and other analyses) do not permit identification of an unknown chemical waste, digested metal samples (per SW3020) will be analyzed for the metals noted.

TABLE 3-5
SAMPLING METHODS FOR HAZARDOUS WASTES TO BE ANALYZED

Hazardous Waste	Sampling Method[1]	Description of Sampling
Basic and Applied Chemistry R&D Program		
Laboratory Waste (liquids)	Coliwasa or disposable glass tubing; glass bottle	Samples of unknown wastes in larger containers (e.g., five-gallon can) taken with coliwasa; smaller containers may be sampled by pouring a small quantity of fluid into a glass bottle
Laboratory Waste (solids)	Thief, trier	Thief or trier used for unknown wastes based on waste physical consistency; in some cases (e.g., contaminated equipment) obtaining a representative sample may be impracticable
Electrochemistry Processing		
Materials Technology Group		
- Cyanide and chromate solutions	Coliwasa on disposable glass tubing	Samples taken from drums before solutions transferred to batch treatment system; samples can also be taken from treatment system tank
Print Circuit Board Shop		
- Acid/base copper etching/plating solutions	Coliwasa or disposable glass tubing	See above description
Isotope Separation		
Isotope and Structural Chemistry Group		
- Nitric and sulfuric acid	Coliwasa or disposable glass tubing	See description for cyanide and chromatic solution sampling

TABLE 3-5
SAMPLING METHODS FOR HAZARDOUS WASTES TO BE ANALYZED

Hazardous Waste	Sampling Method[1]	Description of Sampling
Basic and Applied Chemistry		
Explosives		
Dynamic Testing and Design Engineering Groups		
- Contaminated burn pad sand	Thief	Sample taken from approximate center of recent explosives burn

(1) Sampling methods are adopted from: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition, EPA, July, 1982.

TABLE 3-6
FREQUENCY OF ROUTINE ANALYSES AND RATIONALE

Hazardous Waste	Analysis	Frequency	Rationale
Basic and Applied Chemistry			
R&D Programs			
Laboratory waste (liquids)	Ignitability, Reactivity, pH, EP Toxicity, Chemical Analysis	Each time an unknown waste requires disposal	Analyses for selected parameters will be performed for wastes that are unknown from laboratory process knowledge
	Heat Value, Organic Chlorine, Ash Production, Trichlorofluoromethane, Bromoform, Dichloro-difluoromethane	One incinerator feed tank per three months	Analyses will be required by incinerator permit
	TCLP	Each time waste is thought not to exceed treatment standards and is intended for land disposal	To provide certifiable documentation that waste is land disposable under 40 CFR 268.7
Laboratory waste (solids)	Ignitability, Reactivity, pH, EP Toxicity, Chemical Analysis	Each time an unknown waste requires disposal	Analyses for selected parameters will be performed for wastes that are unknown from laboratory process knowledge
	Organic Chlorine(1) Trichlorofluoro-methane, Bromoform, Dichlorodifluoromethane	One incinerator feed tank per three month	Analyses will be required by incinerator permit
	TCLP	Each time waste is thought not to exceed treatment standards and is intended for land disposal	To provide certifiable documentation that waste is land disposable under 40 CFR 268.7

TABLE 3-6
FREQUENCY OF ROUTINE ANALYSES AND RATIONALE
(Continued)

Hazardous Waste	Analysis	Frequency	Rationale
Electrochemistry Processing			
Materials Technology Group			
- Cyanide and Chromate solutions	Cyanide, Chrome	Per batch	Toxic contaminants concentrations can vary widely and proper treatment of waste is assured by frequent analyses
Print Circuit Board Shop			
- Acid/base copper etching/ plating solutions	pH	Per batch	Same as cyanide, chromate analysis above
Isotope Separation			
Isotope and Structural Chemistry Group			
- Nitric and sulfuric acid	pH	Per batch	The compositions of these wastes do not change significantly; test is performed to confirm composition; additional analyses will be performed if a process change should affect the waste characteristics; any such analyses may be conducted at the discretion of the Group Manager or regulatory agencies

TABLE 3-6
FREQUENCY OF ROUTINE ANALYSES AND RATIONALE
(Continued)

Hazardous Waste	Analysis	Frequency	Rationale
Shops Department			
Main Shops Department			
- Lithium hydride, lithium metal	None	None	Process knowledge allows identification of material without analysis
- Solvents, halogenated and non-halogenated	None	None	Material properties of these solvents are well known and process knowledge allows identification of material without analysis
Explosives			
Dynamics Testing and Design Engineering Group			
- High explosives	None	None	Process knowledge allows identification of material without performing highly dangerous analysis of high explosives
- Contaminated burn pad sand	EP Toxicity for Metals	Annually, and if formulation of explosives changes	Sand is assumed to be contaminated with EP Toxic barium

TABLE 3-6
FREQUENCY OF ROUTINE ANALYSES AND RATIONALE
(Continued)

Hazardous Waste	Analysis	Frequency	Rationale
Chemically Contaminated Equipment			
Many LANL facilities			
- Empty drums, tanks, gas cylinders, etc.	None	None	Contaminants known and contaminated equipment treated with the same precautions as if it were the actual material

(1) The nature of the waste (e.g., contaminated rags, tissues, etc.) may preclude analysis and process knowledge will have to provide necessary information.

4.0 WASTE MANAGEMENT PRACTICES AND FACILITIES

The waste management facilities at Los Alamos to be permitted consist of the following, as noted in Section 2.0:

- TA-50 Batch Treatment System, Modular Container Storage Buildings, and Chemical Waste Incinerator and Associated Container Storage Areas
- TA-54 Waste Transfer, Packaging and Storage Facilities and Treatment Tanks
- TA-16 Industrial Incinerator
- TA-50 Container Storage Pad.

These Laboratory facilities and related hazardous waste processing activities (treatment and storage) are described in the following sections.

4.1 TA-50 BATCH TREATMENT SYSTEM AND ASSOCIATED CONTAINER STORAGE UNITS

The lower level of Building 1 at TA-50 houses waste treatment facilities for treating radioactive liquid wastes and nonradioactive RCRA-regulated wastes. The hazardous waste treatment facilities are located in a room with approximately 425 square feet of floor area (Figure 4-1). The cement pad underlying the treatment system is presently in good condition, free of any cracks, gaps or holes. The cement pad underlying the treatment system is coated with epoxy (see Appendix I) to prevent damage in the event of a spill. The area can easily be inspected and is free of cracks and other signs of deterioration. The treatment facility includes a versatile batch, wet chemical processing system (Figure 4-2), designed to neutralize or treat acids and bases, cyanides and heavy metal-containing solutions.

Container storage for the Batch Treatment System occurs south of Building 1 in modular storage buildings. Drummed or otherwise containerized hazardous waste scheduled for treatment is stored in the prefabricated units. Each unit is 22 feet, 8 inches by 9 feet by 8 feet, 7½ inches high, and is capable of storing a maximum of 30 55-gallon drums or the equivalent amount of bulk storage containers. Up to three storage units are anticipated to provide storage for the Batch Treatment System. Figure 4-1 shows the location of each storage unit. A complete manufacturer's description of the storage units is presented

in Appendix W. Each storage unit is equipped with an epoxy coated metal chemical separation wall to prevent mixing incompatible materials, a corrosive-resistant fiberglass floor grating, a polypropylene building sump liner, fire extinguisher equipment, and ventilation equipment. Only compatible waste materials will be stored in module compartments. The storage units can be loaded by forklift or by hand.

The batch treatment system consists of a totally enclosed, vented 500-gallon pressure vessel which is lined with a nominal 60-mil (0.060-inch) thick Kynar (polyvinylidene fluoride) carbon-mat-reinforced lining. The pressure vessel is equipped with a sparging loop for treatment gas introduction and an agitator for proper homogenization of tank contents. The vessel is also connected to various plumbing to allow the addition of treatment chemicals under enclosed conditions. The pressure vessel is jacketed and the jacket is designed to be connected to steam, hot water and cold water lines to permit heating or cooling the vessel. A vented, 370-gallon blowdown tank is incorporated into the system. This tank ensures that possible overpressuring of the pressure vessel during waste treatment or filling does not result in leaks of hazardous wastes or damage to the treatment system. A vent gas condenser system for pressure vessel venting and a basket/cartridge filter also complement the system. Vacuum transfer lines for pressure vessel loading from drums or from tank trucks complete the mechanical portions of the batch treatment system. All plumbing and hardware that would be subject to corrosion from untreated liquid waste are Kynar lined.

The batch treatment system has a full package of instrumentation to permit continuous or periodic measurement of appropriate treatment parameters and sample collection. The system and its contents are monitored for pH, oxidation-reduction potential, temperature, pressure and flow volume at appropriate locations in the system. The detailed engineering drawings showing the batch treatment system mechanical components and instrumentation are in Appendix I. Appendix I also contains the detailed specifications and the pressure vessel lining inspection report.

The treatment facility also includes a fume hood area that can accommodate two 55-gallon drums for transfer of liquids from one drum to another under ventilated conditions.

4.1.1 Current Management Practices

Building 1 at TA-50 is fenced and the access gates and building doors are locked and the building patrolled by Los Alamos security personnel during unattended hours. Modular storage units for container storage are locked and located within the fenced area. The batch waste treatment system is used primarily to treat the Electrochemistry Processing chromate and cyanide plating solutions and acid/base copper etching/plating solutions. The treatment system is highly flexible, however, and other wastes, particularly heavy metal solutions, may occasionally be treated. Typically, the chromate and cyanide plating solutions are treated in batches of up to 220 gallons several times a year and the copper etching/plating solutions are treated in 400-gallon batches approximately every two months.

Steel 55-gallon drums will be used to store wastes in the TA-50 modular container storage units. These drums will meet the U.S. Department of Transportation Specification No. 17C or 17H. Corrosive wastes will be stored in DOT 17C or 17H drums with polyethylene liners, if necessary, to prevent corrosion of the metal drums. The drums will be handled and transported in the batch treatment and storage areas by hand trucks or forklifts. Other approved containers may also be stored in the modular storage buildings.

Hazardous wastes are currently received at the batch treatment system in drums or other DOT-approved containers (Appendix I-2); however, connections and necessary equipment are in place for off and on loading trucks by vacuum. Drums are kept closed and stored in the modular storage units until their contents are transferred to the treatment system. Transfer from drums to the batch treatment system occurs within a contained area within Building 1. Drums are unloaded by forklift into a small curbed area and suctioned with a drum pump. The curbed area consists of one and one-half inch angle iron bolted to the concrete floor with a rubber gasket to provide a seal. All components of the unloading area are painted and sealed with an epoxy resin. Wastes are also stored in containers described in Section 4.3 and Appendix I-2. Only compatible wastes are handled at any one time in this area; however, the treatment system is used to treat incompatible wastes with thorough washdown between waste batches. Analyses of wastes are performed

both before and after treatment. The Waste Analysis Plan, Section 3.2, discusses the parameters, rationales, test methods and sampling methods pertinent for characterizing these wastes.

After rendering wastes nonhazardous by treatment (see Section 4.1.2), the resulting liquid is sampled by opening of the valves on the treatment tank. The types and frequency of analyses performed and the analytical methods employed are identical to those noted for the wastes prior to treatment (see Section 3.0). Liquid, post-treatment effluent is placed in the treatment tanks at TA-54, Area L and allowed to evaporate. Residue from effluent evaporation in Area L treatment tanks and sludge generated in the treatment of listed wastes (NMHWMR 201.C.2 through 201.C.4) will be mixed with cement in drums and stored at Area L prior to disposal at a permitted off-site facility. Any effluent or sludge resulting from the treatment of material which is a RCRA waste because it exhibits one of the four characteristics (NMHWMR 201.B) will be handled as hazardous waste if the effluent or sludge continues to exhibit the characteristic. After treatment, wastes are discharged to a holding tank pending results of chemical analysis for disposal requirements. Effluent generated by the treatment of a characteristic waste which does not exhibit the characteristic will be discharged to the industrial waste treatment system.

The fume hood area of the batch treatment room is used for transfer of liquids from one drum to another (as, for example, from a damaged drum to a new drum or to collect liquids for incineration, etc.). This area is typically used when a waste generator within the Laboratory cannot transfer liquids without receiving vapor exposures to chemicals such as xylene or toluene.

4.1.2 Secondary Containment Areas

The eight-inch curb which encloses about 150 square feet of floor space beneath the batch treatment system provides containment for approximately 850 gallons of liquid. This containment volume is greater than the 500-gallon capacity of the batch treatment system. Raised floor drains that empty into the industrial (radioactive) sewer system are located within the curbed area. The level of these drains is about one-half inch below the top of the curb; thus, the serrated tops of the floor drains have been replaced with blind

flanges to prevent inadvertent release of hazardous materials into the industrial waste sewer.

Each modular storage unit south of Building 1 is designed to contain any leaks or spills. The units are constructed of 12-gauge steel covered with two coats of chemical-resistant epoxy. The sub-floor containment areas are also lined with polypropylene, providing a 500-gallon spill containment reservoir. Loading drummed waste into the batch treatment system will take place within the angle-iron bermed area. This loading area provides containment of minor drips and spills associated with waste transfer.

4.1.3 Batch Treatment System Description and Processes

The TA-50 Batch Treatment System is designed to treat and neutralize various types of metal waste streams (cyanide, chromate, heavy metal). Even though the waste streams to be treated in the tank will vary, the specific gravity of all wastes entering the tank will not exceed 1.25. A protective KYNAR lining was chosen for the tank because of its corrosive-resistant capabilities and compatibility with the waste streams to be treated (see Appendix K for the Chemical Resistance Table for compatibility information). The tank shell and liner will be inspected annually (see Section 6.3, Procedures to Prevent Hazards) to ensure that the tank walls and liner have not experienced damage due to corrosion or erosion. The following sections discuss the various types of treatment performed in the batch treatment system.

The reactor tank is supported by four legs that are constructed of lengths of six-inch wide by 0.5-inch thick steel plate welded to form a box. Each leg has a pad with a surface area of 2.5 square feet that rests on the concrete floor of the batch treatment system room. The total weight of the filled tank will not exceed 8,000 pounds (the tank weighs about 2,800 pounds and the weight of the contents will not exceed 5,000 pounds). Thus, each leg will be required to support a load of no more than 2,000 pounds, and each pad will exert a load of no more than 800 pounds per square foot on the floor. The concrete floor design load-bearing capacity is approximately 3,000 pounds per square foot; thus, the floor loading is well below the design capacity of the floor.

4.1.3.1 Cyanide Waste Treatment

Batches of up to 220 gallons of waste cyanide solution are treated at one time in the treatment system. Cyanide solutions are received at the facility in 55-gallon drums. After analysis, the solutions are transferred from the drums into the treatment system tank by transfer pump. Pump specifications and the vendor information on the pumps are included in Appendix I (page I-54). Based on the volume of the solution and its cyanide concentration, measured amounts of sodium hypochlorite or a combination of chlorine gas and sodium hydroxide are added to the tank through pipelines and valves. The subsequent series of reactions of these chemicals with the cyanide in solution results in the essentially complete destruction of the cyanide. The end-products of this process are sodium chloride, carbon dioxide and nitrogen.

4.1.3.2 Chromate Waste Treatment

Chromate plating solutions are treated in batches of up to 150 gallons. These wastes are received in 55-gallon drums and transferred to the waste treatment system tank in the same manner as that used for cyanide wastes. Sulfur dioxide gas or sodium hydrosulfide is introduced into the tank and the pH maintained below 2 by addition of sulfuric acid. Resulting reactions reduce the chromium in the plating solutions from the plus six to the plus three valence state. After reduction of the chromium, sodium hydroxide is added to the tank, raising the pH to about eight and precipitating the chromium as the metal hydroxide. This precipitant is filtered from the tank solution, mixed in a drum with cement and stored at TA-54, Area L for disposal at a permitted facility. If the waste liquid contains any listed hazardous waste, or exhibits one of the four characteristics of hazardous waste, it will be evaporated in the Area L treatment tanks and the residue will also be mixed with cement in drums and stored at Area L prior to disposal at a permitted facility.

4.1.3.3 Acid/Base Heavy Metal Waste Treatment

Acid/base wastes resulting from processes such as copper etching and plating are treated in approximately 400-gallon batches which are stored at Area L. These wastes are transferred to the treatment tank in the same manner as other wastes and are neutralized. Sodium hydroxide is used to neutralize waste acids, and hydrochloric or sulfuric acid are the neutralizing agents for alkaline solutions. In addition to neutralization, acid solutions are treated

to remove metals such as copper, arsenic, lead, silver, etc. by appropriate chemical methods. The removal of metals from the acid wastes is accomplished by precipitation and removal of the insoluble metal hydroxide. Treatment and removal of metals is accomplished by the following simplified steps:

1. Wash all pipelines and tanks that will be used in treatment/transfer of wastes with water.

2. Pump waste into reaction vessel.

3. Adjust the pH to the predetermined point by addition of sodium hydroxide or acid (usually the pH will need to be increased by caustic addition).

4. Add sodium hydrosulfide.

5. Adjust the pH to seven (neutral).

6. Filter sludge in basket filter and solidify with cement in 55-gallon drums for storage at Area L with ultimate disposal at permitted landfill.

7. Effluent is evaporated in Area L treatment tanks and the residue is solidified with cement in 55-gallon drums for storage at Area L prior to disposal at permitted facility.

8. Wash all pipelines and tanks used in process with water.

4.2 TA-50 CHEMICAL WASTE INCINERATOR

The chemical waste incinerator, located in Building 37 at TA-50 (Figure 4-3), is a highly modified, controlled air incinerator rated at a nominal waste feed throughput of 45 kilograms per hour. Containerized liquid and solid waste are also stored in Building 37 until accumulation of sufficient material for an incinerator run. The incinerator is currently permitted to burn radioactive and PCB-contaminated materials. The Laboratory is proposing to permit the incinerator under RCRA to provide for future operating flexibility and minimization of land disposal. The incinerator and flue gas treatment systems are capable of safely combusting a variety of hazardous wastes including low-level radioactive wastes and transuranic contaminated wastes. Since the incinerator is designed to combust materials contaminated with radioactivity, the incinerator is fitted with glove boxes that permit operation and maintenance of components that have the potential of becoming radioactively contaminated.

Personnel access to the incinerator equipment can be achieved with proper protective clothing and respiratory equipment (see Section 6.5.2).

The incinerator process is depicted in Figure 4-4. The incinerator, a controlled air, dual chamber design, is natural gas fired to provide waste ignition and to supply supplemental heat. A detailed description of the incinerator and incinerator process is provided in the trial burn plan (Appendix J); a summary of this information is provided in Section 4.2.3. Minor modifications to the incinerator were conducted after completion of the trial burn. These modifications are described in Appendix J-1.

Solid wastes are loaded into the incinerator in batches by a ram feeder. Liquids are loaded by a pump and gaseous wastes fed by gas container pressure or assisted with a vacuum pump. All wastes are charged to the primary combustion chamber operated at a nominal temperature of 760 to 980°C with air controlled to maintain nearly stoichiometric conditions. Unburned volatile components and entrained particles exit the primary chamber to the secondary chamber where excess air and supplemental heat are introduced to promote complete combustion. The secondary chamber is maintained at a nominal temperature of 870 to 1200°C and provides the needed residence time to assure complete combustion.

The flue gas treatment system consists of a quench column, a venturi scrubber, a packed-column scrubber/mist eliminator, a reheater, HEPA filters, an activated carbon adsorber, additional HEPA filters, and an induced draft blower. The purpose of the flue gas treatment system is to remove particulate matter, condense volatile metals and capture acid gases, such as sulfur dioxide, chlorine and fluorine. After purification by the flue gas treatment system, the gas exiting the filters is discharged to the atmosphere through a stack by an induced draft blower.

Container storage for wastes to be incinerated occurs in Room 117 of Building 37. Figure 4-3 shows the location of the storage area. The storage area occupies 2,000 square feet; 920 square feet of this room is dedicated for chemical waste storage and incinerator staging. Appendix V presents the design criteria for the storage/staging area. Liquid and solid wastes are

transported to Building 37 in 30- or 55-gallon drums meeting DOT Specification Nos. 17C or 17H. Corrosive wastes will be stored in DOT 17C or 17H drums with polyethylene liners, if necessary, to prevent corrosion of the metal drums. Drums will be handled and transported within the Building 37 storage area by hand trucks or forklifts. Other DOT approved containers such as 330-gallon containers described in Appendix I-2 may be utilized for storage of some waste. The room will store a maximum of 34,600 pounds of hazardous waste. A maximum of 63 55-gallon drums or 11 330-gallon containers will be stored in Room 117. Drums may be stored two high. Drums on the top layer will be stored on pallets on top of the first layer by using a forklift. Wastes will be segregated spatially in Room 117 such that only compatible wastes will be stored together.

4.2.1 Secondary Containment Areas

Two 155-gallon KYNAR-lined steel tanks are located in the incinerator facility. These tanks are used for less than 90-day storage of waste and for blending of wastes prior to incineration. The tanks and associated pumps are located within a curbed area having dimensions of 0.42 feet by 9.5 feet by 20.83 feet. Curbing around a door reduces the containment volume by about 8 cubic feet. The curbed area can contain approximately 562 gallons of liquid, an amount in excess of the total volume of waste that may be stored in the waste tanks.

The chemical waste storage area in Building 37 will occupy a room approximately 40 feet by 23 feet. The floor of this room will be recessed 16 inches below steel grating to provide approximately 1,224 cubic feet (9,155 gallons) of secondary containment volume. The concrete slab forming the floor will be continuously poured and free of joints, cracks, or gaps. Exposed concrete floors, walls and ceilings will be coated with plasite-type epoxy finish and will be designed to drain and remove liquids resulting from leaks, spills or precipitation. The sub-floor secondary containment system will be divided into two independent compartments which will provide containment for greater than 10 percent of liquids stored in each cell. Each compartment will have an independent drain sump; only compatible wastes will be stored in each containment cell.

4.2.2 Current Management Practices

Building 37 in TA-50 is fenced with access gates locked during unattended hours. Additionally, the building doors are locked when unattended and the area is patrolled by Los Alamos security personnel.

It is intended that the waste incinerator be used to reduce significantly the volume of hazardous waste requiring off-site land disposal. Incineration, coupled with batch treatment and recycling when feasible, should eventually reduce the volume of landfilled wastes to a minimal level. Some wastes may not be suitable for incineration. These wastes will be identified by actual waste analysis or process knowledge (see Section 3.2) and will be segregated from incinerator-suitable materials (see Section 3.3).

Wastes to be incinerated are stored at the Area L Waste Transfer, Packaging and Storage Facility if storage for greater than 90 days is required or in the Room 117 storage area within Building 37. Solid wastes are received at the incinerator facility in sealed containers which may be opened or sorted as necessary. Prior to incineration, the solid wastes are restricted to an area that has been engineered for proper storage of the material. Liquid wastes are also received in sealed containers. Prior to incineration, the liquid wastes are either retained in the sealed container (if the container is within a shipping cask designed for spill control) or may be transferred by dip tube/pump into the 155-gallon KYNAR-lined holding/ blending tanks. Only compatible wastes are placed in the holding/blending tanks at any one time. Compatibility is assured by mixing only wastes that are in the same packaging categories, as described in Appendix L. Segregation and transfer of the wastes are performed by trained chemical waste technicians inside a properly ventilated enclosure (see Figure 4-3 for locations of emergency equipment). During transfer operations, personnel are equipped with protective clothing and respiratory protection, as required.

The pumps used to transfer liquid wastes into the holding/feed tanks are Lutz brand air-driven centrifugal driven pumps. The pump's suction tube fits directly into the bung hole of the waste drum. These pumps are self-priming, made of Kynar and Hasteloy C276, and transfer liquid at a rate of 25 gallons per minute.

The pH of the circulating flue-gas scrub solution is continuously monitored and adjusted when desired by addition of sodium hydroxide. The specific gravity of the scrub solution is monitored and maintained at or below a value

that would allow the precipitation of solids. The specific gravity of the flue-gas solution is monitored and maintained well below the precipitation threshold value by replacement of the recycled solution with fresh water.

Ash is removed from the incinerator via two knife gate valves directly, by gravity, into a 55-gallon drum. Ash cleanup from the cooled incinerator is accomplished using sweeping wands operated through glove ports. The ash storage is limited to less than 90 days, in accordance with 40 CFR 262.34(a) (NMHWMR 204.B.1) so a RCRA permit is not required for the ash hopper. Since the incinerator is used for volume reduction of transuranic and low-level radioactive wastes, the ash, scrub solution and scrub filter bags are handled as suspect radioactive wastes. Ash is first checked to determine its radionuclide content. Ash that is classified as transuranic waste is solidified by mixing with cement, calcium sulfate, or other DOE-approved immobilizing media, and stored for proper disposal. Ash that is classified as low-level radioactive waste is analyzed according to the procedures in Section 3.0 to determine whether or not a hazardous waste component is present. If the waste is also found to be a hazardous waste, it is handled as a mixed waste. Ash that is not found to be radioactive is analyzed according to the plan presented in Section 3.0. If the ash is hazardous waste, it is handled and disposed in accordance with the waste procedures presented in this document. Thus, the incinerator is used for volume reduction of radioactive and hazardous waste as described above, and the ash is considered potentially to be hazardous waste [40 CFR 261.3 (c)(2)] [NMHWMR 201.A.2.c(2)] and is checked for radioactive and hazardous waste contamination and handled appropriately.

4.2.3 Waste Incinerator Trial Burn Plan and Trial Burn Results

Pursuant to RCRA Part B permit application requirements noted in 40 CFR 270.62 (NMHWMR 302.E.2), a trial burn plan (including a quality assurance plan) has been developed for the Controlled Air Incinerator (CAI) system at Los Alamos and a trial burn has been conducted. The trial burn, results of the trial burn, and quality assurance plans are in Appendix J. The trial burn is summarized below. Startup/shakedown procedures are not applicable because the Laboratory incinerator is an existing facility.

The RCRA Trial Burn of the Chemical Waste Incinerator was conducted during September 1986 in accordance with the Trial Burn Plan. The trial burn was

comprised of four test conditions, two of liquid feed and two of solid feed, during which the primary variable was combustion temperature. Each run consisted of six volatile organic sampling trains and three EPA modified Method 5 test periods. The principal organic hazardous constituents (POHCs) for which the destruction and removal efficiency was determined are carbon tetrachloride and trichloroethylene. During the trial burn, a total of 2,223 pounds of carbon tetrachloride and 1,000 pounds of trichloroethylene were fed into the incinerator.

The trial burn test produced process data that permits calculation of POHC destruction and removal efficiency and hydrogen chloride removal efficiency. The trial burn also documented the process feed and operating conditions that will be used in establishing operating permit conditions and allowed calculation of heat and material balances needed to confirm or assess recorded process conditions. Thus, sampling and analysis procedures were included in the trial burn plan to determine the physical-chemical characteristics of the incinerator feed materials, particularly the POHC concentrations, material feed rates, the composition and flow rates of the stack gases, the amounts of POHC discharged in the stack gases and in the quench-scrubber purge water removed by filters in the air pollution control system and the quench-scrubber water recirculation system. The monitoring procedures were selected to measure concentrations of oxygen in the combustion gases and carbon monoxide in the stack gases. Details and locations of monitoring conducted during the trial burn are presented in the trial burn plan (Appendix J).

Temperatures were continuously monitored and recorded in over twenty locations throughout the CAI process. All temperatures are continuously recorded on strip charts in the control room. The temperature in the primary chamber is automatically modulated by adjustment of the natural gas supply to the chamber to maintain the desired temperature.

Feed rates of waste liquid were measured using mass flowmeters and direct measurement of the liquid level in the feed tank. The destruction efficiency calculations are based on the waste feed volumes determined from these measurements.

During the trial burn, and during normal operation of the incinerator, a log is completed for all operations, including completion of data sheets every two hours and continuous monitoring/recording of major parameters. These logs are a record of operating conditions and provide evidence that the operator has checked and is aware of the actual operating status of the system. The time at which entries are made is shown, as are the actual instrument reading for each variable. If automatic shutdown occurs, the log will state the nature of the shutdown, the time it occurred and the suspected cause. Additionally, unusual conditions or situations such as spills or leaks are noted on the log. Further, once each shift, the shift supervisor inspects the facility for malfunctions, deterioration, operator error and discharges that could lead to discharge of hazardous waste constituents to the environment or to a threat to human health. If it is determined that a spill potential exists, corrective action are taken immediately.

Detailed results of the trial burn are presented in Section D-5h of Appendix J. During the trial burn, the incinerator achieved or exceeded the performance standards of 40 CFR §264.343. Based on these results, Los Alamos wishes to permit the incinerator for waste feed of carbon tetrachloride and lower on the EPA Incinerability Index.

After completion of the RCRA Trial Burn, several modifications have been made to the incinerator; however, the modifications are primarily equipment upgrades and thus are considered minor in nature. Detailed descriptions of these minor modifications are presented in Appendix J-1.

The interim period between completion of the trial burn and receipt of final approval for full operating authority could be several months. During this time, Los Alamos intends to continue operating the incineration system under interim status on a full-time basis for volume reduction of hazardous waste.

4.3 TA-54, AREA L WASTE TRANSFER, PACKAGING AND STORAGE FACILITIES

The waste transfer, packaging and storage facilities are used to store and to package or solidify hazardous chemical wastes. When ready, wastes are transported from the facilities to treatment facilities or off-site for disposal or recycling at a permitted facility. Two structures comprise the Area L waste

transfer, packaging and storage facilities. These include a metal building and a roofed concrete pad. A plan view of the metal building is shown in Figure 2-6. The roofed concrete pad plan is shown in Figure 2-7.

These metal building and concrete pad facilities are used to store lab packs in 55-gallon drums. Prior to the containerization of the lab packs into the 55-gallon drums, an identification and appropriate segregation of the hazardous wastes is performed. This may involve the placement of waste in small containers into drums, pouring liquid waste into drums, and transfer of waste from one drum to another. All drums and containers are kept closed during storage and are opened only when chemicals are transferred from one container to another or when lab packs are prepared.

A representative handling/storage load for the metal building consists of the following:

- Four 55-gallon drums as lab packs
- 25 gallons of miscellaneous wastes in assorted small (five-gallon or less) containers

A maximum of eight 55-gallon drums (or 14 30-gallon drums) can be stored in the metal building. The volume of liquid waste stored in the building will not exceed 440 gallons (as described in the Part A Application) due to the mix of lab packs and stabilized and free liquids. The small containers will be stored adjacent to the drums on the grates. The small containers will eventually be placed in lab packs and/or the contents transferred to 55-gallon drums.

A total of 304 55-gallon drums can be stored at the roofed concrete pad by stacking drums on pallets on top of the first layer of drums using a forklift. Two 225-gallon storage containers are also located on the pad. These containers are constructed of polyethylene and are designed to facilitate movement with a forklift truck. The containers meet DOT Specification No. E9052. The material of construction, polyethylene, is compatible with any waste that will be stored in them based on vendor chemical suitability data. Vendor information on the 225-gallon containers is contained in Appendix I-2.

Additional containers of this description in either 225- or 330-gallon size may take the storage place of 55-gallon drums. The total gallon capacity will not be exceeded per storage cell.

[The containers were previously described incorrectly as tanks. This correction has been made in the Part A and B Application (May 1985 submittal). The storage capacity of these containers has been taken into account in the current Part A, in the storage capacity for Area L.]

The 55-gallon drums meet the DOT Specification No. 17C or 17H (small containers are also DOT approved). Corrosive wastes will be stored in DOT drums with polyethylene liners as necessary.

Containers not containing liquids may be stored, on pallets or otherwise elevated four inches, in cleared areas within the fenced portions of Area L. subject to the limitations of NMHWMR 206.D.4.f.(3) and 206.D.4.f.(4). Such containers shall not be stored within 10 feet of the perimeter fence, nor 10 feet of closed disposal unit covers, nor 5 feet on either side of buried or overhead utility lines, nor 20 feet of any structure, nor 5 feet of any paved or unpaved roadway.

Waste handling equipment used at these facilities include the following:

- Hand trucks
- Drum pumps
- Fork lift

The drums will be stored on wooden pallets (only upper layer); the pallets are moved, positioned, and stacked at the roofed storage area by use of a forklift.

The Los Alamos procedure for transferring wastes from containers to the treatment system utilizing the drum pumps is included as Appendix K.

4.3.1 Lab Packs

Lab packs are used at Los Alamos to containerize the laboratory wastes, particularly the laboratory R&D wastes. A typical lab pack (Figure 2-8) consists

of a number of containers of compatible wastes (see Section 3.3) and vermiculite enclosed in a 55-gallon drum. Vermiculite was chosen as a stabilizing material for lab packs because of its good absorbing properties, its resistance to attack by most chemicals (Merck and Company, 1983) and the cushioning it provides for inside containers during handling and transportation of lab packs. Vermiculite is attacked by hydrofluoric acid; however, this chemical constitutes only very small volumes in individual lab packs, and their containers will be wrapped in magnesium oxide pads. Table 4-1 provides data on the absorption capabilities for a few chemicals. None of the chemicals packaged into lab packs deteriorate vermiculite at ambient temperatures.

Los Alamos laboratory wastes are typically received for disposal in the containers in which the chemical manufacturer originally packaged the material. Thus, inside container/waste compatibility is usually not an issue. Wastes not received in their original containers are placed into empty containers that once contained compatible chemicals or in other suitable containers based on 49 CFR §173, §178, and §179. Inside containers are visually checked for signs of leakage and the container lid or top tightened as the containers are placed into lab packs. If simple lid tightening is not thought to be sufficient to correct the leak, the material is transferred to a nonleaking container before it is loaded into the lab pack.

A volume of vermiculite sufficient to absorb the entire aggregate liquid contents of the inside containers is added to the drum initially and as the drum is filled. Addition of the vermiculite in this manner eliminates unfilled voids between containers. After placing the final container in the drum, the remaining drum volume is filled with vermiculite. The required ratio of the volume of liquid waste to that of vermiculite in the lab pack depends on the type of waste to be placed in the drum. However, minimizing vermiculite usage by adding only the required volume of the absorbent to each lab pack would introduce unnecessary complexity to lab pack packaging procedures. Thus, a ratio of about four volumes of vermiculite to one volume of liquid will be maintained in all lab packs. This worst case ratio will ensure that sufficient absorbent volume is present in all lab packs (see Table 4-1 for absorbing capacities of vermiculite). The drums are DOT-approved 17C or 17H drums. Typically, the drums are unlined. When necessary, 83-gallon drums and vermiculite are used to overpack damaged 55-gallon lab pack drums.

4.3.2 Secondary Containment Areas

Three shallow sumps covered by fiberglass grates are located in the concrete floor of the metal building. These sumps are provided to contain any chemical spills that may occur within the building. The concrete floor in the metal building is free of cracks and other signs of deterioration. The approximate dimensions of these sumps are shown in Figure 2-6 and will together contain a liquid volume of about 335 gallons. This secondary containment volume is significantly greater than that required based on the maximum liquid waste storage in the area. The floor slopes generally towards the sumps. The handling of any spilled wastes that collect in the sumps is discussed in Section 6.0. An asphalt-lined run-on control ditch is located outside the building to divert surface drainage away from the building.

The concrete storage pad is divided into six bermed cells. Steel grating lies above the floor of each cell so that waste drums and tanks are elevated several inches above the floor. The floor of each cell slopes toward a sump. The concrete storage pad will be maintained free of unsealed cracks and unchecked deterioration. The six cells have a combined secondary containment capacity of 11,008 gallons. This secondary containment volume is significantly greater than that required based on the maximum liquid waste storage in the area. The containment volume and the maximum liquid waste storage of each cell on the pad is listed below:

Cell[1]	Secondary Containment Volume (gallons)	Maximum Liquid Waste Storage in Cell (gallons)[2]
1	2,676	4,400
2	1,717	2,640
3	1,111	1,570
4	1,717	2,640
5	1,111	1,570
6	2,676	4,400

[1] Numbered left to right as shown in Figure 2-7.

[2] The actual maximum liquid volume will be below these amounts because some of the drums in each cell will be lab packs or contain solid wastes.

The concrete floors at each of these storage areas are presently in good condition, free of any cracks, gaps or holes. The concrete floors are coated

with Semstone® epoxy to prevent damage in the event of a spill. The Semstone® epoxy was chosen for its resistance to a wide range of acids, alkalis, solvents and water solutions (see Appendix I-1 for vendor information). The containers at the metal storage building are elevated by use of the metal or fiberglass grates and wooden pallets to prevent contact with free liquids. The second layer of containers at the roofed concrete pad are stored on wooden pallets.

4.3.3 Current Container Management Practices

When a chemical waste is ready for treatment or disposal, personnel at the generating laboratory contact Group HSE-7. HSE-7 personnel then visit the generating site to package the waste for transport to the waste transfer, packaging and storage facilities at Area L. The wastes are packaged and labeled in compliance with DOT and EPA requirements. The wastes are transported on a three-ton flat-bed truck.

When the HSE-7 personnel pick up the wastes from the generator, a Chemical Waste Disposal Request form (H-1 in Appendix H) is completed. The form lists the chemicals being transported and is carried in the truck during transport. Once the lab wastes are received in the waste transfer, packaging and storage facilities, they are segregated into compatible chemical groups (e.g., oxidizers, organics, etc.). They are then packed with vermiculite (heavier containers at the bottom) in 55-gallon drums as described in Section 4.3.1, and in accordance with Los Alamos' procedure for identification and segregation of hazardous wastes (Appendix L).

A second form called "Los Alamos Hazardous Chemical Waste Disposal Record" (H-2 in Appendix H) is also completed for each lab pack. This form is used to record information such as:

- Origin, description and quantity of each waste received
- Method of treatment, storage or disposal
- Location of disposal
- List of chemicals in lab packs

The segregation capabilities of the waste transfer, packaging and storage facilities permit storage of up to nine waste types at any one time (six on the concrete pad and three in the metal building).

4.3.3.1 Drum Numbering and Recording System

Each repackaging drum, whether for recyclable or nonrecyclable materials, is stenciled with both the drum type number and a record number the first time any materials are placed inside the drum. The drum type is stenciled as "Los Alamos National Laboratory HW type ___" and the record number is stenciled as "Los Alamos National Laboratory drum number ___". Record numbers are obtained from the drum number log book and the appropriate information is entered in the log book when a number is utilized. In addition, each drum is labeled with a completed EPA hazardous waste label. An example of these labels is shown in Figure 4-5.

Each open drum of nonrecyclable materials has a storage and shipment form that is completed with the requested information on all of the materials which are placed into the drum. The drum record number is also recorded on the form. The form is submitted to the records manager after the drum has been sealed.

4.3.3.2 Hazardous Waste Categories for Repackaging Purposes

The first step in the waste categorization process is to determine if the hazardous waste is suitable for recycling. Depending on the quantity generated at any one time, various chemicals at Los Alamos are candidates for recycling. In the past, p-xylene (EPA Hazardous Waste No. U239) and metallic mercury (U151) have been handled as recyclable materials. Other relatively clean hydrocarbon solvents received in excess of 40 gallons at one time may also be handled as recyclable material.

Nonrecyclable materials along with vermiculite are packaged into the appropriate lab pack, as described in Section 4.3.1. Waste types are segregated in accordance with Laboratory segregation practices noted in Section 3.3. Materials in each of the storage categories are kept segregated from each other at all times. Even after wastes have been repackaged, drums from different storage categories are kept segregated.

When appropriate, recyclable materials are poured from their original containers (except for 55-gallon drums) into a new 55-gallon drum constructed of a similar material. Pouring is performed in a well ventilated area. Person-

nel are equipped with appropriate personal protection devices. If greater than 90-day storage of recyclable materials is required, they are stored at the Area L storage facilities.

Any bulging drums are handled in accordance with accepted practice and Laboratory procedures (Appendix M).

Any spills resulting from transfer of materials will be cleaned up in accordance with Section 7.5.1.1.

Other management practices currently followed at Los Alamos as they apply to these facilities include the following:

- Only compatible wastes are handled at any one time.
- Drums are inspected on a weekly basis and prior to their use.
- A maximum of eight 55-gallon drums are handled at any one time in the metal building.
- Appropriate spacing of drums is provided.

4.4 TA-54, AREA L TREATMENT TANKS

Four 1665-gallon ten-gauge carbon steel tanks are also located at TA-54, Area L. The tanks are nine feet in diameter and three feet, six inches high and are constructed of 10-gauge carbon steel. Structural support is provided by a 2-inch by 2-inch angle iron stiffening ring on the lip of the tanks. The tanks are flat-bottomed and rest on four-inch by four-inch redwood lumber. These tanks are used to neutralize acids and bases, oxidize reactive wastes such as lithium hydride, and evaporate RCRA-regulated and non-RCRA-regulated wastes. The tanks are also used to chemically treat sands containing barium and to reduce chromium. Treatment of barium sand involves the addition of Na_2SO_4 and H_2SO_4 to barium-contaminated sands to precipitate $BaSO_4$. Detailed descriptions and procedures for this process are presented in Appendix X. Mildly acidic chromium wastes are treated by addition of powdered or liquid sodium sulfite and precipitation of chromium salts. Reactive wastes are treated by addition of controlled amounts of water to wastes in the tank. The specific gravity of any liquid placed in the tank will not exceed 1.5.

The four treatment tanks have been coated on the inside and outside with Carboline Phenoline 373 film (see Appendix I-1) to prevent corrosion. This is a modified phenolic coating with excellent chemical, thermal shock, and abrasion resistance. An additional tank liner consisting of 100 mil thick UV stabilized PVC designated UL-990 is also utilized. A complete manufacturer's description and compatibility charts for this liner are presented in Appendix I-1.

There is no instrumentation and only one piping connection on each tank. The piping connection is a 2-inch screwed plug in the shell. Level control of the liquids in the tanks is accomplished by visual inspection.

A 210-gallon tank is used to mix treatment chemicals before their addition to the wastes in the treatment tanks. The mix tank is three feet in diameter by four feet high and constructed of 3/16-inch thick stainless steel with three three-inch wide by 3/16-inch thick stiffening bands, one located at the top, middle, and bottom of the tank. Two 3/16-inch plys of polyethylene give a total internal liner 3/8-inch thick. The open top tank has no nozzles or drains and is mounted ten inches off the ground on six inch wheels which allow movement between the treatment tanks. Chemicals and water are added through the top, mixed, and pumped out of the mix tank into the treatment tank.

This mix tank was previously used at TA-50-1 to treat small quantities of the same wastes handled in the Area L treatment tanks.

4.4.1 Secondary Containment Areas

The four treatment tanks are located on a bermed concrete pad, as shown in Figure 2-9. The curb is six inches tall and the containment capacity of the bermed area is approximately 3554 gallons, an amount adequate to contain the maximum contents of one of the treatment tanks. The concrete pad is presently in good condition, free of cracks, gaps or holes. The concrete is six inches thick over compacted gravel and the load-bearing capacity is approximately 3,000 pounds per square foot. Only compatible wastes are treated in the tanks on the treatment tank pad at any particular time.

4.4.2 Current Management Practices

The treatment tanks are double-lined with eight-mil polyethylene except when the tanks are being used to treat reactive materials. The liners are not used when reactives are treated to minimize the potential for combustion. The plastic overlaps the tank top and is held in place with an elastic strap similar to a bungee cord.

The purpose of the polyethylene liners is to facilitate the removal of solids remaining after treatment processes in the tanks. The most common example is dry solid residue remaining after solar evaporation. In addition to the polyethylene liner, the interior of the tank is coated with a phenolic film (see Appendix I-1) which is compatible with all wastes placed in the tanks.

The polyethylene liners are replaced at least yearly when the tanks are in use. The old liner is placed in a 17H drum. If hazardous waste was treated in the tank during the life of the liner, then the liner and residue are handled as hazardous waste.

A description of how wastes are introduced into the tanks for treatment and the Standard Operating Procedure for the treatment tanks are provided in Appendix M-1.

The tanks are maintained so that fluid levels are no higher than six inches below the top of the tanks. If rainfall should elevate fluid levels above this level, portable pumps are used to draw down the tanks. Information on the pumps is included in Appendix K. Pumps are washed after use with water or other suitable solvents. The pumps are stored in Area L. In the event that waste must be removed from a tank, drums sufficient to contain the waste will be brought in from other areas. Once filled, the drums will be taken to Area L storage areas.

During periods of precipitation, the tanks are covered. Tank covers are constructed of styrofoam having rigid metal support members and covered with heavy vinyl. Tank covers are secured with boards and clamps.

The tank covers do not normally come in contact with the waste in the tanks; their purpose is to prevent rain water from entering the tanks so that net evaporation is increased. The tank covers are not routinely discarded. If visual evidence or operating records indicate that a cover is contaminated, it is disposed of as hazardous waste.

Both liquid and solid waste are introduced to the treatment tanks through the open top. Grab samples are taken from tanks prior to and after treatment of wastes (at a minimum). This confirms completeness of treatment prior to removal. Prior to the placement of a new waste into a tank, the old tank liner is removed if the new and old wastes are not compatible.

4.5 TA-16 INDUSTRIAL INCINERATOR

Los Alamos wishes to permit an outdoor installed and operated industrial two-stage incinerator near the TA-16 burning area. The incinerator is manufactured by Spronz Incinerator Corporation of Rochester, New York. Specifications for the TA-16 incinerator are provided in Appendix U. The TA-16 incinerator will be used to burn approximately 810 pounds per day of Incinerator Institute of America Type "Zero" trash potentially contaminated with HE from TA-16. Type "Zero" trash consists of a mixture of highly combustible waste such as paper, cardboard cartons, wood boxes, and combustible floor sweepings from industrial activities. The mixture may contain up to 10 percent by weight of plastic bags, coated paper, laminated paper, treated corrugated cardboard, oily rags, and plastic or rubber scraps. The incinerator is equipped with an oil burner and is anticipated to dispose of approximately ten gallons per month of potentially HE-contaminated hydraulic oil, tramp oil and ignitable solvents from machining operations at TA-16.

The TA-16 incinerator is designed for outdoor or indoor operation and consists of a primary combustion chamber, a secondary combustion chamber and a settling chamber. Both primary and secondary chambers are equipped with gas/oil-fired power burners supplied by small volumes of waste oil and by a local propane tank. The outer shell is fabricated from hot rolled carbon steel (12 gauge) and four-inch vertical buck stays. The incinerator is mounted on four-inch H-Beams and attached to a six-inch thick concrete pad. Incinerator controls are remote, unattended, time-delay type with local manual controls.

4.5.1 Current Management Practices

The TA-16 incinerator is located within a high security/controlled access area within TA-16. The area is patrolled by Los Alamos security personnel during unattended hours. The incinerator is used primarily to dispose of approximately 810 pounds per day of potentially HE-contaminated, Type "Zero" trash and small amounts of waste oil. Only wastes described by NMHWMR Sections 206.D.8.a.(2)(a)(i), (ii), (iii), or (iv) [40 CFR§ 264.340(b)(1)(i), (ii), (iii), or (iv)], and that contain insignificant concentrations of hazardous constituents listed in 201 Appendix III [40 CFR Part 261, Appendix VIII], are disposed of in the TA-16 incinerator.

The incinerator is operated from a cold start. Trash is loaded into the primary chamber by a front-end loader. The burn cycle is then initiated. After the burn and cool-down cycles are complete, ash is removed from the settling chamber by shovels, hoes, and other common hand tools. Waste ash is placed into 55-gallon drums and transferred to the TA-54 Area L storage facilities. The ash is then mixed with cement and disposed of in accordance with its hazard characteristics. Each 810-pound burn produces approximately four cubic feet of ash.

4.5.2 Secondary Containment Areas

Because only small amounts of liquid (less than 10 gallons per month) are to be handled at the TA-16 incinerator, secondary containment areas are not required for safe operation of the systems. The incinerator itself is situated on a concrete pad, and thus any small drips and spills of liquid will be retained in the area and cleaned up.

4.6 TA-50 STORAGE PAD

The TA-50 Storage Pad is used to store containerized hazardous chemical wastes. When ready, wastes are transported from the facility to treatment facilities or off site for disposal or recycling at a permitted facility. The TA-50 Storage Pad consists of a roofed concrete pad identical to the storage pad at TA-54, Area L. The roofed concrete pad plan is shown in Figure 2-7. The TA-50 Storage Pad is used to store lab packs, liquids in 55-gallons drums, and other storage containers, as described in Section 4.3.1.

A total of 304 55-gallon drums can be stored at the roofed concrete pad by stacking drums on pallets on top of the first layer of drums using a forklift. Two 225-gallon storage containers are also located on the pad. These containers are constructed of polyethylene and are designed to facilitate movement with a forklift truck. The containers meet DOT Specification No. E9052. The material of construction, polyethylene, is compatible with any waste that will be stored in them based on vendor chemical suitability data. Vendor information on the 225-gallon containers is contained in Appendix I-2. Additional containers of this description in either 255- or 330-gallon size may take the storage place of 55-gallon drums. The total gallon capacity will not be exceeded per storage cell.

The 55-gallon drums meet the DOT Specification No. 17C or 17H (small containers are also DOT approved). Corrosive wastes will be stored in DOT drums with polyethylene liners as necessary.

Waste handling equipment used at this facility include the following:

- Hand trucks
- Drum pumps
- Fork lift

The drums will be stored on wooden pallets (only upper layer); the pallets are moved, positioned, and stacked at the roofed storage area by use of a forklift.

4.6.1 Secondary Containment Areas

The concrete storage pad is divided into six bermed cells. Steel grating lies above the floor of each cell so that waste drums and tanks are elevated several inches above the floor. The floor of each cell slopes toward a sump. The concrete storage pad will be maintained free of unsealed cracks and unchecked deterioration. The six cells have a combined secondary containment capacity of 11,008 gallons. This secondary containment volume is significantly greater than that required based on the maximum liquid waste storage in the area. The containment volume and the maximum liquid waste storage of each cell on the pad is listed below:

Cell[1]	Secondary Containment Volume (gallons)	Maximum Liquid Waste Storage in Cell (gallons)[2]
1	2,676	4,400
2	1,717	2,640
3	1,111	1,570
4	1,717	2,640
5	1,111	1,570
6	2,676	4,400

[1] Numbered left to right as shown in Figure 2-7.

[2] The actual maximum liquid volume will be below these amounts because some of the drums in each cell will be lab packs or contain solid wastes.

The concrete floors at the storage area are presently in good condition, free of any cracks, gaps or holes. The concrete floors are coated with Semstone® epoxy to prevent damage in the event of a spill. The Semstone® epoxy was chosen for its resistance to a wide range of acids, alkalis, solvents and water solutions (see Appendix I-1 for vendor information).

4.6.2 Current Management Practices

The TA-50 Storage Pad is fenced, the access gates are locked, and the area is patrolled by Los Alamos security personnel during unattended hours. Container management practices and the drum numbering and recording system utilized at TA-50 are identical to those described for the TA-54, Area L Storage Pad, contained in Sections 4.3.3 and 4.3.3.2, respectively. No repackaging of drummed waste occurs at the TA-50 Storage Pad.

TABLE 4-1.

ABSORPTION CAPABILITIES OF VERMICULITE

Chemical	Absorption Per 100 Pints of Vermiculite (pints)
Perchloroethylene	2.3
Sulfuric acid, 98%	2.1
Sodium hydroxide, 50%	4.7

Data from Diamond Shamrock Corporation, 1984.

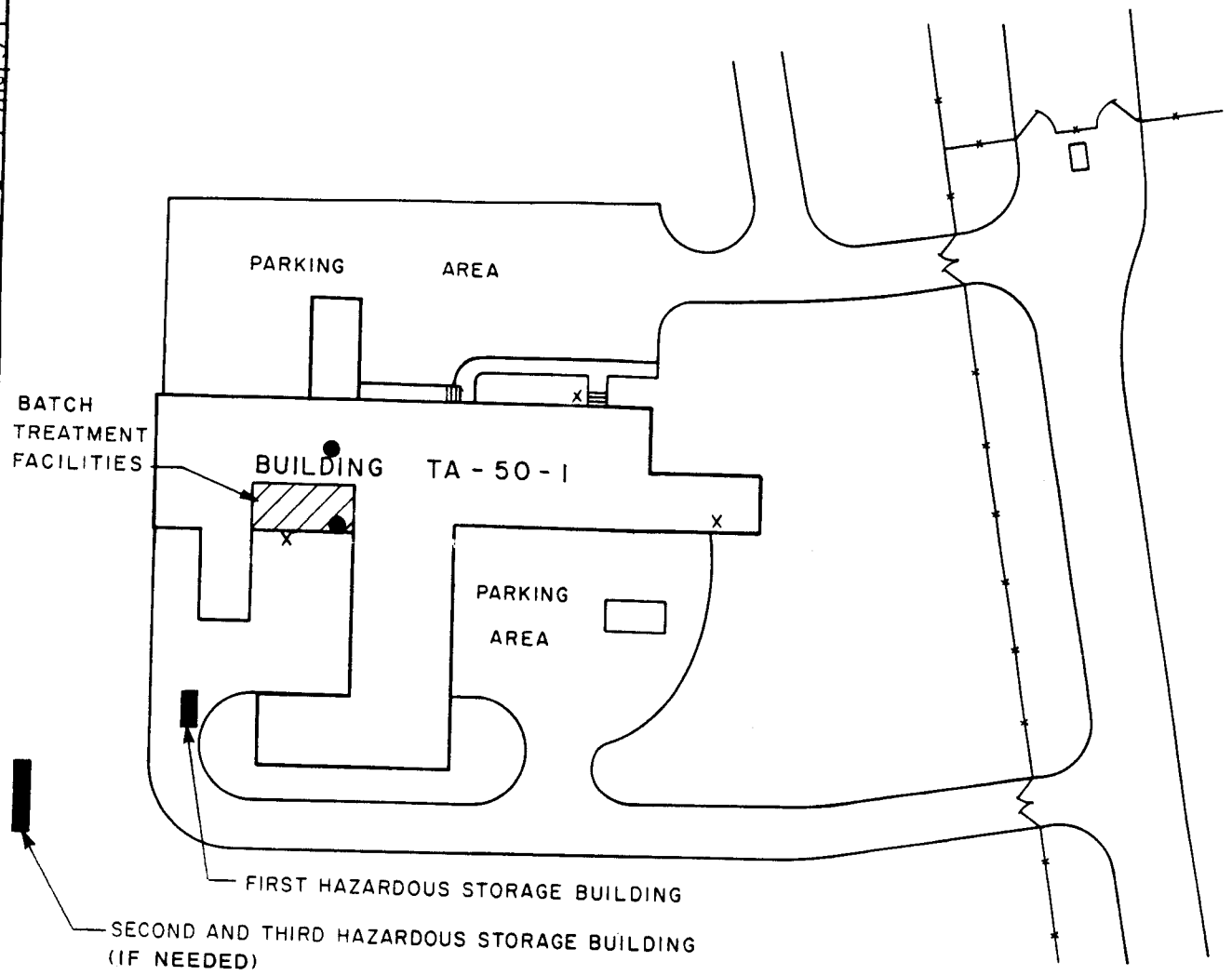


FIGURE 4-1
LOCATION OF
BATCH TREATMENT FACILITIES
IN BUILDING 1 IN TA-50

PREPARED FOR
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

X ALARM PULL BOXES
● FIRE EXTINGUISHERS

IT CORPORATION

DRAWING NUMBER 3u1017.02-A104

CHECKED BY SJS 11/6/87
APPROVED BY DEJ 11/11/87

LLF 11/11/87

32803

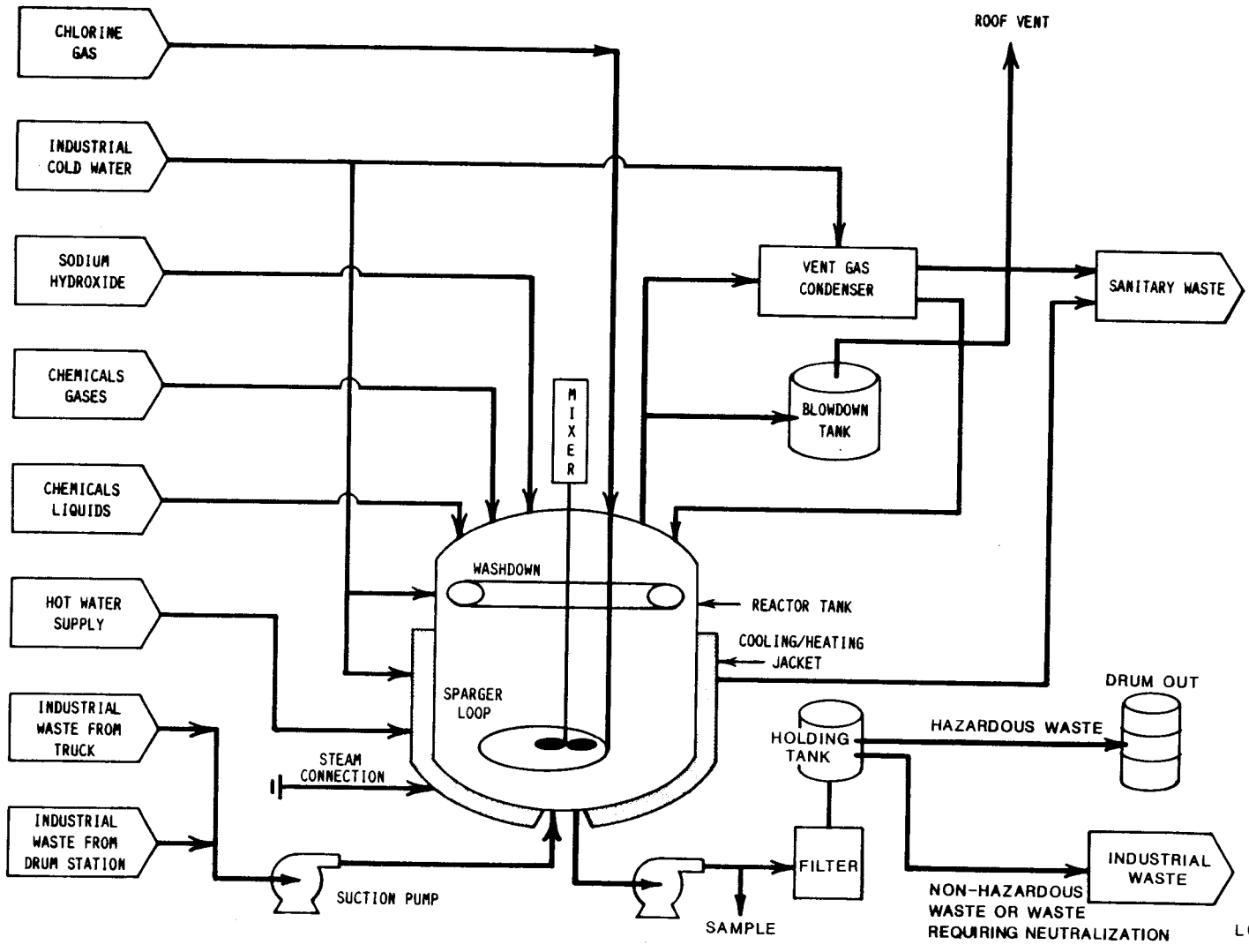


FIGURE 4-2

FLOW DIAGRAM OF BATCH TREATMENT SYSTEM

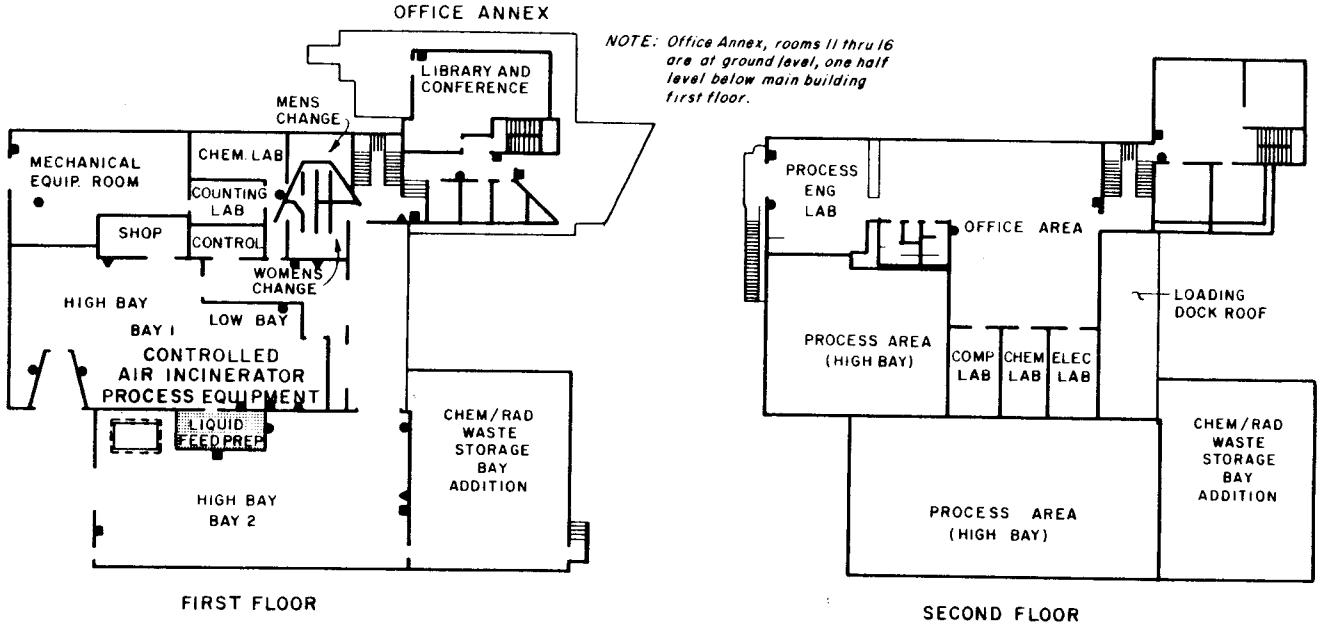
PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	MJG	CHECKED BY	SGS	DRAWING NUMBER	301017-02 B21
	11/18/87	APPROVED BY	DES		

19 1253 HERCULENE A&B SMITH CO PGH PA



NOTE: Office Annex, rooms 11 thru 16 are at ground level, one half level below main building first floor.

TREATMENT DEVELOPMENT FACILITY
TA-50, BUILDING 37

NOTE. All rooms are covered by automatic sprinkler heads Fire water flow activates automatic alarm pull.

▲ EVACUATION ALARM
■ ALARM PULL (FIRE)
● FIRE EXTINGUISHER
HALON SYSTEM

FIGURE 4-3

TREATMENT DEVELOPMENT FACILITY SHOWING LOCATIONS OF CHEMICAL WASTE INCINERATOR AND SUPPORT FACILITIES

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

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18 1253 HERCULENE A&B SMITH CO PGH PA

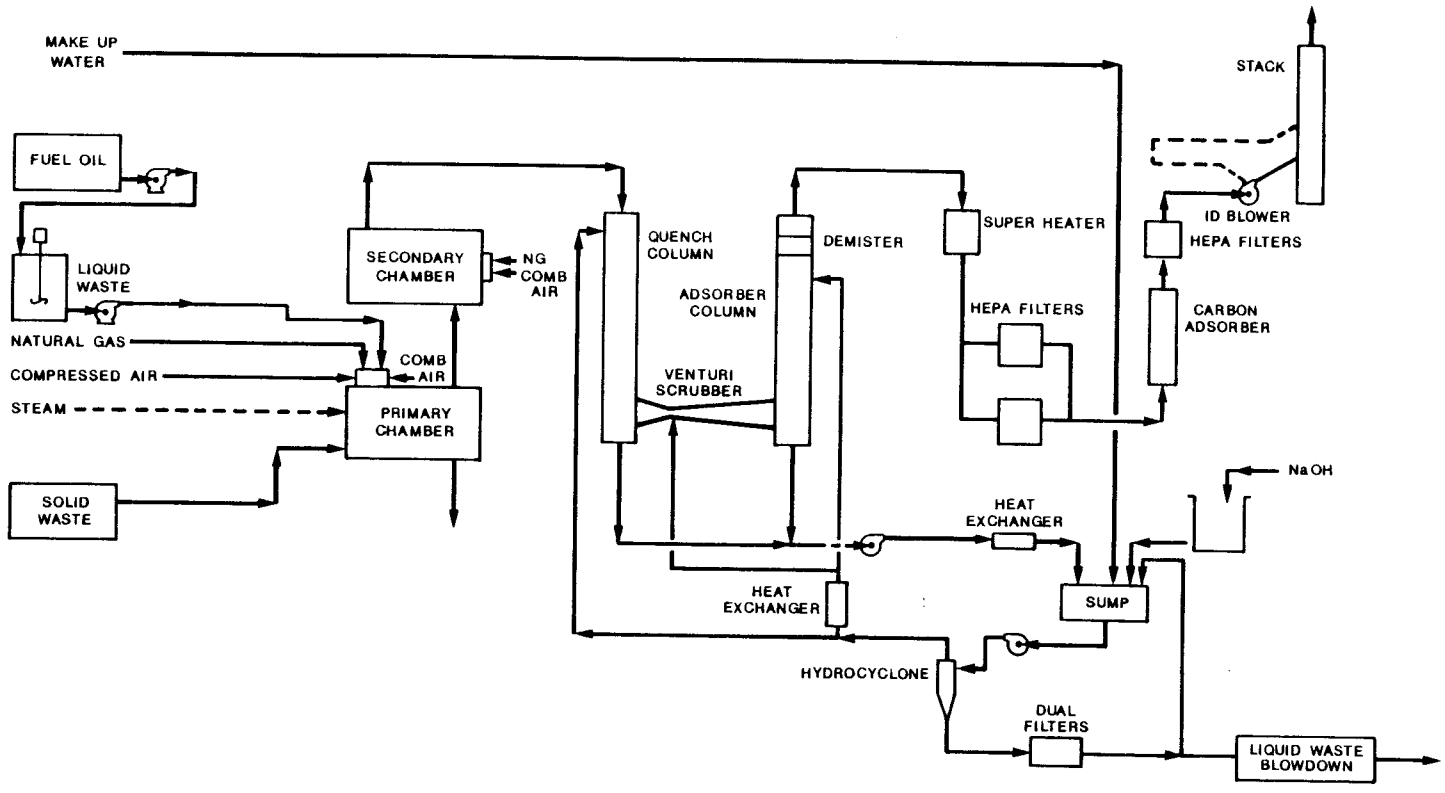

FIGURE 4-4

INCINERATOR PROCESS DIAGRAM

PREPARED FOR

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LOS ALAMOS, NEW MEXICO

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Do Not Scale This Drawing

IT ... Creating a Safer Tomorrow

85380

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE, OR
PUBLIC SAFETY AUTHORITY, OR THE
U.S. ENVIRONMENTAL PROTECTION AGENCY

PROPER D.O.T.
SHIPPING NAME_____ UN OR NA#_____

GENERATOR INFORMATION:

NAME_____

ADDRESS_____

CITY_____ STATE_____ ZIP_____

EPA
ID NO._____

EPA
WASTE NO._____

ACCUMULATION
START DATE_____

MANIFEST
DOCUMENT NO._____

HANDLE WITH CARE!

CONTAINS HAZARDOUS OR TOXIC WASTES

STYLE WM-6

© LABELMASTER, CHICAGO, IL 60646

FIGURE 4-5

TYPICAL DRUM LABEL

PREPARED FOR

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5.0 GROUNDWATER MONITORING

Since the only hazardous waste management facilities operated by Los Alamos National Laboratories are treatment and storage facilities, groundwater monitoring requirements delineated in 40 CFR § 264, Subpart F (NMHWMR 206.D.1) are not applicable.

6.0 PROCEDURES TO PREVENT HAZARDS

The information provided in this section is submitted in accordance with the requirements of 40 CFR §270.14 (NMHWMR 302.A.4.b). The following subject areas are addressed in this section: general security provisions, inspection schedules and requirements; preparedness and prevention requirements; and prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes. Guidelines for personnel working in potentially hazardous situations can be found in the Los Alamos National Laboratory Health and Safety Manual (Appendix N).

6.1 SECURITY

All Laboratory hazardous waste facilities are located within fenced areas which are locked during nonworking hours. The Protective Force (the group responsible for Laboratory security) maintains Laboratory security by manning check stations, patrolling facilities and locking access gates. This security system prevents unknowing entry and minimizes the possibility for unauthorized entry of persons or livestock into any of the hazardous waste facilities. In most cases, the Protective Force is limited to external surveillance of buildings and open areas so that the potential contact with Laboratory hazards is avoided.

The TA-50 batch treatment system, modular container storage buildings, waste incinerator and storage area, and the TA-50 storage pad are located in fenced areas. The fence is an eight-foot chain link "hurricane" type topped by three strands of barbed wire. The buildings and gates are locked during nonworking hours, and externally patrolled by Protective Force guards. All visitors must check in with the reception desk during working hours.

Area L within TA-54 is enclosed by a cyclone security fence with a single 45 degree barbed wire out-rigging. The entrance gates are open during weekday working hours only and manned so that access is limited to authorized personnel. The entrance gates are locked by the users (HSE-7) and externally patrolled by the Protective Force once every four hours, from 5 p.m. to 8 a.m. on weekdays, and all day on weekends and holidays.

6.2 WARNING SIGNS

Warning signs are posted at all entrances to hazardous waste facilities and at other appropriate areas. The letters and colors of the signs are chosen to insure 25 foot legibility.

Warning signs are posted in English and Spanish at all entries to the room containing the TA-50 batch treatment system and to the modular container storage building area. The signs read, "Danger, Unauthorized Personnel Keep Out."

Warning signs in English and Spanish are posted on the doors at the TA-50 waste incinerator and Room 117 storage area and read, "Danger, Unauthorized Personnel Keep Out." There are warning signs posted on the door to the waste incinerator building, all external doors are locked, and access is only with keys and administrative controls. The two doors to the change rooms have electric strike plates for administrative control of access.

Warning signs in Area L read, "Danger, Unauthorized Personnel Keep Out" and "Hazardous Waste Storage Area." Signs in English and in Spanish are on all approachable fences and on the front gate.

Warning signs at the TA-50 storage pad read "Danger, Unauthorized Personnel Keep Out" and "Hazardous Waste Storage Area." Signs in English and Spanish are on all approachable fences and on the front gate.

Los Alamos is not in a county which borders Mexico; however, in the interest of safety, Spanish language warning signs are posted in Area L.

6.3 INSPECTION SCHEDULES AND REQUIREMENTS

Fire hydrants, alarms, extinguishers and sprinkler systems at all locations are inspected and maintained according to guidelines in the "Manual of Fire Protection Policies and Procedures" (Appendix O). The DOE Fire Department and Pan Am World Services (PAWS), a captive contractor to the Laboratory, are responsible for inspecting the fire fighting equipment. All other equipment is inspected and maintained by the operating group. Equipment is inspected according to Equipment Inspection Schedules (Tables 6-1 to 6-5). The

frequency of inspections is based upon the rate of possible deterioration of the equipment and the probability of an environmental or human health incident if the deterioration, malfunction, or any operator error goes undetected between inspections. Inspection schedules and records are kept at the HSE-7 office for a minimum duration of three years.

6.3.1 TA-50 Batch Treatment System and Modular Container Storage Buildings Potential Problems

The batch treatment system and modular container storage area are routinely inspected for potential problems with safety and emergency equipment, security devices, containers, and container storage facilities. Potential problems are listed on a daily inspection checklist. Potential problems include containment failure, fire, explosion, exposure, deterioration of the batch treatment system, construction materials, and system leakage. The SOP for the batch treatment system can be found in Appendix M-2.

Frequency and Content of Inspection

The batch treatment system is inspected according to the schedule in Table 6-1. The modular container storage units are inspected weekly by visually inspecting containers for leakage and deterioration. The containment system is also inspected for spilled or leaked waste and for corrosion. The batch system is inspected before each use and monitored during operation by the operator. This procedure is adequate to detect any cracks, leaks, corrosion, erosion, or wall thinning. In addition, the batch treatment tank shell and liner will be inspected every three years to ensure that the tank walls and liner have not experienced damage due to corrosion or erosion. For the three-year inspection, the tank KYNAR lining will be tested for pinholes, cracks, or other failures using a Holiday Detector spark test or equivalent. The Holiday Detector works by sweeping an electrically-charged brush over the liner surface. If a pinhole or crack is present, the liner no longer insulates the metal tank shell from the current, and a spark is produced thus identifying the failed surface. The tank shell and liner wall thickness will also be acoustically analyzed to determine the extent of deterioration (ASME NDT Section IX). The acoustic analysis utilizes the travel time or changes in the frequency of sound waves through the tank walls to permit calculation of wall thickness. Should the liner wall exhibit considerable (unexpected) thinning

between inspections, the inspection frequency will be increased to once each year.

Prior to the interior inspection, the batch treatment tank is emptied by discharging in the normal manner as described in Section 4.1.1. After it is empty, the tank must be thoroughly cleaned and checked to be sure it is free of flammable, toxic, and corrosive vapors and materials before entry. If this requires steaming, the tank must be cooled after cleaning and the rinse water checked to be sure it is essentially neutral. Any nearby operations considered hazardous to tank entry are shut down. The atmosphere in the tank must be tested for the presence of combustible or toxic vapors and for oxygen content, and the tank must be isolated by disconnecting or blanking off all lines before entry. Agitators must be fixed so they cannot be started by locking out, disconnecting wires, etc. A blower that provides a minimum of 12 air changes/hour or an air mask or air pack may be used. A ladder is provided, and a harness and lifeline and means of removing an unconscious person are required. A sufficient number of standby men must be present to give aid in case of trouble.

Low voltage lighting or approved flashlights are used. Protective clothing or equipment may be required in some instances.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspection, appropriate remedial actions including repairs, maintenance and replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the inspection log.

The extent of damage from containment failure is assessed first by the supervisor's observations of the affected area. Upon this visual observation, he will indicate appropriate emergency response procedures, including the call-out list, evacuation, and cleanup. If necessary, the supervisor will also use Laboratory records to determine the chemicals involved. If observations

indicate that human health and the environment may be adversely affected, the Contingency Plan will be implemented immediately.

Sampling locations are chosen by observations of the released material, if possible. If the release is not observable, sampling locations will be chosen randomly. Guidance in identifying hazardous chemicals is provided by the Safety Group (HSE-3), the Industrial Hygiene Group (HSE-5), the Waste Management Group (HSE-7), and the Environmental Surveillance Group (HSE-8). Table 7-3 contains a list of equipment available for remediation.

If containment failure occurs, wastes will collect in the bermed areas. In the case of a small spill, vermiculite is poured over the spilled liquid. Once the liquid is absorbed, the waste is swept or shovelled and put back into a drum. For a larger spill, the liquid is pumped back into the drums. In either case, once free liquids are removed, the surface is cleaned using cleaners appropriate to the chemicals.

Leaks from the batch treatment system will collect in the eight-inch curb which surrounds the system. The liquid will be collected and handled as though it were the system contents. Cleanup measures will be initiated depending upon the type and extent of the leak.

Leaks from containers in the modular storage buildings will collect in the 500-gallon sump within the unit. In the case of small spills, vermiculite is poured over the spill area and once the liquid is absorbed, it is swept or shoveled into drums or other appropriate containers. For spills involving larger liquid volumes, free liquids are pumped into drums and vermiculite is used as above to remove the remaining liquid. Once liquids are removed, the sump is cleaned using appropriate cleaning agents.

In the case of exposure, remedial actions include treating the exposed personnel at the HSE-2 Medical Facility (see Section 7.5.4) and determining the cause of exposure by observation, Laboratory records, and/or sampling.

Similar to hazardous waste releases, the extent of damage from fire and explosion is assessed by visual observations, Laboratory records, and if

necessary, sampling. Equipment damaged or contaminated by fire, explosion, or spills is identified by visual inspections and sampling, if necessary.

Daily inspections of the batch treatment system by batch operators will detect malfunctions and deteriorations of the system. Depending upon the potential for release of hazardous wastes, the system can be shut down. The extent of the problem is assessed by visual observation by the system operator, who determines whether process shutdown should be initiated. At any time there is an evacuation, a leak of hazardous waste from the batch treatment system, or a fire or explosion, the addition of hazardous waste or chemicals to the batch tank will be stopped. If the batch is being heated, the steam to the jacket will be shut off; however, if the batch is being cooled, the cooling water will shut off only if there is danger of contamination of the cooling water. The mixer will also not be shut off unless continued operation poses a unique hazard (see Section 7.6.2.1).

Inspection Logs

Inspections of the TA-50 batch treatment system and modular container storage buildings area are conducted by the operating group according to the checklist in the inspection log (Table 6-1). Results of the inspection, the inspector's name and title, date and time of inspection, and any remedial action taken are recorded on the inspection log sheet. A copy is sent for records to HSE-7 and kept for at least three years. An inspection log is kept near the system at all times. In addition, an operating log will be completed by the process operator. This log is a record of operating conditions and provides evidence that the operator has checked and is aware of the operating status of the system. The time at which entries are made and the actual instrument reading for each variable will be entered into the log. When shutdown occurs, the log will state the nature of the shutdown, the time it occurred, and the suspected cause. Once each shift, the shift supervisor will inspect the facility for malfunctions, deterioration, operator error, and discharges.

6.3.2 TA-50 Waste Incinerator and Room 117 Storage Area

Potential Problems

The waste incinerator system building and Room 117 storage area are routinely inspected for potential problems with safety and emergency equipment, security

devices, containers, container storage facilities, and loading and unloading facilities. Inspections of specific equipment and systems are conducted with a frequency appropriate to current operations, as well as appropriate to the equipment and systems. Potential problems include containment failure, fire, explosion, exposure, equipment deterioration or malfunction, and leaks from the incinerator. Appendix P contains the operational safety requirements under which the waste incinerator will be operated.

Frequency and Content of Inspection

The waste incinerator, storage area, building, and emergency equipment are inspected according to the schedule in Table 6-2. Standard operating procedures require that process operators "walk through" their operating areas each hour to visually observe, monitor, and record any leaks, spills, malfunctions or other unusual conditions.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspection, appropriate remedial actions including repairs, maintenance and replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the operating log.

Remedial actions in the case of containment failure, fire, explosion, or exposure are identical to the measures at the TA-50 batch treatment system and modular container storage area. Should any of these problems occur, the waste incinerator can be shut down at the discretion of the operator. Failure of the HEPA filtration system or wet scrubbers, equipment deterioration or malfunction, or leaks from the waste incinerator will be remedied during and following process shutdown (see Section 7.6.2). The process operator will assess the situation and decide upon which shutdown method will be most efficient. He will supervise the operating area during the shutdown process.

Inspection Logs

General inspections are conducted by the operating group according to checklists associated with the operating log. Results of the inspection (Table 6-2), the inspector's name and title, and date and time of inspection are recorded on the inspection log sheet. A copy is sent for records to HSE-7 and kept for at least three years. In addition, process operators will fill out process data sheets associated with the operating log at least once every two hours during waste feeding operations and every four hours when not feeding wastes. These sheets are a record of operating conditions and provide evidence that the operator has checked and is aware of the operating status of the system. The time at which entries are made and the actual instrument reading for each variable will be entered into each checklist. When shutdown occurs, the log will state the nature of the shutdown, the time it occurred, and the suspected cause. Once each shift, the shift supervisor will inspect the facility for malfunctions, deterioration, operator error, and discharges. Prestarting inspection procedures, general inspection checklists and the operating log will be kept with the incinerator system during operations.

6.3.3 TA-54, Area L Waste Transfer, Packaging and Container Storage Facilities and Treatment Tanks

Potential Problems

Area L is routinely inspected for potential problems with safety and emergency equipment, security devices, containers, container storage facilities, treatment tanks, and loading and unloading facilities. Potential problems are listed on a weekly inspection checklist. The container storage areas (the metal building and roofed concrete pad) will be inspected weekly. The treatment tanks will be inspected weekly and after storms to detect any leakage, damage, overflow, or cracks. In addition, the interior of each treatment tank will be inspected yearly for thin spots or excessive corrosion. Prior to the interior inspection, the treatment tank will be emptied by pumping into drums following normal procedures as described in Section 4.4.2. After it is empty, any liner is removed and the tank must be thoroughly cleaned and checked to be sure it is free of flammable, toxic, and corrosive vapors and materials before entry. If this requires steaming, the tank must be cooled after cleaning and the rinse water checked to be sure it is essentially neutral. Any nearby operations considered hazardous to tank entry are shut down. The atmosphere

in the tank must be tested for the presence of combustible or toxic vapors and for oxygen content. A sufficient number of standby personnel must be present to give aid in case of trouble. Protective clothing or equipment may be required in some instances. Potential problems at Area L include containment failure, fire, explosion, and exposure.

Frequency and Content of Inspection

Area L is inspected according to the schedule in Table 6-3. In addition, the treatment tank's shell and liner will be inspected annually to ensure that the tank walls and liner have not experienced damage due to corrosion or erosion. The annual inspection procedure is the same as the three-year inspection outlined for the TA-50 Batch Waste Treatment System Tanks in Section 6.3.1.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspection, appropriate remedial actions including repairs, maintenance and replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the operating log.

In the case of failure of run-on and run-off control measures (diversion ditches), the HSE-7 Group Leader or his qualified designee will assess the damage by visual observations and sampling and monitoring to determine the type and extent of contamination. Mitigation procedures and repairs, such as sandbagging and building berms, will be instituted immediately.

Remedial action in the case of drum or container failure, fire, explosion, or exposure is handled as described for the TA-50 batch treatment system. In addition, soil and water samples will be taken down-gradient from the release. At the transfer, packaging and storage facilities in Area L, releases from drum or container failure collect in sumps as well as berms.

If leakage, corrosion, overflow or any other damage is detected in the treatment tanks, the contents will be pumped into a drum or another treatment

tank. At least 33 empty drums are always available to hold the maximum amount of liquid in a treatment tank in the unlikely event that the tank is completely full and the contents cannot be pumped into another treatment tank. The portable pumps used for emptying the tank are the same pumps used to draw down the tanks (see Section 4.4.2 and Appendix K) and have adequate capacity to fill 55-gallon drums. The pumps and hose used are compatible with the hazardous wastes they handle and are decontaminated after use by flushing with water. The pumps are located at TA-54, Area L.

Inspection Logs

Each inspection is conducted by the operating groups according to the checklist in the inspection log. Results of the inspection, the inspector's name and title, and date and time of inspection are recorded on the inspection log sheet. A copy is sent for records to HSE-7 and kept for at least three years.

6.3.4 TA-16 Industrial Incinerator

Potential Problems

The TA-16 Industrial Incinerator is routinely inspected for potential problems with safety and emergency equipment, and security devices. Inspections of specific equipment and systems are conducted with a frequency appropriate to current operations, as well as appropriate to the equipment and systems. Potential problems include fire, explosion, and equipment deterioration or malfunction.

Frequency and Content of Inspections

The Industrial Incinerator, ancillary equipment, and emergency equipment are inspected weekly while the system is in use for proper function. This includes emergency shut-down controls and alarms. Operating procedures require that incinerator operators "walk through" the incinerator area hourly to visually observe, monitor and record the condition of equipment and any leaks, spills, fugitive emissions or signs of tampering.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspection, appropriate remedial actions including repairs, maintenance, and

replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the operation log.

Inspection Logs

General inspections are conducted by the operating group according to checklists associated with the operation log. Results of the inspections, the inspector's name and title, and date and time of inspection are recorded on the inspection log sheet. A copy is sent to HSE-7 and kept for at least three years.

6.3.5 TA-50 Storage Pad

Potential Problems

The TA-50 Storage Pad is routinely inspected for potential problems with safety and emergency equipment, security devices, containers, and container storage facilities. Potential problems are listed on a weekly checklist and include containment failure, fire, explosion, exposure, equipment deterioration or malfunction and leaks.

Frequency and Content of Inspection

The TA-50 Storage Pad and associated equipment are inspected weekly looking for leaking containers and for deterioration of containers and the containment system caused by corrosion or other factors. Weekly inspections will include items listed in Table 6-7.

Remedial Action

If any defects, deterioration, damage or hazards are discovered during inspections, appropriate remedial actions including repairs, maintenance and replacement will be completed as soon as practical to preclude further damage and reduce the need for emergency repairs. If a hazard is found imminent or if a hazardous situation already exists, remedial action will be initiated immediately. Any remedial action taken due to an inspection will be noted on the operating log.

Remedial action in the case of drum or container failure, fire, explosion, or exposure is handled as described for the TA-50 batch treatment system.

Inspection Logs

Each inspection is conducted by the operating group according to the checklist in the inspection log. Results of the inspection, the inspector's name and title, and date and time of inspection are recorded on the inspection log sheet. A copy is sent for records to HSE-7 and kept for at least three years.

6.4 PREPAREDNESS AND PREVENTION REQUIREMENTS

6.4.1 Equipment Requirements

Internal Communication/Alarm Equipment

The following internal communication/alarm equipment is available at Los Alamos to provide emergency instruction for rapid evacuation and to initiate emergency response:

- Centrex telephone system
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Telephone/radio paging
- Two-way hand held radios
- Emergency central alarm system
- Mechanical central alarm system

Since this equipment is laboratory-wide, it allows all personnel to get in contact with emergency coordinators in all areas of the laboratory. All hazardous waste handling personnel have immediate access to internal alarms or emergency communication devices.

The TA-50 batch treatment system is equipped with telephones, one pull alarm, one automatic thermal alarm, and one automatic smoke alarm. There is an intercom system at each telephone. In the case of an emergency, the nearest source of communication for personnel handling wastes is the intercom/paging systems on each telephone.

The TA-50 waste incinerator and storage area is equipped with telephones throughout the facility. A radio with microphones at remote locations is available. Other communication/alarm equipment available at this facility includes:

- One portable radio
- One radio-equipped vehicle
- Telephone paging system
- Internal telephone communication line
- Two-channel work station intercoms for direct communication from process area to offices and labs
- Eleven pull alarms
- Two automatic thermal alarms

The trailer at Area L is equipped with a telephone. A radio-equipped vehicle is available for use at Area L. In addition, Area L is equipped with an alarm system and intercom to Area G for evacuation. These are the nearest communication sources for use in the case of an emergency. Because of the proximity of the TA-50 Storage Pad and modular storage units to other TA-50 facilities and because only containerized waste is handled at these facilities, individual emergency equipment is not required.

External Communication/Alarm Equipment

The Laboratory has established external communication capabilities with the Los Alamos Police Department and the Los Alamos County Hospital (Section 7.2). The following external communication/alarm equipment is available at Los Alamos:

- Centrex telephone system
- Private telephone lines (if Centrex fails)
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Two National Warning System Stations (NAWAS)
- Direct line from Emergency Operations Centers to KRSN (local radio station)

Emergency Equipment

A list of emergency equipment available at Los Alamos, including types of equipment, locations, and contact phone numbers is shown in Table 7-4.

Emergency vehicles include 18 fire trucks, five ambulances, one rescue vehicle, and evacuation vehicles. Vehicles are inspected quarterly, according to the schedule in Table 6-4. Medical supplies include self-contained breathing apparati, wheel chairs, manual resuscitation, portable oxygen units, blankets, blood supplies, and medical kits.

Heavy equipment includes bulldozers, road graders, tractors, loaders, snowplows, semitrailers, and a portable power generator. Power tools include power saws and fire tools. The PAWS inspection schedule for heavy equipment is shown in Table 6-5.

Transportation vehicles include trucks, buses, and vans.

Fire protection equipment includes fire alarms, sprinklers, hydrants, fire extinguishers, and halon extinguishing systems. The locations of fire alarms, hydrants, extinguishers, and halon systems are shown in Figures 2-3, 2-4, 2-5, 4-3, 7-12, and 7-13.

Water for Fire Control

The Department of Energy (DOE) is responsible for overall water production, transmission, and storage for the Laboratory and Los Alamos County. DOE has 5,541.3 acre-feet of groundwater rights, plus 1,200 acre-feet of San Juan-Chama Diversion Rights, for a total of 6,741.3 acre-feet. This is considered adequate for projected needs (Long Range Utilities Development Plan, Los Alamos National Laboratory, 1984). Current consumption is approximately 4,603 acre-feet/year. The present water supply comes from seventeen active wells in three well fields (Figure 2-12). The Los Alamos water distribution system is shown on Figure 6-1. Annual pumping is managed to avoid excessive drawdown in any of the well fields. The Pajarito field offers the best opportunities for further water system development. Storage capacity is adequate to provide water for fire-fighting purposes.

The types of fire protection equipment at Los Alamos hazardous waste facilities are shown in Table 6-6. Appendix O describes inspection procedures for sprinkler systems, alarms, and extinguishers.

Hydrant flow tests and block valve inspections are performed annually. Pressure regulating valves are inspected and adjusted every 60 days. Appendix O describes inspection procedures for fire hydrants. Flow rates for hydrants are specified by ENG-4, an experienced fire protection engineering staff, and are dependent upon site needs, including size of building and presence of sprinkler systems. The contact for fire extinguishers is Al Martinez at ENG-4, phone 667-2146, pager 110-0369. For other fire protection systems, the contact is Howard Richardson at ENG-4, phone 667-7702, pager 117-332.

6.4.2 Aisle Space Requirements

Aisle space between waste containers at all container storage areas is adequate to provide access for inspection purposes, and movement of personnel, containers, and equipment.

There are no ramps provided for fork lifts or drum handling equipment at the TA-50 batch treatment and modular container storage area since they are not required for the existing usage. Drums are placed in the container storage using hydraulically-powered drum tongs on a forklift. Thus, there are no barriers which cause material handling problems at this site.

A description of the size and lift capacity of drum handling equipment used at TA-54 and the TA-50 Storage Pad is included in Appendix M-3.

Aisles between rows of drums at the Area L transfer, packaging and storage facilities and at the TA-50 storage pad are maintained at a minimum width of two feet to permit access for inspection and handling. Much of the bermed or curbed areas are ramped to facilitate access of forklifts and drum handling equipment.

6.5 PREVENTATIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

Each facility has minimum requirements for safety clothing and apparatus to be used for routine operations which are specified in the facilities' Standard Operating Procedures (SOPs). When nonstandard operations or working conditions exist, a special work permit specifying protective equipment and clothing must be obtained from HSE-5, Industrial Hygiene, and HSE-3, Safety, who inspect the site prior to issuing the permit.

6.5.1 TA-50 Batch Treatment System and Modular Container Storage Building Area

Unloading Operations

Sealed and labeled waste drums are handled with a forklift equipped with a drum handling attachment or with drum carts. In addition, the Batch Treatment System room is equipped with a hoist mounted on a rail. Waste containers are secured on the truck during transport. Sealed drums are handled with a forklift equipped with a drum handling attachment or with drum carts at the modular container storage areas. Small containers are manually loaded and unloaded.

Run-Off/Run-On Control

The treatment area is located inside the building. Adequate storm sewers and gutters are provided to prevent sheet flooding of the building. Container storage occurs in the modular storage buildings. The buildings are elevated sufficiently to prevent sheet flooding.

Water Supply Contamination

The treatment process areas are on a curbed cement floor capable of containing spills. The remainder of the building has drained floors and the water collected by the floor drains is collected in a sump and recycled to the industrial (radioactive) waste treatment systems. The container storage areas are enclosed within modular buildings. Areas for loading and unloading waste containers are paved and spills are immediately cleaned up. Water supply lines are under pressure and have backflow preventers. Depth to the main aquifer at TA-50 is approximately 1,300 feet.

Equipment and/or Power Failure

In general, failure of utilities or equipment does not result in a loss of containment. Leaks from equipment are contained in the curbed floor area or in drip pans.

The batch nature of the operation results in shutdown of the treatment process during utility failure.

Run-Off/Run-On Control

The treatment area is located inside the building. Adequate storm sewers and gutters are provided to prevent sheet flooding of the building.

Water Supply Contamination

The waste loading and unloading area is paved. The building has concrete floors. Spills are immediately cleaned up. Liquid wastes are either retained in the sealed container (if the container is within a shipping cask designed for spill control) or may be transferred into holding/blending tanks in the hazardous waste feed preparation enclosure. The enclosure has a cement curb with a designed holding capacity greater than the enclosed liquid storage tanks. Water supply lines are under pressure and have backflow preventers. Depth to the main aquifer is approximately 1,300 feet.

The process area is equipped with drains that collect to a process sump. Any fluid collected in the sump is pumped to the Laboratory's industrial (radioactive) waste treatment plant (IWTP). Hazardous sludges from the IWTP are treated on site or transported off site to a permitted disposal facility.

Equipment and/or Power Failure

Detailed procedures for handling equipment and power failures can be found in the Controlled-Air Incinerator Process Operating Manual (Appendix Q) which includes standard operating procedures for rapid shutdown of the system while maintaining containment. Backup systems have been built into the process.

A battery-based uninterruptable power supply provides continuous 120 VAC power to controls associated with the incineration process. Instrument air is backed up by plant air and then bottled nitrogen. A skid-mounted diesel-engine generator, which is kept on idle during operation, provides backup power source for the incinerator process equipment. The generator connects through an automatic transfer switch which activates if there is a commercial power failure and automatically disconnects when power is restored. In the event of water failure, a pressurized auxiliary water system automatically supplies water to the off gas quench system to remove heat from the incinerator off-gas to allow shut down of the incinerator. Process steam is provided as a snuffing medium to the incinerator fire box should circumstances require immediate shutdown of the incinerator.

Wind Dispersal Control

Only containerized wastes are transferred to and from the building. The transfer of liquid wastes from containers by dip tube/pump is performed in the hazardous waste feed preparation enclosure inside the building. The enclosure is ventilated, the exhaust gases pass through HEPA filters and an activated carbon bed prior to exhausting the atmosphere. Solid wastes are stored in an enclosed area that is maintained at a negative pressure and ventilated through HEPA filters. Solid wastes may be unpacked and sorted. Wind dispersion is not a problem at the TA-50 waste incinerator.

Personnel Protective Equipment

Because of radioactive contamination (low-level and TRU), personnel working in the process area are required to wear, as a minimum, Anti-C (Anti Contamination) clothing. Personnel are required to wear Anti-C booties, caps, coveralls, undershirts, undershorts, and full face masks whenever they are working on any interior components of the incinerator. Surgeons gloves must be worn while working at gloveboxes. The gloveboxes are fitted with PVC gloves. Viton gloves, goggles, Tyvek coveralls, and boots or overshoes must be worn while transferring liquid wastes. Respirators or breathing apparatuses will be assigned if required by the nature of the wastes.

6.5.3 TA-54, Area L Waste Transfer, Packaging and Storage Facilities and Treatment Tanks

At Area L, small bottles and containers of laboratory chemicals are manually loaded and unloaded. Drums are unloaded using a forklift with a drum handling attachment.

Run-Off/Run-On Control

Area L is located on a long narrow mesa. At Area L, the mesa top trends downward along its length at a slope of 4:100. In addition, the mesa top slopes from its approximate centerline to the mesa walls at a slope of 8:100. Immediately up gradient from Area L, the mesa top is only 200 feet wide, so the drainage area affecting Area L is therefore very small. Annual precipitation at the site is estimated at 14 to 16 inches per year. The 100 year 24 hour precipitation event is four inches. Run-on is handled with earth diversion ditches which divert the water into the adjacent canyon.

The reactor mixer, level indicator and temperature indicator as well as the process analytical instruments are electrically operated. During a power failure, the reactor level can be observed through a 6 inch site port and the reactor temperature can be read from a backup dial thermometer. The analytical equipment is not needed during a power failure as treatment is discontinued until power is restored. If mixing is required during power failure, the reactor can be sparged with inert gas.

Cooling water is used to remove heat from the reactor during neutralization processes. Since the cooling water circulates in an enclosed jacket surrounding the reactor tank and does not contact the reactor contents, the cooling water is discharged to the sanitary sewer system. The treatment process would be discontinued and the source of heat removed should cooling water be lost.

Wind Dispersal Control

Only containerized wastes are handled at the TA-50 batch treatment system and modular container storage area. The mixing of absorbents with liquid wastes is performed inside the building under a ventilation hood. Liquids are transferred from drums with a tube pump. No wind dispersion occurs under normal operating procedures.

Personnel Protective Equipment

At a minimum, personnel operating the batch treatment process must wear rubber gloves, safety glasses and coveralls. During liquid transfer to and from drums, the operator must wear a face shield. The use of respirators is specified by HSE-5.

6.5.2 TA-50 Waste Incinerator and Room 117 Storage Area

Unloading Operations

Sealed and labeled drums and large containers are handled with a drum cart or a forklift equipped with a drum handling attachment. Shipping casks are handled with a forklift or a five-ton crane. Small sealed containers are manually loaded and unloaded. Waste containers are secured on the truck during transport.

All waste management facilities at Area L have run-on and run-off control, as well as secondary containment provisions. Since the possibility of run-off from Area L being contaminated is essentially nil, run-off is simply directed around the perimeter of Area L to prevent erosion.

Water Supply Contamination

Water supply lines at Area L are under pressure and have backflow preventers. In general, containerized wastes are stored in curbed concrete pads at Area L.

Evapotranspiration potential exceeds precipitation, so there is no water migration for leachate formation. The depth to groundwater is 950 feet at Area L. The stratigraphy includes layers of volcanic tuff and ash which are unsaturated and have moisture contents of 0.2 to 2.0 percent by weight, which is insufficient for moisture movement through the Bandelier Tuff (see Section 2.2.5).

Equipment and/or Power Failure

Power failures do not significantly affect operations and containment at Area L. Loading and unloading are discontinued until equipment failures are corrected. Wastes are kept in sealed containers so equipment failure would not threaten containment.

Wind Dispersal Control

Only containerized or packaged wastes are handled at Area L and, therefore, wind dispersal is not a problem.

Personnel Protective Equipment

Personnel who handle containers at Area L are required, at a minimum, to wear safety glasses and gloves. Additional clothing and equipment are assigned where personnel are handling open containers. Protective equipment is specified by HSE-3 and HSE-5 by a special work permit.

6.5.4 TA-16 Industrial Incinerator

Unloading Operations

Waste containers are loaded into the Industrial Incinerator by a front-end loader. Small amounts of liquid to be burned are poured from hand carried 5-gallon cans into the system holding tank.

Run-Off/Run-On Control

The incinerator is located on a concrete pad elevated above the surrounding area sufficiently to eliminate run-on and sheet wash. The small area of the pad and lack of liquid handling produces insignificant amounts of run-off.

Water Supply Contamination

The waste loading area is concrete. Spills are immediately cleaned up. Liquid wastes are retained in sealed containers. The depth to the main aquifer is approximately 1,200 feet.

Equipment and/or Power Failure

Procedures for handling equipment and power failures can be found in Appendix U. The system is equipped with manual and automatic shutdown devices.

Wind Dispersal Control

Only bagged solid wastes are transferred to the Industrial Incinerator immediately prior to loading. Therefore, wind dispersal is not a problem.

Personnel Protective Equipment

Personnel who handle containers at the TA-16 Industrial Incinerator are required to wear, at a minimum, gloves and safety glasses. Additional protective clothing and equipment is assigned as required by HSE-3 and HSE-5.

6.5.5 TA-50 Storage Pad

Unloading Operations

Drums are loaded and unloaded at the TA-50 Storage Pad using a forklift with a drum handling attachment or with drum carts. Larger storage containers are handled using a forklift. Smaller containers are manually loaded and unloaded.

Run-Off/Run-On Control

The TA-50 Storage Pad is provided with run-on control by elevation above the surrounding area. In addition, the roof will protect the pad from receiving significant volumes of direct precipitation. The storage pad is also equipped with secondary containment which will collect any precipitation that falls directly on the pad. Should significant volumes of fluid accumulate in the secondary containment system, fluids will be pumped into containers for analysis and/or considered and treated as hazardous waste.

Water Supply Contamination

Water supply lines at TA-50 are under pressure and have backflow preventers. Containerized wastes are stored in curbed pads and spills are promptly cleaned up. The depth to the main aquifer is approximately 1,300 feet below the surface.

Equipment and/or Power Failures

Power failures do not significantly affect operations and containment at the TA-50 storage pad. Loading and unloading are discontinued until equipment failures are corrected. Wastes are kept in sealed containers so that equipment failure would not threaten containment.

Wind Dispersal Control

Only containerized or packaged wastes are handled at the TA-50 storage pad; therefore, wind dispersal is not a problem.

Personnel Protective Equipment

Personnel who handle containers at the TA-50 storage pad are required, at a minimum, to wear safety glasses and gloves. Protective equipment is specified by HSE-3 and HSE-5 by special work permit when necessary.

6.6 PREVENTION OF ACCIDENTAL IGNITION OR REACTION OF IGNITABLE REACTIVE OR INCOMPATIBLE WASTE

6.6.1 TA-50 Batch Treatment System and Modular Container Storage Area

Only compatible and nonignitable wastes are stored at one time at the TA-50 batch treatment system and in individual compartments of modular container storage buildings. Each waste volume to be treated in the batch plant is

carefully characterized to assure proper treatment. Standard operating procedures (SOP) are prepared for wastes that are routinely received and do not significantly change in character. Operating procedures for unique wastes are prepared after the waste is categorized.

The batch treatment system is designed for complete internal wash down to remove residuals which might be incompatible with future wastes treated.

6.6.2 TA-50 Waste Incinerator and Room 117 Storage Area

Only compatible wastes are handled in the same holding/blending tank and associated transfer system at one time. Liquid wastes can be fed directly into the incinerator or pumped to waste holding tanks. Residuals are flushed with a compatible solvent which is burned at the completion of each liquids burn. The tanks and transfer system are left empty. Wastes will be segregated in Room 117 such that only compatible wastes are stored together. The ventilation system will provide a minimum of eight air changes per hour thus, minimizing potential for accumulation of combustible vapors. In addition, all electrical equipment will be classified as Class I, Division I and will be approved for installation in a Class I, Division I, group environment.

6.6.3 TA-54, Area L Waste Transfer, Packaging and Storage Facilities and Treatment Tanks

Incompatible chemicals are segregated for storage to prevent inter-reaction of wastes in the case of a leak.

Containerized wastes are stored in the open air, inhibiting vapor accumulation. Smoking is not allowed and there is normally no ignition source in the area. The stored volatile and flammable wastes are inspected for leakage prior to loading.

Reactive wastes will be placed in the tanks for treatment only. They will not be stored in the tanks. Prior to adding new waste to a tank, the records will be checked to verify that the two waste streams are compatible. If they are not compatible, the second stream will not be placed in that tank until all contents have been removed and the liner has been replaced.

6.6.4 TA-16 Industrial Incinerator

Only potentially HE contaminated materials are disposed of at the TA-16 Industrial Incinerator. Wastes are carefully screened to minimize the amount of the HE in waste materials. Smoking is not allowed while handling waste to be incinerated.

6.6.5 TA-50 Storage Pad

Incompatible chemicals are segregated for storage at the TA-50 Storage Pad to prevent inter-reaction of wastes in the case of a leak.

TABLE 6-1

May 1, 1885
Amended: September 18, 1985

INSPECTION RECORD FORM
TA-50, Batch Plant

Inspected by:_____ Date:_____

Type:_____T_____ Time:_____

Item	Inspected for	Condition	Action/Date
DAILY - to be completed every day of operation			
Loading/Unloading	Spills and deterioration of area		
Communication Equipment	Proper functioning		
Piping/Valves	leaks, damage, poor seals		
Gauges - Pressure -Level -Temperature	Functioning and within operational limits		
Containment Structure	Spills, damage		
Eyewash/Safety Showers	Functioning		
WEEKLY - to be completed the first working day of the week			
Containment Structure	Integrity, leaks, paint spalling		
Integrity of Reaction Tank	Deterioration, leaks, corrosion		
Containers in Storage - Integrity - Labels	Open drums, leaks, corrosion Present - "Hazardous Waste" label and accumulation date		
Security	Integrity of doors/locks		
Warning Signs	Present, out-of-date, legibility		
Lighting	Proper functioning		
Pond	Functioning, leaking containers (if present)		

. Drypolcher, HSE-8, MS K490

TABLE 6-2

August 9, 1985
Amended October 3, 1985

INSPECTION RECORD FORM

FACILITY TA-50-37

Inspected by _____ Date _____

Type _____ Time _____

Item	Inspected for	Condition	Action/Date
DAILY - to be completed every day of operation			
Incinerator/equipment	Deterioration, malfunction		
Pumps, valves, pipes	Leaks		
Loading/unloading area	Spills and deterioration		
Tank by-pass	Leaks, deterioration		
WEEKLY to be completed on the first working day of the week			
Emergency waste feed cutoff system (incinerator)	Proper functioning		
Security	Integrity of doors and locks		
Signs	English/Spanish -Condition		
tank, integrity	Deterioration and leaks		
Container integrity	Deterioration and leaks		
Container covers	Closed and secured		
Containment structures	Integrity, leaks		
Seals on containers	Present -Hazardous Waste		
Tank hi-level alarm	Functioning		
Access gloves	Tears, deterioration		
Warning signs	Present		

cc: A. Drypolcher, HSE-8, MS K490

TABLE 6-2 (continued)

August 9, 1985
Amended October 3, 1985

INSPECTION RECORD FORM

FACILITY TA-50-37

Inspected by _____ Date _____

Type _____ Time _____

Item	Inspected for	Condition	Action/Date
MONTHLY - to be completed by the 10th			
SCBA gear	Deterioration, functioning		
Process floor	Cracks, spalling, coating		
Aisle space	Clear		

cc: A. Drypolcher, HSE-8, MS K490

TABLE 6-2 (continued)

August 9, 1985
Amended October 3, 1985

INSPECTION RECORD FORM

FACILITY TA-50-37

Inspected by _____ Date _____

Type _____ Time _____

Item	Inspected for	Condition	Action/Date
QUARTERLY - to be completed 10th of Oct., Jan., April, July			
Communication equip. (radio, telephones, comm. syst)	Functioning		
Protective clothing	Clean, complete, deterioration		
Medical supplies	Complete, deterioration		

cc: A. Drypolcher, HSE-8, MS K490

TABLE 6-2
(Continued)

INSPECTION RECORD FORM
FACILITY TA-50-37
ROOM 117

INSPECTED BY _____ DATE _____

TYPE _____ TIME _____

ITEM	INSPECTED FOR	CONDITION	ACTION/DATE
WEEKLY TO BE COMPLETED ON THE FIRST WORKING DAY OF THE WEEK			
Storage Containers			
- Integrity	Open drums, leaks, corrosion, aisle space, stack height		
- Labels	Present "Hazardous Waste" and accumulation date		
Pallets	Integrity, damage		
Area Warning Signs	Liability, damage		
Lighting	Functioning properly		
Ventilation	Functioning properly		

TABLE 6-3

May 1, 1985
Amended: January 23, 1986

INSPECTION RECORD FORM
FACILITY TA-54, AREA L

Inspected by _____ Date _____
Type _____ Time _____

Item	Inspected for	Condition	Action/Date
DAILY - to be completed every day of operation			
Communication Equipment	Proper Functioning		
Treatment Tanks	Level - At least 6" of free-board		
Loading/Unloading	Spills and deterioration		
Run-on/off control	Integrity, erosion and ponding		
WEEKLY - to be completed on the first working day of the week			
Storage Containers - Integrity	Open drums, leaks, corrosion, aisle space, stack height		
- Labels	Present "Hazardous Waste" and and accumulation date		
Safety shower and eyewash	Leaks, functioning		
Hose bib	Leaks, functioning		
Metal storage shed	Floor damage, liquid accumulation		
Road/Work Surfaces	Cracks		
Fence	Integrity, damage		
Gate Lock	Integrity, damage		
Wind Sock	Damage, functioning		
Pallets	Integrity, damage		
Area Warning signs	Out-of-date, damage, legibility		
Treatment Tanks	Leaks, damage		
Curbs/Pads(Treatment tank)	Rainwater accumulation/removal cracks, damage		
Lighting	Proper functioning		
Refrigerator (If wastes present)	Leaking/damaged containers		
Mixing Tank	Leaks, deterioration		

Cy: A. Drypolcher, HSE-8, MS K490

TABLE 6-3 (Continued)

May 1, 1985
Amended: January 23, 1986

INSPECTION RECORD FORM
FACILITY SAFETY INSPECTION
CHEMICAL WASTE OPERATION
TA-54, AREA L

Inspected by _____ Date _____

Type _____ Time _____

TO BE COMPLETED BY THE 10TH OF THE MONTH			
Item	Inspected for	Condition	Action/Date
SCBA's	good condition cylinders full		
Electical Generator	functioning		
Protective Clothing	complete, clean good condition		
Floors in storage building	cracks, spalling		
Spill equipment (absorbent, shovel, oversize drums)	complete		
Portable Pumps	clogging, corrosion frayed wires		

Cy: A. Drypolcher, HSE-8, MS K490

TABLE 6-3 (Continued)

May 1, 1985
Amended: January 23, 1986

INSPECTION RECORD FORM
FACILITY SAFETY INSPECTION
CHEMICAL WASTE OPERATION
TA-54, AREA L

Inspected by _____ Date _____

Type _____ Time _____

Item	Inspected for	Condition	Action/Date
QUARTERLY - to be completed every quarter			
Fire Extinguisher - Trailer	Expiration date		
Empty Drum Stack	Order, corrosion, leaks		
YEARLY			
Trailer	integrity, damages		
Overhead Power Line and Poles	sagging, pole damage		
Light and Pole	functioning, damage		
Dumpster	damage		
Treatment Tanks	excessive corrosion		

Cy: A. Drypolcher, HSE-8, MS K490

TABLE 6-4

QUARTERLY VEHICLE INSPECTION FORM

INSPECTED BY: _____ DATE: _____

ITEMS TO INSPECT	VEHICLE NUMBER
1. Brakes, foot	
2. Brakes, parking	
3. Wipers	
4. Washer	
5. Mirrors	
6. Seatbelts	
7. Sun Visors	
8. Door Locks	
9. Horn	
10. Tires	
11. High Beam	
12. Low Beam	
13. Running Lights	
14. Park Lights	
15. Turn Signals	
16. Tail Lights	
17. Brake Lights	
18. Back-up Lights	
19. License Lights	
20. Windshield	
21. Housekeeping	
22. Engine	

TABLE 6-4 (continued)
QUARTERLY VEHICLE INSPECTION FORM

INSPECTED BY: _____ DATE: _____

ITEMS TO INSPECT	VEHICLE NUMBER
Additional Requirements for Explosives Modified Truck	
23. Tie-down Straps	
24. Wheel Chocks	
25. Fire Extinguishers	
26. Spark Arresters	
Additional Requirements for Vacuum Pump Truck	
27. Hose, Visual Inspection	
28. Tank, Visual Inspection	

Comments:

TABLE 6-5

PAWS EQUIPMENT INSPECTION SCHEDULE FOR HEAVY EQUIPMENT

Date _____

EQUIPMENT DESCRIPTION: _____

CHECK:	OK	NO	METER HOURS
MOTOR OIL	____	____	START _____
COOLANT	____	____	FINISH _____
FUEL	____	____	
TIRES	____	____	
LIGHTS	____	____	
TURN SIGNALS	____	____	
BACK-UP ALARM	____	____	
CUTTING EDGE, TEETH	____	____	
INTERIOR CLEAN	____	____	

OTHER: _____

_____

_____

EQUIPMENT PERFORMANCE: OK ____ TROUBLES ____

IF TROUBLES WITH EQUIPMENT, EXPLAIN (IN YOUR OPINION WHAT IS WRONG):

_____

_____

_____

_____

TURN THIS FORM IN TO YOUR FOREMAN AT THE END OF YOUR SHIFT.

TABLE 6-6

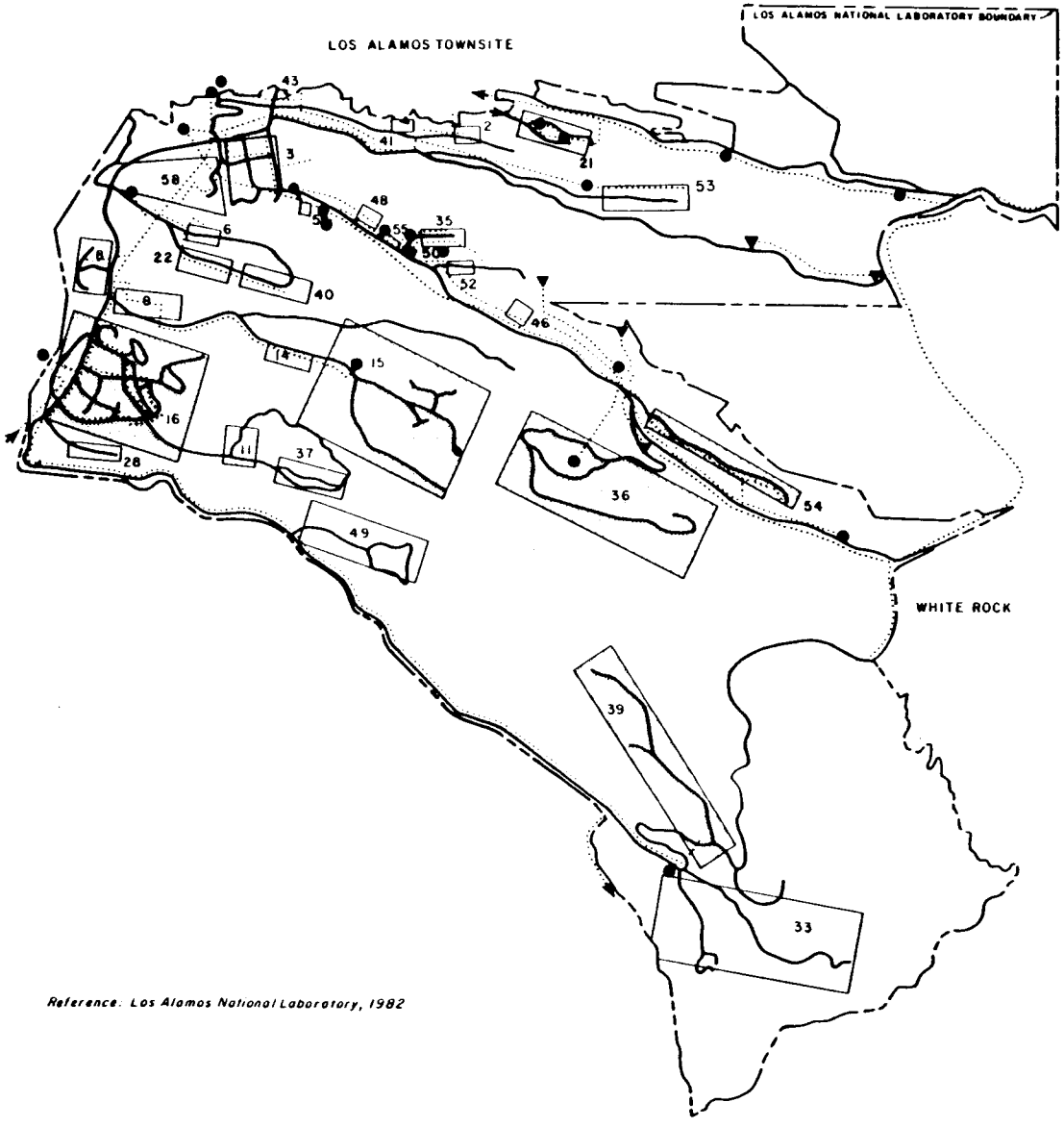
FIRE PROTECTION EQUIPMENT AT LOS ALAMOS HAZARDOUS WASTE FACILITIES

	Pull Box	Alarms Automatic Thermal	Automatic Smoke	Automatic Thermal Sprinkler System	Halon Exting. System	Fire Hydrants	Fire Exting.
TA-50 Batch Treatment System	X	X	X	X		X	X
TA-50 Modular Storage Units				X		X	X
TA-50 Waste Incinerator, and Room 117	X	X		X	X	X	X
TA-50 Storage Pad						X	X
TA-54, Area L						X	X

TABLE 6-7

WEEKLY INSPECTION ITEMS
TA-50 STORAGE PAD,
TA-50 MODULAR STORAGE UNITS

ITEM	INSPECTED FOR
Storage Containers	
- Integrity	Open drums, leaks, corrosion, aisle space, stack height
- Labels	Present "Hazardous Waste" and accumulation date
Safety Shower and Eyewash	Functioning, leaks
Hose Bib	Functioning, leaks
Fence	Integrity, damage
Gate Lock	Integrity, damage
Wind Sock	Functioning, damage
Pallets	Integrity, damage
Area Warning Signs	Legibility, out-of-date, damage
Lighting	Functioning properly



Reference: Los Alamos National Laboratory, 1982

EXPLANATION

- SUPPLY LINES
- STORAGE TANK
- WELL SITE
- 36 TECHNICAL AREAS
- SHADING INDICATES AREAS IN WHICH WASTE MANAGEMENT FACILITIES ARE LOCATED

N

1 0 1 MILE
SCALE

FIGURE 6-1

LOS ALAMOS
WATER SUPPLY SYSTEM

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

IT CORPORATION

DRAWN BY	LLF	CHECKED BY		DRAWING NUMBER	846510-B26
	10/17/84	APPROVED BY			

10 1983 HERCULENE ABB SMITH CO. PGH. PA

7.0 HAZARDOUS WASTE FACILITIES CONTINGENCY PLAN

This section presents the Los Alamos National Laboratory's Hazardous Waste Facilities (HWF) Contingency Plan (also referred to as the Contingency Plan) as required by 40 CFR §270.14(b)(7) (NMHWMR 302.A.4.b[1]) and specific requirements as stated in 40 CFR §264.51 through §264.56 (NMHWMR 206.B.10) as applicable. A copy of the working Contingency Plan is provided in Appendix R.

7.1 INTRODUCTION

Hazardous waste facilities (HWF) currently in operation are summarized in Table 7-1. The locations of the HWF are shown as the shaded areas on Figure 2-2. Overall responsibility for Hazardous Waste Management is with the HSE-7 Waste Management Group in the Health, Safety and Environment (HSE) Division (Figure 7-1). Generators of hazardous wastes are responsible for proper identification, segregation, and documentation of their wastes. Except for HE wastes, packaging, transportation, and final disposition of hazardous wastes are the responsibility of HSE-7 Solid Wastes Operations.

HE wastes are handled by Dynamic Testing (M) and Design Engineering (WX) Division groups whose central purpose is the design and testing of explosives.

The Laboratory maintains its own response forces to handle emergencies. Emergency resources available to the Laboratory include the Fire Department, the contracted services of the Mason-Hanger Protective Force (security), Pan American World Services (PAWS) Co. (maintenance), Los Alamos Medical Center, internal laboratory services including medical facilities, and minor external assistance from the Los Alamos County Police.

7.2 HAZARDOUS WASTE EMERGENCY RESPONSE RESOURCES

The Laboratory maintains its own response resources to handle emergencies. Interaction with outside agencies is limited for security reasons and because it is impractical to train these agencies to cope with the technical diversity of the Laboratory's operations such that they could safely contribute in an emergency. Response resources include personnel, emergency equipment, and communication systems.

7.2.1 Response Groups

The emergency response groups available to the Laboratory include the Fire Department, the contracted services of the Mason Hanger Protective Force (security), PAWS (maintenance), Los Alamos Medical Center internal laboratory services including medical facilities, and minor external assistance from the Los Alamos County Police. The services offered by these response groups are itemized on Table 7-2 and discussed briefly in the following. Each of the emergency response groups retains a current copy of the HWF Contingency Plan.

7.2.1.1 Medical Facilities

The Laboratory maintains its own medical facility, HSE-2 Occupational Medicine, to handle job-related injuries and to monitor employee health. Medical facilities include a staff of six physicians, two physician assistants, ten nurses, six x-ray technicians, and two laboratory technicians.

HSE-2 is supported by HSE-5, Industrial Hygiene. HSE-5 can provide exposure and treatment information via telephone access to Chemtrec and the National Library of Medicine, and via computer access to TOXLINE, CHEMLINE, and the Toxicity Data Bank.

Those cases which cannot be handled at HSE-2 would be forwarded to the Los Alamos County Hospital, where the Laboratory maintains a fully equipped decontamination room. The HSE-2 staff meets with the hospital's emergency staff monthly to go over procedures. In the event that a case is sent to the hospital, staff from HSE-2 provide assistance at the hospital.

7.2.1.2 HSE-3 Safety

HSE-3 reviews and approves fire protection procedures. They may assist in process shutdown and evacuation.

7.2.1.3 HSE-5 Industrial Hygiene

In addition to medical support, HSE-5 provides site field testing to determine the nature (nonradiological) and extent of contamination, provides information on correct handling of chemicals, and specifies protective clothing and equipment.

7.2.1.4 HSE-7 Waste Management

The HSE-7 Waste Management group provides cleanup operations and proper treatment and disposal of hazardous materials and supervises emergency response operations. Since HSE-7 normally handles hazardous waste, the group is highly trained and equipped. This group represents the nucleus of the hazardous waste emergency response.

7.2.1.5 HSE-8 Environmental Surveillance

Provides field surveys of soils, water, air and biota to determine environmental effects of exposure. The group includes expertise in geohydrology.

7.2.1.6 Fire Department

The Fire Department provides fire protection for the Laboratory as well as the communities of Los Alamos and White Rock. The department includes 98 personnel.

In the case of an emergency within the Laboratory, the Fire Department is under the direction of the Laboratory response team.

The Fire Department personnel make regular tours of the Laboratory facilities to detect and discuss hazards associated with individual facilities and are instructed in hazardous material handling and emergency procedures. They are aware of the hazardous waste practices at the Laboratory, and are well equipped to handle any credible emergency situation.

7.2.1.7 Mason & Hanger Protective Force (Pro-Force)

The Pro-Force consists of more than 300 personnel who are responsible for Laboratory security. The security force is provided by Mason & Hanger, Silas Mason, under contract to the Laboratory.

During an emergency, the Pro-Force activities include maintenance of security, direction of vehicular traffic within the Laboratory, and control of access to the emergency site. The Pro-Force maintains the necessary equipment to perform these functions, such as crowd control equipment, patrol cars, etc.

7.2.1.8 Pan-Am World Services (PAWS)

Pan Am World Services (PAWS) provides a maintenance support force on contract to the Laboratory. This support force is under the Laboratory's direction in an emergency. PAWS conducts inspections of Laboratory equipment, maintains equipment, and participates in emergency cleanup.

7.2.1.9 Los Alamos County Police

In keeping with the principle of handling emergencies internally, the Los Alamos County Police have only minimal interaction with the Laboratory in an emergency. That interaction is limited to traffic control on DOE roads with public access. The limits of interaction are included in a signed agreement, a copy of which is included in Appendix R. There are no agreements with other agencies.

7.2.2 Emergency Equipment

A list of emergency equipment for use at the Laboratory and the location of this equipment is provided in Table 7-3. The equipment immediately available for use is located at TA-54, Area L, the TA-50 batch treatment system and the TA-50 waste incinerator. Because of the proximity of the TA-50 modular storage units and the TA-50 storage pad to other TA-50 facilities, emergency equipment from the chemical waste incinerator and batch treatment plant is available for use at the modular units and the storage pad. HSE-8 also has an extensive equipment inventory.

In addition, PAWS, the Fire Department, and HSE-2 maintain emergency equipment. Major emergency facilities are shown in Figure 7-2.

7.2.3 Communications

Effective emergency response at Los Alamos National Laboratory requires an efficient communication system which will integrate all personnel into the emergency response procedure.

There are two central alarm systems (CAS) at the Laboratory; an emergency CAS and a mechanical CAS. The emergency CAS is activated by:

- Telephone communication (9-911)
- Automatic fire alarms

- Manual pull alarms
- Computer interface (to warn of critical events or loss of confinement at selected facilities)
- Break-in security
- Radio communications

The emergency CAS is located in the central control room in Building 440 in TA-3. The control room is manned 24 hours a day and is equipped with telephones, medium and short range radios, direct line telephones, a National Warning System (NAWAS) station, and an emergency power system. The fire alarm board at the control room gives the location of automatic and pull fire alarms.

The maintenance CAS board, located in Building 223 at TA-3, is manned by PAWS personnel 24 hours a day. The maintenance CAS board interfaces with computers which monitor critical equipment throughout the Laboratory. Activation of an alarm triggers a call-out procedure to provide maintenance personnel and management supervision to correct the malfunction. The maintenance CAS does not directly trigger an emergency response.

Internal communication systems at the Laboratory include:

- Centrex telephone system
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Telephone/radio paging

Off-site communications with Federal, state, county and other agencies are maintained by the following:

- Centrex telephone system
- Private telephone lines (if Centrex fails)
- Medium range radio nets (30-60 miles)
- Limited range radio nets (3-10 miles)
- Two National Warning System Stations (NAWAS)
- Direct line to KRSN (local radio station)
- Two-way hand held radios
- Microwave transmitter to Santa Fe central telephone office (Centrex)

All alarm systems and internal and external communication systems are available for use by all employees.

Activation of the emergency CAS automatically alerts the Fire Department, the Mason Hanger Pro-Force, and the CAS dispatcher. For hazardous waste emergencies, the CAS dispatcher notifies the Emergency Preparedness Office Duty Officer (EPODO) who notifies upper management of the problem.

HSE-7 has access to all communications systems including a short wave radio base station located at TA-50-1. During normal working hours, communications to support response groups can be handled by HSE-7. During off hours, the EPODO contacts support groups.

7.3 NONSUDDEN RELEASES

Nonsudden releases include those incidents which, if uncontrolled, impact the environment over a long period of time. Such incidents include minor leaks of containers, loss of integrity of secondary containment and incomplete treatment.

7.3.1 Responsibility

Correction of nonsudden release shall be the responsibility of the HSE-7 Waste Management Group Leader and can be handled with normal maintenance and management procedures. Correction methods for nonsudden releases that have resulted in environmental contamination shall be coordinated with the New Mexico Environmental Improvement Division (NMEID).

7.3.2 Credible Nonsudden Releases

Credible nonsudden releases, their detection and correction are given in Table 7-4. Not all failures can be predicted. In general, the response to nonsudden release will (1) contain the release, (2) correct the cause of the release, and (3) clean up any release to a level that protects health and the environment.

7.3.3 Nonsudden Release Surveillance

In addition to routine inspection and site-specific sampling and testing, the Laboratory maintains an area-wide environmental monitoring network maintained

by HSE-8. Routine monitoring for radiation, radioactive materials, and chemical substances on the Laboratory site helps to fulfill the Laboratory's policy to protect the general public, employees, and the environment.

Monitoring and sampling locations for various types of measurements are organized into three main groups. Regional monitoring stations are located within the five counties surrounding Los Alamos County. They are placed up to 80 kilometers (50 miles) from the Laboratory, and serve to determine background conditions. Perimeter stations are located within approximately four kilometers (2.5 miles) of the Laboratory boundary, and document conditions in residential areas surrounding the Laboratory. On-site stations are within the Laboratory boundary, and most are accessible only to employees during work hours.

The types of routine surveillance conducted at these stations includes radiation measurements and collection of air particulates, waters, soils, sediments, and foodstuffs for subsequent analysis.

Additional samples are collected to gain information about particular events such as major runoff events and nonroutine releases. Data are used for comparison with standards, background radiation levels, and dose calculations.

7.4 SUDDEN RELEASES

This section deals with incidents involving sudden release such as spills, fires, or explosions which pose a significant threat to human health or the environment and includes the release of hazardous materials and hazardous wastes. Hazardous materials are chemical substances that become a regulated waste as the result of the incident and can include hazardous raw materials that are spilled, products of combustion, and products of uncontrolled reactions.

7.4.1 Hazardous Waste Emergency Coordination

The EPODO in conjunction with HSE-7 is responsible for coordinating all emergency response measures involving sudden releases of hazardous wastes with the exception of the thermal treatment facilities at TA-14, 15, 16, 36, and 39. HE waste handling is the responsibility of M and WX divisions, who have

developed Standard Operating Procedures (SOPs) based on safe handling practices designed to eliminate the risk of fire and explosions. Unplanned detonation or combustion of HE renders the HE waste nontoxic. In some cases, residuals contain barium. Cleanup of barium contaminated areas due to unplanned detonations shall be coordinated with the EPODO.

The EPODO can be reached during working hours by contacting the Emergency Management office (7-6211) or the CAS Dispatcher during off hours.

The EPODO shall respond to all incidents involving the release of hazardous wastes including spills, fires, or explosions; assess the possible hazards to human health or the environment; and use whatever response group or emergency equipment needed to control and contain the wastes.

7.4.2 HWF Emergency Contingency Plan

This section defines the guidelines used to initiate the HWF Emergency Contingency Plan and the resulting actions taken.

7.4.2.1 Guidelines for Implementation

The decision to implement the HWF Emergency Contingency Plan depends upon whether or not an imminent or actual incident could threaten human health or the environment. The following guidelines shall be used by the EPODO in making the decision whether or not to institute the HWF Emergency Contingency Plan.

The HWF Emergency Contingency Plan could be implemented in the following situations involving hazardous wastes or hazardous materials:

Spills

- A hazardous waste or hazardous material spill cannot be contained with secondary containment or application of absorbents,
- Precipitation threatens to move spilled material off site,
- A hazardous waste or hazardous material spill causes the release of flammable material, creating a fire or explosion hazard,

- A hazardous waste or hazardous material spill results in toxic fumes which threaten human health, or

- An earthquake or other natural disaster threatens containment integrity.

Explosions

- An unplanned explosion involving hazardous wastes occurred (except at TA-14, 15, 16, 36, and 39), or

- An imminent danger exists that an explosion involving hazardous wastes or hazardous material could occur.

Fires

- Any fire involving hazardous wastes or hazardous material (except planned burning of HE waste), or

- Any building, grass, forest, nonhazardous waste fire that threatens to ignite hazardous wastes.

7.4.2.2 Emergency Notification

Immediately upon discovery of an imminent or actual incident involving hazardous wastes or hazardous materials, the EPODO will be notified first. In the case of fire involving hazardous wastes or hazardous materials, this is superceded by the Laboratory fire alarm system. A fire is reported by dialing 9-911, activation of automatic alarms, or activation of a fire pull box. All fire alarms simultaneously alert the CAS Dispatcher, the Fire Department, and the Mason and Hanger Pro-Force. For fire involving hazardous wastes, hazardous materials, or hazardous waste facilities, the CAS Dispatcher shall contact the EPODO (Figure 7-3).

During off hours, all incidents involving hazardous wastes or hazardous materials shall be reported to the CAS Dispatcher, who will contact the on-call EPODO.

The EPODO shall proceed to the incident and assess the nature of the problem. On an as-needed basis, the EPODO shall contact response groups directly or instruct the CAS Dispatcher to contact them or contact the HSE-Duty Officer (HSE-DO) who will notify the appropriate HSE Groups. Table 7-2 shows the assistance available from each emergency response group. The EPODO will use this list as criteria to determine which groups to contact in an emergency.

Each response group maintains an on-call person and/or a call-down procedure to answer emergencies.

Because the initial observer may not be able to recognize the involvement of hazardous materials, the EPODO shall be notified of any incident as described in Section 7.4.2.1. The EPODO shall use whatever means available including the assistance of other response groups, computer data searches, and sampling to determine if a hazardous waste is generated. HSE-5 and HSE-8 have the expertise to determine the nature and extent of contamination, the chemicals involved in the incident, and the characteristics of the hazardous waste.

7.4.2.3 EPODO Actions

Upon notification of an incident, the EPODO shall:

1. Proceed directly to the site;

2. Assess the nature of the incident, and quantities and types of hazardous wastes or hazardous materials involved; and

3. Based on the guidelines in Section 7.4.2.1 of the Contingency Plan, determine if implementation of the HWF Emergency Contingency Plan is warranted.

Upon the decision to implement the HWF Emergency Contingency Plan, the EPODO shall perform, in this order, the following actions:

1. Assess the hazards to human health and the environment including both direct and indirect effects such as generation of toxic, irritating, or asphyxiating gases, hazards of runoff of fire water or treatment chemicals. The EPODO will use the guidelines in Section 7.4.2.1 to assess the hazards to human health and the environment. If any of the criteria under Section 7.4.2.1 are met, evacuation of the immediate area will be initiated.

2. Determine if evacuation of the local area is advisable, and if so, immediately notify appropriate response groups and/or the Los Alamos County Police.

3. Notify required response personnel and DOE LAAO by phone, radio, or through the CAS Dispatcher in the case of a spill or incident other than fire. In the case of fire, since the fire fighters have already responded,

he shall confirm that the Fire Department Officer-in-Charge is aware of the hazardous waste or hazardous materials involvement and the special hazards associated with the wastes.

4. Warn the remaining personnel of imminent or actual hazards using the radio and/or the PA system.

5. DOE LAAO through the Emergency Management Office will notify the New Mexico Environmental Improvement Division (505) 827-9329, and the National Response Center (800) 424-8802, reporting:

   - Name and telephone number of the reporter

   - Name and address of the facility

   - Time and type of incident

   - Name and quantity of materials involved, to the extent known

   - The extent of injuries, if any

   - The possible hazards to human health or the environment outside the facility

6. Advise the response groups as needed to minimize personnel exposure and expedite control; and

7. For the Batch Treatment Plant and Controlled Air Incinerator, where the emergency stops operations, HSE-7 personnel must monitor for leaks, pressure buildup, gas generation or equipment ruptures. The instruments that are monitored during shutdown and what they are monitored for are shown on Table 7-6 for the Batch Treatment Plant and Table 7-7 for the Incinerator.

Once control of the emergency is established, the EPODO shall:

1. Arrange for site cleanup

2. Provide for treating, storing, or disposing of recovered wastes, contaminated soil or contaminated surface waters

3. Provide for decontamination of equipment as needed

4. Replace and/or repair equipment as needed

5. Conduct testing as needed to verify successful cleanup

6. Within 15 days of the incident, submit to the Regional Administrator and Environmental Improvement Division the report described in Section 7.10.

7.5 SPECIFIC EMERGENCY RESPONSE PROCEDURES FOR HAZARDOUS WASTE FACILITIES

The following section summarizes the guidelines for handling emergencies.

7.5.1 Chemical Spills

Hazardous wastes are handled and stored in small containers, lab packs, 55-gallon drums, and "tuff-tanks." The individual volumes handled are small. Handling of hazardous materials may involve truckload quantities of material such as solvents, fuels, acids, and bases.

The general steps in handling hazardous wastes are:

- Containment including spreading of absorbents or forming of temporary dikes,
- Waste pickup and packaging in sound containers, and
- Decontamination followed by testing to assure adequate clean-up.

The emergency preparedness procedures related to flammable organic solvent spills call for stabilization of the spilled material with the organic solvent spill kit. Other chemical spills are to be stabilized using the acid and caustic spill kits or by the addition of absorbents such as vermiculite. Personnel protective equipment will be worn during spill control and cleanup. The stabilized material will be treated as hazardous waste. Runoff which might occur from spills outside containment areas during precipitation must be contained and handled as a hazardous waste unless analyzed and found to be nonhazardous. Temporary dikes can be constructed to contain runoff.

7.5.1.1 Spill Control Procedures

Vermiculite or prepackaged spill kits will be used to control all chemical spills except hydrofluoric acid spills. Vermiculite is compatible with all chemicals except fluorine and hydrofluoric acid. A hydrofluoric acid spill will be neutralized by carefully adding calcium hydroxide to the spill. After an excess of calcium hydroxide has been added and the reaction has

ceased, the resulting solution will be cleaned up using vermiculite. Vermiculite and calcium hydroxide are stored at all the treatment and storage facilities at the Laboratory. Prepackaged spill kits for acid, caustic, and solvent spills are kept on site at treatment facilities. Kits currently in use are distributed by J.T. Baker under registered trademarks NEUTRASORB, NEUTRACIT, and SOLUSORB for acid, caustic, and solvents, respectively. The kits contain proprietary blends of proper agents for neutralizing and absorbing spills, in addition, they include safety glasses, gloves, scoops, bags, ties and labels. Acid and caustic spill kits contain indicating-type acid and caustic neutralizers; neutralization of spilled material is indicated by color change. Remaining salts can be safely picked up and disposed of. Solvent spill kits contain adsorbents which suppress vapors and raise the flash point of the resulting mixture.

DOT 17H 55-gallon drums will be used to collect all spilled material and contaminated absorbent. There are many drums of this type, located at all treatment and storage facilities at the laboratory. For corrosives, the drums will be lined with polyethylene drum liners, if necessary, to prevent corrosion of the metal drums. The list of emergency equipment (Table 7-3) shows the equipment available at each area to be used to control a spill. The ultimate disposition of any contaminated absorbent or waste material will be decided by HSE-7 according to permit conditions and RCRA standards. The material will be temporarily stored at one or more of the permitted hazardous waste storage areas at the Laboratory.

Decontamination will be accomplished at the spill site. After the spilled material has been absorbed by vermiculite, the material will be drummed. If the spill occurs on a cemented area, water or an appropriate solvent will be used to clean the area and this liquid will be adsorbed onto vermiculite and drummed.

A composite sample will be taken of the vermiculite used to adsorb the final waste water. No contamination should be present in this sample. If contamination is present, the procedure will be repeated (i.e., clean the area and collect and analyze a composite sample). The composite sample will be taken from a drum using a thief or trier as specified in SW-846.

If the spill occurs on soil, any free liquid present will be adsorbed onto vermiculite and the resulting material will be drummed. The contaminated soil will be dug up and drummed. For a spill of less than one gallon, the visibly contaminated dirt plus a sufficient amount of dirt around the spill site will be dug up. For a spill of more than one gallon, the contaminated dirt plus the perimeter dirt will be drummed and a sample taken of the perimeter dirt using the same method as discussed for the vermiculite sample.

There will be no sampling for a spill in a sealed storage area. Once all visible signs of contamination have been removed, it will be simple to verify any remaining contamination because the floors are sealed with epoxy. In addition, sealed storage areas have secondary containment structures that will control potential spills. At closure, if there is any residual contamination, it will be removed.

If a spill is from a known source, the waste will be analyzed for materials present in that container. Analytical procedures specified in Table 7-9 will be used. If the spill is from an unknown source, the chemical composition will be determined by using the parameters and test methods specified in Table 7-9.

7.5.2 Fire

Depending on the size of the fire and fuel source, portable ABC fire extinguishers may be used to put out fires. However, the Laboratory is discouraging the use of portable fire extinguishers by employees and encouraging the immediate evacuation and notification of the Fire Department. The person fighting the fire must wear appropriate protective equipment. If the fire spreads or increases in intensity, all personnel should evacuate to an upwind point at least 100 yards away from the fire. For any fire involving hazardous waste, the EPODO must be contacted immediately, and he will alert all necessary emergency management personnel. The Fire Department is automatically alerted when the CAS is activated. The EPODO should remain near the site, but at a safe distance, so he can advise the personnel responding to the fire of the known hazards. The EPODO is familiar with RCRA provisions, spill response, and emergency actions (Section 8.0) and therefore, is qualified to

advise firefighting personnel of the potential hazards involved. Upon arrival at a fire, the Fire Department Officer-in-Charge will be in command of fire fighting. He will accept and evaluate the advice of Los Alamos personnel and emergency management organization members, but he will retain the responsibility to select the fire fighting methods and tactics. The EPODO will be in overall control of the Laboratory's emergency response efforts until the emergency is terminated.

7.5.3 Explosion

In the case of explosions, all personnel will immediately evacuate the area. Any injured personnel will be immediately transported to the Medical Department for treatment. The EPODO must be contacted immediately upon activation of the CAS, and then he must alert all necessary emergency response personnel. The Fire Department is notified automatically upon CAS activation. The EPODO will remain near the site, but at a safe distance, so he can advise the personnel responding to the explosion of the known hazards.

Upon arrival at the site, the Fire Department Officer-in-Charge will be in command of fire fighting if required. He will accept and evaluate the advice of Los Alamos personnel and emergency management, but he retains the responsibility to select the fire fighting methods and tactics. The EPODO will be in overall control of the Laboratory's emergency response efforts until the emergency is terminated.

7.5.4 Exposure

Chemical material in the eye or on the skin will be washed either with the entire contents of the portable eye wash station or for at least 15 minutes. The eyelids will be held open during washing. The injured person will then be quickly transported to the Medical Department for evaluation. If possible, the chemical material involved in the injury will be ascertained and the information given to the Medical Department.

Other potential chemical exposures will necessitate evacuation if anyone notices any of the following conditions:

- Irritation of the eyes, breathing passages or skin,
- Difficulty in breathing, or
- Nausea, light-headedness, vertigo, or blurred vision.

The affected person will be transferred to the Medical Department and the HSE-5 Group representative will attempt to ascertain what, if any, chemical exposure occurred and what corrective measure is appropriate.

7.5.5 Flood

The U.S. Army Corps of Engineers has documented that Los Alamos National Laboratory's waste management facilities are not located within the 100-year floodplain. Appendix E contains this documentation.

7.6 EVACUATION

A facility will be evacuated upon the voice command of "evacuate the area," or upon the sounding of the evacuation alarm, or upon the fire alarm.

7.6.1 Evacuation Plan

Emergency situations may warrant the shutdown and evacuation of an area(s) or building(s) in order to protect personnel and property, to anticipate the emergency condition, or to enhance the appropriate response. Table 7-8 shows the criteria for evacuation, persons responsible for initiating evacuations, and reentry conditions. The TA-54, Area L evacuation route is shown in Figure 2-4. Building evacuation routes for the TA-50 batch treatment system and TA-50 incinerator building are shown in Figures 7-4 and 7-5. The evacuation route for TA-50 (including the modular storage buildings and waste storage pad) is shown in Figure 2-3.

To initiate building evacuation, the evacuation alarm is sounded and/or the public address system is used. The evacuation alarm, which is more suitable for evacuation of the whole facility, is a steady, continuous, audible signal. This alarm cannot be silenced and reset by site personnel. The Fire Alarm Maintenance Section at 667-4027 and the Fire Department Platoon Chief at 667-7026 can silence and reset the alarm.

To evacuate a portion of the building, the public address system is more appropriate. The PA system will notify the occupants of the area to be evacuated, and additionally, will advise personnel in the rest of the facility of the existence of a problem in that specific area.

Upon initiation of an evacuation, either via the PA or evacuation alarm, all personnel are to leave the specified area and go to the muster area, turning off all equipment that could contribute to the hazard if left unattended.

In the event of an evacuation of only a portion of the building, one of the out buildings, or outlying work areas, the Group Leader will designate a control point at the closest and/or the most convenient location. This area will be outside the affected area and will serve as a muster point and provide control of the affected area to prevent further spread of the hazard.

Sweep Team personnel will remain in the area for a visual inspection of all the affected work areas, laboratories, and offices. At least two persons will do the sweep to insure that if an injured person is found or if a single person is fighting a small fire, turning off equipment or activating fire suppression systems, one sweep team member can give assistance while the other reports to the muster area or control point to obtain additional aid.

If the building is evacuated during normal working hours, the secretary will remove the personnel attendance roster that is posted near the secretary's desk, take it to the muster area, call roll, and report the personnel accounting to the Group Leader. During second or third shift operations, the lead engineer will be responsible for evacuation and roll call. The evacuation procedure follows:

- Group Leader determines cause and probable extent of hazard.
- Group Leader will sound the evacuation alarm or make an announcement on the PA system.
- Group Leader will designate an assembly area if other than muster area.
- Group Leader will notify the on-call EPODO.
- Personnel will shut down equipment that might contribute to the hazard.
- Personnel will activate fire suppression systems.

- Personnel will not remain in affected area except to assist injured personnel.
- Personnel will report to the muster area or designated control point.
- Roll call (general evacuation) or personnel accounting (partial evacuation).
- Building or Area sweep by assigned personnel.

For a small scale evacuation, the Group Leader takes control. For a large-scale evacuation, the CAS will be activated, the EPODO will be notified and will be responsible for the evacuation.

7.6.2 Process Shutdown

Personnel are instructed to shut down equipment prior to evacuating a building unless an immediate building evacuation is announced. To ensure efficient shutdown, training and exercises in process shutdown are required. In the case of an immediate evacuation, a selected team may shutdown designated equipment in an evacuated area. The team will be equipped with the proper equipment, clothing and breathing apparatus. If present, HSE-1, HSE-3, and HSE-5 will provide advice and assistance. Process shutdown procedures only apply to the TA-50 batch treatment system and waste incinerator and the TA-16 Industrial Incinerator. Process shutdown procedures are as follows.

7.6.2.1 TA-50 Batch Treatment System

The Batch Treatment System will be operated in accordance with current standard operating procedures (Appendix M-2). If a fire or evacuation alarm sounds during the operation of the Batch Treatment System, the operating crew will initiate a process shutdown. Because the process is a batch treatment, cessation of treatment is adequate to bring the process to a safe condition. In general, the process shut should include the following:

- Shutdown of the waste pump discontinuing waste transfer or circulation,
- Shutdown of treatment chemical feeds,
- Shutdown of steam to the reactor jacket, if any,

- Shutdown cooling water only if there is a risk of contamination of the water with waste (continued cooling removes residual heat from the system), and

- Allow the reactor mixer to operate unless its operation poses a unique hazard (operation helps remove heat and prevents stratification).

7.6.2.2 TA-50 Waste Incinerator

If a fire or evacuation alarm sounds during the operation of the controlled air incineration process, the operating crew will initiate a process shutdown in accordance with the current Standard Operating Procedures (Appendix Q). Three logic sequences are provided to shut down the process in a safe and orderly manner.

- Controlled Shutdown - initiated when there is potential for significant damage to minor process components. This is also the normal shutdown mode at the completion of a run. When controlled shutdown is initiated, feeding of waste to the incinerator is stopped and a programmable set-point generator is activated that directs remote set-point inputs to the temperature controllers, causing a gradual decrease in chamber temperatures. Switches internal to the set-point generator cause an orderly-timed shutdown of process components.

- Fast Shutdown - initiated for conditions that could likely result in loss of containment or damage to major process components. Waste feeding is stopped. Following a two-minute timed interval following the last feeding of solid waste (immediate, if feeding liquid waste), the upper and lower chamber burners are shut down and the system valves and dampers are positioned so as to maintain a negative pressure in the system while minimizing flow through the system. Snuffing steam is introduced into the lower chamber. The two-minute delay when feeding solid waste allows for the ignition of pyrolitic gases formed immediately after feeding.

- Scram Shutdown - initiated at the discretion of an operator. The chain of events are identical to the fast shutdown except that the sequence is not delayed when feeding solid waste. Scram buttons are located at the incinerator and in the control room.

  The last two shutdown modes are potentially destructive to the incinerator refractory and are initiated only when the consequences of not shutting down are greater

than the consequences to the incinerator during a scram or fast shutdown. It is the responsibility of the operating personnel and the process lead engineer to assess any situation and initiate the proper process shutdown sequence.

7.6.2.3 TA-16 Industrial Incinerator

If a fire or evacuation alarm sounds during the operation of the TA-16 Industrial Incinerator the operating crew will initiate a process shutdown. The TA-16 incinerator is equipped with automatic and manual controls for shutdown of burners. Burners may be shut down manually by tripping a single switch. Automatic shutdown of the burners will occur on occurrence of a power failure, limit failure, or flame failure.

7.7 SALVAGE AND CLEANUP

The affected area will be surveyed by appropriate representatives from HSE Groups before salvage, cleanup and return to normal operations. Visual inspections of the affected area will be supplemented by sampling to determine whether cleanup is complete. After determination of any existing hazards from toxic or hazardous gases or fumes, electrical hazards, or other unsafe conditions, personnel or selected teams, equipped with proper breathing apparatus and protective clothing, will reenter the area to perform designated tasks to affect decontamination, repairs, and salvage to allow the return to normal operations. After an emergency, the EPODO will:

- Provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion. Contaminated material will be treated as a hazardous waste and temporarily stored at one of the permitted hazardous waste storage areas at the Laboratory. HSE-7 will be responsible for determining the final disposition of the waste. This determination will be made in compliance with the permit and RCRA standards.

- Remain at the site to ensure that no waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed.

- Ensure that emergency equipment is cleaned and fit for its intended use before operations are resumed. Equipment will be visually inspected and sampled to

determine the type and degree of contamination and appropriate cleanup measures will be used.

Prior to resuming operations, appropriate local authorities will be notified that cleanup procedures are completed and emergency equipment is cleaned and fit for its intended use.

Damage assessment and recovery shall be performed within the reporting and investigative requirements of DOE Order 5484.1 (Appendix R). The EPODO has general responsibility for coordinating post-emergency actions, particularly during the time period immediately after the emergency. Such actions include cleanup operations, repair of vital equipment, or interim hazard-removing operations (such as demolition of unstable walls). The services of the affected operational organizations, HSE Division, PAWS, and other on-site talent will also be utilized to estimate cleanup costs and operational impact. The EPODO declares the end of the emergency; an Incident Report is filled out, and the HSE-7 Group Leader and his staff review emergency actions.

7.8 POST-EMERGENCY ASSESSMENT

When the emergency is over, the causes of the emergency and the effectiveness of the response are investigated, in order that future emergencies may either be prevented, or that the response to them may be more effective. Following each event requiring the implementation of the HWF Contingency Plan, the EPODO shall meet with representatives of all response functions to determine the adequacy of the response.

7.9 EMERGENCY RECORDS

The details of any incident that requires implementation of the HWF Emergency Contingency Plan must be noted in that facility's log book. This record must include the time, date, and full description of the incident.

7.10 EMERGENCY REPORTS

Any emergency that requires implementation of the HWF Emergency Contingency Plan will be reported in writing within 15 days to the EPA Regional Administrator and to the New Mexico Environmental Improvement Division (EID).

The report shall include the following data:

- Name, address, and phone number of owner or operator
- Name, address and phone number of the facility
- Date, time, and type of incident (e.g. fire, explosion, spill)
- Name of material involved
- Quantity of material involved
- Extent of injuries (if any)
- Assessment of actual or potential hazards to human health or the environment
- Estimated quantity and disposition of material recovered from the incident

7.11 CONTINGENCY PLAN AMENDMENT

The Contingency Plan shall be reviewed by the HSE-7 Group Leader and immediately amended if determined to be inadequate to handle nonsudden and sudden releases, and whenever:

- The HWF permit is revised
- There is significant change in the design or operation of the HWF (i.e., waste quantities handled, handling techniques, or final disposition)
- The list of emergency coordinators changes
- The list of emergency equipment significantly changes
- Operating experience, drills, or technical review demonstrates the plan is inappropriate
- Actual implementation of the plan demonstrates inadequacies

The Contingency Plan shall have a cover sheet (Appendix R) noting the date of the last amendment. Each amendment date shall be initiated by the HSE-7 Group Leader authorizing the changes. Amendments shall be issued to all HWF Contingency Plan holders and shall include a cover letter that describes the plan changes and rationale for those changes.

TABLE 7-1

SUMMARY OF HAZARDOUS WASTE FACILITIES
LOS ALAMOS NATIONAL LABORATORIES

Technical Area and Building or Area Designation	Wastes Handled	Activity Description
TA-14, 15, 16, 36, and 39	High explosives (HE)	Thermal treatment facilities used to burn waste HE and HE-contaminated material
TA-50-01	Electrochemistry wastes Isotope separation wastes	Chemical batch treatment by neutralization, metal precipitation, and cyanide destruction
TA-50 Modular Storage Units	Shops department wastes Wastes from Basic and Applied Chemistry R&D programs	Storage of wastes prior to treatment, incineration
	Electrochemistry wastes Isotope separation wastes	
TA-50-37	Combustible liquids and solids, including chlorinated and fluorinated hydrocarbons, and carcinogenic materials	Waste incineration with flue gas treatment
TA-50-37 Room 117 Storage Area	Combustible liquids and solids, including chlorinated and fluorinated hydrocarbons, and carcinogenic materials	Storage/Staging area for incinerator
TA-50 Storage Pad	Shops department wastes Wastes from Basic and Applied Chemistry R&D programs	Waste storage prior to treatment, incineration, or shipment off-site
TA-54 Area L	Shops department wastes Wastes from Basic and Applied Chemistry R&D programs	Wastes are segregated and stored prior to treatment, incineration, recycling, or shipment off-site

TABLE 7-2

HAZARDOUS WASTE EMERGENCY RESPONSE GROUPS

Laboratory Controlled Response Group	Emergency Telephone	Assistance Available
HSE-2 Occupational Medicine	667-7878 (8 am - 5 pm) 988-0539 off-duty hours	Emergency medical treatment
HSE-3 Safety		Reviews and approves fire protection procedures. May assist in process shutdown and evacuation
HSE-5 Industrial Hygiene		Site evaluation - field testing to determine the nature and extent of contamination (nonradiological)
		Specify protective clothing and equipment
		Information services regarding hazards of wastes and treatment for exposure
HSE-7 Waste Management		Hazardous waste cleanup, handling, treatment, and disposal
HSE-8 Environmental Surveillance		Field surveys to determine spread of contamination and adequacy of clean up
		Meterological information
		Geohydrologic support
HSE-9 Health and Environmental Chemistry		Chemical analytical services
Fire Department	9-911	Firefighting personnel and equipment
		Ambulance and parametic service
Mason & Hanger Protective Force (Pro Force)	667-4437	Traffic Control
		Security

TABLE 7-2
(Continued)

Laboratory Controlled Response Group	Emergency Telephone	Assistance Available
Pan Am World Services	667-6196	Maintenance personnel and equipment
Non-Laboratory Controlled		
Los Alamos County Police	662-4176	Traffic control on DOE roads with public access
Los Alamos Medical Center*	662-4201	Medical Services

*Medical services related to hazardous wastes injuries provided under the direction of HSE-2.

TABLE 7-3

EMERGENCY EQUIPMENT

EMERGENCY EQUIPMENT AT THE TA-50 BATCH WASTE TREATMENT FACILITY (BWTR)

Fire Control Equipment:

2 fire extinguishers (B,C)

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

East wall of Batch Waste Treatment Room (BWTR)
West wall of adjoining room (Rm. 24) to west of BWTR

Fire alarm pull box

Description of General Capabilities:
Manually operated fire alarm which may be activated by any employee in the event of fire to notify Central Alarm Station.

Located on east wall immediately outside BWTR
1 automatic thermal alarm

Sprinkler system

Description of General Capabilities:
The sprinkler system is an automatic system which delivers a maximum of 200 psi of water spray through shower heads placed at locations which maximize fire suppression range capability. In the event of fire, this system should function automatically, requiring no manual assistance.

2 sprinkler heads in ceiling of BWTR, set off at 212°F

Communication Equipment:

Telephones

Description of General Capabilities:
Telephones for internal communication at the Laboratory and off-site communication with Federal, State, County and other agencies are available. A Centrex telephone system and a private telephone line (if Centrex fails) are available for use by all employees.

Located in Room 24 and at the BWTR
Telephones equipped with building-wide paging system

Evacuation alarm, single tone horn

Description of General Capabilities:
The evacuation alarm activates the central alarm system, which automatically activates the emergency response procedures.

TABLE 7-3
(Continued)

Spill Control Equipment:

Eight-inch curb around reactor and receiving tanks
Absorbent kept onsite

Description of General Capabilities:
The curbing and enclosed containment volume has been designed to satisfy containment requirements specified in 40 CFR 261.

Decontamination Equipment

Safety shower located next to reactor tank outside curbed area
Eye wash located on south wall next to hood

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

TABLE 7-3
(Continued)

EMERGENCY EQUIPMENT AT THE TA-50 CHEMICAL WASTE INCINERATOR AND ROOM 117 STORAGE AREA

Fire Control Equipment:

13 fire extinguishers (9C-CO; 4 A-water)

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

Manually operated fire alarm may be activated by any employee in the event of fire to notify Central Alarm Station.

The sprinkler system is an automatic system which delivers a maximum of 200 psi of water spray through shower heads placed at locations which maximize fire suppression range capability. In the event of fire, this system should function automatically, requiring no manual assistance.

Halon Extinguishing Systems are indicated to supplement automatic sprinkler systems which protect high value equipment, or suppress special hazardous operations or occupancies.

Location:
1 Mechanical Equipment Room 111
2 High Bay Room 112
2 High Bay Room 114
1 South of Library and Conference Room
1 Chemistry Laboratory Room 107
1 Process Engineering Laboratory Room 209
1 Office Area Room 202
1 Room 21
1 Room 117

11 Fire Alarm Pull Boxes connected to the CAS
Location:
1 Mechanical Equipment Room 111
1 High Bay Room 112
2 South of Library and Conference Room
2 High Bay Room 114
1 East of women's changing room
1 Process Engineering Laboratory
1 Office Area Room 202
2 Room 21

Automatic thermal alarm on inlet and exhaust of ventilation system
Automatic thermal sprinkler system throughout offices

4 Fire Hydrants
Location:
1 Northwest corner of Building 84
1 West of Building 69
1 Northeast of Building 37

Halon Extinguishing System, manual and ultraviolet in Room 115

TABLE 7-3
(Continued)

Communication Equipment:

Telephones throughout building with building-wide paging system

Description of General Capabilities:
Telephones for internal communication at the Laboratory and off-site communication with Federal, State, County and other agencies are available. A Centrex telephone system and a private telephone line (if Centrex fails) are available for use by all employees.

Radio located in Room 202

Spill Control Equipment:

Absorbent kept onsite
PCB room is bermed to handle all liquids stored
Have Spill Prevention and Containment Plan

Description of General Capabilities:
Containment is designed to handle all liquids stored. Absorbent is used in the event of a small spill.

Decontamination Equipment:

Showers
Emergency eyewash

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

TABLE 7-3

(Continued)

EMERGENCY EQUIPMENT - HSE-7 CONTROLLED

Spill Control Equipment: Located at TA-54, Area G

Heavy equipment available for emergencies may include
- 2 scrapers
- 1 bulldozer
- 1 tractor (front end loader)

Shovels
Absorbents (vermiculite) in combustibles storage shed

Description of General Capabilities:
The following pieces of heavy equipment will be used in the event of large spills. Small spills will be absorbed with absorbent.

Decontamination Equipment:

Small decontamination pit for heavy equipment
Showers (MD-11)

Other:

Change room with protective clothing (MD-11)
2-3 dozen respirators (particulates) (MD-11)
2 self-contained, portable air masks (MD-11)
2 emergency generators, portable
3 vehicles are available for evacuation of personnel:
- 2 sanfu
- 1 Jeep (with emergency equipment, e.g., coveralls, booties, tape, rope)

TABLE 7-3
(Continued)

EMERGENCY EQUIPMENT AT TA-54, AREA L

Fire Control Equipment:

1 fire hydrant located 30 feet south of site entrance to site
1 CO fire extinguisher located inside trailer at west end of site (B,C)
1 CO fire extinguisher located inside storage shed (B,C)
1 freeze-proof faucet located immediately east of shed

Description of General Capabilities:
These are portable units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications. May be used by any employee in the event of fire.

Spill Control Equipment:

Shovels
Oversized drums
Absorbent inside storage shed
Heavy equipment from Area G available for any emergencies at Area L
Bermed storage area

Description of General Capabilities:
The following pieces of heavy equipment will be used in the event of large spills. Small spills will be absorbed with absorbent.

Communications Equipment:

2-way radios are available to all personnel when in area
2-way radios are in all vehicles used for moving hazardous waste
Telephone located inside trailer

Description of General Capabilities:
External and internal Laboratory communications which may be used in emergency situations are listed.

Decontamination Equipment:

1 emergency shower and eye wash located immediately east of shed

Description of General Capabilities:
Safety showers and eye washes are used by personnel who receive a chemical splash to skin or eyes. Specific material safety data sheets for the chemical should be obtained prior to working with the chemical to determine if the application of water is indicated for decontamination.

Other:

2 self-contained, portable air masks located inside trailer

TABLE 7-3
(Continued)

SUPPLEMENTARY EMERGENCY EQUIPMENT

PAN AM WORLD SERVICES (667-6196)

Equipment	Number
A. Transportation	
1. Pickups, 1/2 through 3/4 ton	183
2. Trucks 1 through 3 ton	25
3. Powerwagon (E-20781 with welder (PN-30256) mounted on vehicle, CC-135	1
4. Buses (11-passenger)	2
5. Stationwagens	11
6. Vans, panels, and carryalls	24
B. Special Equipment	
1. Road grader, Champion, self-propelled blade, with radio	1
2. Grader, John Deere, self-propelled, with radio	1
3. Loaders, bucket, Melroe, Bobcat, 1/3 cubic yards	3
4. Loader, bucket, Michigan, 2-3/4 cubic yards	1
5. Loader, Fiat-Ellis, 3 cubic yards	1
6. Loader, bucket, Michigan, 2-1/2 cubic yards	1
7. Loader, bucket, Michigan, 3-1/4 cubic yards	1
8. Loader, bucket, Yale, 3 cubic yards, with radio	1
9. Loader, bucket, backhoe, International, 1-1/2 cubic yards	1
10. Loaders, bucket, backhoe, Case, 7/8 cubic yards	2
11. Loader, backhoe, Ford, 1 cubic yard	1
12. Snowplows, Bombardier, with blade	2
13. Bulldozer, D-8, Crawler	1
14. Bulldozers, TD-25, International	2
15. Scraper, Terex, self-propelled	1
16. Scraper, Fiat-Ellis, self-propelled	1
17. Bulldozer, 280, rubber-tired, with radio	1
18. Semitrailers	5
19. Lights, camp (electrical, plant, portable, 1000 to 5000 watts)	4
20. Power saws	14 (approx)
21. Flusher, street, 3000-gallon Truck, tanker, 500-gallon, International	1
22. Mobile transceivers (2-way, KOB-753)	64

TABLE 7-3
(Continued)

PAN AM WORLD SERVICES (667-6196)

Equipment	Number
B. Special Equipment (cont)	
3. Mobile transceivers (2-way, fire network)	7
4. Handsets (2-way)	8
5. Pageboys (1-way)	235
6. Welders, mounted on trailers and trucks	32
7. Fire tools (hand)	150 (approx)
C. Supplies	
1. Food	
Box lunches	150
D. Other Supplies	
1 Bedding	
Blankets	60
Bedrolls (disposable)	50
(from U.S. Forest Service in Santa Fe)	
2 Butane gas (25-gallon tanks)	4
3 Fuel and lubricants	
4 Miscellaneous supplies	

Manpower	
A. Fire Bosses	
1. Crew bosses	3
2. Straw bosses	12
B. Service Bosses	
1. Transportation boss	1
C. Specialists	
1. Cat bosses	2
2. Bulldozer operators	14
3. Clerks	10
4. Dispatchers	3
5. Mechanics	17
6. Power saw operators	8
7. Radio and telephone operators	10
8. Truck drivers	13
9. Tool sharpener	4

TABLE 7-3
(Continued)

PAN AM WORLD SERVICES (667-6196)

Manpower (cont)	Number
7. Radio and telephone operators	10
8. Truck drivers	13
9. Tool sharpener	4
D. Firefighters	
1. Organized crews (approximately 8 men per crew)	14 crews

TABLE 7-3
(Continued)

EMERGENCY EQUIPMENT AT THE FIRE DEPARTMENT
(9-911)

8 1000-gallons-per-minute pumper trucks
5 Minipumper trucks
5 1500-gallon tank trucks
4 Modular ambulances
1 Rescue vehicle
69 Self-contained breathing apparati
Various firefighting equipment
Emergency Medical Technician (EMT) medical equipment
98 Personnel with 81 hours MTA training
1 75-foot elevated platform

TABLE 7-3
(Continued)

EMERGENCY RESOURCES AT THE MEDICAL FACILITY (HSE-2)
(667-7878) 8 am - 5 pm
(988-0539) off-duty hours

Manpower

6 (2 casual) physicians
2 physician's assistants
10 (1 part-time) nurses
3 (2 casuals) x-ray technicians
2 laboratory technicians

Special Equipment - Portable

1 Radio base station (HSE-Div. net, being installed)
3 Walkie talkies (HSE-Div. net)
1 Portable cardiac monitor and defibrillator
1 Crash cart - emergency equipment
1 Portable physicians bag - drugs
1 Portable suction unit
5 Portable stretchers
1 Ambulance stretcher with straps
6 Wheel chairs
1 Manual resuscitator
6 Portable oxygen units
Several intravenous holders and solutions
6 Otoscope/opthalmoscope sets
1 Portable sphygmomanometer
10 Stethoscopes
Many contamination apparel
1 Eye irrigation system
Many inflatable limb traction splints
3 Industrial first aid kits
Many extrication and cervical collars
Many crutches and canes
Many suture sets

Supplies

Bedding and pillows
Rescue blankets
Burn blankets
Thermal/icing pouches
Multitrauma dressing and bandages

TABLE 7-3
(Continued)

EMERGENCY RESOURCES AT THE MEDICAL FACILITY (HSE-2)
(667-7878) 8 am - 5 pm
(988-0539) off-duty hours

Special Facilities - Nonportable

Completely equipped medical clinic with emergency lighting system, x-ray machine, and ambulance entrance. Contamination showers, protective clothing, and wound counters. Suction unit, electrocardiograph (12 lead), pulse rate monitor/recorder, primary response trauma kits are included.

Transportation

1970 Plymouth Sedan

TABLE 7-4

CREDIBLE NONSUDDEN RELEASES

Location	Credible Releases	Detection	Correction
TA-14, 15, 16, 36, 39	Toxic material leaching	Sand and soil samples	Removal and proper treatment or disposal of contaminated sand and soil
	Wind dispersion (prevented by procedures)	Visual	Operating procedures prohibit treatment under adverse weather conditions
TA-50-1	Incomplete treatment	Analysis	Continue or modify treatment (notify NMEID of modification and revise permit as required)
	Failure of containment	Inspection for leaking containers and tanks, inspect secondary containment for integrity	Maintenance or replacement of containment
Transport	Leaking containers	Inspection prior to transfer	Repackage in sound container
TA-50-37	Incomplete treatment	Analysis and stack monitoring	Modify treatment procedure prior to continuing (notify EID of modification and revise permit as required)
	Failure of containment	Inspection for leaking containers and tanks, inspect secondary containment for integrity	Maintenance or replacement of containment
TA-54 Area L, TA-50 Storage Pad, TA-50 Modular Storage Buildings, TA-50-37 Storage Area	Failure of containment	Inspection for leaks, inspect secondary containment for integrity	Maintenance or replacement of containment

TABLE 7-5
HAZARDOUS WASTE EMERGENCY COORDINATORS

(To be notified in succession)

Primary Coordinator	Laboratory Telephone	Telephone	Home Address
1. Donald Winston, Emergency Management	7-6211	662-2453	450 Navajo Road, Los Alamos, NM
Secondary Coordinators			
1. Ralph Koenig, HSE-7 Group Leader	7-7920/4301	662-2458	971 Alamo Road, Los Alamos, NM
2. J. L. Warren, HSE-7 Section Leader	7-5398	662-9639	1082 Big Rock Loop, Los Alamos, NM
3. Jerry Buchholz Section Leader	7-4301	672-3647	316 Potrillo Drive, White Rock, NM
4. Lee Borduin Section Leader	7-7391	455-2882	Rt. 1, Box 92G, Santa Fe, NM
5. Karen Balo Section Leader	7-6095	672-1369	400 Kolleen Court, White Rock, NM
6. W. M. Sanders Section Leader	7-4301	672-1931	214 Rover, White Rock, NM
7. B. R. Myers Staff Member	7-6095	672-9509	83 Mimbres, White Rock, NM
8. D. G. Vance Staff Member	7-4301	None at present	Rt. 14, Box 750, Santa Fe, NM
9. M. D. Salazar Staff Member	7-6095	753-4423	Rt. 2, Box 124, Espanola, NM

TABLE 7-5
(Continued)

Primary Coordinator	Laboratory Telephone	Telephone	Home Address
10. W. D. Moss Fac. Equip. Oper.	7-6094	662-5124	2932 Woodland, Los Alamos, NM
11. D. L. Volz Fac. Equip. Oper.	7-6094	662-3287	2146-C 43rd St., Los Alamos, NM
12. D. F. Salazar Fac. Equip. Oper.	7-6904	852-2456	P.O. Box 922, San Juan Pueblo, NM
13. L. D. Williams Fac. Equip. Oper.	7-6904	753-5782	P.O. Box 3754, Fairview, NM
14. L. L. Hupke PCB Disposal Coord.	7-7316	753-6984	P.O. Box 905, Los Alamos, NM
15. C. L. Gilley Tech. Liason Spec.	7-7391	662-4051	2173 B. 36th St., Los Alamos, NM
16. R. J. Payne Fac. Oper.	7-4301	672-9744	128 Aragon, Los Alamos, NM

TABLE 7-6

ITEMS MONITORED AT THE BATCH TREATMENT PLANT DURING EMERGENCY SHUTDOWN

Item	Monitored For
Piping/Valves	Leaks, damage, poor seals
Gauges	Acceptable range

TABLE 7-7

ITEMS MONITORED AT THE WASTE INCINERATOR DURING EMERGENCY SHUTDOWN

Item	Monitored For
Incinerator/Equipment	Functioning
Pumps, valves, pipes	Leaks
Tank by-pass	Leaks
Emergency waste feed cutoff system	Functioning
HEPA Filtration System	Functioning
Radiation	Levels

TABLE 7-8

EVACUATION DETERMINATION AND REENTRY

Reason for Evacuation	Determination Made By	Reentry Conditions
Fire	Fire or Evacuation Alarm; Group Leader; Alternate; Lead Engineer, Senior Staff Member present, or HWEC	Following survey by the Chief Fire Officer, HSE-1 and/or HSE-5, and R&D Supervision
E[illegible]losion	Same as above	Same as above plus HSE-3
L[illegible] of Ventilation	Group Leader, Alternate, Senior Staff Member, Lead Engineer, or Senior Technician	Following survey by HSE-1 and/ or HSE-5, and R&D Supervision
Los[illegible] of Electric Power	Same as above	Same as above
Exte[illegible]ive Contamination	Same as above or HSE-1 Representative	Same as above
Airb[illegible]e Contamination	Same as above or Rad Monitor	Same as above
Escap[illegible] or Release of T[illegible]c or Hazardous [illegible] or Fumes	Group Leader, Alternate, Senior Staff Member, Lead Engineer, Senior Technician, or HWEC	Same as above plus HSE-5
Bomb [illegible]reat	HSE-3 or Protective Force Representative, R&D Section Leader, Alternative, Senior Staff Member or Lead Engineer	Following determination by HSE-3 or Protective Force Representative and R&D Supervision

TABLE 7-9
WASTE ANALYSIS PARAMETERS AND TEST METHODS

Parameter	Test Method	Reference[1]
Ignitability	Pensky-Martens Closed-Cup Method	(L) SW1010 (L) ASTM D93-80
Reactivity	Numerous methods and tests[2]	(L,S) SW Section 2.1.3
pH	Electrometric	(L) SW9040
EP Toxicity	EP Toxicity Extraction[3] and Graphite Furnace Atomic Absorption Spectrophotometry	(L,S) SW1310
Arsenic		(L) SW7060
Barium		(L) SW7081
Beryllium		(L) SW7091
Cadmium		(L) SW7131
Chromium		(L) SW7191
Lead		(L) SW7421
Selenium		(L) SW7740
Silver		(L) SW7761
	EP Toxicity Extraction[3] and Manual Cold Vapor Technique	(L,S) SW1310
Mercury		(L) SW7470
EP Toxicity	EP Toxicity Extraction[3] and Gas Chromatography	
Organochlorine Pesticides		(L) SW8080
Chlorinated Herbicides		(L) SW8150
Mobility of Organic and Inorganic Waste Constituents	Toxicity Characteristic Leaching Procedure (TCLP)	(L,S) 40 CFR Part 268, Appendix I
Chemical Composition	Any of those methods in this Table plus the following:	
	Chemical analysis for volatile organic compounds using gas chromatography/ mass spectrometry	(L) SW8240

TABLE 7-9
WASTE ANALYSIS PARAMETERS AND TEST METHODS
(Continued)

Parameter	Test Method	Reference[1]
Chemical Composition (cont.)	Chemical analysis for semi-volatile organic compounds using gas chromatography/ mass spectrometry	
	- with packed column	(L) SW8250
	- with capillary column	(L) SW8270
Heat Value	Bomb calorimeter	(L) A006, ASTM D240
Organic Chlorine	Halide titration of combustion residue	(L,S) A004, ASTM D2361
Trichlorofluoromethane, Bromoform, Dichloro-difluoromethane	Chemical analysis for volatile organic compounds using gas chromatography/ mass spectrometry	(L) SW8240
Ash Content	Residue after combustion in muffle furnace	(L) A001, ASTM D482 (S) A001, ASTM D3174
Cyanide	Distillation and titration	(L) SW9010
Chrome	Colorimetric method for hexavalent chromium	(L) SW7196

TABLE 7-9
WASTE ANALYSIS PARAMETERS AND TEST METHODS
(Continued)

Parameter	Test Method	Reference[1]
Total Metals	Digestion and inductively coupled plasma method	SW3020
Arsenic		(L) SW6010
Barium		(L) SW6010
Beryllium		(L) SW6010
Cadmium		(L) SW6010
Chromium		(L) SW6010
Lead		(L) SW6010
Selenium		(L) SW6010
Silver		(L) SW6010
Thallium		(L) SW6010
Zinc		(L) SW6010
Mercury	Manual Cold Vapor Technique	(L) SW7470, (S) 7471
Free Liquids	Paint Filter Liquids Test	(S) 9095

(1) "A" refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, February 1984.

"ASTM" refers to American Society for Testing Material Standards.

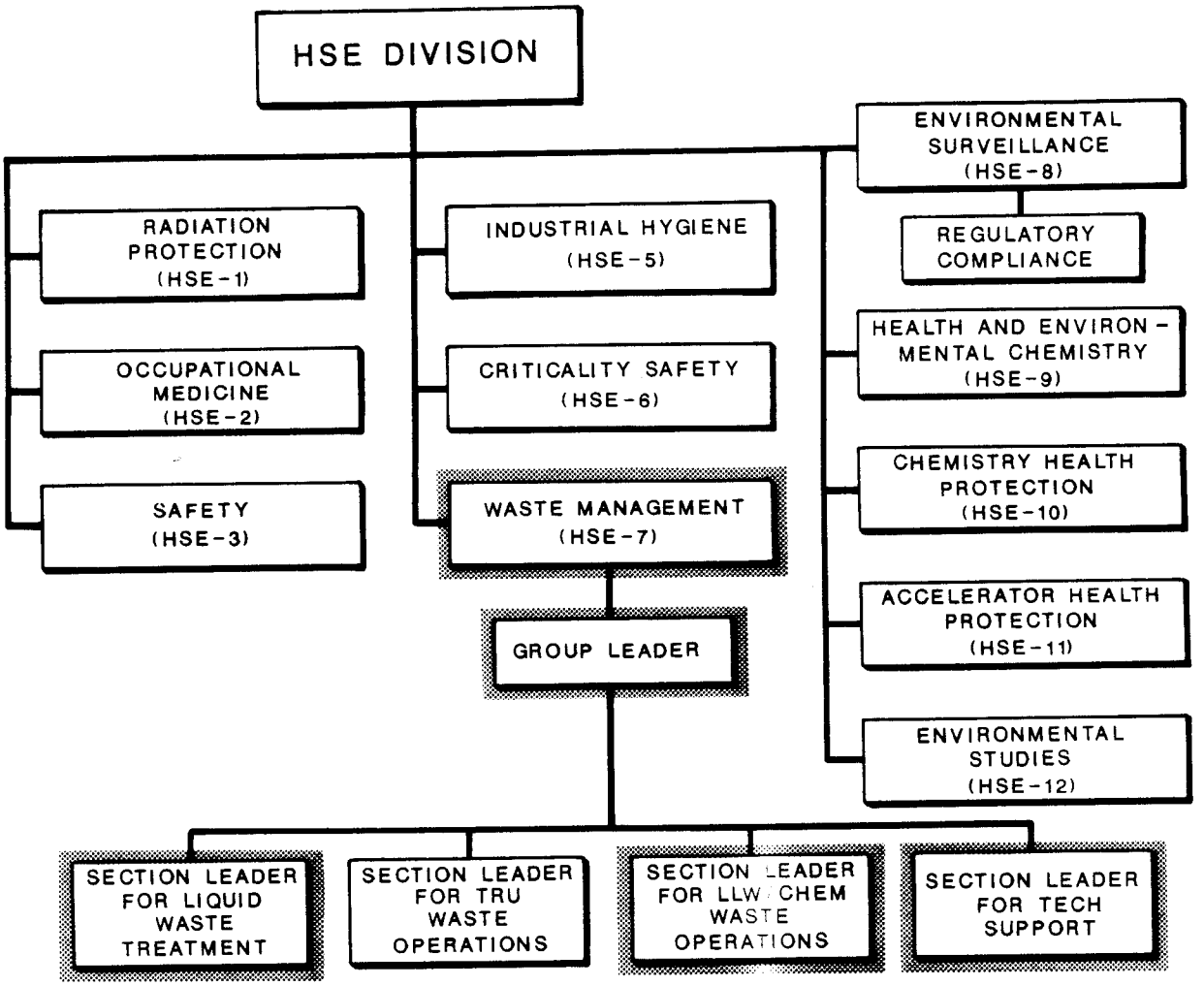
"SW" refers to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition, EPA, July 1982.

"L" refers to liquid waste.

"S" refers to solid waste.

(2) Methods for cyanide and sulfide gas generation are pending. SW-846 methods will be used when they become available. Methods recommended by the EPA will be used in the interim.

(3) If EP Toxicity (and other analyses) do not permit identification of an unknown chemical waste, digested metal samples (per SW3020) will be analyzed for the metals noted.



NOTE: SCREENED BOXES INDICATE PRIMARY RESPONSIBILITY FOR CHEMICAL WASTE MANAGEMENT

FIGURE 7-1

HEALTH, SAFETY AND ENVIRONMENT DIVISION MANAGEMENT CHART

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LOS ALAMOS, NEW MEXICO

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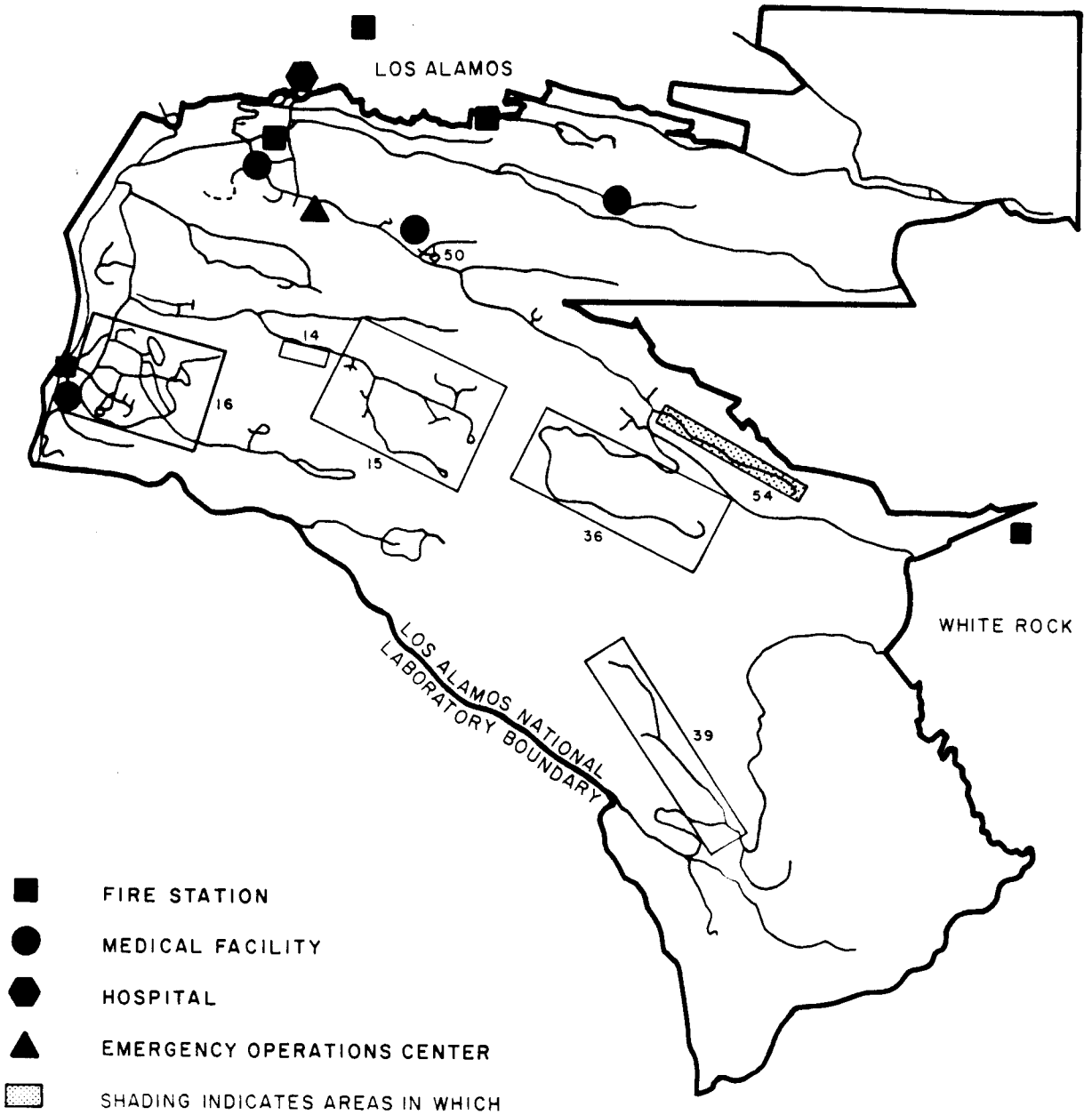

FIRE STATION

MEDICAL FACILITY

HOSPITAL

EMERGENCY OPERATIONS CENTER

SHADING INDICATES AREAS IN WHICH WASTE MANAGEMENT FACILITIES ARE LOCATED

N

4000 0 4000

SCALE

FIGURE 7-2

EMERGENCY FACILITIES

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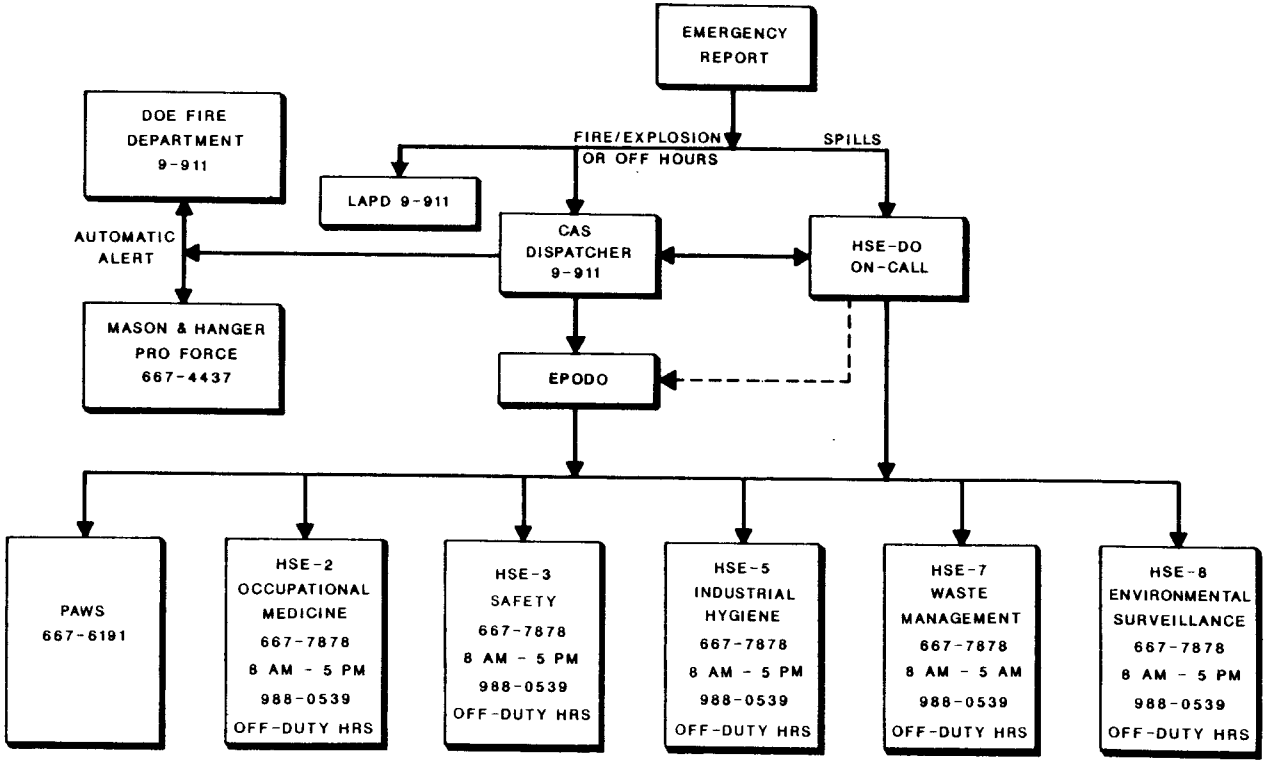

FIGURE 7-3

HAZARDOUS WASTE EMERGENCY NOTIFICATION STRUCTURE

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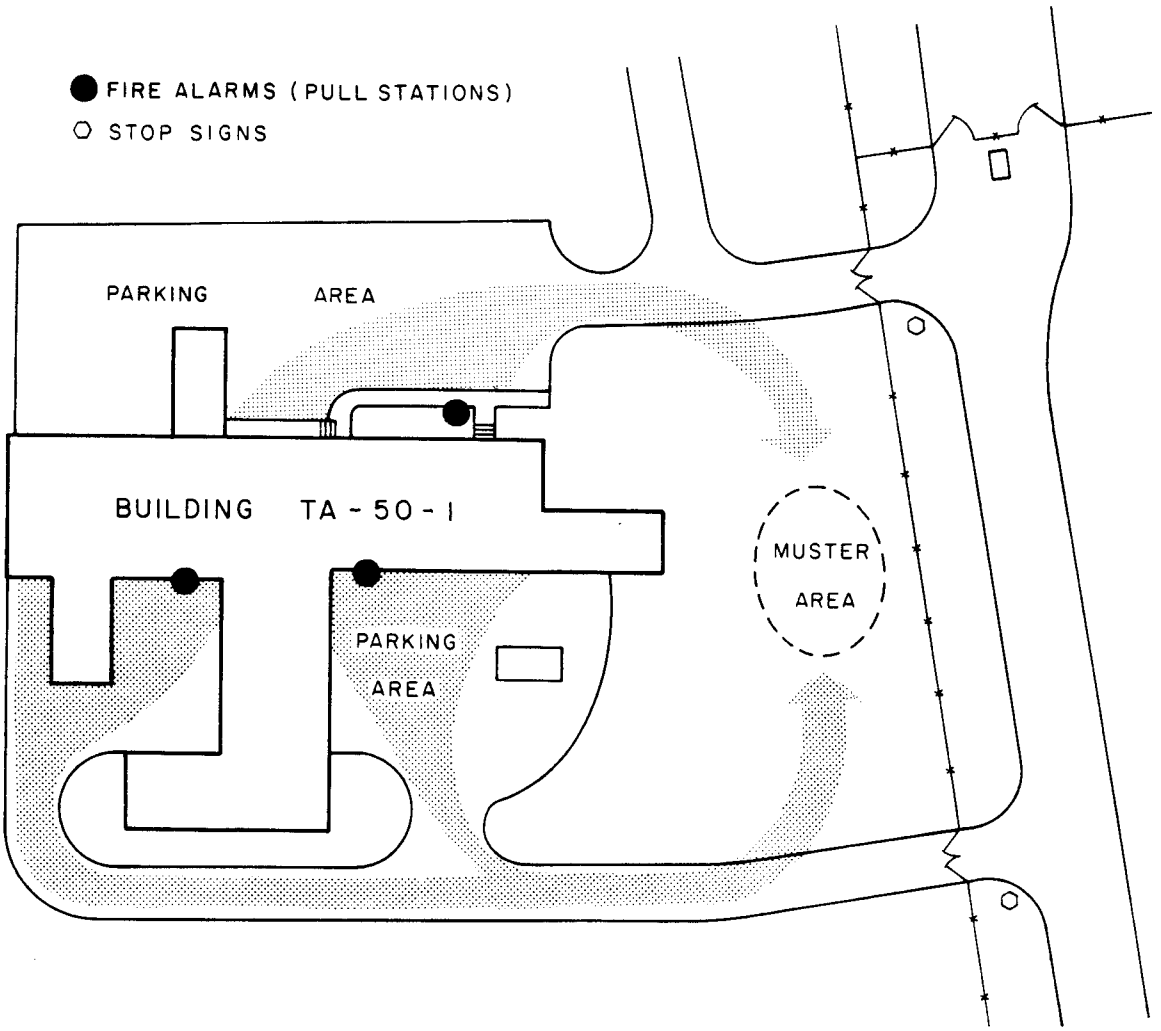

FIGURE 7- 4

TA-50,
BATCH TREATMENT PLANT
EVACUATION ROUTE

PREPARED FOR

LOS ALAMOS NATIONAL LABORATORY
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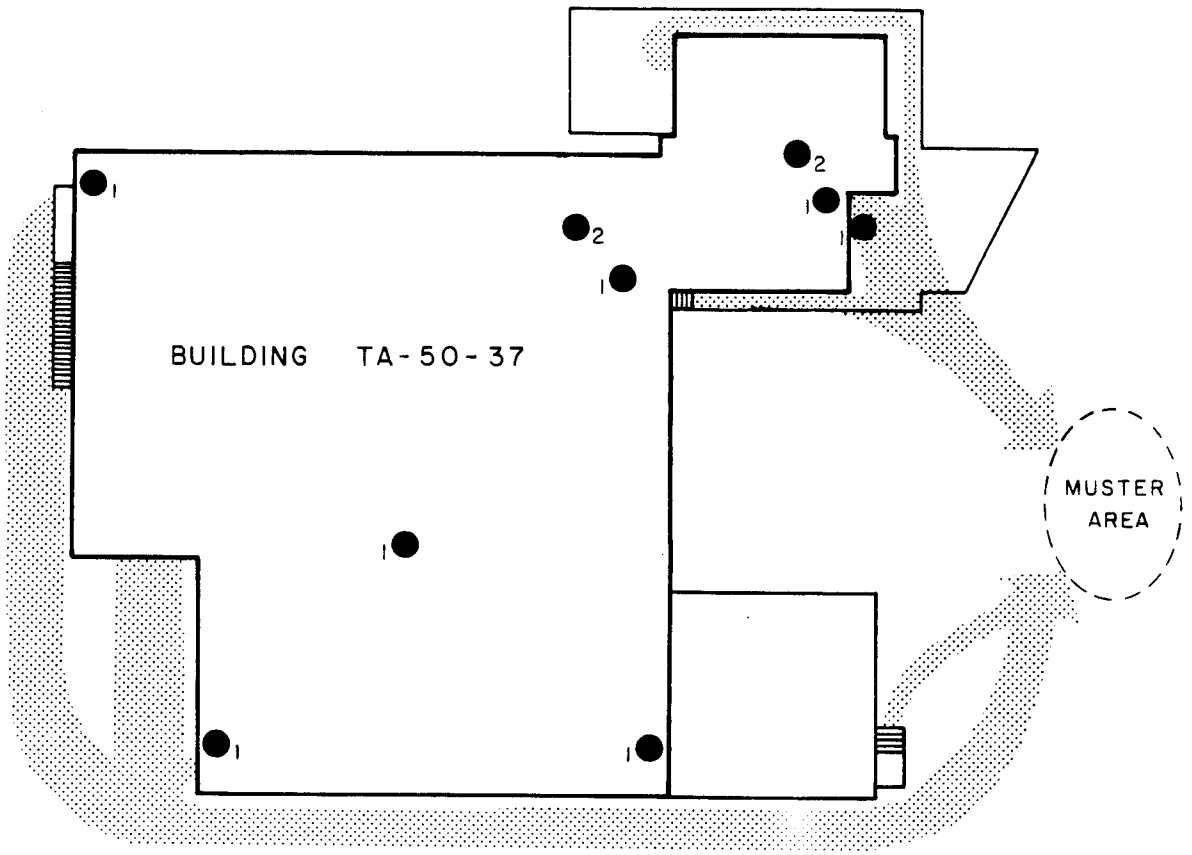

FIGURE 7-5

TA-50
WASTE INCINERATOR BUILDING
EVACUATION ROUTE

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32803

8.0 PERSONNEL TRAINING

This section describes the personnel training program for Los Alamos National Laboratory's facilities in accordance with the regulatory requirements of §264.16 (NMHWMR 206.B.6). These requirements are submitted with the Part B Application, as specified in §270.14(b)(12) (NMHWMR 302.A.4.b.[1]).

The information presented outlines the personnel training programs at the Laboratory. The primary objective of the program is to prepare persons to safely operate and maintain those areas containing hazardous wastes.

8.1 OUTLINE OF TRAINING PROGRAM

8.1.1 Responsibilities

Figure 7-1 presents the organization of Health, Safety, and Environment Division. HSE Division handles all waste management activities except for high explosives treatment, which is handled by the WX and M Divisions. Individuals who are directly involved with waste management are in Health, Safety, and Environment Group 7 (HSE-7). Pan Am World Services (PAWS) provides trained personnel to assist HSE-7 in waste handling activities. The Environmental Surveillance Group is responsible for RCRA compliance. Personnel in the Occupational Medicine (HSE-2), Safety Group (HSE-3), Industrial Hygiene Group (HSE-5), and Environmental Surveillance Group (HSE-8) are trained in their specialties to provide emergency response support. Job descriptions for the Laboratory's hazardous waste management personnel are included in Appendix S.

8.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES

Past training was conducted by training contractors, (i.e., J. T. Baker Chemical Company; R. F. Weston, Deuel and Associates; and National Spill Control School). The training program now instituted at the Laboratory includes a combination of internal training courses, on-the-job training, and courses taught by outside contractors.

Records of each individual's formal training are maintained in the HSE Division office. Training records of current employees are kept until closure

of the facility. Records of former employees are kept for at least three years from the date the employee last worked at the facility.

The training outline is on file in the HSE Division Office and is available for review by all hazardous waste management and handling personnel, emergency response personnel, and all regulatory agencies. Training records and procedures are reviewed by the DOE and the EPA and during internal audits/inspections. Provisions are made for updating and reviewing courses, as necessary, to ensure RCRA Part B compliance.

The training coordinator will work with the group leaders of HSE-2, 3, 5, 7, and 8, WX and M Divisions, and PAWS to ensure that all employees receive the proper level of training. All new employees will receive training within six months of their date of hire or transfer. Personnel will not work in unsupervised positions until they successfully complete the training course.

8.2.1 Internal Training

The personnel training courses developed at the Laboratory emphasize the safe handling of hazardous wastes. Program instructors are trained in hazardous waste management procedures and RCRA provisions. The Laboratory's internal training program is designed to provide training commensurate with the employee's responsibilities. An outline of the Los Alamos National Laboratory Training Program can be found in Appendix T.

8.2.2 On-the-Job Training

Appropriate personnel will participate in on-the-job training programs. These programs are designed to give field demonstrations of Laboratory procedures for hazardous waste handling, inspections, and hazardous waste transportation requirements. Personnel responsible for directing on-the-job training participate in the RCRA provisions course so that they are familiar with hazardous waste management procedures as they relate to RCRA. An outline of on-the-job training programs can be found in Appendix T.

8.2.3 External Training

In addition to internal training, appropriate personnel will participate in contractor-taught courses. Those personnel who will participate in the

external training program are shown in Appendix S. These contractor-taught courses will serve to supplement the internal training program.

8.2.4 Training Coordinator

The personnel training program is directed by Dr. Thomas C. Gunderson. As Associate Division Leader for the Health, Safety, and Environment Division at Los Alamos National Laboratory, Dr. Gunderson is knowledgeable about hazardous waste management facilities and practices and emergency procedures. Dr. Gunderson's resume can be found in Appendix T.

8.2.5 Relevance of Training to Job Position

Dr. Thomas C. Gunderson, the training coordinator, is responsible for coordinating the internal and external training courses and for assuring that all waste management and handling personnel receive the required training. Job descriptions for each position related to hazardous waste management are provided in Appendix S. The training program provides employees with training relevant to their positions within the organization. Supervisors and staff receive training appropriate to their degree of handling hazardous waste (e.g., reporting and other procedures required for compliance). For example, management responsibilities for compliance with RCRA are assigned to the HSE-7 Group Leader, who receives training in RCRA provisions. Material handlers are trained to maintain proper and safe operating procedures and to respond effectively to spills and other emergencies. In Appendix S, duties for each job description are matched to a Los Alamos training course to demonstrate that training is adequate for all positions.

8.3 EMERGENCY RESPONSE TRAINING

The outside professionals (PAWS and the Protective Force) assist the Hazardous Waste Emergency Coordinator (HWEC) (Table 7-5) as soon as they arrive on the scene of the emergency. These people are trained in their specialties (i.e., heavy equipment operations, traffic control). PAWS personnel are also trained in personal safety. At all times during an emergency, these contractors are under the direct supervision of the HWEC and other trained Laboratory personnel. All actions taken by contractors during an emergency must be approved by the HWEC. These contractors do not perform activities other than those for which they are trained (heavy equipment operations, constructing dikes).

In order to ensure maximum protection of life and property and to mitigate the consequences of an emergency situation, it is imperative that all HSE personnel, WX and M Division personnel, and PAWS personnel involved in waste handling and emergency response be knowledgeable about appropriate building and operating area emergency procedures. These groups will participate in the Laboratory's formal training program.

In addition to the Laboratory's formal program, division and group leaders and immediate supervisors are responsible for providing education and training in emergency response procedures. Periodic unannounced emergency drills and exercises are used to familiarize employees with emergency procedures. Training is also provided through prominent instruction displays and through presentations and discussions in safety meetings.

Each new or transferred employee is indoctrinated by his immediate supervisor regarding the general emergency procedures and those specific procedures related to his/her work area. Each employee is advised of changes to any emergency procedures and is given an annual review of procedures affecting his/her work area. The review may be given separately in writing or included in an overall indoctrination.

Specialized training is given to those employees assigned special functions or specific emergency duties. Emergency response personnel (HSE-2, 3, 5, and 8, the DOE Fire Department, Laboratory Emergency Response Coordinators, and Chemical Waste Management Coordinators) participate in the formal Laboratory training program and are required to attend courses on spill response, the RCRA contingency plan and RCRA provisions. All waste handling personnel (HSE-7, WX and M Divisions, and PAWS) also participate in the formal training program in which they are instructed in emergency procedures pertinent to their work area. The emergency procedures instruction in which hazardous waste management and handling personnel and emergency response personnel are required to participate will ensure a coordinated response to hazardous waste emergencies.

8.4 IMPLEMENTATION OF TRAINING PROGRAM

The Los Alamos National Laboratory introductory training program is offered at six-month intervals, when needed, to ensure that all employees receive training within six months of their date of hire or transfer. Employees will not work in unsupervised positions until they have been trained.

All hazardous waste management and handling personnel must attend annual refresher courses. These courses are intended to update personnel on Laboratory procedures and provide them with an overview of their introductory training.

In addition, a complete Respirator or SCBA training course is taught annually, where appropriate, and must be successfully completed by hazardous waste handling personnel.

Group leaders, along with the training coordinator, will ensure that all personnel participate in the introductory and annual training programs.

9.0 CLOSURE AND POST-CLOSURE PLAN

9.1 GENERAL CLOSURE/POST-CLOSURE INFORMATION

Introduction

This section is submitted in accordance with the requirements of 40 CFR 264.110 through 120 (NMHWMR 206.D.2.a[1] through 206.D.2.j[2]), 264.178 (NMHWMR 206.D.4.i) and 270.14(b)(13) (NMHWMR 302.A.4.b[1]). The plan identifies all steps that will be necessary to close the facility at the end of its operating life or to partially close the facility at any point during its intended operating life.

Facilities for the treatment and storage of hazardous waste at Los Alamos National Laboratory include container storage, chemical treatment, controlled-air incineration, industrial incineration and thermal treatment. The functions of the individual hazardous waste facilities are outlined in Table 9-1.

9.1.1 Closure Performance Standard

Closure plans are designed to meet the following performance standards:

- Protect human health and the environment
- Prevent the escape of hazardous waste, hazardous waste constituents, leachate, contaminated-rainfall, or waste decomposition products to the ground or surface waters or atmosphere
- Minimize future maintenance

9.1.2 Partial and Final Closure

The Laboratory's hazardous waste facilities will be closed in the year 2100. All hazardous wastes will be recycled, treated, and/or disposed of off-site at a permitted facility before closure.

TA-54 Area L includes land disposal shafts that were operated and closed under interim status. Individual shafts were closed as they were filled constituting partial closure of the landfill. The Area L landfill was closed under interim status in 1986.

9.1.3 Closure and Post-Closure Cost Estimates

Federal facilities are exempt under 40 CFR 264.140(c) (NMHWMR 206.D.3.a[3]) from the requirements for closure and post-closure cost estimates and financial assurance. These data are therefore not included.

9.1.4 Personnel Protection

Good industrial hygiene practices shall be followed during all phases of closure and post-closure to protect employees from exposure to hazardous waste constituents. Normal Los Alamos National Laboratory operating procedures require that the Laboratory's Industrial Hygiene Group (HSE-5) survey a site before personnel arrive in order to specify protective clothing and respiratory protection equipment. Contaminated protective clothing and protection equipment shall be treated as hazardous and either decontaminated or treated of on-site or disposed of off-site by a permitted commercial disposal firm, in compliance with appropriate regulations (40 CFR 260 et seq. and NMHWMR-2).

9.1.5 Certification of Closure

When a facility undergoes final closure, a certificate, attested to by a registered professional engineer and signed by the appropriate Department of Energy official, in accordance with 40 CFR 264.115 (NMHWMR 206.D.2.f), shall be submitted to the Regional Administrator or the Director of the New Mexico Environmental Improvement Division, as appropriate stating that the facility has been closed in accordance with an approved closure plan.

9.1.6 Post-Closure Care Office

None of the facilities closed under this section require post-closure care. The office to which contact may be made concerning closure activities is:

Area Manager
Los Alamos Area Office
U.S. Department of Energy
Los Alamos, New Mexico 87544
(505) 667-5105

A copy of the closure plan will be maintained at this office until the time of closure. The facility copy of the closure plan will be updated by the Area Manager or his designee. This office will also ensure that other copies of the closure plan are updated, as needed, by maintaining a list of holders of the plan and by issuing plan modifications to all holders of the plan.

9.1.7 Security

Because low-level radioactive wastes have been handled and buried at TA-54, this site will be under the permanent care of the Department of Energy (DOE) or other authorized federal agency. Fences and site security (as described in Section 4.0) will be maintained in perpetuity to prohibit public access and to meet DOE requirements for radiation protection.

9.1.8 Notation of Deed

Notice to local land authority as per 40 CFR §264.119 (NMHWMR 206.D.2.i) and notation of deed as per §264.120 (NMHWMR 206.D.2.j[1]) is not required for facilities closed under this section. Land plats for Los Alamos landfill facilities closed under interim authority are provided to the local land authority as described in the closure plan for each landfill facility. The past use of the TA-54 site precludes any circumstances under which the deed for this area will be transferred to the public domain. The land will remain federally owned in the care of the DOE or other authorized federal agency.

9.1.9 Individual Closure Plans

Details of the closure plans for individual Los Alamos hazardous wastes facilities are included in the following sections.

9.2 CLOSURE PLAN FOR THERMAL TREATMENT FACILITIES AND THE INDUSTRIAL INCINERATOR

9.2.1 Technical Areas 14, 15, 36, and 39 Thermal Treatment Facilities

High explosives (HE) detonation sites are located at Los Alamos National Laboratory in Technical Areas 14, 15, 36, and 39. These sites are used routinely to detonate scrap high explosives (HE), failed experimental detonations, unneeded classified explosives shapes, other HE and reactive wastes determined to be excess. A site at TA-36 has also been used to detonate reactive wastes and other assorted regulated wastes. These sites consist of firing pads often located within a small canyon. Associated facilities at these sites include bunkers, which are occupied by technical personnel during detonations.

9.2.1.1 TA-14 Firing Site Description

The waste firing site at TA-14 is located just south of Control Building TA-14-23 (Figure 9-1). Four additional firing points are located south of the waste detonation site, but these have not been used for waste detonations. The waste detonation firing site consists of a three-sided blast shield that directs the impact of detonations away from the control building. At the base, the shield is a two-foot thick by six-foot square concrete pad overlaid with a neoprene shock pad, a 4.5-inch steel plate, and several inches of sand. Wastes are placed on the pad and detonated from the Control Building. Detonations at this firing site are limited to small pieces. Just southeast of the firing pad is a small wire cage used to burn paper, tape, cotton swabs, and other trash items that have contacted HE and are suspected of being contaminated.

The firing site is located on a mesa top and the topography around the firing site is generally flat, sloping gently to the south.

9.2.1.2 TA-15 Firing Site Description

The firing site at TA-15 is occasionally used to detonate regulated wastes and is located at the end of Building TA-15-184, the Phermex Chamber (Figure 9-2). The site is normally used for test detonations, but unneeded classified shapes and scrap HE have also been detonated. The firing site is underlain with two massive steel plates 0.5-foot thick by 5 feet wide by 20 feet long. The steel plates are laid lengthwise end-to-end with one end against the Phermex Building. There are various small housings for cameras and instrumentation around the firing pad. The Phermex Chamber and small housings are protected from detonations with sand bags.

The firing site is located on a mesa top and the topography of the area is generally flat with a gentle slope to the southwest.

9.2.1.3 TA-36 Firing Site Description

The firing site at TA-36 used for waste detonation is designated as Minie Site and is located west-southwest of Control Building 8 in a small canyon (Figure 9-3). The site is a flat area covered with sand. To the south of the detonation site is an instrument chamber.

In addition to the HE wastes associated with explosives studies, reactive wastes and other regulated wastes have been detonated or included in HE detonations.

9.2.1.4 TA-39 Firing Site Description

Two sites normally used for test detonations have been used for HE waste detonations at TA-39. These detonation sites are those located at Firing Point 6 and 57 (Figures 9-4 and 9-5). The sites are all similar and consist of a sand pad located at the bottom of a narrow canyon. The canyon walls rise steeply 220 to 270 feet near the detonation sites and contain debris thrown by the detonations. The drainage channel is approximately in the center of the canyon floor and drains to the southwest.

9.2.1.5 Estimate of Maximum Waste in Treatment

Wastes are not stored at the detonation site, but are held in short-term storage (less than 90 days) at the generation point and moved to the site just before detonation. The maximum HE waste in treatment at any one time is 45 kg (100 lbs).

9.2.1.6 Description of Waste Handled

All the detonation sites have been used to detonate waste HE and some of the sites have been used to burn paper, tape, and other trash items assumed to be contaminated with HE. HE considered to have been burned or detonated include HMX (cyclotetramethylenetetramine), RDX (cyclonite), TNT (2,4,6-trinitrotoluene), PETN (pentaerythritol tetranitrate), ammonium nitrate, barium nitrate, TATB (triaminotrinitrobenzene), nitrocellulose, tetryl, nitroguanidine, and various plastic binders.

The detonation site at TA-36 Minie has been used to detonate other regulated wastes that represented handling or storage risks; these are listed in Table 9-2 and consist of small volumes, usually residual laboratory chemicals in small packages or leaking gas cylinders.

9.2.1.7 TA-14, TA-15, TA-36 and TA-39 Closure Procedure

Closure for each site is similar. A sampling survey is conducted using a grid to determine the area of possible contamination. A surface sample is taken at each grid point, and vertical soil sampling is done at one-foot intervals to bedrock or to a maximum depth of three feet for the initial survey. If the initial grid sample analysis indicates vertical contamination at the maximum sample depth, additional sampling at one-foot intervals will be performed to determine the depth of contamination. If contamination is determined on the surface, additional sampling will be conducted by reducing the grid distance by one-half and taking additional site samples, dictated by terrain, until the contaminated area is defined. If contamination is found at the outside grid samples, the limits of the grid will be expanded to determine the outside perimeter of contamination. The contaminated soil will then be removed and handled as a regulated waste. The adequacy of decontamination is determined by additional sampling. Sampling, analysis, and documentation procedures are defined in Section 9.5.

TA-14 Sampling and Analysis Survey

The TA-14 waste detonation site will be separated into 40-foot by 40-foot grid squares extending 60 to 140 feet from the detonation point (Figure 9-1). The grid is offset to the south because deflection from the blast shield directs the debris in that direction. The grid is small in size because the site is used for the detonation of small HE pieces.

Composite soil samples will be taken representing the intersection of grid lines. Additional composite sediment samples will be taken in the drainage channel at the approximate locations shown in Figure 9-1. If channel sediment samples show contamination by regulated constituents, additional samples will be taken along the channel at 30-foot intervals. One additional composite soil sample will be taken at the burn cage location.

Four background composite samples will be taken; one to the north, east, south, and west of the site at a distance greater than 1500 feet from the detonation site. The exact sites for background samples will be field selected based on similar topographic and geologic characteristics to the detonation site and the lack of possible interference of other operating

Laboratory sites. Two background sediment samples will be taken from the drainage channel upstream of the detonation site. If there is no sediment channel site outside the grid, background samples may be taken from similar nearby drainage channels. Care will be taken in selecting these background sample sites to preclude influences of other operating sites.

Field relocation of grid points may be required by topographic features. In such a case, the sample will be taken as closely as possible to the grid point and the new location will be documented.

Each grid point will be represented by a composite sample made up of four core samples taken ten feet along each grid line from the grid intersection. Background soil samples will be a composite of four cores with the same orientation as grid samples.

Sediment samples will be a composite of four sediment samples taken from the channel and evenly spaced over a ten-foot line following the channel. The burn pit center composite sample will be made up of four core samples taken from the center of each quarter of the pit.

Vertical soil sampling will be done at the topsoil, then at one-foot intervals to bedrock or to a maximum depth of three feet for the initial survey. Core samples shall include soil depth segments from 0.5 foot to one foot, 1.5 feet to two feet, and 2.5 feet to three feet.

Soil and sediment samples will be analyzed for the constituents listed in Table 9-3. Barium is a possible contaminant because it is used in several HE mixtures. The other toxic metals are included to ensure that these materials were not included in past detonations. A scan for volatile and semivolatile organics is conducted to ensure that residual from solvents used in HE preparation is not present.

Analysis is not conducted for HE constituents because these are a regulated waste based on reactivity and detonation or burning renders them nonreactive. Furthermore, none of the HE materials used at this site are 40 CFR 261, Appendix VIII constituents. Analysis and Quality Assurance/Quality Control

will follow methods defined in Test Methods for Evaluating Solid Wastes, USEPA SW-846, most current edition (SW-846).

The closure regulation 40 CFR 265.114 (NMHWMR 206.D.2.e) requires that all facility equipment and structures be disposed of or decontaminated by removing all hazardous waste and residues. The closure regulation specific to thermal treatment, 40 CFR 265.381 (NMHWMR 206.C.11.e), states that the owner or operator must remove all hazardous waste and hazardous waste residues from the thermal treatment process or equipment. The above regulations both relate decontamination to equipment, and the term residue is not defined. The regulation 40 CFR 261.3(c)(2)(i) [NMHWMR 201.A.2.c.(2)] states that any solid waste generated from the treatment of solid waste is a hazardous waste except as provided in 40 CFR 261.3(d)(1) [NMHWMR 201.A.2.c.(3)], which states that solid waste described in 40 CFR 261.3(c)(2)(i) [NMHWMR 201.A.2.c.(2)] is not a hazardous waste if, in the case of any solid waste, it does not exhibit any of the characteristics of a hazardous waste identified in 40 CFR 261 Subpart C (NMHWMR 201.B). Those characteristics include ignitability, corrosivity, reactivity, and EP Toxicity. The intent of these closure regulations is to guarantee that a closed area possesses no risk to human health or the environment.

The definition as to what constitutes contamination of the detonation site, based on the above-cited regulations, is not clear. Barium is the most probable regulated constituent expected to be found at a detonation site. According to 40 CFR 261.3(d)(1) [NMHWMR 201.A.2.C.(3)], the residue would not be a regulated waste for barium or other metals unless the concentration exceeded the EP Toxicity limit. There are no limiting concentrations for hazardous constituents other than those listed as EP Toxic.

If a significant increase of hazardous constituents over background is used to determine the residue that must be removed, then it is conceivable that the large quantities of soil around the detonation site would have to be removed, even though the concentration of hazardous constituents would not pose a risk to human health or the environment. The comparison against background samples is further complicated by validity of the background samples. The detonation site is located on a mesa, and the area survey of this site and other

detonation sites include the mesa's surface and, in some cases, a canyon floor. Developing background constituent concentrations levels that account for rapid changes in geology, as well as the effects of erosion and deposition, is not practical.

Should contamination removal be based solely on a significant increase of a hazardous constituent, the soil may not be a regulated waste per 40 CFR 261.3(d)(1) [NMHWMR 201.A.2.c.(3)] and may be handled and disposed of as an unregulated waste. The cost of removing the contamination may not afford any additional protection to human health or the environment.

Basing the determination of contamination of total metals on EP Toxicity limits is not valid. As shown in Table 9-4, the mean ambient background concentration for total metals for soils exceeds the EP Toxicity limit for several metals. It is possible that background concentration of EP Toxic metals may exceed the limit.

As a result of these considerations, the following contamination criteria are selected. On completion of the analytical survey, the Laboratory will prepare a risk assessment for each constituent showing significant increase over background concentrations. A significant increase will be determined using statistical methods described in SW 846. The risk assessment will determine the threshold concentration for each constituent that represents a significant risk to human health and the environment and will take into account all possible pathways. Soils containing regulated constituent levels above the threshold concentration will be considered contaminated.

A copy of the completed risk assessment, along with pertinent backup data, will be provided to the NMEID for review and approval of the threshold values. Should NMEID find the threshold contamination levels inadequate, the Laboratory will negotiate threshold values agreeable to both parties.

TA-15 Sampling and Analysis Survey

The TA-15 waste detonation site will be divided into a grid on 75-foot grid centers near the detonation site center expanded to 150-foot centers at a distance of 150 feet or greater from the center (Figure 9-2). Because TA-15

has been used for major detonations, the grid is expanded to cover an extensive area.

Composite sediment samples will be taken in the drainage channels at the approximate locations indicated in Figure 9-2. The location of the samples will be documented.

Four background samples (north, east, south and west) at a distance greater than 3000 feet from the detonation site and two background channel sediment samples will be taken. Considerations for selecting background sample sites are as discussed for TA-14.

Composite sampling, analysis, and determination of contamination are the same as discussed for TA-14.

TA-36 Sampling and Analysis Survey

The TA-36 waste detonation site will be divided into a grid on 75-foot centers near the site center, expanded to 150-foot centers at a distance of 150 feet or greater from the center (Figure 9-3). The center of the grid is at the firing point. Composite soil samples will be taken representing the intersection of grid lines. A composite sediment sample will be taken in the drainage channels at the approximate locations indicated in Figure 9-3.

Background samples and determination of contamination are the same as discussed for TA-14. Soil background samples will be taken at a distance greater than 3,000 feet from the detonation site. The samples will be analyzed forthe constituents given in Table 9-5, which include the regulated wastes detonated at this site.

TA-39 Sampling and Analysis Survey

TA-39 waste detonation sites will be separated into 75-foot grids extending down the canyon floor from the detonation site (Figures 9-4 and 9-5). Composite soil samples will be taken representing the intersection of grid lines. Sediment samples will be taken in the drainage channels at the approximate locations shown on the figures. The exact locations of the sediment samples will be documented.

Four background samples (north, east, south and west) at a distance greater than 3,000 feet from the detonation sites and two background channel sediment samples will be taken. Because the debris from detonations may have been confined to the canyon floor by the steep canyon walls, the four background samples may be taken from the floors of similar adjacent canyons that are not affected by other laboratory operations. The northernmost firing point is near the head of the canyon and may have contaminated the channel sediment throughout the canyon. Background samples for sediment will be taken from an adjacent canyon.

The determination of contamination is the same as discussed for TA-14.

9.2.1.8 Decontamination

The decontamination procedure is similar for all sites. The approach to decontamination depends on the extent of contamination, as determined by the sampling survey. If the sampling survey indicates that there are no contaminated areas, no further action will be taken at the site. Where sites have small concrete pads covered with sand, such as TA-14, the sand will not be tested, but will be placed in barrels and taken to Area L for storage and treatment or ultimate disposal off-site at a permitted facility. The sand pad at TA-15 will be tested for contamination as part of the grid because of its size. The pads of TA-36 and TA-39 have no concrete pad or other base, and will be handled similarly to other potentially contaminated soil areas. Should a small soil area be affected, the contaminated soil will be removed with hand shovels or a backhoe, loaded into drums, and transferred in a truck to Area L for storage and treatment or ultimate disposal off-site at a permitted facility.

Large contaminated soil volumes will dictate the use of sealed and covered dump trucks. In this event, the Laboratory will contract with a permitted transporter and disposal site contractor who will provide sealed gondola trucks and provide for decontamination of those trucks at the off-site disposal facility.

Personnel involved in sampling and decontamination will wear rubber gloves, safety glasses, and coveralls. Personnel involved in dust-generating activities, such as digging and filling drums, will wear dust masks to prevent inhalation of contaminated dust. The Laboratory's Industrial Hygiene Group, HSE-5, will review the site survey analytical data and recommend additional protective clothing.

Small equipment used to pick up soil will be scraped and brushed clean, and the accumulated dust will be placed in drums for transport to Area L. The equipment will be wrapped in sheet plastic and sealed with tape, then transported to the HE decontamination slab at TA-16-400.

The decontamination pad at TA-16-400 is used to wash down equipment used in handling HE. The cleaning water is collected in a sump and then hauled to the TA-16 burn pad area with a vacuum truck. At the burn pads, the water is filtered in two sand filters, the filter residual is burned, and the filtered water discharged under a NPDES permit. Residues from the filter have been tested and are not regulated under RCRA. The equipment will be decontaminated by washing with detergent and water at TA-16-400. No testing for decontamination of equipment will be conducted because the regulated substances present are not acutely toxic and washing with detergent is adequate for safe handling.

The Laboratory recognizes that if extensive contamination has occurred, the closure plan presented here may be impractical. If the detonation site analytical survey proves this to be true, the Laboratory will provide thesurvey data to the Director of NMEID within 30 days of the completion of the analytical work. Within 60 days of submission of the survey data, the Laboratory will provide an amended closure plan. The plan may also be amended under other circumstances as per 40 CFR 265.112(b) [NMHWMR 206.C.2.c(2)].

9.2.1.9 Decontamination Verification

Decontamination of the site will be demonstrated by additional sampling. Because removal of contaminated soil will leave an exposed surface, the disturbed surface will be resampled on the same grid used to define the contaminated area. Analysis and the determination of contamination is as

previously discussed, and an analysis will be conducted only for those constituents that caused the area to be contaminated.

9.2.1.10 Closure Schedule for TA-14, TA-15, TA-36, and TA-39

The year of closure is 2100. The following closure schedule allows survey and closure of the four thermal treatment areas in a consecutive manner; that is, on completion of the initial site sampling survey at the first site, the survey will be initiated at the second site. The soil sampling survey and selection of the decontamination contractor will be completed before closure begins. All four sites will be closed together but will, by necessity, be at different stages of closure. The lengths of time required for individual survey and closure steps are shown in Table 9-6.

Contracting for analytical services will include all four sites. The sampling survey will have to be staggered from site to site for efficient use of time and must be completed at all sites before complete data are available to allow contracting for decontamination. The analytical survey for the four sites will take a cumulative 570 days and is dictated by the time required for sample analysis. Closure, followed by decontamination verification, will take 177 days for each site.

No time is allowed for removal or treatment of the final volume of wastes because there is no waste on-site except just before treatment. Closure will not commence until the last wastes from the source generator have been received and treated, and further acceptance of waste will cease.

Contracts for analytical work and soil removal are expected to exceed $100,000. Because laboratory policy requires that the work be put out for bid, 90 days are allowed to solicit and process the bids.

The location of the site is prone to snow cover in the winter months. Depending on the date NMEID approves the closure plan, the sampling survey may be delayed until the site is free of snow and the ground is thawed adequately to allow the soil sampling. The schedule includes a weather contingency to allow for weather delays.

9.2.1.11 Post-Closure Care

Post-Closure care plans are not required for thermal treatment facilities.

9.2.1.12 Closure Certification for TA-14, TA-15, TA-36, and TA-39 Waste Detonation Sites

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed in accordance with this plan. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE offices and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.2.2 Technical Area 16 (TA-16) Thermal Treatment Facilities

The thermal treatment facilities located at TA-16 include three general types. One type consists of a sand pad on which explosives or explosives-contaminated equipment are placed and remotely burned using an "electric match" firing device. The burn pad is a 30 by 30-foot square concrete pad covered with two inches of sand. Each pad is located at the center of a 100- by 100-foot square area enclosed by a cyclone fence. The surface of the concrete slopes from the center to the edge. The pads are dedicated to wastes that can be burned without detonation, although unplanned detonations have occurred. The pads used for waste burning are designated as TA-16-387, TA-16-388, and TA-16-399.

A second type of thermal treatment facility at TA-16 consists of a sand-filled metal pan on which five smaller shallow pans lined with fire brick are located. Waste HE-contaminated fluids are poured into the smaller pans and the HE is remotely ignited with an "electric match." The outside pan is roughly 12- by 12-foot square and is filled with sand to six inches below the lip. The smaller pans are approximately two- by three-foot rectangular pans. The Laboratory has one facility of this type. About 55 gallons of waste are burned approximately once a month.

The third type of thermal treatment facility at TA-16 is used to burn sludges containing waste HE. These facilities consist of steel cone-shaped vessels having a diameter of about eight feet, buried with only the upper three to four feet of the vessel above ground. The steel vessels are filled with sand and gravel and an open fluids drain is located at the bottom of the cone. Sludge HE is gravity fed from vacuum trucks into the top of the cone, onto the sand and gravel bed. A heavy steel cap is then placed over the top of the cone and hot air is forced into the cone through air ducts. The hot air dries the waste sludge and liquids from the sludge migrate downward through the sand and gravel bed and through the fluids drain. Effluent from these drains is regulated by NPDES permit (NM 0028355). When the remaining explosive material is relatively free of moisture, the steel cap is removed from the cone and the filter surface residue is ignited remotely with an "electric match." Los Alamos National Laboratory has two facilities of this type, and both are located in Technical Area 16. Explosives are burned at these two facilities at a rate of about one burn per week. Each burn consists of about 750 pounds of waste explosive sludge.

9.2.2.1 Estimate of Maximum Waste in Treatment

HE wastes are not stored at these sites, but are held in short-term storage (less than 90 days) at the generation point and moved to the sites just before a scheduled burn. The maximum waste in treatment at one time is 340 kg (750 lbs). Residual barium contaminated sand may be stored in drums on the sites. The maximum volume of sand stored is two cubic meters (550 gallons).

9.2.2.2 Description of Waste Handled

The burn pads are used to burn scrap HE, equipment, and trash that have contacted HE and are considered to be contaminated. HE thought to have been burned include HMX (cyclotetramethylenetetramine), RDX (cyclonite), TNT (2, 4, 6 trinitrotoluene), PETN (pentaery thritol tetranitrate), ammonium nitrate, barium nitrate, TATB (triaminotrinitrobenzene), nitrocellulose, tetryl, nitroguanidine and various plastic binders. These wastes are transferred to the site by trucks. Trash and HE scrap are containerized. Large equipment is wrapped to ensure containment.

The pan burning pad handles waste oils and solvents that are considered to be contaminated with HE. Small volumes are handled in metal containers, and the contents are poured by hand into the burn pans. Larger volumes are delivered with a vacuum truck and drained through a hose into the pans.

The waste handled at the sand filter is HE-contaminated wastewater delivered to the site with a vacuum truck and drained from the truck through a hose into the filter.

Burning HE wastes can leave a residual that is EP Toxic for barium. The concentration of barium in the residual varies with the concentration of barium nitrate in the waste.

9.2.2.3 TA-16 Thermal Treatment Facilities Closure Procedure

For each pad, (388 and 399) an analytical survey will be conducted to determine the nature and extent of contamination. Decontamination of the facility will include removal of contaminated soil and cleaning of equipment. Adequate decontamination will be verified by additional sampling and analysis.

The sand on the sand pad is to be handled as a regulated waste and not sampled. One composite soil sample will be taken six inches off each edge of each pad to determine if surface drainage has moved contamination off the pad. The composite will be three soil cores, one on the pad centerline and two, ten feet from centerline. To determine if unplanned detonations have caused significant contamination, twelve composite soil samples will be taken at each pad. These composite samples will be made up of three cores each taken in each direction at 25-foot intervals, the first sample 25 feet off the pad edge. One core will be taken on the centerline, the other two at the pad ends. The sampling locations are shown in Figure 9-6.

At the liquid burn pad, the sand in the large pan and the fire bricks will be handled as a regulated waste and need not be sampled. Soil samples will be taken around the pan perimeter as shown in Figure 9-7 to determine if materials have splashed out of the pan and caused contamination. Composite soil

samples of three cores will be taken along each edge of the large pan six inches and 1.5 feet off the pan edge.

The sand and gravel in the soil filters will be considered a regulated waste, packed in drums, and transported to Area L for storage and ultimate disposal at a permitted landfill. Composite soil sampling will be conducted outside the filters as shown in Figure 9-8 to determine if contamination outside the vessel has occurred. Each composite will be three cores, equally spaced, to represent a quadrant of the circumference of the vessel. Cores will be taken six inches and 1.5 feet off the vessel edge.

If contamination is found at the outside samples, the limits of the sampling area will be expanded by the same distance intervals to determine the outside perimeter of the contamination. If any soil sample shows contamination, additional sampling will be conducted at the sampler's discretion to determine the extent of contamination.

Six background samples will be taken around the site no closer than 600 feet from any pad. The exact sites for background samples will be field selected based on similar topography characteristics and geologic structure to the site and the lack of possible interference of other operating Laboratory sites.

Field relocation of sample points may be required by topographic features. In such a case, the sample will be taken as closely as possible to the designated sample point and the new location will be documented.

Soil and samples will be analyzed for the constituents listed in Table 9-3. Barium is a possible contaminant because it is in several HE mixtures. The other toxic metals are included to ensure that the materials were not included in past burns. A scan for volatile and semivolatile organics is conducted to ensure that residual from solvents used in HE preparation are not present. Analysis is not conducted for HE constituents because these are a regulated waste based on reactivity, and detonation of burning renders them nonreactive. Furthermore, none of the HE materials used at this site are 40 CFR 261 Appendix VIII (NMHWMR 201 Appendix III) constituents. Analysis, quality assurance, and quality control will follow methods defined in SW 846.

9.2.2.4 TA-16 Thermal Treatment Facilities Decontamination

Sand from the burn pads, liquid burn pans, and the filters will be manually shoveled into drums and transported to Area L for storage. The pads, pans, and equipment will be scraped, swept, or brushed clean, and the resulting residue picked up and placed in drums for transport to Area L.

A small trench will be dug around the burn pads, with a sump at one corner. The trench and sump will be lined with sheet plastic. The pads will then be scrubbed with a warm Liquinox or Alconox solution in water. The run-off from the pad, collected in the sump, will be sampled, then bailed into drums and transported to Area L where the solution will be evaporated in open treatment tanks.

Residue from this evaporation will be disposed of off-site at a permitted facility. Section 9.5 describes sampling procedures for this water. The washing will be repeated until decontamination is demonstrated. The clean pads will be treated as a nonregulated waste and left in place, or if removed, the resulting rubble used as landfill.

The same procedures will be used for the liquid burn pans. The sand and any fire brick will be removed manually with a shovel and containerized for transport to Area L. The remaining pans will be scraped, swept, and/or brushed to remove residuals, which will be placed in drums for transport to Area L. The pans will then be washed internally with the warm Liquinox or Alconox solution, the dirty wash water sampled to determine decontamination, then transported to Area L in drums for evaporation. Washing will be repeated until decontamination is demonstrated by testing the wash water. The decontaminated pan is a nonregulated waste and will be sold as scrap, or landfilled.

The filter vessels will be manually emptied of sand and gravel with shovels, and the sand and gravel will be placed in drums for transport to Area L. Residues will be removed by scraping, wiping, and/or brushing, and the residues placed in drums for transport to Area L. The internal walls of the filter vessels will be washed with warm Liquinox or Alconox solution in

water. The wash water will be drained from the bottom of the vessels through existing drain piping into drums. The dirty water will be sampled to determine the adequacy of decontamination, and the washing will be repeated until decontamination is demonstrated. The wash water will be evaporated in treatment tanks at Area L. The decontaminated vessels are not a regulated waste and can be landfilled or disassembled and sold as scrap.

Soil decontamination is similar for all burn pads. The approach to decontamination depends on the extent of contamination, as determined by the sampling. If the sampling survey indicates that there are no contaminated soil areas, no further action will be taken at the site. Should a small soil area be affected, the contaminated soil will be removed with shovels or a backhoe, loaded into drums, and transferred in a stake truck to Area L for storage with ultimate off-site disposal at a permitted facility.

Large contaminated soil volumes will dictate the use of sealed and covered dump trucks. In this event, the Laboratory will contract with a permitted transporter and disposal site contractor who will provide sealed gondola trucks and provide for decontamination of the trucks at the off-site disposal site.

Personnel involved in soil sampling and soil decontamination will wear rubber gloves, safety glasses, and coveralls. Personnel involved in dust-generating activities, such as digging and filling drums, will wear dust masks to prevent inhalation of contaminated dust. Personnel washing down equipment will wear rubber gloves, neoprene acid/solvent-resistant coveralls, rubber boots, and a face shield, The Laboratory's Industrial Hygiene Group, HSE-5, will review the site survey analytical data and recommend additional protective clothing.

Small equipment used to pick up soil will be scraped and brushed clean, and the dust accumulated will be placed in drums for transport to Area L. The equipment will be taken to the decontaminated liquid burn pan, which will function as a trough to collect run-off wash water. The backhoe will be scraped and brush-cleaned, the shovel positioned over the liquid burn pan. The shovel and small equipment will be washed with warm Liquinox or Alconox in

water solution. The wash water will be placed in drums for transport to Area L where the water will be evaporated in open tanks.

The residues from evaporating wash water at Area L will be placed in drums and disposed of off-site at a permitted facility.

The Laboratory recognizes that if extensive contamination has occurred, the closure plan presented here may be impractical. If the site analytical survey proves this to be true, the Laboratory will provide the survey data to the Director of NMEID within 30 days of the completion of the analytical work. Within 60 days of submission of the survey data, the Laboratory will provide an amended closure plan. The plan may also be amended under other circumstances as per 40 CFR 265.112(b) [NMHWMR 206.C.2.c.(2)].

9.2.2.5 Decontamination Verification

Decontamination of the site soil will be demonstrated by additional sampling. Because removal of contaminated soil will leave an exposed surface, the disturbed surface will be resampled in the same places used to define the contaminated area. Analysis and the determination of contamination are as discussed in Section 9.2.1.7, and an analysis will be conducted only for those constituents that caused the area to be contaminated.

For a washed surface, a minimum of two samples of the clean Liquinox or Alconox solution will be sampled and, along with the wash water samples, analyzed for the constituents shown as discussed in Section 9.2.2.3. Equipment will be considered contaminated if the dirty wash water analyses show a significant increase over the clean wash solution. A significant increase is determined using statistical methods defined in SW 846.

9.2.2.6 Closure Schedule for TA-16 Thermal Treatment Facilities

The year of closure is 2100. All pads and equipment at TA-16 will be closed at the same time. The time required for individual survey and closure steps are shown in Table 9-7.

Because wastes are not stored on site and closure will not start until the last wastes are treated, no time is allowed for treatment or removal of final

wastes. Closure will not commence until the last wastes from generating organizations have been received and treated and further acceptance of waste will cease. Soil sampling and contractor selection will be completed before closure begins. Closure including decontamination and decontamination verification, will take 180 days.

Contracts for analytical work and soil removal are expected to exceed $100,000. Because laboratory procedures require that the work be put out for bid, 90 days are required to solicit and process the bids.

The location of the site is prone to snow cover in the winter months. Depending on the date NMEID approves the closure plan, the sampling survey may be delayed until the site is free of snow and the ground is thawed adequately to allow the core sampling. The schedule includes a weather contingency to allow for this potential delay.

9.2.2.7 Closure Certification for TA-16 Thermal Treatment Facilities

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed in accordance with this plan. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained by the HSE-8 Regulatory Compliance Section.

9.2.2.8 Post-Closure for TA-16 Thermal Treatment Facilities

Post-closure plans are not required for thermal treatment facilities.

9.2.3 Technical Area 16 (TA-16) Industrial Incinerator

The industrial incinerator is located outdoors in the northeastern part of TA-16 (Figure 9-19) and is equipped for combustion of potentially HE-contaminated trash and machine oils. The incinerator consists of a primary combustion chamber, a secondary combustion chamber, and a settling chamber. Both primary and secondary chambers are equipped with gas/oil fired power burners supplied by small volumes of waste oil and propane. The outer shell

is fabricated from hot-rolled carbon steel and is mounted on four-inch thick concrete pad.

9.2.3.1 Estimate of Maximum Waste in Treatment or Storage

Potentially HE-contaminated wastes are not stored at this site, but are held in short-term storage (less than 90 days) at the generation point and moved to the site just before a scheduled incineration. The maximum waste in treatment at one time is 810 pounds. After the burn and cool down cycles are complete, ash is removed from the settling chamber and placed in 55-gallon drums. The drums are stored temporarily (less than 90 days) at the site and then transferred to TA-54 Area L for determination of appropriate ultimate disposal.

9.2.3.2 Description of Waste Handled

The industrial incinerator will be used to burn Type "Zero" trash, potentially HE-contaminated from TA-16. The Type "Zero" trash consists of a mixture of highly combustible waste such as paper, cardboard cartons, wood boxes, and combustible floor sweepings from industrial activities. The mixture may contain up to ten percent by weight of plastic bags, coated paper, laminated paper, treated corrugated cardboard, oily rays, and plastic or rubber scraps. The incinerator is also equipped to burn potentially HE-contaminated hydraulic oil, tramp oil, and ignitable solvents from machining operations at TA-16.

9.2.3.3 Closure Procedure

All remaining wastes will be incinerated before shutting down the industrial incinerator. If for some reason it is not possible to incinerate all the waste on the site, the waste will be sent to a designated treatment facility or disposed of off-site at a permitted facility. When all the waste inventory has been properly treated or disposed of, the site will be decontaminated as follows: First the entire incineration system, including the two combustion chambers and the setting chamber will be scraped and brushed clean to remove any solid residue. All residue will be placed in 55-gallon drums and transferred to TA-54, Area L for appropriate disposal. The incinerator will be wrapped in plastic and sealed with tape, then transported to the HE decontamination slab at TA-16-400. Decontamination of the incinerator at TA-16-400 will follow the same procedures outlined in 9.2.1.8.

The concrete pad underlying the incinerator will be scraped, swept, or brushed clean, and the resulting residue placed in 55-gallon drums. The drums will be transferred to TA-54, Area L for appropriate disposal. A small trench will be dug around the concrete pad, with a sump at one corner. The trench and sump will be lined with sheet plastic. The pad will then be scrubbed with a warm Liquinox or Alconox solution in water. The run-off from the pad, collected in the sump, will be sampled, then bailed into drums and transported to TA-54, Area L where the solution will be evaporated in open treatment tanks.

Residue from this evaporation will be disposed of off-site at a permitted facility. Section 9.5 describes sampling procedures for this water. The washing will be repeated until decontamination is demonstrated. The clean pads will be treated as a nonregulated waste and left in place, or if removed, the resulting rubble used as landfill. Personnel involved in decontamination and disassembly activities will wear rubber gloves, safety glasses, and coveralls. Personnel involved in dust-generating activities, such as scraping residue and filling drums, will wear dust masks to present inhalation of contaminated dust.

9.2.3.4 Closure Schedule for TA-16 Industrial Incinerator

The year of closure is 2100. Closure will observe the schedule provided in Table 9-13.

The contract for equipment disassembly is expected to exceed $100,000. Because laboratory policy requires that work be put out to bid, 90 days are required to solicit and process the bids. The selection of a contractor will be made before closure begins. Closure is estimated to take 180 days.

9.2.3.5 Closure Certification

An independent, registered professional engineer and the owner/operation of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the facility has been closed in accordance with this plan. The letter shall be dated and signed by each party, stamped by the registered engineer, and the original copy submitted by the DOE to the

Director of the NMEID. One copy shall be maintained at the DOE office and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.2.3.6 Post-Closure for TA-16 Industrial Incinerator

Post-closure plans are not required for incineration facilities.

9.3 CLOSURE PLAN FOR TA-50 STORAGE, BATCH TREATMENT, AND INCINERATION FACILITIES

9.3.1 Batch Treatment System and Container Storage Area

The Batch Treatment System is located in Building 1 at Technical Area 50 (Figure 9-9). The system consists of a totally enclosed, vented, 500-gallon pressure vessel equipped with a filtering system, condenser, and vacuum transfer lines. Total system wash-down between batches allows for the treatment of incompatible wastes in the facility. Wastes treated in the Batch Treatment System include cyanide, chromate plating solutions, and solutions of acids, bases, and heavy metals. The batch treatment equipment is mounted on a crack-free concrete floor that is curbed to contain the contents of the process equipment should a leak occur.

A waste transfer and packaging area is also housed in the room in which the Batch Treatment System is located. This area consists of a small space that is covered with a ventilation hood. Small quantities of waste are repackaged within this area, when necessary.

Containerized wastes scheduled for treatment at the facility will be stored in three prefabricated modular storage buildings south of Building 1 (Figure 9-9). These storage units are self-contained and are capable of storing a maximum of thirty 55-gallon drums. Each storage unit is equipped with chemical separation walls to prevent mixing of incompatible wastes, a corrosive-resistant fiberglass floor grating, and a polypropylene building sump liner.

9.3.1.1 Estimate of Maximum Waste in Storage

The maximum inventory of hazardous wastes in storage or treatment at the TA-50 storage and Batch Treatment Facilities including drum storage and pipe and vessel inventory, is estimated at 21 cubic meters (5,500 gallons).

9.3.1.2 Description of Waste Handled

Three waste streams compose the bulk of the waste treated in the Batch Treatment System, although the system is flexible enough to allow treatment of other wastes that may be generated through new Laboratory projects. These streams are an acid/base waste that contains copper, chromate plating waste, and waste cyanide plating solutions. Treatment includes neutralization of acids and bases, decomposition of cyanides and precipitation of metals.

Upon completion of treatment, the resulting solution is filtered and the filtered liquid discharged to the effluent tank at (TA-50) the wastewater treatment plant. The effluent from the wastewater treatment plant is discharged under an NPDES permit. Metal sludges recovered in the filters are taken to Area L for storage, and with ultimate off-site disposal at a permitted facility.

9.3.1.3 Closure Procedures and Decontamination

The treatment facility in TA-50 consists of versatile wet chemical processing equipment capable of neutralizing acids and bases, oxidizing cyanides, and precipitating heavy metals. Wastes in storage at the initiation of closure will be treated using the standard operating procedure (SOP) for the waste, and no more waste will be received.

Following the treatment of the last waste, the system will be washed down using the facility's wash-down system, and the resulting liquid will be collected in approved containers, sampled, and analyzed for hazardous constituents. Non-hazardous wastes, or waste requiring only neutralization, will be discharged to the industrial wastewater sewer. Hazardous waste liquids will be placed in the TA-54, Area L treatment tanks for evaporation. Residue from the effluent evaporation in the tanks will be removed and mixed with cement in drums and stored at Area L prior to off-site disposal at a permitted facility. This is consistent with normal operating procedures for system wash-down between treating noncompatible wastes and acknowledges that analytical procedures associated with previous treatment have reduced hazardous constituents to a level allowable for discharge. Following wash-down, the system filter cartridges will be replaced with new cartridges. The used cartridges

will be placed in drums and transferred to TA-54, Area L for storage and ultimate off-site disposal at a permitted facility. The equipment will then be filled with a Liquinox or Alconox solution in water and circulated and flushed for two hours. Following circulation, the solution will be sampled to verify decontamination, then pumped into drums and transported to the evaporation tanks at Area L. If analysis of the solution indicates contamination, additional washings will be conducted until decontamination is verified. Following successful internal decontamination, the filter cartridges will be removed, placed in drums and transported to Area L, with ultimate off-site disposal at a permitted facility.

When internal decontamination is complete, the outside of the equipment will be scrubbed and rinsed with a warm solution of Liquinox or Alconox in water. The cleaning solutions will accumulate in the curbed area and will be pumped into drums with a small manually operated drum pump. Samples of this solution will be taken from the drum to verify decontamination. Wash-down will be repeated until decontamination is verified. The drummed liquid will be transported to Area L for evaporation.

Upon successful external decontamination, the equipment will be disassembled and internally inspected. Any residual matter found will be scraped or brushed off the area where the residue occurred, then washed and rinsed. Dry residues will be placed in drums for transport to TA-54, Area L with ultimate off-site disposal at a permitted facility. Liquids from washing and rinsing will be placed in drums and transported to TA-54, Area L for evaporation. Cleaned equipment will be removed from the building and handled as a nonregulated waste.

Following removal of the batch treatment equipment, the floor within the curbed area and the waste handling hood will be washed and rinsed with a warm Liquinox and Alconox solution in water. The wash water will be packed up and put in drums using a drum pump, rags and/or mops, wringing the excess water into a drum. This water will be sampled to demonstrate decontamination.

Ultimately, residues from evaporation of dirty wash waters at Area L will be placed in drums and disposed of off-site at a permitted facility. The only regulated constituents expected to be in these residues are metals.

Personnel involved in disassembly and handling of equipment will wear protective equipment, including: acid/solvent-resistant coveralls, head protection, neoprene-coated gloves, and boots. Wrists and ankles are to be taped to protect against upward and inward splash. As a minimum protection, face shields will be worn. Full face respirators will be used if specified by the Laboratory's Industrial Hygiene Group, HSE-5, following a field inspection.

Spills occurring during equipment disassembly will be contained in the curbed area and will be picked up with mops. No decontamination of container handling equipment is anticipated during closure because the wastes are inside containers and no contact is expected between wastes and handling equipment.

Protective clothing, coveralls, face shields, and boots worn during the wash down will be rinsed in clean water while the items are within the curbed area. The rinse water will be handled with the dirty water from the external wash down. Following internal and external decontamination, the equipment will be considered free from regulated wastes. Protective clothing will be worn by personnel disassembling the equipment. The protective clothing and tools used during disassembly will be washed with detergent and water. The wash water will be collected and analyzed. If the wash water is non-hazardous, the water will be discharged to the industrial waste water sewer. If the wash water contains hazardous constituents, it will be treated on-site or transported off-site to a permitted disposal facility. Mops and rags used for clean-up will be placed in drums for transport to Area L, with ultimate off-site disposal at a permitted facility.

9.3.1.4 Decontamination Verification

Before the first wash down, at both the batch treatment system and the modular storage buildings, two samples will be taken of the clean Liquinox or Alconox solution in water and analyzed for the constituents listed in Table 9-8.

One additional clean solution sample will be taken for each additional wash-down event. These analytical results provide background data for decontamination verification.

"Dirty" wash-down solutions will also be analyzed for the constituents listed in Table 9-8. Analytical procedures will conform to methods found in SW 846. Equipment will be considered to be contaminated if the "dirty" wash solutions show a significant increase in the listed constituents over the clean wash solutions. A significant increase is determined using statistical methods defined in SW 846.

The constituents listed in Table 9-8 include regulated constituents normally stored and treated in the plant, and additional metals that may have been inadvertently included in treated solutions. A scan for volatile and semivolatile organics is performed to ensure that solvents commonly used within the Laboratory have not contaminated the equipment.

9.3.1.5 Closure Schedule

The year of closure for the TA-50-1 Batch Treatment Plant and the modular storage buildings is 2100. Closure will observe the schedule given in Table 9-9.

The contract for equipment disassembly is expected to exceed $100,000. Because laboratory policy requires that the work be put out for bid, 90 days are required to solicit and process the bids. The selection of a contractor will be made before closure begins. Closure is estimated to take 180 days.

9.3.1.6 Closure Certification

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the facility has been closed in accordance with this plan. The letter shall be dated and signed by each party, stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE office and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.3.1.7 Post-Closure

Post-closure plans are not required for container storage facilities or treatment facilities.

9.3.2 Chemical Waste Incinerator and Container Storage Area

9.3.2.1 Chemical Waste Incinerator Description

The waste incinerator is located in Building 37 at Technical Area 50. The highly modified, controlled-air incinerator is rated at a nominal 45 kilograms per hour waste feed throughout. The incinerator was developed as part of a continuing incinerator study and demonstration program being conducted by Los Alamos National Laboratory and is currently permitted to burn PCB-contaminated liquid materials. Modifications to the incinerator include additions of liquid and solid waste feed preparation lines, a gravity ash removal system, a high-efficiency off-gas cleanup system, and backup utility systems. Standard combustion equipment has been modified to permit effective incineration of waste in solid, liquid, slurry, or gaseous form. Particular attention has been given to engineering for proper waste containment, resulting in a system that is safe for evaluating the incineration of hazardous chemicals and certain radioactive waste forms.

Containerized wastes to be incinerated will be stored in Room 117 of Building 37 (Figure 9-20). The storage area has a concrete floor with a grated false floor sixteen inches above the concrete. The concrete will be coated with Semstone®. Liquid and solid containerized compatible wastes will be stored in the area. The waste containers will be 55-gallon drums and 330-gallon containers meeting all DOT specifications.

9.3.2.2 Estimate of Maximum Waste in Storage and Treatment

The maximum inventory of hazardous wastes stored and treated at the TA-50 waste incinerator is estimated at 13 cubic meters (3,460 gallons).

9.3.2.3 Description of Waste Handled

The incinerator and the flue gas treatment systems are capable of safely combusting a variety of hazardous wastes including low-level radioactive wastes and transuranic wastes. The Laboratory wastes are a mixture of liquid and solid hazardous wastes composed of various organic solvents and liquids as well as chemically contaminated paper, wood, and plastics. The liquids can contain either ignitable or U- or P-listed wastes containing Appendix VIII

constituents. The incinerator will be fed all Appendix VIII constitutents with an incinerability ranking equal to or less than carbon tetrachloride.

9.3.2.4 Closure Procedure

All remaining wastes will be incinerated before shutting down the incinerator. If for some reason it is not possible to incinerate all the waste on the site, the waste will be sent to a designated treatment or disposal facility.

When all the waste inventory has been properly disposed of, the facility will be decontaminated as follows: First, the entire incineration system (incinerator, all relevant lines and pumps, and the air pollution control system) will be cleaned. The two incinerator chambers, including all attached refractory and residual solid residue, will then be sealed and sent to a designated treatment or disposal facility. Next, the remaining components of the system will be steamed for a minimum of 24 hours, after which they will be visually inspected, may be dismantled, and will be disposed of in an appropriate manner. The manner of disposal will depend on any residual radionuclide contamination as well as any residual hazardous waste contamination. All radioactive components will be decontaminated to the extent practicable and disposed of according to appropriate regulations.

A detailed description of decontamination procedures for the incinerator upon closure is not possible at this time because the equipment may be contaminated with transuranic (TRU) and low-level radioactive wastes. Decommissioning will follow Laboratory guidelines and procedures for handling radioactive contaminated equipment. Exact procedures are a function of the degree of contamination at the time of closure.

Upon the decision to close the facility, the equipment and building will be surveyed to determine the nature and levels of both radioactive and hazardous chemical contamination. Using the Laboratory guidelines and procedures, a decommissioning document will be prepared describing in detail the methods and procedures for decontamination, demolition, packaging, and disposal. All materials generated from decontamination and demolition will be treated as radioactive or mixed waste and disposed of in accordance with appropriate regulations.

Following removal of all stored waste, the floor and grate of Room 117 will be washed and rinsed with a warm Liquinox and Alconox solution in water. The wash water will be packed up and put in drums using a drum pump, rags and/or mops, wringing the excess water into a drum. This water will be sampled to demonstrate decontamination and transferred to TA-54, Area L for evaporation. Ultimately, residues from evaporation of dirty wash waters at Area L will be placed in drums and disposed of off-site at a permitted facility.

Personnel involved in decontaminating the storage area will wear protective equipment, including: acid/solvent-resistant coveralls, head protection, neoprene-coated gloves, and boots. Wrists and ankles are to be taped to protect against upward and inward splash. As a minimum protection, face shields will be worn. Full face respirators will be used if specified by the Laboratory's Industrial Hygiene Group, HSE-5, following a field inspection.

The protective clothing and tools used during the wash down will be cleaned with detergent and water. The wash water will be collected and analyzed. If the wash water is non-hazardous, the water will be discharged to the industrial waste water sewer. If the wash water contains hazardous constituents, it will be treated on-site or transported off-site to a permitted facility. Mops and rags used for clean-up will be placed in drums for transport to Area L, with ultimate off-site disposal at a permitted facility.

9.3.2.5 Decontamination Verification

Before the first wash down, at both the batch treatment system and the modular storage units, two samples will be taken of the clean Liquinox or Alconox solution in water and analyzed for the constituents listed in Table 9-14. The constituents listed in Table 9-14 include regulated constitutents normally stored in the building.

One additional clean solution sample will be taken for each additional wash-down event. These analytical results provide background data for decontamination verification.

"Dirty" wash-down solutions will also be analyzed for the constituents listed in Table 9-14. Analytical procedures will conform to methods found in SW 846. Equipment will be considered to be contaminated if the "dirty" wash solutions show a significant increase in the listed constituents over the clean wash solutions. A significant increase is determined using statistical methods defined in SW 846.

9.3.2.6 Closure Schedule

Characterization of the final delivery of hazardous waste may require up to 30 days. An estimated 60 days will be required to schedule and process the final wastes received.

The survey of the incinerator facilities to determine the nature and level of contamination and to prepare the decommissioning document is estimated to take one year. Decommissioning and final disposal are estimated to take up to two years.

The year of closure for the TA-50-37 container storage area is 2100. Closure will observe the schedule given in Table 9-15.

9.3.2.7 Closure Certification

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed accordingly. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy shall be submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE offices and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.3.2.8 Post-Closure

Post-closure plans are not required for incineration and storage facilities.

9.3.3 TA-50 Storage Pad

9.3.3.1 TA-50 Storage Pad Description

The TA-50 Storage Pad is used to store hazardous chemical waste labpacks in 55-gallon drums and other storage containers meeting DOT specifications. The Storage Pad consists of a roofed concrete pad encompassing 1,596 square feet located south of Building TA-50-37 (Figure 9-20). The wastes are segregated into compatible waste types upon arrival at the facility and placed within one of the six storage cells. A total of 304 55-gallon drums can be stored on the pad. In addition, two 225-gallon polyethylene storage containers are also located on the pad. Additional 255- or 330-gallon containers may replace some 55-gallon drums. All containers meet DOT specifications.

9.3.3.2 Estiamte of Maximum Waste in Storage

The maximum amount of waste in storage at the TA-50 storage pad is 65 cubic meters (17,220 gallons).

9.3.3.3 Description of Waste Handled

A wide variety of wastes generated throughout the Laboratory are brought to the TA-50 Storage Pad, including wastes from basic and applied chemistry R&D programs (small quantities of different acids, bases, organics, inorganics,and reactive metals), processing waste (sludge resulting from treatment at TA-50-1 Batch Treatment Plant), and chemically contaminated equipment containerized for off-site disposal at a permitted facility.

9.3.3.4 Closure Procedure

Closure for the TA-50 Storage Pad will be done in sequential order. Before decontamination, all wastes in storage will either be treated or transferred to TA-54, Area L for disposal off-site at a permitted facility. Given the diversity of wastes handled, it is not possible to estimate the exact wastes on hand at the initiation of closure and, therefore, the final disposition of the wastes. In general, recyclable wastes will be reused internally or recycled to users off-site. Organic wastes will be burned at the CAI (Controlled-Air Incinerator) at TA-50-37. Any wastes compatible with permitted treatment at the TA-50-1 Batch Treatment Plant or the TA-54, Area L treatment tanks will be so treated. The remaining wastes will be transported off-site to a permitted facility.

Following removal or treatment of the wastes on-site at the start of closure, the storage facility will be decontaminated by washing with Liquinox or Alconox in water. The resulting wash solutions will be evaporated in the TA-54, Area L treatment tanks. When the wash water has evaporated, the residue in the tanks and the tank liners will be removed, placed in drums, and transported off-site to a permitted facility.

Personnel involved in decontaminating the storage area will wear protective equipment, including: acid/solvent-resistant coveralls, head protection, neoprene-coated gloves, and boots. Wrists and ankles are to be taped to protect against upward and inward splash. As a minimum protection, face shields will be worn. Full face respirators will be used if specified by the Laboratory's Industrial Hygiene Group, HSE-5, following a field inspection.

The protective clothing and tools used during wash down will be cleaned with detergent and water. The wash water will be collected and analyzed. If the wash water is non-hazardous, the water will be discharged to the industrial waste water sewer. If the wash water contains hazardous constituents, it will be treated on-site or transported off-site to a permitted facility. Mops and rags used for clean-up will be placed in drums for transport to TA-54, Area L, for disposal off-site at a permitted facility.

9.3.3.5 Decontamination Verification

Before the first wash down, at both the batch treatment system and the modular storage units, two samples will be taken of the clean Liquinox or Alconox solution in water and analyzed for the constituents listed in Table 9-16. The constitutents listed in Table 9-16 include regulated constituents normally stored at the facility.

One additional clean solution sample will be taken for each additional wash-down event. These analytical results provide background data for decontamination verification.

"Dirty" wash-down solutions will also be analyzed for the constituents listed in Table 9-16. Analytical procedures will conform to methods found in SW 846.

Equipment will be considered to be contaminated if the "dirty" wash solutions show a significant increase in the listed constituents over the clean wash solutions. A significant increase is determined using statistical methods defined in SW 846.

9.3.3.6 Closure Schedule

The year of closure for the TA-50 Storage Pad is 2100. Closure will observe the schedule given in Table 9-17.

9.3.3.7 Closure Certification

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed in accordance with this plan. The letter shall be dated and signed by each party and stamped by the registered engineer, and the original copy submitted by the DOE to the Director of the NMEID. One copy shall be maintained by the HSE-8 Regulatory Compliance Section.

9.3.3.8 Post-Closure

Post-closure plans are not required for storage facilities.

9.4 CLOSURE FOR TA-54 AREA L FACILITIES

9.4.1 TA-54 Area L Description

TA-54 Area L consists of a waste transfer, packaging and storage facilities and liquid treatment tanks (see Figure 9-10).

The storage facilities consist of a single-story metal building encompassing 196 square feet, a roofed concrete storage pad encompassing 1,595 square feet, and specified areas within the fenced portions of Area L for storage of solid containerized waste. These areas are used for the accumulation, packaging, and storage of waste containers, which are generated throughout the laboratory and delivered to the facility routinely. They are segregated into compatible types and placed upon the three fiberglass grates inside the metal building or within one of the six storage cells on the roofed concrete pad. Wastes in small containers are put into lab-packs. Wastes suitable for recycling are

consolidated into drums, and any damaged or leaking drums are repackaged into larger drums in this area. Solid containerized wastes are stored on pallets, or otherwise elevated four inches, in cleared areas within the fenced portions of Area L, subject to the limitations of NMHWMR 206.D.4.F.(3) and 206.D.4.F.(4). Such containers are stored within ten feet of the perimeter force, nor ten feet of closed disposal unit covers, nor five feet on either side of buried or overhead utility lines, nor twenty feet of any structure, nor five feet of any paved or unpaved roadway.

Four 1,665-gallon, 10-gauge steel treatment tanks are located at Area L. They are lined with plastic (except when treating reactive wastes) and used to neutralize, oxidize, and evaporate waste. The tanks are located on a bermed concrete pad. The waste most commonly oxidized in these tanks is lithium hydride. Aqueous ammonium biflouride solution (a "non-RCRA" waste) is the waste most commonly evaporated in the tanks.

9.4.1.1 Estimate of Maximum Waste in Storage and Treatment

The maximum amount of waste stored in the metal building at Area L is 220 gallons. The maximum amount of waste stored at the concrete storage pad is 16,720 gallons. No more than 3,600 55-gallon containers of solidified wastes will be stored within the fenced area at Area L. The maximum amount of waste treated in the tanks is 5,700 gallons.

9.4.1.2 Description of Waste Handled

A wide variety of wastes generated throughout the Laboratory are brought to Area L, including wastes from basic and applied chemistry R&D programs (small quantities of different acids, bases, organics, inorganics and reactive metals), processing wastes (sludge resulting from treatment either at Area L or at TA 50-1 Batch Treatment Plant), and chemically contaminated equipment, to be stored, recycled, treated or packaged for off-site disposal at a permitted facility.

9.4.1.3 Partial Closure

Within the fence at Area L are 34 shafts that were used for landfill or wastes and two impoundments used for evaporation of non-RCRA wastes. The landfill facility and ponds will be closed under interim status. Closing of individual

shafts occurred as they were filled and the dates of shaft closings are in Figure 9-10. The landfill will be closed in 1986. The impoundments will be closed in 1988. No partial closure of the storage and treatment facility at Area L is anticipated.

9.4.2 Closure Procedure

Cleanup and closure for treatment and storage facilities at Area L will be done in sequential order, culminating in the disposal of any residues or contaminated material by shipment off-site to a permitted facility. Before decontamination, all wastes in storage in either the roofed storage pad, the metal building, or solidified wastes within the fenced area will either be treated on-site or disposed of off-site. Given the diversity of wastes handled, it is not possible to estimate the exact wastes on hand at the initiation of closure and, therefore, the final disposition of the wastes. In general, recyclable wastes will be reused internally or recycled to users off-site. Organic wastes will be burned at the CAI (Controlled-Air Incinerator) at TA-50-37. Any wastes compatible with permitted treatment at the TA-50-1 Batch Treatment Plant or the TA-54, Area L treatment tanks will be so treated. The remaining wastes will be transported off-site to a permitted disposal facility.

Following removal or treatment of the wastes on-site at the start of closure, the metal building and roofed concrete pad will be decontaminated by washing with Liquinox or Alconox in water. The resulting wash solutions will be evaporated in the four treatment tanks. When the wash water has evaporated, the residue in the tanks and the tank liners will be removed, placed in drums and transported off-site to a permitted facility.

The tanks will then be decontaminated by washing and the decontaminated tanks handled as a nonregulated waste.

The closure steps are discussed in more detail in the following text.

9.4.2.1 Waste Removal

The waste on-site at the start of closure includes containerized wastes, as well as liquids and residues in the treatment tanks. Containerized wastes

will be handled with hand trucks or forklifts. Trucks of adequate size will be used to move containerized wastes to off-site treatment or disposal facilities, and a forklift is suitable to move wastes to the treatment tanks at Area L. All wastes shipped off-site will be manifested in accordance with 40 CFR 262 Subpart B (NMHWMR 203). The waste transporter will have an EPA identification number in accordance with 40 CFR 263.11 (NMHWMR 205.B).

9.4.2.2 Storage Area Decontamination

All floor surfaces within the roofed concrete storage pad, as well as any equipment present, will be washed down using a solution of Liquinox or Alconox in warm water. Areas will be scraped or brushed clean as necessary to remove any residues. The floor of the concrete pads are sloped to sumps, and wash water will flow into them. The water in each cell will be tested using the sampling and analytical procedures described in Section 9.5. Afterwards, the water will be removed from each sump with a vacuum truck or pumped into drums with a hand pump and transferred into the treatment tanks to be evaporated. This washing procedure will be repeated until decontamination of the cells is demonstrated by testing of the wash water. Following decontamination, the building and equipment will be handled as nonregulated waste. The inside of the vacuum truck, if used, will be rinsed when its service is complete and the rinse water will be placed in evaporation tanks.

The same procedure will be used for the metal building. All equipment, as well as the walls and floor, will be washed and the wash water will be channeled into one of the three floor sumps. The fiberglass grates covering each sump and the sumps themselves will be washed down. The wash water will be sampled and analyzed to determine adequate decontamination. Every effort will be made to minimize the volume of wash and rinse water generated by decontamination.

9.4.2.3 Treatment Tank Decontamination

When all liquid has been evaporated from the treatment tanks, the plastic liner with any dry residue will be removed, and placed in drums and disposed of in a permitted land disposal facility.

The tanks will be scraped and brushed to remove residue and the residue will be collected and placed in drums. The tanks and the concrete pad on which the treatment tanks are placed will be washed with a Liquinox or Alconox solution in water. The wash water will be contained within the curbed concrete pad, sampled, and analyzed. If the wash water is non-hazardous or requires only neutralization, it will be removed with a vacuum truck and transported to an industrial sewer which drains to the industrial wastewater treatment plant at TA-50-1. If the water contains hazardous waste, one of the treatment tanks will be double-lined with sheet polyethylene plastic and the water will be pumped into the tank for evaporation. Wash-down of the tanks and pad will be repeated until decontamination is demonstrated. The plastic liner and residue from the final evaporation will be removed and handled as was the previous tank residue.

9.4.2.4 Soil Decontamination

Soil sampling, which will be conducted to determine if hazardous wastes have been tracked outside of contaminated areas, will be taken in the manner described in Section 9.5. Composite soil samples will be collected around the edge of the roofed concrete pad asphalt apron, as shown in Figure 9-11, and also at the bermed concrete pad beneath the treatment tanks, as shown in Figure 9-12. Composite soil samples will be taken at each edge of the asphalt apron around the metal building. Each composite will be made up of three cores taken six inches off the asphalt edge and equally spaced to cover the edge.

If contamination is found in these samples, the limits of the sampling area will be expanded by establishing a sampling grid to determine the outside perimeter of the contamination. Sampling will be continued at the sampler's discretion to determine the extent of contamination.

Background soil samples will be taken before the storage pad and tank pad are used for regulated wastes. Composite background samples will be taken in the same locations as the initial closure soil survey.

A sampling survey of the containerized solid waste storage areas will be conducted using a grid with 75-feet centers to determine the area of possible

contamination. The survey will be performed by collecting a surface sample and a sample one foot below ground surface at each grid point. Additional surface and subsurface samples will be collected from areas with visible contamination (i.e., soil discoloration). If the initial grid sample analysis indicates vertical contamination at the maximum sample depth, additional sampling at one-foot intervals will be performed to determine the depth of contamination. If contamination is determined on the surface, additional sampling will be conducted by reducing the grid distance by one-half and taking additional site samples, dictated by terrain, until the contaminated area is defined. If contamination is found at the outside grid samples, the limits of the grid will be expanded to determine the outside perimeter of contamination. The contaminated soil will then be removed and handled as a regulated waste. The adequacy of decontamination is determined by additional sampling. Sampling, analysis, and documentation procedures are defined in Section 9.5.

Soil and sediment samples will be analyzed for the constituents listed in Table 9-10. Analysis and quality assurance/quality control will follow methods defined in SW-846 and noted in Section 3.0. The approach to soil decontamination depends on the extent of contamination determined by thesampling. If the sample survey indicates that there are no contaminated soil areas, no further soil decontamination action will be taken at the site. If the soil is contaminated, it will be placed in drums or sealed in dump trucks for off-site disposal at a permitted facility.

9.4.2.5 Personnel Protection

Personnel who are washing equipment will wear rubber gloves, neoprene acid/solvent resistant coveralls, rubber boots, and a face shield. The Laboratory's Industrial Hygiene Group (HSE-5) will review the site survey analytical data and recommend additional protective clothing.

9.4.2.6 Equipment Decontamination

Shovels, drum trucks and other equipment used for decontamination will be scraped and brushed to remove residue, and the residue collected will be placed in drums for disposal off-site at a permitted facility.

The equipment will be placed on a plastic sheet that is bermed to contain liquids and washed with water and detergent. Larger equipment such as back-hoes and forklifts will also be washed. No testing will be performed on this water and washing is considered adequate to decontaminate the equipment. The wash water will be allowed to evaporate and the plastic and residue will be packed in drums for off-site disposal at a permitted facility.

9.4.3 Decontamination Verification

Soil samples will be analyzed for the constituents shown in Table 9-10. These combined tests are adequate to screen for almost all of the regulated constituents which, if handled at Area L, would have been present in small volume, laboratory-size containers.

The criteria for determining contaminated soil are the same as discussed in Section 9.4.2.4. Regulated constituent concentrations will be compared to background concentrations. A risk assessment will be prepared for each regulated constituent showing a significant increase over background concentration. A significant increase will be determined by using statistical methods described in USEPA SW 846. The risk assessment will determine the threshold concentration for each constituent that represents a significant risk to human health and the environment, and will take into account all possible pathways. Soils containing levels of contamination above the threshold will be considered contaminated.

A copy of the completed risk assessment, along with pertinent backup data, will be provided to the NMEID for review and approval. Should NMEID find the threshold contamination levels inadequate, the Laboratory will negotiate threshold values agreeable to both parties.

Decontamination of the site soil will be demonstrated by additional sampling. Because removal of contaminated soil will leave an exposed surface, the disturbed surface will be resampled in the same places used to define the contaminated area. Analysis and the determination of contamination is as previously discussed, and an analysis will be conducted only for those constituents that caused the area to be contaminated.

A minimum of two samples of the clean Liquinox or Alconox solution will be sampled as background for wash water and, along with the wash water samples, analyzed for the constituents shown in Table 9-10. The area will be considered contaminated if the wash water analyses show a significant increase in constituents over the clean wash solution. A significant increase is determined by using statistical methods defined in USEPA SW-846.

9.4.4 Closure Schedule

The year of closure is 2100. Soil survey, contracting and closure activities will observe the schedule given in Table 9-11.

Soil sampling and the decontamination contractor selection will be completed before closure begins. Because several of the closure steps will occur simultaneously, closure is estimated to take 360 days.

Contracts for analytical work and, if necessary, soil removal are expected to exceed $100,000. The Laboratory is required by policy to put the work out for bid, and ninety days are required to solicit and process the bids.

The location of the site is prone to snow cover in the winter months. Depending on the date NMEID approves the closure plan, the closure may be delayed until the site is free of snow and the ground is thawed adequately to allow the soil sampling and other closure operations. The schedule includes a weather contingency to allow for this potential delay.

Because of the time required for wash water evaporation and the projected decontamination time, approval of a closure period greater than 180 days 40 CFR 265.113(b) [NMHWMR 206.D.2.d(2)] is requested per 40 CFR 265.113(b)(1)(i) [NMHWMR 206.D.2.d.(2)(b)(i)].

9.4.5 Closure Certification

An independent registered professional engineer and the owner/operator of the facility shall witness the closure and ensure that the closure follows this plan. Upon completion of closure, the engineer and the DOE shall prepare a letter certifying that the area has been closed accordingly. The letter shall be dated and signed by each party and stamped by the registered engineer, and

the original copy shall be submitted by the DOE to the Director of the NMEID. One copy shall be maintained at the DOE offices and one copy maintained by the HSE-8 Regulatory Compliance Section.

9.4.6 Post-Closure

Post-closure care is not required for storage and treatment facilities. Post-Closure care for the landfill closed under interim status is discussed in the closure plan for the landfill facility.

9.5 SAMPLING AND ANALYTICAL PROCEDURES

The following sections define procedures and methods for sampling, analysis and documentation applicable to closure plans. While the procedures and method are specific, any applicable procedure or method given in SW-846 may be used if conditions or experience shows the alternate method to be more appropriate.

9.5.1 Soil Sampling

The sampling procedures outlined below are used to determine the amount of hazardous material deposited on a particular area of land, or to determine the leaching rate of the material, or determine the residue level on the soil. Adequate preparation ensures that proper sampling is accomplished. A check-list of items required for field sampling is given in Table 9-12.

Surface soil samples will be collected with a trowel or scoop. To sample below 3 in. (8 cm), samples will be collected with a Veihmeyer soil sampler (Figure 9-13).

9.5.1.1 Cleaning of Sampler

It is important to clean the samplers after each site is sampled. The samplers will be washed with a warm Liquinox or Alconox solution, rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. Lack of cross-contamination is of particular importance in these samples, because they will be taken for regulatory purposes. One-quart glass containers will be used for the samples because they are compatible with the waste. Sampling will be conducted in

accordance with procedures given in Samplers and Sampling Procedures for Hazardous Waste Streams, EPA 600/2-80-018 and SW 846.

Samples will be taken, placed in bottles, sealed, tagged, and immediately packed in vermiculite, sawdust, or, if refrigeration is required, an insulated container with ice. One sample for every ten samples will be either duplicated or split. The duplicated or split sample will be identified by a code so that its source is not available to the analytical laboratory, but analytical results can be compared to its twin.

9.5.1.2 Sampling Procedures

Trowel or Scoop

- Take small, equal portions of sample from the surface or near the surface of the material to be sampled.
- Combine the samples in a glass container.
- Cap the container, attach a label and seal, record in field log book, and complete the sample analysis request sheet and chain-of-custody record.

Veihmeyer Sampler

- Assemble the sampler by screwing in the tip and drive head on the sampling tube.
- Insert the tapered handle (drive guide) of the drive hammer through the drive head.
- Place the sampler in a perpendicular position on the soil to be sampled.
- With the left hand holding the tube, drive the sampler into the ground to the desired sampling depth by pounding the drive head with the drive hammer. Do not drive the tube further than the tip of the hammer's drive guide.
- Record the length of the tube that penetrated the ground.
- Remove the drive hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.
- Rotate the sampler at least two revolutions to shear off the sample at the bottom.

- Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head and rotate about 90 degrees.

- Withdraw the sampler from the ground by pulling the handle (hammer) upwards. When the sampler cannot be withdrawn by hand, as in deep soil sampling, use a puller jack and grip.

- Dislodge the hammer from the sampler, turn the sampler tube upside down, tap the head gently against the hammer, and carefully recover the sample from the tube. The sample should slip out easily.

- Store the core sample in a 1,000 or 2,000 ml (1 qt or 1/2 gal) sample container.

- Label the sample, affix the seals, record in the field log book, complete sample analysis request sheet and chain-of-custody record, and deliver the samples to the laboratory for analysis.

9.5.2 Liquid Sampling

A Coliwasa sampler or similar device will be used to sample water solutions in order to determine background parameters before washing the area; it will also be used to sample the dirty wash water used in cleaning equipment. The recommended model of the Coliwasa is shown in Figure 9-14, the main parts consisting of the sampling tube, the closure-locking mechanism, and the closure system. As an alternative to the Coliwasa, glass tubes may be used to sample liquids. The primary advantage in utilizing a glass tube is that the tube will be disposed of as hazardous waste after each sample is collected, thus eliminating the potential for cross-contamination.

9.5.2.1 Cleaning of Sampler

The sampler must be clean before use. The used sampler must be washed with a warm detergent solution (Liquinox or Alconox), rinsed several times with tap water, rinsed with distilled water, drained of excess water, and air-dried or wiped dry. A necessary piece of equipment for cleaning the tube of the Coliwasa is a bottle brush that fits tightly inside the diameter of the tube.The brush is connected to a rod of sufficient length to reach the entire length of the sampler tube. Using this ramrod and fiber-reinforced paper towels, the Coliwasa tube may be quickly cleaned. Improper cleaning of sample equipment

will cause cross-contamination of samples. Lack of contamination is of particular importance in these samples, because they will be taken for regulatory purposes. Clean samples should be stored in polyethylene plastic tubes or bags in a clean and protected area.

9.5.2.2 Sampling Procedures

- Assemble the glass Coliwasa sampler.
- Make sure that the Coliwasa sampler is clean.
- Check to make sure the sampler is functioning properly. Adjust the locking mechanism, if necessary, to make sure the neoprene rubber stopper provides a tight closure.
- Wear necessary protective clothing and gear and observe required sampling precautions.
- Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
- Slowly lower the Coliwasa sampler into the liquid at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sampler tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.
- When the sampler stopper hits the bottom of the liquid container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
- Slowly withdraw the sampler from the container with one hand while wiping the sampler tube with a disposable cloth with the other hand.
- Carefully discharge the sample into a glass container by slowly opening the sampler. This is done by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in the glass container.
- Cap the glass container, attach a label and seal record in the field log book, and complete the sample analysis request sheet and chain-of-custody record.

- Unscrew the T-handle of the sampler and disengage the locking block. Clean the sampler on-site or store the contaminated parts of the sampler in a plastic storage tube or bag for subsequent cleaning. Store used rags in plastic bags for subsequent disposal.

9.5.3 Sample Handling and Documentation

Soil and liquid samples will be analyzed either internally or at a commercial laboratory. In either case, each sample will be labeled, sealed, and accompanied by a chain-of-custody and a sample analysis request form.

The sample container must be sealed with a gummed paper seal attached to the container in such a way that the seal must be broken in order to open the container. The seal and sample tag must be completed with a waterproof pen. An example of a sample seal is shown in Figure 9-15.

The sample label is necessary to prevent misidentification of samples and shall include, if applicable, the grid number referenced to positions staked on the site perimeter. The "field information" in the case of soil sampling, shall include observations such as the soil texture and surface appearance, ambient temperature and cloud cover at time of sampling, and precipitation conditions 24 hours before sampling. An example of a sample label is shown in Figure 9-16.

The chain-of-custody form is necessary to trace sample possession from the time of collection and must accompany every sample. This record becomes especially important when the sample is to be introduced as evidence in a court litigation. This is a two-page record with the original accompanying shipment and the "copy" retained by the Laboratory. An example of this form is shown in Figure 9-17.

A separate closure sampling field log book will be kept and will contain all information pertinent to field surveys and sampling. The log book shall have bound and consecutively numbered pages in 8-1/2 by 11-inch format. Minimum entries include:

a. Purpose of sample (routine sampling, special sampling)

b. Location of sampling (coordinates referenced to staked field points, if soil sample)

c. Name and address of person making log entry

d. Type of process producing waste

e. Number and volume of sample taken

f. Description of each sampling location, sampling methodology, equipment used, etc.

g. Date and time of sample collection

h. Sample destination and transporter's name (name of laboratory, UPS, etc.)

i. Map or photograph of the sampling site, if any

j. Field observations (ambient temperature, sky conditions, past 24-hour precipitation, etc.)

k. Field measurements, if any (pH, flammability, explosivity, etc.)

l. Collector's sample identification number(s)

m. Signature of person responsible for the log entry

Sampling situations vary widely. No general rule can be given as to the extent of information that must be entered in the log book. A good rule, however, is to record sufficient information so that someone can reconstruct the sampling situation without relying on the collector's memory.

The sample shipment and chain-of-custody record is accompanied by a sample analysis request sheet (Figure 9-18). The request sheet has two parts: field and laboratory. The field portion of this form must be completed by the person collecting the sample and include most of the pertinent information noted in the log book. The laboratory portion is intended to be completed by the laboratory personnel when the sample is received.

TABLE 9-1

SUMMARY OF HAZARDOUS WASTE FACILITIES
AT LOS ALAMOS NATIONAL LABORATORY

Facility	Treatment	Storage
TA-14	Thermal	None
TA-15	Thermal	None
TA-16	Thermal Incineration	None
TA-36	Thermal	None
TA-39	Thermal	None
TA-50	Batch Chemical Incineration	Container
TA-54	Solidification Neutralization Oxidation Evaporation	Container

TABLE 9-2

REGULATED WASTES DETONATED AT TA-36 MINIE

Hazardous Waste Code	Name	Hazard
P006	Alumiumun phosphide	
P009	Ammonium picrate	R
P022	Carbon disulfide	
P031	Cyanogen	
P033	Cyanogen chloride	
P048	2,4,-Dinitrophenol	
P054	Ethylenimine	
P056	Fluorine	
P063	Hydrogen cyanide	
P064	Isocyanic acid (methyl isocyanate)	
P065	Mercury fulminate	R,T
P069	2-Methyllactonitrile	
P071	Methyl parathion	
P073	Nickel carbonyl	
P076	Nitric oxide	
P077	p-Nitroaniline	
P081	Nitroglycerine	R
P096	Phosphine	
P107	Strontium sulfide	
P112	Tetranitromethane	R
P122	Zinc phosphide (10%)	
U006	Acetyl chloride	
U008	Acrylic acid	
U020	Benzenesulfonyl chloride	C,R
U023	Benzene	C,R,T
U033	Carbonyl oxyfluoride	R,T
U042	2-Chloroethyl vinyl ether	
U044	Chloroform	

TABLE 9-2

REGULATED WASTES DETONATED AT TA-36 MINIE

(Continued)

Hazardous Waste Code	Name	Hazard
U045	Chloromethane	I,T
U075	Dichlorodifluoromethane	
U092	Dimethylamide	I
U096	alpha, alpha-Dimethylbenzylhydroperoxide	R
U108	1,4-Dioxane	
U112	Ethyl acetate	I
U113	Ethyl acrylate	I
U115	Ethlene oxide	I,T
U117	Ethyl ether	I
U118	Ethylmethacrylate	
U113	Hydrazine	R,T
U134	Hydrogen fluoride	C,T
U135	Hydrogen sulfide	
U171	Nitropropane	I
U205	Selenium disulfide	R,T
U213	Tetrahydrofuran	I
U217	Thallium nitrate	I
U234	sym-Trinitrobenzene	R,T

TABLE 9-3

ANALYTICAL PARAMETERS AND METHODS FOR TA-14, TA-15, TA-16, AND TA-39

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
Cyanide			9010
Nitrates			9200

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-4

AMBIENT TOTAL METALS IN SOIL

PARAMETER	MEAN AMBIENT BACKGROUND[1] Western U.S. (mg/kg)	Eastern U.S. (mg/kg)
Matrix Type	Soil	Soil
Aluminum	5.4	3.3
Chromium	38	36
Barium	560	500
Beryllium	0.6	0.6
Cobalt	8	7
Copper	21	14
Iron	20,000	15,000
Nickel	16	13
Manganese	390	290
Zinc	51	36
Boron	22	36
Vanadium	66	46
Silver	-	--
Arsenic	6.1	5.4
Antimony	150	--
Selenium	0.25	0.39
Thallium	--	--
Mercury	0.055	0.096
Tin	10	10
Cadium	1	1
Lead	18	14
Ammonia	--	--
Cyanide	--	--
Sulfide	--	--

[1]Ambient background concentrations apply only to soil matrix samples. Values obtained form "Geochemistry of Some Rocks, Soils, Plants, and Vegetables in the Conterminous United States," United States Geological Survey Professional Paper 574 F, 1975.

TABLE 9-5

ANALYTICAL PARAMETERS AND METHODS FOR TA-36

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
--	Zinc	-	6010
--	Thallium	-	6010
--	Selenium	-	6010
Organic Scan			
	GC/MS for volatiles		8240
	GC/MS for semivolatiles		8250 or 8270
	Total Organic Halogen		9020 or 9022
Other			
	Cyanide		9010
	Soil pH		9045
	Sulfides		9030
	Nitrates		9200

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-6

SAMPLING SURVEY AND CLOSURE SCHEDULE FOR
TA-14, TA-15, TA-36, AND TA-39
THERMAL TREATMENT FACILITIES

Activity	Maximum Time Required
Sampling Survey and Contracting	
Contract for sampling and/or analytical services	90 days
Conduct the first sampling survey	30 days
Analyze the first samples	60 days
Determine contaminated areas	20 days
Conduct the second sampling survey	30 days
Weather delay contingency	60 days
Analyze the second samples	60 days
Determine contaminated areas	20 days
Contract for decontamination, if necessary	90 days
Closure	
Remove soil, if necessary	90 days
Decontaminate equipment	7 days
Weather delay contingency	30 days
Conduct verification samples	20 days
Analyze samples	30 days

Many of the above steps will be taken concurrently, and the total closure period will not exceed 180 days.

TABLE 9-7

SAMPLING SURVEY AND CLOSURE SCHEDULE FOR TA-16 THERMAL TREATMENT FACILITY

Activity	Maximum Time Required
Sampling Survey and Contracting	
Contract for sampling and/or analytical services	90 days
Conduct the first sampling survey	30 days
Analyze the first samples	60 days
Determine contaminated areas	20 days
Conduct the second soil sampling survey	30 days
Weather delay contingency	60 days
Analyze the second samples	60 days
Determine areas of contamination	20 days
Contract for decontamination, if necessary	90 days
Closure	
Decontaminate pads and equipment, if necessary	20 days
Soil removal, if necessary	90 days
Weather delay contingency	20 days
Conduct verification samples	20 days
Analyze samples	30 days

Many of the above steps will be taken concurrently, and the total closure period will not exceed 180 days.

TABLE 9-8

ANALYTICAL PARAMETERS AND METHODS FOR TA-50-1 BATCH TREATMENT SYSTEM

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
--	Zinc	-	6010
--	Thallium	-	6010
--	Selenium	-	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
Cyanide			9010
pH			9045
Nitrates			9200

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-9

CLOSURE SCHEDULE FOR TA-50 BATCH TREATMENT SYSTEM AND MODULAR STORAGE BUILDINGS

Activity	Maximum Time Required
Treatment of final wastes	30 days
Internal wash down	10 days
External wash down	20 days
Equipment disassembly	70 days
Floor wash down	10 days
Final cleanup	20 days
Decontamination verification	20 days
Total	180 days

TABLE 9-10

ANALYTICAL PARAMETERS AND METHODS FOR TA-54, AREA L FACILITIES

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
--	Nickel	-	6010
--	Beryllium	-	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
Cyanide			9010
Nitrates			9200
Sulfides			9030
pH (liquids)			9040
Soil pH			9045

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-11

SAMPLING SURVEY AND CLOSURE SCHEDULE FOR TA-54, AREA L FACILITIES

Activity	Maximum Time Required
Sampling Survey and Contracting	
Contract for sampling and/or analytical services	90 days
Conduct first soil sampling survey	30 days
Analyze first soil samples	60 days
Conduct second soil sampling survey, if needed	30 days
Analyze second soil samples, if needed	60 days
Contract for soil decontamination	90 days
Weather delay contingency	60 days
Closure	
Treat or remove final wastes from waste transfer, packaging and storage areas	90 days
Decontaminate waste packaging, transfer and storage areas	30 days
Evaporate waste wash water from treatment tanks	90 days
Dispose of tanks and residue	60 days
Remove soil	30 days
Weather delay contingency	30 days
Conduct verification samples	20 days
Analyze samples	30 days

Many of the above steps will be taken concurrently, and the total closure period will not exceed 180 days.

TABLE 9-12

CHECKLIST OF SUGGESTED ITEMS FOR FIELD SAMPLING

Quantity	Item	Use	Supplier
1	Field log book	To keep sample records	Office supply stores
1	Disposable towels or rags	To clean sampling equipment	Terry towels or equivalent; available at chemical supply houses
6	Large polyethylene bags	To store waste papers, rags, etc.	Plastic supply houses
12	Polyethylene bags	To store sample containers	Plastic supply houses
4	Waterproof pens	To complete records and labels	Stationary stores
1	Apron, oil and acid proof	Protective garment	McMaster-Carr Co. P. O. Box 4355 Chicago, IL
1	Face mask	Protective garment	MSA 400 Penn Center Boulevard Pittsburgh, PA 15235
1	Liquinox or Alconox Detergent	Used to clean sampler	

TABLE 9-13

CLOSURE SCHEDULE FOR TA-16 INDUSTRIAL INCINERATOR

ACTIVITY	MAXIMUM TIME REQUIRED
Treatment of final wastes	30 days
Residue removal from incinerator	10 days
Internal/external wash down	10 days
Equipment disassembly	75 days
Residue removal from concrete pad	10 days
Concrete pad wash down	5 days
Final cleanup	20 days
Decontamination verification	20 days
TOTAL	180 days

TABLE 9-14

ANALYTICAL PARAMETERS AND METHODS FOR TA-50-37 CONTAINER STORAGE AREA

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
pH			9045

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-15

CLOSURE SCHEDULE FOR THE TA-50-37 CONTAINER STORAGE AREA

ACTIVITY	MAXIMUM TIME REQUIRED
Removal of final wastes	60 days
Floor wash down	10 days
Analyze samples	50 days
Final cleanup	10 days
Decontamination verification	50 days
TOTAL	180 days

TABLE 9-16

ANALYTICAL PARAMETERS AND METHODS FOR THE TA-50 STORAGE PAD

EPA Hazardous Waste Number	Metals	EP Toxic Regulated Concentrations	EPA Analytical Method[1]
D004	Arsenic	5.0 mg/l	6010
D005	Barium	100.00	6010
D006	Cadmium	1.0	6010
D007	Chromium	5.0	6010
D008	Lead	5.0	6010
D009	Mercury	0.2	7470 or 7471
D010	Selenium	1.0	6010
D011	Silver	5.0	6010
Organic Scan			
GC/MS for volatiles			8240
GC/MS for semivolatiles			8250 or 8270
Other			
pH			9045

[1]Analytical methods are taken from Test Methods for Evaluating Solid Waste, EPA SW 846, and may be superceded by more current or alternate methods from SW 846.

TABLE 9-17

CLOSURE SCHEDULE FOR THE TA-50 STORAGE PAD

ACTIVITY	MAXIMUM TIME REQUIRED
Removal of final wastes	60 days
Floor wash down	10 days
Analyze samples	50 days
Final cleanup	10 days
Decontamination verification	50 days
TOTAL	180 days

11/16/87 A301017.02- A119

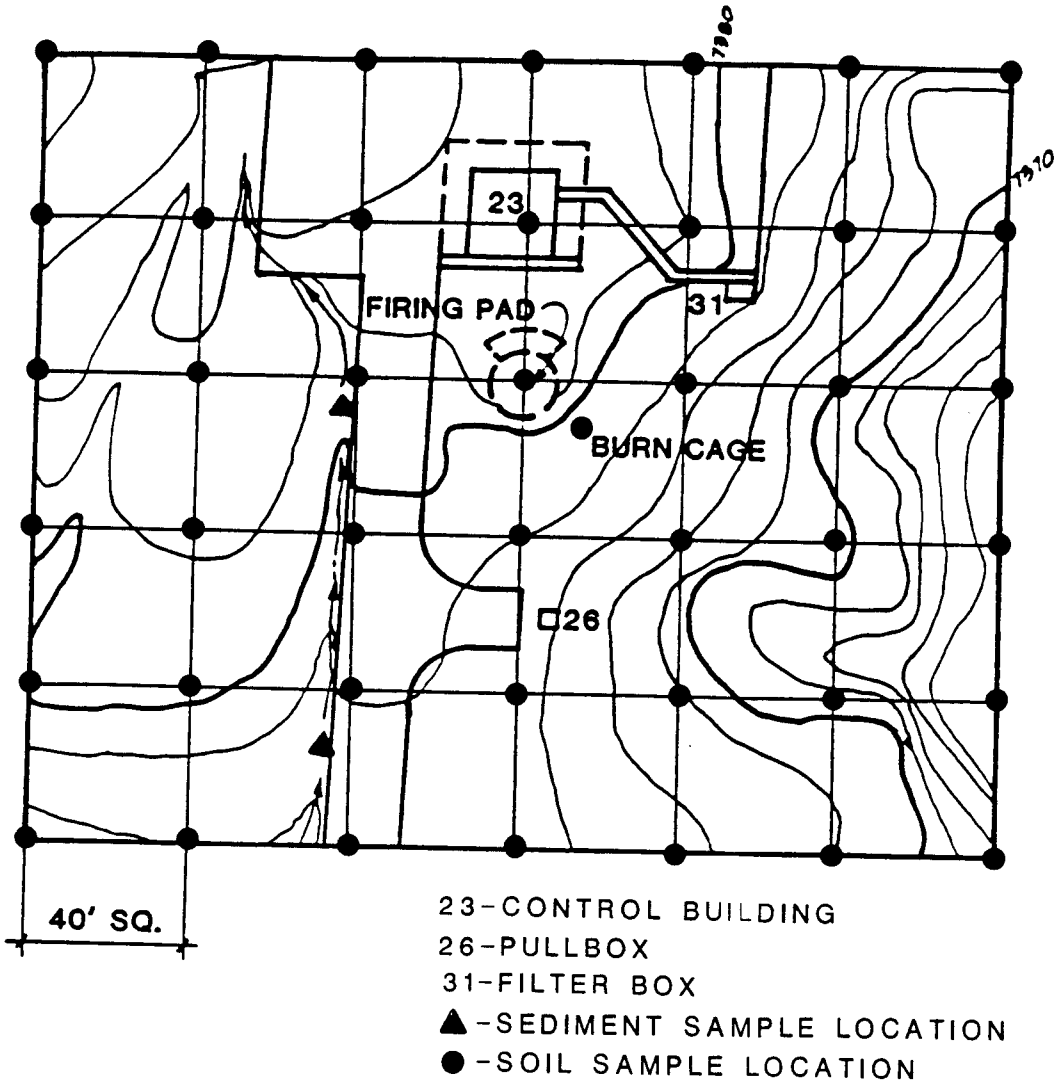


FIGURE 9-1 TA-14 WASTE FIRING SITE

11/16/87 A301017.02- A120

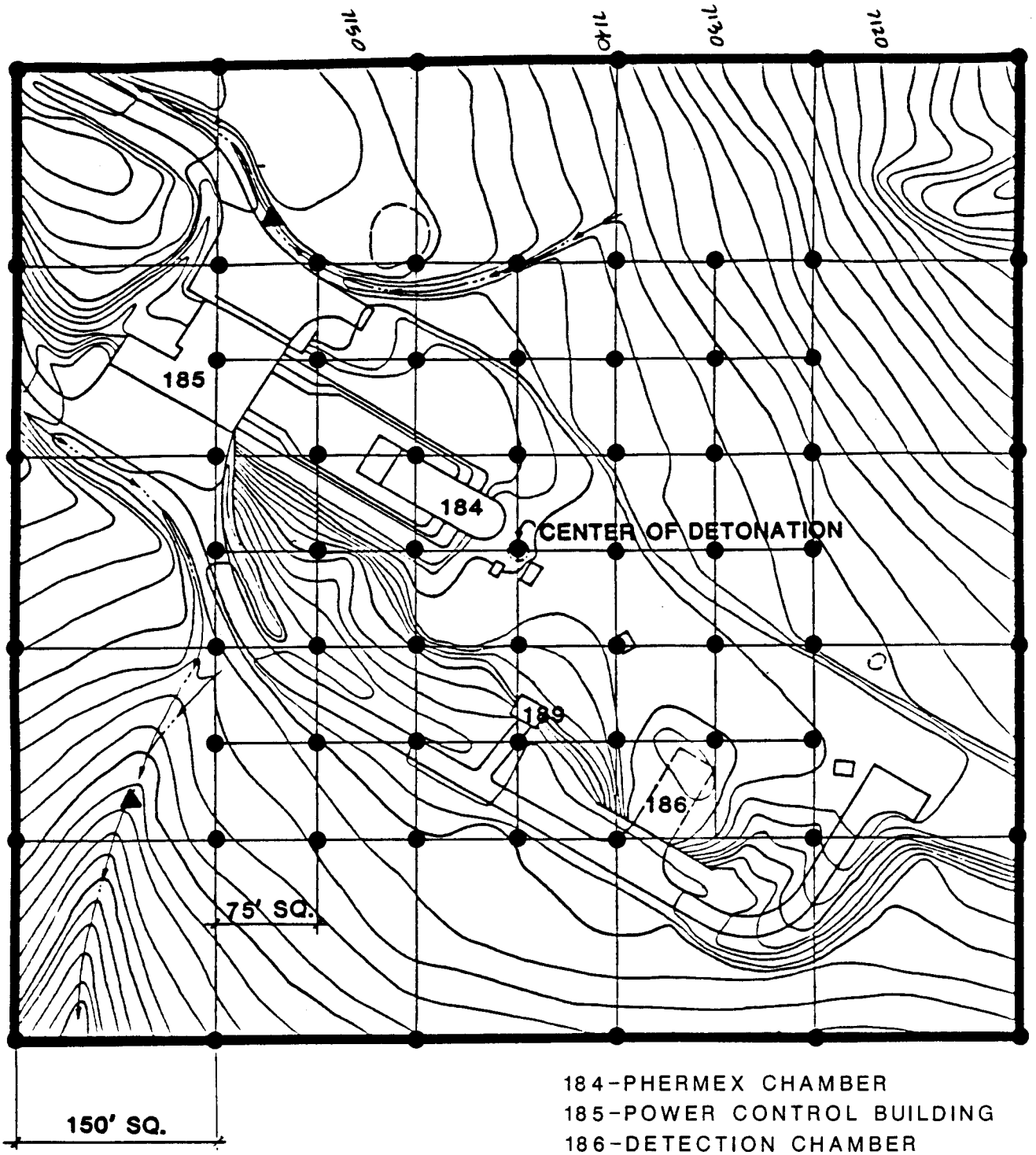


FIGURE 9-2 TA-15 FIRING SITE

11/16/87 A301017.02- A121

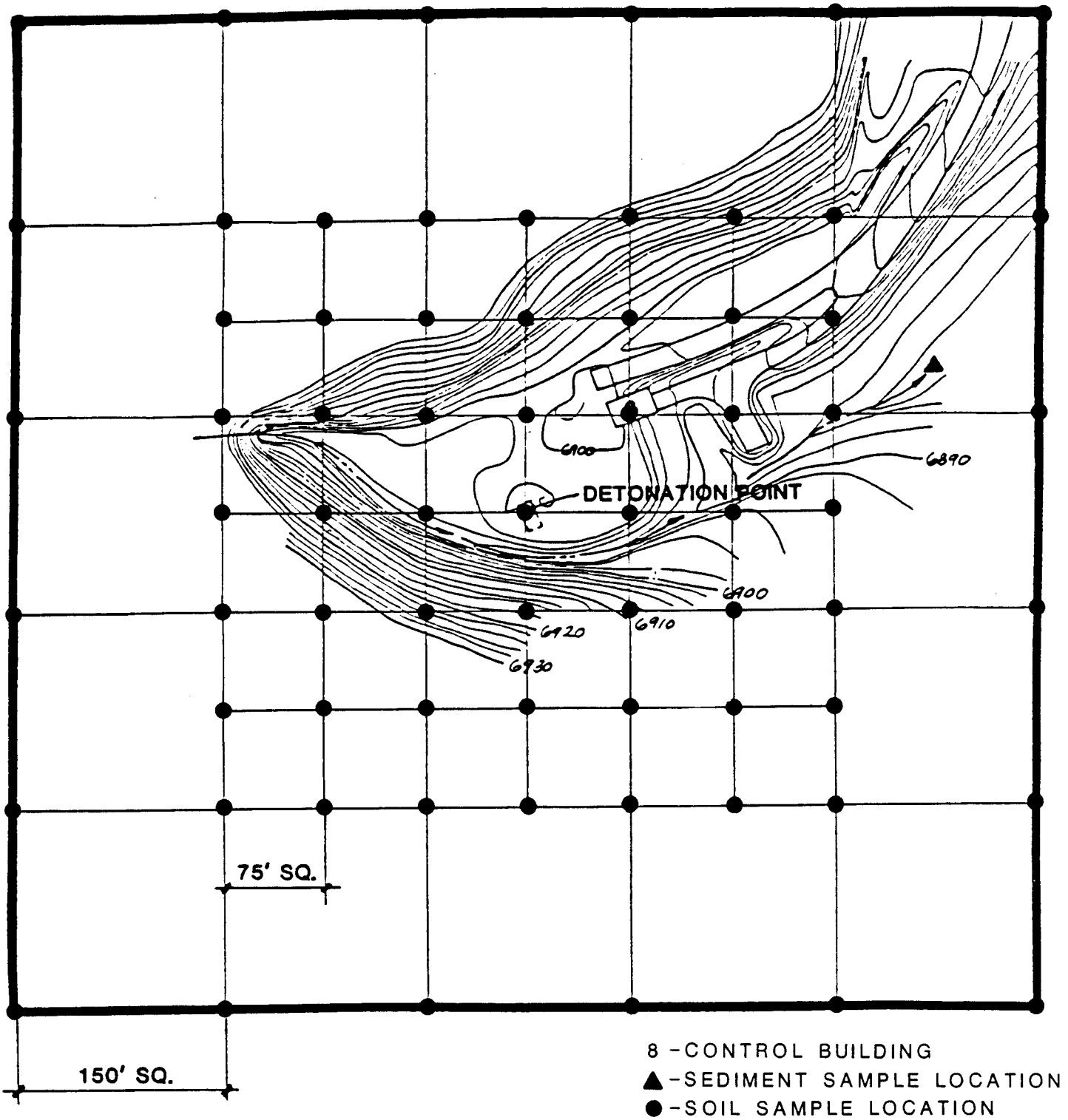


FIGURE 9-3 TA-36 MINIE FIRING SITE

11/16/87 A301017.02- A122

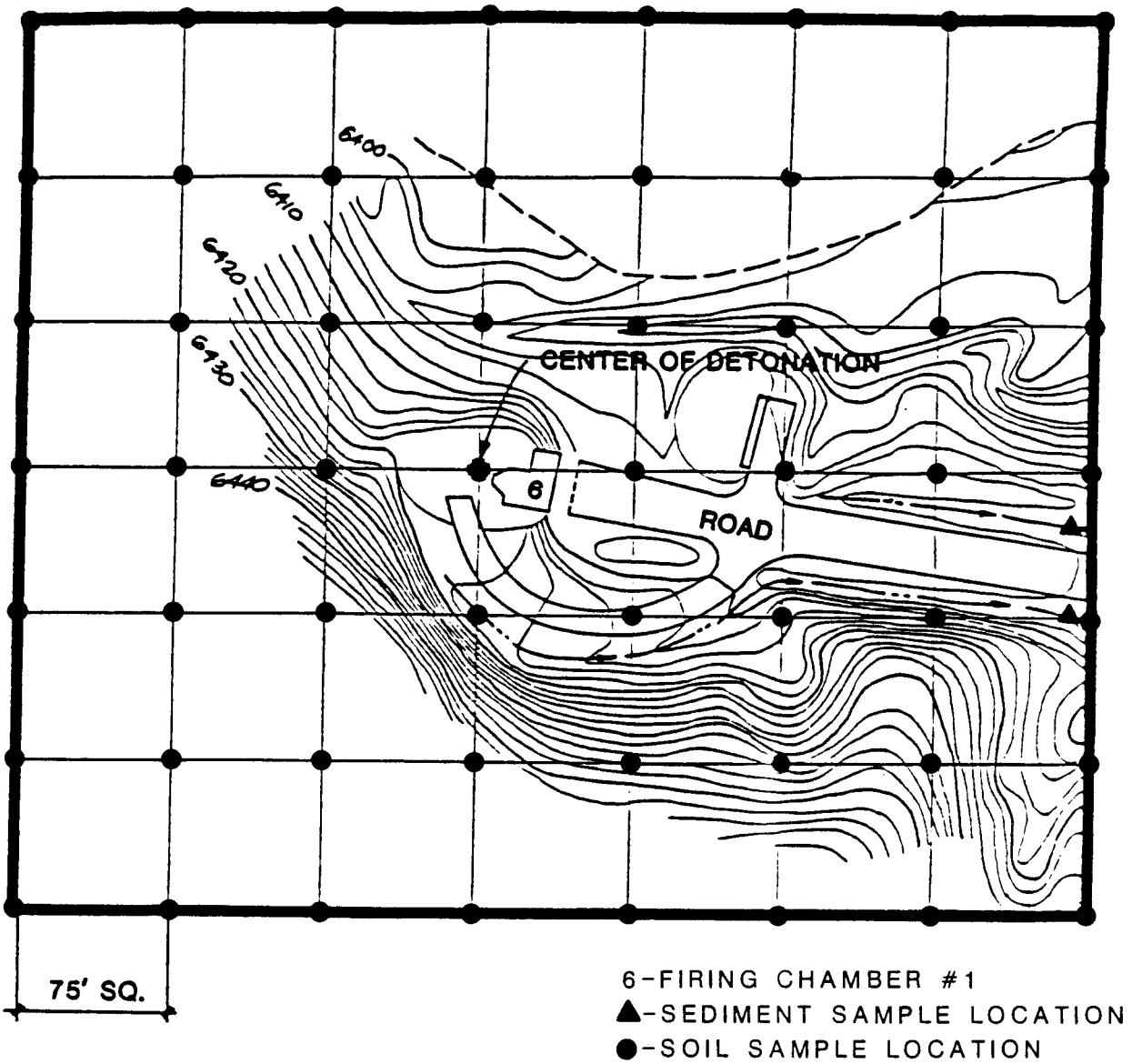
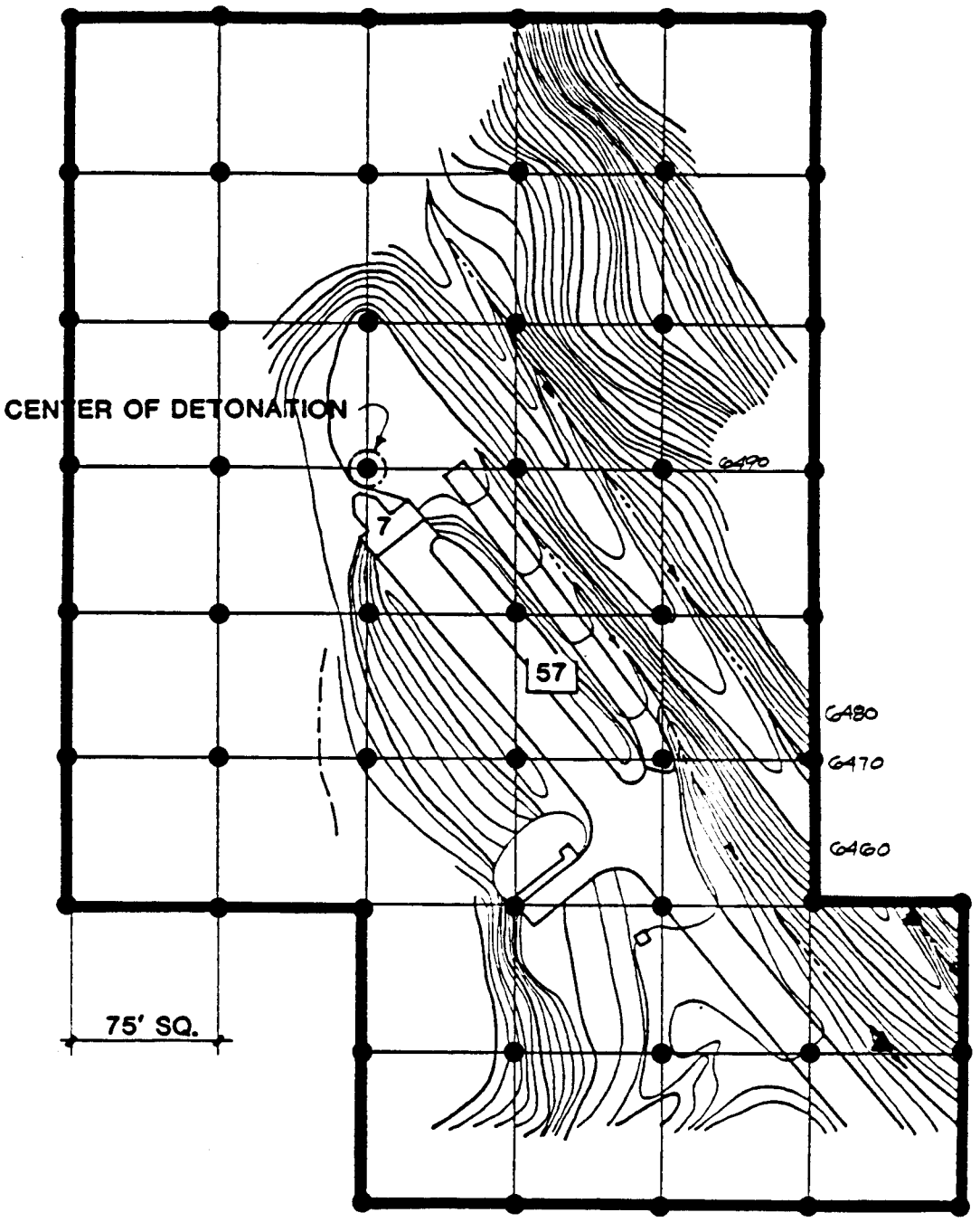


FIGURE 9-4 TA-39-6 FIRING SITE

11/16/87 A301017.02- A12



7-FIRING CHAMBER #2
57-FIRING CHAMBER
▲-SEDIMENT SAMPLING LOCATION
●-SOIL SAMPLING LOCATION

FIGURE 9-5 TA-39-57 FIRING SITE

11/16/87 A301017.02- A124

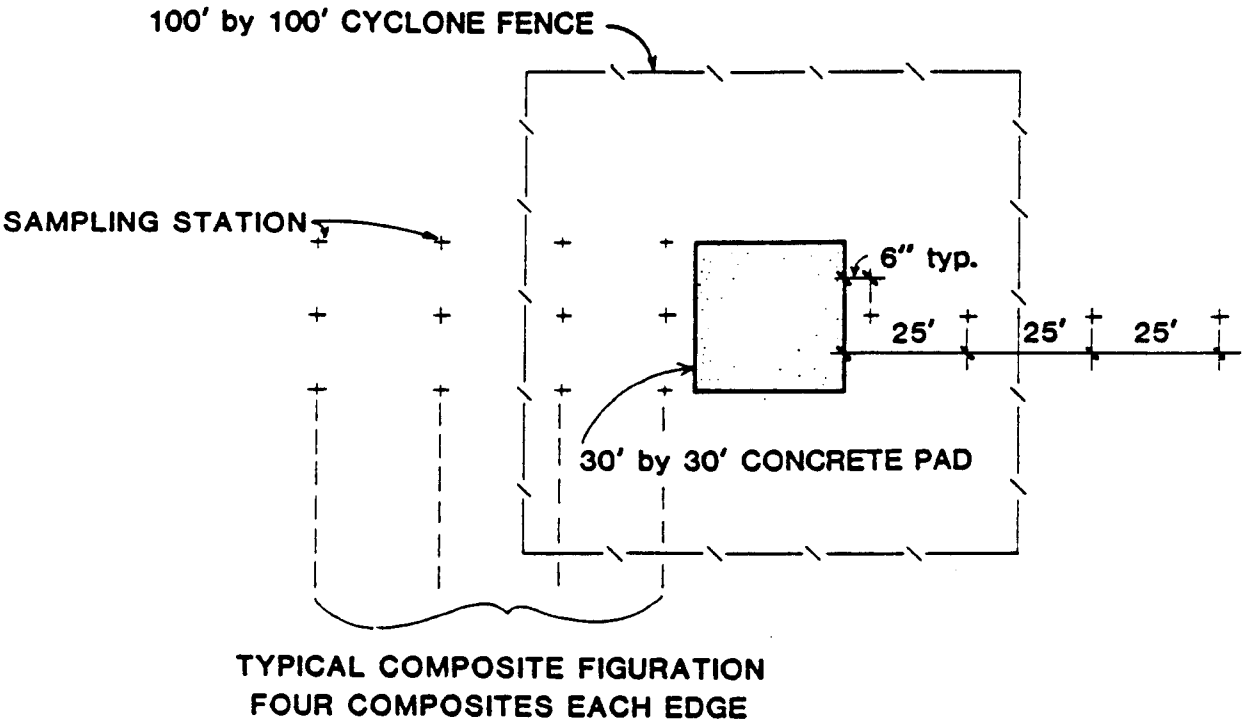


FIGURE 9-6 TA-16 BURN PAD SAMPLE LOCATIONS

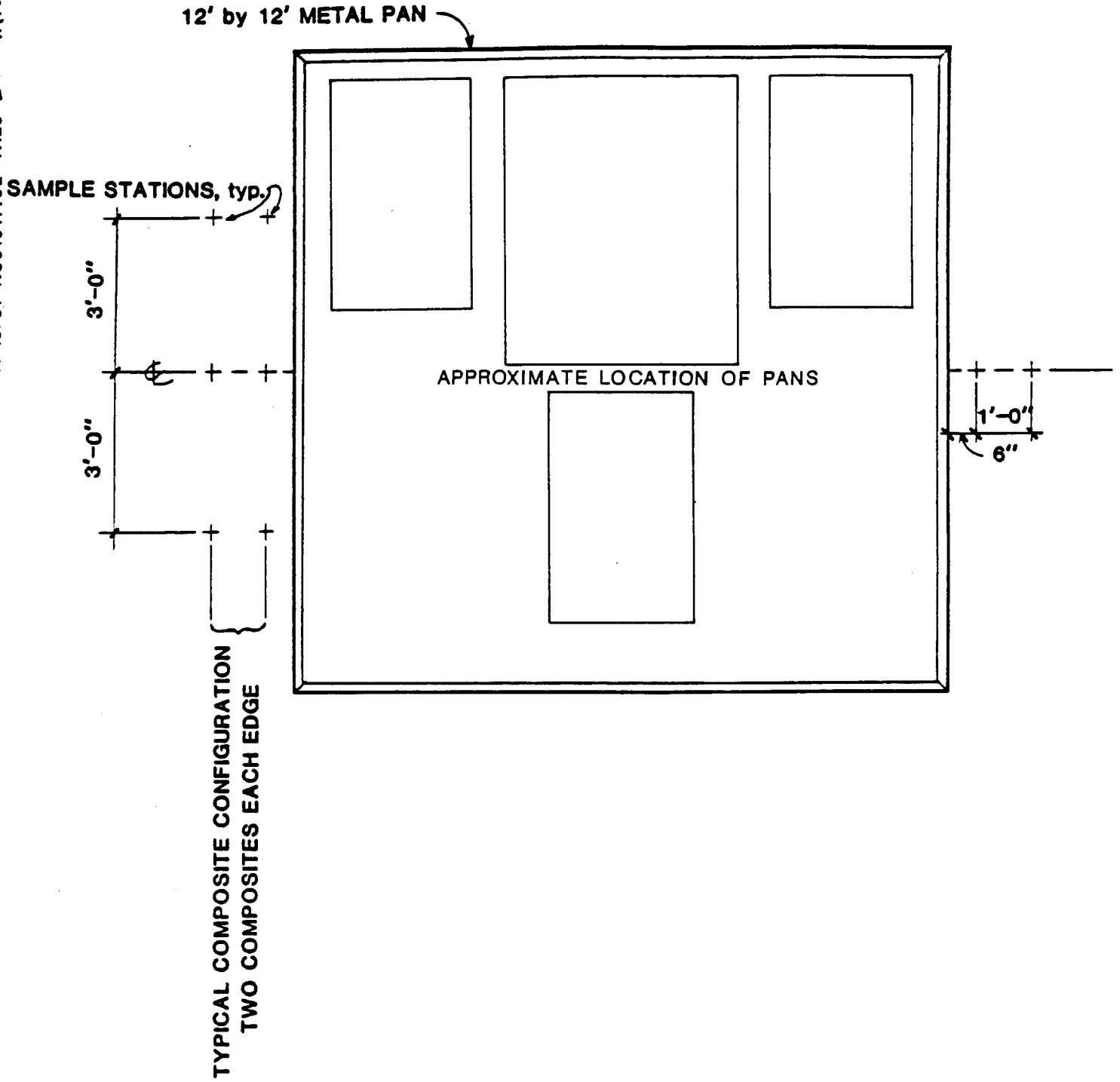


FIGURE 9-7 TA-16 LIQUID BURN PAD SAMPLE LOCATIONS

11/16/87 A301017.02-A125 SWJ DE 11/16/87

11/16/87 A301017.02-A126 DE

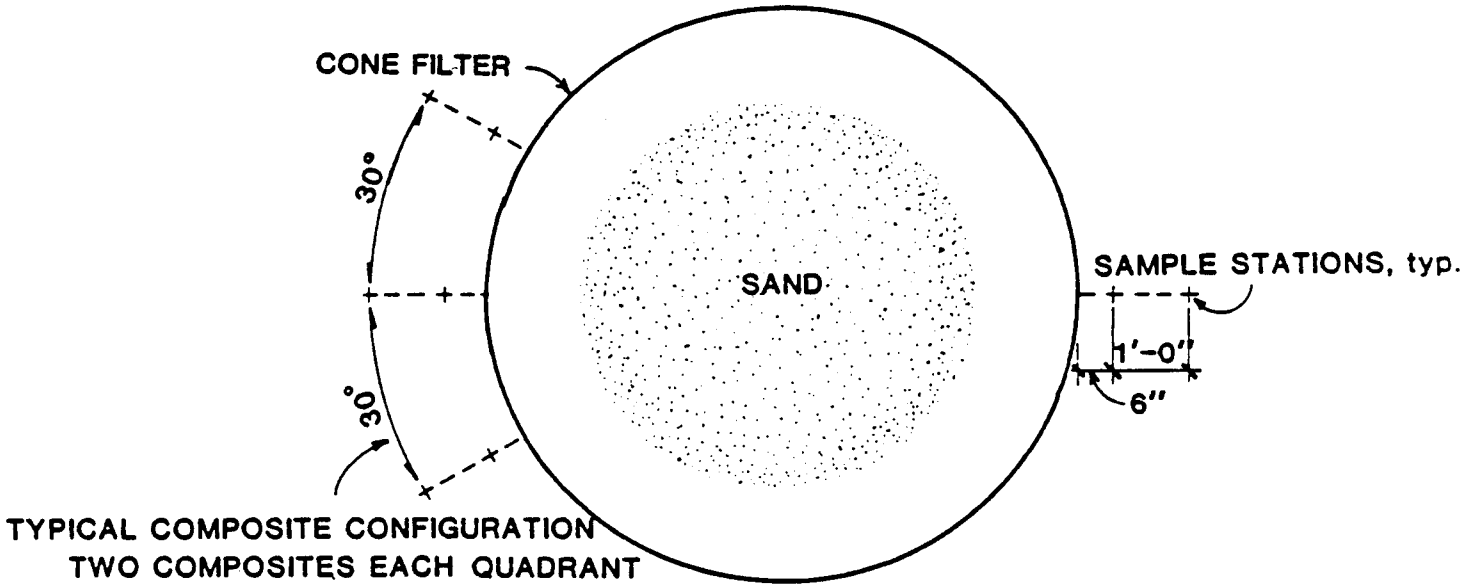


FIGURE 9-8 TA-16 FILTER VESSEL SAMPLE LOCATIONS

11/16/87 A301017.02-A127

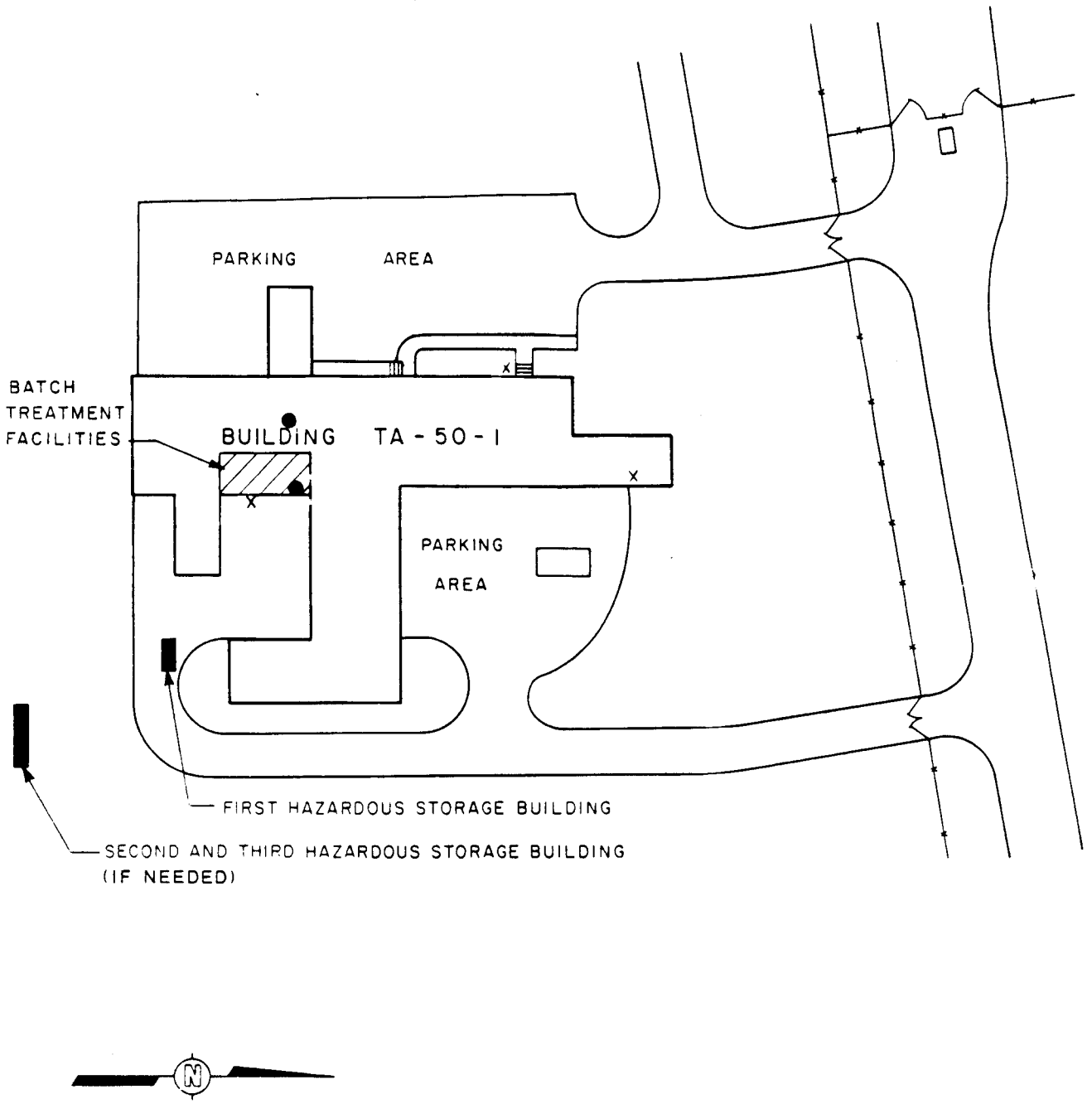


FIGURE 9-9 BATCH TREATMENT FACILITIES BLDG. TA-50-1

11/16/87 A301017.02-

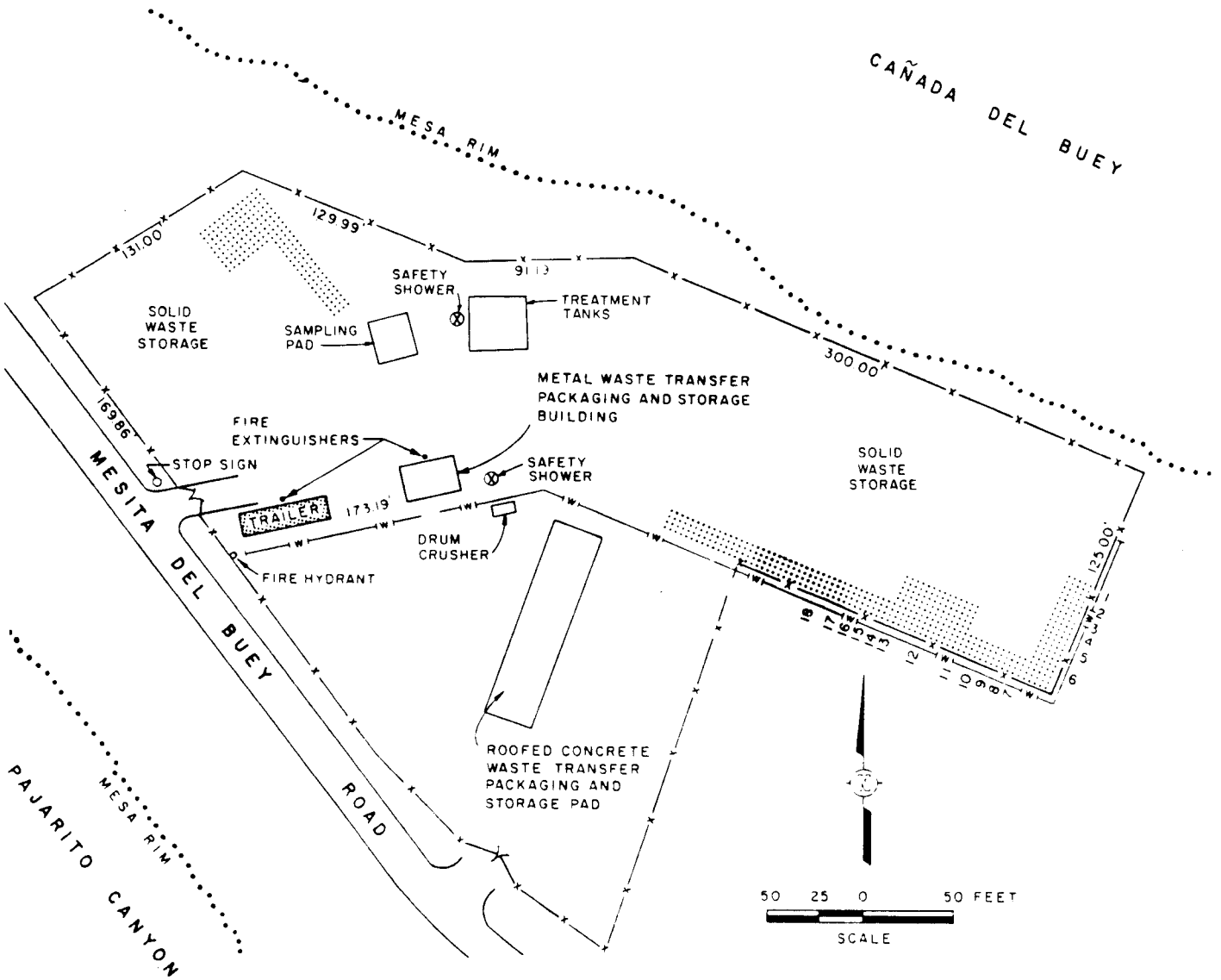


FIGURE 9-10 TA-54 AREA L

11/16/87 A301017.02 - A129

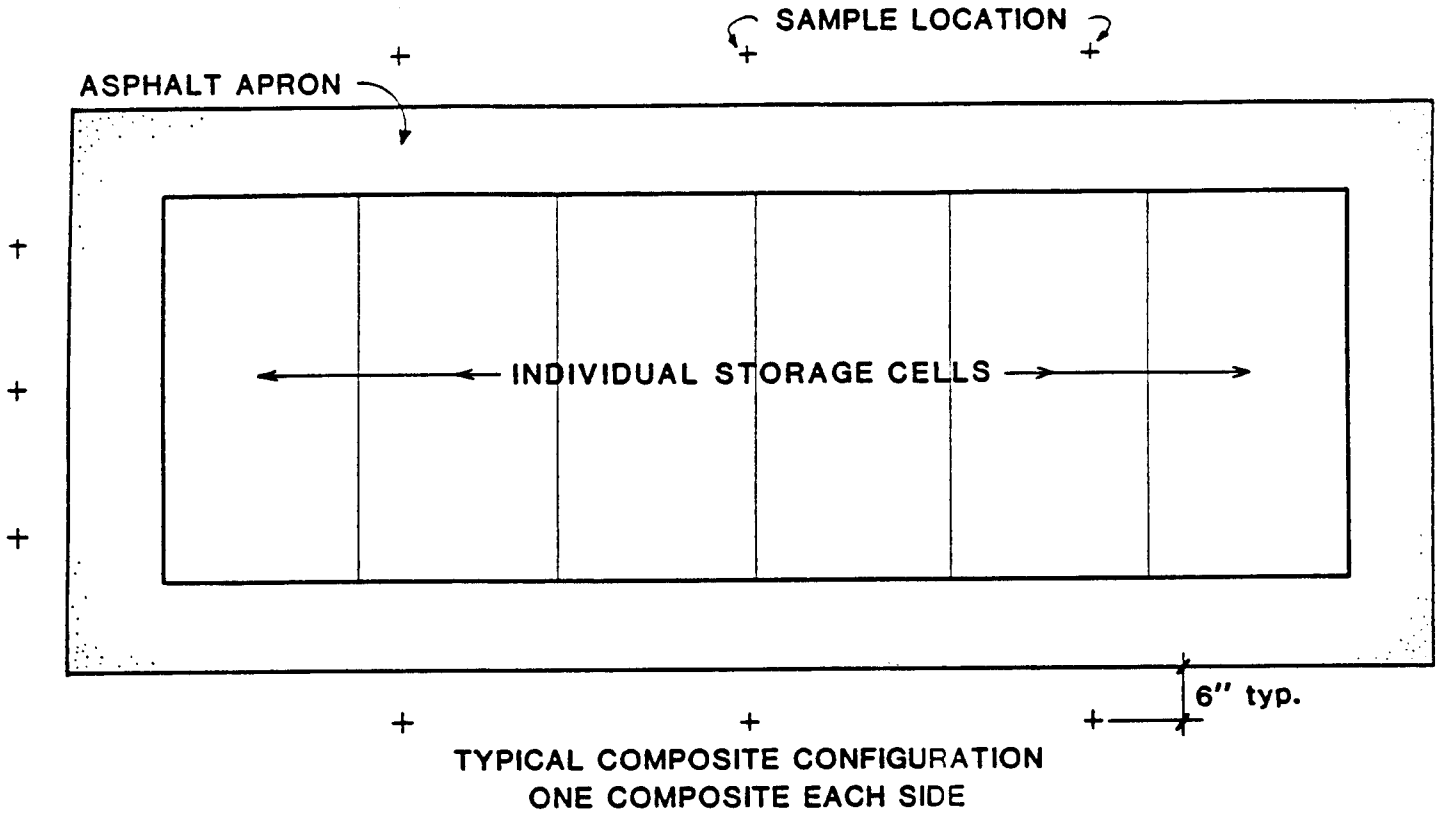


FIGURE 9-11 TA-54 AREA L COVERED CONCRETE PAD SAMPLE LOCATIONS

11/16/87 A301017.02-A130

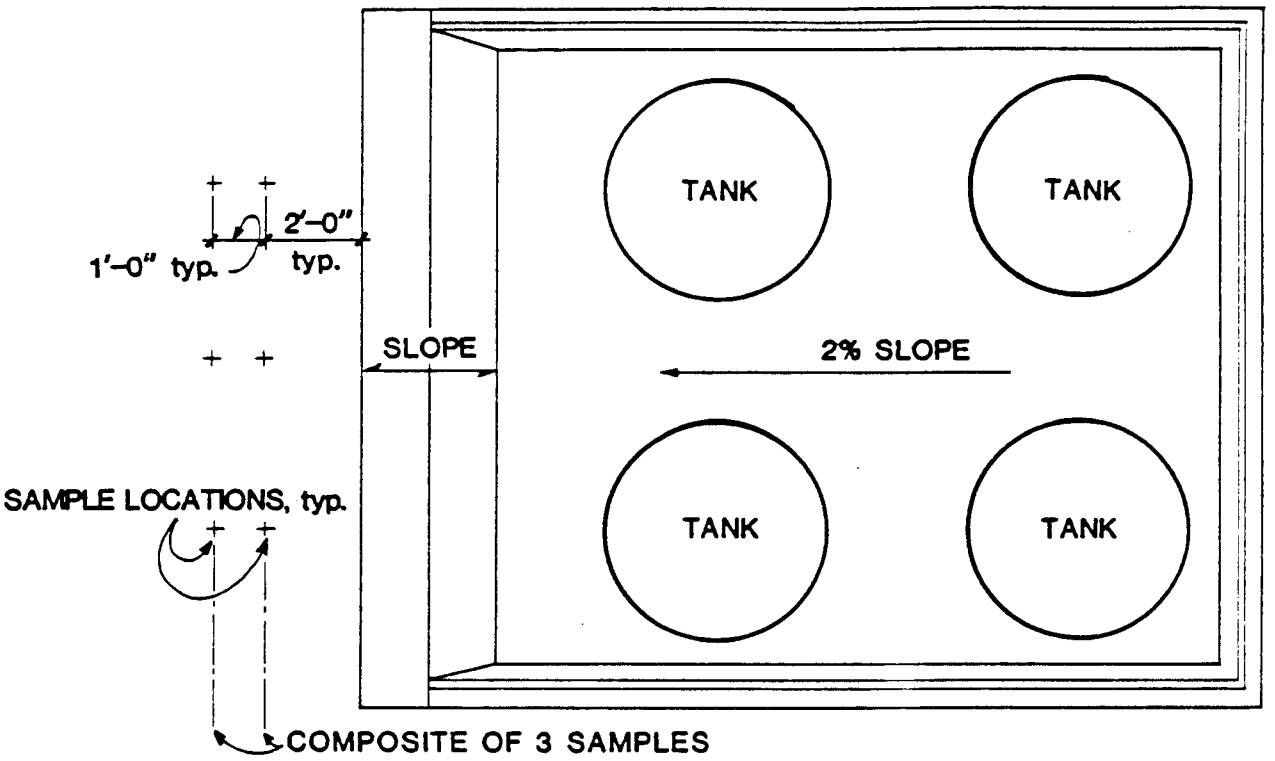
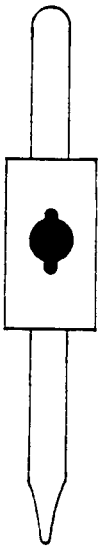
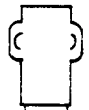


FIGURE 9-12 TA-54 AREA L TREATMENT TANKS SAMPLE LOCATIONS

11/16/87 A301017.02-A131



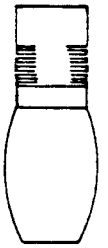
A. DRIVE HAMMER



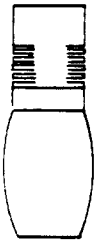
B. HEAD

C. TUBE

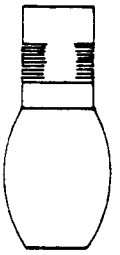
D. POINT



STANDARD POINT



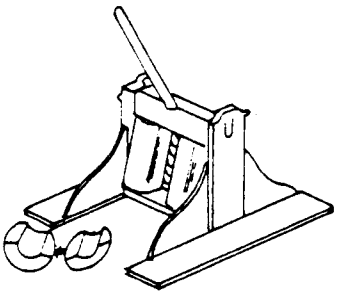
CONSTRICTED POINT



BULGE POINT

SPECIAL POINT

POINT TYPES



PULLER JACK & GRIP

FIGURE 9-13 VEIHMEYER SOIL SAMPLER

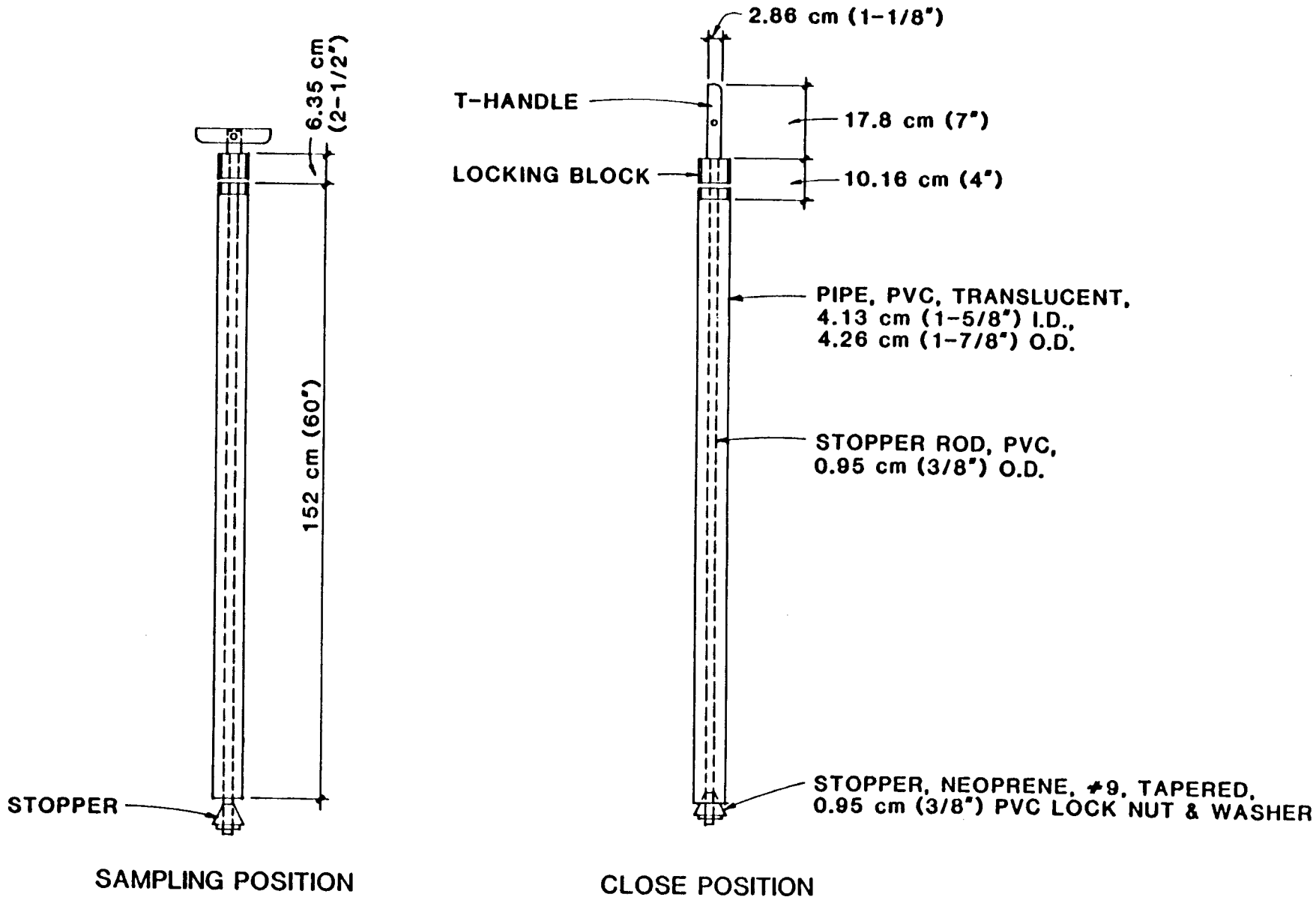


FIGURE 9-14 COMPOSITE LIQUID WASTE SAMPLER (COLIWASA)

11/16/87 A301017.02-A133

FIGURE 9-15

EXAMPLE OF SAMPLE SEAL

OFFICIAL SAMPLE SEAL

Collected by _____ Collector's Sample No._____
(Signature)

Date Collected_____ Time Collected_____

Place Collected_____

11/16/87 A301017.02- A134

FIGURE 9-16

EXAMPLE OF SAMPLE LABEL

OFFICIAL SAMPLE LABEL

Collector_____ Collector's Sample No._____

Place. of Collection_____

_____

Date Sampled_____ Time Sampled_____

Field Information_____

_____

_____

11/16/87 A301017.02-A135 5 wk 11/16/87

FIGURE 9-17
CHAIN OF CUSTORY RECORD

Hazardous Materials
Collector's Sample No.___

Location of Sampling: __Producer __Hauler
__Disposal Site
__Other:_____

_____

Company's Name _____Telephone (___)_____

Address_____
number street city state zip

Collector's Name_____Telephone (___)_____
signature

Date Sampled_____Time Sampled_____hours

Type of Process Producing Waste_____

Waste Type Code_____Other_____

Field Information_____

_____

_____

Sample Allocation:

1. _____
name of organization

2. _____
name of organization

3. _____
name of organization

Chain of Possession:

1. _____ _____ _____
signature title inclusive dates

2. _____ _____ _____
signature title inclusive dates

3. _____ _____ _____
signature title inclusive dates

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FIGURE 9-18

HAZARDOUS MATERIALS SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector_____ Date Sampled_____ Time_____ hours

Location of Sampling_____
name of company, disposal site, etc.

Address_____
number street city state zip

Telephone (____)_____ Company Contact_____

HML NO.. (Lab only)	COLLECTOR'S SAMPLE NO.	TYPE OF SAMPLE*	FIELD INFORMATION

Analysis Requested_____

Special Handling and/or Storage_____

PART II: LABORATORY SECTION

Received by _____ Title_____ Date_____

Sample Allocation: ___HML ___LBL ___SRL Date_____

Analysis Required_____

*Indicate whether sample is sludge, soil, etc.:**Use back of page for additional information.

11/16/87 A301017.02 - A137GES 11/16/87

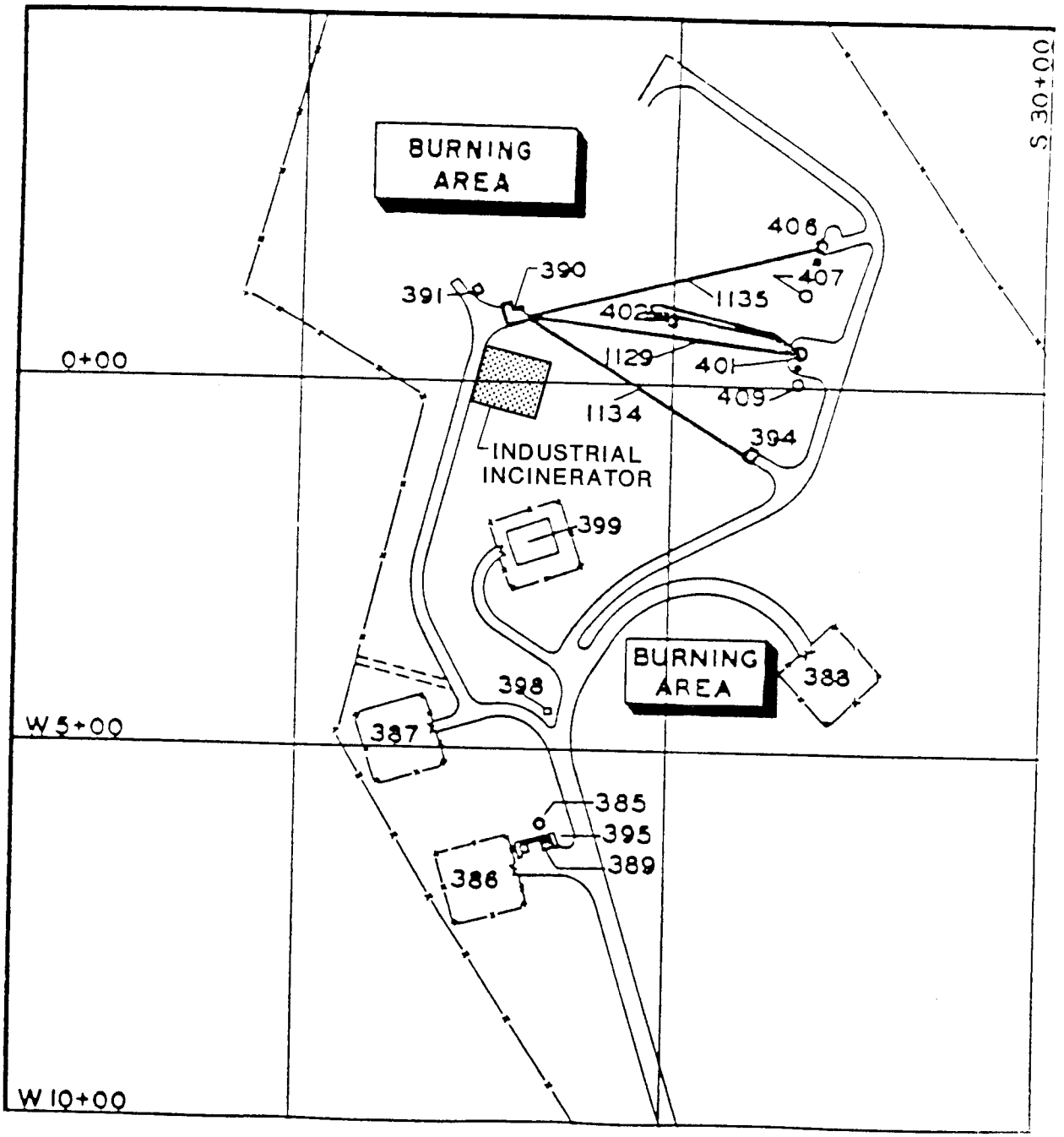

FIGURE 9-19 TA-16 INDUSTRIAL INCINERATOR

11/16/87 A301017.02-A

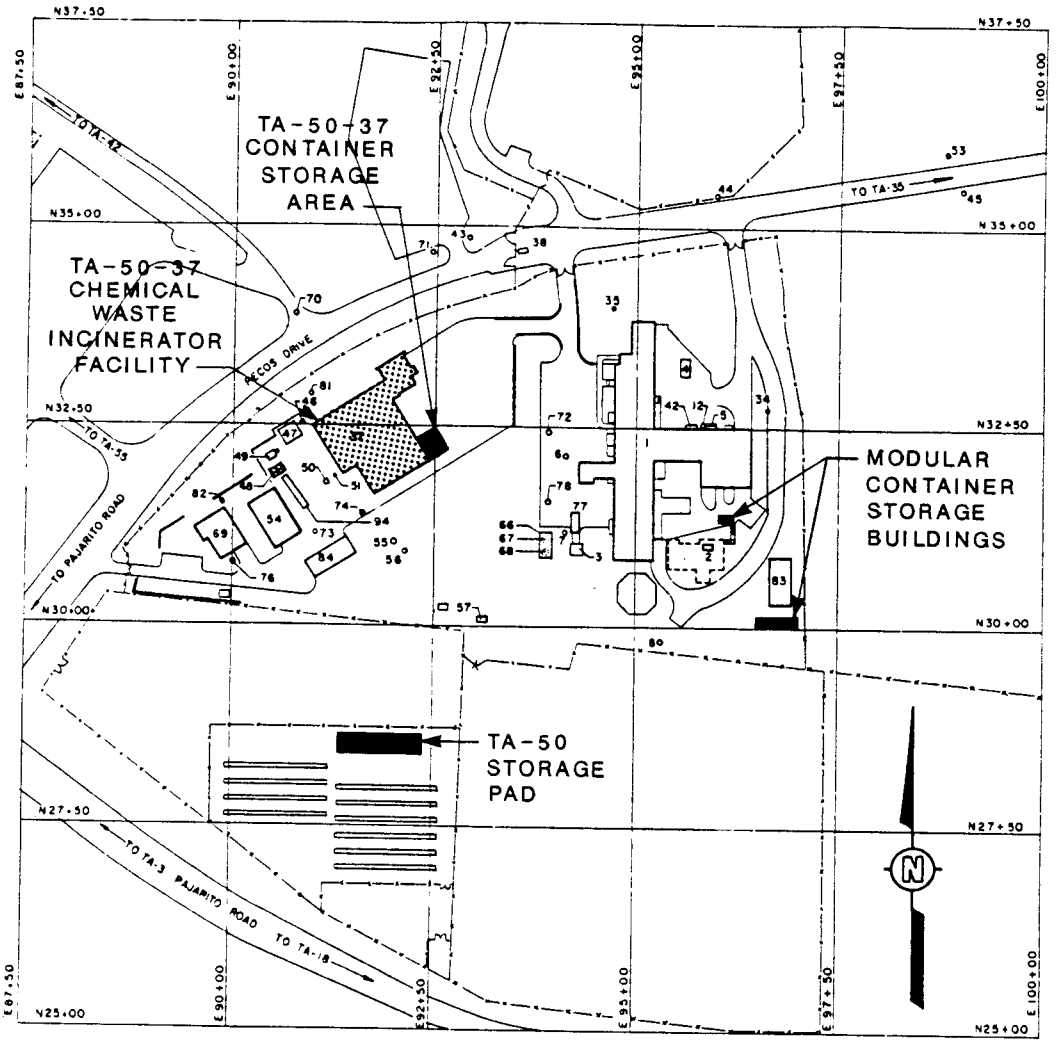

FIGURE 9-20 LOCATIONS OF TA-50 CHEMICAL WASTE INCINERATOR AND CONTAINER STORAGE FACILITIES

10.0 OTHER FEDERAL LAWS

The Los Alamos National Laboratory, Los Alamos, New Mexico (LANL) has reviewed and is in compliance with the following federal laws:

1. The Fish and Wildlife Coordination Act of 1934 (PL 121 and amendments). An act to promote the conservation of wildlife, fish and game, and for other purposes.

   (PL 85-624) An act to amend the Act of March 10, 1934, to provide for more effective integration of a fish and wildlife conservation program with Federal water-resource developments, and for other purposes.

   (PL 89-72) An act to provide uniform policies with respect to recreation and fish and wildlife benefits and costs of Federal multiple-purpose water resource projects, and for other purposes.

2. The National Historic Preservation Act of 1966 (PL 89-665 and subsequent amendments). An act to establish a program for the preservation of additional historic properties throughout the Nation, and for other purposes.

3. The Wild and Scenic Rivers Act of 1968 (Public Law 90-542 and subsequent amendments). An act to provide for a National Wild and Scenic Rivers System, and for other purposes.

4. The Coastal Zone Management Act of 1972 (PL 92-583 and subsequent amendments). An act to establish national policy and develop a national program for the management, beneficial use, protection, and development of the land and water resources of the Nation's coastal zones, and for other purposes.

5. The Endangered Species Act of 1973 (PL 93-205 and subsequent amendments). An act to provide for the conservation of endangered and threatened species of fish, wildlife, and plants, and for other purposes.

Further information will be provided at the request of the EPA Region VI or the New Mexico Environmental Improvement Division.

Los Alamos is also in full compliance with the Federal Water Pollution Control Act of 1977 and the Clean Air Act and its subsequent amendments. Los Alamos has on-going programs in support of the National Historic Preservation Act and the Endangered Species Act.

11.0 CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Siegfried S. Hecker
Director
Los Alamos National Laboratory
Operator

11/18/87
Date Signed

Harold E. Valencia
Area Manager, Los Alamos Area Office
U.S. Department of Energy
Albuquerque Operations
Owner

11-23-87
Date Signed

12.0 LIST OF REFERENCES

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INTERNATIONAL TECHNOLOGY CORPORATION

Project No. 301017.02
November 1987

Volume II - Appendices Rev. 4.0

RCRA Part B Permit Application

Los Alamos National Laboratory
Los Alamos, New Mexico

Los Alamos National Laboratory
Environmental Surveillance Group HSE-8
Los Alamos, New Mexico 87545

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

Volume II – Appendices Rev. 4.0

RCRA Part B Permit Application

APPENDIX A

EPA AUTHORIZATION FOR LOS ALAMOS TO OPERATE UNDER INTERIM STATUS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

August 11, 1982

Los Alamos Scientific Laboratory
Attn: William Crismon
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: EPA ID Number: NM0890010515
Facility Location: Los Alamos Area Office
Los Alamos, New Mexico

This is to acknowledge that the Environmental Protection Agency has completed processing the information submitted in your Part A Hazardous Waste Permit Application. It is the agency's opinion, based on the assumption that the information submitted is complete and accurate, that you as an owner or operator of a hazardous waste management facility, have met the requirements of Section 3005(e) of the Resource Conservation and Recovery Act (RCRA) for interim status. EPA has not verified the information submitted. If it is determined that the information is incomplete or inaccurate, you may be asked to provide additional information or in certain circumstances it may be determined that you do not qualify for interim status. In addition, this notice does not preclude a citizen from taking legal action under the provisions of Section 7002 of RCRA.

A facility not meeting the requirements for interim status under Section 3005 of RCRA may be required to close until such time as a Hazardous Waste Permit is issued. Interim status may also be terminated, according to procedures in 40 CFR, Part 124, if the owner or operator fails to furnish additional information which EPA requests in order to process a permit application.

As an owner or operator of a hazardous waste management facility, you are required to comply with the interim status standards as prescribed in 40 CFR, Parts 122 and 265, or with state rules and regulations in those states which have been authorized under Section 3006 of RCRA. In addition, you are reminded that operating under interim status does not relieve you from the need to comply with all applicable state and local requirements.

The enclosure to this letter identifies the processes your facility may use, their design capacities and the types of waste your facility may accept during interim status. This information was obtained from Part "A" of the Permit Application. If you wish to handle new wastes, change processes, increase the design capacity of existing processes, or change ownership or operational control of the facility, you may do so only as provided in 40 CFR, Sections 122.22 and 122.23.

If you have any questions concerning this letter, please contact Jack Paul at 214/767-9400 or write Environmental Protection Agency, Mail Code 6E-P, 1201 Elm Street, Dallas, Texas 75270.

Sincerely yours,

Allyn M. Davis

Allyn Davis
Director, Air and Waste Management Division (6AW)

Enclosure

cc: New Mexico Health and
Environmental Department
Scott Nicholson

CONDITIONS OF OPERATION DURING INTERIM STATUS

Date prepared: August 11, 1982

The information shown below is based solely on the information that the owner and operator of this facility submitted in Part A of the Hazardous Waste Permit Application. This is not a determination by EPA that this facility is an environmentally acceptable facility for treating, storing or disposing of the hazardous wastes listed below.

I. Facility name, location and EPA identification number:

Name: Los Alamos Scientific Laboratory

Location: Los Alamos Area Office

Los Alamos, New Mexico

EPA ID No: NMO 89 001 0515

II. EPA considers the following to be the owner or operator of the facility and therefore the person(s) who must comply with the requirements set forth in 40 CFR Parts 122 and 265:

Owner's name: United States Department of Energy

Operator's name: Los Alamos National Scientific Laboratory

III. During the period of interim status, the facility may use only the following processes for treating, storing or disposing of hazardous waste, up to the design capacities that are indicated:

Process Code	Design Capacity Amount	Unit of Measure
D80	100.	Acre-feet
D83	4,000.	Gallons
T04	15,008.	Gallons per day

IV. During the period of interim status, the facility may handle only the hazardous wastes with the following EPA Hazardous Waste Numbers, and/or solid wastes exhibiting hazardous characteristics with the following EPA Hazardous Waste Numbers:

D000	D001	D002	D003	F001	F002	F003	F004	F005	F006	F007
F008	F009	P032	P035	P039	P040	P053	P073	P074	P075	P076
P077	P083	P090	P095	P098	P104	P106	P107	P113	P115	P120
P121	P122	U001	U002	U003	U004	U009	U011	U012	U013	U014

EPA Region VI, Dallas, TX 75270
(214) 767-2765

U017	U019	U020	U021	U023	U031	U032	U037	U044	U048	U052
U056	U057	U063	U068	U069	U070	U071	U072	U075	U077	U080
U081	U088	U092	U095	U108	U112	U115	U117	U122	U123	U127
U131	U134	U135	U138	U144	U145	U147	U151	U154	U156	U159
U160	U161	U166	U167	U168	U170	U188	U189	U190	U191	U194
U196	U197	U204	U207	U209	U210	U211	U213	U216	U217	U218
U219	U220	U226	U228	U229	U231	U239	D006	D007	D009	D010
D012	K044	P015	P018	P130	P105	U010	U022	U043	U045	U093
U102	U157	U201	U223							

P030

APPENDIX B

EPA REQUEST FOR LOS ALAMOS RCRA PART B PERMIT APPLICATION

Allyn Davis 6/11/84

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
INTERFIRST TWO BUILDING, 1201 ELM STREET
DALLAS, TEXAS 75270

FEB 22 1984

CERTIFIED MAIL: RETURN RECEIPT REQUESTED

Donald Kerr
Laboratory Director
U.S. Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: NM0890010515

Dear Mr. Kerr:

This letter constitutes a formal request for your Part B permit application for a hazardous waste facility permit under the Resource Conservation and Recovery Act for the above referenced facility. This request is made under the authority of 40 CFR 270.10(e)(4).

The requirements for a Part B permit application are given in 40 CFR Parts 264 and 270. To assist you in preparing a Part B permit application, I have enclosed some guidance material. Please provide one (1) original and three (3) copies of your Part B permit application to the Environmental Protection Agency's Region VI office no later than September 1, 1984. In your application, if any of the information is being submitted under a claim of confidentiality, please indicate this fact in the cover letter and by separating out the confidential information. (For more details on confidentiality, see 40 CFR Part 2.) Should you decide to withdraw your Part A permit application which you filed in November 1980, please contact this office within thirty (30) days from the receipt of this request.

Any questions regarding this request or the Part B permit requirements should be directed to Mr. Strad Will at (214) 767-3451 or Mr. Will Focht at (214) 767-9878. Also, we will be happy to meet with you to discuss the requested Part B application in more detail. You may also wish to contact Mr. Ray Sisneros of the New Mexico Environmental Improvement Division (NMEID) at (505) 984-0020 regarding NMEID's permitting requirements.

Sincerely yours,

Allyn M. Davis

Allyn M. Davis, Director
Air and Waste Management Division

Enclosure (Permit Applicants Guidance Manual)

cc: Raymond Sisneros, Manager
Environmental Improvement Division

0 5 4 4 0 9 2 4

APPENDIX C

NMEID NOTICE OF JOINT EPA/EID PART B CALL-IN

HEALTH & ENVIRONMENT department

STATE OF NEW MEXICO

ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 984-0020
STEVEN ASHER, Director

TONEY ANAYA
GOVERNOR

JOSEPH GOLDBERG
SECRETARY

TED GUAMBANA
DEPUTY SECRETARY

JOSEPH F. JOHNSON
DEPUTY SECRETARY

April 23, 1984

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Harold Valencia
Area Manager
U.S. DOE Los Alamos National Laboratories
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: EPA ID Number NM0890010515

Dear Mr. Valencia:

This letter constitutes a formal notice of joint Part B call-in by the New Mexico Environmental Improvement Division (EID), Hazardous Waste Section. This is in reference to the U.S. Environmental Protection Agency's (EPA) formal request for your Part B permit on February, 1984. By notice of this letter, EPA will be the lead agency for the processing of your Part B application and, upon Final Authorization of the New Mexico program (January, 1985), EPA will transfer your permit application (at whatever point of progress) to EID for final processing.

EPA and EID are presently working on coordinating the processing of your permit application. Therefore, please submit a copy of your upcoming EPA Part B submission to our office at the following:

Mr. Peter H. Pache, Acting Program Manager
Hazardous Waste Section
New Mexico Environmental Improvement Division
P.O. Box 969
Santa Fe, New Mexico 87504

If you have any questions concerning the processing of your permit, please contact either Strad Will of EPA at (214) 767-3451 or Peter H. Pache of EID at (505) 984-0020, Ext. 340.

Sincerely,

Peter H. Pache
Acting Program Manager
Hazardous Waste Section

cc: Strad Will, EPA
Susan Stark, EPA

APPENDIX D

EPA REQUEST FOR LOS ALAMOS PART B ADDRESSING RADIOACTIVE/CHEMICAL MIXED WASTE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
INTERFIRST TWO BUILDING, 1201 ELM STREET
DALLAS, TEXAS 75270

August 7, 1984

Mr. Harold Valencia
Department of Energy
Albuquerque Operations
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Valencia:

Recent developments regarding the Environmental Protection Agency (EPA)/Department of Energy (DOE) Memorandum of Understanding (MOU) have complicated the situation between EPA Region VI and the call-in of Los Alamos National Scientific Laboratory's (LANSL) Resource Recovery and Conservation Act (RCRA) Part B permit application. The radioactive-mixed hazardous wastes, as defined in the MOU, are subject to regulation under RCRA and were to be included in the submission of a Hazardous Waste Compliance Plan. EPA Headquarters has indicated that DOE agreed to include these wastes in the RCRA Part B permit application. As you know, EPA Region VI called-in LANSL's Part B on February 22, 1984, with a subsequent due date of September 1, 1984.

There are several important issues which have yet to be resolved in a manner agreeable to both EPA and DOE. Such as: which radioactive-mixed hazardous wastes are subject to regulation under RCRA, and authorized state participation in the permitting of these wastes. With the inclusion of these wastes in the Part B, security clearances for EPA and State officials will be essential to complete the review of the Part B.

Security clearances require at least six (6) months to process, as a result, those recently applied for by EPA and State officials will not be granted by September. Additionally, it does not appear that EPA and DOE will resolve the stated problems in a timeframe which allows LANSL to submit a complete Part B on September 1, 1984. Therefore, Region VI feels it is mutually beneficial to extend the due date for LANSL's Part B permit application to May 1, 1985. This extension should grant DOE and EPA adequate time to come to an agreement and provide sufficient time to LANSL to submit a complete Part B.

This letter, also, constitutes a formal request for your Part B permit application for those radioactive-mixed hazardous wastes designated by EPA and DOE to be subject to regulation under the Resource Conservation

1 of 2

and Recovery Act. This request is being made by EPA, as agreed upon by DOE, under the authority of 40 CFR 270.10(e)(4). If any of your information will be submitted under a claim of confidentiality or is considered classified, please include this fact in the cover letter and separate out the classified and/or confidential information.

Please provide one (1) original and three (3) copies of your RCRA Part B permit application to the Environmental Protection Agency Region VI office no later than May 1, 1985.

Any questions regarding this request or the Part B requirements should be directed to Ms. Jamie Wright at FTS 729-2614. We will be happy to meet with you to discuss the requested Part B in more detail.

Sincerely yours,

Allyn M. Davis

Allyn M. Davis, Director
Air and Waste Management Division

cc: Peter Pache, Program Manager
New Mexico Environmental Improvement Division

Steven Asher, Director
New Mexico Environmental Improvement Division

APPENDIX E

DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS, FLOODPLAIN DOCUMENTATION

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103-1580

November 20, 1984

REPLY TO
ATTENTION OF:

Engineering and Planning Division
Planning Branch

Mr. M. L. McCorkle
Mail Stop: E518
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Dear Mr. McCorkle:

In response to your letter of October 15, 1984 (HSE8-84-913) to Mr. Boyd Lare. I am providing the following four flood plain evaluations:

a. TA-54, area L is not in a 100-year flood plain.

b. TA-54, area G is not in a 100-year flood plain except for the "burial pits." The burial pits will collect rain that falls into the pits. Rainwater will drain, collect, and be confined to the lowest depressions in the pits.

c. TA-16, "S" site burn pits are not in a 100-year flood plain except for the northern portion of pad 388. More detailed site data are needed to accurately evaluate the flood plain at pad 388. There is a two-foot diameter culvert under the access road and adjacent to the northern edge of the pad. This culvert is subject to clogging by debris during intense thunderstorms such as the storm which would produce the 100-year flood plain.

d. TA-40, HE scrap burn pits are not in a 100-year flood plain.

The above flood plain information is based upon a September 5, 1984 site visit made by Mr. Boyd Lare and Mr. Thomas Ryan of my staff and on topographic information provided by Los Alamos National Laboratory from Lab. Job No. 5682 Plan/Topo Sheet No.s 2, 5, and 16.

If you should need further evaluation of TA-16, please call Mr. Boyd Lare at 766-3225 to discuss additional data needs.

Sincerely,

John J. Cunico, P.E.
Chief, Planning Branch
Engineering and Planning Division

APPENDIX F
PHYSICAL AND HYDROLOGIC CHARACTERISTICS OF THE BANDELIER TUFF

PHYSICAL CHARACTERISTICS OF THE BANDELIER TUFF

The Bandelier Tuff is formed by a series of ash flows and ash falls which are described as nonwelded, moderately welded, and welded tuff. The nonwelded, moderately welded, and welded tuff grade one into the other both vertically and horizontally.

The upper Tshirege Member is about 250 m thick along the western edge of the Pajarito Plateau and thins eastward to less than 15 m. Individual moderately welded and welded ash flows in the upper part of the Tshirege Member range from 6 to 40 m thick. Some of the uppermost ash flows are beveled off by erosion eastward across the plateau. Outliers of tuff overlie the Puye formation along Puye Escarpment. Most all ash flows thin eastward from the source area (Sierra de los Valles). Nonwelded ash flows of the Otowi Member may be as much as 90 m thick near the center of the plateau.

I. Welding

The welding process of an ash flow tuff begins after emplacement. The major factors affecting welding are heat at the time of emplacement, amount of volatiles in the mass, rate of cooling, and thickness of the ash flow. The degree of welding ranges from incipient stages marked by the cohesion of glassy fragments, to complete welding marked by the cohesion of the surfaces of glassy fragments accompanied by their deformation and the elimination of pore space.

Zonal variation of welding occurs vertically within individual flows or within a series of flows that have cooled as a single unit. Single ash flows or series of ash flow that have cooled as a unit may show a greater degree of welding near the center than near the upper and lower contacts. A series of ash flows that have been emplaced in rapid succession may cool as a single unit with the greatest degree of welding near the center.

Variation of welding occurs horizontally within individual flows with greater degree welding near the mountains (the source area). The degree of welding becomes less eastward across the plateau.

The tuffs in the Los Alamos area are classified according to the degree of welding--i.e., nonwelded, moderately welded, and welded tuffs. Welding results in increased cohesion and deformation of the glassy fragments in the tuff. Nonwelded tuff has high porosity, only slight cohesion of the glassy fragments, and crumbly fracture; moderately welded tuff has lesser porosity, moderate cohesion, slight deformation of the glassy fragments, and a somewhat brittle fracture; and welded tuff has lower porosity, good cohesion, a high degree of deformation by flattening of glassy fragments, and a brittle fracture.

The degree of welding influences most of the physical characteristics of the individual ash-flow tuff units.

The following shows a large range in porosity in each of the variations of tuff indicating that welding is only one of several factors determining porosity.

	Range in porosity (percent by volume)
Nonwelded tuff	40 to 60
Moderately welded tuff	30 to 55
Welded tuff	15 to 40

The surface of exposed tuff (nonwelded to welded) becomes "case hardened" as it is exposed to the weather. In this process, due to the porosity of the tuff, moisture is absorbed and some minerals are dissolved. The minerals are returned to the surface by evaporation as the tuff dries out where they are precipitated to form a rind. This rind forms a protective surface which resist the erosion of the surface by wind and water. However, exposed pumice fragments weather out rapidly leaving small cavities in tuff surface.

II. Density

The density of nonwelded tuff is lower than in welded tuff. This is due to the compaction of the matrix (glass shards and ash) and closer arrangement of the quartz and sanidine crystals, and rock fragments in a welded tuff. The specific gravity of the tuff matrix averages about 1.55. The range in bulk density of nonwelded to welded tuff depends on the porosity (i.e., the larger a porosity, the smaller the density).

The following table shows a comparison of the densities of pumice and the tuff (nonwelded towelded) with other rock types.

Rock Type	Range in density (gm/cm^3)
Pumice (nonwelded)	< 1.0
Nonwelded tuff	1.02-1.52
Moderately welded tuff	1.15-1.84
Welded tuff	1.52-2.16
Granite	2.64-2.76
Marble	2.60-2.84
Sandstone	2.14-2.36
Basalt	2.4 -3.1

III. Bearing Capacities

The bearing capacities of a tuff are dependent upon the density of tuff (i.e., the greater bearing capacities occur with the tuff of greater density). The density of the tuff is related to welding (i.e., density of the tuff increases from nonwelded tuff to welded tuff).

Data are available on the bearing capacities of the moderately welded tuff. The following table shows the relationship of density change to the resistance to crushing of a moderately welded tuff.

Density (gm/cm^3)	Resistance to Crushing (kg/m^2)
1.73	2.4×10^5
1.74	3.7×10^5
1.77	3.9×10^5
1.79 (probably with pumice inclusion)	3.4×10^5
1.81	4.8×10^5
1.83	5.6×10^5

Rock inclusions of pumice, rhyolite, and latite are found in the tuff. The frequency of occurrence of the rock fragments differs in individual ash flows and at different locations within the same ash flow.

The pumice fragments may be as much as 5 cm in length and 2 cm in diameter. The pumice is soft and friable. Pumice fragment inclusion in a small sample of the tuff would decrease the bearing capacity as failure would most likely occur within the pumice fragment. The rhyolite and latite fragments are dark gray, hard, and may be as much as five to seven cm across. These large rock fragments would add strength to the matrix of tuff.

The following table is a comparison of the bearing capacities of a moderately welded tuff (density 1.73 and ~ 1.82 g/cm^3) and miscellaneous rock type. The bearing capacity is computed as 1/5 of rupture strength of the material.

Rock Type	Bearing Capacity (kg/m^2)
Moderately welded tuff (1.73 g/cm^3)	4.7×10^4
Moderately welded tuff (1.82 g/cm^3)	1.1×10^5
Sandstone	3.4×10^5
Limestone	8.4×10^5
Marble	1.1×10^6
Granite	1.4×10^6

IV. Thermal Conductivity

The thermal conductivity of the tuff is inversely related to porosity, thus, the thermal conductivity of the nonwelded tuff would be less than a welded tuff as more pore space is available for insulation.

The only data available on the thermal conductivity was made of a moderately welded tuff in one area investigated. The following table is a comparison of the thermal properties of the tuff and miscellaneous rock types. A decrease in thermal conductivity increases the insulating value.

Rock Type	Range of Thermal Conductivity $\left(\frac{\text{cal, gm-cm}}{\text{hr x cm}^2 \text{ x oC}}\right)$
Moderately welded tuff	0.38-0.47
Limestone	4.9-11
Sandstone	9.9-20
Marble	17-25
Granite	16-35

V. Mineral Composition

The tuff is rhyolitic in composition and contains small rock fragments of rhyolite, latite and devitrified pumice and crystals and crystal fragments of sanidine and quartz, in a matrix of glass shards and welded ash. Dark minerals are scarce although traces of crystal fragments of biotite, hornblende, and pyroxene have been observed.

Seven samples of a moderately welded tuff were analyzed petrographically by C. S. Ross (written communication, July 7, 1960). Ross recalculated the proportions of phenocrysts in terms of proportion by weight. The results of all seven were similar, one of which is presented here:

Pore space	about 30 percent by volume
Phenocrysts	about 20 percent by weight
Sanidine	12 percent by weight
Quartz	6 percent by weight
Magnetite	1 percent by weight
Pyroxene	± 0.5 percent by weight

The ground mass is typical devitrified welded tuff. The devitrification products are very fine grained, but show typical cristobalite feldspar structure. Cavities contain radial groups of feldspar and tridymite. The rocks contain a few fragments of altered andesite, and some brown birefracting clay like material (probably montmorillonite).

VI. Chemical Composition

The color of the tuff ranges from very light gray to medium dark gray. Some units range from pinkish gray to light pink. Large fragments of pumice that appear much darker than the matrix in some units enchance the color of the tuff. Moderately welded units are generally lighter in color than the welded units. The coloring is inherent in the tuff and probably the result of minor changes in the chemical constituents and heat of emplacement.

In general the tuff is composed namely of silica and alumina. The range in chemical constituents is shown on the following table.

Chemical Constituents	Range (in percent)
Silica (SiO_2)	72.0-78.2
Alumina (Al_2O_3)	11.2-13.8
Ferric oxide (Fe_2O_3)	1.1-2.1
Ferrous oxide (FeO)	.21-.75
Magnesium oxide (MgO)	.02-.33
Calcium oxide (CaO)	.26-1.17
Sodium oxide (Na_2O)	3.5-4.5
Potassium oxide (K_2O)	4.2-4.7
Water (H_2O)	.15-2.8
Titanium oxide (TiO_2)	.10-.32
Phosphorous oxide (P_2O_5)	.10-.07
Manganese oxide (MnO)	.00-.98
Carbon dioxide (CO_2)	<.05

VII. Joints

Joints and joint systems are prominent in the Tshirege Member. The joints divide the rocks into polygonal blocks, many of which are prismatic or columnar.

The joints can be classified into two groups, master joints and minor joints. The term "master joint" signifies those joints that are numerically predominant, are most persistent in length, and pass through several groups of beds.

The master joints can be traced vertically across two or more units of the Tshirege Member. They are vertical or near vertical, dipping more than 80°. The overall vertical trends of the individual master joints are relatively straight; however, they curve slightly through individual units and upon entering a unit of different degree of welding, may be deflected slightly.

The minor joints dip at angles from about 40° to 80° and in most instances, intersect the master joints. These joints are not as persistent as master joints.

Master joint systems in Mortandad Canyon display orientation differences of about 60°. Joint systems mapped at Mesita del Buey also indicate orientation differences of 60°. The angular differences between these joint systems suggest that these sets are conjugate tension joints caused by shrinkage during cooling of the rocks.

HYDROLOGICAL CHARACTERISTS OF THE BANDELIER TUFF

The natural moisture content of the tuff forming the mesas between the eastward-trending canyons is generally less than five percent of volume. Thus, movement of moisture is under unsaturated conditions. The low moisture content of the tuff is caused by the protective cap of clay soil derived by weathering of the tuff near the surface and low rainfall and high evaportranspiration. The hydrologic characteristics of the tuff depend largely upon the degree of welding of the individual ash flows.

I. Hydrologic Effects of Soil

The surfaces of the finger-like mesas which form the Pajarito Plateau are covered by a clayey soil derived by weathering of the underlying tuff of the Tshirege Member. The soil is thickest near the axes of the mesas and thins toward the edges where the tuff is exposed. Thick sections of soil have also developed along slow draining arroyos cut into the surfaces of mesas and in relatively flat areas where water collects and stands, allowing some infiltration into the tuff. The greatest known thickness of soil is at Frijoles Mesa where 2.7 m was logged in a shallow test hole located in a relatively flat area.

Petrographic examination of the soil derived from the Tshirege Member was made by Staritzky of the Los Alamos Scientific Laboratory. He found that the size distribution of the "sand" fraction (greater than 50 microns in diameter) varied between 15 and 38 percent, the "silt" fraction (2 to 50 microns in diameter) varied between 58 and 73 percent, and the "clay fraction" (less than 2 microns in diameter) varied between 4 and 12 percent. Mineralogically, the principal constituents of the soil were quartz and feldspar, and the most important secondary constituents are the clay minerals, montmorillonite and illite. Montmorillonite is know to have the highest base-exchange capacity (85 to 100 millequivalents per 100 grams) and illite the next highest (25 to 30 millequivalents per 100 grams) among the clay minerals.

A study of the natural distribution of moisture in soil and in near surface tuff was made at Frijoles Mesa during a 2-year period. The moisture content in the soil cover, including the transition zone from the soil to weathered tuff, varied according to prevailing weather conditions. The moisture content was highest in March and April as the result of late winter snows and thawing and was generally lowest in the months of August through October owing to high evapotranspiration rates. Water from precipitation rarely infiltrated through the undisturbed soil cover into the underlying tuff and only in an extremely low moisture range (less than 5 percent moisture by volume) within the upper 1 m of the tuff.

The upper two units of moderately welded tuff (thickness about 36.5 m) at Frijoles Mesa blow air through open joints in response to a declining atmospheric pressure; therefore, the soil cover, which prevents most of the precipitation from infiltrating into the underlying tuff, also impedes the exchange of air from the atmosphere to the tuff.

II. Hydrologic Characteristics of Nonwelded, Moderately Welded and Welded Tuff

The hydrologic characteristics of tuff related to porosity, specific yield, specific retention, pore size distribution and hydrologic conductivity were determined of in six units of the Tshirege Member at Frijoles Mesa. These hydrologic characteristics were determined in the laboratory under saturated conditions. As saturated conditions rarely occur in the tuff, these parameters may be of only general interest.

The porosity of the tuff at Frijoles Mesa ranged from 19 to 54 percent by volume; the lowest porosities are in the welded tuffs. Specific yield and specific retention decrease with a decrease in porosity. Specific yield is greater than specific retention in a nonwelded tuff (high porosity); however, as the porosity decreases the difference becomes smaller and low porosity specific retention in a welded tuff may be greater than specific yield.

The relationship of porosity to pore size depends on the degree of welding, thickness of the flow, and position in the flow. The larger pore sizes and greater porosities are near the top of the flow and decrease vertically through the flow. This is due to the larger pores formed by escaping gases near the top and compaction and baking of the middle and lower portion of the flow as it cools.

The hydrologic conductivity is indirectly related to porosity depending upon pore size and the degree of interconnection of the pores. The permeability of the tuff matrix decreases with depth for the same reasons that the porosity decreases.

Hydrologic characteristics of the Tshirege Member of the Bandelier Tuff, as determined in the laboratory are shown in the following table.

Hydrologic Characteristics of the Tshirege Member at Frijoles Mesa

	Hydrologic Characteristics					
Unit	Depth below surface of mesa (m)	Degree of welding	Porosity (percent)	Specific yield (percent)	Specific retention (percent)	Range of Hydrologic Conductivity (m/day)
6	0- 19.5	Moderate	38-54	18-34	16-27	0.004-0.25
5	19.5- 20.1	None (sand)	-	-	-	1.4-2.4
4	20.1- 41.1	Moderate	33-54	11-43	12-22	0.012-0.53
3	41.1- 53.3	Nonwelded	48	34	14	0.9
2	53.3- 83.5	Welded	19-37	.6-26	11-21	0.003-0.08
1B	83.5-152.7	Nonwelded	-	-	-	50-2.1

III. Movement of Water

The Tshirege Member is dry beneath the surfaces of the finger-like mesas. The moisture content of the tuff generally is less than 5

percent by volume, even though the specific retention ranges from 11 to 27 percent. Beneath the canyons which contain perennial or intermittent streams, the moisture content of the tuff may be as much as 60 percent by volume; however, the water movement through the tuff is as unsaturated flow. Test holes drilled through alluvium and into the tuff in Water and Mortandad Canyons penetrated thick sections (up to 55 m) of wet tuff (up to 60 percent moisture by volume); however, no free water moved into the test holes.

Instruments were used to measure moisture content of the bore wall in holes constructed in the tuff beneath the stream channel in upper Mortandad Canyon. These holes contained no free water, although the welded tuff beneath the stream contained as much as 25 percent moisture by volume. Specifically constructed moisture access holes in the tuff underlying water perched in the alluvium in lower Mortandad Canyon had moisture contents of the tuff as much as 45 percent by volume but the rock yielded no free water. The welded and nonwelded tuff in the canyon are transmitting water (high moisture content) downward by gravity into the tuff by unsaturated flow. There is some lateral movement by capillarity.

The water in the tuff moves as unsaturated flow. The majority of the pores are of capillary size. The energy relationship with moisture content of a moderately welded tuff was determined by Abrahams (Fig. 1). The saturated moisture content of the tuff was about 41 percent by volume. When moisture contents are below 4 percent there is no movement of water; from 4 to 8 percent moisture is redistributed by diffusion; from 8 to 23 percent distribution is by gravity and capillarity, and above 23 percent the movement is by drainage from gravity.

A study of the movement of water through the tuff was made at Mesita del Buey by adding water to an infiltration pit. The amount of water added was equivalent to 110 years of precipitation on the Pajarito Plateau. The movement of water from an infiltration pit was monitored by a series

of moisture access tubes set in the tuff and a neutron-scattering moisture probe and scaler. The average infiltration rate from a $1m^2$ pit under a constant head of 23 cm of water averaged about 0.34 m/day for a period of about 160 days. The wetted front moving into the tuff was sharpest during the first part of the test. After about 2 months of infiltration moisture had moved downward more than 4.5 m; moisture content ranged as follows: 35 percent by volume at 0.6 m below the pit, 30 percent at 0.9 m, 25 percent at 4 m, and 20 percent at 4.6 m.

IV. Hydrologic Effects of Welding

The uppermost ash flow at Frijoles Mesa exhibits zonal variations of welding in a single cooling unit which causes vertical changes in porosity. The moderately welded flow is about 24 m thick near the center of the mesa. The greatest porosities are in the upper and basal parts of the flow. Lesser porosities (zone of denser welding) are in the lower one-third of the flow, and pore size decreases with increased depth. The following table presents the hydrologic characteristics at different intervals in a single ash flow tuff.

Hydrologic Characteristics of an Ash-Flow Tuff at Frijoles Mesa

Height above base of flow (m)	Porosity (percent)	Specific yield (percent)	Specific retention (percent)	Hydrologic Conductivity (m/day)		Pore Size distribution (percent of porosity)	
				vert.	horiz.	>.01 mm	<.01 mm
17.9	54	35	19	10.082	-	-	-
14.3	50	34	16	0.12	0.12	39	61
14.3	54	38	16	0.25	0.21	26	74
12.2	51	34	17	0.16	0.16	20	80
8.8	49	28	21	0.041	-	-	-
6.7	41	24	17	0.004	0.082	20	80
6.1	47	27	20	0.082	0.082	15	85
5.8	42	23	19	0.041	0.033	-	-
3.6	38	18	20	0.037	0.041	-	-
0.3	51	33	18	0.041	-	17	83
0.3	49	24	25	0.037	0.082	20	80

A decrease in porosity in an ash flow tuff results in a decrease in specific yield and as the specific yield decreases, the specific retention increases proportionately (Fig. 2). The hydrologic conductivity is related to pore size and pore-size distribution rather than porosity. The permeability of the tuff matrix decreases at increased depth with a general decrease in the percentage of pore sizes greater than 0.1 mm.

Variations in vertical and horizontal permeability in the lower one third of the flow may be due to movement and compaction of the ash flow as it cooled. Movement of flow as it cools could result in elongation of the pores in a horizontal plane, and the greatest permeability probably is in this direction. Three of the five horizontal hydrologic conductivities in the lower one third of the flow are greater than the vertical conductivities; however, the conductivity measurements were taken in random directions and no attempt was made at orientation to the probable direction of movement of the flow.

V. Hydrologic Effects of Joints and Contacts

Joints and the fractures in the tuff are capable of transmitting fluid. The interconnection of the joint system is an important aspect of the hydrologic regime.

Joints in moderately welded to welded tuff of the Tshirege Member range from closed to open. Locally the amount of opening is as much a 5 cm; however, the majority of joints are open less than 1 cm. All joints terminating at the base of the soil zone, which covers the surfaces of the mesas, are filled with a light-brown clay. The depth of clay filling varies from 0.9 to 1.2 m below the soil zone at Mesita del Buey and Frijoles Mesa. The joint openings are plated with clay to depths of 21 m at Frijoles Mesa. Some of the joints are filled or plated with a light-gray clay. The light-gray clay is derived from weathering of the tuff and is composed of minerals leached from the tuff by water. This clay was precipitated along the joint openings prior to the development

of the soil zone. The joints are interconnected and master joints transect one or more flows. Joints are more numerous and open in ash flows of moderately welded to welded tuffs than in nonwelded tuff.

Joints in the moderately welded to welded tuffs will transmit depending upon availability of large volumes of water and the amount of opening and the degree of interconnection between different joint systems. More than 15,000 m^3 of drilling fluid was lost while drilling 300 m of Bandelier Tuff at Frijoles Mesa. Most of the loss was in the upper 150 m in the Tshirege Member which here consist of moderately welded to welded tuff in which open joints are numerous. During grouting of a casing in a large diameter hole at Frijoles Mesa (a 76 cm dia., 15.2 m depth casing filled with water to prevent collapse), the bottom seal in the casing ruptured and the water from within the casing drained into the formation within 3 hours. The number and orientation of joints in the hole were determined before the casing was installed. A joint near the bottom was open 1 to 3 cm for about 1.2 m. The 6.9 m^3 of water moved into the joint and downward into the joint systems of the underlying flow. Observation of another large-diameter hole 15.2 deep and located 7.6 m to the north failed to disclose a trace of the water.

The experiment at Mesita del Buey indicated that water from the infiltration pit (42 m^3 of water equivalent of 110 years of precipitation on the Pajarito Plateau) moved downward through a moderately welded tuff into a pumice zone which is more porous and permeable. Movement in the pumiceous zone was lateral. Infiltration into a moderately welded tuff underlying the pumice zone was from near the center of the saturated area in the pumiceous lense. The moisture content of the upper moderately welded tuff was much lower than the underlying pumiceous zone, which indicates that specific retention of the pumice zone is greater.

Vertical infiltration through the Tshirege Member would be affected by zonal variations of welding as well as by horizontal contacts between flows.

Vertical changes in hydrologic conductivity caused by contacts between flows tend to perch infiltrating water. In the stream channel in Mortandad Canyon, water is returned to the surface from underflow in the alluvium and in a moderately welded tuff at the contact with a nonwelded tuff.

Industrial wastes discharged into surface water in Acid Canyon move into the joints and tuff of the Tshirege Member, are perched on the top of the Otowi Member, and then move laterally along the contact into a seep area at the junction of Acid and Pueblo Canyons.

Results of an infiltration experiment in the soil near TA-50 indicated that precipitation that is not removed by surface drainage infiltrates into the soil on the mesas of the Pajarito Plateau; however, the downward movement of this water is impeded or stopped by the dense transition zone between the soil and tuff and the water is returned to the atmosphere by evapotranspiration. During this experiment, the amount of water added to the soil was equivalent to 50 years of precipitation on the Pajarito Plateau.

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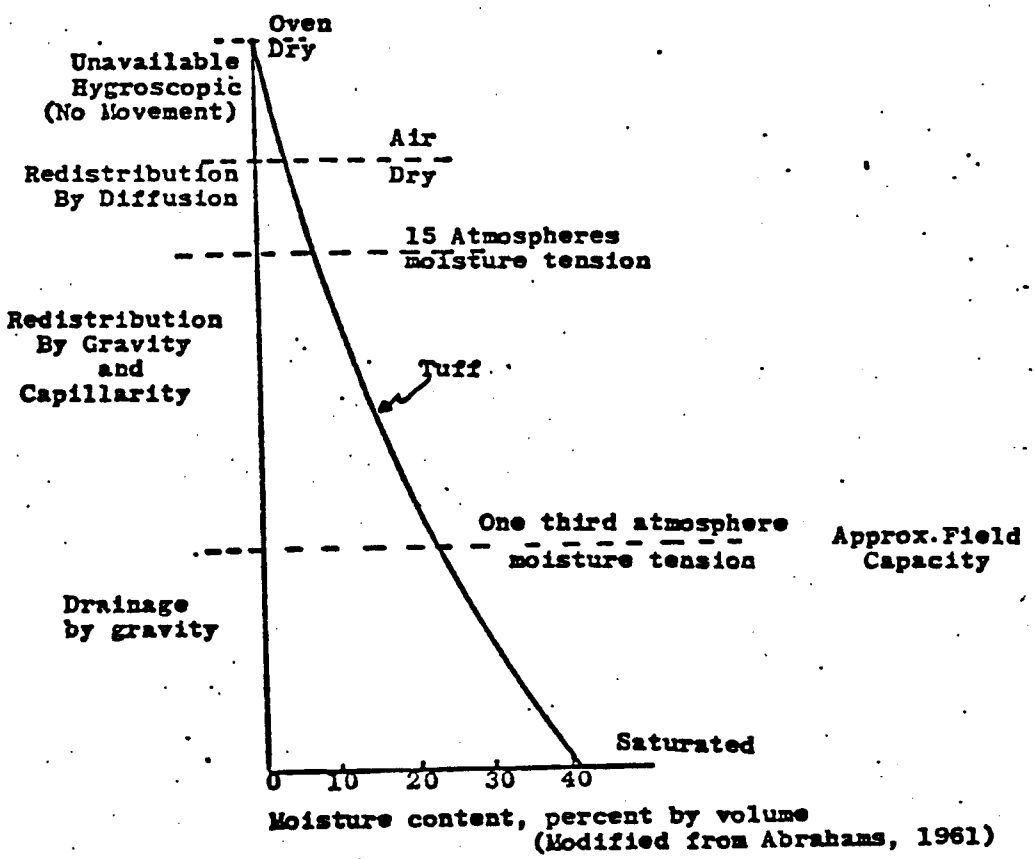


Figure 1. Energy relationships with moisture content of tuff.

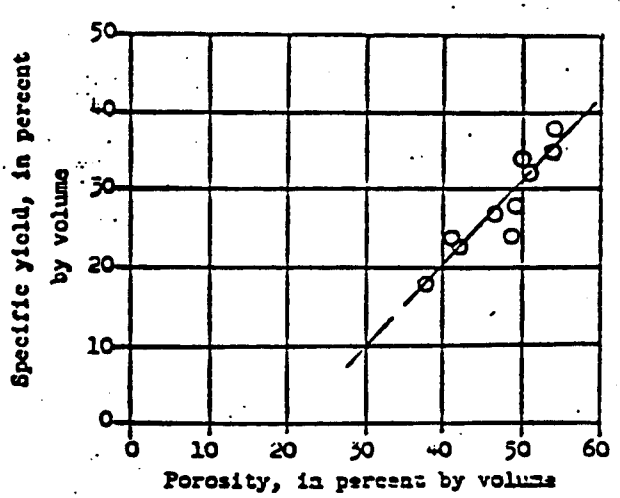


Figure 2. Relationship of specific yield to porosity of the tuff.

APPENDIX F-1

MAPS FROM "TA-3 TRAFFIC STUDY" DEPICTING VEHICULAR COUNT MOVEMENTS AT VARIOUS INTERSECTIONS

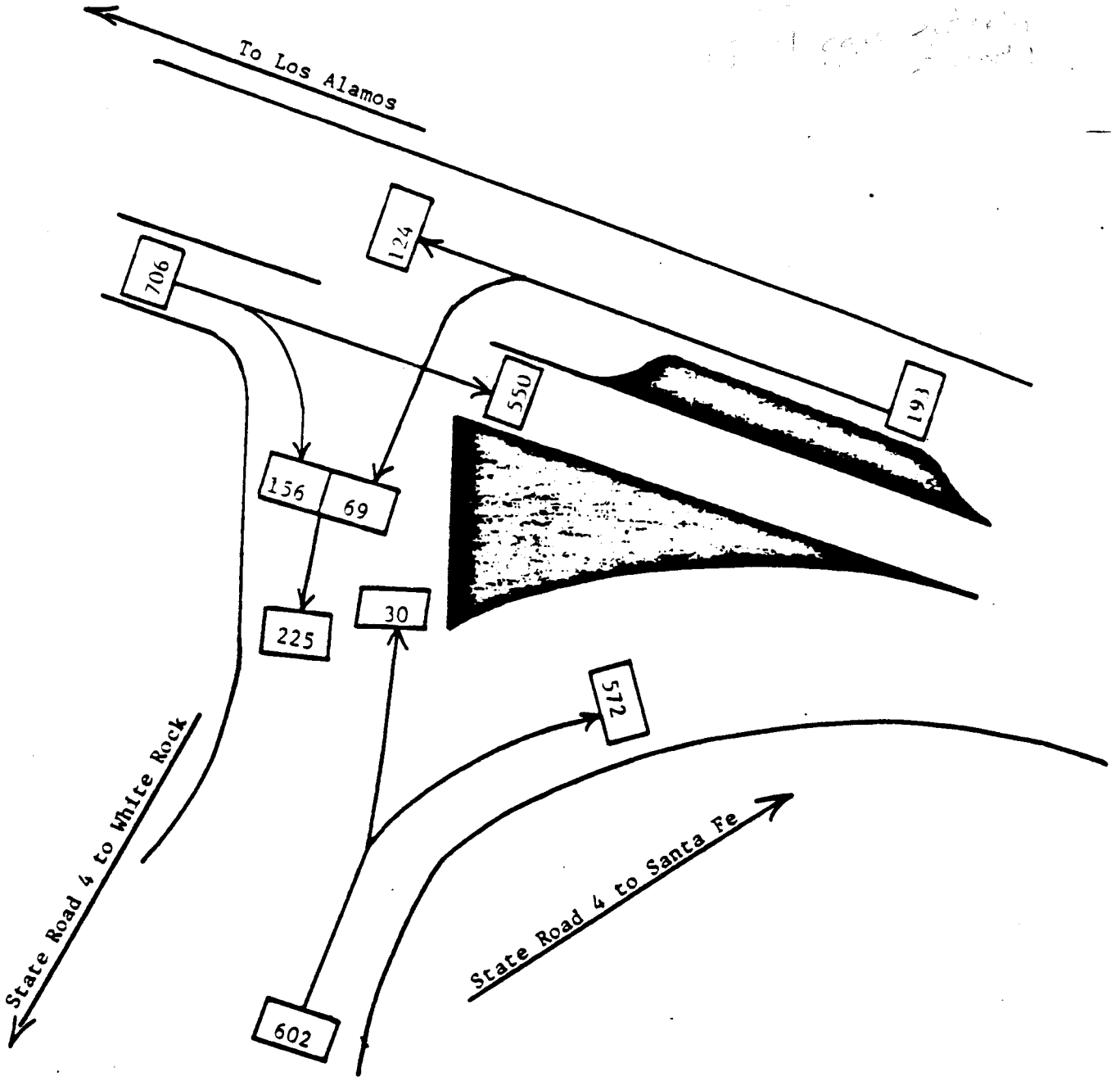
4/14/83
SB

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Wye. Evening

Date of Survey: 4/13/83
Taken for 1 hours
from: 4:30 to 5:30 pm
Day of Week Wednesday
Weather: Cloudy
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



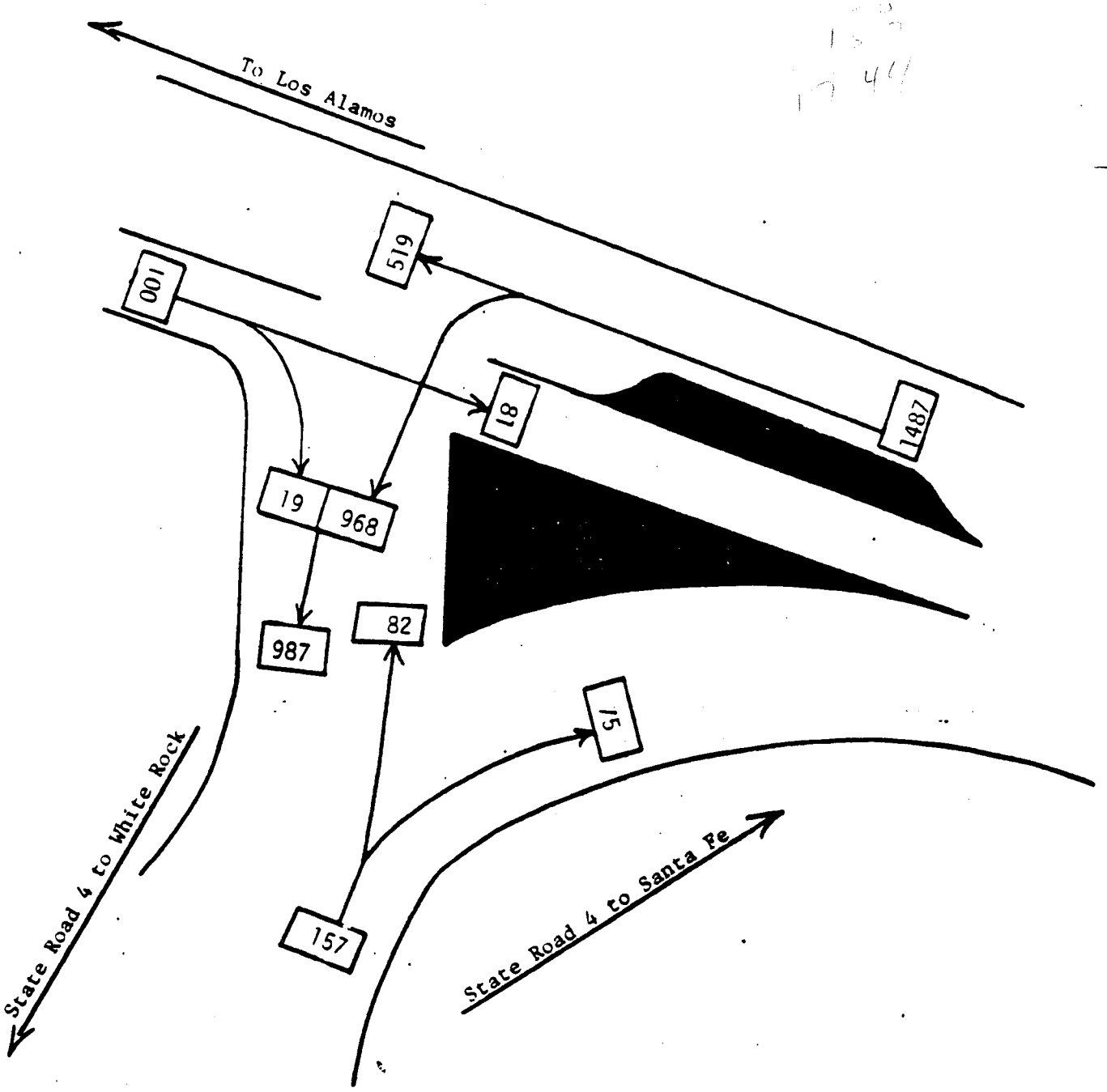
5/12/83

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Wye.

Date of Survey: 5/9/83
Taken for 1 hours
from: 7:00 to 8:00
Day of Week Monday
Weather: Clear
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



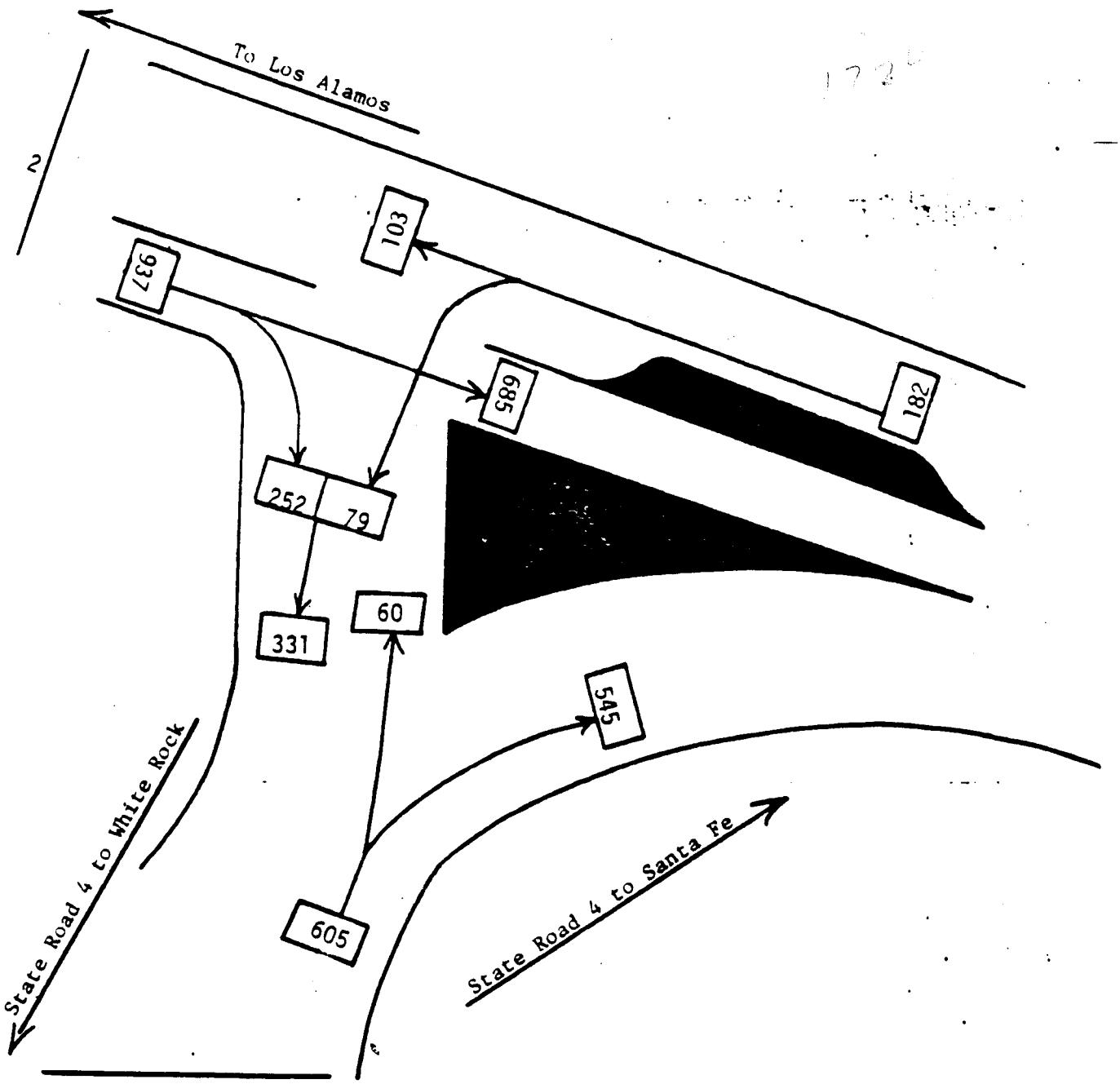
5/10/83
GB

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Wye.

Date of Survey: 5/6/83
Taken for 1 hours
from: 4:30 to 5:30 pm
Day of Week Friday
Weather: Clear
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



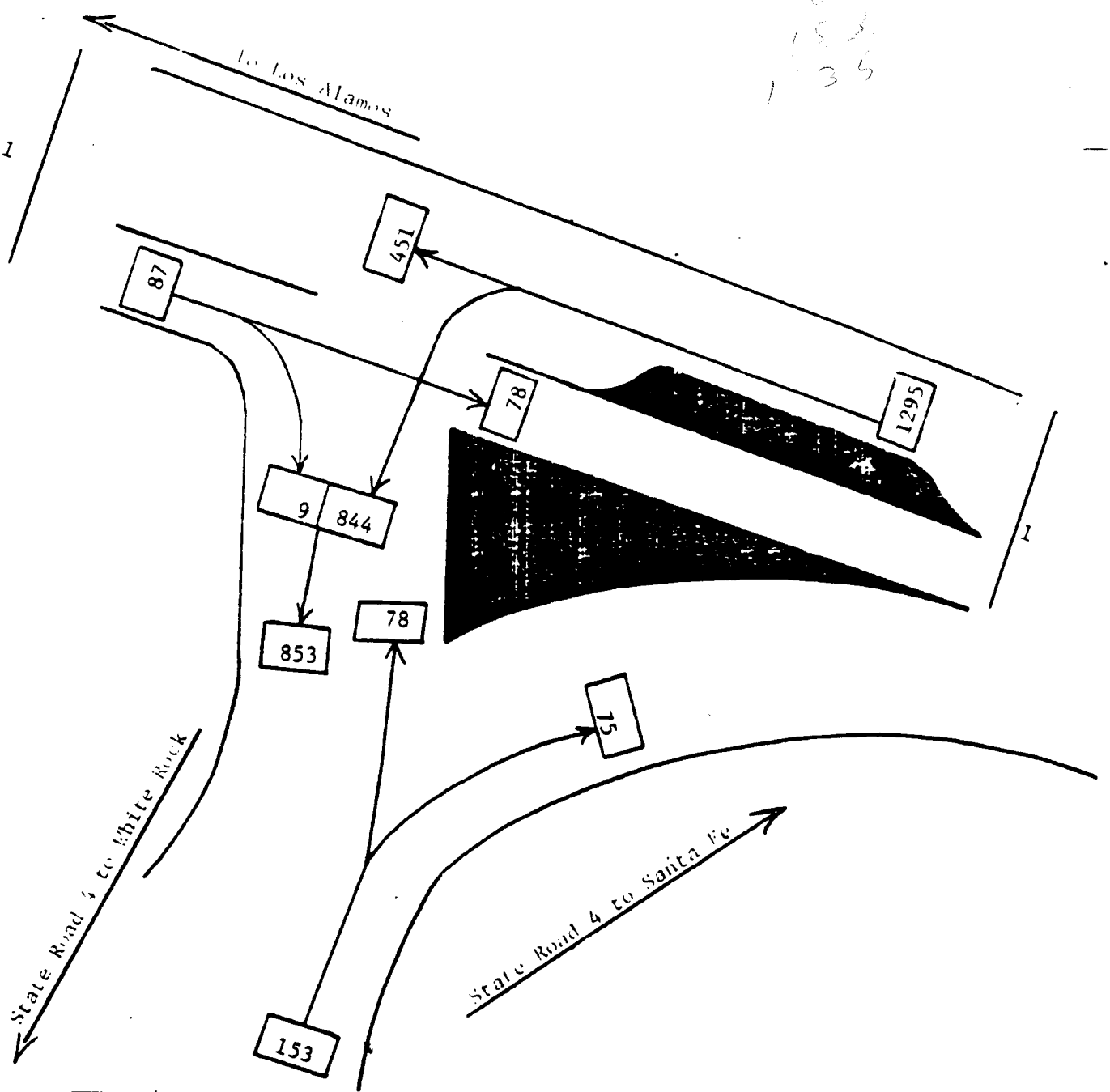
4/21/83
GB

TRAFFIC ENGINEERING DEPARTMENT
OF LOS ALAMOS COUNTY

Vehicular traffic count movements at the intersection of the White Rock Bye.

Date of Survey: 4/18/83
Taken for 1 hours
from: 7:15 to 8:15 am
Day of Week Monday
Weather: Clear
Road surface: dry
Survey taken by:
Holcomb & Haas

Indicate North
by arrow



AMENDED PAGES FOR

APPENDIX G

NOV. 1 3 1993

APPENDIX G

DESCRIPTION OF HAZARDOUS WASTES

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
P001	250(4)	S01	O	Warfarin (H)
P002	250(4)	S01	O	1-Acetyl-2-thiourea (H)
P003	250(4)	S01	O	Acrolein (H)
P004	250(4)	S01	O	Aldrin (H)
P005	250(4)	S01	O	Allyl alcohol (H)
P006	250(4)	S01, T04	R	Aluminum phosphide (H)
P007	250(4)	S01	O	Muscimol (H)
P008	250(4)	S01	O	4-Aminopyridine (H)
P009	250(4)	S01, T04	R	Ammonium picrate (R)
P010	250(4)	S01	M	Arsenic acid (H)
P011	250(4)	S01	M	Arsenic pentoxide (H)
P012	250(4)	S01	M	Arsenic trioxide (H)
P013	250(4)	S01, T01	M	Barium cyanide (H)
P014	250(4)	S01	O	Benzenethiol (H)
P015	6000	S01	M	Beryllium dust (H)
P016	250(4)	S01	O	Bis(chloromethyl) ether (H)
P017	250(4)	S01	O	Bromoacetone (H)
P018	250(4)	S01	O	Brucine (H)
P020	250(4)	S01	O	Dinoseb (H)
P021	250(4)	S01, T01	M	Calcium cyanide (H)
P022	250(4)	S01, T04	O	Carbon bisulfide (H)
P023	250(4)	S01	O	Chloroacetaldehyde (H)
P024	250(4)	S01	O	p-Chloroaniline (H)
P026	250(4)	S01	O	1-(o-Chlorophenyl) thiourea (H)
P027	250(4)	S01	O	3-Chloropropionitrile (H)
P028	250(4)	S01	O	Chloromethylbenzene (H)
P029	250(4)	S01, T01	M	Copper cyanide (H)
P030	250(4)	S01, T01	M	Cyanide salts (H)
P031	250(4)	S01, T04	M	Cyanogen (H)
P033	250(4)	S01, T04	M	Cyanogen chloride (H)
P034	250(4)	S01	O	2-Cyclohexyl-4,6-dinitrophenol (H)
P036	250(4)	S01	O	Dichlorophenylarsine (H)
P037	250(4)	S01	O	Dieldrin (H)
P038	250(4)	S01	O	Diethylarsine (H)
P039	250(4)	S01	O	Disulfoton (H)
P040	250(4)	S01	O	Thionazin (H)
P041	250(4)	S01	O	Paraoxon (H)
P042	250(4)	S01	O	Epinephrine (H)
P043	250(4)	S01	A	Isoflurophate (H)
P044	250(4)	S01	O	Dimethoate (H)
P045	250(4)	S01	O	Thiofanox (H)
P046	250(4)	S01	O	Phentermine (H)
P047	250(4)	S01	O	Dinitrocresol (H)
P048	250(4)	S01	O	2,4-Dinitrophenol (H)
P049	250(4)	S01	O	2,4-Dithiobiuret (H)
P050	250(4)	S01	O	Endosulfan (H)
P051	250(4)	S01	O	Endrin (H)
P054	250(4)	S01, T01, T04	O	Ethylenimine (H)
P056	250(4)	S01, T04	G	Fluorine (H)
P057	250(4)	S01	O	Fluoroacetamide (H)
P058	250(4)	S01	O	Fluoroacetic acid, sodium salt (H)
P059	250(4)	S01	O	Heptachlor (H)
P060	250(4)	S01	O	Hexachlorohexahydro-exo, (H) exo-dimethanonaphthalene

DESCRIPTION OF HAZARDOUS WASTES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
P062	250(4)	S01	A	Tetraphosphoric acid, hexaethyl ester (H)
P063	250(4)	S01, T04	CN	Hydrogen cyanide (H)
P064	250(4)	S01, T04	A	Isocyanic acid, methyl ester (H)
P065	250(4)	S01, T04	R	Mercury fulminate (R, T)
P066	250(4)	S01	O	Methomyl (H)
P067	250(4)	S01	O	1,2-Propylenimine (H)
P068	250(4)	S01	O	Methylhydrazine (H)
P069	250(4)	S01, T04	CN	2-Methyllactonitrile (H)
P070	250(4)	S01	O	Aldicarb (H)
P071	250(4)	S01, T04	O	Methyl parathion (H)
P072	250(4)	S01	O	2-Naphthylthiourea (H)
P073	250(4)	S01, T01, T04	M	Nickel tetracarbonyl (H)
P074	250(4)	S01, T01	CN	Nickel cyanide (H)
P075	250(4)	S01	O	Nicotine and salts (H)
P076	250(4)	S01, T01, T04	G	Nitric oxide (H)
P077	250(4)	S01, T04	O	p-Nitroaniline (H)
P078	250(4)	S01, T01	G	Nitrogen dioxide (H)
P081	250(4)	S01, T04	R	Nitroglycerine (R)
P082	250(4)	S01	O	Dimethylnitrosamine (H)
P084	250(4)	S01	O	N-Nitrosomethylvinylamine (H)
P085	250(4)	S01	O	Schradan (H)
P087	250(4)	S01	M	Osmium tetroxide (H)
P088	250(4)	S01	O	Endothall (H)
P089	250(4)	S01	O	Parathion (H)
P092	250(4)	S01	M	Phenyulmecuric acetate (H)
P093	250(4)	S01, T03	O	N-Phenylthiourea (H)
P094	250(4)	S01, T03	O	Phorate (H)
P095	250(4)	S01, T03	O	Phosgene (H)
P096	250(4)	S01, T04	G	Phosphine (H)
P097	250(4)	S01, T03	O	Famphur (H)
P098	250(4)	S01, T01	CN	Potassium cyanide (H)
P099	250(4)	S01, T01	CN	Potassium silver cyanide (H)
P101	250(4)	S01, T03	CN	Acrylonitrile (H)
P102	250(4)	S01, T03	O	Propargyl alcohol (H)
P103	250(4)	S01, T03	M	Selenourea (H)
P104	250(4)	S01, T01	CN	Silver cyanide (H)
P105	250(4)	S01	O	Sodium azide (H)
P106	250(4)	S01, T01	CN	Sodium cyanide (H)
P107	250(4)	S01, T04	S	Strontium sulfide (H)
P108	250(4)	S01, T03	O	Strychnidin-10-one, and salts (H)
P109	250(4)	S01, T03	O	Sulfotepp (H)
P110	250(4)	S01, T03	O	Tetraethyl lead (H)
P111	250(4)	S01, T03	O	Tetraethyl pyrophosphate(H)
P112	250(4)	S01, T03, T04	R	Tetranitromethane (R)
P113	250(4)	S01	M	Thallic oxide (H)
P114	250(4)	S01	M	Thallium selenite (H)
P115	250(4)	S01	M	Thallium sulfate (H)
P116	250(4)	S01	O	Thiosemicarbazide (H)
P118	250(4)	S01, T03	O	Trichloromethanethiol (H)
P119	250(4)	S01	A	Vanadic acid, ammonium salt (H)
P120	250(4)	S01	M	Vanadium pentoxide (H)
P121	250(4)	S01, T01	CN	Zinc cyanide (H)
P122	250(4)	S01, T04	R	Zinc phosphide (R, T)
P123	250(4)	S01, T03	O	Toxaphene (H)

NOV. 1 3 1996

DESCRIPTION OF HAZARDOUS WASTES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U001	250(4)	S01, T03	O	Acetaldehyde (I)
U002	1000	S01, T03	O	Acetone (I)
U003	250(4)	S01, T03	O	Acetonitrile (I, T)
U004	250(4)	S01, T03	O	Acetophenone (T)
U005	250(4)	S01	O	2-Acetylaminofluorene (T)
U006	250(4)	S01, T04	R	Acetyl chloride (C, R, T)
U007	250(4)	S01, T03	O	Acrylamide (T)
U008	250(4)	S01, T03, T04	A	Acrylic acid (I)
U009	250(4)	S01, T03	O	Acrylonitrile (T)
U010	250(4)	S01, T03	O	Mytomycin-C (T)
U011	250(4)	S01, T03	O	Amitrole (T)
U012	250(4)	S01, T03	O	Aniline (I, T)
U014	250(4)	S01, T03	O	Auramine (T)
U015	250(4)	S01, T03	O	Azaserine (T)
U016	250(4)	S01, T03	O	3,4-Benzacridine (T)
U017	250(4)	S01, T03	O	Benzal chloride (T)
U018	250(4)	S01, T03	O	1,2-Benzanthracene (T)
U019	250(4)	S01	O	Benzene (I, T)
U020	250(4)	S01, T03, T04	R	Benzenesulfonyl chloride (C, R)
U021	250(4)	S01, T03	O	Benzidine (T)
U022	250(4)	S01, T03	O	3,4-Benzopyrene (T)
U023	250(4)	S01, T03, T04	R	Benzotrichloride (C, R, T)
U024	250(4)	S01, T03	O	Bis(2-chloroethoxy) methane (T)
U025	250(4)	S01, T03	O	Dichloroethyl ether (T)
U026	250(4)	S01, T03	O	Chlornaphazine (T)
U027	250(4)	S01, T03	O	2,2 Oxybis-2-chloropropane (T)
U028	250(4)	S01, T03	O	Bis(2-ethylhexyl) phthalate (T)
U029	250(4)	S01, T03	G	Methyl bromide (T)
U030	250(4)	S01, T03	O	4-Bromophenyl phenyl ether (T)
U031	250(4)	S01, T03	O	n-Butyl alcohol (I)
U032	250(4)	S01, T01	M	Calcium chromate (T)
U033	250(4)	S01, T04	G	Carbon oxyfluoride (R, T)
U034	250(4)	S01, T03	O	Chloral (T)
U035	250(4)	S01, T03	O	Chlorambucil (T)
U036	250(4)	S01, T03	O	Chlordane (T)
U037	250(4)	S01, T03	O	Chlorobenzene (T)
U038	250(4)	S01, T03	O	Chlorobenzilate (T)
U039	250(4)	S01, T03	O	4-chloro-m-cresol (T)
U041	250(4)	S01, T03	O	Epichlorohydrin (T)
U042	250(4)	S01, T03, T04	O	Chloroethyl vinyl ether (T)
U043	250(4)	S01, T04	G	Chloroethene (T)
U044	1000	S01, T03	O	Chloroform (T)
U045	250(4)	S01, T04	G	Methyl chloride (I, T)
U046	250(4)	S01, T03	O	Chloromethoxymethane (T)
U047	250(4)	S01, T03	O	-Chloronaphthalene (T)
U048	250(4)	S01, T03	O	o-Chlorophenol (T)
U049	250(4)	S01, T03	O	4-Chloro-o-toluidine, hydrochloride (T)
U050	250(4)	S01, T03	O	Chrysene (T)
U051	250(4)	S01, T03	O	Creosote (T)
U052	250(4)	S01, T03	O	Cresols (T)
U053	250(4)	S01, T03	O	Crotonaldehyde (T)
U055	250(4)	S01, T03	O	Cumene (I)
U056	250(4)	S01, T03	O	Cyclohexane (I)

DESCRIPTION OF HAZARDOUS WASTES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U057	250(4)	S01, T03	O	Cyclohexanone (I)
U058	250(4)	S01, T03	O	Cyclophosphamide (T)
U059	250(4)	S01, T03	O	Daunomycin (T)
U060	250(4)	S01, T03	O	DDD (T)
U061	250(4)	S01, T03	O	DDT (T)
U062	250(4)	S01, T03	O	Diallate (T)
U063	250(4)	S01, T03	O	Dibenzanthracene (T)
U064	250(4)	S01, T03	O	Dibenzopyrene (T)
U066	250(4)	S01, T03	O	1,2-Dibromo-3-chloropropane (T)
U067	250(4)	S01, T03	O	Ethylene dibromide (T)
U068	250(4)	S01, T03	O	Methylene bromide (T)
U069	250(4)	S01, T03	O	Dibutyl phthalate (T)
U070	250(4)	S01, T03	O	o-Dichlorobenzene (T)
U071	250(4)	S01, T03	O	m-Dichlorobenzene (T)
U072	250(4)	S01, T03	O	p-Dichlorobenzene (T)
U073	250(4)	S01, T03	O	3,3-Dichlorobenzidine (T)
U074	250(4)	S01, T03	O	1,4-Dichloro-2-butene (T, I)
U075	250(4)	S01, T04	G	Dichlorodifluoromethane (T)
U076	250(4)	S01, T03	O	1,1-Dichloroethane (T)
U077	250(4)	S01, T03	O	Ethylene dichloride (T)
U078	250(4)	S01, T03	O	1,1-Dichloroethylene (T)
U079	250(4)	S01, T03	O	1,2-Dichloroethylene (T)
U080	3000	S01, T03	O	Dichloromethane (T)
U081	250(4)	S01, T03	O	2,4-Dichlorophenol (T)
U082	250(4)	S01, T03	O	2,6-Dichlorophenol (T)
U083	250(4)	S01, T03	O	1,2-Dichloropropane (T)
U084	250(4)	S01, T03	O	1,3-Dichloropropene (T)
U085	250(4)	S01, T03	O	1,2:3,4-Diepoxybutane (I, T)
U086	250(4)	S01, T03	O	N,N-Diethylhydrazine (T)
U087	250(4)	S01, T03	O	O,O-Diethyl-s-methyl-dithiophosphate (T)
U088	250(4)	S01, T03	O	Diethyl phthalate (T)
U089	250(4)	S01, T03	O	Diethylstilbestrol (T)
U090	250(4)	S01, T03	O	Dihydrosafrole (T)
U091	250(4)	S01, T03	O	3,3-Dimethoxybenzidine (T)
U092	250(4)	S01, T04	O	Dimethylamine (I)
U093	250(4)	S01, T03	O	Dimethylaminoazobenzene (T)
U094	250(4)	S01, T03	O	7,12-Dimethylbenzanthracene (T)
U095	250(4)	S01, T03	O	3,3-Dimethylbenzidine (T)
U096	250(4)	S01, T03	R	- -Dimethylbenzylhydroperoxide (R)
U097	250(4)	S01, T03	O	Dimethylcarbamoyl chloride (T)
U098	250(4)	S01, T03	O	1,1-Dimethylhydrazine (T)
U099	250(4)	S01, T03	O	1,2-Dimethylhydrazine (T)
U101	250(4)	S01, T03	O	2,4-Dimethylphenol (T)
U102	250(4)	S01, T03	O	Dimethyl phthalate (T)
U103	250(4)	S01, T03	O	Dimethyl sulfate (T)
U105	250(4)	S01, T03	O	2,4-Dinitrotoluene (T)
U106	250(4)	S01, T03	O	2,6-Dinitrotoluene (T)
U107	250(4)	S01, T03	O	Di-n-octyl phthalate (T)
U108	250(4)	S01, T03	O	1,4-Dioxane (T)
U109	250(4)	S01, T03	O	1,2-Diphenylhydrazine (T)
U110	250(4)	S01, T03	O	Dipropylamine (I)
U111	250(4)	S01, T03	O	Di-n-propylnitrosamine (T)
U112	250(4)	S01, T03, T04	O	Ethyl acetate (I)

NOV. 13 1986

DESCRIPTION OF HAZARDOUS WASTES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U113	250(4)	S01, T03, T04	O	Ethyl acrylate (I)
U114	250(4)	S01, T03	O	1,2 Ethanediylbiscarbamodithioc acid (T)
U115	250(4)	S01, T03, T04	O	Ethylene oxide (I, T)
U116	250(4)	S01, T03	O	Ethylene thiourea (T)
U117	250(4)	S01, T03, T04	O	Ethyl ether (I)
U118	250(4)	S01, T03, T04	O	Ethyl methacrylate (T)
U119	250(4)	S01, T03	O	Ethyl methanesulfonate (T)
U120	250(4)	S01, T03	O	Benzo(j,k)fluorene (T)
U121	250(4)	S01	O	Trichlorofluoromethane (T)
U122	250(4)	S01, T03	G	Formaldehyde (T)
U123	250(4)	S01	A	Formic acid (C, T)
U124	250(4)	S01, T03	O	Furan (I)
U125	250(4)	S01, T03	O	Furfural (I)
U126	250(4)	S01, T03	O	Glycidylaldehyde (T)
U127	250(4)	S01, T03	O	Hexachlorobenzene (T)
U128	250(4)	S01, T03	O	Hexachlorobutadiene (T)
U129	250(4)	S01, T03	O	Hexachlorocyclohexane (T)
U130	250(4)	S01, T03	O	Hexachloropentadiene (T)
U131	250(4)	S01, T03	O	Hexachloroethane (T)
U132	250(4)	S01, T03	O	Hexachlorophene (T)
U133	250(4)	S01, T03, T04	R	Hydrazine (R, T)
U134	250(4)	S01, T01, T04,	G	Hydrogen fluoride (C, T)
U135	250(4)	S01, T04	G	Hydrogen sulfide (T)
U136	250(4)	S01	A	Cacodylic acid (T)
U137	250(4)	S01, T03	O	Indeno (1,2,3) pyrene (T)
U138	250(4)	S01, T03	O	Methyl iodide (T)
U139	250(4)	S01, T03	O	Iron dextran (T)
U140	250(4)	S01, T03	O	Isobutyl alcohol (I, T)
U141	250(4)	S01, T03	O	Isosafrole (T)
U142	250(4)	S01, T03	O	Kepone (T)
U143	250(4)	S01, T03	O	Lasiocarpine (T)
U144	250(4)	S01	M	Lead acetate (T)
U145	250(4)	S01	M	Lead phosphate (T)
U146	250(4)	S01	M	Lead subacetate (T)
U147	250(4)	S01, T03	O	Maleic anhydride (T)
U148	250(4)	S01, T03	O	Maleic hydrazide (T)
U149	250(4)	S01, T03	O	Malononitrile (T)
U150	250(4)	S01, T03	O	Melphalan (T)
U151	250(4)	S01, T03	M	Mercury (T)
U152	250(4)	S01	O	Methacrylonitrile (I, T)
U153	250(4)	S01, T03	G	Methanethiol (I, T)
U154	250(4)	S01, T03	O	Methanol (I)
U155	250(4)	S01, T03	O	Methapyrilene (T)
U156	250(4)	S01, T03	O	Methyl chlorocarbonate (I, T)
U157	1000	S01, T03	O	3-Methylcholanthrene (T)
U158	250(4)	S01, T03	O	4,4-Methylenebis[2-chloroaniline] (T)
U159	1000	S01, T03	O	Methyl ethyl ketone (I, T)
U160	250(4)	S01, T03, T04	R	Methyl ethyl ketone peroxide (R, T)
U161	250(4)	S01, T03	O	Methyl isobutyl ketone (I)
U162	250(4)	S01, T03	O	Methyl methacrylate (I, T)
U163	250(4)	S01, T03	O	N-Methyl-N-nitro-nitrosoguanidine (T)
U164	250(4)	S01, T03	O	Methylthiouracil (T)

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DESCRIPTION OF HAZARDOUS WASTES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U165	250(4)	S01, T03	O	Naphthalene (T)
U166	250(4)	S01, T03	O	1,4-Naphthalenedione (T)
U167	250(4)	S01, T03	O	1-Naphthylamine (T)
U168	250(4)	S01, T03	O	2-Naphthylamine (T)
U169	250(4)	S01, T03	O	Nitrobenzene (I, T)
U170	250(4)	S01, T03	O	p-Nitrophenol (T)
U171	250(4)	S01, T03	O	2-Nitropropane (I)
U172	250(4)	S01, T03	O	N-Nitrosodi-n-butylamine (T)
U173	250(4)	S01, T03	O	N-Nitrosodiethanolamine (T)
U174	250(4)	S01, T03	O	N-Nitrosodiethylamine (T)
U176	250(4)	S01, T03	O	N-Nitroso-N-ethylurea (T)
U177	250(4)	S01, T03	O	N-Nitroso-N-methylurea (T)
U178	250(4)	S01, T03	O	N-Nitroso-N-methylurethane (T)
U179	250(4)	S01, T03	O	N-Nitrosopiperidine (T)
U180	250(4)	S01, T03	O	N-Nitrosopyrrolidine (T)
U181	250(4)	S01, T03	O	2-Methyl-5-nitrobenzenamine (T)
U182	250(4)	S01, T03	O	Paraldehyde (T)
U183	250(4)	S01, T03	O	Pentachlorobenzene (T)
U184	250(4)	S01, T03	O	Pentachloroethane (T)
U185	250(4)	S01, T03	O	Pentachloronitrobenzene (T)
U186	250(4)	S01, T03	O	1,3-Pentadiene (I)
U187	250(4)	S01, T03	O	Phenacetin (T)
U188	250(4)	S01, T03	O	Phenol (T)
U189	250(4)	S01, T03, T04	R	Phosphorous sulfide (R)
U190	250(4)	S01, T03	O	Phthalic anhydride (T)
U191	250(4)	S01, T03	O	2-Picoline (T)
U192	250(4)	S01, T03	O	Pronamide (T)
U193	250(4)	S01, T03	O	1,3-Propane sulfone (T)
U194	250(4)	S01, T03	O	n-Propylamine (I, T)
U196	250(4)	S01, T03	O	Pyridine (T)
U197	250(4)	S01, T03	O	p-Benzoquinone (T)
U200	250(4)	S01, T03	O	Reserpine (T)
U201	250(4)	S01, T03	O	Resorcinol (T)
U202	250(4)	S01, T03	O	Saccharin and salts (T)
U203	250(4)	S01, T03	O	Safrole (T)
U204	250(4)	S01	M	Selenious acid (T)
U205	250(4)	S01, T04	R	Selenium disulfide (R, T)
U206	250(4)	S01, T03	O	Streptozotocin (T)
U207	250(4)	S01, T03	O	1,2,4,5-Tetrachlorobenzne (T)
U208	250(4)	S01, T03	O	1,1,1,2-Tetrachloroethane (T)
U209	250(4)	S01, T03	O	1,1,2,2-Tetrachloroethane (T)
U210	500(4)	S01, T03	O	Tetrachloroethylene (T)
U211	250(4)	S01, T03	O	Carbon tetrachloride (T)
U212	250(4)	S01, T03	O	2,3,4,6-Tetrachlorophenol (T)
U213	250(4)	S01, T03, T04	O	Tetrahydrofuran (I)
U214	250(4)	S01, T03	M	Thallium acetate (T)
U215	250(4)	S01	M	Thallium carbonate (T)
U216	250(4)	S01	M	Thallium chloride (T)
U217	250(4)	S01, T04	M	Thallium nitrate (T)
U218	250(4)	S01, T03	O	Thioacetamide (T)
U219	250(4)	S01	O	Thiourea (T)
U220	1000	S01, T03	O	Toluene (T)

NOV. 1 3 1986

DESCRIPTION OF HAZARDOUS WASTES (Continued)

EPA Hazardous Waste Number	Estimated Annual Quantity of Waste (lb)	Process/Disposal Codes (1)	Waste Type for Segregation (2)	Waste Materials (3)
U221	250(4)	S01, T03	O	Toluenediamine (T)
U222	250(4)	S01, T03	O	o-Toluidine hydrochloride (T)
U223	1000	S01, T03	R	Toluene diisocyanate (R, T)
U225	250(4)	S01, T03	O	Bromoform (T)
U226	1500	S01, T03	O	1,1,1-Trichloroethane (T)
U227	250(4)	S01, T03	O	1,1,2-Trichlorethane (T)
U228	2000	S01, T03	O	Trichloroethylene (T)
U230	250(4)	S01, T03	O	2,4,5-Trichlorophenol (T)
U231	250(4)	S01, T03	O	2,4,6-Trichlorophenol (T)
U232	250(4)	S01, T03	O	2,4,5-Trichlorophenoxyacetic acid (T)
U233	250(4)	S01, T03	O	Silvex (T)
U234	250(4)	S01, T04	R	syn-Trinitrobenzene (R, T)
U235	250(4)	S01, T03	O	Tris (2,3-dibromopropyl) phosphate (T)
U236	250(4)	S01, T03	O	Trypan blue (T)
U237	250(4)	S01, T03	O	Uracil mustard (T)
U238	250(4)	S01, T03	O	Ethyl carbamate (T)
U239	1000	S01, T03	O	Xylene (I)
U240	250(4)	S01, T03	O	2,4-D, salts and esters (T)
U242	250(4)	S01, T03	O	Pentachlorophenol (T)
U243	250(4)	S01, T03	O	Hexachloropropene (T)
U244	250(4)	S01, T03	O	Thiram (T)
U246	250(4)	S01	M	Bromine cyanide (T)
U247	250(4)	S01, T03	O	Methoxychlor (T)

(1) S01 - Temporary Storage; T01 - Tank Treatment; T03 - Incineration; T04 - Thermal Treatment

(2) O - Organic Solvent Waste; R - Reactive Metals and Compounds; M - Non-reactive Metals, Salts and Compounds; A - Acids; CN - Cyanide Waste; G - Gases

(3) Potential hazardous property of a waste material cited is indicated as follows: (T) toxic; (I) ignitable; (R) reactive; (C) corrosive; (H) acutely hazardous

(4) Waste is generated in lab pack quantities only.

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APPENDIX H
SAMPLE WASTE DISPOSAL RECORDS

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

CHEMICAL WASTE DISPOSAL REQUEST

Disposal Form Number(s)
This information is to be filled in by H-7 personnel.

Requested by	Telephone number	Group	Date

Location: Tech Area, building, area/wing, room number.

Number of Containers	Volume of Containers	Chemical Name	Solid(S) Liquid(L) Gas(G)	Hazards	Removed

Reviewed for disposal by

Other useful information

LIS Form Number 10 378 (12/78.2) *Mail this form to Waste Management (H-7) Mail Stop E516*

FORM H-1

FORM H-2

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

LOS ALAMOS HAZARDOUS CHEMICAL WASTE DISPOSAL RECORD

1 Form Number	L = Lab Pack S = Secondary N = Other
H 8	

2 Date
M M D D Y Y

PRIMARY WASTE

3 Origin Of Waste					4 HSE-7	5 RCRA	6 WASTE	7 Storage
Group	TA	Bldg.	Wing	Room	Code	Code	Code	Code

8 Waste Description

9 Numbers Of Waste Packages						10 Gross Volume	L = Liter G = Gallon M = Meter 3 F = Feet3	11 Gross Weight	K = Kilogram P = Pound T = Ton
Plastic	Card Board	Drums		Wooden Crates			Units		Units
Bags	Boxes	No.	Gal.	No.	Volume - ft. 3				

12 Treatment Code(s)	13 Disposal/Treatment Performed By	14 Disposal Code	15 Disposal Date
			M M D D Y Y

16 Disposal Location					
TA	Shaft	Pit	Post(s)	Layer	Pond

HSE-7 Representative(s)

SECONDARY WASTE

17 HSE-7 Code	18 RCRA Code	19 Waste Code	20 Waste Description

21 Numbers Of Waste Packages				22 Gross Volume	L = Liter G = Gallon M = Meter3 F = Feet3	23 Gross Weight	K = Kilogram P = Pound T = Ton
Drums					Units		Units
No.	Gal.	No.	Gal.				

24 Treatment Code(s)	25 Disposal/Treatment Performed By	26 Disposal Code	27 Disposal Date
			M M D D Y Y

HSE-7 Representative(s)

28 Disposal Location					
TA	Shaft	Pit	Post(s)	Layer	Pond

HS Form Number 10-3B (3/84)

FORM H-3

CHEMICALS IN LABPACK DRUM

ANALYSES PERFORMED

Tested For	Original Concentration	Final Concentration *(After Treatment)*

LABORATORY ANALYSES H-4

FORM H-4

SAMPLE SUBMITTED BY			DATE:		
ORIGIN OF SAMPLE (S)					
GENERAL DESCRIPTION RANGE OF ACTIVITY					
DATE SAMPLE COLLECTED					
Test/Analysis	Result/Conc	By (Initials)	Test/Analysis	Result/Conc	By (Initials)
REMARKS:					

APPROVED: _____ DATE: _____

Chief Chemist

Lab Copy

H7-LAB-35

LABORATORY ANALYSES

SAMPLE SUBMITTED BY			DATE:		
ORIGIN OF SAMPLE (S)					
GENERAL DESCRIPTION RANGE OF ACTIVITY					
DATE SAMPLE COLLECTED					
Test/Analysis	Result/Conc	By (Initials)	Test/Analysis	Result/Conc	By (Initials)
REMARKS:					

APPROVED: _____ DATE: _____

Chief Chemist

Lab Copy

FORM H-5

LABORATORY ANALYSES

SAMPLE SUBMITTED BY:

DATE:

ORIGIN OF SAMPLE(S)

DATE SAMPLED

DATE BEGUN	METHOD	ANALYZED BY	DESCRIPTION	DATE BEGUN	METHOD	ANALYZED BY

Test/Analysis	Result/Conc				Test/Analysis	Result/Conc			

REMARKS:

H7-LAB-35A

APPROVED: _____ DATE: _____

Chief Chemist

Lab Copy

APPENDIX I

DETAILED SPECIFICATIONS AND PLANS FOR TA-50 BATCH TREATMENT SYSTEM

APPENDIX I-1

MANUFACTURER'S INFORMATION ON PROTECTIVE COATINGS, PRIMERS, FINISHES AND FLEXIBLE LINERS

0089C

CONTRACT NO. DE-AC32-80AL13151

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

MODIFICATION SPECIFICATION NO. 3

UPGRADING OF BATCH WASTE TREATMENT SYSTEM

REVISED

May 24, 1983

by

Los Alamos National Laboratory

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

MODIFICATION SPECIFICATION NO. 3
UPGRADING OF BATCH WASTE TREATMENT SYSTEM

SUBMITTED _____ DATE 2-24-83
The Ralph M. Parsons Company

RECOMMENDED _____ DATE 2/24/83
Los Alamos National Laboratory

APPROVED _____ DATE 2/24/83
U.S. Department of Energy

REVISION _____ for DATE 5/25/83
Los Alamos National Laboratory
for (Technical Manager)
(Engineering Manager)

I. DESCRIPTION OF WORK

The work consists of furnishing, installing, and constructing a Batch Waste Treatment System, including treatment vessels, heat exchanger, pumps, piping, valves, platforming, floor curbing, partition walls, modifications to existing fume hood, drum and truck loading and unloading stations, power, and instrumentation as indicated on the drawings and in accordance with this Specification.

II. TECHNICAL PROVISIONS

Reference is made to Specifications for Upgrading of Industrial Liquid Waste Treatment Plant, Invitation No. DE-FB32-81AL16099, May 8, 1981, and all Amendments and Changes, and as follows:

1.0 GENERAL REQUIREMENTS

General Requirements shall be in accordance with Division 1.0, except as follows:

a. Par. 1.2 Work to be Performed by Others. Add as follows:

3. Demolition and removal of all existing equipment, furnishings, facilities, and services in Room 24 of Bldg. WM-1 at TA-50 as required to interface with the construction.

b. Par. 1.3.2 Schedule. Delete second sentence and Par. 1.3.2.1, 1.3.2.2, 1.3.2.3, and 1.3.2.4. Add the following: The Contractor shall provide, as a minimum, three weeks written notice to the Contracting Officer prior to commencing work within Room 24 of Bldg. WM-1 at TA-50, to allow for required demolition and removals by the Government.

c. Par. 4.4 Descriptive Submittal List. Delete all Submittal Package Nos. except 10001, 30101, 90601, 150301, 150302, 151101, and 151102.

2.0 NOT USED

3.0 CONCRETE

3.01 Cast-In-Place Concrete

Cast-In-Place Concrete shall be in accordance with Subdivision 3.01.

4.0 NOT USED

5.0 METALS

5.01 Structural Steel and Miscellaneous Metals

Structural Steel and Miscellaneous Metals shall be in accordance with Subdivision 5.01.

6.0 NOT USED

7.0 NOT USED

8.0 DOORS AND WINDOWS

8.01 Metal Doors and Frames

Metal Doors and Frames shall be in accordance with Subdivision 8.01.

8.02 Not Used

8.03 Not Used

8.04 Hardware

Hardware shall be in accordance with Subdivision 8.04.

8.05 Not Used

9.0 FINISHES

9.01 Not Used

9.02 Gypsum Wallboard

Gypsum Wallboard shall be in accordance with Subdivision 9.02.

9.03 thru 9.05 Not Used

9.06 Special Coating

Special Coating shall be in accordance with Subdivision 9.06. All new non-stainless steel surfaces, the north wall of Room 24, and the curbed floor area shall be special coated.

9.07 Not Used

9.08 Not Used

10.0 NOT USED

11.0 NOT USED

12.0 NOT USED

13.0 SPECIAL CONSTRUCTION

13.01 Not Used

13.02 Not Used

13.03 Pressure Vessels

Pressure Vessels shall be in accordance with Subdivision 13.03, except as follows:

a. Par. 2.1.2 Technical Requirements. Add as follows:

Tag No.	Name	Data Sheet
[redacted]		
TK-21	Reactor	13.03-11
TK-22	Blowdown Tank	13.03-12

b. Add Par. 2.7 Kynar Lining, as follows:

Surfaces to be lined shall be free from all sharp corners, edges, and projections, and shall have inside edges of nozzles and corners rounded to a radius of at least 1/8 inch. Kynar (polyvinylidene fluoride) lining shall consist of alternate layers of carbon veil or mat and Kynar dispersion compound, with a final Kynar dispersion seal coat. The lining shall be not less than 0.060 inches thick, and the final seal coat shall be not less than 0.010 inches thick, as determined by visual comparator and/or micrometer reading. The lining shall extend through all nozzles and cover the raised faces of all flanges. The finished lining shall be pinhole free when tested with a dc Spark Tester at 3000 Volts. Test results shall be documented and submitted to the Contracting Officer for approval.

c. Add Data Sheets 13.03-10, 13.01-11, and 13.03-12, as included herein.

13.04 thru 13.12 Not Used

13.13 Heat Exchangers

Heat Exchangers shall be in accordance with Subdivision 13.13 as included herein.

14.0 NOT USED

15.0 MECHANICAL

15.01 Piping

Piping shall be in accordance with Subdivision 15.01, except as follows:

a. Add the following services to Class AD: treated industrial waste, chemical gas, chemical liquid, acid vent, vent.

b. Add the following service to Class ND: chlorine.

c. Add Class NV in accordance with Piping Material Specification included herein.

d. Par. 3.7.4 Color Codes. Add the following identification colors:

Lettered Legend	Identification Band Color	Service Legend Color
Industrial Waste	Yellow	Black
Treated Industrial Waste	Yellow	Black
Chemical Gas	Yellow	Black
Chemical Liquid	Yellow	Black
Acid Waste	Yellow	Black
Acid Vent	Yellow	Black
Vent	Yellow	Black

e. Par. 3.10 Pressure Testing. Add as follows: Piping for compressed air and chemical gas shall be pneumatically tested per ANSI B31.1, Par. 137.4.5, because water is detrimental to these systems. All other piping shall be hydrostatically tested.

f. Add Piping - Specialty Items as included herein.

15.03 thru 15.09 Not Used

15.10 Control Instrumentation

Control Instrumentation shall be in accordance with Subdivision 15.10 except as follows:

a. Delete Par. 2.5 through 2.9.

b. [redacted]

Replace Data Sheet Nos. identified in sub-paragraph (2) with 43, 44.

c. Delete Par. 2.11 through 2.15.

d. Par. 2.16 Pressure Control Valves. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
PCV-226	45

e. Par 2.17 Pressure Gages. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
PI-203	46
PI-225	46

f. Par. 2.18 Safety and Relief Valves. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
PSV-205	47

g. Par. 2.19 Temperature Instruments. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
TE/TT-198A	48, 49

The flanged thermowell shall be Hastelloy rather than stainless steel. The Contractor shall coordinate the length of the element and well with the tank and agitator construction to assure no interference.

h. Par. 2.20 Bi-Metal Dial Thermometers. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
TI-263	50

i. Par. 2.21 Solenoid Valves. Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
ZZ-222	51
ZZ-223	51

j. Par. 2.22. Revise title and first paragraph to read "Leve and Temperature Indicator Receivers". Delete Tag Nos. and Data Sheet Nos. shown. Add as follows:

Tag No.	Data Sheet No.
LI-198	52
TI-198A	52

k. Add as follows:

2.23 RUPTURE DISCS

The Contractor shall provide rupture discs as specified herein and on the following Data Sheets:

Tag No.	Data Sheet No.
RD-227	53

Rupture discs shall have seals, discs, liners, covers, and retaining rings bolted together as one unit, and shall include the required ASME Code data on a permanently attached tab.

2.24 pH AND ORP ANALYZERS

The Contractor shall provide pH and ORP (oxidation reduction potential) analyzers as specified herein and on the following Data Sheets:

Tag No.	Data Sheet No.
AE-199A (pH)	54
AE-199B (ORP)	54
AIT-199A (pH)	54
AIT-199B (ORP)	54

The pH and ORP analyzers shall consist of the following components:

(1) Electrode station with pre-amplifier (transmitter) and probe.

(2) Monitor (microprocessor) and local indicator readout.

(3) Interconnecting cable and mounting hardware as specified on the Data Sheet.

The monitor and local indicator readout, and the electrode station with pre-amplifier, shall be housed in a NEMA 4 enclosure.

The electrical input power source to the AIT unit shall be 120V, 60 Hz, single phase. The enclosure shall have provisions and hardware for mounting on a flat plate.

Interconnecting cable shall be 20 feet long with 3/4 inch NPT connections. The cable inner and outer jacket insulation shall be non-PVC and flame retardant.

The pH analyzer shall be capable of display from 0.00 to 14.00 by four digit direct readout. Sensing range shall be 4.00 to 10.00 pH and adjustable to a minimum span of -0.5 to 2.0 units with an isolated output range of 4 to 20 madc. The analyzer shall have an accuracy and repeatability of plus or minus 0.5 percent of full scale.

The ORP analyzer shall be capable of display from -1400 to +1400 mv by four digit direct readout, with a minimum span of 200 mv and an isolated 4 to 20 madc output. The analyzer shall have an accuracy and repeatability of plus or minus 0.5 percent of full scale.

The analyzers and accessories shall be prepared for delivery in accordance with ANSI C83.66. Hardware and wiring shall be in accordance with the National Electric Code ANSI C1.

2.25 TIMING RELAYS

The Contractor shall provide timing relays in accordance with the following Data Sheet:

Tag No.	Data Sheet No.
KC-224	55
KC-278	56

2.26 SIGHT FLOW INDICATORS

The Contractor shall provide sight flow indicators in accordance with the following Data Sheet:

Tag No.	Data Sheet No.
FI-272	54
FI-273	54
FI-274	54

2.27 LEVEL TRANSMITTERS

The Contractor shall provide level transmitters as specified herein and on the following Data Sheets:

Tag No.	Data Sheet No.
LE/LT-198	58

The transmitter shall be remote mounted from the probe. The probe shall be a Kynar-coated capacitance type. The transmitter shall be a blind device installed in a NEMA 7 explosion-proof case with a 4-20 madc output. The probe length shall be approximately 66 inches. The Contractor shall coordinate the length of the probe with the tank and agitator construction to assure no interference.

2.28 RESTRICTING ORIFICES

The Contractor shall provide restricting orifices in accordance with the following Data Sheet.

Tag No.	Data Sheet No.
RO-199	59

1. Add Data Sheets 15.10-1, sheets 43 through 59, as included herein.

15.11 Agitators

Agitators shall be in accordance with Subdivision 15.11, except as follows:

a. Par. 2.1 Description. Add as follows:

Tag No.	Name	Data Sheet
[redacted]		
M-21	Reactor Agitator	15.11-05 1 of 2
M-21	Induction Motor	15.11-05 2 of 2

b. Add Data Sheets 15.11-04, sheets 1 and 2, and 15.11-05, sheets 1 and 2, as included herein.

15.12 Diaphragm Pump

Diaphragm Pumps shall be in accordance with Subdivision 15.12 as included herein.

16.0 ELECTRICAL

16.01 Interior Electrical Work

Interior Electrical Work shall be in accordance with Subdivision 16.01.

16.02 Not Used

III. DRAWINGS

The Contract Drawings are:

Drawing No.	Title
LA-RV-A-16	Reflected Ceiling Plan and Partial Floor Plans and Details
LA-RV-S-22	Upgrading of Batch Waste Treatment System Platform Framing Plan and Details
LA-RV-MP-9, Rev. 1	Piping and Instrument Diagram, Batch Waste Treatment System
LA-RV-P-19, Rev. 1	Batch Waste Treatment Piping Plan and Sections

Drawing No.	Title
LA-RV-E-27, Rev. 1	Batch Waste Treatment and Exhaust Air Filtration Plans and Diagrams
LA-RV-I-8	Instrument Symbols and General Notes
LA-RV-I-9	Instrument Installation Details
LA-RV-I-10	Instrument Installation Details
LA-RV-I-13, Rev. 1	Instrument Location Plan, Batch Waste Treatment System

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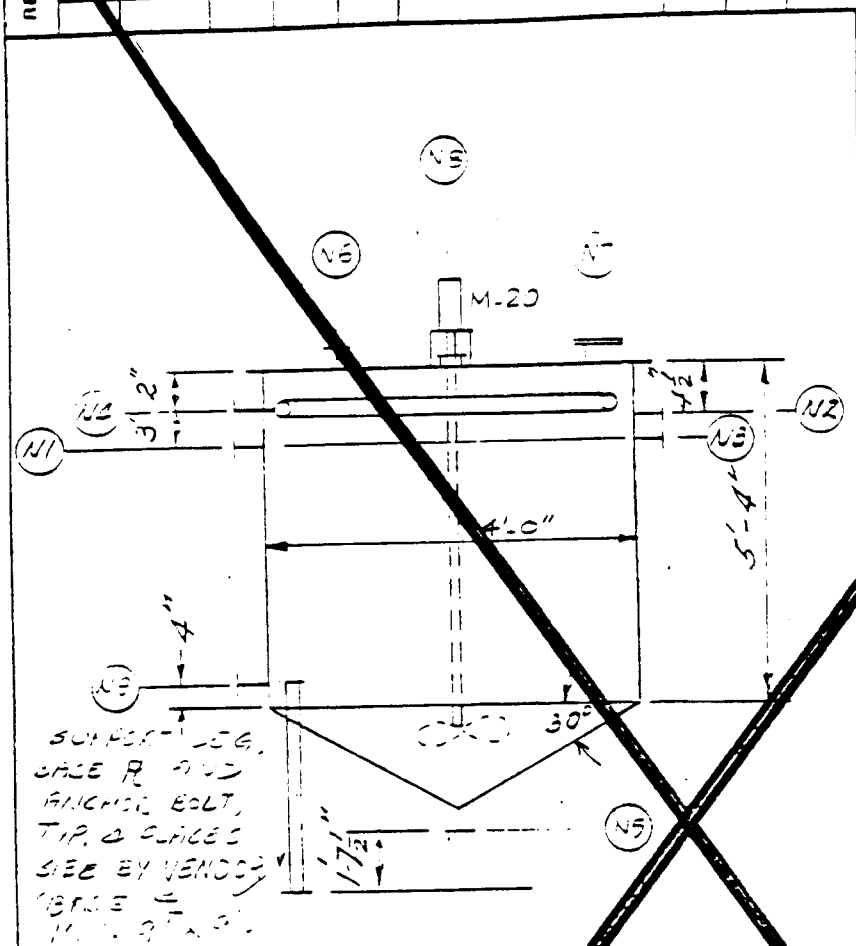
REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	C	[illegible]	[illegible]	[illegible]		[illegible]

I-12

REVISIONS



SUPPORT LEG, GALV R AND ANCHOR BOLT, TYP. 4 SUPPORTS SIZE BY VENDOR [illegible]

NOTES:

1. FLANGES & NOZZLE NECKS ON TOP TO BE 304L S.S.
   TOP TO BE 304L S.S., FLAT, BOLTED, W/ TOP MOUNTED MIXER.
2. NOZZLE SIZES SHOWN ARE MINIMUM REQ'D FOR PROCESS. ACTUAL SIZES SHALL BE DETERMINED BY VENDOR FOR ADEQUATE LINING.
3. SPRAY HEADER: 1" SCH 40 304L S.S. PIPE W/ 1/8" Ø HOLES 4" APART @ 45° IN THE LOWER QUADRANT FACING THE WALL.
4. BAFFLES : AS DETERMINED BY AGITATOR VENDOR.

TA-20

Opr Temp 200 °F	Press [illegible]	psig	
Design Temp 250 °F	Press [illegible]	psig	
Ext Temp AMB °F	Press ATM	psig	
New Ltd by [illegible]	[illegible]	psig	
Crsn Allow S —	Has [illegible]	N —	
Code Stamp [illegible]			
Code ASME [illegible]			
PWHT [illegible]	X-Rayed [illegible]		
Allow Stress @ Des Temp BY CONTR			
Joint Eff Shell [illegible]	Has [illegible]		
Hydrotest (Hor) [illegible] °F		psig	
MATERIALS SA: Shell SA 285-C [illegible]			
Head SA-312-TP 304L			
Support SA-36			
Trays —			
Bolts SA-193-B7 Nuts SA-194-2H			
Flanges C.S. RAISED FACE [illegible]			
Nozzle-Necks C.S. RUBBER LINED [illegible]			
Gaskets SEE PIPING SPEC.			
Capacity 500 GAL			
Weights BY CONTR	Fab		
Trays	Empty		
Opr	Test		
Paint [illegible]			
Insulation YES [illegible]			
Fireproofing NONE			
Access Supplied & Inst by Fabricator YES NOTE			
Vessel Davit NO	Mark No. —		
Ladder & Platform Clips — NO			
Pipe Support & Guide Clips [illegible]			
Insulation Supports [illegible]			
Fireproofing Supports [illegible]			

Openings NOTE 1

Item	No.	Size	Service
N1	1	1½"	IND. WASTE INLET
N2	1	1"	WATER INLET
N3	1	1½	CHEM. LIQUID INLET
N4	1	1"	SPRAY WATER
N5	1	[illegible]	PUMP SUCTION
N6	1	2"	VENT
N7	1	10"	SOLID CHARGING
N8	[illegible]	[illegible]	MIXER MOUNT
N9	2	[illegible]	LEVEL ELEMENT

ASA Rating & Facing [illegible]

[illegible]

NOTED

RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

VESSEL (PLAIN) WITH NOTES
TK-20
RECEIVING/SETTLING CHEM MIXE TANK

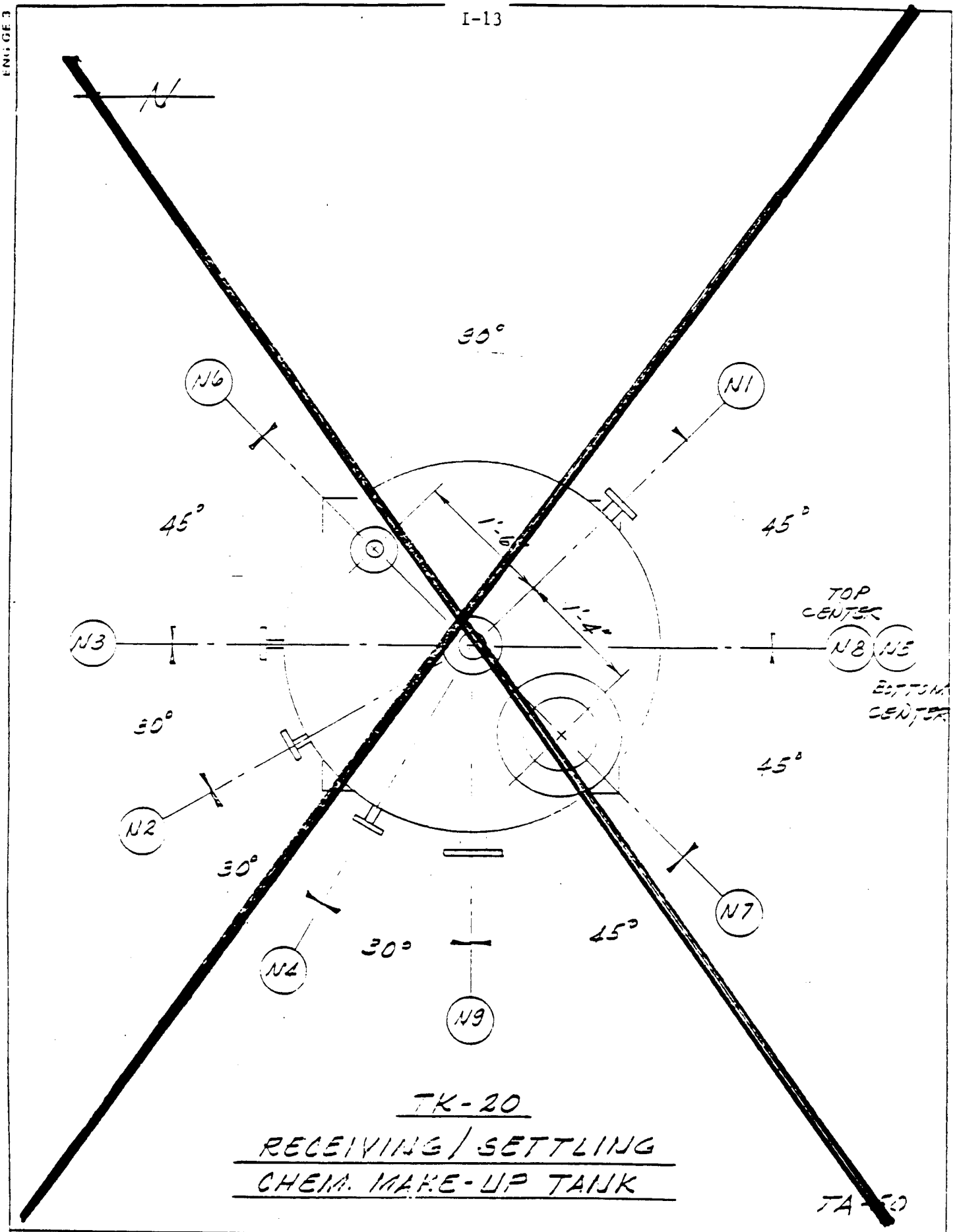
SHEET 1 OF 2

JOB NUMBE [illegible]

NUMBER 13.0P-10

DC-

ENG-VS-205



TK-20

RECEIVING / SETTLING

CHEM. MAKE-UP TANK

TA-50

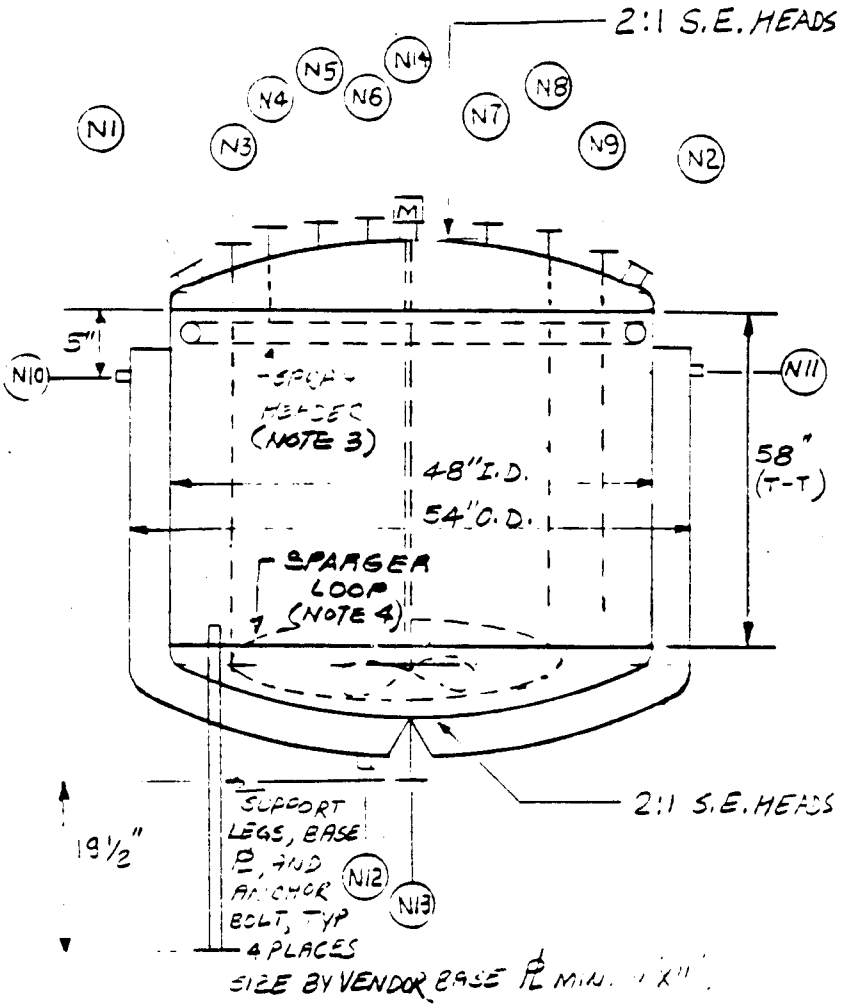
FMP THE RALPH M. PARSONS COMPANY	SHEET 2 OF 2	JOB NUMBER 4089-0001	DOCUMENT NO. 13.03-10	REV. 0

Tank Data Sheet Certificate of Compliance

I-14

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2.16/83	JJS	[illegible]		REVISED ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION



Opr Temp	250 °F	Press	ATM psi
Design Temp	275 °F	Press	50 psi
Ext Temp (NOTE 1)	°F	Press (NOTE 2)	psi
New Ltd by	BY CONTR.	@	BY CONTR. psi
Crsn Allow S	—	Hds	— N
Code Stamp	YES		
Code	ASME SEC [illegible], DIV. I		
PWHT	NONE	X-Rayed	YES, RT-3
Allow Stress @ Design Temp	BY CONTR.		
Joint Eff Shell	85%	Hds	85%
Hydrotest (Horiz)	75.		psi

MATERIALS: SA	
Shell	SA-285C W/ KYNAR LINING
Heads	SA-285C W/ KYNAR LINING
Support	SA-36
Trays	—
Bolts	SA-193-B7 Nuts SA-194-2H
Flanges	C.S. W/ KYNAR LINING
Nozzle-Necks	C.S. W/ KYNAR LINING
Gaskets	PER PIPING SPEC

Capacity	500 GAL.
Weights	BY CONTR. Fab
Trays	Empty
Opr	Test
Paint	YES, PER SPEC.
Insulation	YES, PERSONAL PROTECT
Fireproofing	NONE
Access Supplied & Inst by Fabricator	YES
Vessel Davit	NO Mark No.
Ladder & Platform Clips	NO
Pipe Support & Guide Clips	NO
Insulation Supports	NO
Fireproofing Supports	NO

Openings NOTE (5)

Item	No.	Size	Service
N1	1	6"	SIGHT & SOLID CHARGE
N2	1	6"	SIGHT BOLT
N3	1	1"	CHEMICAL GASES INLET
N4	1	1"	SPRAY WATER
N5	1	1 1/2"	CHEM. LIQ. & ACID WASTE IN
N6	1	2"	ACID VENT
N7	1	1 1/2"	IND. WASTE RECIR.
N8	1	3"	TEMP. ELEMENT
N9	1	3"	LIQUID LEVEL ELEM
N10	1	2"	STEAM INLET
N11	1	1"	HOT WATER HEATING OUT
N12	1	1"	HOT WATER HEATING IN
N13	1	3"	IND. WASTE INLET/OUT
N14	1	BY VENDOR	MIXER MOUNT
M1	1	MIN. 24"	COVER HEAD (SEE SHT.

NOTE 6

ASA Rating & Facing 150# F.F. KYNAR

LINED EXCEPT AS NOTED.

NOTES

1. JACKET: AMBIENT ; SHELL : 250°F
2. JACKET : ATMOSPHERIC ; SHELL : 50 PSIG
3. SPRAY HEADER : 1" KYNAR PIPE W/ 1/8" Φ HOLES 4" APART, @ 45° IN THE LOWER QUADRANT FACING THE WALL.
4. SPARGER LOOP: 1" KYNAR PIPE W/ 1/8" Φ HOLES 4" APART, 30° DOWN, STAGGERED IN VERTICAL. THE LOOP SHALL BE REMOVABLE FOR MAINT.
5. NOZZLE SIZES SHOWN ARE MINIMUM REQ'D FOR PROCESS. ACTUAL SIZE SHALL BE DETERMINED BY VENDOR FOR ADEQUATE LINING.
6. ONE NOZZLE MIN. EACH.

RMP DATA SHEET
THE RALPH M. PARSONS COMPANY

VESSEL (PLAIN) WITH NOTES
TK-21
REACTOR

SHEET 1 OF 2

JOB NUMBER 608[illegible]-C

NUMBER 13.03-11

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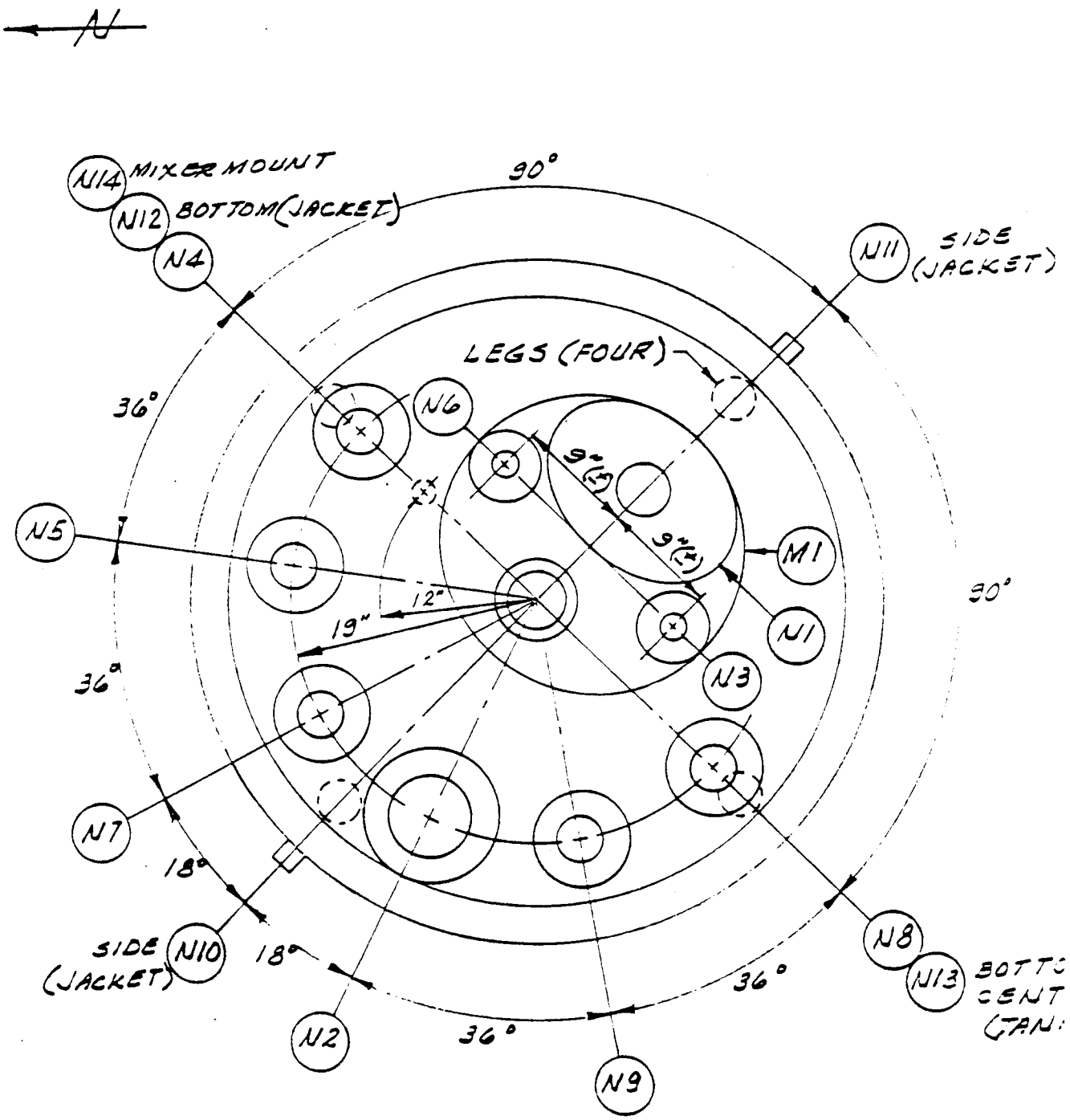

TK-21

REACTOR

TA-50

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	ORIENTATION NOZZLES, ~~LADDERS AND PLATFORMS~~ FOR: TK-21 REACTOR	SCALE NONE	JOB NUMB 6089-
		DOCUMENT NUMBER 13.03-11	

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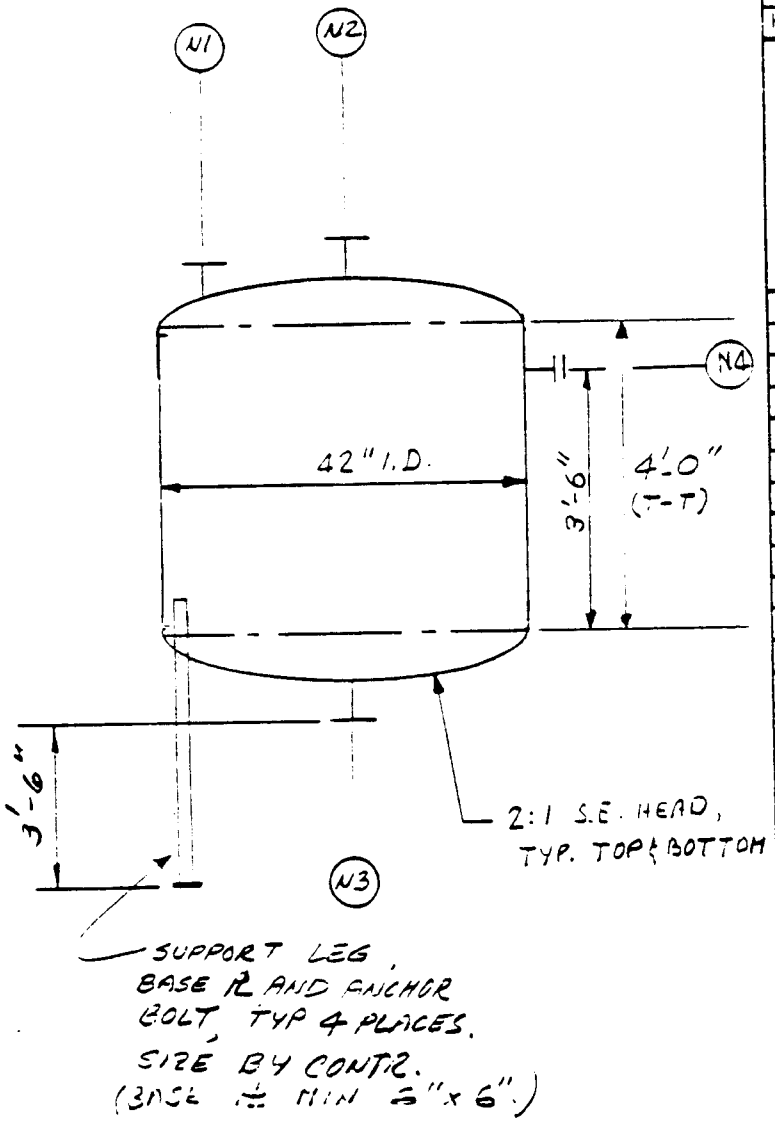
REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/14/83	JS	NB		INITIAL ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION



Opr Temp 250 °F	Press ATM psig		
Design Temp 275 °F	Press 50 psig		
Ext Temp AMB °F	Press ATM psig		
New Ltd by BY CONTR @ BY CONTR psig			
Crsn Allow S 1/8" Hds 1/8" N 2"			
Code Stamp YES			
Code ASME SEC VIII, DIV. 1			
PWHT NONE	X-Rayed YES, RT-3		
Allow Stress @ Design Temp BY CONTR.			
Joint Eff Shell 85% Hds 85%			
Hydrotest (Horiz) 75. psig			
MATERIALS: SA			
Shell	SA-285C		
Heads	SA-285C		
Support	SA-36		
Trays	—		
Bolts SA-193-B7	Nuts SA-194-2H		
Flanges	SA-105		
Nozzle-Necks	SA-53-B		
Gaskets	PER PIPING SPEC.		
Capacity 370 GAL			
Weights BY CONTR	Fab		
Trays —	Empty		
Opr	Test		
Paint VEN. PER SPEC			
Insulation NO			
Fireproofing NONE			
Access Supplied & Inst by Fabricator			
Vessel Davit NONE	Mark No.		
Ladder & Platform Clips NO			
Pipe Support & Guide Clips NO			
Insulation Supports NO			
Fireproofing Supports NO			

Openings

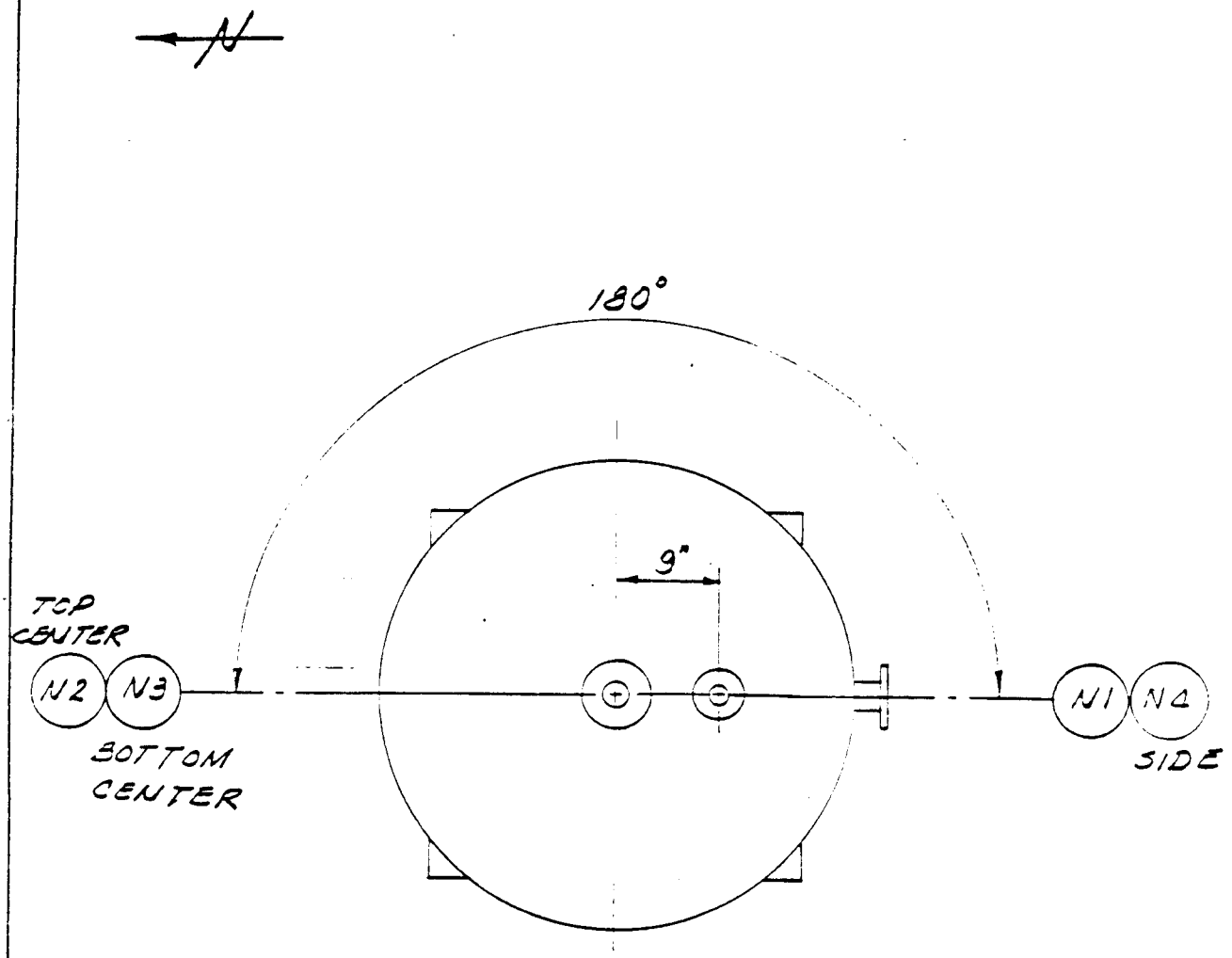
Item	No.	Size	Service
N1	1	1½"	GAS INLET
N2	1	2"	GAS OUTLET
N3	1	1"	DRAIN
N4	1	4"	HANDHOLE W/ BLIND F

ASA Rating & Facing 150# R.F

UNLESS NOTED OTHERWISE

TA-50

RMP DATA SHEET	VESSEL (PLAIN) WITH NOTES TK-22 HIGH POINT TANK	SHEET 1 OF 2	JOB NUMBER 6000-000
		NUMBER 13.03-12	



TK-22
BLOW DOWN TANK

TA-50

RMP THE RALPH M. PARSONS COMPANY	SHEET	OF	JOB NUMBER	DOCUMENT NO.	REV.
	2	2	6089-0001	13.03-12	0

0084C

CONTRACT NO. DE-AC32-80AL13151

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 13 SPECIAL CONSTRUCTION

SUB-DIVISION 13.13

DOUBLE PIPE HEAT EXCHANGER

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment and services to manufacturer, procure, inspect, install, and test double pipe vent gas condenser as indicated on the drawings and specified herein.

1.1.1 Furnished Equipment

The Contractor shall furnish the condenser as a complete unit, including support frame, special features, and accessories as specified herein.

The Contractor shall furnish to the Contracting Officer documents in accordance with Section 1.3.

Standard equipment and design are requested provided the performance requirements of this Specification are met. Engineering, fabrication, and quality assurance and control shall result in equipment capable of operation at specified design conditions.

1.1.2 Related Work

The following associated work shall be performed by the Contractor:

Emplacement, final alignment verification, and piping installation.

Work performed per this Sub-Division shall be coordinated with work accomplished per the following Sub-Divisions:

15.01 Piping

1.2 REFERENCE DOCUMENTS

The Contractor shall comply with codes and standards referenced in this Specification.

American National Standards Institute (ANSI)

ANSI B16.5 - 1977	Steel Pipe Flanges, Flanged Valves and Fittings

American Society of Mechanical Engineers (ASME)

Section VIII, Division 1 - 1980	Unfired Pressure Vessels
Section IX - 1980	Welding and Brazing Qualifications

American Society of Testing Materials (ASTM)

ASTM A 53-1980	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 268-1980	Specification for Seamless and Welded Ferritic Stainless Steel Tubing for General Service

1.3 SUBMITTALS

1.3.1 Shop Drawings and Product Data

The Contractor shall submit to the Contracting Officer drawings, completed data sheets, parts lists, performance curves, inspection and test results installation and operating instructions, code data sheets, certificate of compliance, and recommended spare parts list with prices in accordance with Attachment "Data Requirements List".

PART 2 PRODUCTS

The condenser shall meet the technical and performance requirements outlined herein and on the data sheet "Double Pipe Heat Exchanger", Tag No. CD-2. In the event of conflict between this Specification and the data sheets, the data sheet information shall govern.

2.1 CONDENSER DESIGN

2.1.1 The fouling factor shall be as shown on the data sheet.

2.1.2 Nozzles shall be as follows:

Corrosion allowance for tube nozzles shall be equal to 1.5 times the corrosion allowance specified for the pipes. This allowance shall be added to the nozzle thickness required by the ASME Code.

2.1.3 All welds shall be by the shielded metal-arc, inert gas tungsten arc, or submerged arc process, unless otherwise approved by the Contracting Officer. Provide all seams with full penetration butt welds, double welded wherever possible.

2.1.4 Flange connections shall be per ANSI B16.5.

2.1.5 The Contractor shall advise the Contracting Officer of any shop remedial measure made to minor defects in materials as permitted by the ASME Code for Pressure Vessels. Information furnished shall include the type and extent of the defect, method of repair, location on exchanger, and the name of the inspection agency's inspector approving the repair. The Contractor shall require all fabricators to furnish this information. Correction of major defects will be performed only if approved by the Contracting Officer. Approval does not relieve the Contractor of responsibility.

PART 3 EXECUTION

3.1 FABRICATION REQUIREMENTS

3.1.1 Materials for double pipe condenser shall be as specified on the data sheet, this Specification, or any alternates or deviations specifically approved by the Contracting Officer.

3.1.2 Deposited weld metal for all pressure containing welds shall have: 1) a chemical composition within the range of the base material ASTM specification and 2) mechanical properties at ambient, design and operating temperatures that are within the range of the base material ASTM specification.

3.1.3 All welding procedures and welder qualifications shall be in accordance with Section IX of ASME Code and shall be submitted to the Contracting Officer and approval obtained before any welding is begun.

3.1.4 Tagging of Equipment

The nameplate for the exchanger shall be of 24 US Standard Gauge (minimum) stainless steel and shall be securely attached. The nameplate shall include as a minimum the manufacturer's name, design pressure and temperature (maximum fluid temperature), test pressure, corrosion allowance, dry and wet weight, manufacturer's serial number, date of fabrication and equipment item number

3.1.5 Painting and Surface Preparation

Stainless steel surfaces shall not be painted. Carbon steel surfaces except heat transfer surfaces shall be painted using the Vendor's standard materials.

Standard paint used shall remain intact at operating temperature of carbon steel surfaces to which it is applied. All exposed surfaces shall receive a coat of rust preventative such as Exxon Chemical Co. Rust Ban 392 or Approved Equal

3.2 SHIPPING AND STORAGE

Flange closures shall consist of a rubber gasket and a full size 1/4 inch thick exterior plywood cover. This cover shall be bolted in place by a minimum of four full size bolts. All drilled and tapped holes shall have metal or plastic plugs and all exposed pipe ends shall be capped.

Equipment shall be boxed or crated for full protection against damage during transport and yard handling. Exchangers shall be prepared to prevent damage from the elements and temperatures ranging from minus 40 deg F to plus 120 deg F.

The Contracting Officer reserves the right to inspect the equipment at the manufacturer's plant.

3.2.1 Receipt Inspection

The Contracting Officer will inspect the equipment and documentation specified herein upon receipt at the site to determine if the equipment as received has suffered damage during shipment. The inspection will include appurtenances shipped separately or together with the equipment.

3.2.2 Storage

The Contractor shall allocate sufficient storage space and employ protective measures to protect the equipment and appurtenances specified herein from any damage due to natural elements or the Contractor's equipment. Particular care shall be taken to prevent damage to flange faces, seal surfaces, and all interfacing parts or surfaces between equipment piping, or structures. The Contractor shall allocate equipment storage space in an area segregated from fabrication operations and maintained free from debris. Temporary structures, supports, cribbing, or bracing may be provided and employed by the Contractor to prevent damage to the equipment and appurtenances specified herein.

The Contracting Officer reserves the right to inspect, without notice, all equipment storage areas, protective measures, and temporary structures used to store equipment.

3.2.3 Handling

The Contractor shall provide and use suitable devices to handle without damage the equipment and appurtenances specified herein from receipt through installation. The Contractor shall be responsible for providing suitable access into the facility for handling devices with equipment for installation.

3.3 INSTALLATION

Installation of equipment shall be in accordance with the piping drawings and the Vendor's installation instructions. The Contractor shall be responsible to provide necessary foundations, brackets, anchorings, bolts, studs, and nuts for proper installation, and interfacing with equipment.

3.4 PRESSURE TESTING

The condenser shall be hydrostatically tested in accordance with Section VIII of ASME Code with clean water at a minimum temperature of 60°F in the shop.

(1) Vents shall be provided at all high points of the test set up to purge air pockets when the condenser is filling.

(2) The hydrostatic test pressure shall be maintained for a minimum of 10 minutes to verify that no leaks exist.

(3) Leakage of temporary gaskets and seals, installed for the purpose of conducting the hydrostatic test and which will be replaced or discarded later, is permitted provided the leakage does not exceed the capacity to maintain system tes pressure for the required length of time or does not mask leaks from other joints.

(4) No visual weeping or leakage is permitted from any condensers assembly joint. If weeping or leakage occurs, proposed repair method shall be submitted to the Contracting Officer. After approval repairs shall be done and equipment retested per above procedure.

3.5 ACCEPTANCE

Equipment, materials, and workmanship not in accordance with the requirements specified herein shall be corrected by the Contractor.

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DATA REQUIREMENTS LIST

	DESCRIPTION	CHECK IF REQ'D.	* WHEN REQ'D.	NO. OF COPIES REQ'D.	REFERENCE	** REQ'd. FOR
1.	Outline Drawings, Cross-Section Drawing	X	BFR		1.3.1	ACO
2.	Parts Lists	X	WS		1.3.1	INFO
3.	Performance Characteristics	X	BFR		1.3.1	ACO
4.	Inspection and Test Results	X	PS		1.3.1	ACO
5.	Installation, Operating, and Maintenance Instructions	X	PS		1.3.1	INFO
6.	Data Sheets	X	BFR		1.3.1	ACO
7.	Recommended Spare Parts w/prices	X	PS		1.3.1	INFO
8.	Certificate of Compliance	X	AS		1.3.1	ACO
9.	Code Data Sheets	X	AS		1.3.1	ACO
10.	Weld Repair Procedures	X	BU		3.4	ACO

* "AC" - As Completed
"BC" - Before Contract can be awarded
"BU" - Before Use (of procedure or by personnel)
"BFR" - Before Fabrication Releas
"PS" - Prior to Shipment
"WS" - With Shipment

** "ACO" - Approval by Contracting Officer "INFO" - Information

PARSONS	SHEET 7 OF 7	JOB NUMBER 6089	DOCUMENT NO. 13.13

ENG-GE-3 (11/82)

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REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	J.S.	MJ		INITIAL ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION

Service: VENT GAS CONDENSER — Item No. CD-2

Type: DOUBLE PIPE HEAT EXCHANGER — Order No.

Mfr Type No. — Mfr

OPERATING CONDITIONS		SHELL SIDE	TUBE SIDE
Fluid Circulated		IND. COLD WATER	ACID GAS VENT
Total Fluid Entering	lb/hr	5500	220
Liquid	lb/hr	5500	—
Vapor	lb/hr	—	220
Noncondensables	lb/hr	—	
Steam	lb/hr	—	
Fluid Vaporized or Condensed	lb/hr	—	220
Gravity Liquid at 60 °F		1.0	1.0
Molecular Weight – Vapor			
Viscosity at 60 °F	Cp	1.0	
Viscosity at °F	Cp		
Temperature – In	°F	70	210
Temperature – Out	°F	110	210
Inlet Pressure	psig	60	ATM

DESIGN CONDITIONS		SHELL	TUBES
Pressure	psig	85	50
Temperature	°F	160	240
Max Allowable Pressure Drop	psi		
Computed Pressure Drop	psi		
Hydrostatic Test Pressure	psig	130	75
Nozzle Size	In.	In 1" Out 1"	In 2" Out 2"
Nozzle Rating & Facing		150# R.F	150# R.F.
Required Corrosion Allowance	In	1/8"	1/8"

Duty 220,000	Btu/hr	Fouling Factor – Minimum Shell	Tube
Transfer Rate – Clean 300		Fouling Factor – Actual Shell (0.00005 OVERALL)	Tube
Transfer Rate – Spec Service		Surface – Per Unit 6.0	sq ft
MTD (Corrected)	°F	Surface – Total 6.0	sq ft

MATERIALS AND CONSTRUCTION

No. of Units ONE	Tubeside Arrangement: NOTE 3	Parallel	Series
Setting	Shellside Arrangement: NOTE 3	Parallel	Series
Shell Diameter (IPS) 4"	Sched Wall 40	Overall Length 8 FT	
Tube – Diameter (IPS)	OD 2" BWG 16	Sched Wall	
Fins – No. —	Height — Thickness —	Finned Length —	
Weight – Each Unit	Bundle Only	Each Unit Full of Water	

PART	MATERIAL	PART	MATERIAL
Shell	ASTM A 53	Tubes	ASTM A 268 316L
Shell Cover		Fins	
Gasket, Shell Side	SEE PIPE SPEC. 15.01	Gasket, Tube Side	SEE PIPE SPEC
Bolts	SA-193 - B7		SA-194 - 2H

Notes: ~~(1) Stress Relieved Parts Marked SR – Radiographed Parts X-R~~

~~(2) ASME "UPV" Code, Section VIII Latest Edition – Code Stamp and Certificates Required.~~

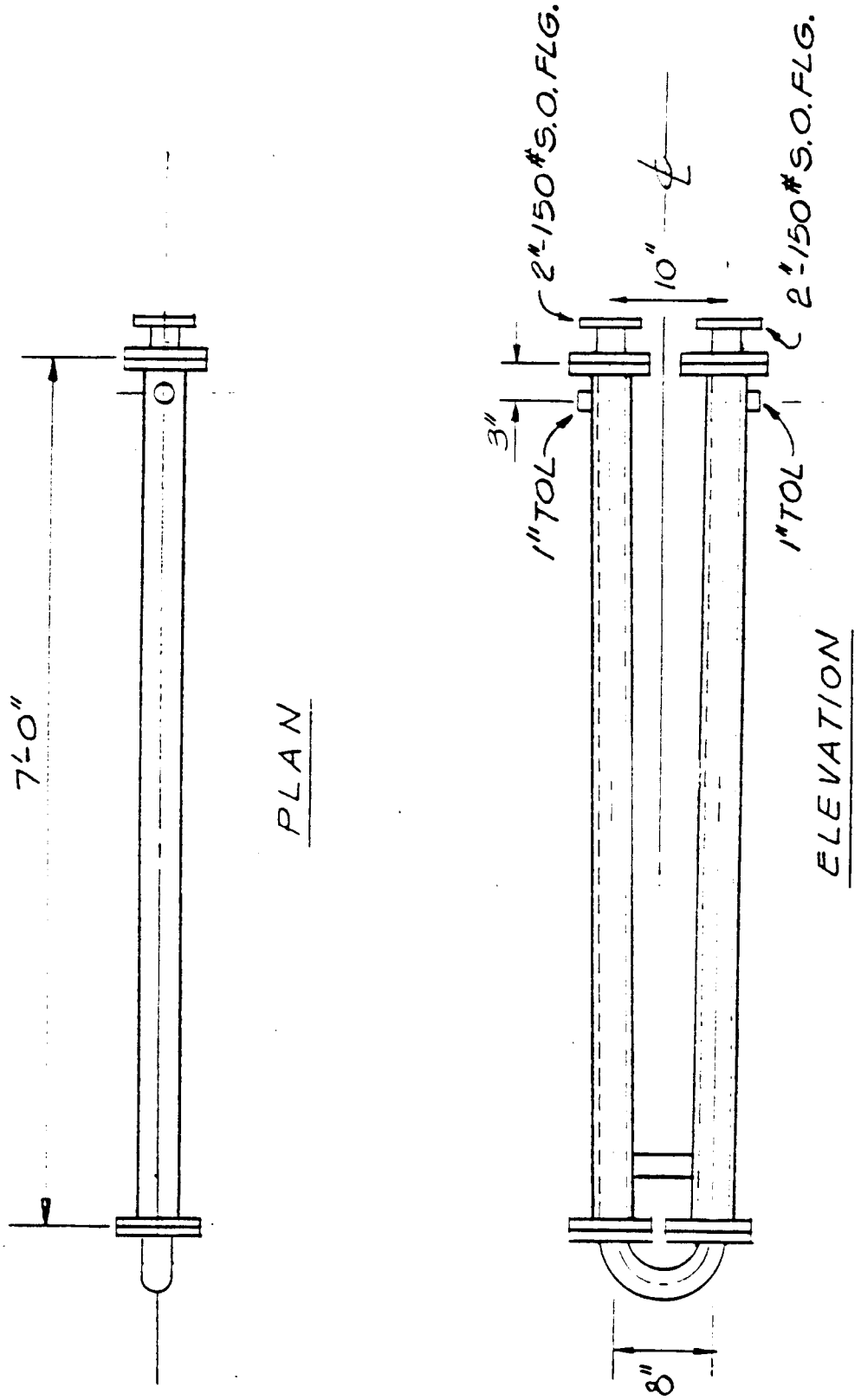
(1) DOUBLE PIPE TJ-TUBE EXCHANGER, TUBE LENGTH APPROX. 7' FLANGE TO FLANGE COUNTER-CURRENT

RMP DATA SHEET — THE RALPH M. PARSONS COMPANY

DOUBLE PIPE HEAT EXCHANGER

SHEET 1 OF 2 — JOB NUMBER 6059-5001

DOCUMENT NUMBER CD-2 — REV



NOTE: INTERFACE FLANGE FACES AND TOL CENTERLINES TO BE PERPENDICULAR TO CONDENSER ASSEMBLY ℄.

VENT GAS CONDENSER

CD-2

PARSONS	SHEET OF	JOB NUMBER	DOCUMENT NO.	RE
	2 2	[illegible]	13 13-1	

SERVICE: Industrial Waste	CLASS NV PAGE 1 OF 2

RATING:	150# ANSI	CORROSION ALLOWANCE:	None
FACING:	Flat Faced	PRESSURE LIMIT:	816.5
MATERIAL:	Carbon Steel - Kynar Lined	TEMPERATURE LIMIT:	300°F

CODE NUMBER	ENCODER	SIZE FROM	TO	DESCRIPTION	NOTES	REV
		1" - 6"		----------PIPE---------- Carbon Steel, Schedule 40 Lined with Kynar, 160# ANSI Screwed Cast Steel Flanged Ends ASTM A53 Grade B		
		1" - 6"		----------FITTINGS---------- Cast Steel Flanged Fittings, 150# ANSI Lined with Kynar, Molded Raised Face		
		1/2" - 6"		----------DIAPHRAM VALVES---------- 150# FF Kynar Lined Cast Carbon Steel Hand Wheel Operated with TFE Diaphrams		
		1" - 6"		----------CHECK VALVES---------- 150# RF Cast Steel, Kynar Lined		
				---------CONNECTIONS FLANGED---------- For Pressure Connection, Use 1" Flanged		
		1" - 6"		----------COMPANION FLANGES---------- 150# ANSI, Forged Steel, Screwed, Chamfered ASTM A 105, ASTM A 181		
		1" - 6"		---------(BLIND) FLANGES---------- 150# ANSI Forged Steel Blind Flanges (Use with Kynar Full Face Blind Spacer ASTM A 105, ASTM A 181		
				----------REDUCING FLANGES (LOOSE)------- Kynar Lined 150# ANSI Cast Steel ASTM A 105, ASTM A 181		
				----------FLANGES KYNAR---------- Solid Kynar 2" Thk with Stainless Steel Backup Washers		
				----------GASKETS---------- Viton A, 1/16" Thickness 60 Durometer		
				----------BOLTING---------- Hex Head Machine Bolt with Hex Nut, Chrome Moly Steel ASTM A193 Grade B7 ASTM A194 Grade 2H		

SERVICE Industrial Waste

CLASS NV

PAGE 2 OF 2

CODE NUMBER	ENCODER	SIZE FROM	SIZE TO	DESCRIPTION	NOTES	REV
		1"	6"	----------BRANCHES---------- Use Full or Reducing Kynar Lined Flanged Fittings		

----------SPACERS----------

Use Standard Full Face or Reducing Full Face Kynar Spacer of 1/2" Minimum Thickness when Mating Kynar Lined Piping Items with all Other Types of Flanged Piping

NOTES:

1. All spool assemblies involving lined piping shall be fabricated from Kynar lined carbon steel pipe w/150# steel flanges and flanged cast steel Kynar lined fittings

2. Manufacturers suggested bolt torque shall be used in assembling flange joints.

3. No gaskets required between flanges with molded raised faces.

4. The following pressure limitations shall be followed for diaphram valves at 100°F.

Size	Max. Pressure	Size	Max. Pressure
1/2"-1"	200 psig	3"&4"	150 psig
1 1/2 - 2	175 psig	6" only	125 psig

PIPING – SPECIALTY ITEMS

SP

This symbol on P&ID or isometric denotes a piping specialty item not specified in the piping material specification. These items are as follows:

ITEM	SIZE	DESCRIPTION
13	3/4"	3/4" pipe size Combination Filter and Lubricator Unit. 5 micron filter Acceptable Model Model No. C4D-600-MIE-AU C.A. Norgren Co., or equal
15	1-1/2"	Quick Disconnect Socket - 316 stainless steel, female (ANPT) socket, automatic shut-off Acceptable Model Transamerica Delaval Fig. No. EC-250B24 w/Vitron "A" O-Rings or equal
16	1-1/2"	Quick Disconnect Nipple - 316 stainless steel, male (ANPT) nipple, automatic shut-off Acceptable Model Transamerica Delaval Figure No. EC-255A24 with Vitron O-Rings, or equal
17	1-1/2	Flexible Metal Hose - 316 stainless steel innercore, 321 stainless braid, heavy wall innercore, annular corrugations and close pitch with one hex male nipple on each end. Length 10'-0" long. Acceptable Model Titeflex 5920606241200 or equal
18	1"	Quick Disconnect Socket - 316 stainless steel, female (ANPT) socket, automatic shut-off Acceptable Model Transamerica Delaval Figure No. EC-250B16 with Vitron O-Rings, or equal

PIPING – SPECIALTY ITEMS

SP

This symbol on P&ID or isometric denotes a piping specialty item not specified in the piping material specification. These items are as follows:

ITEM	SIZE	DESCRIPTION
19	1-1/2"	Basket Cartridge Filter - Single filter housing with interchangeable cartridge or basket - bag type filter element. Housing material shall be 304L stainless steel and shall be designed and constructed to the ASME Code Sect. VIII, Div. 1 for pressure vessels. Max. flow thru filter shall be 20 GPM with allowable pressure drop when clean of 1 psi. The inlet and outlet nozzles shall be 150# FF flanges. Design pressure 150 PSIG @ 200°F. Acceptable Model AMF-CUNO 7PC1, or equal.

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REQUISITION NO.

Reference Specification Sheet No.

VENDOR [illegible]

Model No. [illegible]

GENERAL

1 Description: ☐ Recorder ☒ Indicator ☐ Blind ☐ Controller ☒ Transmitter

2 Case: ☐ Rectangular ☐ Circular ☒ Standard ☐ Other ____

3 Case Color: ☐ Black ☒ Standard ☐ Other ____

4 Mounting: ☐ Flush ☐ Surface ☒ Yoke

5 No. Points Recording ____ Indicating ____

6 Chart Type: ☐ [illegible] in. Circular ☐ Other ____

7 Chart Range ____ Number ____

8 Scale Range ____ Type ____

9 Chart Drive: ☐ Spring ☐ Electric ☐ Pneumatic

10 Chart Speed ____ Wind ____

Volts ____ Hertz ____ Explosion Proof

11 Air Pressure ____

12 Other ____

TRANSMITTER

13 Type: ☐ Pneumatic ☒ Electric

14 Output: ☐ 3-15 psi ☒ 4-20 mA DC ☐ Other ____

15 ____

CONTROLLER

16 Type: ☐ Pneumatic ☐ Electric ☐ Other ____

17 Prop ____ % ☐ Auto-Reset ☐ Rate Action ☐ [illegible] ☐ Other ____

18 Output: ☐ 3-15 psi ☐ 4-20 mA DC ☐ Other ____

19 On Measurement Increase Output: ☐ Increases ☐ Decreases

AUTO MANUAL SWITCH

20 No. Positions ____ ☐ External ☐ Internal ☐ Integral

SETPOINT ADJUSTMENTS

21 Manual: ☐ Internal ☐ External

22 Remote: ☐ Pneumatic ☐ Electric

23 Control Point Span: ☐ Fixed ☐ Adjustable

24 Other ____

STATIC PRESSURE OR RECEIVER ELEMENT

25 Type ____ Material ____

26 Range ____

27 For other elements see Tag No. ____ on Sheet No. ____

DIFFERENTIAL UNIT

28 ☐ Flow Rate ☐ Level ☐ Pressure

28a Suppression ☐ Yes ☒ No

29 ☐ Mercury ☐ Bellows ☒ Diaphragm

30 Others ____

31 Material: Body 316 SS; Diaphragm or Bellows HASTELLOY C 276

32 Body Rating 1500 psig @ 60 °F

33 Differential Range 0-5 [illegible]

34 Differential Connection ☐ [illegible] in. ☐ [illegible] in. ☒ Other [illegible]

ACCESSORIES

35 Filter and Regulator ____

36 Air Supply Gauge ____

37 Local Indicator YES

38 Charts and Inkset ____

39 Mounting Yoke ____

40 Pulsation Dampener ____

41 Mercury ____

42 Lubricator and Isolation Valve ____

43 Integrator ____

44 Primary Measuring Element ____ Type ____

45 Alarm Switch ____

☐ Hermetically Sealed ☒ Explosion Proof ☐ General Purpose

Notes: 3" 150 # FLANGED CONNECTION
SEE SHEET ENG-IN-0611B
TAG NO. [illegible]-207
* VENDOR TO PROVIDE 1- MODICON INDUSTRIES INC
DIGITAL PROCESS SUPPLY MODEL PPS/20[illegible]

RMP DATA SHEET
THE RALPH M PARSONS COMPANY

DIFFERENTIAL PRESSURE INSTRUMENTS

SHEET 43 | JOB NUMBER [illegible] | DOCUMENT NUMBER [illegible] | REV 0

ENG-IN-0611A

DC-

REQUISITION NO. | VENDOR [illegible]

Reference Specification Sheet No. | Model No. [illegible]

Rev	Tag No.	Item No.	P&ID No. and Section	Differential Range	Static Pressure Range	Scale or Chart Range	Measurement Increase Output	Service
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Notes: [illegible] VENDOR TO [illegible] [illegible] OPTIONAL METER

RMP DATA SHEET
THE RALPH M PARSONS COMPANY

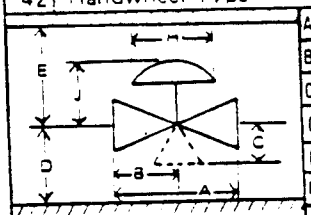
DIFFERENTIAL PRESSURE INSTRUMENTS
LEVEL

SHEET [illegible] | JOB NUMBER [illegible]-3

DOCUMENT NUMBER [illegible] | REV 0

ENG-IN-06119-G

				VENDOR CASHCO OR APPROVED EQUAL
	REQUISITION NO.			
1	Tag No.		PCV-226	
2	Item No.		/	
3	Model No.		TYPE D	
4	Service		PLANT AIR TO TRANS PUMP	
5	Line No.		1/2"-CA125-1129NE	
6	P&ID No./Section		A-RY-MP9/C9	
	SERVICE CONDITIONS			
7	Fluid	Units	AIR	SCFM
8	Min Flow	Max Flow	20	
9	Normal Flow	Sizing Flow	40	
10	Inlet Press Max	Norm	125	100
11	ΔP Max	ΔP For Valve Sizing		0-100PSI
12	Temp Max	Norm °F		AMB
13	sp gr @ 60° F	@ Opr Temp	2×10^{-3}	2×10^{-3}
14	Viscosity @ Opr Temp	cp	$\approx 1.84 \times 10^{-2}$	
	BODY			
15	Body Size	Port Size	3/4"	(1)
16	Type of Body			
17	Material		BRONZE	
18	End Connections		SCREWED	
19	Bonnet		STD	
20	Lubricator	Isolating Valve	—	—
21	Packing or Seal		—	
22	Position Indicator		—	
23	Guiding		—	
24	No. of Ports		ONE	
25	Valve Characteristic		—	
26	Trim Mat'l: Cage ☐ Disc ☐	Ball ☐	STD	
27	Trim Mat'l: Plug ☐ Shaft ☐	Shaft ☐	STD	
28	Trim Mat'l: Seat ☐	Seal ☐	STD	
29	Trim Mat'l:			
30	C_v for Sizing Flow	Furn C_v		
	NOISE DATA			
31	Line Size	Pipe Schedule	3/4"	XS
32	Insulation		—	
33	Sound Pressure Level	dBA	—	
	ACTUATOR & ACCESSORIES			
34	Actuator Type		SELF REG.	
35	Fail Position		CLOSED	
36	Close @	Open @	—	—
37	ΔP For Actuator Sizing		—	
38	Positioner Required	W/Filter Rglr	—	—
39	Bypass	Gauges	—	—
40	For Input Signal of		—	
41	Output Shall Be		ADJ. 0-100PSI	
42	Handwheel Type		—	



A	FACE TO FACE
B	FACE TO CENTER
C	FACE TO CENTER
D	CLEARANCE
E	CLEARANCE
H	ACTUATOR DIA
J	ACTUATOR HEIGHT

Notes: (1) BY VENDOR

PARSONS
SPECIFICATION

CONTROL VALVES

SHEET 46 | JOB NUMBER 5033 | DOCUMENT NUMBER 15.10-1

DC-

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REQUISITION NO.	VENDOR DRESSER ASHCROFT OR APPD EQUAL
Reference Specification Sheet No.	Model No. 127 9 SS

1	Type:	☒ Indicating	☐ Receiver		8	Pressure Element:	☒ Bourdon	☐ Bellows	
		☐ Other					☐ Other		
2	Mounting:	☐ Surface	☐ Local	☐ Flush	9	Element Material:	☐ Bronze	☐ Steel	
3	Dial Diameter	4 1/2"				Type 316 SS	☐ Stainless Steel	☐ Other	
4	Dial Color:	☐ Black	☒ White	BLACK	10	Socket Material:	☐ Bronze	☐ Steel	
5	Case Material:	☐ Cast Iron	☐ Aluminum	☒ Phenol		Type 316 SS	☐ Stainless Steel	☐ Other	
		☐ Other			11	Connection - NPT		☐ ¼ - in.	☒ ½ - i
6	Ring Type:	☐ Screwed	☐ Hinged	☐ Slip			☒ Bottom	☐ Back	
		☒ Other SNAP			12	Movement:	☐ Bronze	☒ Stainless Steel	
7	☐ Liquid Filled Case	☐ Glycerine Fill					☐ Nylon	☐ Other	
		☐ Other			13	Blowout Disk	☒ Yes	☐ No	

Rev	Tag No.	Item No.	P&ID No. and Section	Range (1) Tube	Range (1) Dial	Operating Pressure PSIG	Service	Accessories
	PI-203	1	LA-RV-MP -9/C6	0-100	0-600	0-60	REACTOR TK-21 TO SURGE TANK PRESSURE	
	PI-125	2	1/C9	0-200	0-200	100 TO 125	PLANT AIR TO TRANSFER PUMP	

Notes: (1) SCALES TO BE IN METRIC EQUIVALENTS

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	PRESSURE GAUGES	SHEET 46	JOB NUMBER 5059-1
		DOCUMENT NUMBER 15.10-1	REV C

ENG-IN-1211A-G

	REQUISITION NO.			VENDOR	CLOSEST FOR APPROVED			
1	Tag No.		PSV-203					
2	Item No.		5					
3	Model No.		JMBUC					
4	Service		REACTOR					
			VENT					
5	Line or Equipment No.		1" AV-1125-AD					
6	P&ID No. /Section		LA-RV-MP.9/K7					
	SERVICE CONDITIONS							
7	Fluid		STEAM					
8	Required Capacity	Units	400	#/HR				
9	Maximum Capacity							
10	Mol Wt or sp gr @ Opr Temp		18					
11	Viscosity @ Opr Temp cp		0.018					
12	Press psig: Norm	Relieving	ATM					
13	Temp °F: Norm	Relieving	210	240				
14	Spring Set Press (psig)		30					
15	Accumulation %		10					
16	Back Press—Constant		10 PSIG					
	Varies: From	To						
17	Bubble Tight @ 90% Set Press		COMMERCIAL					
	BASIS OF SELECTION							
18	Code		ASME SECTION ~~VIII~~ DIV. I					
19	Fire							
20	Other							
21								
	ORIFICE AREA							
22	Calculated sq in							
23	Selected sq in							
24	Orifice Designation							
	GENERAL							
25	Seat Type		FULL NOZZLE					
26	Design Type		SAFETY RELIEF					
27	Bonnet		CLOSED					
28								
	BODY							
29	Material		CARBON STEEL					
30	Size Inlet	Outlet	1"	1 1/2"				
31	Flange Rating ANSI		SCREWED					
32	Type Facing							
33								
	TRIM MATERIAL							
34	Seat and Disk		304 SS					
35	Guide & Ring(s)		316 SS					
36	Spring		CARBON STEEL					
37	Bellows		—					
	ACCESSORIES							
38	Cap		YES					
39	Lever Plain	Packed	[illegible]	[illegible]				
40	Gag		YES					
41	Other		—					
42	Code Stamp (ASME)		NOT REQ					

Notes:

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	RELIEF VALVES	SHEET 47	JOB NUMBER [illegible]
		DOCUMENT NUMBER [illegible]	R

REQUISITION NO.

Reference Specification Sheet No.

VENDOR ROSEMOUNT (OR APPROVED EQUAL

Model No. 444 RL2 U1A1NA

GENERAL

1 Description ☐ Recorder ☐ Indicator ☒ Blind ☐ Controller ☒ Transmitter

2 Case ☐ Rectangular ☐ Circular ☒ Standard ☐ Other ____

3 Case Color ☐ Black ☒ Standard ☐ ____

4 Mounting ☐ Flush ☐ Surface ☐ Yoke

5 No. Points....Recording — Indicating —

6 Chart Type — -in. ☐ Strip ☐ 12-in. Circular ☐ Other —

7 Chart Range and No. —

8 Scale Range and Type —

9 Revolutions per Day — or Inches per Hour —

10 Pen or Pointer Speed — Seconds Full Scale Travel

11 Printing Speed — Seconds per Point

12 Balancing ☐ Electronic ☐ Mechanical ☐ Manual ☐ Other ____

13 Volts * 24 Hz DC

TRANSMITTER

14 Type ☐ Pneumatic ☒ Electric

15 Output ☐ 3-15 psi ☒ Other 4-20 MADC

16 ____

CONTROLLER

17 Type ☐ Pneumatic ☐ Electric ☐ Other ____

18 Prop ____ % ☐ Auto-Reset ☐ Rate ☐ On-Off ☐ Other ____

19 Output ☐ 3-15 psi ☐ 4-20 mA DC ☐ Other ____

20 On Measurement Increase Output: ☐ Increases ☐ Decreases

21 Electric Switch Type ____ ; On Measurement Increase Contacts: ☐ Open ☐ Close

22 Contact Rating Amps ____ Volts ____

AUTO MANUAL SWITCH

23 No. Positions ____ ☐ External ☐ Internal ☐ Integr

SETPOINT ADJUSTMENTS

24 Manual ☐ Internal ☐ External

25 Remote ☐ Pneumatic ☐ Electric

26 Control Point Span ☐ Fixed ☐ Adjustable

27 ☐ Other ____

MEASUREMENT

28 ☐ Thermocouple
Type ☐ J(IC) ☐ K(CA) ☐ T(CC)
☐ Other ____
☐ Reference Junction Compensation
☐ Automatic Standardization

29 ☐ Radiation Type

30 ☒ Resistance Bulb Type
Material ☐ Nickel ☒ Platinum ☐ Other ____

31 ☐ Other Type ____

32 Range ____ to ____ ☐ °F ☐ °

33 Other ____

ACCESSORIES

34 Filter and Regulator ____

35 Air Supply Gauge ____

36 Charts and Inkset ____

37 Zener Diode ____

38 Alarm Contacts ____

39 Other ____

Notes:
1. TRANSMITTER INTEGRAL PART OF RTD AND WELL
2. ZERO AND SPAN ADJUSTABLE
3. SEE FORM 1612B-G FOR RANGE, RTD, WELL

TAG NO. TT-192H

VENDOR TO PROVIDE 1- MOORE INDUSTRIES INC 24V/dc POWER SUPPLY MODEL PPS/24DC/200MA/CT/CTD

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	TEMPERATURE INSTRUMENTS (POTENTIOMETER, PYROMETER AND RESISTANCE)	SHEET 48	JOB NUMBER 6078-3
		DOCUMENT NUMBER 25.10-1	REV

REQUISITION NO.	VENDOR ROSEMOUNT / OR APPROVED EQ
Reference Specification Sheet No.	Model No. 88G81EC6050066 SEE NOTE

Rev	Tag No.	Item No.	P&ID No. & Sect	Range °F	Type of ~~TC~~ RTD ~~Rec Bulb~~ PENT.	Scale and Chart	No. Points	Meas Incr Output	Service
	TE/TT-198A	1	MP-7 R-7	0-600	4-WIRE 100 OHM	—	—	INCR	REACTOR TANK TR-21 TEMP.

Notes: WELL TO BE SUITABLE FOR ELEMENT. WELL TO BE FLANGE MOUNTED STRAIGHT STYLE, 3" 150# RAISED FACE HASTELLOY MATERIAL

RMP DATA SHEET	TEMPERATURE INSTRUMENTS (POTENTIOMETER, PYROMETER, AND RESISTANCE)	SHEET 49	JOB NUMBER 6047-3
		DOCUMENT NUMBER	R

REQUISITION NO.	VENDOR ASHCROFT (OR APPROVED EQUA
Reference Specification Sheet No.	

GENERAL

1 Bulb Type: [X] Threaded [ ] Plain [ ] Union [ ] Other ____

2 Case Material: [■] Manufacturer Standard [ ] Other ____

3 Dial Size 5" Color ~ - -E

4 Form: [ ] Straignt [ ] Angle [ ] Fixed [X] Adjustable

5 Bulb or Union Thread Size: [X] ½-in. [ ] ¾-in.

6 Manufacturer Model No. 50 E I 42 E

WELL

7 Construction: [ ] Built-up [■] Drilled Bar Stock [ ] Other ____

8 Material: [ ] 304 SS [X] 316 SS [ ] Other ____

9 Process Connection: [ ] 1-in. NPT [X] Other ½" NPT

10 Lag Extension T: [X] None [ ] Shown Below [ ] 3-in.

11 Manufacturer Model No. * LIGHT DUTY TAPERED

Rev	Tag No.	Item No.	P&ID No. & Sect	Range	Opr Temp	Stem Length	*T Dim	Type Connection	Line Size and Spec	Service
	--- 263	1	LA-RY M2-9/M3	0° TO 100° C	≈ 80°C	*	—	—	1"-ICW 1121-NE	WASTE WATER

Notes:

* T Dimension is lag length.

* ½" MNPT SCREWED WELL "U" DIMENSION 2½"
STEM LENGTH OR ELEMENT MUST BE SELECTED FOR THIN "U" DIMENSION

P.V.D.	INDICATING BIMETAL	SHEET 50	JOB NUMBER 2029-3

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	REQUISITION NO.			VENDOR ASCO (OR APPROVED EQUAL)					
1	Tag No.		EE-222		EE-223		22-278		
2	Item No.		1		2				
3	Model No.		HT8211D89MO		→		HB8211C87MO		
4	Service		ICW TO		ICW TO		SEAL WATER		
			CONDENSER		REACTOR		TO REACTOR MAKE-U		
5	Line No.		1-ICW-1120-NE		1-ICW-1123-NE				
6	P&ID No., Section		LA-RV-MP9 1-4		LA-RV-MP9 1-5		MP-9/J-7		
	SERVICE CONDITIONS								
7	Fluid	Units	WATER	GPM	WATER	GPM	WATER	GPM	
8	Flow Normal	Maximum	11.0	15.0	11.0	15.0		.5	
9	Pressure in Normal	Maximum	60		60		60		
10	ΔP Normal	Maximum	2		2		2		
11	Temperature Normal	Maximum	70	80	70	80	70		
12	Visc @ Opr Temp Cp	Sp Gr	1.0	1.0	1.0	1.0		1.01	
13	Gas or Vapor Mol Wt		—		—				
14	S.G. VISCOSITY		1.0		1.0				
	BODY								
15	Body Size	Port Size	1"		1"		1/2"	3/8	
16	Type of Body		2 WAY		2 WAY		2 WAY		
17	Material		316 SS		→		316 SS		
18	End Connections		SCRD		→		SCRD		
19	Direct Lift	Internal Pilot	YES	—	YES	—	YES	—	
20	Packing or Seal		—		—		—		
21	Manual Operator		YES		YES		YES		
22	Reset		—		—		—		
23	Material Plug	Seat	SS	BUNA N	SS	BUNA N	SS	BUNA N	
24	Cv for Maximum Flow	Furnished Cv	8	11.2	8	11.2		3	
25									
	ACTION								
26	Normally Closed or Normally Open		CLOSED		CLOSED		CLOSED		
27									
	SOLENOID				All Solenoids Shall Be Designed for Continuous Duty				
28	Voltage DC or AC & Hz		120V 60 HZ		→		115V 60HZ		
29	~~Amps~~ WATTS Pull In	Hold	15.4		→		—	—	
30	Enclosure		NEMA 4		→		NEMA 4		
31	Electrical Connections and Size		1/2" ENT		→		1/2" CONDUIT		
32	Coil		CLASS H		CLASS H		CLASS H		
33	Connections (Reference Sketch)		1 INLET		→		1 INLET		
34	" " "		2 OUTLET		→		2 OUTLET		
35	" " "								
36	" " "								
	Notes:	37 Energized	1 2		1 2		1 2		
		38 Deenergized							

SHEET		JOB NUMBER	

REQUISITION NO.

Reference Specification Sheet No.

VENDOR FISCHER PORTER (OR APPROVED EQUAL)

Model No. 51 EG 1212 ** B

Rev	Tag No.	Item No.	P&ID No. & Section	Chart Range	Scale Range **	Measurement Increase Output	Service
	LI-198	1	MP-9 K-8	#	0-66"	INC	REACTOR TANK LEVEL
	TI-198A	2	MP-9 K-8		0-400F	INC	REACTOR TANK TEMP

COR REACTOR TO COORDINATE RANGE BASED ON FINAL LENGTH OF LEVEL PROBE TAG NO TE-198A

RMP DATA SHEET
THE RALPH M PARSONS COMPANY

RECEIVER INSTRUMENTS

SHEET 52

JOB NUMBER 60F9-3

DOCUMENT NUMBER 15.10-1

REV

ENG-IN-1611B-G

	REQUISITION NO.		VENDOR B S & B SAFETY SYSTEMS		(OR APPROVED EQU
1	Tag No.	PD-227			
2	Item No.	1			
3	Model No.	2			
4	Service	REACTOR			
		VENT			
5	Line or Equipment No.	1"-AV-1112-NE			
6	P&ID No./Section	LA-RY-MP-9/K6			
	SERVICE CONDITIONS				
7	Fluid	STEAM VAPOR			
8	Required Capacity / Units	400 / F/HR			
9	Maximum Capacity				
10	Mol Wt or Sp Gr @ Operating Temp	1.3 APPROX			
11	Viscosity @ Operating Temp Cp	0.013			
12	Pressure psig: Normal / Relieving	ATM			
13	Temp °F: Normal / Relieving	200 / 200			
14	Back Pressure - Constant	ATM			
	Varies: from / to				
15	Bursting Pressure, Desired psig	62			
16	Bursting Pressure, Minimum psig	57			
17	Bursting Pressure, Maximum psig	63			
	BASIS OF SELECTION				
18	Code				
19	Fire				
20	Other	PSV PROTECTION			
21					
	SAFETY HEADS				
22	Size	1"			
23	Type	QUIK-SERT FA-7R			
24	Inlet Connection - Type	WELD NECK FLG			
25	Inlet Connection - Rating	1"-150# RF			
26	Inlet Connection - Material	304L SS			
27	Outlet Connection - Type	WELD NECK FLG			
28	Outlet Connection - Rating	1"-150# RF			
29	Outlet Connection - Material	304L SS			
30	Bolting	ANSI			
31	Gauge Tap	—			
32	BORE	SCHED. 40			
	RUPTURE DISK				
33	Disk Type	B			
34	Disk Material	316 SS			
35	Vacuum Support Material	NO			
36	Seal Material	TEFLON			
37	Protective Ring Material	—			
38	Lining	TEFLON			
39	Coating	—			
40	Knife Blade Material	—			
41	Gasket Material	—			
42					
	ACCESSORIES				
43	Spare Disks	2 REQ'D			
44	Code Stamp (ASME) on Handle	YES			
45	Excess Flow Valve	—			
46					
47					

Notes: RUPTURE DISC AND SAFETY HEAD BY VENDOR
CONTRACTOR TO ASSEMBLE PARTS AND INSTALL BETWEEN PIPE FLANGES

RVP DATA SHEET	RUPTURE DISKS	SHEET 53	JOB NUMBER 6081-3
		DOCUMENT NUMBER LE-10	

H C H

REQUISITION NO. | VENDOR BECKMAN (OR APPROVED EQUAL)

Reference Specification Sheet No.

MODEL Nº 942, pH MONITOR CONSISTING OF COMPONENTS AS FOLLOWS:

P&ID LA-RV-MP-9, REV 1

1 - MODEL 942 ANALYZER PN646949-pH, WITH PN636199 INTEGRAL PREAMPLIFIER

TAG Nº AIT-199A, ANALYZER

TAG Nº AE-199A, SUBMERSIBLE ELECTRODE STA. PREAMP

SERIES III ELECTRODE STATION 300-2-0-21-3-1-3-0

INCLUDING:

316 SS FLOW CHAMBER AND DOME ASSY

#19036 GOLD LABEL DOUBLE JUNCTION REFERENCE ELECTRODE

#19501 PH GLASS ELECTRODE, GENERAL PURPOSE

#19590 RTD THERMOCOMPENSATOR

POWER SUPPLY 120 V ± 5% 60 HZ SINGLE PHASE

RANGE PH: ADJUSTABLE FROM 0-14

OUTPUT: 4-20 MA dc INTEGRAL (WITH ANALYZER) TRANSMITTER

HIGH IMPEDENCE CABLE #646983 20 FT

1 - SAME AS ABOVE EXCEPT TAG NOS AE-199B AND AIT-199B WITH A MEASURING ELECTRODE FOR OXIDATION REDUCTION POTENTIAL (ORP) MEASUREMENT

ANALYZER #615300 -1400 TO +1400 mV (ADJUSTABLE)

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	pH/ORP ANALYZER	SHEET 54	JOB NUMBER 10089-3
		DOCUMENT NUMBER 15-10-1	REV 0

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REQUISITION NO.	VENDOR ALLEN-BRADLEY
Reference Specification Sheet No.	(OR APPROVED EQUAL)

TAG NO : KC-224

P&ID : LA-RV-MP-9, REV 1/H6

TIMING RELAY

SERVICE : WATER FLOW SOLENOID VALVE CONTROL

MODEL NO : 700-RTA20V200-A1

CONTACTS : 2 N.O. CONTACTS, CLOSE INSTANTANEOUS

2 N.C. CONTACTS, TIMED OPENING

TIMING RANGE : 1 TO 64 MINUTES

5 PROGRAM KEYS ARE PROVIDED FOR

THE FOLLOWING RANGES:

0.015 TO 1, 0.06 TO 4, 0.25 TO 16 & 1-64 M

EX LISTING : CLASS I DIV. 2 & GROUPS A, B, C & D

POWER REQMNTS : 120 V & 60 HZ

CONTACT RATING : 120 VAC 5 AMPS

PARSONS		SHEET 55	JOB NUMBER 6099-3

REQUISITION NO.	VENDOR ALLEN-BRADLEY OR APPROVED EQUAL
Reference Specification Sheet No.	

TIME DELAY RELAY WITH SEC
CONTAINED POTENTIOMETER

TYPE : SOLID STATE
INPUT VOLTAGE : 115VAC 60 HZ

TIME DELAY (MAX) - 30 SEC. (MIN) - 0.5 SEC.
CONTACTS (TDOAE) TIME DELAY OPEN AFTER ENERGIZING

AC RATING MAKE (30 AMPS) BREAK (3 AMPS)

MODEL : ALLEN-BRADLEY 855-N5B

TAG NO. KC-278

REQUISITION NO.	VENDOR DENBESTY - CADILLE (OR EQUAL)
Reference Specification Sheet No.	REV 1.

TAG NOS: FI-272 FI-273 FI-274

P&ID: LA-RV-MP-9 ZONE M N 10-7,8 & 9

SIGHT FLOW INDICATORS

MODEL No: SFR-1 ROTATOR STYLE-3 REQ'D

SERVICE: COOLING WATER DISCHARGE VENT GAS CONDENSER

FLUID: WATER

S.G.: 0

TEMP:

LINE No: 1½"-4W-[illegible]-AD 1"-ICW-[illegible]-VE & [illegible]-HWHR-[illegible]-VE

PHYSICAL LENGTH = 4 1/4 INCHES, 5 1/2 INCHES

CONNECTION: SCREWED 1" NPT-F, 1½" NPT-F *

ROTATOR MAT'L: TEFLON PADDLE WHEEL

ANSI RATING: 150 #

SIGHT GLASS: TEMPERED

BODY MAT'L: 316 SS

* FI-272 - 1½"
FI-273 274 - 1"

PARSONS SPECIFICATION	SIGHT FLOW INDICATORS	SHEET 57	JOB NUMBER 6089-3
		DOCUMENT NUMBER 15.10-1	REV 0

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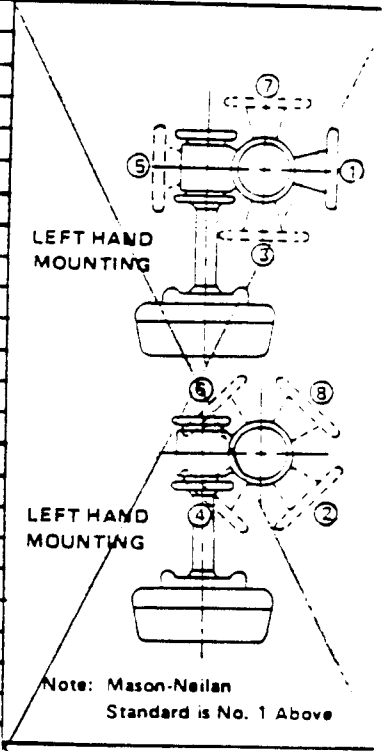
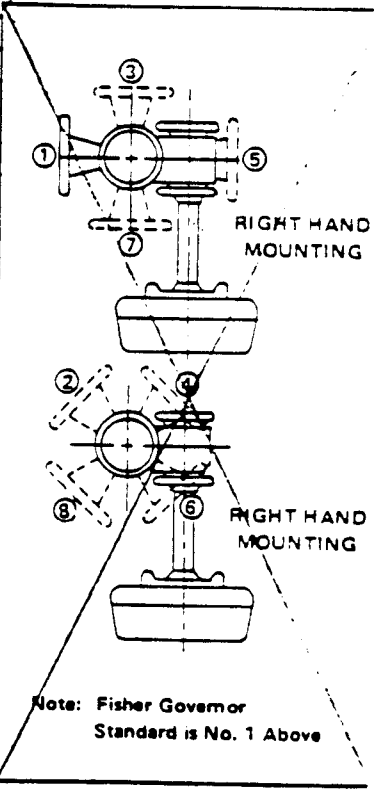
	REQUISITION NO.		VENDOR MAGNETROL OR APPROVED EQUAL
1	Tag No.	LE/LT-195	
2	Item No.	1	
3	Model No.	82-7002-001	
4	Service	REACTOR TANK LEVEL	
5	Vessel or Equipment No.	TK-21	
6	P&ID No., Section	MP-9 K-8	
7	Type	CAPACITANCE TYPE	
	SERVICE CONDITIONS		
8	~~Upper~~ Fluid	TREATED WATER	
9	~~Lower~~ Fluid		
10	sp gr ~~Upper~~ / sp gr ~~Lower~~		
11	Press Max / Norm (psig)	AMB	
12	Temp Max / Norm (°F)	240 / 210	
13			
14			
	~~Body~~ PROBE	41-1001-001X	
15	Material	KYNAR COATED	
16	Size & Type Connections	3"-150# FLANGE R.F.	316 SS
17	Top Connection ~~Location~~	NOZZLE TOP OF TANK	
18	Bot Connection ~~Location~~		
19	Case Mounting		
20	Flange Orientation		
21	Rotatable Head		
22	LENGTH	66"	
	FLOAT OR DISPLACER		
23	Diameter or Length, in.		
24	Extension, in.		
25	Material		
26	Torque Tube Material		
27	Air Fin		
28			
	TRANSMITTER		
29	Type	ELECTRIC	
30	Output	4-20 MADC	
31			
	CONTROL		
32	Type		
33	Proportional % / Reset		
34	Output		
35	On Level Increase, Output		
36			
	ACCESSORIES		
37	Filter & Regulator		
38	Gauge Glass Connections		
39	Gauge Glass		
40	Purge Connection		
41	Electric Switch		
42	CABLE 500F	37-3112-020	20 FT
43			

ORIENTATION





Notes:

RMP DATA SHEET	LEVEL INSTRUMENTS	SHEET 58	JOB NUMBER 6089-2

REQUISITION NO.

VENDOR DANIEL INDUSTRIES (OR APPROVED EQUAL)

	ORIFICE PLATE		ORIFICE FLANGE
1	Concentric: ☒ Other	7	Taps: Flange ☐ Pipe ☐ Other —
2	Make to ASME Standard ☒ Other	8	Rating & Facing 150# FLAT FACE
3	Plate Material: 316 SS ☐ Other HASTELLOY	9	Type: Weld Neck ☒ Other SLIP ON
4	RTJ Ring Matl & Type	10	Material: Steel ☒ Other
5	Bore Maximum Rate ☐ Nearest 1/8 in. ☒	11	Tap Size 1/2 in. NPT ☐ Other —
6	Stamp to ISA Standard ☒ Other	12	Flanges by Mat'l Control ☐ —

13	Tag Number			PD-199						
14	Item Number			1						
15	Service			REACTOR						
				TK-21 PH						
16	Line No.			1" AW-HR-1124-NE						
17	P&ID No./Section			MP-9 M-7						
	SERVICE CONDITIONS									
18	Fluid			LIQUID						
19	Flow Units									
20	Full Scale Flow	Opr	Base							
21	Norm Flow	Opr	Base							
22	Press (psia)	Opr	Base	AMB						
23	Barometric Pressure (psia)									
24	Temperature °F	Opr	Base	210						
25	sp gr @ 60° F & Base Press									
26	sp gr @ Opr Conditions									
27	Supercomp Factor @ Opr Press									
28	Vapor, Gas Mol. Wt.									
29	Viscosity @ Opr Temp (cp)									
30	Steam Qual	Superheat °F								
31	Weep Hole Required									
32	Viscosity Correction (Fc)									
33	Liquid Compressibility Factor (Fp)									
34	Density (lbs/ft3)	Opr	Base							
35	Compressibility	Opr	Base							
36	Cp/Cv									
37	Specific Volume (ft3/lb)									
	MEASURING STATION DATA									
38	Actual Orifice ID in.			3/4"						
39	Line Flange ID in.			STD						
40	Orifice Plate Thickness in.			1/8"						
41	Seal sp gr @ 60° F			—						
42	Meter Type			—						
43	Diff Range in H_2O Dry			N/A						
44	Static Range psia			—						
45	Chart or Scale Range			—						
46	Chart Multiplier (C)			—						
47	Beta Ratio d/D			.75						
48	Manometer Correction (Fm)			—						
49	Flow Equals			—						
50	Line:	Size	Sched	1"	STD					

Notes:

1. Volume rates of flow are expressed at 60° F for liquids and on base conditions for gases and vapors.
2. Vents and drains (weep holes) when specified shall conform to ¶20 (i) of the ASME "Flow Measurement" Chap 4, PTC 19.5, 4-1959
3. "F" equals flow pen reading; "P" equals static pressure pen reading.

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	ORIFICE PLATES	SHEET 59	JOB NUMBER 6089-3
		DOCUMENT NUMBER 15.13-1	REV

ENG-IN-1511-G

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	C	[illegible]				[illegible]

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION

For LOS ALAMOS NATIONAL LAB. Site LOS ALAMOS [illegible]
Unit [illegible] (LUM-1) Service AGITATOR - [illegible]
Item No. M-20
Mfr Size/Type TURBINE Quantity ONE
Item No. Motor Driver M-20 Serial No.
Other Furn By VE-202 Mtd By VENDOR

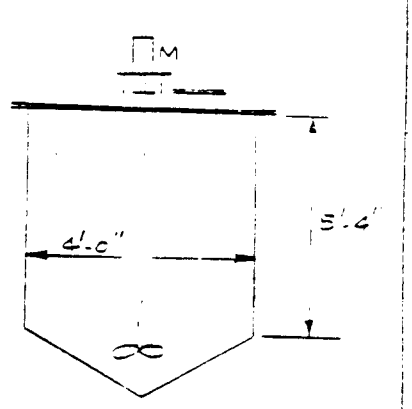
MIXING CONDITIONS

Mixer Function TO MAINTAIN SOLIDS IN SUSPENSION AND MIX THE CONTENTS
Final State Reqd: ☐ Complete Uniformity ■ 98 % Uniformity ■ Off Bottom Susp ☐ Other
Withdrawal Rate gpm Batch Blending Time hrs Solids Settling Velocity fpm

COMPONENTS

	1st Cmpnt	2nd Cmpnt	3rd Cmpnt	Mixture
Type of Liquid	NOTE 1			
Type of Solid				
Specific Gravity @ 60 °F				1.5
Viscosity cp @ 60 °F				500
% of Mix ☐ Vol ☐ Wt				
Component Temp DESIGN °F	225	225	225	
Solids Size				

APPLICATION SKETCH



MIXER DWG
VESSEL DWG TK-20

MIXER DESIGN

■ Top Entry ☐ Side Entry ☐ Bottom Entry Wetted Parts Material [illegible]
Impeller: Type TURBINE No. ONE No. of Blades
Diameter in. Stabilizer Off Bottom in.
Speed rpm Pumping Capacity 20-30 gpm Tip Speed rpm
Shaft: Diameter in. Length in. bhp 1st Critical rpm
Coupling Type Location
Seal LIP SEAL Style
Seal Lubricator Style
Mixer Mount: ■ Closed Tank Flange Mounted ☐ Open Tank Beam Mounted
☐ Center Mounted ☐ Angle Riser Mounted ☐ Off Center Mount in.
Mounting Flange Size in. Rating psig Facing
Design Loads: Vertical Downward Load lbs
Bending Moment ft.-lbs Torque in.-lbs
Other

Gear Type
Mfr Ratio
Service Factor
Maximum Case Horsepower

VESSEL DESCRIPTION

Material SHELL CARBON STEEL RUBBER LINED (TOP 30% S.S.
Type CYL VERTICAL Diameter 4' Height 5'-6"
Top ☐ Open ■ Closed ■ Flat ☐ Dished Max Manway Dia in.
Bottom ☐ Flat ☐ Dished 20° CONE BOTTOM Max Head Room Avail ft
Capacity 200 gal Normal 500 gal Maximum
Liquid Level (NOTE 2) ft Normal 5' ft Maximum
Pressure ATM. NON-EXPL psig Normal 15 psig Maximum
Agitator Flange Size in. For ☐ Mixer Support ☐ Shaft Seal
Baffles No. Width in. Height Off Wall in.
Other

WEIGHTS

Mixer lbs
Driver lbs
Shaft & Impeller lbs
Total lbs

MOTOR DRIVER

Mfr
rpm hp
Data Sheet

Notes 1. NITRIC ACID, HYDROCHLORIC ACID, FLUOROSILIC ACID, VARIOUS GASES, CYANIDES, CYANATES, CHROMATES AND CADMIUM SOLUTIONS AT VARIOUS CONCENTRATIONS.
2. MINIMUM CAPACITY 100 GAL (SEE SHT 2 OF 2 FOR [illegible])

RMP DATA SHEET THE RALPH M. PARSONS COMPANY	RECEIVING/SETTLING TANK MIXER/AGITATOR M-20	SHEET 1 OF 2	JOB NUMBER 602 00
		DOCUMENT NUMBER 15.11-02	REV. 0

ENG-RE-404 DC-

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2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

REVISIONS NO	DATE	BY	CK	APP	DESCRIPTION

DESIGN DATA AND ACCESSORY EQUIPMENT

No. of Identical Units: ONE Tag No.: M-20

Service: RECEIVING/SETTLING TANK AGITATOR

Nameplate: [illegible] hp 660 V 3 Phase 60 Hz SEE SPEC Service Factor [illegible] Amps [illegible] Duty [illegible] Locked-Rotor [illegible] A

Insulation Class A ☐ B ☐ F ☐ H ☐ [illegible] °C Ambient

Sealed ☐ Encapsulated ☐

Area Classification: Class [illegible] Group A B C D Division (1) (2)

Atmospheric Mixture [illegible] T-Rating [illegible] °C Unclassified ☐

Enclosure: Weather-Protected Type (I) (II) Totally Enclosed Fan-Cooled ■

Totally Enclosed Nonventilated ☐ Explosionproof ☐

Location: Indoor ■ Outdoor ☐ Dusty ☐ Altitude 7200 FT

Bearing type: Ball ☐ Sleeve ☐ Forced-Feed Lubrication ☐

Specification: NEMA Standard MG 1 ■ API RP 541 ☐

Sound Pressure Level Requirements: [illegible]

Starting: Full Voltage ☐ Reduced Voltage ☐ [illegible] % of Voltage

Unloaded ☐ Loaded ☐ Capacitors for Power Factor Correction ☐

Mounting Method: Horizontal ☐ Vertical ■

Stainless Steel Nameplate ■ Filter for WP (I) (II) ☐

Drain Plugs ☐ Thermal Temperature Switches ☐ Thermocouples ☐

Resistance Temperature Detectors ☐ Bearing Temperature Detectors ☐

Space Heaters ☐ [illegible] V [illegible] W [illegible] Phase

Differential Protection ☐ Surge Protection ☐ Oversized Terminal Box ☐

INFORMATION BELOW TO BE COMPLETED BY VENDOR

Motor Mfr [illegible] Type [illegible] Style No. [illegible]

Full Load r/min [illegible] Weight [illegible] Frame No. [illegible]

Bearing Mfr [illegible] Bearing No. [illegible]

Starting Torque [illegible] Locked Rotor Torque [illegible]

Locked Rotor Amperage [illegible]

LOAD	FULL	¾	½
Amperes			
Efficiency %			
Power Factor			
Speed r/min			

Pull Up Torque [illegible]

Full Load Torque [illegible]

Breakdown Torque [illegible]

Accelerating Time in Seconds (0 – Full Speed) [illegible]

Tests (When Specified) [illegible]

Safe Time-Current Curve ☐

Speed-Torque Curve ☐

Stall Time at Zero r/min [illegible] Seconds

Number of Consecutive Starts [illegible]

Notes: 2. SOLE SPEED, TWO WINDING, FLYING LEADS 2/3, 1/2. AND 1/2 OF HIGH SPEED. STARTER SHALL BE FOUR SPEED TWO WINDING NEMA SIZE 1.

PARSONS DATA SHEET	INDUCTION MOTOR M-20	ACCOUNT NUMBER SHT 2 OF 2	JOB NUMBER 60[illegible]
		DOCUMENT NUMBER 15.11-02	REV

ENG-ES-101 (6/81)

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REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	[illegible]	[illegible]			REVISED ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION

For [illegible] NATCO - [illegible] Site [illegible]
Unit [illegible] Service [illegible]
Item No. M-21 Quantity ONE
Mfr [illegible] Size/Type [illegible] Serial No. [illegible]
Item No. (Motor Driver) [illegible] Furn By [illegible] Mtd By [illegible]
Other

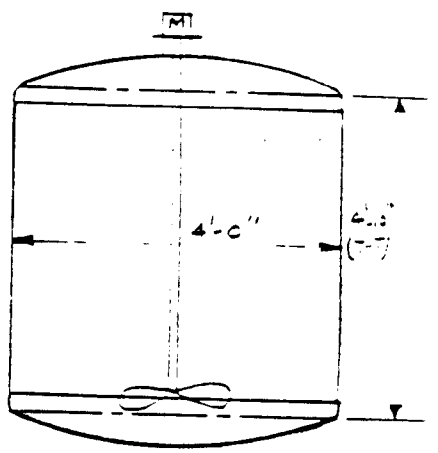
MIXING CONDITIONS

Mixer Function TO MAINTAIN SOLIDS IN SUSPENSION - GAS DISPERSION (NOTE 3)
Final State Reqd: ☐ Complete Uniformity ■ 98 % Uniformity ■ Off Bottom Susp ☐ Other
Withdrawal Rate — gpm Batch Blending Time ____ hrs Solids Settling Velocity ____ fpm

COMPONENTS

	1st Cmpnt	2nd Cmpnt	3rd Cmpnt	Mixture
Type of Liquid [illegible]				
Type of Solid				
Specific Gravity @ 60 °F				1.3
Viscosity cp @ 60 °F				500
% of Mix ☐ Vol ☐ Wt				
~~Component~~ Temp °F	225	225	225	
Solids Size				

APPLICATION SKETCH



MIXER DWG
VESSEL DWG TK - 21

MIXER DESIGN

■ Top Entry ☐ Side Entry ☐ Bottom Entry Wetted Parts Material HASTELOY C
Impeller: Type TURBINE No. ONE No. of Blades ____
Diameter ____ in. Stabilizer ____ Off Bottom ____ in.
Speed ____ rpm Pumping Capacity [illegible] gpm Tip Speed ____ fpm
Shaft: Diameter ____ in. Length ____ in. bhp ____ 1st Critical ____ rpm
Coupling Type ____ Location ____
Seal [illegible] Style BY VENDOR
Seal Lubricator END WATER (NOTE 4,5) Style ____
Mixer Mount: ■ Closed Tank Flange Mounted ☐ Open Tank Beam Mounted
☐ Center Mounted ☐ Angle Riser Mount ☐ Off Center Mount ____ in.
Mounting Flange Size ____ in. Rating ____ psig Facing ____
Design Loads: Vertical Downward Load ____ lbs
Bending Moment ____ in.- lbs Torque ____ in.-lbs
Other

Gear Type ____
Mfr ____ Ratio ____
Service Factor ____
Maximum Case Horsepower ____

VESSEL DESCRIPTION

Material SA-[illegible] W/ KYNAR LINING
Type CYL VERTICAL Diameter 4' Height 4'-10"
Top ☐ Open ☐ Closed ☐ Flat ■ Dished Max Manway Dia ____ in.
Bottom ☐ Flat ■ Dished Max Head Room Avail ____ ft
Capacity 300 gal Normal 250 gal Maximum
Liquid Level 2'-7" (NOTE 2) ft Normal ____ ft Maximum
Pressure [illegible] psig Normal 50 psig Maximum
Agitator Flange Size 2 VENDOR in. For ☐ Mixer Support ☐ Shaft Seal
Baffles No. ____ Width ____ in. Height ____ Off Wall ____ in.
Other

WEIGHTS

Mixer ____ lbs
Driver ____ lbs
Shaft & Impeller ____ lbs
Total ____ lbs

MOTOR DRIVER

Mfr ____
rpm ____ hp ____
Data Sheet ____

Notes 1. NITRIC ACID, HYDROCHLORIC ACID, FLUOROBORIC ACID, VARIOUS BASES, CYANIDES, CYANATES, CHROMATES AND CADMIUM SOLUTIONS AT VARIOUS CONCENTRATIONS.
2. [illegible] 100 GAL. (SEE SHT 2 OF 2 FOR CONT)

RMP DATA SHEET	MIXER/AGITATOR M-21	SHEET 1 OF 2	JOB NUMBER [illegible] - 01
		DOCUMENT NUMBER	REV.

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REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION
	0	2/16/83	J.S.	[illegible]		INITIAL ISSUE

REVISIONS	NO.	DATE	BY	CK	APP	DESCRIPTION

DESIGN DATA AND ACCESSORY EQUIPMENT

No. of Identical Units: ONE Tag No.: M-21

Service: REACTOR AGITATOR

Nameplate: 1 (ESTIMATED) hp 460 V 3 Phase 60 Hz (SEE SPEC) Service Facto
(SEE NOTE 5) r/min(syn) _____ Duty _____ Locked-Rotor kVA
Insulation Class: A ☐ B ☐ F ☐ H ☐ _____ °C Amb en
Sealed ☐ Encapsulated ☐

Area Classification: Class (I) (II) (III), Group (A) (B) (C) (D), Division (1) (2)

Atmospheric Mixture _____ T-Rating _____ °C Unclassified ☐

Enclosure: Weather-Protected Type (I) (II) Totally Enclosed Fan-Cooled ■
Totally Enclosed Nonventilated ☐ Explosionproof ☐

Location: Indoor ■ Outdoor ☐ Dusty ☐ Altitude 7200 FT

Bearing type: Ball ☐ Sleeve ☐ Forced-Feed Lubrication ☐

Specification: NEMA Standard MG 1 ■ API RP 541 ☐

Sound Pressure Level Requirements: _____

Starting: Full Voltage ☐ Reduced Voltage ☐ _____ % of Voltage
Unloaded ☐ Loaded ☐ Capacitors for Power Factor Correction ☐

Mounting Method: Horizontal ☐ Vertical ■

Stainless Steel Nameplate ■ Filter for WP (I) (II) ☐

Drain Plugs ☐ Thermal Temperature Switches ☐ Thermocouples ☐

Resistance Temperature Detectors ☐ Bearing Temperature Detectors ☐

Space Heaters ☐ _____ V _____ W _____ Phase

Differential Protection ☐ Surge Protection ☐ Oversized Terminal Box ☐

INFORMATION BELOW TO BE COMPLETED BY VENDOR

Motor Mfr _____ Type _____ Style No. _____

Full Load, r/min _____ Weight _____ Frame No. _____

Bearing Mfr _____ Bearing No. _____

Starting Torque _____

LOAD	FULL	¾	½
Amperes			
Efficiency, %			
Power Factor			
Speed, r/min			

Locked Rotor Torque _____

Locked Rotor Amperage _____

Pull Up Torque _____

Full Load Torque _____

Breakdown Torque _____

Accelerating Time in Seconds (0 – Full Speed) _____

Tests (When Specified) _____

Stall Time at Zero r/min _____ Second

Number of Consecutive Starts _____

Safe Time-Current Curve ☐

Speed-Torque Curve ☐

Notes:

3) VENDOR TO INCLUDE IN HIS SHOP DRAWING SUBMITTAL GAS DISPERSION SCHEME PROPOSED TO THOROUGHLY MIX GASES ENTER THE VESSEL VAPOR SPACE INTO THE LIQUID.

4) SEAL WATER AVAILABLE IS 0.5 G.P.M @ 60 PSIG

5) VENDOR TO PROVIDE STRAINER, REGULATOR (IF REQ'D), FLOW INDICATOR-SWITCH W/ N.C. CONTACTS ON NO FLOW AND C.S. SEAL WATER PIPING.

6) FOUR SPEED, TWO WINDING, HAVING 2/3, 1/2, AND 1/3 OF HIGH SPEED. STARTER SHALL BE FOUR SPEED TWO WINDING NEMA SIZE 1.

PARSONS DATA SHEET	INDUCTION MOTOR M-21	ACCOUNT NUMBER SHT 2 OF 2	JOB NUMBER 6CE9-0001
		DOCUMENT NUMBER	REV

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0083C

CONTRACT NO. DE-AC32-80AL13151

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 15 MECHANICAL

SUB-DIVISION 15.12

DIAPHRAGM PUMPS

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment and services to manufacture, procure, install, inspect, test and accept a double diaphragm pump as indicated on the drawings and specified herein.

1.1.1 Furnished Equipment

The Contractor shall furnish the pump as a complete unit, including air valve, silencer, baseplate, special features, and accessories as specified herein.

The Contractor shall furnish to the Contracting Officer documents in accordance with Section 1.3.

Standard equipment and design are requested, provided the performance requirements of this Specification are met. Engineering, fabrication, and quality assurance and control shall result in equipment capable of operation at specified design conditions.

1.1.2 Related Work

The following associated work shall be performed by the Contractor:

Emplacement, shimming, grouting, final alignment verification, piping installation and compressed air system.

Work performed per this Sub-Division shall be coordinated with work accomplished per the following Sub-Divisions:

3.01	Cast-In-Place Concrete
15.01	Piping

1.2 REFERENCE DOCUMENTS

The Contractor shall comply with codes and standards referenced in this Specification.

American National Standards Institute (ANSI)

ANSI B16.5 - 77	Steel Pipe Flanges, Flanged Valves and Fittings

US Department of Labor

Occupational Safety and Health Administration (OSHA)

29 CFR 1910 - 79	Occupational Safety and Health Standards for General Industry

1.3 SUBMITTALS

1.3.1 Shop Drawings and Product Data

The Contractor shall submit to the Contracting Officer drawings, completed data sheets, parts lists, performance curves, inspection and test results, installation, operating and maintenance instructions, certificate of compliance and recommended spare parts list with prices in accordance with Attachment "Data Requirements List".

PART 2 PRODUCTS

2.1 DESCRIPTION

The pumps shall meet the technical and performance requirements outlined herein.

2.1.1 Performance Characteristics

The pump shall be capable of flowing strong acids at 200°F (hydrochloric, sulfuric and fluroboric acid; 20% concentration) at 15 to 40 gpm with a maximum of 60 feet total differential head. Adjustable pressure compressed air will be supplied. Maximum air pressure will be 125 psig.

2.1.2 Material of Construction

2.1.2.1 Wetted Parts. Pump housing wetted with the process liquid shall be Kynar. Non-wetted parts shall be cast iron.

2.1.2.2 Valves. Valves shall be ball type, Teflon with Teflon seats.

2.1.2.3 Diaphragm. Diaphragm shall be Teflon.

2.1.3 Flanges

Pump flange connections shall be 2" 150# per ANSI B16.5, flat face Kynar lined.

2.1.4 Sound Level

Pump sound level shall not exceed 85 db as defined per OSHA.

PART 3 EXECUTION

3.1 FABRICATION REQUIREMENTS

3.1.1 Tagging of Pumps

The nameplate shall be of 24 US Standard Gauge (minimum) stainless steel and shall be securely attached to the pump. The nameplates shall include, as a minimum, the manufacturer's name, pump model, standard dimension designation, serial number, size, unit weight, impeller diameter (maximum and installed), materials of construction, horsepower rating, maximum design pressure for 40 deg C (100 deg F) service as shown on the pump data sheet, and equipment item number. The direction of rotation shall be marked on the pump.

3.1.2 Painting and Surface Preparation

Stainless steel surfaces shall not be painted. Carbon steel surfaces shall be painted using the Vendor's standard materials.

Standard paint used shall remain intact at operating temperature of the surfaces to which it is applied. All exposed surfaces shall receive a coat of rust preventative such as Exxon Chemical Co. Rust Ban 392 or Approved Equal.

3.2 SHIPPING AND STORAGE

All components shall be completely assembled and match-marked, as required, at the assembly area prior to shipment.

Flange closures shall consist of a rubber gasket and a full size 1/4 inch thick exterior plywood cover. This cover shall be bolted in place by a minimum of four full size bolts. All drilled and tapped holes shall have metal or plastic plugs and all exposed pipe ends shall be capped.

Pump shall be boxed or crated for full protection against damage during transport and yard handling. Pump shall be prepared to prevent damage from the elements and temperatures ranging from minus 40 deg F to plus 120 deg F.

3.2.1 Receipt Inspection

The Contracting Officer will inspect the equipment and documentation specified herein upon receipt at the site to determine if the equipment as received has suffered damage during shipment. This inspection will include appurtenances shipped separately or together with the equipment.

3.2.2 Storage

The Contractor shall allocate sufficient indoor, non-heated storage space and employ protective measures to protect the equipment and appurtenances specified herein from any damage due to natural elements or the Contractor's equipment. Particular care shall be taken to prevent damage to flange faces, seal surfaces, and all interfacing parts or surfaces between equipment piping, or structures. The Contractor shall allocate equipment storage space in an area

segregated from fabrication operations and maintained free from debris. Temporary structures, supports, cribbing, or bracing may be provided and employed by the Contractor to prevent damage to the equipment and appurtenances specified herein.

The Contracting Officer reserves the right to inspect, without notice, all equipment storage areas, protective measures, and temporary structures used to store equipment.

3.2.3 Handling

The Contractor shall provide and use suitable devices to handle, without damage the equipment and appurtenances specified herein from receipt through installation. The Contractor shall be responsible for providing suitable access into the facility for handling devices with equipment for installation.

3.3 INSTALLATION

Installation of equipment shall be in accordance with the piping drawings and the manufacturer's installation instructions. The Contractor shall be responsible to provide necessary foundations, anchorings, bolts, studs, and nuts for proper installation, and interfacing with equipment.

3.3.1 Foundations

The structural drawings will define the size, type, elevation, location, and material of equipment foundations and the size, type, location, and material of anchorings to be provided. Grouting, if required, shall provide full bearing support. Anchor bolts shall be provided with sufficient length to allow for double nuts above the face of base rings, base plates, or saddles. Double nuts shall be provided and installed on all anchor bolts.

3.3.2 Appurtenances

The Contractor shall be responsible for the lubrication and installation of all necessary appurtenances, blind flanges, studs, nuts, seals, gaskets, connectors, and clips, including removal of test gaskets, seals, bolts, or connectors, and installation of service gaskets, seals, bolts, or connectors, when such appurtenances are not installed prior to shipment. Installation of all such appurtenances shall be in accordance with the installation instructions.

3.4 PRESSURE TESTING

The pump shall be hydrostatically tested at 1.5 times the design pressure with clean water at a minimum temperature of 60 deg F.

(1) The hydrostatic test pressure shall be maintained for a minimum of 10 minutes and during pump examination for leakage.

(2) Leakage of temporary gaskets and seals, installed for the purpose of conducting the hydrostatic test and which will be replaced or discarded later, is permitted provided the leakage does not exceed the capacity to maintain system test pressure for the required length of time or does not mask leaks from other joints.

(3) No visual weeping or leakage is permitted from any pump assembly joint nor external component. If weeping or leakage occurs, defective part(s) shall be replaced with new ones, and pump shall be retested and inspected as above.

3.5 ACCEPTANCE

Equipment, materials, and workmanship not in accordance with the requirements specified herein shall be corrected by the Contractor.

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DATA REQUIREMENTS LIST

	DESCRIPTION	CHECK IF REQ'D.	* WHEN REQ'D.	NO. OF COPIES REQ'D.	REFERENCE	** REQ'd. FOR
1.	Outline Drawings, Cross-Section Drawing	X	BFR		1.3.1	ACO
2.	Parts Lists	X	WS		1.3.1	INFO
3.	Performance Characteristics	X	BFR		1.3.1	ACO
4.	Inspection and Test Results	X	PS		1.3.1	ACO
5.	Installation, Operating, and Maintenance Instructions	X	PS		1.3.1	INFO
6.	Data Sheets	X	BFR		1.3.1	ACO
7.	Recommended Spare Parts w/prices	X	PS		1.3.1	INFO
8.	Certificate of Compliance	X	WS		1.3.1	ACO

* "AC" - As Completed
"BC" - Before Contract can be awarded
"BU" - Before Use (of procedure or by personnel)
"BFR" - Before Fabrication Release
"PS" - Prior to Shipment
"WS" - With Shipment

** "ACO" - Approval by Contracting Officer "INFO" - Information

H-P HYDRO-PURE SYSTEMS COMPANY
WATER TREATMENT EQUIPMENT
75 BLOOMFIELD AVENUE-DENVILLE, N.J. 07834-(201) 627-1315

November 15, 1983

Brown-Olds Corp.
Mechanical/Industrial Contractors
P.O. Drawer 9158
El Paso, TX 79983

Attention: Mr. Ariel Gutierrez

Subject: Upgrading of Industrial Liquid Waste Treatment Plant, Los Alamos National Laboratory
Brown-Olds P.O. #: E-65076
Hydro-Pure Job No: 20831

Dear Ariel,

This letter shall serve to confirm our telephone conversation (11/10/83) in regards to the Kynar lining application to vessel TK-21, for the above specified job.

The vessel is being fabricated per the specification and approved submittal as follows:

Operating Temperature:	250 F
Jacket Design Pressure:	50 psig
Jacket Operating Pressure:	50 psig

If the jacket is actually operated with 50 psig saturated steam (approximately 300 F) the Kynar lining system cannot be guaranteed. The maximum allowable pressure for the jacket must not exceed 20 psig.

Please take the appropriate action and confirm to H-P.

If you require any clarifications , and/or additional information please do not hesitate to call.

Sincerely,

Larry Wnek
Project Manager

LW:vg

Enclosure

02:11/15.831
file: cust. corr.

H-P HYDRO-PURE SYSTEMS COMPANY
WATER TREATMENT EQUIPMENT
75 BLOOMFIELD AVENUE-DENVILLE, N.J. 07834-(201) 627-1315

August 2, 1981

Brown-Olds Corp.
Mechanical/Industrial Contractors
P.O. Box 740
Los Alamos, NM 87544

Attention: Mr. Tom Preckett

Subject: Upgrading of Industrial Liquid Waste Treatment Plant, Los Alamos National Laboratory
Brown-Olds P.O. #: E-65076
Hydro-Pure Job No: 20831

Dear Tom,

Per our telephone conversations of August 4, 1983, H-P would like to clarify the following items prior to formal approval:

1. Nozzle type (Vessel TK-21) - Due to the fact that this vessel is to be Kynar lined, a corrosion allowance is not required. Therefore, all listed nozzles (further detailed on H-P Dwg. C-20831-C01 and corresponding data sheet #N/C01.831) are to be schedule 40 with slip-on type flanges.

2. Vessel heads - Cold formed heads, which are in complete compliance with the ASME code Section VIII, are to be utilized. The vessel manufacturer requests the option of not using stress relieved heads, due to the fact that the heads are [redacted] under 1-1/2" in thickness.

3. Welding tests and Inspection - All welding, including tests and inspection, has been bid in complete compliance with the ASME code Section VIII, as is normally performed on vessels in this industry. Therefore, we request that the extensive examination (above and beyond normal code requirements) of welds by the liquid penetrant method, which we were unaware of at bid time, be waived. By the elimination of this testing, less time will be required by the tank manufacturer to complete the fabrication of the vessels, which will keep in line with our present offering, otherwise an expected delay of 4 weeks may be encountered.

4. Film type for radiograph inspection to be: Type AA Film.

HYDRO-PURE SYSTEMS COMPANY

Please advise H-P as soon as possible regarding these items so that the tank shop may continue with material purchases. We request a response in regards to the types of heads to be utilized (item #2) as soon as possible, due to the long delivery associated with these items. Please note that this request for using these types of heads is in accordance with the specification where written approval from the Contracting officer is required.

A delay in correspondance regarding these items may consequently result in a delay in the overall delivery to the job site.

If you require any clarifications , and/or additional information please do not hesitate to call.

Sincerely,

Larry Wnek
Project Manager

LW:vg
Enclosure

cc:
Brown-Olds Corp.
Mechanical/Industrial Contractors
P.O. Drawer 9158
El Paso, TX 79983

Attention: Mr. Ariel Gutierrez

01:8/2.831
file: cust. corr.

NOTES

DIAMETER.....	48"	STRAIGHT SIDE ...	58"		
MATERIALS OF CONSTRUCTION:		HEAD(S).....	SA-285C	SHELL(S).....	SA-285C
		FLANGES.....	SA-105	NOZZLE NECKS.....	SA-53-B
		CLIPS.....	N/A	VESSEL ATTACHMENTS..	SA-36
		BOLTS.....	SA-193-B7	NUTS.....	SA-194-2H
HEAD THICKNESS....	3/8"	SHELL THICKNESS..	5/16"	CORROSION ALLOWANCE.	NONE
TYPE HEADS.....	2:1 ELLIPTICAL				
DESIGN PRES.....	50 PSIG	TEST PRESSURE....	75 PSIG	OPERATING PRES.....	ATM
DESIGN TEMP.....	275 F	TEST TEMP.....	AMB	OPERATING TEMP.....	250 F

OUTER JACKET DESIGN DATA:

DIAMETER.....	54"	STRAIGHT SIDE ...	56-1/2"		
MATERIALS OF CONSTRUCTION:		HEAD(S).....	SA-285C	SHELL(S).....	SA-285C
		FLANGES.....	SA-105	NOZZLE NECKS.....	SA-53-B
		CLIPS.....	N/A	VESSEL ATTACHMENTS..	SA-53-B
		BOLTS.....	SA-193-B7	NUTS.....	SA-194-~~B~~2H
HEAD THICKNESS....	3/8"	SHELL THICKNESS..	1/4"	CORROSION ALLOWANCE.	NONE
TYPE HEADS.....	2:1 ELLIPTICAL BOTTOM ONLY, 3" X 1" ROLLED BAR TOP ONLY.				
DESIGN PRES.....	50 PSIG	TEST PRESSURE....	75 PSIG	OPERATING PRES.....	50 PSIG
DESIGN TEMP.....	275 F	TEST TEMP.....	AMB	OPERATING TEMP.....	250 F

NOZZLE/SPOOL/CONNECTION SCHEDULE:

ITEM	SIZE	TYPE	RATING	FUNCTION	DESCRIPTION
	6"	FF	150 #	SOLID CHARGE	PAD FLANGE WITH COVER (BLIND FLG)
	6	FF	150 #	SIGHT PORT	SCH 40 WITH COVER (BLIND FLG)
[illegible]	~~2~~	FF	150 #	CHEM GASES INLET	PAD FLANGE
N4	3	FF	150 #	SPRAY WATER	SCH 40
N5	3	FF	150 #	CHEM & ACID INLET	SCH 40
N6	2	FF	150 #	ACID VENT	PAD FLANGE
N7	~~2~~	FF	150 #	IND WASTE	SCH 40
N8	3	FF	150 #	TEMP ELEMENT	SCH 40
N9	3	FF	150 #	LIQ LEVEL ELEMENT	SCH 40
10	2	COUP	3000#	STEAM INLET	1/2 COUPLING
[illegible]	~~1-1/2~~	COUP	3000#	HOT WATER OUTLET	1/2 COUPLING
[illegible]2	~~1-1/2~~	COUP	3000#	HOT WATER INLET	1/2 COUPLING
N13	3	FF	150 #	IND WASTE CONNECT	SCH 40
N14	6	FF	150 #	MIXER MOUNT	PAD FLANGE
N15	24	FF	150 #	MANWAY COVER	SCH 40 (32 " COVER)

- NUMBER OF VESSELS TO BE FABRICATED: ONE (1)
- IDENTIFICATION OF VESSELS (TAG NOS.): TK-21
- DIMENSIONS AND DEGREES OF ORIENTATION TO BE HELD TO A TOLERANCE OF ±1/8".
4. DIMENSIONS ARE TO FACE OF STEEL (INSIDE WALL OF VESSEL FOR DIMENSIONS INSIDE TANK AND OUTSIDE WALL OF VESSEL FOR DIMENSIONS OUTSIDE OF TANK).

5. ALL NOZZLES ARE TO HAVE A DIMENSION OF 6" FROM VESSEL TO FLANGE FACE UNLESS OTHERWISE NOTED. (PAD FLANGES).

6. FOR MANHOLE SUPPLY; COVER, GASKETS, AND FASTENING HARDWARE.

7. EXTERIOR PAINTING AND SURFACE PREPARATION: STAINLESS STEEL SURFACES SHALL NOT BE PAINTED. CARBON STEEL SURFACES SHALL BE PAINTED USING THE VENDOR'S STANDARD MATERIALS BUT SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

SURFACE PREPARATION- POWER TOOL CLEAN IMMEADIATELY PRIOR TO PRIMING. SURFACES SHALL BE FREE OF MILL SCALE, RUST, DIRT, DUST, OIL, GREASE, WELD SPLATTER, AND ANY FOREIGN MATTER.

PRIME COAT-STANDARD PRIME COAT MATERIAL WHICH SHALL CONTAIN RUST INHIBITORS; MINIMUM DRY FILM THICKNESS SHALL BE 1.5 MILS.

8. LINING: KYNAR, 60 MILS
SUPPLIED:

9. INTERIOR SURFACE PREPARATION: INTERIOR SURFACES, IF UNIT IS TO BE LINED, ARE TO BE PREPARED PER THE LINING MANUFACTURES REQUIREMENTS AND RECOMMENDATIONS (WELDS GROUND SMOOTH, SPLATTER REMOVED, ETC.).

10. IF THE VESSEL(S) ARE TO BE LINED, AFTER EXTERIOR PAINTING, PAINT ON THE OUTSIDE SHELL IN THREE OBVIOUS PLACES, WITH 6" LETTERS: "LINED VESSEL DO NOT WELD OR BURN".

11. ALL OPENINGS SHALL BE COVERED AND PROTECTED. FLANGE CLOSURES SHALL CONSIST OF OF RUBBER GASKET WITH FULL FACE, 1/4" THICK, PLYWOOD COVER FASTENED WITH AT LEAST FOUR (4) FULL SIZE BOLTS. THREADED OPENINGS SHALL BE PROTECTED WITH METAL OR PLASTIC INSERTS OR CAPS. OTHER METHODS OF PROTECTION MUST BE APPROVED BY HYDRO-PURE.

ITEMS SHIPPED LOOSE ARE TO BE BOXED OR CRATED FOR FULL PROTECTION DURING SHIPMENT.

12. VESSEL IS TO BE BUILT IN ACCORDANCE WITH LATEST EDITION OF SECTION VIII A.S.M.E. CODE WITH STAMP.

13. LIFTING LUGS TO BE LOCATED BY TANK MANUFACTURER AND OF VESSEL MANUFACTURERS STANDARD DESIGN WITH A 2" DIAMETER HOLE.

14. BOLT HOLES TO STRADDLE CENTERLINE OF FLANGE CONNECTIONS.

15. SUPPLY ALL FASTENING HARDWARE (STUDS, NUTS, ETC.) AND GASKETS AS CALLED FOR BY DRAWING(S).

16. HYDRO-PURE TO BE NOTIFIED FOR: WITNESS HYDRO STATIC TESTING AND INSPECTION, IN ADDITION FORWARD ALL COPIES OF CERTIFICATIONS TO HYDRO-PURE.

17. SIESMIC REQUIREMENTS: ZONE 2, 'I' = 1.5; 'S' = 1.5

ADDITIONAL DETAILS (OR REFERENCE DRAWINGS):

- LEGS: FOUR (4) EACH 6 X 6 X 1/2 WITH 11 X 11 X 1 PAD WITH 1-1/8" HOLE FOR 1" BOLT.
- NAMEPLATE BRACKET/STAMPING: DRAWING 20831-_____

*** END ***

KAREN

ner: Write or type message, pull out yellow sheet, mail the other two by folding in half and inserting in #771 DU-O-VUE envelope.

FORM 187-3 Available from [illegible] Inc., Townsend, Mass. 01470 NO CARBON PAPER REQUIRED: Type or write on original – impression will automatically appear on copies beneath.

BROWN-OLDS CORPORATION
P. O. Box ~~[illegible]~~ 740
LOS ALAMOS, NM 87544
Job ~~[illegible]~~ ~~P.O. [illegible]~~
10W5

Message Reply

DATE: 6/6/84

FILE NO.

PRIORITY
- ☐ URGENT!
- ☐ SOON AS POSSIBLE
- ☐ NO REPLY NEEDED

ATTENTION: ISAAC SUAZO

LANL
TA-50

SUBJECT: TEST REPORTS
KYNAR LINED TANK
TK-21

ATTACHED PER YOUR REQUEST ARE CERTIFICATION REPORTS ON THE TESTING OF THE KYNAR LINING OF TK-21.

SIGNED: R Young

DATE OF REPLY:

REPLY TO:

SIGNED:

SENDER: MAIL RECIPIENT WHITE AND PINK SHEETS.

RECIPIENT: WRITE REPLY. RETURN WHITE TO SENDER. KEEP THIS PINK COPY.

HRSL

HYDRO-PURE SYSTEMS COMPANY

75 BLOOMFIELD AVENUE
DENVILLE, N.J. 07834

PHONE: 201-627-1315

BROWN-OLDS CORPORATION

TRANSMITTAL NO: 06

DATE: 05/23/84

TO:
BROWN OLDS CORPORATION
P.O. BOX 8739
ALBUQUERQUE, NM 87198

ATTN: MR. ARIEL GUTIERREZ

JOB:
H-P 20831
B-O PO E-[illegible]

ITEM NO.	REV	DRAWING/DOCUMENT TITLE	QUANT	TYPE	CODE
1	---	KYNAR CERTIFICATION OF VESSEL TK-21	ONE	COPY	I

L. Wnek

LARRY WNEK
PROJECT MANAGER

A. APPROVAL
C. CERTIFIED
F. FOR FABRICATION
I. FOR INFORMATION
P. PRELIMINARY

FILE: L:03,TR/06.331

ELECTRO CHEMICAL
ENGINEERING & MFG. CO.
Corrosion Specialists
965-9061 (Area Code 215)
750 BROAD STREET, PO BOX 509 • EMMAUS, PENNSYLVANIA 18049-0399

REC'D MAY 10 1984

May 8, 1984

Hydro Pure Systems Company
70 Bloomfield Avenue
Danville, New Jersey 07834

Attention: Larry Wnek

Re: Purchase Order 20831-4719
ELECTRO CHEMICAL Sales Order Y-1394

Gentlemen:

This is to certify that Reactor Vessel TK-21 has been lined with a nominal 60 mil thick KYNAR* laminate lining reinforced with carbon cloth, and that the lining has withstood a 5000 volt spark test without a burn through.

Very truly yours,

ELECTRO CHEMICAL ENGINEERING & MFG. CO.

Ernest V. Rohrbach

Ernest V. Rohrbach
Customer Service

EVR:tac
In duplicate

*tm of Pennwalt Corp.

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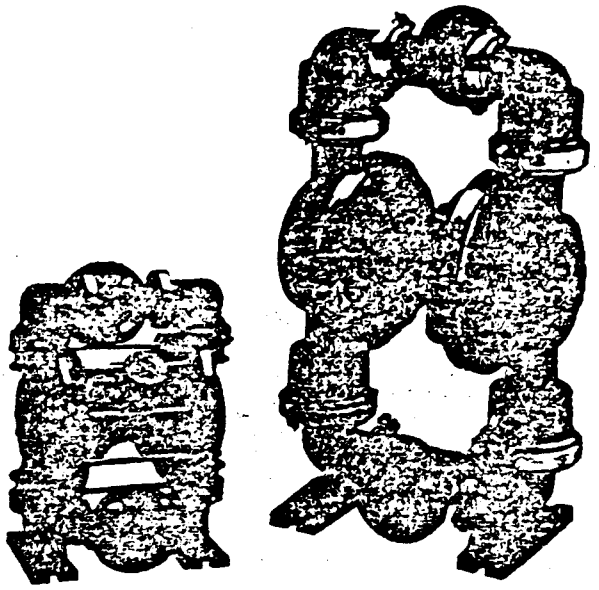
The Wilden

Available in Two Sizes

THE PUMP THE CHEMICAL PROCESS INDUSTRY HAS DEMANDED



M2 Champ
1" Flanged Inlet/Outlet

M8 Champ
2" Flanged Inlet/Outlet

A CORROSION-RESISTANT, SEALLESS, VIRTUALLY INDESTRUCTIBLE, INJECTION-MOLDED, SOLID . . .

PVDF OR POLYPROPYLENE WILDEN PUMP

The Wilden Champs operate on pressure to 100 psi with variable flow from 0 to 130 GPM. Broad application potential with special appeal to the chemical process industry.

- Self Priming
- High Suction Lift
- Can Run Dry
- Variable Speed & Pressure
- No Pressure Relief Required
- Sealless/Packingless Construction
- Easily Portable
- Low Maintenance
- Ferric Chloride
- Etching Solutions
- Planting Solution
- Acids/Bases
- Photo/Graphic Solutions
- Textile/Dye Solutions
- Solvents
- Pickling Solutions
- Aqua Regia
- Drum Pumping

"Our Business is making tough pumping jobs simple."

WILDEN PUMP® & ENGINEERING CO.

22069 Van Buren Street / Colton, CA 92324 / (714) 783-0621 / Telex (714) 676-452

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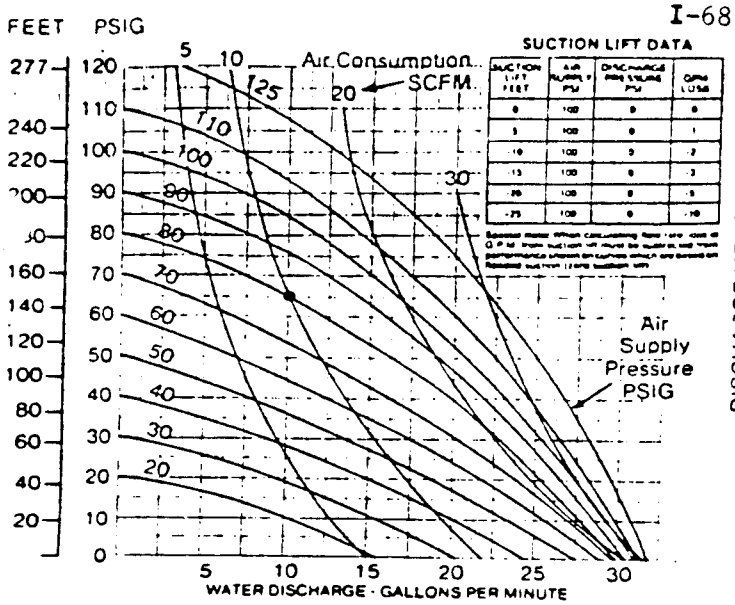


SUCTION LIFT DATA

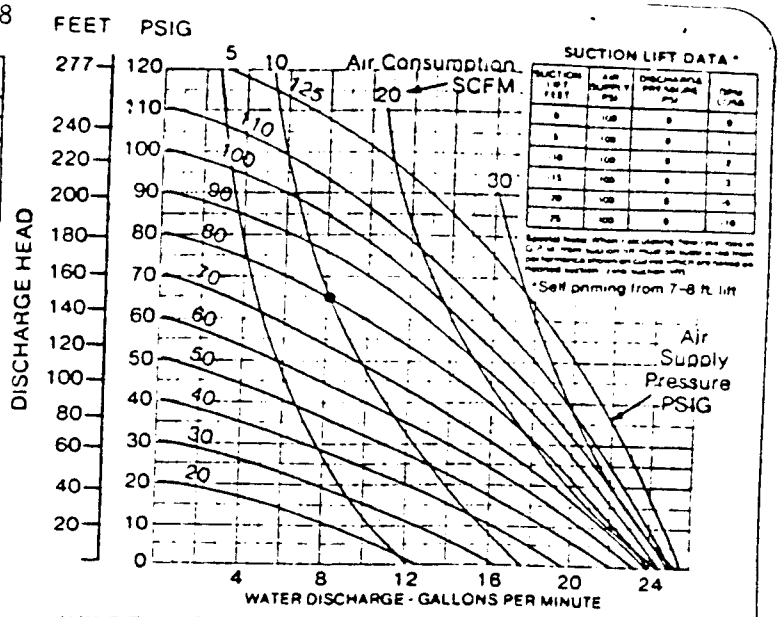
SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
5	100	0	1
10	100	0	2
15	100	0	3
20	100	0	5
25	100	0	10

Suggested models without cavitating flow (and loss of G.P.M. from suction lift must be subtracted) and their performances shown on curves which are based on Registered suction lines (same suction lift).

WILDEN MODEL M-2 SPECIFICATIONS AND PERFORMANCE

Height ..... 14"
Width ..... 10½"
Depth ..... 8 7/16"
Weight (Polypropylene) ..... 20 lbs
PVDF ..... N/A
Air Inlet ..... ¼" NPT
Inlet ..... 1" Flanged
Outlet ..... 1" Flanged
Suction Lift ..... 15' Dry 25' Wet
Max. Size Solids ..... ⅛" Dia.

Example: *With 80 PSIG inlet pressure and 10 SCFM air consumption, water discharge is 10 GPM against a head of 85 PSIG.*



SUCTION LIFT DATA*

SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
5	100	0	1
10	100	0	2
15	100	0	3
20	100	0	4
25	100	0	10

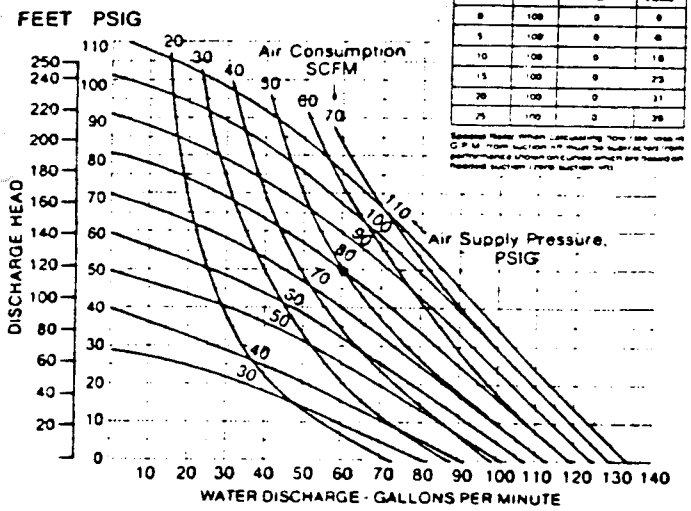
Suggested models without cavitating flow (and loss of G.P.M. from suction lift must be subtracted) and their performances shown on curves which are based on Registered suction lines (same suction lift).

*Self priming from 7-8 ft. lift

WILDEN MODEL M-2 T SPECIFICATIONS AND PERFORMANCE

Height ..... 14"
Width ..... 10½"
Depth ..... 8 7/16"
Weight (Polypropylene) ..... 20 lbs
PVDF ..... N/A
Air Inlet ..... ¼" NPT
Inlet ..... 1" Flanged
Outlet ..... 1" Flanged
Suction Lift ..... 7'-8' Dry 25' Wet
Max. Size Solids ..... ⅛" Dia.

Example: *To pump 8 GPM against a discharge pressure of 65 PSIG requires 60 PSIG and 10 SCFM air consumption.*
CAUTION: *Do not exceed 125 PSIG air supply pressure.*



SUCTION LIFT DATA

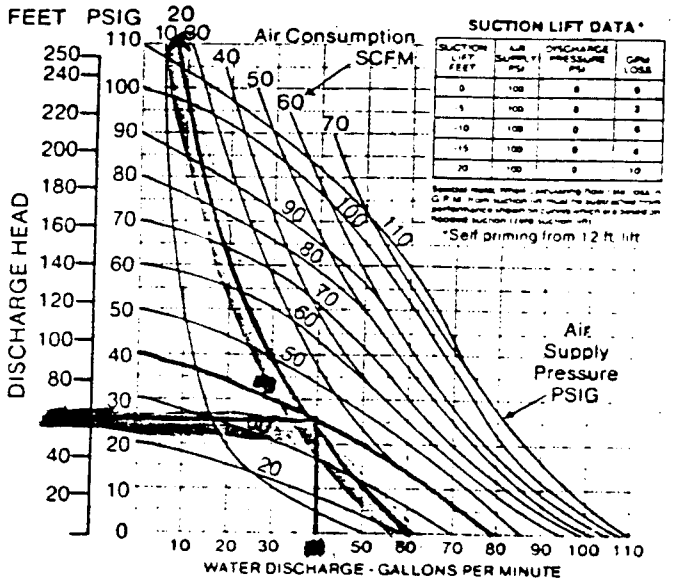
SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
5	100	0	4
10	100	0	18
15	100	0	23
20	100	0	31
25	100	3	38

Suggested models without cavitating flow (and loss of G.P.M. from suction lift must be subtracted) and their performances shown on curves which are based on Registered suction lines (same suction lift).

WILDEN MODEL M-8 SPECIFICATIONS AND PERFORMANCE

Height ..... 30⅛"
Width ..... 19½"
Depth ..... 13⅛"
Weight (Polypropylene) ..... 60 lbs
PVDF ..... 100 lbs
Air Inlet ..... ½" NPT
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ..... 20' Dry 25' Wet
Max. Size Solids ..... ¼" Dia.

Example: *To pump 80 GPM against a discharge pressure of 50 PSIG requires 80 PSIG and 50 SCFM air consumption.*
Caution: *Do not exceed 125 PSIG air supply pressure.*



SUCTION LIFT DATA*

SUCTION LIFT FEET	AIR SUPPLY PSI	DISCHARGE PRESSURE PSI	GPM LOSS
0	100	0	0
5	100	0	2
10	100	0	6
15	100	0	4
20	100	0	10

Suggested models without cavitating flow (and loss of G.P.M. from suction lift must be subtracted) and their performances shown on curves which are based on Registered suction lines (same suction lift).

*Self priming from 12 ft. lift

WILDEN MODEL M-8 T SPECIFICATIONS AND PERFORMANCE

Height ..... 30⅛"
Width ..... 19½"
Depth ..... 13⅛"
Weight (Polypropylene) ..... 60 lbs
PVDF ..... 100 lbs
Air Inlet ..... ½" NPT
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ..... 12' Dry 18' Wet
Max. Size Solids ..... ¼" Dia.

Example: *To pump 28 GPM against a discharge pressure of 40 PSIG requires 50 PSIG and 20 SCFM air consumption.*
Caution: *Do not exceed 125 PSIG air supply pressure.*

Wilden "Champ" is tested and proven for handling corrosive, abrasive, or viscous liquids and slurries for the Chemical Process Industry. Engineered in response to your requests for a able, non-metallic, sealless, positive displacement pump, the "Champ" adds emphasis to the versatility of the Wilden Air Operated Diaphragm Pump line.

ELIABILITY, CORROSIVE RESISTANCE, AND SAFETY were key words in the "Champ" Research and Development Program.

ELIABILITY was insured by the decision to build the non-metallic wetted parts around the proven Wilden Air Valve System, and to incorporate the time tested Wilden M-2 and diaphragms in the "Champ" design.

ORROSIVE RESISTANCE centered on selection of materials. Wilden engineers spent many months analyzing the broad range of available thermoplastic, thermoset, and other non-tallic equipment and evaluation of their field experience as well as discussions with material suppliers and plastics fabricators led to the selection of PVDF and Polypropylene as the st suitable materials to complement the versatile Wilden Diaphragm Pump System.

POLYPROPYLENE has good chemical resistance, moderate heat resistance, and exceptional flex fatigue resistance at a reasonable cost.

PVDF (polyvinylidine fluoride), while higher in cost, offers exceptional chemical resistance, higher temperature resistance, and excellent mechanical properties.

Th materials in combination with either the patented Wilden Teflon® diaphragm or any one of four elastomeric materials offer the broadest possible range of compatibility with s and solvent.

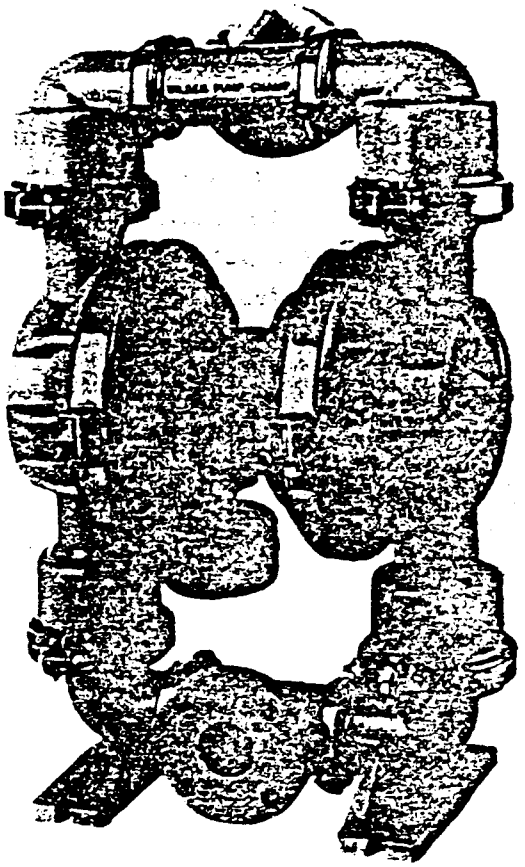
Y is evident in the rugged appearance of the "Champ". The massive ribs of the water chambers, the large flanges with sturdy, specially designed stainless steel clamp bands, and ck wall sections are testimony to the efforts of Wilden engineers.

We proudly present the "Champ", a pump we build with care and pride to handle your most difficult assignments. We ask your cooperation in carefully selecting the appropriate terials for your specific applications. Many factors affect the chemical and mechanical properties of materials. These include, but are not limited to exposure time, extremes of tempera- e and pressure, frequency of temperature and/or pressure cycling and attrition due to abrasive particles. Wilden Air Diaphragm Pumps are also available in four sizes in Aluminum, Cast n, 316 Stainless Steel and Hastelloy C® for those applications where polypropylene and PVDF are not appropriate.

PERATURE LIMITS: Polypropylene +32°F – 150°F; PVDF 200°F.

N: Temperature limits are based upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult engineering for chemical compatibility and temperature limits. M-2 Polypropylene is glass filled and not suitable for handling hydrofluoric acid.

M-8 "CHAMP"



IF IT POURS IT PUMPS

WILDEN PUMPS

AIR OPERATED DOUBLE DIAPHRAGM POLYPROPYLENE/KYNAR® MODEL M8 "CHAMP"

"OUR ONLY PRODUCT"

REPAIR PARTS LIST AND OPERATING INSTRUCTIONS

INSTALLATION INSTRUCTIONS

The Wilden "Champ" is a Wilden model M-8 pump (2 inch) with all wetted parts of injection molded polypropylene or Kynar® (PVDF) material. Performance and operation of the "Champ" are essentially the same as other Wilden model M-8 pumps of metal construction subject to temperature and chemical compatibility of the material being pumped with polypropylene and Kynar.

The M-8 Champ comes standard with aluminum/brass non-wetted parts. Optional cast iron/brass non-wetted parts are available. The M-8 Champ should not be used for submersible applications unless both wetted and non-wetted portions are compatible with the material being pumped.

The M-8 Champ has 150 psi American Standard two inch pipe flange inlet and outlet ports. In permanent installations, the pump should be attached to plant piping through flexible couplings on both the inlet and outlet ports to reduce pipe vibration due to the reciprocating nature of the pump. To further reduce vibration, a surge suppressor may be installed immediately adjacent to the discharge port.

Suction pipe size should be at least 2" diameter or even larger if highly viscous material is to be pumped. If suction hose is used, it must be of a [illegible] capable, reinforced type as the M-8 is capable of pulling a high v[illegible]. Discharge piping should be at least 2". It is critical, especially on the [illegible]ion side of the pump, that all fittings and connections are air tight or a reduction or loss of pump suction capability will result.

*Kynar (PVD Resin) is a registered trademark of Pennwalt Corp.

THE M-8 PUMP WILL PASS ¼" DIAMETER SOLIDS. WHENEVER THE POSSIBILITY EXISTS THAT LARGER SOLID OBJECTS MAY BE SUCKED INTO THE PUMP, A STRAINER SHOULD BE USED ON THE SUCTION LINE.

The inlet to the air valve is ½" NPT. The compressed air line to the pump should be at least ½". The air line should be large enough to supply the volume of air necessary to achieve the desired pumping rate (see M-8 pump performance curve.) Use air pressure up to 110 psig depending upon pumping requirements.

CAUTION: DO NOT EXCEED 125 PSIG AIR SUPPLY PRESSURE.

Pump discharge rate can be controlled by:

1. Limiting the volume and/or pressure of the air supply to the pump (preferred method). The use of a gate valve or needle valve installed at the air inlet to the pump is suggested for this purpose.
2. Throttling the pump discharge by installing a valve in the discharge line of the pump when the need to control the pump from a remote location exists. When the pump discharge pressure equals or exceeds the air supply pressure, the pump will stall out; no bypass or pressure relief valve is needed and pump damage will not occur.

Sound level can be reduced below 90 dba by attaching our optional muffler at pump air exhaust port.

Temperature Limits: Polypropylene – 150°F
Kynar® (PVDF) – 200°F

Caution: Maximum temperature limits are based upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult engineering guide for chemical compatibility and temperature limits.

OPERATING INSTRUCTIONS

A. The model M-8 comes with a built-in oil reservoir. This should be kept filled with a 10 weight motor oil. If the pump is placed in a permanent installation, the use of an air line oil lubricator is suggested. No alterations should be made to the pump. In cold weather operation or conditions of high discharge pressure, the air valve may freeze due to moisture in the air line. if this occurs the use of ehtylene glycol type anti-freeze or other deicer such as Tannergas can be substituted for the 10 weight oil.

B. Make sure air line to pump is free from dirt or other foreign matter. The air valve screen P/N 20E (see air valve diagram) will generally collect any particles too large to pass through the pump's air system. If pump performance drops off, check this screen for clogging.

C. Turn on air supply to pump. CAUTION: Make sure air supply pressure to pump does not exceed 125 psig. If it does, a pressure regulator should be installed and set at a maximum of 125 psig.

D. Pumping volume (gpm) can be set by counting the number of strokes per minute. The M-8 pumps approximately .77 gallons per stroke. A stroke is ½ cycle or one air exhaust.

When pump is used for moving thick materials, check stroke rate to determine that pump is not operating at a faster rate than material is capable of flowing, or cavitation will occur. If pump is operating at a speed too fast for available flow, reduce the volume of air to the pump until stroke rate approximates discharge volume.

E. Always flush pump after use if material being pumped will pack or solidify. The pump can be turned upside down and all liquid will drain out.

F. For pumps fitted with teflon diaphragms, limit suction inlet pressure to 10 psig maximum.

CAUTION: WEAR SAFETY GLASSES. WHEN DIAPHRAGM FAILURE OCCURS, MATERIAL BEING PUMPED MAY BE FORCED OUT AIR EXHAUST.

TROUBLE SHOOTING

Pump will not run or runs slowly

1. Check air inlet screen for dirt.
2. Check for sticking air valve, flush air valve in solvent.
3. Check for worn out air valve. If piston face in air valve is shiny instead of dull, air valve is probably worn beyond working tolerances and must be rebuilt by Wilden or replaced.
4. Check center block O-rings. If worn excessively they will not seal and air will simply flow through pump and out air exhaust. Use only Wilden O-rings as they are of special construction.

Pump runs but little or no product flows

1. Check for pump cavitation; slow pump speed down to match thickness of material being pumped.
2. Check for sticking valve balls. If material being pumped is not compatible with pump elastomers, swelling may occur; replace balls and seats with proper elastomers.
3. Check to make sure all suction connections are air tight, especially clamp bands around intake balls.

Pump air valve freezes

Check for excessive moisture in compressed air. Either install dryer for compressed air or use an anti-freeze such as Tannergas or Killfrost in lieu of SAE 10W oil.

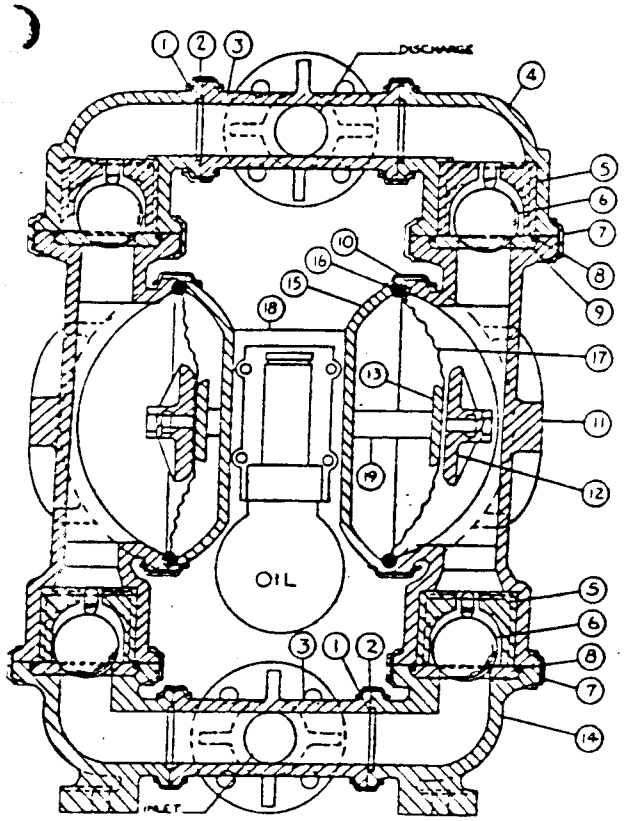
Air bubbles in pump discharge

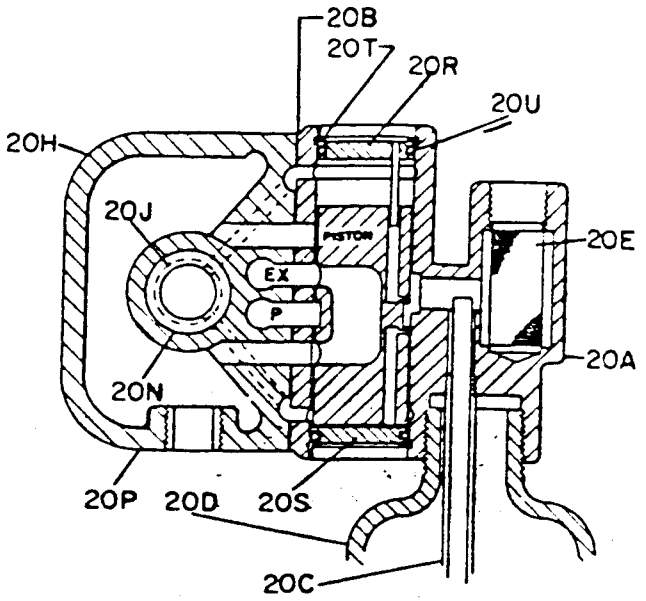
1. Check for ruptured diaphragm.
2. Check tightness of clamp bands, especially at intake manifold.

Product comes out air exhaust

1. Check for diaphragm rupture.
2. Check tightness of piston plates to shaft
3. Insure Piston O-Ring is in place, if required on model involved.

WILDEN AIR OPERATED DOUBLE DIAPHRAGM PUMP MODEL M-8 "CHAMP"





AIR VALVE ASSEMBLY, P/N 20

PARTS LIST

Drawing Index No.		Part Numbers for* M8/PT/TF/TF/PT
1	Manifold O-Ring	PT32B
2	Clamp Band, Small	P32
3	Manifold "T" Section	P33
4	Discharge Elbow	P36
5	Ball Guide Bushing	P41C
6	Valve Ball	TF41
7	Clamp Band, Medium	P39
8	Valve Seat O-Ring	PT40B
9	Valve Seat	P40
10	Clamp Band, Large	P30
11	Water Chamber	P35
12	Piston Outer W/Lug	PT21B
13	Piston Inner	T21C
14	Inlet Elbow	P37
15	Air Chamber	22
16	Teflon Diaphragm O-Ring	TF24A
17	Diaphragm	TF24
18	Air Valve Assembly	B20
19	Shaft	T21A

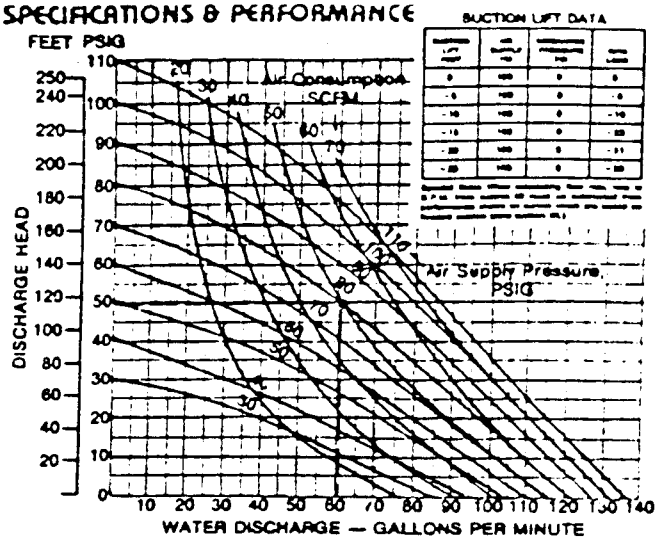
M-8 STANDARD AIR VALVE PARTS LIST

P/N	
20A	Valve Body & Piston (ii)
20B	Valve Gasket
20C	Capillary Rod
20D	Oil Bottle
20E	Valve Screen
20H	Center Block Assembly (iii)
20JH	O-Ring (7 each)
20N	Block Bushing
20P	Block Gasket (2 each)
20R	Valve Cap w/Guide Pin
20S	Valve Cap
S20T	Snap Ring (2 each)
20U	Valve Cap O-Ring (2 each)

(i) P/N 20 includes 20A through 20U
(ii) P/N 20A includes only 20E, 20R, 20S, 20T and 20U.
(iii) P/N 20H includes only 20N and 20JH.

NOTE: *Part numbers shown are for polypropylene pumps fitted with teflon diaphragms. See M-8 prices sheet for specific part number information on standard parts as well as on parts of other plastic and elastomeric materials or configurations.

SPECIFICATIONS & PERFORMANCE



SUCTION LIFT DATA

0	100	0	0
-4	100	0	3
-10	100	0	6
-15	100	0	8
-20	100	0	10

WILDEN

MODEL M-8®

Height ..... 30⅜"
Width ..... 19½"
Depth ..... 13⅜"
Weight .....
..... POLYPROPYLENE 60 lbs.
..... KYNAR 100 lbs.
Air Inlet ..... ½" N.P.T.
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ... 20' Dry
25' Wet
Max. Size Solids ¼" Dia.

Example: *To pump 60 gpm against a discharge pressure of 50 psig, requires 80 psig and 50 scfm air consumption.*

CAUTION: Do not exceed 125 psig air supply pressure.

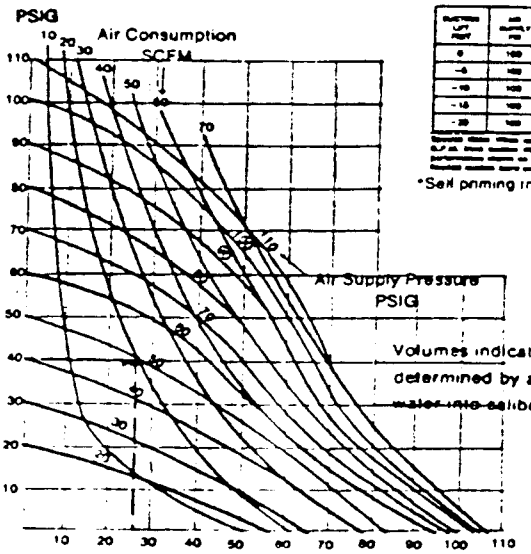
SPECIFICATIONS & PERFORMANCE
TEFLON DIAPHRAGMS

WILDEN®
MODEL M-8®

Height ..... 30⅜"
Width ..... 19½"
Depth ..... 13⅜"
Weight .....
..... POLYPROPYLENE 60 lbs.
..... KYNAR 100 lbs.
Air Inlet ..... ½" N.P.T.
Inlet ..... 2" Flanged
Outlet ..... 2" Flanged
Suction Lift ... 12' Dry
18' Wet
Max. Size Solids ¼" Dia.

Example: *To pump 28 gpm against a discharge pressure of 40 psig, requires 50 psig and 20 scfm air consumption.*

CAUTION: Do not exceed 125 psig air supply pressure.

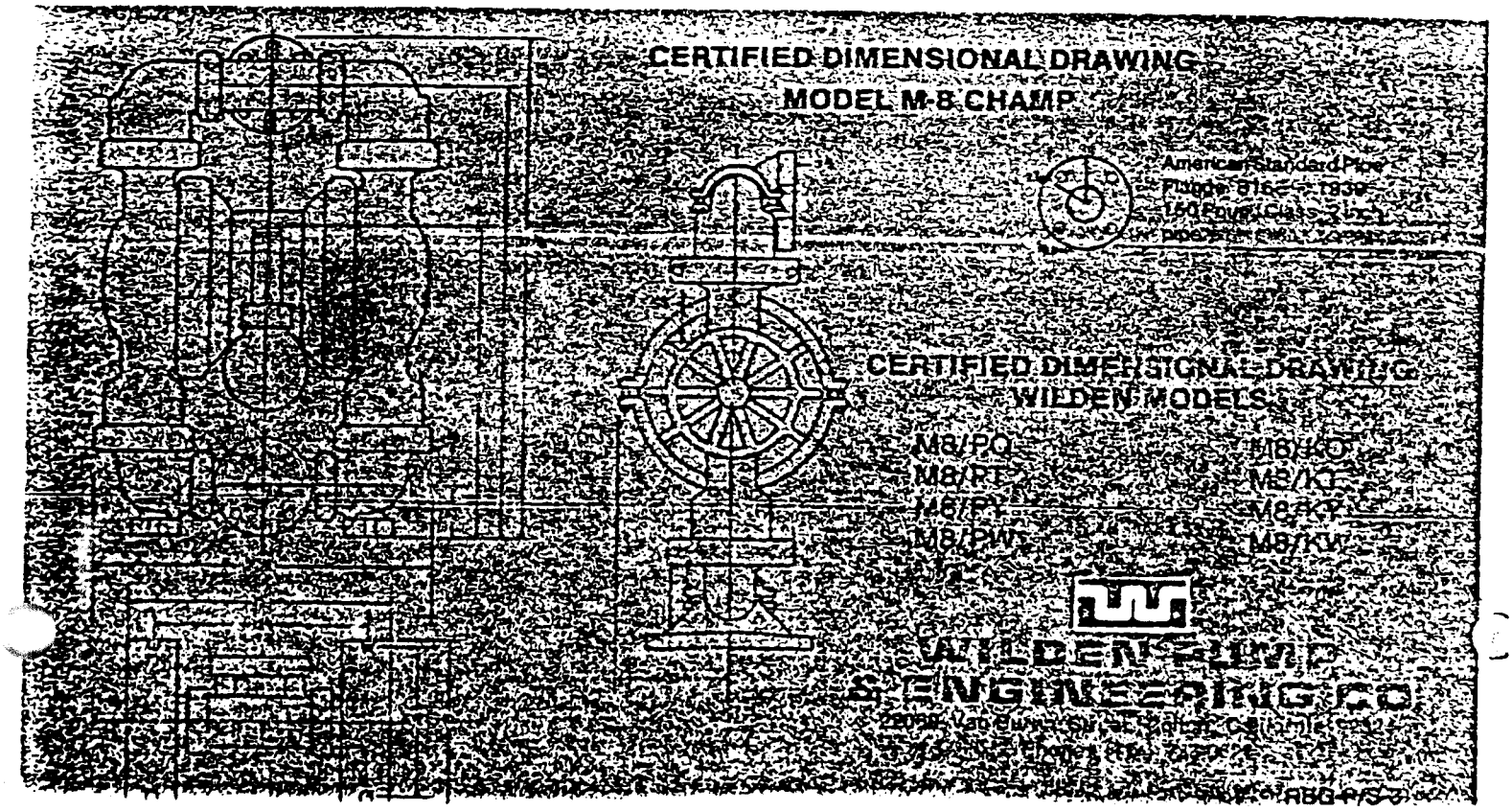


SUCTION LIFT DATA*

0	100	0	0
-4	100	0	3
-10	100	0	6
-15	100	0	8
-20	100	0	10

*Self priming from 12 feet lift.

Volumes indicated on chart were determined by actually pumping water into calibrated tanks



WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P O BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621

February 27, 1981

(INTERIM) M8 "CHAMP" ASSEMBLY/DISASSEMBLY INSTRUCTIONS

The M8/PT/TF/TF/PT pump is essentially a standard Wilden M8 pump with injection molded wetted parts. The air valve, center assembly and diaphragms are standard proven Wilden components. Principal differences other than material include: 150 psi American Standard pipe flanges instead of threaded inlet and discharge ports; increased external dimensions; ten sets of clamp bands as compared with six; and the use of O-rings for seals. Performance and operation is the same as a metal construction M8 with one exception. The maximum temperature for the polypropylene is limited to 150 degrees Fahrenheit and 200 degrees Fahrenheit for the KYNAR^R PVDF Resin.

Dismantling and assembly is also very comparable to other Wilden pumps with a couple of minor variations. First, the inlet and discharge manifolds are obviously an assembly of three molded parts, two O-rings and two sets of clamp bands rather than a single casting. We would suggest that these components be treated as a single part when possible during diaphragm changes or other maintenance requiring dismantling of the pump. If it is necessary to disassemble the manifolds, the customer should plan on replacing the Teflon O-ring seals. If disassembled, the manifolds should be completely reassembled and the manifold clamp bands securely fastened prior to reinstalling the manifolds on the pump center assembly. A key factor during reassembly of the manifolds is correct alignment. The two flange surfaces which mate with the water chambers must be parallel and in the same plane. The inlet or discharge flange face should be perpendicular to the clamp band flanges.

To dismantle the manifolds, simply remove the clamp bands. To reassemble a manifold, first install the O-rings in the O-ring grooves on each of the manifold elbow sections, and place one elbow in a soft jawed vise with the smaller flanged surface horizontal. Next, the manifold "T" section may be placed in position and the clamp band installed. Insure that the flanged surfaces remain aligned while tightening the clamp band bolts. Correct, if necessary, by tapping the parts firmly with a rubber or plastic mallet. Now place the remaining elbow in position and install the second clamp band. As the clamp band is tightened, use a straight edge to insure that both of the larger flanges remain in the same plane.

Another significant difference is that the plastic pumps have removable ball cages in place of the cast-in fingers in the metal parts. Prior to reassembling a pump, insure that the ball cages are installed in each discharge elbow and the bottom of each water chamber. If required, the ball cage should be seated by tapping with a rubber or plastic mallet so that the surface of the ball cage is flush with the flange surface.

over . . .

The polypropylene and KYNAR pumps have removable ball seats with a step around the outer circumference which forms an O-ring groove when the seat is placed in the inlet elbow or top of the water chamber. When assembling the inlet and discharge manifolds to the center assembly, place the seats in the top of the water chambers and inlet elbows, and place an O-ring on the groove. Place the center assembly on the inlet manifold carefully aligning the flanges. Install both clamp bands and alternately tighten the bands maintaining correct flange alignment by tapping with a rubber or plastic mallet as required. Install the top manifold using the same technique.

Another tip which will minimize leakage problems is not to attempt to reuse the Teflon O-ring seals. The O-rings are intentionally distorted during the assembly process conforming to the exact shape of the O-ring groove and opposite flange, and may not be reusable.

Upon completion of our printed literature, copies will be mailed to you. If you have any questions or comments regarding these instructions or the plastic pumps, please do not hesitate to call.

The results of our research and testing conducted with the "Champ" have been excellent, and have exceeded our expectations. We trust your experience will be similar.

ADT:vv

SUGGESTED SPARE PARTS

WILDEN M-8 "CHAMP" WITH TEFLON

QUANTITY	PART NUMBER	DESCRIPTION
4	TF24	Diaphragm (Teflon)
4	TF24B	Back-up Diaphragm (Neoprene)
4	TF41	Valve Balls (Teflon)
8	KT40B	Valve Seat O-ring (Teflon)
8	KT32B	Manifold O-ring (Teflon)
2	20B	Air Valve Gasket
4	20P	Block Gasket
1	T21A	Shaft w/studs
7	20JH	Bushing O-rings

NOTE: Frequency replacement may vary depending on severity of service.

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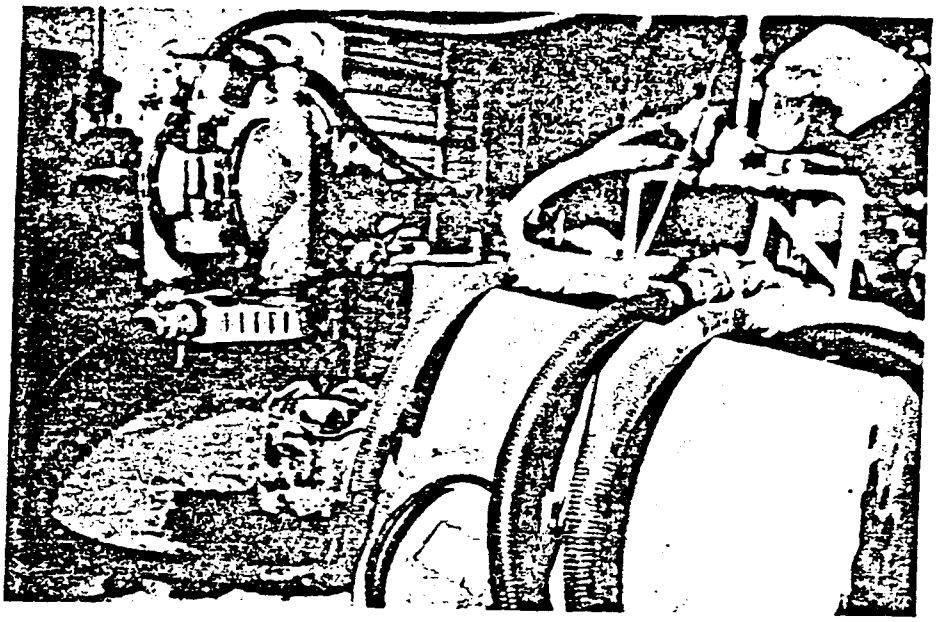


INFORMATION BULLETIN
PUMP TEST PROCEDURE

The following is an explanation of the procedure used to test every pump manufactured and shipped by Wilden Pump and Engineering Company.

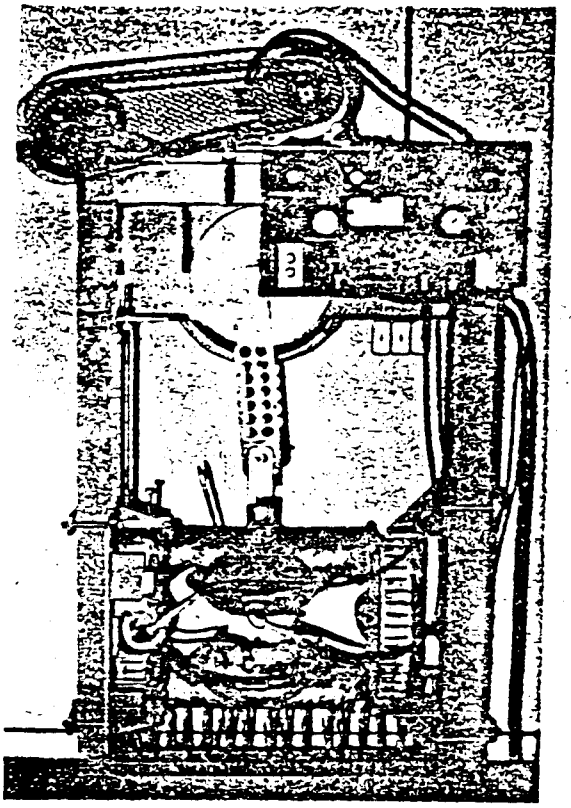
1. 90 to 100 PSI air is applied to the pump to verify that the air valve and the pump is shifting properly.

2. Hoses are hooked up to the suction and discharge manifolds. The pump is then operated by pumping water into a recirculating tank. Self-priming characteristics are verified and the pump is stalled out with a shut-off valve in the discharge line. The pump is allowed to set under pressure to check for any leaks in the casting and the air valve is tested at near-stall conditions for proper function.

3. The pump is then pressurized with an external pump to check for leaks in the intake manifold.

4. After every pump built by Wilden is tested in the above procedure, it is then sealed, painted and shipped to a distributor for resale.

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621

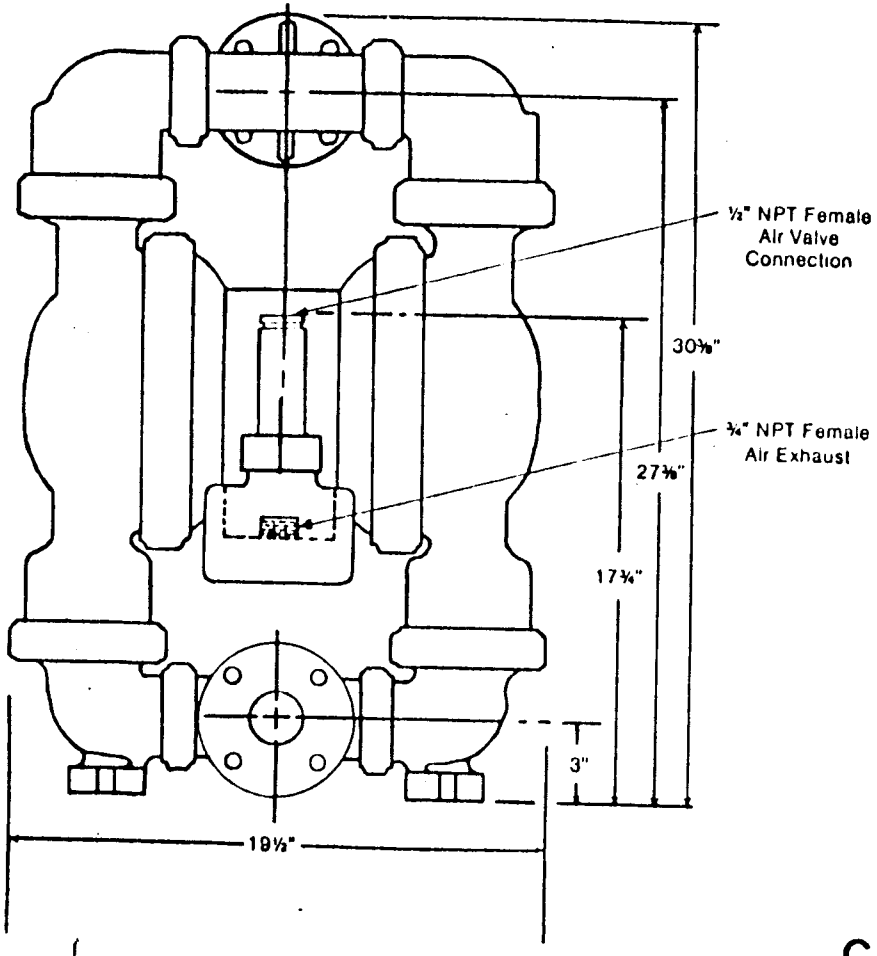


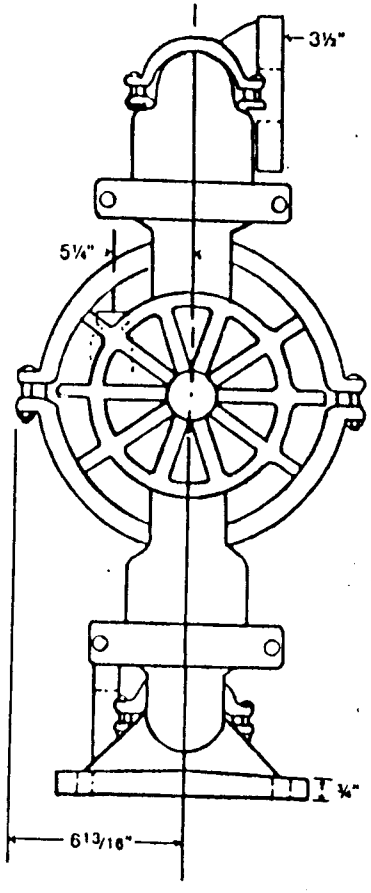
INFORMATION BULLETIN
DIAPHRAGM TESTING PROCEDURE

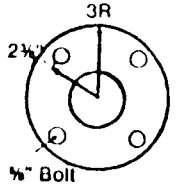
Wilden Pump and Engineering Company continuously tests the diaphragms for the pumps on the tester shown in the photo above. Through the use of this unique tester, we have been able to continually develop better, longer lasting diaphragms for the Wilden Pumps.

A specially modified pump is used in the horizontal position. The diaphragms are stroked mechanically by an electric motor connected through a cam and shaft arrangement to the diaphragms. The cycle rate is set at 200 rpm's and a 50 psi head of air is used to provide a working load on the diaphragms. An elapsed time counter is attached to a pressure-sensitive switch so that power is cut off when diaphragm failure occurs.

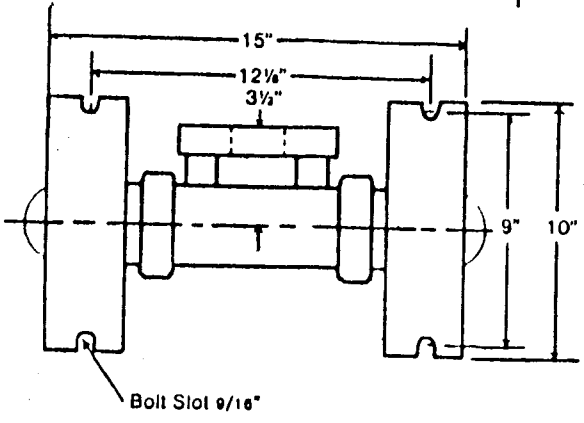
The unique tester, which can be used to test all diaphragm types and sizes, is one more way for Wilden Pump and Engineering to assure the finest quality for its pumps and parts.







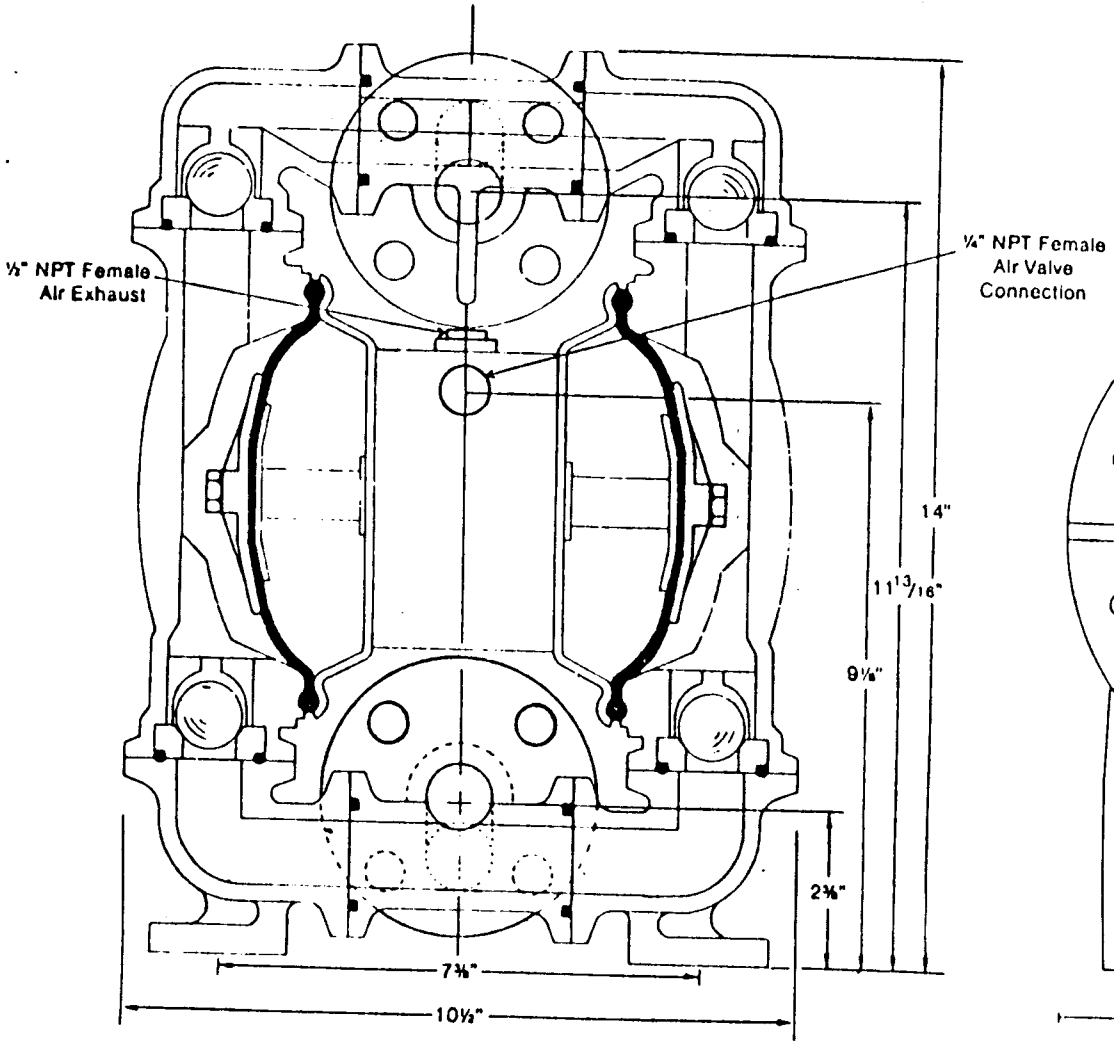
American Standard Pipe Flange B16E - 1939 - 150 Pound Class - 2 inch pipe.

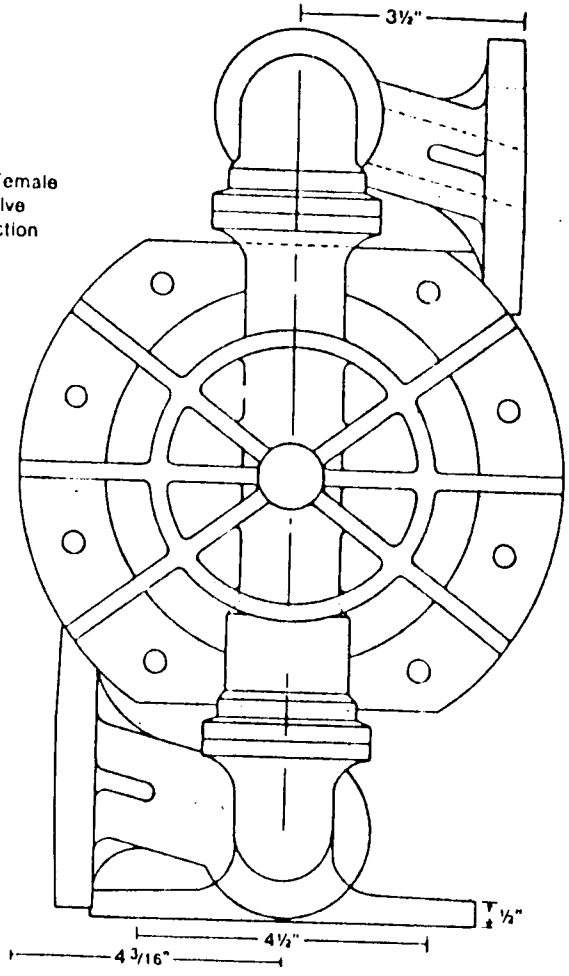


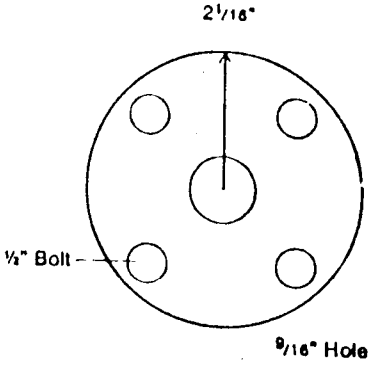
CERTIFIED DIMENSIONAL DRAWING
WILDEN MODELS
MODEL M-8 CHAMP

M8/PO	M8/KO
M8/PT	M8/KT
M8/PY	M8/KY
M8/PW	M8/KW

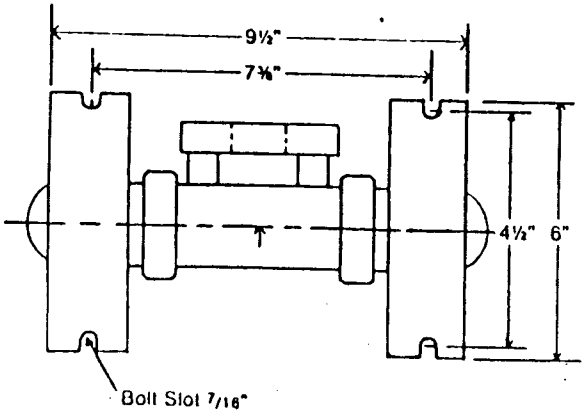
* Copyright Wilden Pump and Engineering, 1983







American Standard Pipe Flange 150 Pound Class – 1 inch pipe. 3 130" bolt circle.



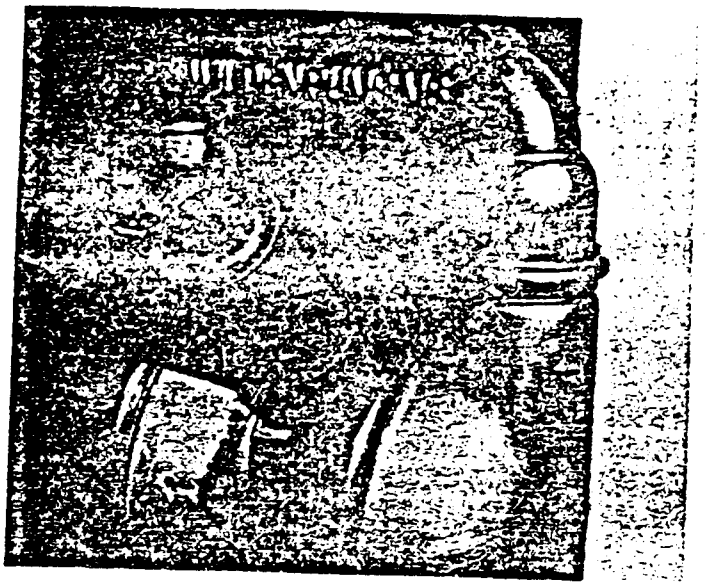
CERTIFIED DIMENSIONAL DRAWING

WILDEN MODELS
MODEL M2 CHAMP

M2/PO M2/PT

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET P.O. BOX 845 COLTON CA 92324

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621



NOISE CONTROL
WILDEN AIR OPERATED DOUBLE DIAPHRAGM PUMPS

All Wilden pumps can be ordered with an optional, large volume muffler.

This muffler reduces the exhaust sound level to below 90 decibels; the level which is generally accepted by OSHA as a cut-off for eight hours of continuous operator exposure.

Following are the db reading for all three Wilden models with and without a muffler.

MODEL	WITH MUFFLER	WITHOUT MUFFLER
M-4	81 db	108 db
[redacted]	[redacted]	[redacted]
M-15	89 db	115 db

The above readings were made at a distance of one meter from the pump and a height of one and one-half meters above the exhaust part of the pump.

AIR PUMP CO.
AREA CODE 313 PHONE 234-8894
P.O. BOX 4389 • FLINT, MICHIGAN 48504

SHOULD YOUR WILDEN AIR DRIVEN PUMP GIVE YOU TROUBLE BECAUSE OF "ICING" PLEASE READ THIS:

FREEZE UP OF EXHAUST PORTS OF AIR DRIVEN MACHINERY HAS BEEN A PROBLEM FOR MANY YEARS BLAMED ON TO THE MACHINE; WHEREAS ITS CAUSE IS THE INHERENT WATER VAPOR IN ALL COMPRESSED AIR SYSTEMS. 5412 PPM @ 100°F AND 100 PSIG AND ONLY 125 PPM @ 5°F AND 100 PSIG.

WHEN THE AIR EXPANDS FROM ONE PRESSURE TO ANOTHER LOWER PRESSURE IT REQUIRES HEAT AND THEREFORE PRODUCES A REFRIGERATION EFFECT IN ACCORDANCE WITH THE EQUATION PV/T = pv/t. THIS MAY FREEZE THE WATER OUT OF THE COMPRESSED AIR AND CLOG THE EXHAUST PORT.

SINCE THE INLET PRESSURE, VOLUME AND TEMPERATURE VARY ON ALMOST EVERY APPLICATION, IT REALLY FURTHER CONFUSES THE PROBLEM WHEN ONE AIR SYSTEM HAS A PRESSURE DEWPOINT OF 130°F BECAUSE OF INADEQUATE AFTERCOOLING AND THEN THE NEXT HAS A PRESSURE DEWPOINT OF 35°F. BECAUSE OF GOOD COMMERCIALLY AVAILABLE REFRIGERATED DRYER EQUIPMENT.

THE VARIABLES IN LOAD, AIR QUALITY AND AMBIENT TEMPERATURES ARE SO COMPLEX THAT IT ISN'T POSSIBLE TO MAKE A BLANKET STATEMENT AS TO WHEN FREEZE UP TEMPERATURES WILL OCCUR; HOWEVER, IF WE REMOVE WATER FROM THE COMPRESSED AIR DOWN TO 22°F. @ ATMOSPHERIC PRESSURE, WE ARE BELOW THE LIQUID STATE OF WATER WHICH FREEZES TO CAUSE THE ICE AND THUS THE CLOGGED PORT.

THE SOLUTIONS AVAILABLE ARE THE FOLLOWING AND ANY STEP BEYOND WHAT YOU ARE DOING TO YOUR COMPRESSED AIR MIGHT SOLVE YOUR PROBLEM, BUT WITH STEP 10 BEING MONEY BACK GUARANTEED TO SOLVE IT.

ON PUMP:

1. ETHYLENE GLYCOL IN THE OIL BOTTLE.
2. REMOVE AIR EXHAUST BALL CHECK AND COME OUT OF EXHAUST WITH ELBOW AND 6" OF STRAIGHT PIPE.
3. PUT AIR LINE LUBRICATOR (FILLED WITH ETHYLENE GLYCOL) IN AIR SUPPLY LINE.
4. TRY "KILL FROST" IN PUMP OIL BOTTLE AND AIR LINE LUBRICATOR.

ON AIR SYSTEM:

5. AIR COOLED AFTERCOOLER WITH SEPARATOR.
6. WATER COOLED AFTERCOOLER WITH SEPARATOR.
7. 25°F DEWPOINT DEPRESSANT (SALT) DESICCANT TYPE DRYER.
8. 50°F DEWPOINT DEPRESSANT GENERAL SUPER DRY DESICCANT DRYER.
9. REFRIGERATED TYPE COMPRESSED AIR DRYER 35°F DEWPOINT AT PRESSURE.
10. COMBINATION REFRIGERATED AND DESICCANT TYPE COMPRESSED AIR DRYER PRODUCING 5°F PRESSURE DEWPOINT @ 100 PSI.

Roy R. Haedt

Effective Date April 1, 1983

WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621 / Telex 678-452

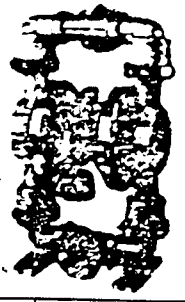
MODEL M 8

POLYPROPYLENE PUMP PARTS

for Models:

M8/PO/ M8/PW/
M8/PT/ M8/PY/

(Suggested U.S. List Prices)



DESCRIPTION	Qty. Per Pump	M8/PO/		M8/PT/		M8/PW/		M8/PY/	
		P/N	Price	P/N	Price	P/N	Price	P/N	Price
Air Valve Assembly	1	B20	375.00	←	←	N/A		N/A	
Air Valve Body & Piston	1	B20A	175.00	←	←	W20A	180.00	←	←
Air Valve Screen	1	20E	5.00	←	←				
Air Valve Cap w/Guide (Top)	1	20R	6.00	←	←	20RB	10.00	←	←
Air Valve Cap (Bottom)	1	20S	5.00	←	←	20SB	9.00	←	←
Snap Ring	2	S20T	2.00	←	←				
Air Valve Cap O-ring	2	20U	.50	←	←				
Air Valve Gasket	1	20B	1.00	←	←				
Lubricator Capillary Rod Assy.	1	20C	18.00	←	←				
Lubricator Oil Bottle	1	20D	26.00	←	←	W20D	32.00	←	←
Center Block Assembly	1	20H	140.00	←	←	W20H	210.00	←	←
O-ring	7	20JH	.50	←	←				
Block Bushing	1	20N	30.00	←	←				
Check Body	1	20K8	6.00	←	←	W20K8	12.00	←	←
Nipple	1	20FS	5.00	←	←				
Check Ball	1	20M	2.00	←	←				
Block Gasket	2	20P	1.00						
Shaft	1	21A	45.00	T21A	45.00	21A	45.00	T21A	45.00
Piston, Inner	2	21B	25.00	T21C	20.00	21B	25.00	T21C	20.00
Piston, Outer w/Lug	2	P21B	125.00	PT21B	85.00	P21B	125.00	PT21B	85.00
Piston O-ring	2	N/R		N/R		N/R		N/R	
Air Chamber, Tapped (Replaced by 22B)				←	←				
Air Chamber, Counter Sunk	2	22B	60.00	←	←	W22B	86.00	←	←
Water Chamber	2	P35	345.00	←	←				
Clamp Band (Large)	2	P30	45.00	←	←				
Clamp Band (Medium)	4	P39	25.00	←	←				
Clamp Band (Small)	4	P32	20.00	←	←				
Discharge Elbow	2	P36	125.00	←	←				
Inlet Elbow	2	P37	140.00	←	←				
Manifold "T" Section	2	P33	145.00	←	←				
Ball Guide Bushing	4	P41C	35.00	←	←				
Valve Seat	4	P40	20.00	←	←				
Valve Seat O-ring (Buna N)	4	P40B*	1.00	N/R		P40B*	1.00	N/R	
Manifold O-ring (Buna N)	4	P32B**	1.00	N/R		P32B**	1.00	N/R	
Valve Seat O-ring (TFE)	4	N/R*		PT40B	4.00	N/R*		PT40B	4.00
Manifold O-ring (TFE)	4	N/R**		PT32B	3.00	N/R**		PT32B	3.00
Teflon Diaphragm O-ring	2	N/R		TF24A	10.00	N/R		TF24A	10.00
Teflon Back-up Diaphragm (Neoprene)	2	N/R		TF24B	20.00	N/R		TF24B	20.00
Expanded Teflon Gasket Kit	1	N/R		TF4/8GK	25.00	N/R		TF4/8GK	25.00

* Check first to see if pump was supplied originally with Valve Seat O-rings of Teflon, P/N PT40B.
** M8/PO and M8/PW which have Nordel or Viton diaphragms are fitted with P/N PT32B, Manifold O-rings of Teflon.

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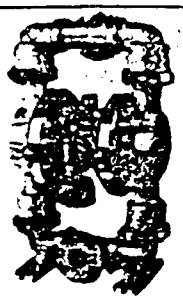
RBG-P-S

Effective Date April 1, 1983

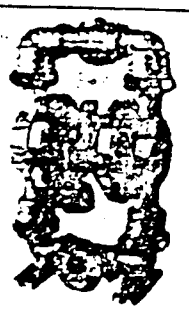
WILDEN PUMP & ENGINEERING CO.
22069 VAN BUREN STREET, P.O. BOX 845, COLTON, CALIFORNIA 92324 / (714) 783-0621 / Telex 876-452



MODEL M 8

KYNAR PUMP PARTS for Models:

M8/KO/ M8/KW/
M8/KT/ M8/KY/



(Suggested U.S. List Prices)

DESCRIPTION	Qty. Per Pump	M8/KO/		M8/KT/		M8/KW/		M8/KY/	
		P/N	Price	P/N	Price	P/N	Price	P/N	Price
Air Valve Assembly	1	B20	375.00	←		N/A		N/A	
Air Valve Body & Piston	1	B20A	175.00	←		W20A	180.00	←	
Air Valve Screen	1	20E	5.00	←					
Air Valve Cap w/Guide (Top)	1	20R	6.00	←		20RB	10.00	←	
Air Valve Cap (Bottom)	1	20S	5.00	←		20SB	9.00	←	
Snap Ring	2	S20T	2.00	←					
Air Valve Cap O-ring	2	20U	.50	←					
Air Valve Gasket	1	20B	1.00	←					
Lubricator Capillary Rod Assy.	1	20C	18.00	←					
Lubricator Oil Bottle	1	20D	26.00	←		W20D	32.00	←	
Center Block Assembly	1	20H	140.00	←		W20H	210.00	←	
O-ring	7	20JH	.50	←					
Block Bushing	1	20N	30.00	←					
Check Body	1	20K8	6.00	←		W20K8	12.00	←	
Nipple	1	20FS	5.00	←					
Check Ball	1	20M	2.00	←					
Block Gasket	2	20P	1.00	←					
Shaft	1	21A	45.00	T21A	45.00	21A	45.00	T21A	45.00
Piston, Inner	2	21B	25.00	T21C	20.00	21B	25.00	T21C	20.00
Piston, Outer w/Lug	2	K21B	265.00	KT21B	140.00	K21B	265.00	KT21B	140.00
Piston O-ring	2	N/R		N/R		N/R		N/R	
Air Chamber, Tapped (Replaced by 22B)				←					
Air Chamber, Counter Sunk	2	22B	60.00	←		W22B	86.00	←	
Water Chamber	2	K35	1125.00	←					
Clamp Band (Large)	2	P30	45.00	←					
Clamp Band (Medium)	4	P39	25.00	←					
Clamp Band (Small)	4	P32	20.00	←					
Discharge Elbow	2	K36	465.00	←					
Inlet Elbow	2	K37	495.00	←					
Manifold "T" Section	2	K33	410.00	←					
Ball Guide Bushing	4	K41C	65.00	←					
Valve Seat	4	K40	50.00	←					
Valve Seat O-ring (Buna N)	4	P40B*	1.00	N/R		P40B*	1.00	N/R	
Manifold O-ring (Buna N)	4	P32B**	1.00	N/R		P32B**	1.00	N/R	
Valve Seat O-ring (TFE)	4	N/R*		PT40B	4.00	N/R*		PT40B	4.00
Manifold O-ring (TFE)	4	N/R**		PT32B	3.00	N/R**		PT32B	3.00
Teflon Diaphragm O-ring	2	N/R		TF24A	10.00	N/R		TF24A	10.00
Teflon Back-up Diaphragm (Neoprene)	2	N/R		TF24B	20.00	N/R		TF24B	20.00
Expanded Teflon Gasket Kit	1	N/R		TF4/8GK	25.00	N/R		TF4/8GK	25.00

*heck first to see if pump was supplied originally with valve seat O-rings of teflon, P/N PT40B.
** M8/KO and M8/KW which have Nordel or Viton diaphragms are fitted with P/N PT32B, Manifold O-rings of Teflon.

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APPENDIX I

Note: Specification for Epoxy Coating used on floor. New information begins on page I-84.

ENGLE 3

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 9 FINISHES

SUB-DIVISION 9.06 SPECIAL COATING

RMP THE RALPH M. PARSONS COMPANY	SHEET 1 OF 13	JOB NUMBER 6089	DOCUMENT NO. 9.06	REV

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish and apply special coatings in accordance with the contract drawings and this Specification. The Contractor shall apply the special coatings where indicated per the Room Finish Schedule.

1.2 RELATED WORK SPECIFIED ELSEWHERE

(1) CAST-IN-PLACE CONCRETE, Subdivision 3.01
(2) STRUCTURAL STEEL AND MISCELLANEOUS METALS, Subdivision 5.01
(3) METAL DOORS AND FRAMES, Subdivision 8.01
(4) PAINTING, Subdivision 9.07
(5) PIPING, Subdivision 15.01

1.3 REFERENCE DOCUMENTS

1.3.1 Codes and Standards

The Contractor shall comply with the applicable federal, state, and industry regulations and other codes and standards referenced in this Specification.

American National Standards Institute (ANSI)

ANSI N101.2	Protective Coatings (Paints) for Light Water Nuclear-Reactor Containment Facilities

American Society for Testing and Materials (ASTM)

ASTM D 659-74	Standard Method of Evaluation Degree of Chalking of Exterior Paints
ASTM D 714-56 (1974)	Standard Method of Evaluating Degree of Blistering of Paints
ASTM D 772-47 (1975)	Standard Method of Evaluating Degree of Flaking (Scaling) of Exterior Paints

Steel Structures Painting Council (SSPC)

SSPC-SP1-63	No. 1 Solvent Cleaning
SSPC-SP2-63	No. 2 Hand Tool Cleaning
SSPC-SP3	No. 3 Power Tool Cleaning
SSPC-SP5-63	No. 5 Blast Cleaning White Metal
SSPC-SP6-63	No. 6 Commercial Blast Cleaning

National Fire Protection Association (NFPA)

NFPA No. 30	Flammable and Combustible Liquids Code

00530

ENGGE J

CONSTRUCTION SPECIFICATION
FOR
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

DIVISION 9 FINISHES

SUB-DIVISION 9.06 SPECIAL COATING

ENG-013

PART 1 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish and apply special coatings in accordance with the contract drawings and this Specification. The Contractor shall apply the special coatings where indicated per the Room Finish Schedule.

1.2 RELATED WORK SPECIFIED ELSEWHERE

(1) CAST-IN-PLACE CONCRETE, Subdivision 3.01
(2) STRUCTURAL STEEL AND MISCELLANEOUS METALS, Subdivision 5.01
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(5) PIPING, Subdivision 15.01

1.3 REFERENCE DOCUMENTS

1.3.1 Codes and Standards

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SSPC-SP3	No. 3 Power Tool Cleaning
SSPC-SP5-63	No. 5 Blast Cleaning White Metal
SSPC-SP6-63	No. 6 Commercial Blast Cleaning

National Fire Protection Association (NFPA)

NFPA No. 30	Flammable and Combustible Liquids Code

ENG-GE 3

1.4 SUBMITTALS

The Contractor shall submit the following to the Contracting Officer in accordance with the "Data Requirements List".

1.4.1 Materials List

Before commencing work under this Subdivision, the Contractor shall furnish to the Contracting Officer for approval, a complete list of special coating materials to be used on the project, and printed recommendations of the Manufacturer of the special coatings, relating to the requirements for surface preparation, thinning, mixing, handling, application, and storage of materials. Also included shall be a list of approved form release agents which are certified by the special coating Manufacturer to be compatible with his coating products. A list of such form release agents shall be made available to the Contracting Officer preparatory to the concrete work.

1.4.2 Samples

The Contractor shall submit coating samples on 9" x 9" hardboard for approval. The samples shall be clearly marked with the Manufacturer's name and product identification, and shall be submitted in sufficient time to allow for approval and, if necessary, disapproval and resubmittal without causing any delay of the project. Color chips of finish special coatings shall be submitted showing the range of Manufacturer's standard colors.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Handling

The Contractor shall deliver all materials to the job site in original, new, and unopened packages and containers bearing Manufacturer's name and label, and the following information: name of material; Manufacturer's stock number and date of manufacture; contents by volume for major pigment and vehicle constituents; thinning instructions; application instructions, color name and number; and shelf life.

1.5.2 Storage

The Contractor shall store all special coatings, including, primers and fillers, in an enclosed area with adequate ventilation. Each type of coating material shall be stored in a separate area within the room or space. All containers shall be kept closed until ready for mixing procedures. The Contractor shall not damage the containers, labels, and tags. No materials shall be used which have been stored beyond the indicated shelf life. Special coating materials shall be stored at temperatures between 40°F and 90°F. Closed container storage instructions shall conform to NFPA No. 30, Chapter V.

1.6 SAFETY PRECAUTIONS

1.6.1 General

The Contractor shall comply with the safety precautions specified hereinafter during the time of mixing, preparation, installation and drying periods of the special coatings.

ENG-GE-3

In addition to the safety requirements specified herein, which shall be considered as minimum, the Contractor shall submit to the Contracting Officer additional safety procedures as may be required for the installation of the work.

Work shall not begin prior the Contracting Officer's approval of the submittal.

1.6.2 Acid Etching

When hydrochloric acid and water solution etching of surfaces is required the Contractor shall:

(1) Mix and apply the solution in accordance with the coating manufacturer's recommendations.

(2) Require that all employees wear proper protective clothing and equipment to prevent acid burns to skin and eyes, and irritation to nose and throat.

(3) Provide adequate ventilation during the application and drying period, and prevent drippage of acid solution onto personnel and equipment.

(4) Arrange for the provision of an on the spot water supply in each location where acid is used.

1.6.3 Sandblasting

When sandblasting of surfaces is required the Contractor shall:

(1) Provide respirators of types approved by the U.S. Bureau of Mines, selected to provide protection for the specific hazard.

(2) Provide cartridge type respirators where concentration of the injurious material is so low that damage will be produced only by long continued or repeated exposure.

(3) Exclude all employees not properly equipped with respiratory equipment from the sandblasting area. Dust respirators may be acceptable for inspectional or temporary conditions when combined with proper eye protection.

(4) Barricade the sandblasting area and post adequate warning signs.

1.6.4 Ventilation

The Contractor shall provide adequate ventilation during the application and drying periods of the special coatings as follows:

(1) A three-minute air change of the area shall be provided with proper air pattern maintained to uniformily flow downward through the area.

(2) The vapors shall flow naturally downward into the air pattern. Drafty overhead supply (due to poor distribution) or crossroom currents (due to outside atmospheric effects, open doors, windows, etc.) shall be prevented. Floor level exhausters shall be used to prevent the accumulation of explosive vapors.

(3) Air flow pattern shall be checked before application is started of any sealer, primer or coating.

(4) Fans used as exhausters shall be explosion-proof.

(5) Fans used as blowers to force fresh air under pressure into an area, need not be explosion-proof.

(6) Ventilation and fan capacities shall be sufficient in volume to prevent the accumulation of explosive vapors above 20% of the lower explosive limit of the solvents of the special coatings being applied.

(7) Fumes from operations inside buildings shall be exhausted directly to the atmosphere. Ventilation shall be continued for a minimum of 6 hours after application of each coating.

(8) Welding burning, flame or spark producing work shall be prohibited near the intake or exhaust outlets from or to such ventilation.

1.6.6 Electrical Equipment

The Contractor shall comply with the following:

(1) All metal receptacles (drums, pots, cans, etc.) used in the transfer of special coatings, including their primers and solvents from one container to another shall be bonded together by means of portable bonding cable, clamp type. Prior to start of work, the spray nozzle shall be effectively bonded to the paint pot and the paint pot shall be provided with a positive static ground.

(2) All energized lighting luminaires, switches, electric motors and other electrical equipment shall be of the explosion-proof type in the immediate area and in the vicinity of where air mixtures in the explosive range might possibly collect. All extension cords shall be of the one-piece type. Connecting sockets shall not be used.

(3) All metal parts of apparatus used in systems for the removal of vapor, including fans, ducts, etc., shall be electrically grounded in an effective and approved manner.

(4) All lighting luminaires, motors and other electrical equipment used in direct connection with this work shall be inspected. Defective equipment shall be removed and replaced with non-defective equipment.

1.6.7 Health and Fire Hazard Control Measures

The Contracting Officer will check all phases of the work from the standpoint of the hazards involved during all actual performance of the work.

The Contractor shall provide fire extinguishers.

The Contractor shall furnish all equipment and supplies required to conform to the following:

(1) Fresh air hoods or masks shall be worn by all personnel applying special coatings and by any other persons entering the immediate area. Approved filter respirator may be used by personnel when the concentrations of organic vapors are within permissible limits.

(2) Personnel handling and applying the special coatings shall wear plastic or acid-resistant type gloves.

(3) The Contractor shall arrange for a suitable area outside of permanent buildings for storage and mixing of the protective coatings. This area shall be situated so that these materials will not be exposed to any danger of fire. Adequate ventilation shall be provided at each storage and mixing area so as to prevent collection of flammable air mixtures.

(4) Only explosion-proof electric motors or air driven mixers shall be used for mixing the solvents and materials.

(5) Barricades or other markings acceptable to the Contracting Officer shall be installed around all special coating work. In the event the barricaded area is large in size and other crafts are involved, the barricaded area is to be cleared of other crafts until the coating is completed and properly dried.

(6) Welding, burning, flame or spark producing devices shall be prohibited inside the barricaded area. Spark-proof tools, such as nonferrous paint scrapers shall be used.

(7) Smoking, open flame or lights shall be prohibited inside the barricaded area and the Contractor will so post all entrances as well as conspicuous locations within the area.

(8) Tennis shoes or protective shoe covers are to be worn by all personnel within the immediate application area.

(9) In case of any power failure affecting the lighting or ventilation of any operation the personnel involved are to cease work immediately and evacuate the work area. Explosion proof emergency lighting shall be provided at all interior areas.

PART 2 PRODUCTS

2.1 DESCRIPTION

The Contractor shall apply special coatings, to floor, wall, and ceiling surfaces in accordance with the contract drawings and Specifications. The special coatings shall meet the performance tests in accordance with ASTM D 659, ASTM D 714, and ASTM D 772. The special coating materials shall consist of poly-amide and/or epoxy-amide surfacers, fillers, and epoxy hi-build enamels. Special coating systems of these materials shall be applied to the following surface types in accordance with the Manufacturer's instructions and the contract drawings:

(1) Coating A - concrete floors

(2) Coating B - concrete walls and concrete masonry unit

(3) Coating C - plaster walls and gypsum wallboard

(4) Coating D - structural steel, decking, carbon steel; doors and frames.

2.2 SPECIAL COATING SYSTEMS

The following special coating systems are based on Ameron protective coatings. Other manufacturers (such as Keeler and Long, Carboline, or Tnemec) of coating materials Approved Equal for nuclear coating systems may be used. The components of the coating systems shall be the products of one manufacturer.

2.2.1 Coating A - Concrete Floors

2.2.1.1 Primer/Sealer. Primer/Sealer shall be Nu-klad 108, or Approved Equal.

2.2.1.2 Intermediate Coat. Intermediate coat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; medium gray in color, with a dry film thickness of 5 mils.

2.2.1.3 Topcoat. Topcoat shall be 2 coats of Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; white in color, with a total 2 coat dry film thickness of 10 mils.

2.2.2 Coating B - Concrete Walls and Concrete Masonry Units

2.2.2.1 Primer/Sealer. Where a curing compound or form release agent has been used, the primer/sealer shall be Nuklad 105, or Approved Equal.

2.2.2.2 Filler. Filler shall be Nu-klad 114, or Approved Equal, where required.

2.2.2.3 Intermediate Coat. Intermediate coat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; medium gray in color, with a dry film thickness of 5 mils.

2.2.2.4 Topcoat. Topcoat shall be Amercoat 66, polyamide cured epoxy, or Approved Equal; white in color, with a dry film thickness of 5 mils.

2.2.3 Coating C - Plaster Walls and Gypsum Wallboard

2.2.3.1 Sealer. Sealer shall be Amercoat 66, polyamide-cured catalyzed epoxy or Approved Equal, with 2 quarts of thinner per one gallon of paint; the color shall be gray.

2.2.3.2 Topcoat. Topcoat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; the color shall be white with a dry film thickness of 5 mils.

2.2.4 Coating D - Structural Steel, Decking, Carbon Steel; Doors, and Frames

2.2.4.1 Primer for System with Sandblasting Preparation. Primer shall be Dimetcote 6, inorganic zinc primer, or Approved Equal.

2.2.4.2 Primer for System without Sandblasting Preparation. Primer shall be Amercoat 71, epoxy primer or Approved Equal. This preparation shall be used for doors and frames and for the sprinkler system. Cleaner for galvanized metals shall be Galvaprep, or Approved Equal.

2.2.4.3 Intermediate Coat. Intermediate coat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal; medium gray in color with a dry film thickness of 5 mils.

2.2.4.4 Topcoat. Topcoat shall be Amercoat 66, polyamide-cured catalyzed epoxy, or Approved Equal, red in color for sprinkler system and white in color for other items, with a dry film thickness of 5 mils.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Inspection

The Contractor shall examine the substrates, adjoining construction, and the conditions under which the work is to be installed. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected. The Contractor shall co-ordinate the work with the work of other trades such that application of the special coatings does not hinder the progress or the quality of related work.

3.1.2 Environmental Conditions

The Contractor shall apply the special coatings only when the surfaces to coated and the surrounding air temperature is at or above 40 deg. F, or as otherwise recommended by the manufacturer. This temperature shall be maintained during application of coatings and for a minimum of 18 hours after application.

3.1.3 Protection

The Contractor shall provide suitable coverings to protect surfaces not requiring coating; place materials which might constitute fire or explosion hazard into metal containers and remove from premises at the close of each days work; and take every precaution to avoid damage by fire or explosion.

3.2 SURFACE PREPARATION

3.2.1 General

The Contractor shall prepare surfaces to receive special coatings. The Contractor shall thoroughly clean off substances that may interfere with proper adhesion. He shall coat or cover dry surfaces only. The Contractor shall fill dents, cracks, hollow places, open joints, and other irregularities with a filler suitable for the purpose and, after setting, sand to a smooth finish. The Contractor shall prime surfaces not more than 8 hours after cleaning. No more than 160 hours shall elapse between the installation of the first and successive coats.

3.2.2 Cementitious Surfaces

The Contractor shall perform the work as follows:

3.2.2.1 Preparation. Prepare cementitious surfaces of concrete and cement plaster to receive special coatings by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening if required to remove glaze. Use abrasive blast cleaning methods if recommended by coating system manufacturer.

3.2.2.2 Alkalinity and Moisture Content. Clean concrete surfaces with an alkaline wash of tri-sodium phosphate in a concentrate specified and where required by the manufacturer of the specified materials. Do not apply special coatings over surfaces where the moisture content exceeds that permitted in the manufacturer's printed directions.

3.2.2.3 Acid Etch. Moist cured concrete shall be acid etched with one part 30 percent hydrochloric acid and two parts water, then neutralized with a rinse of potable water. The Contractor shall not apply the coating system until surfaces are thoroughly dry.

3.2.3 Ferrous Metal Surfaces

The Contractor shall clean and prepare surfaces by one of the following methods in accordance to the coating manufacturer's instructions for the metal substrate and applications required.

Clean non-galvanized, ferrous surfaces, which have not been shop-coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning, complying with SSPC-SP1. Blast clean steel surfaces as recommended by the coating system manufacturer and in accordance with SSPC-SP5 & SSPC-SP6. Hand tool cleaning shall be done in accordance with SSPC-SP2. Power tool cleaning shall be in accordance with SSPC-SP3.

3.2.4 Non-Ferrous Metal Surfaces

The Contractor shall clean non-ferrous and galvanized surfaces in accordance with the special coating system Manufacturer's instructions for the type of service, metal substrate, and application required.

3.3 MATERIALS PREPARATION

3.3.1 Mixing

The Contractor shall mix and prepare special coating materials in strict accordance with the Manufacturer's directions; stir all materials before application, and as required during the application of the materials to maintain a uniform consistency. If necessary, the Contractor shall strain before using. He shall not mix special coatings of different Manufacturers together.

3.4 APPLICATION

3.4.1 General

The Contractor shall provide a 24 hr written notice prior to application of special coatings in each room. The Contractor shall apply special coatings with brush, roller, spray, or other acceptable practice in accordance with the Manufacturer's directions; use brushes and rollers best suited for the type of material being applied; apply materials with care to a uniform thickness, showing no runs, holidays, sags, crawls, or other defects. He shall finish surfaces uniform in sheen, color, and texture; allow coats to cure thoroughly before succeeding coats are applied as specified by the coating materials Manufacturer; coat surfaces behind movable equipment and furniture the same as similar exposed surfaces; and coat all surfaces as indicated on the contract drawings and in this Specification.

3.4.2 Topcoat

Topcoat for Coating A, B, C, & D, specified hereinbefore shall be applied in accordance with the Manufacturer's application instructions.

3.4.3 Primer/Sealer

The Contractor shall use Primer/Sealer specified hereinbefore. Oil or wax-based curing compounds and form release agents shall be removed by sandblasting. Apply the primer/sealer as soon as practical after cleaning to prevent foreign material (oil, salt, etc) from entering the concrete while it is porous. Apply the primer/sealer in accordance with the Manufacturer's recommendations.

3.4.4 Primer for System with Sandblasting Preparation

Primer specified hereinbefore shall be applied at a dry film thickness of 2-1/2 mils.

3.4.5 Primer for System without Sandblasting Preparation

Primer specified hereinbefore shall be applied at a dry film thickness of 2 mils.

3.4.6 Filler

Filler for concrete walls and ceilings, specified hereinbefore shall be used to fill small holes and voids so as to provide a smooth surface on which to place a topcoat.

3.5 PROTECTION AND CLEAN UP

3.5.1 Protection

(1) The Contractor shall protect work of other trades, whether to be painted or not, against damage by the special coating and plastic sheet work; leave all such work undamaged; and correct any damaged by cleaning, repairing or replacing, and recoating, as required.

(2) The Contractor shall provide "Wet Paint" signs to protect newly coated finishes; and remove temporary protective wrappings provided by others for protection of their work after completion of special coating operations.

3.5.2 Clean-up

(1) During the progress of the work, the Contractor shall remove from the site all discarded paint materials, rubbish, cans, and rags at the end of each work day and clean all coating equipment, brushes, sprayers, etc. as recommended by the manufacturer, at the end of each day's work.

(2) Upon completion of special coating work, the Contractor shall clean window glass and other special coating spattered surfaces; and remove special coating spatters by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces. The Contractor shall not use cleaners containing chlorides on stainless steel.

(3) At the completion of work the Contractor shall touch-up, restore, and/or recoat surfaces of unacceptable work.

3.6 FINAL ACCEPTANCE

Materials, workmanship, and installation not in accordance with the requirements of this specification shall be replaced or repaired by the Contractor.

PLASITE'

TECHNICAL BULLETIN

7100
July 1984
(Replaces March 1980)

PLASITE 7100 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.

INTENDED USE: PLASITE 7100 is an ideal heavy maintenance coating due to its thixotropic qualities and excellent edge coverage. PLASITE 7100 is similar in vehicle formulation to PLASITE 7122 but has a different pigment ratio and lower solids. It has lower comparative gloss and higher build characteristics. PLASITE 7122 is generally superior for immersion service. Refer to ZONE OF USAGE below.

CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.

TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods; 250°F continuous. Continuous immersion temperatures depend on particular reagent.

SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.

APPLICATION: PLASITE 7100H is formulated for standard production spray equipment. PLASITE 7100B is formulated for brush and roller application and should be force cured for immersion service. Refer to last page for details on APPLICATION PROCEDURE.

COLORS: Standard colors are green, light gray, medium gray, black, white, tile red, clear. Special colors are available.

FILM THICKNESS PER COAT: A 6 to 7 mil film is easily produced in one multi-pass spray coat. A 2 to 4 mil film may be produced in one "flow on" brush coat.

COVERAGE: 769 mil ft^2/gallon ± 4% theoretical. For estimating purposes, 90 ft^2/gallon will produce a 6 to 7 mil film (20% loss included). Two coats will produce a 12 to 15 mil film for immersion service.

DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.

CURING TIME: 5 to 7 days at 70°F to 90°F. Refer to page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.

SOLIDS: 60% by Weight; 48% ± 2% by Volume depending on color.

POT LIFE: Approximately 24 hours at 70°F.

SHELF LIFE: 24 months minimum at 70°F. Material in stock should be turned upside down every 3 to 6 months.

SPRAY VISCOSITY: 16 ± 7 seconds Ford Cup #4 depending on color.

SHIPPING WT.: Approximately 12 lbs./gallon.

ELECTRICAL RESISTANCE: 3.9 x 10^{12} ohm-cm Volume Resistivity. ASTM D257-66.

ABRASIVE RESISTANCE: 61 Milligrams loss average, 1000 Cycles Taber CS-17 Wheel, 1000 Gr. Wt. Lt. Gray Color.

HARDNESS: Barcol 55.

THERMAL SHOCK: Unaffected in 5 cycles, -70°F to +200°F.

FLEXIBILITY: ½" bend, Zuhr Conical Mandrel, 15 mil film.

NOTE: Above tests were conducted on film cured at 150°F.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors, or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.

C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, primer and topcoat, of 7 to 10 mils required.

D ZONE: Process plant exteriors subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, primer and topcoat, of 6 to 8 mils required.

WISCONSIN PROTECTIVE COATING CORP.
614 Elizabeth Street
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Green Bay, WI 54305
414-437-6561

Represented by:

SURFACE PREPARATION

STEEL

High Temperature & Immersion Service (A & B Zones as described under ZONE OF USAGE.)

1. All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. All skip welds shall be welded solid.
2. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease, etc. may be used. Prebaking of old tanks is required.
3. The surface shall be blasted to an SSPC-SP5 or NACE-1 white metal surface using a 5/16″ or 3/8″ blast nozzle supplied with 80 to 100 psi. An anchor pattern or "tooth" in the metal shall correspond to approximately 20 to 25% of the total film thickness of the coating.
4. Contaminated grit shall not be used for the finish work.
5. The grit used shall be a sharp silica sand, steel slag grit similar or equal to BLACK BEAUTY® BB1240 or any other abrasive that has a sharp, hard cutting surface, properly graded, dry and of best quality. The grit shall be of proper size to obtain the specified anchor pattern.
6. The anchor pattern shall be sharp and no evidence of a polished surface is allowed.
7. Remove all traces of grit and dust with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface with fingerprints or from detrimental material on the workers' clothes.
8. The surface temperature shall be maintained at a minimum of 5° above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared.

Service in Corrosive Atmospheres (B, C & D Zones as described under ZONE OF USAGE.)

1. Degrease as described in Item 2 under A & B Zones.
2. Remove all loose mill scale, rust scale, and old paint scale by one of the following methods:
   a. Near White Metal Blast Cleaning: (B Zone) SSPC-SP10 or NACE-2.
   b. Commercial Blast Cleaning; (C Zone) SSPC-SP6 or NACE-3.
   c. Brush-Off Blast Cleaning; (C & D Zones) SSPC-SP7 or NACE-4.
   d. Power Tool Cleaning; (D Zone) SSPC-SP3.

When utilized, inhibitive primer should be applied as soon as possible after surface preparation.

7100-3

NOTE: The above specification numbers are from the Steel Structures Painting Council Surface Preparation Specifications, 4400 Fifth Ave., Pittsburgh, PA 15213 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218. D Zone application surface preparation as in above Paragraph 2(d) must result in a relatively rough surface. If the steel is new and this type of surface preparation does not leave a reasonably rough surface on the steel, then the heavy film system is not recommended.

CONCRETE

A ZONE: All concrete surfaces require whip blasting for immersion service. Fully cured concrete must be blasted to provide a hard, firm, clean and neutral surface for coating. All concrete surfaces must be filled and sealed with PLASITE 9028M1 or PLASITE 9028M2, applied in accordance with PLASITE Bulletin 9028. All surface imperfections, "bug holes", etc. must be completely repaired before application of PLASITE 7100. PLASITE 9028M1 and 9028M2 are not recommended for food service.

B ZONE: Severity of expected service will dictate minimum concrete surface preparation. Severe service (strong fumes, spillage, etc.) will probably require A Zone surface preparation and PLASITE 9028M1 or PLASITE 9028M2 filling and sealing before application of PLASITE 7100.

GALVANIZED SURFACE

The surface shall be clean and grease free and properly etched with a standard solution such as PARKER® #37 as produced by Occidental Chemical Company, Parker Division, or a phosphating solution. After the surface is properly etched, it should be thoroughly rinsed with water and thoroughly dried prior to coating application. No inhibitive primer is required providing the galvanized surface is continuous.

ALUMINUM

Surface shall be clean and grease free with a blast produced anchor pattern or "Tooth" as described earlier under "STEEL". In addition, the blasted surface shall be given a chemical treatment such as ALODINE® 1200S as produced by Amchem Products, Inc., Ambler, PA or IRIDITE® 14-2 as produced by Allied-Kelite Division of the Witco Chemical Corporation, Des Plaines, IL. For immersion, blasting with sharp grit followed by the chemical surface treatment is required.

NOTE: On metallic surfaces prepared only by chemical etching the total coating film thickness applied should be restricted to only half the film normally applied to blasted surfaces. This reduced film thickness should be considered during selection of the coating for the service and the type of surface preparation performed.

WOOD, TRANSITE AND SIMILAR SURFACES

Normally these materials need no surface treatment provided they are free of grease, oil and dirt and are dry. It is generally recommended that the first coat be diluted one part of recommended PLASITE Thinner to one part of material and brush applied.

TECHNICAL BULLETIN

7100-ACP
MARCH 1984
(Replaces November 1980)

PLASITE 7100-AC HEAVY DUTY PRIMER - HI-RESISTANT ANTI-CORROSIVE PRIMER

TYPE: A cross-linked epoxy-phenolic, amine cured, combined with the proper modifying agents and Strontium Chromate inhibitive pigmentation.

INTENDED USE: Primarily as a combination inhibitive and high chemical resistant metal primer. It is an established fact that the paint or coating system chemical resistance is no better than the material next to the substrate. PLASITE No. 7100-AC Primer was designed to be used in combination with coatings of the high chemical resistant type.

CHEMICAL RESISTANCE: Excellent chemical resistance to spills and fumes of a wide range of acids, alkalies and solvents.

TEMPERATURE RESISTANCE: Dry temperature basis is 400°F for short periods, 350°F continuous.

SURFACE PREPARATION: Steel surfaces may be prepared by blasting or power tools as required by ZONE OF USAGE and SURFACE PREPARATION on Page 2.

APPLICATION: PLASITE 7100-AC Primer as formulated can be applied by standard production spray equipment or by brush and roller. Refer to Page 2 for details on application.

COLORS: Standard primer color is Moss Green.

FILM THICKNESS PER COAT: A 1½ to 3 mil DFT may be applied in one coat by any of the following methods: roller spray or brush. A 2 mil minimum DFT is normally required.

COVERAGE: 625 mil ft.²/gallon ± 4% (theoretical). 250 to 166 ft.²/gallon will produce the 2 to 3 mil DFT recommended for use under a chemical resistance top coat for Zone B applications (20% loss included). 333 to 250 ft.²/gallon will produce the 1.5 to 2 mil DFT required for use under a chemical resistant top coat for Zones C and D applications (20% loss included).

DRYING TIME: At 70°F the 2 mil film will normally be tack free in 3 to 4 hours and may be overcoated by spray application at this time. If the top coat is to be applied by brush, then it is recommended that the primer dry for at least 8 hours.

CURING TIME: 5 to 7 days at 70°F to 90°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied a minimum substrate temperature of 70°F is required for proper polymerization.

SOLIDS: By weight, 59% ± 2%; by volume, 39% ± 2%.

POT LIFE: Approximately 24 hours at 70°F.

SHELF LIFE: At 70°F 24 months. Material in stock should be turned upside down every 3 months.

SPRAY VISCOSITY: At 70°F 20 ± 7 seconds Ford Cup #4.

SHIPPING WT.: Approximately 12 lbs./gallon.

ZONE OF USAGE

B ZONE: Interior process areas where structural steel, floors, equipment, ducts and surfaces subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. Sandblasting to near white metal preferred for long life followed by 2 to 3 mils DFT PLASITE 7100-AC with top coat of appropriate PLASITE finish coating.

C ZONE: Interior and exterior areas of surfaces subject to fumes of fairly high concentration at ambient temperatures. Commercial blast surface preparation combined with PLASITE 7100-AC and appropriate PLASITE high resistant finish coat.

D ZONE: Process plant exteriors subject to chemical atmosphere and weathering. Good power tool cleaning or brush-off blast cleaning with the use of PLASITE 7100-AC Primer and appropriate PLASITE high resistant finish coat.

THINNERS

PLASITE 7100-AC Primer normally may be applied by brush as received. PLASITE 71 Thinner recommended to adjust spray viscosity and the amount required will vary depending on air and surface temperature and application equipment. Normal spray application conditions will require addition of approximately 10 to 20% PLASITE 71 Thinner by volume. Airless spray equipment and above normal temperatures require additional thinning.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

WISCONSIN PROTECTIVE COATING CORP.
614 Elizabeth Street
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414-437-6561

Represented by:

VENDOR INFORMATION FOR SEMSTONE® 140-S
ADDED FOR REVISION 4.0
NOVEMBER 1987

SEMSTONE® 140-S

DESCRIPTION: SEMSTONE 140-S is a 100% solids high build epoxy coating which has excellent chemical and wear resistance. SEMSTONE 140-S is applied by airless spray, brush, trowel or roller. SEMSTONE 140-S is self priming and has the unique ability to achieve 100 mils in one coat on a vertical surface.

PACKAGING:

SEMSTONE 140-S is packaged in pre-measured units of 1 and 5 gallons.

TYPICAL PROPERTIES (Wet):

1. Mixing Ratio:
   4 parts A to 1 part B by volume
2. Mixed usable pot life:
   45 - 60 minutes @ 75°F
3. Solids by volume:
   100%
4. Weight per mix gallon:
   10 lbs.
5. Flash point:
   Non-flammable
6. Dry time to touch
   6 - 8 hours @ 77°F
7. Cure Time:
   75% cured 24 hours @ 80°F
   100% cured 48 hours @ 80°F

TYPICAL PROPERTIES (Cured):

1. Color:
   Light grey
2. Compressive strength, psi:
   8,500 - 9,000
3. Tensile strength, psi:
   5,000 - 6,000
4. Flexural strength, psi:
   8,000 - 10,000
5. Elongation:
   8%
6. Temperature limits for service conditions:
   - 40°F + 180°F

CHEMICAL RESISTANCE GUIDE: This guide is intended as an aid to determine the potential value of SEMSTONE 140-S as a protective coating against chemical exposure. Each application must be evaluated with regards to the conditions that exist.

(continued on back....)

CHEMICAL RESISTANT SPRAYABLE EPOXY

USES: SEMSTONE 140-S is applied over prepared concrete or steel surfaces to protect from attack of many acids and alkalies.

SEMSTONE 140-S has been in use at chemical plants to protect concrete from the ravages of sulfuric acid and HCL acid, in industrial vacuum tank trucks to combat corrosion and abrasion and to facilitate cleaning, in municipal sewage digesters to protect concrete from the degrading effects of Hydrogen Sulfide gases.

SEMSTONE 140-S has been applied to industrial equipment for use in corrosive environments. Because of its unique high build characteristics SEMSTONE 140-S is ideally suited for coating structural I-beams and other types of structural steel in high corrosive areas.

Sentry POLYMERS
P.O. BOX E / FREEPORT, TEXAS 77541
(409) 233-0312 / (713) 393-1736 (Houston)

Rev. 4-85

APPLICATION INSTRUCTIONS:

1.0 Surface Preparation

1.1 All concrete surfaces must be structurally sound.
1.2 Concrete surfaces must be free of oil and grease.
1.3 Concrete must be acid-etched or sandblasted to remove laitance and surface contaminants and to expose sound concrete.
1.4 Concrete must be dry and free of dirt and dust before proceeding with SEMSTONE 140-S.
1.5 Locate all expansion joints, control joints and termination points and handle as per attached drawing.
1.6 Steel - sandblast to white metal (Sp-5).

2.0 Application

2.1 All materials should be stored at a constant temperature of 75 - 85°F for 24 hrs. before use to insure proper set times and proper sprayability.
2.2 Mix premeasured unit of part B into container holding part A and mix thoroughly for 2 minutes using electric drill or air drill with mixing paddle attached. Usable pot life will be 45-65 minutes @ 75°F.
2.3 Spraying is the preferred method of application. Use Graco 45-1 King airless spray equipment. Spray gun should be a Graco Golden Mastic gun equipped with reversible self-cleaning tip with orifice size of .028-.045. Spray hose should be high pressure 3/4" diameter and not longer than 50'. Surfaces should be sprayed with multi-directional spray passes to assure positive coverage and proper film build. A film build of 100 mils can be achieved in one coat on a vertical surface.
2.4 Coverage will depend on condition of surface being coated. SEMSTONE 140-S will cover approximately 30 sq. ft. per gallon @ 50 dry mils.
2.5 Broadcast sharp, dry sand into surfaces intended for foot traffic to effect a non-slip surface. Allow to cure 24 hrs. @ 77°F before placing in service.
2.6 Clean up equipment and tools with GC33A or Xylene.

3.0 Safety

3.1 When spray applying SEMSTONE 140-S in a confined area, make provisions for forced ventilation and wear fresh air hood, rubber gloves and long sleeves buttoned at the wrist. When spraying in open area, wear organic mist respirator, rubber gloves, long sleeve shirts.
3.2 As with all epoxy materials, care should be taken to avoid skin contact. While handling and working with epoxy materials, wear rubber gloves, long sleeve shirts, chemical goggles. If material comes in contact with skin or clothing, wash with soap and water and remove contaminated clothing immediately.

The technical data furnished is true and accurate to the best of our knowledge. However, no guarantee of accuracy is given or implied. We suggest that you evaluate these recommendations and suggestions prior to use. We guarantee our products to conform to our standards. We assume no responsibility for coverage, performance, or injuries resulting from use. Liability, if any, is limited to replacement of products.

Key:
1 - Excellent
2 - Good
3 - Fair
NR - Not recommended

ACIDS

	RATING
Acetic-10%	2
Acetic-30%	3
Benzoic-Sat.	2
Boric-Sat.	2
Citric-Sat.	1
Chromic-15%	2
Chromic-30%	3
Cresylic	3
Diglyclic	3
Fatty	1
Formic-10%	3
Hydrochloric-15%	1
Hydrochloric-37%	2
Lactic-Up to 20%	3
Maleic-10%	1
Maleic-30%	2
Maleic-Sat.	3
Malic-30%	1
Malic-50%	1
Monochloroacetic-5%	2
Monochloroacetic-10%	3
Monochloroacetic-20%	NR
Oleic	1
Oxalic-Sat.	1
Phosphoric-50%	3
Phosphoric-85%	NR
Picric-Sat.	1
Succinic-Sat.	1
Sulfuric-50%	1
Tannic-Sat.	1
Tartaric-Sat.	1
Trichloroacetic-5%	2
Trichloroacetic-10%	3
Trichloroacetic-20%	NR

ALKALIES & SALTS

	RATING
Ammonium Chloride-Sat.	1
Ammonium Hydroxide-Up to 20%	1
Ammonium Hydroxide-Up to 40%	2
Ammonium Nitrate	1
Ammonium Sulfate-Sat.	1
Calcium Chloride-Sat.	1
Calcium Hypochlorite-Up to 15%	2
Copper Flouroborate	1
Ferric Chloride-Sat	2
Potassium Hydroxide-Up to 40%	1
Sodium Carbonate(Soda-Ash)-Sat.	1
Sodium Bicarbonate-Sat.	1
Sodium Bisulfate-Sat.	1
Sodium Bisulfite-Sat.	1
Sodium Chloride (Salt)	1
Sodium Hydroxide-Up to 50%	1
Sodium Hypochloride-Up to 10%	2
Sodium Sulfate-Sat.	1
Sodium Sulfide-Sat.	1
Trisodium Phosphate-Sat.	1

OTHER CHEMICALS

	RATING
Carbon Tetrachloride	1
Chlorobenzene	1
Cyclohexane	1
Ethylene Glycol	1
Formaldehyde	1
Gasoline	1
Glycerine	1
Hydrogen Peroxide	1
JP- 4 Jet Fuel	1
Methylene Chloride	NR
Mineral Spirits	2
Toluene	3
Trichlorothane	2
Water	1
Xylene	1

The ZIA Company
P.O. Box 1539
Los Alamos, New Mexico 87544

DUNS No. 00-382-9661

SHIPPER (if other than vendor)

PALLET

Sentry Polymers
PO Box 2076-A
Freeport, TX 77541

5 1 1 1 45 NEW

PURCHASE ORDER No. 6V974 DATE 5-27-86

FOR WORK ORDERS ONLY

ITEM	REQN NO	C/C	WORK ORDER	O/C	AMOUNT	HANDLING
		1000	0031000	30		
		1000	0840500	30		
ALL	V974	2365	09068-90	30		

WORK AREA—OTHER REASONABLENESS—ETC. TA-54

JOB IN PROGRESS (39)

BUSINESS CODE	AMOUNT	QUOTATION NO	DATE
S-5-S	2200.97		5-21-86

SHIPPING DATE (USE REALISTIC DATE)	TERMS	RECD LA	PCS	RECD LA	PCS	RECD LA	PCS
5-22-86	N 30	6-3-86	1/12				

TO ARRIVE AT LOS ALAMOS ON OR BEFORE	FOB	CARRIER & NO	CARRIER & NO	CARRIER & NO
5-29-86	Freeport TX	576-420 461 Fax		

PRIORITY RATING		DATE MATERIAL REQ	REQUISITIONER-DELIVER-TO	SHIP VIA	BY	DATE	BY	DATE	BY	DATE
DO-E2	9	5-27-86	Leos/Angie CA3D	CF (Y)	Gal	6-3				

ITEM	QUANTITY	UNIT	STOCK NO AND/OR DESCRIPTION	UNIT COST	SHIPMENT NO	SHIPMENT NO	SHIPMENT NO	TOTAL COST
1	12	CN	EPOXY-SEMSTONE 140-S: Curetme 75% cured 24 @ 80°F, 100% cured 48 hours @ 80°F. 5 gal/cn with Part B-	181.60	12			
2	1	CN	XYLENE THINNGER: GC33A. 5 gal/cn	21.77	1			

CONFIRMING VERBAL ORDER TO BILL 5-22-86
DO NOT DUPLICATE

CATEGORY 2

ATTN: PAUL KENNINGTON
ELSIE RUNNELS
JESSE CASTANON

Del. to Angie @ TA-52

SEE ATTACHED

DO NOT INSURE: If charges are dependent on reduced valuation, release to value resulting in lowest charges. Mark order number on all packages and consolidate daily shipments.

IMPORTANT NOTICE

TO EXPEDITE PAYMENT OF YOUR INVOICES, PLEASE SHOW OUR PURCHASE ORDER NUMBER ON ALL SHIPMENTS, BILL OF LADING, PACKING SLIPS AND INVOICES. MATERIAL RECEIVED WITHOUT IDENTIFICATION WILL BE RETURNED AT YOUR EXPENSE.

PAGE 1 OF 1 PAGES

P.O.No. 6V974

PURCHASE ORDER SIGNATURE

RECD BY DATE

THE ZIA COMPANY Subcontractor to the University of California operating Under Contract No. W-X24-J5361-1

The Standard terms and conditions for a fixed price purchase order set forth on the reverse side of Form 800 YTO 63 attached hereto incorporated as a part of this purchase order

carboline®

PHENOLINE® 373 Primer & Finish

SELECTION DATA

GENERIC TYPE: Modified Phenolic. Part A & Part B mixed prior to application.

GENERAL PROPERTIES: A low cost medium build modified phenolic tank lining having excellent all-around chemical, thermal shock and abrasion resistance. Cures to a hard, tough yet flexible film. A 3 coat system at 5 mils per coat can be used on steel or concrete. Phenoline 373 is acceptable under 21 CFR 121.2514 (FDA) for direct food contact surfaces, in appropriate colors, as recommended.

RECOMMENDED USES: Phenoline 373 is an effective and economical lining system for steel and concrete tanks containing dilute acids, caustic, salt or solvents. Also for tanks storing or processing wet, or dry food products. A system consisting of Phenoline 373 Primer and Phenoline 373 Finish is used for lining tanks of ocean-going chemical carriers because of resistance to wide range of chemicals and food products. Phenoline 373 Finish can be used to protect floors from splash and spillage of corrosives.

NOT RECOMMENDED FOR: Exposure to strong mineral and organic acids.

CHEMICAL RESISTANCE GUIDE:

Exposure	Immersion	Splash and Spillage
Acids	Very Good	Excellent
Alkalies	Excellent	Excellent
Solvents	Excellent	Excellent
Salt	Excellent	Excellent
Water	Very Good	Excellent

TEMPERATURE RESISTANCE: (Non-immersion)
Continuous: 180°F (82°C)
Non-continuous: 200°F (93°C)

Immersion temperature resistance depends on exposure. Consult Carboline Chart #18, Chart #42 or the Technical Service Department for specific recommendations. Metal tanks operating above 140°F (60°C) must normally be insulated.

FLEXIBILITY: Fair

WEATHERING: Good (Chalks)

ABRASION RESISTANCE: Excellent

SUBSTRATES: Apply over properly prepared steel, concrete, stainless steel, aluminum or others as recommended.

TOPCOAT REQUIRED: None for Phenoline 373 Finish. Phenoline 373 Primer may be topcoated with epoxies, modified phenolics or other generic types as recommended.

COMPATIBILITY WITH OTHER COATINGS: Phenoline 373 Finish is normally used over Phenoline 373 Primer or other modified phenolics and catalyzed epoxy primers as recommended.

SPECIFICATION DATA

THEORETICAL SOLIDS CONTENT OF MIXED MATERIAL:

	By Volume
Phenoline 373 Primer & Finish	75 ± 2%

RECOMMENDED DRY FILM THICKNESS PER COAT:
(Typical System)

1 coat Phenoline 373 Primer	5 mils (125 microns)
1 coat Phenoline 373 Finish Green	5 mils (125 microns)
1 coat Phenoline 373 Finish Gray	5 mils (125 microns)

THEORETICAL COVERAGE PER MIXED GALLON*:
1200 mil sq. ft. (29.4 sq. m/l @ 25 microns)
240 sq. ft. at 5 mils (5.9 sq.m/l @ 125 microns)

***NOTE:** Material losses during mixing and application will vary and must be taken into consideration when estimating job requirements.

SHELF LIFE: 2 years minimum

COLORS: Phenoline 373 Primer — White 0810 only
Phenoline 373 Finish — Green 4339, Gray 2790

GLOSS: Medium

ORDERING INFORMATION

Prices may be obtained from Carboline Sales Representative or Main Office. Terms — Net 30 Days.

SHIPPING WEIGHT:	1's	5's
Phenoline 373 Primer	14 lbs. (6.5 kgs)	70 lbs. (31.8 kgs)
Phenoline 373 Finish	15 lbs. (6.8 kgs)	75 lbs. (34.1 kgs)
Phenoline Thinner	9 lbs. (4.1 kgs)	45 lbs. (20.4 kgs)

FLASH POINT: (Pensky-Martens Closed Cup)

Phenoline 373 Primer Part A	72°F (22°C)
Phenoline 373 Primer Part B	40°F (4°C)
Phenoline 373 Finish Part A	66°F (19°C)
Phenoline 373 Finish Part B	71°F (22°C)
Phenoline Thinner	77°F (25°C)

To the best of our knowledge the technical data contained herein are true and accurate at the date of issuance and are subject to change without prior notice. User must contact Carboline to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products. Prices and cost data if shown, are subject to change without prior notice. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY THE SELLER, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OR LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

line Thinner #2 or Toluol.

Steel: For immersion service, dry abrasive blast to a White Metal finish in accordance with SSPC-SP 5-63 to a degree of cleanliness in accordance with NACE #1 to obtain a 2 to 3 mil (50-75 microns) blast profile. For a non-immersion service, dry abrasive blast to a commercial finish in accordance with SSPC-SP 6-63 to a degree of cleanliness in accordance with NACE #3 to obtain a 2 to 3 mil (50-75 microns) blast profile.

Concrete: Remove fins and other protrusions by stoning, sanding or grinding. Concrete must be cured at least 28 days at 70°F (21°C) and 50% R.H. or equivalent time. Remove form oils, incompatible curing agents and hardeners by abrasive blasting.

IMMERSION SERVICE: Abrasive blast to open all voids and obtain a surface similar to medium grit sandpaper (horizontal surfaces may be acid etched). Blow or vacuum off sand and dust.

NON-IMMERSION SERVICE: Horizontal surfaces must be acid etched or abrasive blasted to remove laitance. For other surfaces blow off with compressed air to remove dust.

Phenoline 373 Finish can be applied over a recommended surfacer.

MIXING: Mix separately, then combine and mix in the following proportions:

	1 Gal	5 Gal
Phenoline 373 Primer or Finish Part A	.8 Gal.	4 Gal.
Phenoline 373 Primer or Finish Part B	.2 Gal.	1 Gal.

Thin up to 18% by volume with Phenoline Thinner

POT LIFE: 1½ hours at 75°F (24°C) and less at higher temperatures. Pot Life ends when coating loses body and begins to sag.

APPLICATION TEMPERATURES:

	Material	Surfaces
Normal	65-85°F (18-29°C)	65-85° (18-29°C)
Minimum	55°F (13°C)	50°F (10°C)
Maximum	90°F (32°C)	110°F (43°C)

	Ambient	Humidity
Normal	65-85°F (18-29°C)	30-70%
Minimum	50°F (10°C)	0%
Maximum	110°F (43°C)	85%

SPRAY: Use adequate air volume for correct operation. Hold gun 8-10 inches from the surface and at a right angle to the surface.
Use a 50% overlap with each pass of the gun. On irregular surfaces, coat the edges first, making an extra pass later.

NOTE: The following equipment has been found suitable, however, equivalent equipment may be substituted.

Conventional: Use 3/8" I.D. Mat'l. Hose.

Mfr. & Gun	Fluid Tip	Air Cap
Binks #18 or #62	66	66PE
DeVilbiss P-MBC or JGA	E	704
	Approx. .070"I.D.	Approx. 9-10 cfm @ 30 psi

Airless: Use a 3/8" I.D. Mat'l. Hose.

Mfr. & Gun	Pump*
DeVilbiss JGB-507	QFA-514
Graco 205-591	President 30:1 or Bulldog 30:1
Binks Model 500	Mercury 5C

*Teflon packings are recommended and available from pump manufacturer. Use a .019-.025" tip with 2200 psi.

BRUSH: Brush application is recommended for touch-up only. Brush out well using full strokes and avoid rebrushing.

RECOAT AND CURE TIME:

Temperature	Primer Minimum	Finish Minimum	Primer & Finish Maximum*	Final Cure for Immersion*
50°F (10°C)	6 days	72 hours	30 days	60-120 days
60°F (16°C)	3 days	36 hours	14 days	15-60 days
75°F (24°C)	36 hours	18 hours	7 days	7-30 days
90°F (32°C)	12 hours	12 hours	4 days	5-15 days

*If maximum recoat time is exceeded and recoat is necessary, special surface preparation may be required. Force curing is recommended for all tank linings. Final cure temperatures below 60°F (16°C) are not recommended for tank linings. Final cure requirement varies depending on exposure.

CLEAN UP: Use Carboline Thinner #2 or Xylol.

STORAGE CONDITIONS:
Temperature: 40-110°F (4-43°C) Humidity: 0-100%

NOTE: Excessive film thickness or poor ventilating conditions require longer dry times and in extreme cases may cause premature failure. Excessive humidity or condensation on the surface during curing may result in a surface haze or blush; any haze or blush should be removed by water washing before recoating.

For more detailed information please consult specific Carboline Application Guides.

CAUTION: CONTAINS FLAMMABLE SOLVENTS. KEEP AWAY FROM SPARKS AND OPEN FLAMES. IN CONFINED AREAS WORKMEN MUST WEAR FRESH AIRLINE RESPIRATORS. HYPERSENSITIVE PERSONS SHOULD WEAR GLOVES OR USE PROTECTIVE CREAM. ALL ELECTRIC EQUIPMENT AND INSTALLATIONS SHOULD BE MADE AND GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. IN AREAS WHERE EXPLOSION HAZARDS EXIST, WORKMEN SHOULD BE REQUIRED TO USE NONFERROUS TOOLS AND TO WEAR CONDUCTIVE AND NONSPARKING SHOES.

UNIVERS[redacted]

Date of Request	Requested By	Telephone	Group	Mail Stop	Realistic Date Req.
2/5/85	H PATTERSON	7-6095	HSE7	J592	ASAP

STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES

Acct. Code	Program Code	Exp. Code	Job Order No.	Cap. Equip. Code	Correspondence to	Telephone	Mail Stop
5707	W57W				H. PATTERSON	6095	J592

Deliver to (Name)	Area	Building	Room	Telephone	Mail Stop
K. Balo	TASY	AREAL			

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (Signature): H. Patterson

Z Number: 82174

Typed Name: H. PATTERSON

Title: STAFF

Auth. Level: S / K

Foreign Country

ACT-1 Use Only

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess	Date	Date Assigned	Buyer	Telephone
				(505) 667–

Invoice Terms	Required Shipping Date	Date of Order	SOCIO ECONOMIC SOURCE
			☐ Yes ☐ No

TO

PURCHASE REQUEST NUMBER

Y 2691

Quoted By	Telephone	Date	Quote Number

F.O.B.	Ship Via:
From	

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QTY.	UNIT	UNIT PRICE	EXTENSION
1	CARBOLINE- PHENOLINE 373- PRIMER	2	GAL.	$64.50	
2	CARBOLINE-PHENOLINE 373- FINISH (IN BLACK IF POSSIBLE OR DARKEST COLOR AVAILABLE)	4	GAL	$62.80	
	For Preparation [illegible]				
	Please Rush!!				

Use Purchase Request Supplementary page if additional space is required.

PAGE OF PAGES

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)

JAMES COOKE + HOPSON CO.

125 EUBANK N.E.

ALBUQUERQUE, N.M. 87123

Telephone: 292-7100

Contact:

Total Estimated Cost: $400 ~~00~~ XX

Previous P.O. Number

Important handling or delivery information. QA? Hazards? Remarks

Items	Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Account

Bids Requested				Bids Received				Bids Rejected			Seller's Number	Ex.	Due Date	Ship Date
S	D	W		B	S	D	W	Small	Disadvantaged	Woman				

LOS ALAMOS NATIONAL LABORATORY

PURCHASE REQUEST

copies to MAT-12, MS-274. Return ruined or unused copies to MAT-12. Do Not Destroy. DO NOT USE FOR STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES.

Date of Request	Requested by	Group	Mail Stop	Telephone	Realistic Date Reqd.	Date/Time Stamp
1-9-86	A. Salo	HSE-7	J592	7-6095	1-25-86	

Code	Program Code/J.O.	Capital Equip. Code	Correspondence to	Mail Stop
707	X57W		Karen A. Salo	J592

Deliver to (name)	Area	Building	Room	Telephone	Mail Stop
Karen A. Salo	54			7-6095	J592

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (signature) — Typed Name: John L. Larsen

Title: Asso. Grp. Ldr. — Authority Level: $ 10 K

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess	Date	Buyer	Date Assigned	Telephone

Invoice Terms	Negotiated Shipping Date	Date of Order	Blanket Purchase Agreement

TO

PURCHASE REQUEST NUMBER
M 4713

Quoted By	Telephone	Date	Quote Number	SOCIO ECONOMIC SOURCE
				☐ Yes ☐ No

F.O.B.	Ship Via	Ship From

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
	3 ft-6 inches High MDS 9/25/81				
	Tank, 10 gauge carbon steel, 9 ft. diameter, 3'6" high,	4	ea.		
	with a 2"x2" angle iron stiffening ring at the top,				
	2" screwed plug for drain mounted in shell.				
	THESE ARE THE EVAPORATION TANKS				

Use a plain sheet of paper for continuation pages.

SUGGESTED SOURCES (Sole source over $2.0K requires written justification)

Canyon Steel

Albuquerque, NM

Talk to Garrett (873-0160)

Total Estimated Cost: $2480

Previous P.O. No.

State important handling or delivery information. QA handling? _____

Please call 2-3 hours ahead of delivery as we need to have equipment available to off-load the tanks.

Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Count	Proc.	Wk.	Surp.	Source	Accept

Bids Requested				Bids Received				Bids Rejected				Solicitation No.	Ex.	Due Date	Ship Date
B	S	D	W	B	S	D	W	Small	Disadvantaged	Women					

Group	Site	Building	Room	For	Foreign Country	ACT-1 Use

Form 838 (2/81)

REQUESTER

[redacted]	[redacted]	J592	7-6095	1/23/85

Date/Time Stamp

Account Code: 3707	Program Code/J.O.: W57W	Capital Equip. Code	Correspondence to: F. Garcia	Mail Stop: J592
Deliver to (name): H. Patterson	Area: TA-54	Building: Area L	Room	Telephone: 7-6095

Mail Stop: J592

OWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (signature)

Typed Name: Harry Patterson

Title: Staff Member

Authority Level: $ 1K K

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess | Date | Buyer | Date Assigned | Telephone

Invoice Terms | Negotiated Shipping Date | Date of Order | Blanket Purchase Agreement

TO

PURCHASE REQUEST NUMBER
M 4721

Quoted By | Telephone | Date | Quote Number

F.O.B. | Ship Via | Ship From

SOCIO ECONOMIC SOURCE
☐ Yes ☐ No

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
1	4" x 4" redwood lumber in 10 foot lengths	32	ea.	0.78/ linear foot	
	Please Rush				

Use a plain sheet of paper for continuation pages.

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)

Little Rock Builders Supply

Total Estimated Cost: $250.00

Previous P.O. No.

54 Meadow Lane

State important handling or delivery information. QA handling?

Los Alamos, NM 87544

505 672-3871

Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Accept

Bids Requested			Bids Received				Bids Rejected				Seller's No.	Ex.	Due Date	Ship Date
S	D	W	B	S	D	W	Small	Disadvantaged	Woman					

Site	Building	Room	For	Foreign Country	ACT-1 Use

ACT-1 Use (2/81)

REQUESTER

Foreign Country | ACT-1 Use

[illegible]

ITEM SUB-ITEM	DESCRIPTION	RECD	UNIT PRICE	EXTENSION
[illegible]	4" X 4" REDWOOD LUMBER IN 10 FOOT LENGTHS	[illegible]	[illegible]	[illegible]

RECEIVING REPORT TOTAL

Rec. by Tom Montoya
1-23-85

U.S. GOVERNMENT PRINTING OFFICE: 1983—419-097

Los Alamos National Laboratory

PURCHASE REQUEST

Requester: Remit pink copy and all copies to MAIL STOP ... Return unused or unused copies to MAIL STOP ... Do Not Destroy. DO NOT USE FOR STOCK ISSUE ITEMS OR CONTROLLED STORY WAREHOUSE

Requisition Number					
103					
Requester	Group	Mail Stop	Telephone	Realistic Date Reqd.	Date/Time Stamp
Harry Patterson	HSE-7	J592	7-6095	3/15/85	
Charge Number	Program Code	Cost Acct. Code	Correspondence to	Mail Stop	
5707	W57M		Rosalia Garcia	J592	
Deliver to (name)	Area	Building	Room	Telephone	Mail Stop
H. Patterson	TA-54	22	104	7-6095	J592

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (signature): H. P. Patterson

Typed Name: Harry Patterson

Title: Staff Member

Authority Level: $ 1K K

Date Assigned

Date of Order

Quote Number

Ship From

TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	
1. Plastic Bag Liner to fit a nine foot diameter tank with 3 1/2 foot sides. Should have excess for tie down. 8 mil thick. For Evaporation Tanks (9 Dia - 3½ High)	6	ea.	
See PR. M4715 date 1/9/85			
Price. Please calculate and include shipping arrangements and charges.			

Use a plain sheet of paper for continuation pages.

SUGGESTED SOURCES (Note source over which you have no control or limitation.)	Total Estimated Cost	Previous P.O. No.
Packaging Research Design Corp.	$225.00	M4715 1/9/85
10717 Pecos Ave.	State important handling or delivery information. (DA handling)?	
Mill Springs, LA 70709		
Ph: (504) 261-1474		

Acquisition	Program	Loc.	Sor.	Exp.	Cap Order	Sec.	Proc.	Wk.	Surp.	Source

Est. Del. Date | Ship Date

ACT Use

*U.S. GOVERNMENT PRINTING OFFICE: 1983-679-728

UNIVERSITY OF CALIFORNIA — LOS ALAMOS NATIONAL LABORATORY

PURCHASE REQUEST

Date of Request	INSTRUCTIONS: Requester retains pink copy and sends all other copies to MAT-10, MS P274. Return ruined or unused copies to MAT-12, MS P274. DO NOT DESTROY. DO NOT USE FOR STOCK ISSUE ITEMS IN LABORATORY WAREHOUSES.
21/85	

Requested By	Telephone	Group	Mail Stop	Realistic Date Req.
Harry Patterson	7-6095	HSE-7	J592	ASAP

Acct. Code	Program Code	Exp. Code	Job Order No.	Cap. Equip. Code	Correspondence to	Telephone	Mail Stop
5707	W57W1				Rose Garcia	7-6095	J592

Deliver to (Name)	Area	Building	Room	Telephone	Mail Stop
Harry Patterson	TA-54	Area L		7-6095	J592

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (Signature): Karen A. Balo

Z Number: 92928

Typed Name: Karen A. Balo

Title: Section Supervisor

Auth. Level: $ 1K

Foreign Country

ACT-1 Use Only

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Solicited for Excess	Date	Date Assigned	Buyer	Telephone
				(505) 667-

Terms	Required Shipping Date	Date of Order	SOCIO ECONOMIC SOURCE
			☐ Yes

TO

PURCHASE REQUEST NUMBER

Y 2695

Quoted By	Telephone	Date	Quote Number

Shipment from

Ext.	TYPE CLEARLY & DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QTY.	UNIT	UNIT PRICE	EXTENSION
1.	CARGO NET - 20 feet x 20 feet 168 braided strand - 1/2" border treated to resist UV radiation	1	ea.		
	PLEASE RUSH!!				

Use Purchase Request Supplementary page if additional space is required.

PAGE OF PAGES

Sole Source over $2.5K requires written justification. Estimated Cost: $1050.00

Previous P.O. Number

Important handling or delivery information. Cost? Hazards?

NYLON NET COMPANY

Dept. P.O. Box 592

Memphis, TN 38101

Telephone: (901) 774-1500

Contact: Dee

Items	Total Cost	Account	Program	Loc.	Sub.	Exp.	Princ.	Job Order	Ord.	Proc.	Vac.	Surp.	Source

Seller's Number | Ex. Delv. Date | Ship Via

CDF CORPORATION "The Liner People"

100 Enterprise Drive
Marshfield, MA 02050
617 - 837 - 2823

CONTOUR UL-990 FLEXIBLE LINING

BRIEF HISTORY OF CONTOUR UL-990 HEAVY DUTY LINING MATERIAL--
THE LONG-TERM SERVICE PROVEN SOLUTION TO:

CONTAINMENT--Expensive liquids-crude oil-fuels-acids, chemicals, etc.

CORROSION CONTROL--New and or existing tanks of all types- steel, wood, concrete, fiberglass, plastic

POLLUTION ABATEMENT--Leakproof containment of hazardous and waste fluids-storage-vessels

WHAT IS UL-990?

Contour UL-990 is a polymeric thermoplastic composition manufactured by extruding a unique proprietary blend of polyester and polyvinyl chloride to form a pinhole-free, flexible sheeting.

UL-990 has been thoroughly tested and field service proven as a leakproof liquid containment lining for tanks, ponds, and lagoons in thousands of applications throughout the United States. In long-term service while tensile strength increases, UL-990 remains flexible and pliable under a wide range of environmental and service conditions.

UL-990 is readily sealable to virtually any size, dimension or configuration--subject only to a weight handling limitation of approximately 4,000 lbs.

Contour UL-990 liners are fabricated with electronic (radio frequency) equipment for welding or sealing which provides a full material strength lifetime bond.

For field bonding large sections together and for patching, CDF has UL-770, a quick set chemical bond adhesive and UL-775, a seam or patch cover coating. This sealing and patching system, used since 1970, has been very effective as a long-term bond or repair medium on millions of square feet of UL-990 flexible liners.

DEVELOPED IN A RANGE OF THICKNESSES TO MEET INDUSTRY'S NEEDS

UL-990 was initially introduced in 1967 as a calendered 30 mil sheeting. This was custom fabricated into one-piece liners to restore useful service life to leaking tanks in the oil and gas industry. Gaining wide acceptance as a lining medium under

the severe service conditions encountered in the oil/gas industry, use of UL-990 liners naturally expanded to other industrial tanks for containment of various chemicals, acids, waste and toxic fluids.

Although many types of flexible linings have been tested and sometimes used in specific applications, UL-990 has proven to be the most universally sericeable flexible lining encountered.

In late 1980, a successful testing program was conducted to extrude the unique UL-990 formulation in a heavier gauge flexible sheeting. Customers then had the option of using UL-990 in 40 mil thickness. This 40 mil material is currently used extensively as a heavy-duty liner in large industrial tanks and earthen reservoirs.

UL-990 IN PREMIUM GAUGE FOR METALS PROCESSING INDUSTRY

In 1984, UL-990 was extruded in 60 mil, 100 mil and 125 mil thickness for service in metals processing tanks. The metals processing industry had been using heavy gauge standard PVC liners for several years. Our service experience with 30 mil and 40 mil UL-990 indicated, however, that UL-990 had a superior performance over a greater temperature range and in exposure to more severe fluid service conditions than the standard PVC formulation. Thus, UL-990 in 60, 100 and 125 mil thickness provided a premium extra heavy duty drop in tank lining and at only a modest cost over standard PVC linings.

BENEFITS OF CONTOUR UL-990 OVER STANDARD VINYL = LOWER COSTS

* Superior chemical and acid resistance
* Higher temperature resistance--190°
* Better abrasion and puncture resistance
* Superior exterior durability
* Substantially longer service life
* Greater protection from hazardous spills

FOR MORE INFORMATION ON CONTOUR UL-990 OR STANDARD VINYL LINERS CONTACT:

Roger H. Carlson, Manager
Contour Liner Div./CDF Corp.
100 Enterprise Drive
Marshfield, MA 02050
1-800-443-1920/617-837-2823

Custom contour liners

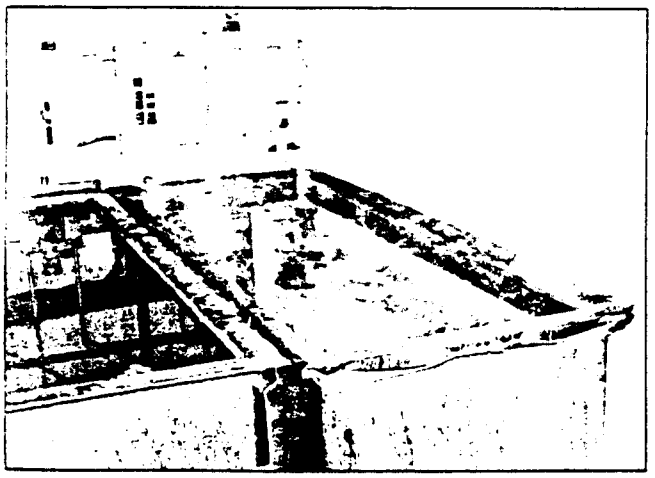
CDF's contour liners are flexible, one-piece drop-in liners. They are custom designed to fit any tank, pit or drum. Steel, wood, fiberglass or concrete containers are all ideally suited for CDF's flexible contour liner.

Contour liners are available in a wide range of thicknesses and grades to meet all your containment needs—from FDA food and potable water to your most demanding high temperature and corrosive applications.

Simple to install, CDF's contour liner can be easily dropped or lifted into place by your own maintenance people. Engineers are available to oversee installation should you require it.

Need a liner fast?

CDF contour liners are available now. A custom-fabricated contour liner can be on a truck or plane to you within 48 hours. Many standard A.P.I. (American Petroleum Institute) tank liners are inventoried for immediate shipment.



Materials

We offer two grades of contour liners to meet your specific containment needs.

Standard contour liners

are made exclusively of virgin grade PVC in thickness ranging from 12 to 125 mil. Potable water, acid and alkaline solutions can be stored in the standard contour liner. A variety of chemical, UV, soil and oil resistant grades are also available for special applications.

CONTOUR STANDARD VINYL *

Thickness	12 mil	20 mil	30 mil	40 mil	60 mil	93 mil	125 mil
Color	clear				grey		
Chemical Resistance	Potable Water Acids Alkalines						
U.V. Resistance	fair to good						
Soil Burial Resistance	poor to good						
Temp Range	-30°F to 150°F						
Graves Tear	240						
Tensile	2100 to 2700						
Elongation	320 to 350						
100 Modular PSI	1000 to 1200						
sp gr	1.205 to 1.250						
Durometer	70 to 80						

Super contour liners

are recommended where heat, cold, abrasion, acid or corrosion resistance is required. Made of designated UL-990 (a unique polymeric thermoplastic flexible membrane sheeting), the super contour liner is available in 30-125 mil thickness.

SUPER CONTOUR - UL990 *

Thickness	30 mil	40 mil	60 mil	100 mil	125 mil
Color	black				
Chemical Resistance	Maximum Acid & Temperature Resistance Crude Oil Hydrocarbons Chemicals Acids Oxidizers				
U.V. Resistance	excellent				
Soil Burial Resistance	good to excellent				
Temp Range	-40°F to 190°F				
Graves Tear	310				
Tensile	2300				
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*Average typical values presented. ASTM test procedures used where applicable. These are standard materials for most applications. Specialized materials are available.

Chemical Resistance Chart

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Chemical Resistance Guideline Chart for Standard and Super Contour Tank Liners

Chemical	Concentration	Standard Liner high temp/rating	Super Liner high temp/rating
Acetic Acid	10%	70°b	70°a
Alcohol	any	110°b	110°b
Ammonia Compounds	any	150° a	190°a+
Barium Compounds	any	150°a	190°a+
Black Sulfate Liquor	any	150°a	190°a+
Butanol	any	140°b	150°a
Caustic	any	150°a	190°a+
Chlorox	5%	150°a	190°a+
Chromic Acid	10%	150°a	190°a+
Deionized Water		150°a+	190°a+
Diethelene Glycol	any	150°a	190°a+
Ethanol	100%	150°a	190°a
Ethylene Glycol	100%	150°a	190°a
Food Products		150°a	x c
Fertilizer Solutions	any	150°a	190°a+
Fluboric Acid	50%	150°a	190°a
Formaldehyde	40%	150°a	190°a
Gasoline		100°a	100°a+
Glycerine	any	x c	80°b
Glycol	100%	150°a	190°a+
Hydrocloric Acid	15%	150°a	190°a+
Hydrochloric Acid	50%	80°b	120°a
Hydrofluoric Acid	20%	120°a	150°a
Hydrofluoric Acid	50%	70°b	100°a
Hydrofluorosilic Acid	50%	150°a	190°a
Hydrogen Peroxide	10%	140°a	160°a
Jet Fluel JP I-6	any	100°a 150°	100°a+ 150°
Magnesium Compounds	any	125°a 150°	125°a 180°
Naptha	any	x c	100°b
Nitric Acid	10%	150°a	180°a
	25%	110°a	130°a
	50%	x c	80°b
Oil		150°a	190°a+
Paper Alum	any	150°a	190°a+
Phosphoric acid	50%	150°a	190°a
	85%	140°a	170°a
Plating Solutions Antimony Arsenic Brass Cadmium Chrome Cobalt Copper Gold Iron Lead Nickel Platinum Silver Tin Zinc		140°a	190°a+
Potable water		150°a+	x c
Salt Solutions		150°a	190°a
Sewage		150°a	190°a+
Sodium Compounds	any	150°a	190°a
Sulfite Liquors	any	x c	150°a
Sulfuric Acid	10%	150°a	180°a
	50%	130°b	150°a
	75%	80°c	100°b
Tanning Solutions		100°b	140°a

a = very satisfactory
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c = unsatisfactory, not recommended for this application.

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following warranty is made in lieu of all other warranties, express or implied.
CDF warrants the Tank Liners will be free from defects in material and workmanship for a period of six months from the date of delivery. Seller's and manufacturer's sole obligation and liability shall be to replace the liners which are so defective provided the defective liners are returned to CDF.
The foregoing limited warranty is exclusive and expressly in lieu of all other warranties (express or implied, including, but not limited to the warranties of merchantability and fitness for a particular purpose), liabilities, or claims or remedies in contract, tort or otherwise. Neither CDF nor manufacturer shall be liable for any injury, loss or damage, direct or consequential, arising out of the use of or inability to use the liners. Prior to use, the user shall independently determine the suitability of the liners for user's intended use and user assumes all risk and liability whatsoever in connection therewith.

CDF CORPORATION
100 Enterprise Drive
Marshfield, MA 02050

1-800-443-1920
1-617-837-2823

VENDOR INFORMATION FOR
CONTOUR TANK LINERS ADDED FOR
REVISION 4.0

NOVEMBER 1987

Contour Tank Liners

CDF CORPORATION 1-800-443-1920 1-617-837-2823

Do you have

- *A leaky tank?*
- *Failure of an existing tank lining?*
- *Current or potential pollution problems?*

Do you want to

- *Cut costs?*
- *Extend the life of an existing tank?*
- *Prevent loss of expensive chemicals?*
- *Reduce downtime for costly tank repairs and relinings?*

Then you need CDF's Contour Liner – the fast answer to long-term industrial fluid containment problems.

CDF Corporation "The Liner People"

Custom contour liners

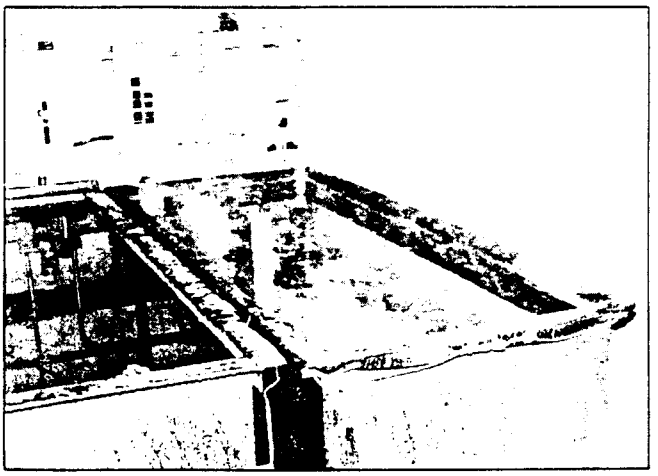
CDF's contour liners are flexible, one-piece drop-in liners. They are custom designed to fit any tank, pit or drum. Steel, wood, fiberglass or concrete containers are all ideally suited for CDF's flexible contour liner.

Contour liners are available in a wide range of thicknesses and grades to meet all your containment needs—from FDA food and potable water to your most demanding high temperature and corrosive applications.

Simple to install, CDF's contour liner can be easily dropped or lifted into place by your own maintenance people. Engineers are available to oversee installation should you require it.

Need a liner fast?

CDF contour liners are available now. A custom-fabricated contour liner can be on a truck or plane to you within 48 hours. Many standard A.P.I. (American Petroleum Institute) tank liners are inventoried for immediate shipment.



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Standard contour liners

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CONTOUR STANDARD VINYL *

Thickness	12 mil	20 mil	30 mil	40 mil	60 mil	93 mil	125 mil
Color	clear				grey		
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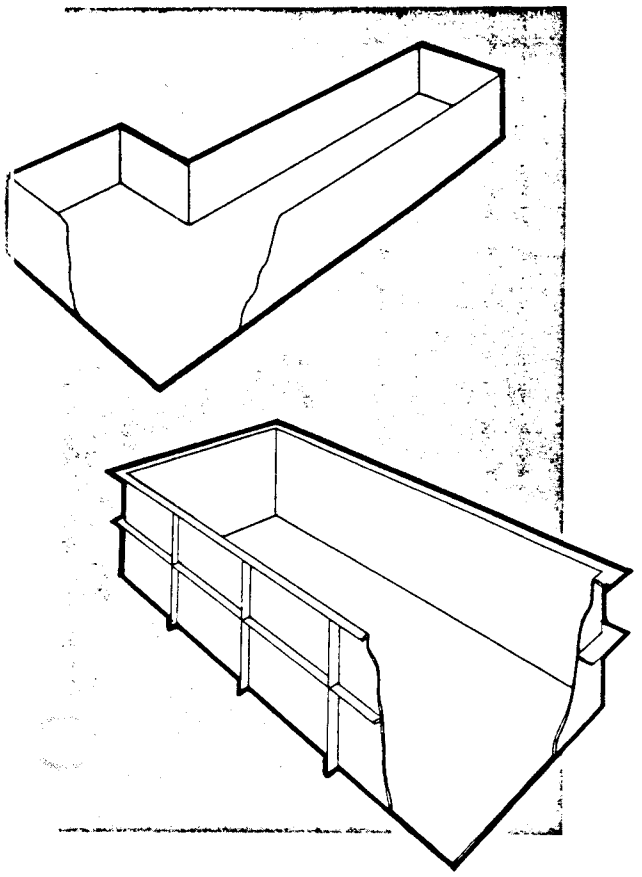
R IMMEDIATE SHIPMENT CALL TOLL-FREE – 1-800-443-1920 (in Massachusetts call 617-837-2823)



CONTOUR LINERS IN PLACE IN A WIDE RANGE OF INDUSTRIES

PLATING INDUSTRY
Electroplating – Pickling – Anodizing Tanks

CHEMICAL INDUSTRY
Corrosives – Acids – Alkaline Tanks

WATER TREATMENT INDUSTRY
Potable Storage – Chlorinization Tanks

PETROCHEMICAL INDUSTRY
A.P.I. – Oilfield Brine – Fuel Tanks

POWER INDUSTRY
Oil Storage, Solar-Nuclear Cooling Tanks

POLLUTION CONTROL
Hazardous Holding – Waste – Sludge Tanks

FOOD PROCESSING
Brine Solution – Chilling Tanks

PULP & PAPER INDUSTRY
Alum – Slurry – Mill Liquor Tanks

DF Contour Liners—Flexible One-Piece rop-In Liners

Custom-fabricated for all your tank needs
Economical
- Protect against leakage and loss of costly chemicals
- Extend tank life on new or existing tanks
- Stop pollution; prevent floor safety hazards

Simple to install; no special tank preparation
Ideal for chemicals, acids, waste fluids, toxics and corrosives

Based on your requirements, we suggest this type of contour liner material:

DF Corp—"The Liner People"
DF Corp is industry's major supplier of heavy gauge plastic ine d lids. Sized for tanks, drums, and pails, CDF's profit ine cost savers for the chemical, petroleum, paint, od and pharmaceutical industries. CDF Corp is committed providing quality products and service to all its customers. all for a free product brochure 1-800-443-1920 (in Massa- usetts 617-837-2823).

CDF Corporation "The Liner People"

CDF CORPORATION
100 Enterprise Drive
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CDF CORPORATION "The Liner People"

100 Enterprise Drive
Marshfield, MA 02050
617 - 837 - 2823

CONTOUR UL-990 FLEXIBLE LINING

BRIEF HISTORY OF CONTOUR UL-990 HEAVY DUTY LINING MATERIAL--
THE LONG-TERM SERVICE PROVEN SOLUTION TO:

CONTAINMENT--Expensive liquids-crude oil-fuels-acids, chemicals, etc.

CORROSION CONTROL--New and or existing tanks of all types- steel, wood, concrete, fiberglass, plastic

POLLUTION ABATEMENT--Leakproof containment of hazardous and waste fluids-storage-vessels

WHAT IS UL-990?

Contour UL-990 is a polymeric thermoplastic composition manufactured by extruding a unique proprietary blend of polyester and polyvinyl chloride to form a pinhole-free, flexible sheeting.

UL-990 has been thoroughly tested and field service proven as a leakproof liquid containment lining for tanks, ponds, and lagoons in thousands of applications throughout the United States. In long-term service while tensile strength increases, UL-990 remains flexible and pliable under a wide range of environmental and service conditions.

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Contour UL-990 liners are fabricated with electronic (radio frequency) equipment for welding or sealing which provides a full material strength lifetime bond.

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Roger H. Carlson, Manager
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100 Enterprise Drive
Marshfield, MA 02050
1-800-443-1920/617-837-2823

Requested By	Telephone	Group	Mail Stop	
Brian R. Myers	7-6095	HSE-7	J592	5/30/86

Acct. Code	Program Code	Exp. Code	Job Order No.	Cap. Equip. Code	Correspondence to	Telephone	Mail Stop
5707	W57J				B. R. Myers	7-6095	J592

er to (Name)	Area	Building	Room	Telephone	Mail Stop
ian R. Myers	TA-54	AreaL		7-6095	J592

NOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED

Purchase approved by (Signature) 5/12/86

Z Number 80753

Typed Name: John L. Warren

Title: Assoc. Grp. Ldr.

Auth. Level: $10K K

Foreign Country

ACT-1 Use Only

SHADED AREAS FOR MATERIALS MANAGEMENT USE ONLY

Screened for Excess	Date	Date Assigned	Buyer	Telephone
				(505) 667–

Invoice Terms	Required Shipping Date	Date of Order	SOCIO ECONOMIC SOURCE
			☐ Yes ☐ No

TO

PURCHASE REQUEST NUMBER

Y 2733

Quoted By	Telephone	Date	Quote Number

F.O.B.	Ship Via:
Ship From	

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QTY.	UNIT	UNIT PRICE	EXTENSION
1.	Countour tank liner 107" in Diameter 42" high	1	ea.		
	with a 2" lip for securing. Tank liner to be				
	made of UV stablized PVC designated UL-990				
	~~mil~~ 100 mil thick compatible with Ammonia				
	Biflouride				
	PLEASE RUSH!!!				
	Use Purchase Request Supplementary page if additional space is required.				
	PAGE OF PAGES				

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)

CDF Corporation

100 Enterprise Drive

Marshfield, MA 02050

Telephone: 1-800-443-1920

Contact: Roger H. Carlson (Mgr.)

Total Estimated Cost: $1391

Previous P.O. Number

Important handling or delivery information. QA? Hazards? Remarks

ems	Total Cost	Account	Program	Loc.	Sor.	Exp.	Paren.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Ac

Bids Requested				Bids Received				Bids Rejected				Seller's Number	Ex.	Due Date	Ship Date
B	S	D	W	B	S	D	W	Small	Disadvantaged	Women Owned					

Form Number 838 (5/83)

BUYER FILE/ACT TO MAT–4

APPENDIX I-2

MANUFACTURERS INFORMATION ON CONTAINERS

CHEC
CHEMICAL HANDLING EQUIPMENT CO., INC.

PRICE BULLETIN

"TUFF-TANK 225" & "TUFF-TANK 225W"
DOT Authorized Mini-Bulk Containers

No. 104T Date January 1, 1984 Superseding Bulletin Dated 1/1/83

U.S. Department of Transportation Approved Container (DOT E-9052)
and U.S. Coast Guard Approved Container

"TUFF-TANK 225" For Transporting and Storing Hazardous Liquids
"TUFF-TANK 225W" For Transporting and Storing Hazardous Liquid Wastes**

Standard Specifications

- Rotationally molded container made of tough polyethylene. (FDA Approved)
- 225 gallon capacity (850 liters)
- Molded-in bottom sump, for near complete drainage.
- Large recessed fill opening, 7" dia., with heavy duty buttress type threads.
- Injection molded polyethylene fill cap, 7" dia., with Hypalon elastomer seal. Cap has integral locking ring.
- Built-in, recessed, top mounted discharge outlet with 1" dia. suction pipe and foot valve with strainer mounted in depressed sump.**
- Quick-Disconnect coupling, 1" dia. polypropylene, with captured lever lock cap at discharge outlet for quick and safe connection to pumping source. **
- Rugged steel wire mesh enclosure to secure and protect polyethylene container. Enclosure is made of 2 guage wire mesh on all four sides and bottom, welded to rigid steel corner posts and to channel iron grid base support structure. Heavy duty self aligning stacking legs allow stacking of containers three high. Enclosure is painted with corrosion resistant epoxy paint in OSHA yellow color. Enclosure is manufactured to meet the Material Handling Institute Specifications for Industrial Metal Containers.
- Overall Dimensions - 48" long x 40" wide x 42" high
- Weight of Unit (Empty) - 360 lbs.
- Rated Gross Weight (DOT Approved) - 3850 lbs.
- Rated Maximum Liquid Weight (DOT Approved) - 15.3 lbs./gal.

** "TUFF-TANK 225W" for hazardous liquid wastes has a 2" dia. suction pipe, quick disconnect fitting and cap, but no foot valve.

PRICES

1 through 5 units	$975.00 ea.
6 through 10 units	945.00 ea.
11 through 19 units	895.00 ea.
20 through 39 units	825.00 ea.
40 or more units	795.00 ea.

Prices are FOB Detroit, Michigan

(OVER)

CHEC CHEMICAL HANDLING EQUIPMENT CO., INC.
20505 WOODINGHAM DRIVE, DETROIT, MICHIGAN 48221, PHONE 313/861-7555

316 Stainless tank → too high not in market anymore can't compete

ACCESSORY ITEMS

ALTERNATE MATERIAL INNER TANKS

Interchangeable with Polyethylene Inner Tank

316 Stainless Steel ..... consult factory for price
Mild Steel ..... consult factory for price

FILLER CAP ACCESSORIES

Each "TUFF-TANK 225" comes standard with one polyethylene filler cap with Hypalon elastomer seal and locking ring.

EXTRA FILLER CAP, with Hypalon Seal $32.00

VITON SEAL in place of Hypalon Seal .... add 38.00

SUCTION/PRESSURE RELIEF DEVICE, EPT 16.00

LOCKING CABLE, vinyl coated stainless steel cable with cast locking lugs 9.00

CLEANING HEAD

316 Stainless Steel multi-nozzle spray head and 1" dia. stainless pipe secured to standard filler cap with stainless steel fasteners. Included in cap are polypropylene quick disconnect fitting and EPT suction relief device. Cleaning Head attaches to "TUFF-TANK" filler neck.

Price 885.00

MIXER HEAD

316 Stainless Steel Mixer, 27" long shaft with 4" dia. stainless steel propeller, attached to standard filler cap. A 1/3 HP air motor powers the mixer head. Mixer head attaches to "TUFF-TANK" filler neck.

Price 965.00

HOSE/VALVE ASSEMBLY

(For connecting "TUFF-TANK 225" to "CHEC-Mate II" Automatic Liquid Metering System, or any other pumping source.)

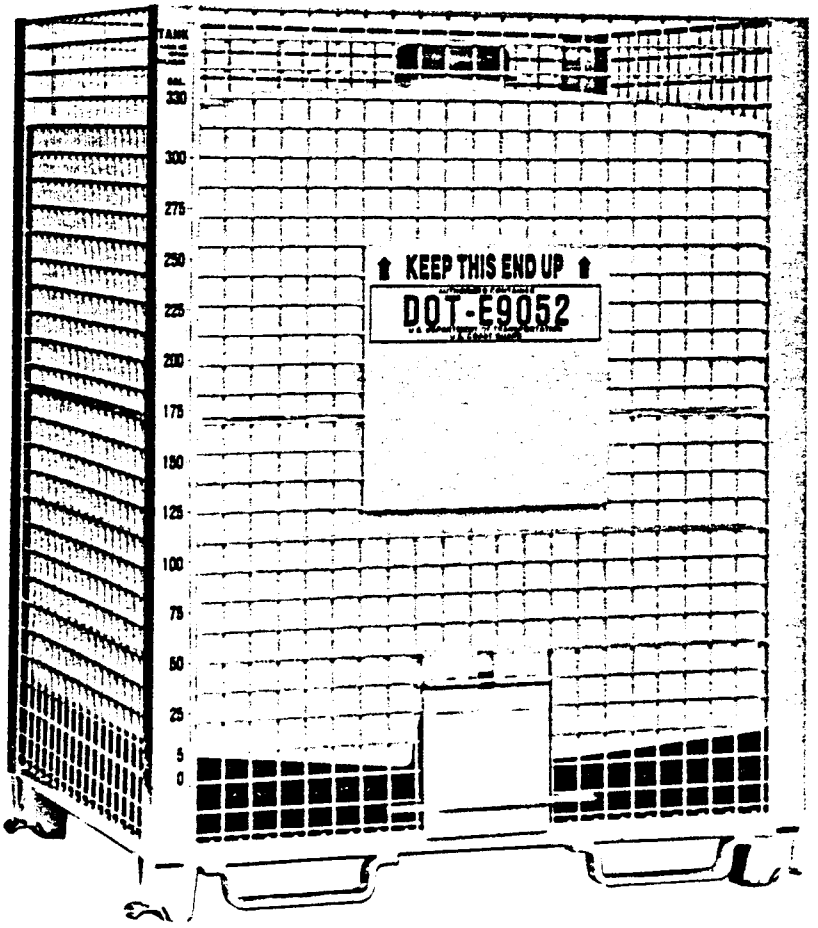
12' of reinforced polyethylene hose, 1" dia., with 1" polypropylene ball valve and quick disconnect fittings, to mate with "TUFF-TANK 225"

Price 395.00

Pat Norton
220 gal
330 gal

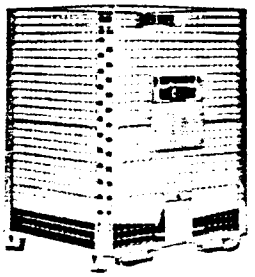
ALL PRICES ARE FOB: DETROIT, MICHIGAN

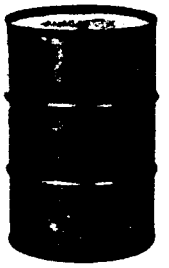
If you handle hazardous liquids you need the innovative new TUFF TANK System.



CHEC

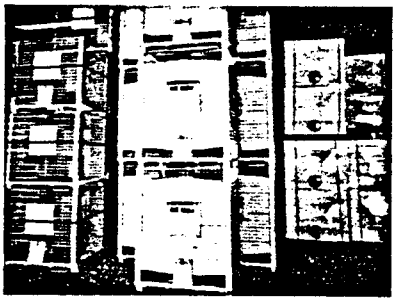
TUFF TANK vs. DRUMS
Compare for yourself.



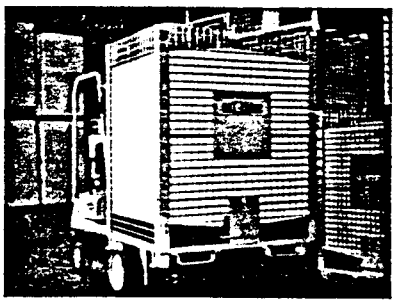


Look at the TUFF TANK. Then look at a 55-gallon drum. TUFF TANK is square. The drum is round.
That might seem like a little thing at first. But it's the shape that makes TUFF TANK the modern way to handle hazardous liquids. And it's the shape that makes the 55-gallon drum obsolete.
Let's take a look at the facts.

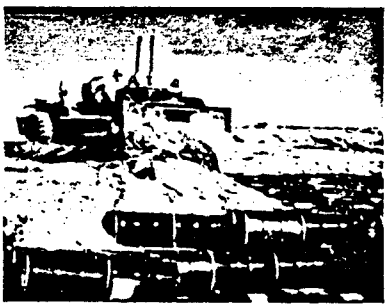
TUFF TANKS stack higher than drums. And handle easier.



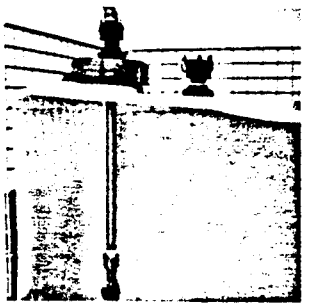
The drum is round, cylindrical. It's difficult to handle. And almost impossible to stack. And drums take up more warehouse space. That means more cost to you.
TUFF TANK, with its cube-like shape, is designed for easy handling. TUFF TANK has 4-way lift truck entry and safety fork pockets for secure in-plant transportation. And TUFF TANK's self-aligning stacking legs make it easy to stack. Up to 3 high.
And since TUFF TANKS hold more liquid than drums, you won't need to move them as frequently. TUFF TANKS hold up to 330 gallons. Six times more than drums.



TUFF TANKS are reusable. No more disposal problems.

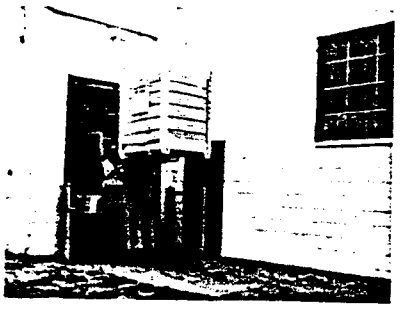


There's another problem using drums. How do you get rid of them? If drums are filled with a hazardous liquid, they too become a hazardous substance—with environmental and legal repercussions for those who try to dispose of them. Most drums are designed to be used once, then safely disposed of.



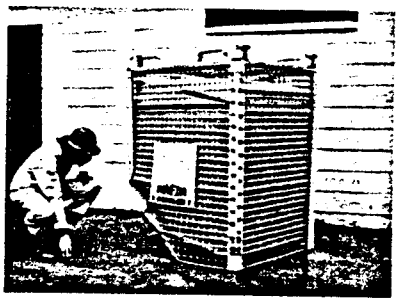
TUFF TANKS can be used over and over again. A specially designed cleaning head attaches securely to the top of TUFF TANK. The cutaway view above shows the rotating spray head which directs a steady stream of water over the entire inner surface of the container—making it ready for immediate reuse.

We tested TUFF TANK to DOT standards. Then we really tested it.



We subjected TUFF TANK to the tests required for authorization by the U.S. Department of Transportation and the U.S. Coast Guard. The stacking test. The pressure test. The vibration test. And the cold drop test.

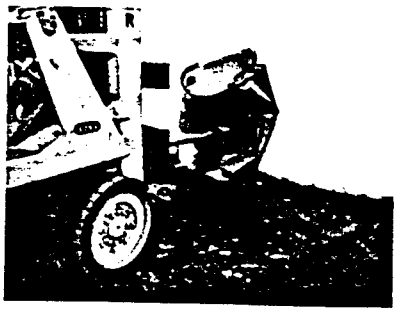
TUFF TANK passed with flying colors.



In fact, TUFF TANK proved capable of handling liquids as heavy as 15.3 pounds per gallon, the highest tested and authorized rating in the industry.

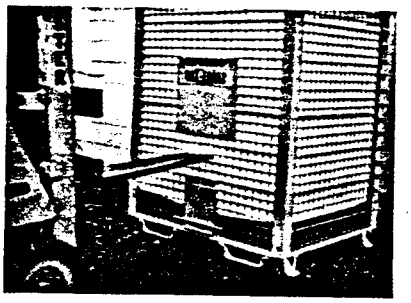
But we weren't satisfied. After we finished testing TUFF TANK to DOT standards, we really tested it.

The DOT drop test calls for the container to be dropped from the height of a flat bed trailer. About 4 feet.



We dropped TUFF TANK from 7 feet. And while the cage sustained some damage, the tank was unharmed. Absolutely no leakage.

Then we took the TUFF TANK, a 55-gallon drum, and four other competitive containers and we put them through the fork truck test.



The fork truck test recreates a real in-plant accident situation.

We rammed our lift truck into each container. From the same angle. At the same speed. Tank after tank was punctured, pierced, destroyed.

All except one. TUFF TANK.

Protected behind its heavy-duty wire mesh cage, TUFF TANK was the only container to survive the fork truck test.

TUFF TANKS cost less to handle. About half the cost of drums.

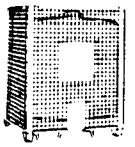
COST OF HANDLING

6 DRUMS = $240 to $300

A study made by a major Fortune 500 company determined that the cost of handling and disposing of a 55-gallon drum is between $40 and $50.

Since it takes six drums to equal one TUFF TANK 330; the cost of using six drums will range from $240 to $300.

COST OF HANDLING



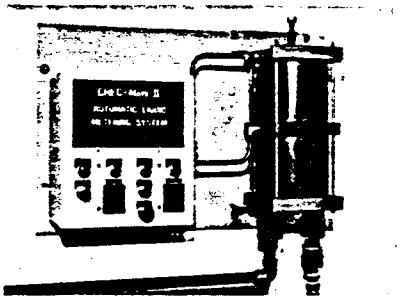
1 TUFF TANK = $130

A large 330-gallon TUFF TANK costs no more than $130 to handle, including return freight. About half the cost of drums. And the average payback period for TUFF TANK users is less than six months.

The TUFF TANK System.

TUFF TANK is more than a container, it's part of an engineered handling system that combines features and benefits no other storage container can match.

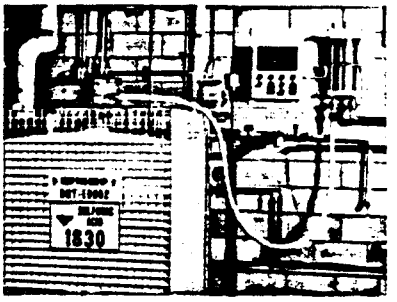
CHEC MATE II. The automatic liquid metering system. For hazard-free dispensing.



When you want to empty TUFF TANK, you can do it easily through the top or bottom discharge outlets—by gravity or with any pump.

But the most efficient way to dispense liquids is through our own specially designed liquid metering system: CHEC MATE II.

CHEC MATE II connects quickly and safely to TUFF TANK for hazard-free dispensing. You simply insert the number of gallons, or liters, to be pumped into the digital counter. Push the start button and the system will pump the exact

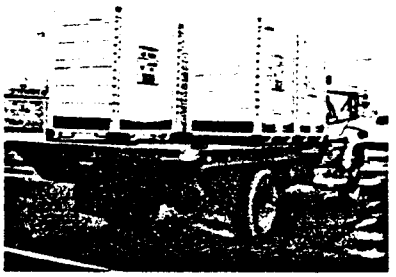


number of gallons you want. And turn itself off automatically.

CHEC MATE II will also record the number of gallons left in TUFF TANK—and stop the pumping action and give a visual sign when the tank is empty.

CHEC MATE II is completely air-operated and explosion-proof. It can be used with any container or storage tank for virtually all hazardous liquids.

We even have a way to transport TUFF TANKS.



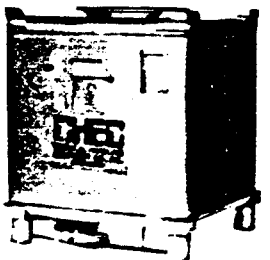
Our trucking system is designed to transport TUFF TANKS on a standard flat bed trailer. Specially designed containment brackets secure the tanks safely during transport. And allow for easy unloading wherever they're delivered.

TUFF TANK has an optional security top.

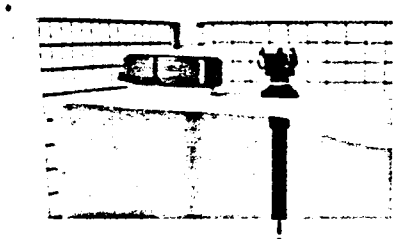
TUFF TANK's rigid, one-piece security top will support the weight of a man, but can still be easily removed for inspection or maintenance.

TUFF TANK comes in metal, too.

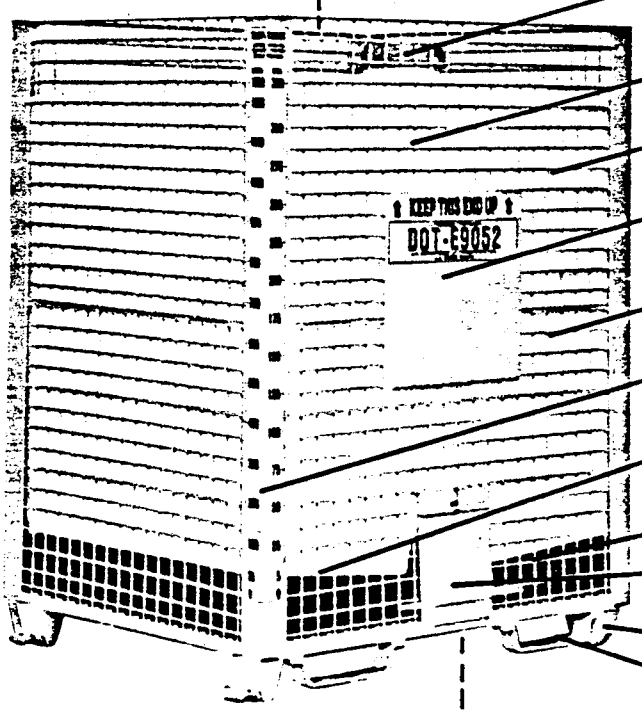
For liquids that are not compatible with polyethylene, we offer TUFF TANK in stainless steel, mild steel and aluminum.



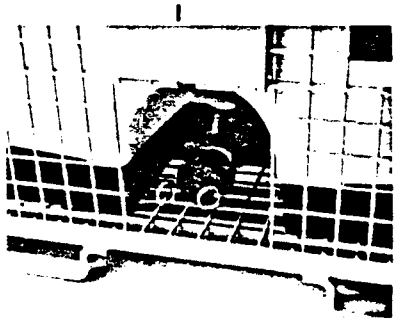
Introducing TUFF TANK. The safest, easiest, most cost effective way to handle hazardous liquids.



The top discharge option includes a 1-inch quick disconnect fitting and cap, suction line and foot valve/ strainer in a recessed sump.



- Large lockable fill cap with heavy-duty buttress-type threads.
- Rugged translucent polyethylene inner tank.
- Rigid heavy-duty wire mesh enclosure.
- Large panel (2 sides) for DOT, EPA safety labels.
- Liquid level constantly visible.
- Volume gauge (Gallons & Liters).
- Sloped bottom to recessed sump for complete emptying.
- Tapered polyethylene cushion.
- Rugged hinged door protects bottom valve assembly and is lockable.
- Self-aligning stacking legs.
- Four-way lift truck entry with safety fork pockets.



The bottom discharge option includes a 2-inch ball valve, quick disconnect coupling and cap, in a recessed sump.

U.S. Patent Pending

TUFF TANK SPECIFICATIONS

	220 Gal. (840 liter)	330 Gal. (1250 liter)
DOT Authorization:	DOT-E9052	DOT-E9052
Dimensions:	40" x 48" x 48" H	40" x 48" x 62" H
Tare Weight:	420 lbs.	550 lbs.
Authorized Gross Weight:	3790 lbs.	5600 lbs.
Maximum Liquid Density: (When filled)	15.3 lbs./gal.	15.3 lbs./gal.

Now you can see the remarkable TUFF TANK System in action. We'll send you a VHS copy of our video presentation demonstrating the unique features and benefits of TUFF TANK. Contact our master distributor:

GENERAL BOX COMPANY
5656 Opportunity
Toledo, OHIO 43612
(419) 476-6705

or your local distributor:

CHEC
CHEMICAL HANDLING EQUIPMENT CO., INC.
17700 Northland Park Ct.
Southfield, Michigan 48075
(313) 557-1151

CHEC TECHNICAL BULLETIN

CHEMICAL HANDLING EQUIPMENT CO., INC.
20505 WOODINGHAM DRIVE, DETROIT, MICHIGAN 48221 TELEPHONE (313) 861-7555

CHEMICAL SUITABILITY DATA

The following chemical suitability data is based upon rating information gathered from extensive laboratory and field testing, recommendations of our raw material suppliers and various technical publications. All ratings are based on a temperature of 73°F/23.3°C. This bulletin was prepared as a guide to be used only as a basis of recommendation. It is impossible to take into consideration the unlimited variations in physical properties that can affect a material's chemical resistance. Under no circumstances is the information contained herein to be construed as a guarantee. Materials should be tested under actual service to determine suitability for a particular application. Please consult factory for suitability ratings on any materials which do not appear in this bulletin.

RATING CODE

A .....Excellent = Recommended
B .....Good = Recommended
C .....Fair = Use under limited conditions
X .....Unsatisfactory = Not recommended
Blank.....Chemical Suitability Unknown

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Acetaldehyde ✓		A	X	A	C	A	X	X	C	A	X	B
Acetaldehyde (Aqueous)	40		X	A		A	X	X	B	A		
Acetic Acid	10-40	A	A	A	A	A	A	X	B	B	B	A
Acetic Acid	40-80	B	A	A	A	A	A	X	B	X	B	A
Acetic Acid (Glacial)		B	X	A	A	B	A	X	B	X	B	
Acetic Anhydride	Pure	A	X	B	A	A	B	X	X	C	B	A
Acetone		A	X	A	B	A	X	X	X	B	X	A
Acetone (Aqueous)	Trace		A	A		A	A	B	A	A		
Acetonitrile				B		A	A	C		A		A
Acetophenone				A		A	A	X	C	A	X	A
Acetyl Acetone			X				X	X	X	A	X	
Acetyl Bromide						A	A					
Acetyl Chloride		A	A	A	A	A	A	X	B	X	X	A
Acetylene		A	X	A		A	A	A	A	C	B	A
Acrylic Acid Ethyl Ester			X			A	A					A
Acrylonitrile				B	A	A	A	X	X	A	C	
Adipic Acid Aqueous	Satu		A	A		A	A	A	A	A		A
Allyl Alcohol		A	X	A	B	A	A	A	A	B		A
Allyl Chloride			X			A	A	B	B	X		
Alum (Potassium Alum)	Satu	X	A	A	A	A	A	A	A	A	A	A
Aluminum Acetate	Satu		A	A		A	A	A	A	A	X	A
Aluminum Ammonium Sulfate	Satu			A		A	A	A	A	A		
Aluminum Bromide	Satu					A	A	A	A	A	A	
Aluminum Chloride	Satu	C	A	A	A	A	A	A	A	A	A	A
Aluminum Fluoride	Satu	C	A	A	A	A	A	A	A	A	A	A
Aluminum Hydroxide	Satu	A	A	A	A	A	A	A	A	A		A
Aluminum Nitrate	Satu		A	A	A	A	A	A	A	A	A	A
Aluminum Sulfate	Satu		A	A	A	A	A	A	A	A	A	A
Amber Acid (Succinic Acid)	Satu		A	A		A	A	A	A	A		
Ammonia Liquid	100	A	C	A	A	A	A	A	C	A	X	A
Ammonia Water	10		A	A		A	A	A	B	A		A
Ammonium Acetate	Satu		A	A	A	A		A	A	A		A
Ammonium Bifluoride	Satu	A	A	A	A	A	A	A	A	A		
Ammonium Carbonate	Satu	B	A	A	A	A	A	A	A	A	A	A
Ammonium Chloride	Satu	B	A	A	A	A	A	A	A	A	A	A
Ammonium Fluoride	20		A	A		A	A	A	A	A		A
Ammonium Hydroxide		A	A	A	A	A	A	B	B	A	A	A
Ammonium Metaphosphate			A	A		A	A	A	A	A		
Ammonium Nitrate		A	B	A	A	A	A	A	A	A	A	A
Ammonium Phosphate		C	A	A	A	A	A	A	A	A	A	A
Ammonium Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Ammonium Sulfide	Satu		A	A	A		A	A	X	A	A	A
Amyl Acetate ✓	Pure	A	X	X	C	A	A	X	X	B	X	A
Amyl Alcohol	Pure	A	A	A	B	A	A	B	A	A	B	A
Amyl Borate	Pure					A	A	A	A	B		

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Amyl Chloride		B	X	X		A	A	B	B	X	X	A
Aniline	Pure	A	C	B	B	A	A	X	B	B	X	A
Aniline Hydrochloride	Pure		B	X	B	A	A	B	A	B	X	A
Antimony Trichloride	Satu	X	A	A	B	A	A		A	B		A
Aqua Regia			C	C	A	A	A	X	C	B	X	A
Arsenic Acid	Satu	B	A	A	A	A	A	A	A	A	A	A
Barium Carbonate	Satu	B	A	A	A	A	A	A	A	A	A	A
Barium Chloride	Satu	B	A	A	A	A	A	A	A	A	A	A
Barium Hydroxide	Satu	A	A	A	A	A	A	A	A	A	A	A
Barium Nitrate	Satu	A	A	A	A	A	A	A	A	A		A
Barium Sulfate	Satu	A	A	A	A	A	A	A	A	A	A	A
Barium Sulfide	Satu	A	A	A	A	A	A	B	A	A	B	A
Beer		A	A	A	A	A	A	B	A	A	A	
Benzaldehyde		A	A	A	A	A	A	X	C	C	X	A
Benzene	Pure	B	C	B	X	A	A	X	B	X	X	A
Benzene Sulfonic Acid	10		X	X		A	B	X	A			
Benzine	Pure		X	A	A	A	A	A	A	X		A
Benzoic Acid	Pure	B	A	A	A	A	A	B	A	A	X	A
Benzyl Alcohol	Pure			A		A	A	X	A	B		A
Benzyl Benzoate	Satu							X		B		A
Benzyl Chloride	Pure			A			A					A
Black Liquor	Satu		A	A	A	A	A	A	A	A	B	
Bleach	12.5	X	A		B	A	A	C	A	B	B	A
Borax	Satu	A	A	A	A	A	A	A	A	A	X	A
Boric Acid	Satu	A	A	A	A	A	A	A	A	A	B	
Borofluoric Acid			A	A		A	A		A	A		
Brine			A	A		A	A	A	A	A		A
Bromic Acid	Pure			X		A	A					
Bromine Water	Satu	X	B	C	X	A	A	X	A	X	X	
Butyl Acetate ✓	Pure	C	C	C	C	A	A	X	X	B	X	A
Butyl Acrylate	Pure		X	X		A	A	X	X	A	X	
Butyl Alcohol	Pure		A	A	A	A	A	B	B	A	A	A
Butyl Amine	Satu		X	X			B	A	A	X	X	A
Butyl Bromide	Pure					A	A					
Butyl Cellosolve	Pure					A	A	X	X	B	X	
Butyl Chloride						A	A					
Butyl Diol			B			A	A	A	A	A		
Butyl Ether			X	X		A	A	B	X	X	X	
Butyl Mercaptan	Pure					A	A					A
Butyl Phenol						A	A					A
Butyl Phthalate				A		A	A	X	B	B		A
Butyl Stearate	Pure					A	A	B	A	C	X	A
Butylene						A	A		A			A
Butyric Acid ✓	Pure	A	X	A	C	A	A	X	B	B	X	B
Caffeine Citrate						A	A					

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Calcium Acetate	Satu		A	A		A	A	A	A	A	B	A
Calcium Bisulfide	Satu		A	A	A	A	A	A	A	X		A
Calcium Bisulfite	Satu	B	A	A	A	A	A	A	A	B	A	A
Calcium Carbonate	Satu	A	A	A	A	A	A	A	A	A	A	A
Calcium Chlorate	Satu		A	A	A	A	A	C	A	A	A	A
Calcium Chloride	Satu	B	A	A	A	A	A	A	A	A	A	A
Calcium Hydroxide	Satu	A	A	A	A	A	A	A	A	A	A	A
Calcium Hypochlorite	Satu	X	A	A	A	A	A	C	A	B		A
Calcium Nitrate	Satu		A	A	B	A	A	A	A	A	A	A
Calcium Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Calcium Sulfide	Satu					A	A	A	A	A		A
Cane Sugar Liquors			A	A		A	A	A	A	A		
Capryllic Acid	Pure					A	A					
Carbitol	Pure		A			A		A	A	A		A
Carbon Disulfide ✓	Pure	A	C	X	X	A	A	C	A	X	X	A
Carbon Tetrachloride ✓	Pure	A	C	X	X	A	A	X	B	X	X	A
Carbonic Acid	Satu	A	A	A	A	A	A	A	A	A	A	
Casein						A	A		A	A		A
Caustic Potash	25		A	A		A	A	A	X	A		A
Cellosolve			B	A	A	A	A	C	C	B	X	A
Chloramine							X					A
Chloric Acid	20		A			A	A					
Chlorinated Solvents		A				A		X	B	X	X	A
Chlorine Dioxide	Pure		A	C		A	A		X			A
Chlorine Water ✓	400	X	A	C	X	A	A	X	C	B	A	A
Chlorobenzene ✓	Pure	A	X	B	X	A	A	X	A	X	X	A
Chloroform ✓	Pure	A	X	B	C	A	A	X	B	X	X	A
Chlorosulfonic Acid ✓	Pure	X	X	X	X	A	C	X	X	X	X	
Chromic Acid	10	A	A	X	A	A	A	X	A	B	X	A
Chromic Acid	50	X	C	X	B	A	A	X	X	X	X	A
Chromium Alum	Satu		A	A		A	A	A	A	A		
Citric Acid	10	A	A	A	A	A	A	A	A	A	A	
Copper Acetate	Satu		A	A		A	A	A	A	A	B	A
Copper Borofluoride			A	A		A	A	A	A	A		A
Copper Carbonate	Satu		A	A		A	A					A
Copper Chloride	Satu	B	A	A	A	A	A	A	A	A	B	A
Copper Cyanide	Satu	A	A	A	A	A	A	A	A	A	A	A
Copper Fluoride	Satu		A	A		A	A	A	A	A	A	A
Copper Nitrate		A	A	A	A	A	A	A	A	A	A	A
Copper Sulfate	Satu	A	A	A	A	A	A	A	A	A	A	A
Corn Oil		A	A	A		A	A	A	A	B		
Corn Syrup			A	A		A	A	A	A	A		
Cottenseed Oil		A	A	A	A	A	A	A	A	A	A	
Creosote			X			A		A	A	X		A
Cresol	Pure	A	C	C	B	A	A	X	A	X	X	A
Croton Aldehyde	Pure					A	A	C	A	B		A
Crude Oil ✓		B	A		X	A	A	B	A	X	X	
Cryolite			B	A		A	A					
Cupric Fluoride	Satu		A	A		A	A	A	A	A		
Cupric Sulfate	Satu		A	A		A	A	A	A	A		
Cuprous Chloride	Satu		A	A		A	A	A	A	A		
Cyclohexane	Pure	A	X	C	B	A	A	B	A	X		A
Cyclohexanol	Pure		X	A		A	A	C	A	B	X	A
Cyclohexanone	Pure		X	B		A	B	X	X	C		A
Decalin	Pure					A		X	A	X		
Decane	Pure					A	A	X		X		
Dextrin	Satu		A	A		A	A	A	A	A		A
Dextrose		A	A	A		A	A	A	A	A	A	A
Diacetone	Pure						X					A
Diacetone Alcohol	Pure			A		A	A	X	X	A	B	A
Dibenzyl Ether	Pure					A	A	X	X	C	X	A
Dibutly Amine	Pure					A	A					A
Dibutyl Ether	Pure						A	B	X	X	X	A
Dibutyl Phthalate	Pure					A	A	X	B	A	X	A
Dibutyl Sebacate						A	A	X	C	B	X	A
Dichlorobenzene	Pure					A	A	X	B	X		A
Dichloroethylene						A	A	X	A	X		A
Dichloroisopropylether	Pure						A					
Diesel Fuels						A	A					
Diethylamine	Pure	A	X	A		A	B	X	X	A	C	A
Diethylenetriamine							A					
Diethyl Ether	Pure		X	C		A	A	C	C	C	X	A
Diglycolic Acid	Satu		A	A		A	A	A	A	A		
Diisobutyl Ketone	Pure						A	B	X	X		A
Diisobutylene	Pure					A	A	A	A	X	X	A

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Diisopropyl Ketone	Pure					A	B	X	X	B		A
Dimethyl Amine	Pure		X	A		A	B	X	X	A		A
Dimethylaniline	Pure						B	X		X		
Dimethylformamide	Pure		X	A		A	X	X	X	B		A
Dimethyl Phthalate						A	B	X	B	B	X	A
Dioctyl Phthalate						A	A	B	A	A	X	A
Dioxane	Pure			B			C	X	X	X	X	A
Dioxolane							X	X	X	X	X	A
Diphenyl Oxide	Satu							X	A	X	X	A
Disodium Phosphate			A			A	A		A		A	A
Epichlorohydrin	Pure		X	A		A	C	X	X	X	X	A
Epsom Salt	Satu	A			A	A	A	A	A	A		
Esters						A	A					A
Ethanolamine	Pure	A	X			A	X	A		A		A
Ethers ✓		A	X	C	X		A	X	X	X	X	A
Ethyl Acetate ✓	Pure	A	X	B	X	A	A	X	X	B	X	A
Ethyl Acetoacetate	Pure					A	A	X	X	A		A
Ethyl Acrylate ✓	Pure		X		X	A	A	X	X	B	X	A
Ethyl Alcohol	Pure		A	A	A	A	A	A	A	A		A
Ethyl Benzene						A	A	C	A	X		A
Ethyl Chloride		A	X	C	B	A	A	B	A	A	X	A
Ethyl Ether ✓	Pure	B	X	X	X	A	A	B	C	C	X	A
Ethyl Formate	Pure							X	X	B		A
Ethyl Hexanol						A	A	X				A
Ethyl Mercaptan	Pure							X	A	A		A
Ethyl Oxalate								X	X	A		A
Ethylene Bromide ✓	Pure		X	X	X	A	A	X	C	B	X	A
Ethylene Chloride		A		B	D	A	A	X	A	X		A
Ethylene Chlorohydrin	Pure		X	A		A	A	X	X	A	B	A
Ethylene Diamine	Pure					A	B	A		A		A
Ethylene Dichloride	Pure		X			A	A	X	A	X	X	A
Ethylene Glycol	Pure	A	A	A	A	A	A	A	A	A	A	A
Ethylene Oxide ✓		A	X		X	A	A	X	X	X	X	A
Fatty Acids		A	A	A	B	A	A	A	A	X	X	
Ferric Hydroxide	Satu		A	A	A	A	A	A	A	A		A
Ferric Nitrate	Satu	A	A	A	A	A	A	A	A	A	A	A
Ferric Sulfide			A	A		A	A	A	A	A		
Ferric Chloride	Satu	X	A	A	A	A	A	A	A	A	B	A
Ferrous Chloride	Satu	X	A	A	A	A	A	A	A	A	A	A
Ferrous Hydroxide	Satu		A	A		A	A	A	A	A		
Ferrous Nitrate	Satu		A	A		A	A	A	A	A		
Ferrous Sulfate		C	A	A	B	A	A	A	A	A	A	
Fluoboric Acid	Pure	B	A	A	A	A	A	B	A	A	A	
Fluosilicic Acid	50	B	B	A	A	A	A	A	A	A	A	
Formaldehyde	35	A	A	A	A	A	A	B	A	A	X	B
Formaldehyde	37	A	A	A	A	A	A	B	A	A	X	B
Formaldehyde	50	A			A	A	A	X	B	A	X	B
Formic Acid	90	B	A	A	A	A	A	X	X	A	A	
Freon F-11		A	A			A	A	X	B	C	A	B
Freon F-12		A	A	B		A	A	C	B	B	A	B
Freon F-21		A	X			A	A	X	C	C	A	A
Freon F-22		A	X	B		A	A	X	X	B	A	A
Freon F-113		A	B			A	A	X	B	X	A	B
Freon F-114			B			A	A	B	A	C	A	B
Fructose			A	A	A	A	A	A	A	A		
Fruit Juice	Pure	A	A	A	A	A	A	A	A		A	
Furane							X	X	X	X		
Furfural ✓	Pure	A	X	C	C	A	A	X	B	A	X	A
Furfuryl Alcohol	Pure					A	B	X	X	C		A
Gallic Acid		A	A			A	A	A	A	A	B	
Gasoline Leaded ✓		A	A	X	X	A	A	B	B	X	X	
Gasoline Unleaded ✓		A	A	X	X	A	A	B	B	X	X	
Gasoline Sour ✓		A	A	X	X	A	A	B	A	X	X	
Glucose		A	A	A	A	A	A	A	A	A	B	A
Glycerol (Glycerine)	Pure	A	A	A	A	A	A	A	A	A	A	A
Glycolic Acid	Satu		A	A	A	A	A	A	A	A		
Glycols					A	A	A	A	A	A		
Grape Sugar		A	A	A	A	A	A	A	A	A		
Heptane ✓		A	A	B	X	A	A	A	A	X	B	A
Hexane		A	A	B	A	A	A	A	A	X	B	A
Hexyl Alcohol	Pure		A			A		A	A	B		
Hydrazine	Pure	A	X		A	A		A	X	A	A	A
Hydrobromic Acid	20	X	A	A	A	A	A	C	A	A	A	A
Hydrobromic Acid	50	X	A	A	A	A	A	C	A	A	A	A
Hydrochloric Acid	25	X	A	A	A	A	A	C	A	A	X	

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Hydrochloric Acid	38	X	A	A	A	A	A	C	B	C	X	
Hydrocyanic Acid		A	A	A	A	A	A	B	B	B	A	
Hydrofluoric Acid	Dilute	C	A	A	A	A	A	X	A	A	A	
Hydrofluoric Acid	40	C	B	A	A	A	A	X	A	A	A	
Hydrogen Fluoride						A	A	X	X	B		A
Hydrogen Peroxide	5	A	A	A	A	A	A	X	A	A		A
Hydrogen Peroxide	50	A	B	C	A	A	A	X	A	C	X	A
Hydrogen Peroxide	90	A			A	A	A	X	A	X	X	A
Hydrogen Sulfide (Aqueous)		A	A	A	A	A	A	A	A	A	B	A
Hydroquinone	Satu		A			A	A	A	A	A		A
Hypochlorous Acid	10		A	A	A	A	A	C	A	A	X	
Iodine		X	B	A	B	A	A		B	X	B	A
Iodine Solution	10	X	A			A	A					
Isobutyl Alcohol	Pure					A	A	B	A	A		
Iso-octane						A	A	A	A	X	A	A
Isophorone	Pure							X	X	X	X	A
Isopropyl Acetate	Pure	B				A		X	X	B	X	A
Isopropyl Alcohol ✓	Pure		A	A	X	A	A	A	A	A	A	A
Isopropyl Chloride						A	A	B	A	X	X	A
Isopropyl Ether ✓	Pure	A			C	A	A	A	C	C	C	A
Jet Fuel JP-4		A	A			A	A	B	A	X		A
Jet Fuel JP-5		A	A			A	A	A	A	X		A
Kerosene ✓		A	A	A	X	A	A	A	A	X	X	A
Lacquer		A						X	X	X		A
Lactic Acid	25	A	A	A	A	A	A	A	A	A	B	
Lactic Acid	80	A	A	A	A	A	A	A	A	A	X	
Lauric Acid						A	A					
Lauroyl Chloride	Pure					A	A					
Lead Acetate	Satu	B	A	A	A	A	A	A	A	A	X	A
Lead Chloride			A	A	B	A	A	A	A	A		A
Lead Nitrate	Satu		A	A	B	A	A	A	A	A		A
Lead Sulfate			A	A		A	A	A	A	A		A
Linoleic Acid			B	B		A	A	B	A	X	X	
Linoleic Oil			B			A	A					
Linseed Oil		A	A	A		A	A	B	A	B	B	
Lithium Bromide	60		A			A	A		A			A
Lubricating Oil ✓		A	A	B	X	A	A		A			
Machine Oil			A	A		A	A	A	A	X		
Magnesium Carbonate		A	A	A	A	A	A	A	A	A	A	A
Magnesium Chloride	Satu	A	A	A	A	A	A	A	A	A	A	A
Magnesium Citrate			A	A		A	A	A	A	A		A
Magnesium Hydroxide	Satu	A	A	A	A	A	A	A	A	A	A	A
Magnesium Nitrate		A	A	A	A	A	A	A	A	A	A	A
Magnesium Sulfate		A	A	A	A	A	A	A	A	A	A	A
Manganese Sulfate			A	A		A	A	A	A	A		A
Maleic Acid	Satu	A	A	A	A	A	A	A	A	A	X	A
Mercuric Chloride		X	A	A	A	A	A	A	A	A	A	
Mercuric Cyanide	Satu	A	A	A	A	A	A	A	A	A		A
Mercuric Sulfate	Satu		A	A		A	A	A	A	A		A
Mercurous Nitrate	Satu		A			A	A	A	A	A		A
Mercury		A	A	A	A	A	A	A	A	A	A	A
Methane Sulfonic Acid	50					A	A					
Methyl Acetate	Pure	A	X	B		A	A	X	X	B	X	A
Methyl Acrylate	Pure					A	A	X	X	B	X	A
Methyl Alcohol	Pure	A	A	A	A	A	A	B	B	A	A	A
Methyl Amine			X	X		A	C	C		A		A
Methyl Bromide					B	A	A	X	A	B	X	A
Methyl Cellosolve			A				A		X	B	B	A
Methyl Chloride ✓		A	X	X	X	A	A	X	X	B	X	A
Methyl Chloroform						A	A	X	B	X	X	A
Methyl Ether								B	X	X	X	A
Methyl Ethyl Ketone ✓		A	X	B	C	A	X	X	X	B	X	A
Methyl Formate								X	X	A	B	A
Methyl Isobutyl Carbinol				A		A		A	A	A		
Methyl Isobutyl Ketone ✓		A	X	B	X	A	A	X	X	B	X	A
Methyl Isopropyl Ketone ✓		A			X	A	A	X		X	X	A
Methyl Methacrylate			B			A	A	X	X	X	X	A
Methyl Sulfoxide						A	X					A
Methylene Bromide						A	A	X	A	X		A
Methlene Chloride ✓		A	X	X	C	A	B	X	C	X		A
Methlene Dichloride						A		X	B	X		
Methlene Iodine			A			A	A		A			A
Milk		A	B	A	A	A	A					
Mineral Oil			B	A	A	A	A	A	A	X		A
Monobromo Benzene								X	A	X	X	

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Monochloracetic Acid	50		A	B		A	A	X	B	C		A
Monochlorobenzene				B		A	A	X	A	X	X	A
Monoethanolamine						A	X	A		A		A
Monomethylaniline								X	A	X		A
Motor Oil			A	A		A	A	A	A	X		
Naptha ✓		A	A	A	C	A	A	C	A	X	X	A
Napthalene ✓		B	X	B	C	A	A	X	A	X	X	A
Nickel Acetate			A			A		A	C	A	X	A
Nickel Chloride	Satu	C	A	A	A	A	A	A	A	A	A	A
Nickel Nitrate	Satu		A	A	A	A	A	A	A	A		A
Nickel Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Nicotine Acid			A	A	A	A	A			A		
Nitric Acid	10	A	A	A	A	A	A	X	A	A	X	A
Nitric Acid	30	A	A	A	A	A	A	X	A	B	X	A
Nitric Acid	50	A	A	A	B	A	A	X	A	X	X	B
Nitric Acid	70	A	A	C	B	A	A	X	C	X	X	B
Nitric Acid ✓	98	A	X	X	X	A	A	X	C	X	X	B
Nitrobenzene ✓		B	X	B	C	A	B	X	A	B	X	A
Nitroethane	Pure					A	A	X	X	A	B	A
Nitrogen Dioxide						A	A					
Nitromethane	Pure					A	A	X		B	B	A
Nitrous Acid	10			X				X	A	B		A
Nitrous Oxide			A	A		A	A		A	A		
Octane						A	A	A	A	X		
Octene	Pure					A	A	A	A	X		
Oleic Acid		A	A	A	A	A	A	X	A	X	X	
Oleum ✓		A	X	X	X	A	X	X	X	X	A	A
Oxalic Acid	20-50	A	A	A	A	A	A	A	A	A	B	
Paint Solvents		A						X	X	X		A
Palmitic Acid	5			A		A	A	A	A	B	X	A
Palmitic Acid	10			A		A	A	A	A	B	X	A
Palmitic Acid	70			A		A	A	A	A	B	X	A
Paraffin ✓		A	A	A	C	A	A	A	B	X		
Perchloroethylene ✓	Pure	A			C	A	A					B
Perchloric Acid	10		A	A	A	A	A	X	A	B	B	A
Perchloric Acid	70				A	A	A				B	A
Perphosphate			A	A		A	A	A	A	A		
Petroleum Oils			A	B		A	A	A	A	X	B	A
Phenol		A	A	A	A	A	A	X	B	A	X	A
Phenyl Bisulfide	Pure					A		C	A	X		
Phenylhydrazine						A	A	X	X	B		A
Phosgene Liquid			A	A			A					A
Phosphoric Acid	10	A	A	A	A	A	A	A	A	A	C	A
Phosphoric Acid	50	B	A	A	A	A	A	A	A	A	X	A
Phosphoric Acid	80	C	A	A	A	A	A	A	A	A	X	A
Phosphorus Pentoxide			A	A	A	A	A					
Phosphorus Red			A	A		A	A					A
Phosphorus Trichloride	Pure	A				A	A	X	A	A	X	A
Phosphorus Yellow			A	A		A	A					A
Photographic Solutions		A	A	A	A	A	A					A
Phthalic Acid			X	X		A	A	A	A	A		A
Picking Solutions (Steel)			A	A		A	A	X	B	C	B	
Picric Acid	10	A	A	A	A	A	A	B	A	A	A	A
Plating Sol'n (Brass)		A	A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Cadmium)			A	X	A	A	A	A	A	A	X	A
Plating Sol'n (Chrome)			A	X	B	A	A				X	A
Plating Sol'n (Copper)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Gold)		A	A	X	A	A	A	A	A	A	X	A
Plating Sol'n (Lead)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Nickel)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Rhodium)			A	A	A	A	A		A	A	X	A
Plating Sol'n (Silver)		A	A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Tin)			A	A	A	A	A	A	A	A	X	A
Plating Sol'n (Zinc)			A	A	A	A		A	A	A	X	A
Polyethylene Glycol			A	A		A	A		A	A		A
Polyvinyl Acetate						A	A	A	A	A	C	A
Polyvinyl Alcohol			A	A		A	A	A	A	A		
Potash		A	A	A	A	A	A	A	A	A		A
Potassium Acetate	Satu		A	A	A	A	A	A	A	A	A	A
Potassium Alum			A	A	A	A	A	A	A	A	A	A
Potassium Aluminum Sulfate			A	A	A	A	A	A	A	A	A	A
Potassium Bicarbonate	Satu	B	A	A	A	A	A	A	A	A	A	A
Potassium Bichromate	Satu		A	A	A	A	A	A	A	A	A	A
Potassium Bisulfate			A	A	A	A	A	A	A	A	A	A
Potassium Borate			A	A	A	A	A	A	A	A	A	A

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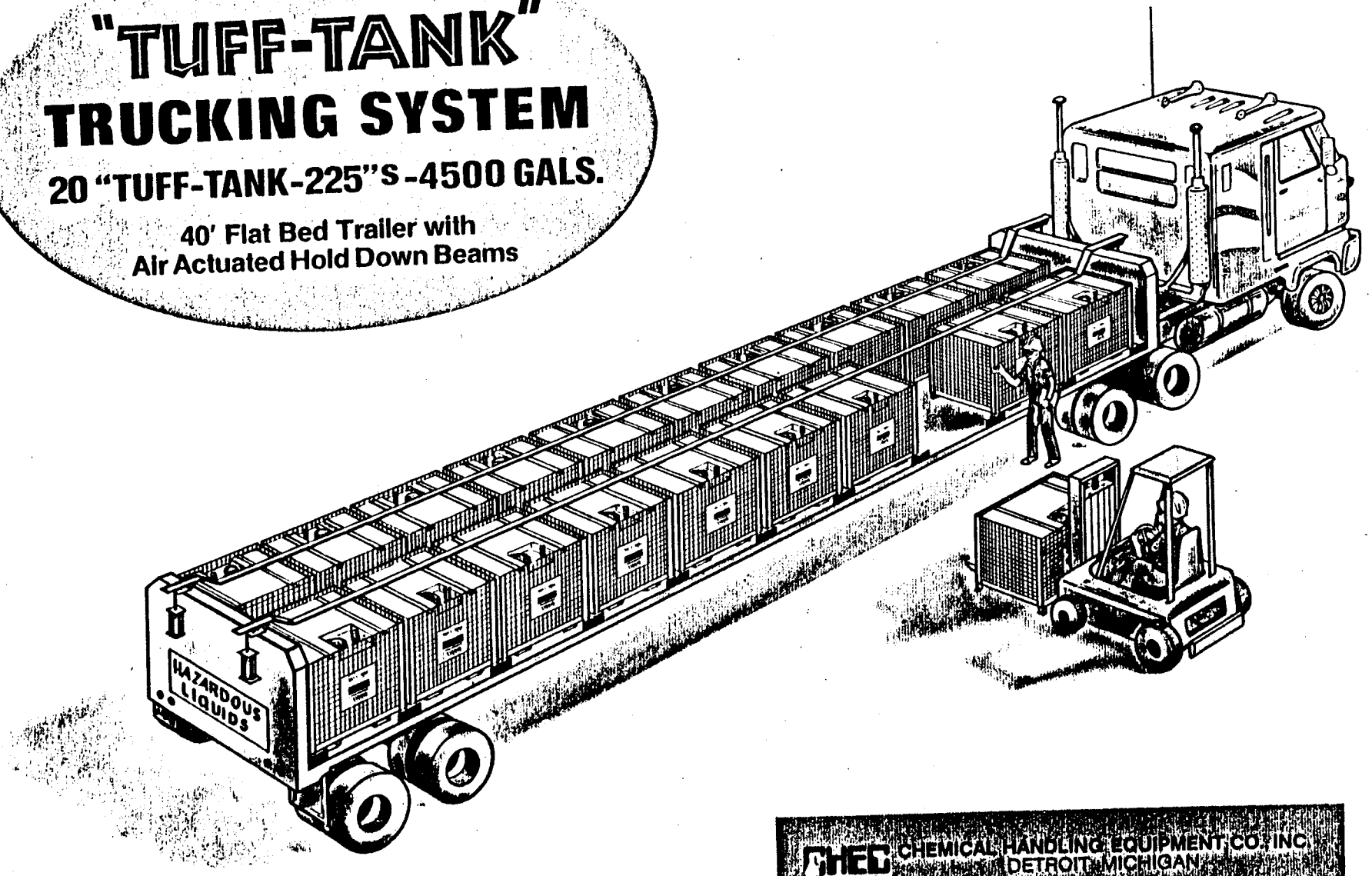
Potassium Bromate			A	A	A	A	A					A
Potassium Bromide		B	A	A	A	A	A	A	A	A	A	A
Potassium Carbonate		A	A	A	A	A	A	A	A	A	A	A
Potassium Chlorate		A	A	A	A	A	A	C	A	A	A	A
Potassium Chloride		A	A	A	A	A	A	A	A	A	A	A
Potassium Chromate		B	A	A	A	A	A	A	A	A	A	A
Potassium Coppercyanide			A	A	A	A	A	A	A	A	A	A
Potassium Cyanide		A	A	A	A	A	A	A	A	A	A	A
Potassium Dichromate	Satu	A	A	A	A	A	A	A	A	A	A	A
Potassium Ferricyanide			A	A	A	A	A	A	A	A	A	A
Potassium Ferrocyanide			A	A		A	A	A	A	A	A	A
Potassium Fluoride			A	A	A	A	A	A	A	A	A	A
Potassium Hydroxide	25	B	A	A	A	A	A	B	X	A	A	A
Potassium Hypochlorite			A	A		A	A	B	A	A	A	A
Potassium Iodide			A	A		A	A	A	A	A	A	A
Potassium Nitrate		B	A	A	A	A	A	A	A	A	A	A
Potassium Perborate			A	A		A	A					
Potassium Perchlorate			A	A		A	A					A
Potassium Permanganate	10	B	A	A	A	A	A	C	A	A	A	A
Potassium Permanganate	25	B	A	A	A	A	A	X	A	A	A	A
Potassium Persulfate			A	A		A	A					
Potassium Sulfate	Pure	B	A	A	A	A	A	A	A	A	A	A
Propane		A	A	A	A	A	A	A	A	X		A
Propyl Acetate	Pure					A	A	X	X	B		A
Propyl Acetone	Pure						X					
Propyl Alcohol	Pure		A	A	A	A	A	B	A	A		A
Propylene Dichloride	Pure		A	A	A			X	B	X		A
Propylene Oxide			X				X	X	X	X		
Pyridine		B	X		A		C	X	X	B	X	A
Rhodan Salts			A	A		A	A	C	A	A		
Salicylaldehyde						A	A	A	A	A		
Salicylic Acid			A			A	A	A	A	A		A
Sewage			A	A	A	A	A	A	A	A	A	A
Silicic Acid			A	A	A	A	A	A	A	A		A
Silicone Oil			A	A		A	A	A	A	A	A	A
Silver Cyanide		A	A	A		A	A	A	A	A		A
Silver Nitrate		A	A	A	A	A	A	A	A	A	A	A
Silver Sulfate			A	A		A	A	A	A	A		A
Soaps ✓		A	A	A	C	A	A	A	A	A	A	A
Sodium	Satu		A	A		A	A	A	A	A		X
Sodium Acetate	Satu	B	A	A	A	A	A	A	B	A	X	A
Sodium Alum	Satu	A	A	A	A	A	A	A	A	A		
Sodium Benzoate			A	A		A	A					A
Sodium Bicarbonate	Satu	A	A	A	A	A	A	A	A	A	A	A
Sodium Bichromate	Satu		A	A		A	A	A	A	A		
Sodium Bisulfate		A	A	A	A	A	A	A	A	A	A	A
Sodium Bisulfite		A	A	A	A	A	A	A	A	A	A	A
Sodium Borate	Satu			A	A	A	A	A	A	A	A	A
Sodium Bromide	Satu		A	A		A	A					
Sodium Carbonate		A	A	A	A	A	A	A	A	A	A	A
Sodium Chlorate	Satu	B	A	A	A	A	A	C	A	A	A	A
Sodium Chloride		B	A	A	A	A	A	A	A	A	A	A
Sodium Chlorite	25		X	X		B	B	X	X	X		A
Sodium Cyanide		A	A	A	A	A	A		A	A	A	A
Sodium Ferricyanide	Satu		A	A	A	A	A	A	A	A		A
Sodium Ferrocyanide	Satu		A	A	A	A	A	A	A	A	A	A
Sodium Fluoride			A	A	A	A	A	A	A	A	A	A
Sodium Hydroxide	15	A	A	A	A	A	A	A	C	A	A	A
Sodium Hydroxide	30	A	A	A	A	A	A	A	C	A	A	A
Sodium Hydroxide	50	B	A	A	A	A	A	A	X	A	A	A
Sodium Hydroxide	70			B	A	A	A	X	X	A		
Sodium Hypochlorite	13	C	A	B	A	A	A	X	X	X	A	A
Sodium Metasilicate		A	A	A		A	A	A	A	A		A
Sodium Nitrate	Satu	B	A	A	A	A	A	A	A	A	A	A
Sodium Nitrite	Satu		A	A		A	A	A	A	A		
Sodium Palmitate	5						A					
Sodium Perborate		C	A	A	A	A	A	B		A		A
Sodium Perchlorate			A	A		A	A					A
Sodium Peroxide		A	A	A	A	A	A	A	A	A	B	A
Sodium Phosphate Acid		B	A	A	A	A	A	A	A	A		A
Sodium Phosphate Alkaline		B	A	A	A	A	A	A	A	A		A
Sodium Phosphate Neutral		A	A	A		A	A	A	A	A	A	A
Sodium Sulfate	Satu	B	A	A	A	A	A	A	A	A	A	A
Sodium Sulfide		B	A	A	A	A	A	A	A	A	A	A
Sodium Sulfite		B	A	A	A	A	A	A	A	A	A	A

CHEMICAL NAME	CONC %	316 STAINLESS	PVC	POLYPROPYLENE	POLYETHYLENE	TEFLON	PVDF	BUNA N	VITON	ETHYLENE/PROPYLENE	HYPALON	KAL-REZ
Sodium Thiocyanate			A	A		A	A	A	A	A		A
Sodium Thiosulfate		A	A	A	A	A	A	A	A	A	A	A
Sour Crude Oil		B		A		A	A	B	A	X		
Stannic Chloride		A	A	A	A	A	A	A	A	A	X	A
Stannous Chloride		X	A	A	A	A	A	A	A	B	A	A
Starch		A	A	A	A	A	A	A	A	A		A
Stearic Acid		B	A	B	A	A	A	B	A	X	X	A
Styrene		A				A	A	C	C	X		A
Succinic Acid			A	A		A	A	A	A	A		A
Sulfamic Acid	20		X	X			X					A
Sulfate Liquors (Oil)		C						A	A	A		A
Sulfite Liquors	6	C	A	A		A	A	X	A	A		
Sulfur		B	A			A	A	X	A	C	B	A
Sulfur Chloride		X		C		A	A	C	A	X		A
Sulfur Dichloride				C		A	A	X	A	X		A
Sulfur Dioxide	Wet	C	A	A	A	A	A		A	A		
Sulfur Trioxide		C	X	X	A	B	X	X	C	C	X	A
Sulfuric Acid	10-50	X	A	A	A	A	A	A	A	A	A	A
Sulfuric Acid	70-80	X	A	A	A	A	A	B	A	A	A	A
Sulfuric Acid	90	X	A	A	B	A	A	C	A	A	X	A
Sulfuric Acid	93	X	A	A	B	A	A	C	A	B	X	A
Sulfuric Acid	94	X	A	B	B	A	A	X	A	C	X	A
Sulfuric Acid	95	X	A	C	B	A	A	X	A	X	X	A
Sulfuric Acid ✓	96-98	A	B	X	X	B	A	X	X	X	X	A
Sulfuric Acid ✓	100	A	X	X	X	B	X	X	X	X	X	A
Sulfurous Acid		B	A	A	A	A	A	C	A	A	A	A
Summition (Insecticide)			X	A		A	A	C	A	A		
Tannic Acid		C	A	A	A	A	A	B	A	B	B	A
Tanning Liquors		A	A	A		A	A	A		B		A
Tar			X	B		A	A	A	A	X		A
Tartaric Acid		B	A	A	A	A	A	A	A	A		
Tertiary Butyl Alcohol			A	A		A	A	X	A	B		
Tertiary Butyl Catechol								X		B		
Tetrachloroethane ✓	Pure	A			X	A	A	X	A	X	X	A
Tetrachloroethylene	Pure	A				A	A	X	A	X	X	B
Tetraethyl Lead	Pure	A				A	A	X	B	X	X	A
Tetrahydrofuran ✓	Pure	A	X	B	X	A	B	X	X	X	X	A
Tetralin	Pure							C	A	X		A
Tetramethyl Ammonium (OH)	50					A	A					
Titanic Sulfate			A	A		A	A					A
Titanous Sulfate			A	A		A	A					A
Titanium Tetrachloride									A			A
Toluene (Toluol) ✓		A	X	B	X	A	A	X	B	X	X	A
Tomato Juice		A	A	A		A	A					
Triacetin	Pure							B	B	A		
Tributyl Phosphate				B		A	A	X	X	B		A
Trichloroacetic Acid				A		A	A	X	X	X		A
Trichloroethylene ✓		A	X	B	X	A	A	X	A	X	X	A
Triethanolamine			B	X	B		X	C	X	A	C	A
Triethylamine			B	X			B					
Trimethylpropane		A	A	X		A	A					A
Turbine Oil (#140)			A	B		A	A	A	A	X	X	
Turpentine		A	A	B	B	A	A	B	A	B	X	A
Urea			A	A	A	A	A	A	A	A		
Urine		A	A	A	A	A	A	A	A	A		
Varnish						A	A	A	A	X		A
Vaseline			A	A		A	A	A	A	A		
Vegetable Oil		A	A	A	A	A	A	A	A	A		
Vinegar		A	A	A		A	A	C	A	A	A	
Vinyl Acetate			X			A	A	X	X	B		
Water		A	A	A	A	A	A	A	A	A	A	A
Water Distilled		A	A	A	A	A	A	A	A	A	A	A
Water (Potable)		A	A	A	A	A	A	A	A	A	A	A
Water (Salt)	Satu	A	A	A	A	A	A	A	A	A	A	A
Water (Sea Water)		A	A	A	A	A	A	A	A	A	A	A
Water (Sewage)		A	A	A	A	A	A	A	A	A	A	A
Whiskey		A	A	A	A	A	A	A	A	A	A	
White Acid					A	A	A					
White Liquor ✓		A	A	A	C	A	A	A	A	A		A
Wines		A	A	A	A	A	A	A	A	A	A	
Xylene ✓		A	X	X	X	A	A	C	B	X	X	
Zinc Acetate			A	A		A	A	A	A	A		A
Zinc Chloride		B	A	A	A	A	A	A	A	A	A	A
Zinc Nitrate			A	A		A	A	A	A	A		A
Zinc Sulfate		A	A	A	A	A	A	A	A	A	B	A

"TUFF-TANK" TRUCKING SYSTEM

20 "TUFF-TANK-225"s -4500 GALS.

40' Flat Bed Trailer with
Air Actuated Hold Down Beams



CHEC CHEMICAL HANDLING EQUIPMENT CO., INC.
DETROIT, MICHIGAN

VAALER AWARDS

Material Handling

Portable, reusable container features 6-drum capacity

HONORS

"This is a safe, well engineered tank system that can eliminate the problem of moving and storing hazardous and non-hazardous liquids in hard-to-handle 55-gal drums," a chief judge comments about an *Honors* winning development in the 1984 CHEMICAL PROCESSING Vaaler Awards. Tanks are polyethylene containers placed in a rigid wire mesh enclosure for maximum protection and convenience. They are authorized by the U.S. Department of Transportation and the U.S. Coast Guard for the shipping and storing of hazardous liquids and wastes.

Containers are portable, reusable and built for extended, repeated filling. According to the developer, most hazardous and non-hazardous liquids have previously been shipped in 55-gal drums which often became a hazardous waste problem in themselves and were also unsafe and inconvenient to handle. The award-winning development is said to be novel because it replaces the smaller 55-gal drums with one container that can hold up to six times the capacity of the drum. It has the option of having top discharge with its built-in suction line in a depressed bottom sump, or can have a complete discharge bottom drain. The manufacturer describes the development as not just a container, but a complete liquid handling system with accessories for cleaning, locking, and convenient trucking.

Potential breadth of application of the container is wide. Every chemical processing operation is said to have an application for the unit for either receiving raw liquids or for shipping the liquid product.

Other features of the container are its system-engineered design, the ease of filling, a sloped bottom to depressed sump, complete emptying ability, a visual indication of liquid level, a puncture-resistant outer enclosure, stackability, and ease of transporting.

(Tuff-Tank Intermediate Bulk Container — Chemical Handling Equipment Co., Inc., 17700 Northland Park Court, Southfield, Michigan 48075)

APPENDIX J
RCRA TRIAL BURN PLAN

RCRA TRIAL BURN PLAN
FOR A MODULAR INCINERATOR
AT THE LOS ALAMOS NATIONAL LABORATORY
IN LOS ALAMOS, NEW MEXICO

Revision 2.0

NOVEMBER 1987

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SECTION D
PROCESS INFORMATION

D-5 INCINERATOR

Introduction

This trial burn plan is submitted as part of the RCRA Part B Permit Application requirements (40CFR 270.62) for the Controlled Air Incinerator (CAI) system at the Los Alamos National Laboratory in Los Alamos, New Mexico. The trial burn was conducted in September 1987. Exceptions to the Trial Burn Plan described herein are presented in Attachment F.

D-5a Justification for Exemption

Some Los Alamos waste forms, for which the incinerator operating permit is being sought, contain significant amounts of some hazardous constituents as listed in Appendix VIII of Part 261, and therefore, Los Alamos will not apply for an exemption as outlined in 264.340 (NMEID 206.D.8.a).

D-5b Trial Burn

D-5b(1) New Incinerator Startup/Shakedown

The Los Alamos incinerator is an operating incinerator. The provisions of 270.62(a) (NMEID 302.E.2.a) do not apply to this system.

D-5b(2) Trial Burn Plan

D-5b(2)(a) Incinerator Performance

Los Alamos seeks an operating permit by way of an additional trial burn of a principal organic hazardous constituent (POHC) with a high degree of difficulty of incineration, and will not submit results of earlier successful trial burns of hazardous wastes as justification for the permit.

D-5b(2)(b) Detailed Engineering Description of Incinerator

1. Manufacturer's Name and Model Number of Incinerator

   The Los Alamos CAI system was manufactured by Environmental Control Products (ECP) of Charlotte, North Carolina. The model number is ECP 500-T.

2. Type of Incinerator

The CAI system consists of a waste feed system and a controlled air incinerator. The Los Alamos CAI was developed through extensive modification and integration of commercially available and custom fabricated equipment. The small production-scale CAI system at Los Alamos was originally designed for the demonstration of volume reduction of combustible solid radioactive wastes. Components of the system include a dual chamber incinerator with a ram feeder for solids and a high intensity vortex liquid injection burner firing into the primary chamber, a secondary combustion chamber (SCC), an ash handling system, a water spray quench column, a high-energy venturi scrubber, a packed-column acid gas absorber followed by an offgas condenser, gas reheater, high efficiency particulate air (HEPA) filters, an activated carbon adsorber, and a final HEPA filter. One of the primary purposes of the CAI is incineration research. Research studies which have been completed in the CAI unit have included the incineration of various radioactively contaminated solid wastes, liquid PCBs, and pentachlorophenol contaminated wood.

A block flow diagram of the CAI incinerator is shown on Figure 1. The block flow diagram begins where the waste and auxiliary fuel is injected into the primary chamber and then traces the flow of the hot combustion gases to the secondary chamber, quench tower, and other pollution control devices with all discharge points noted.

3. Linear Dimensions of the Incinerator Unit Including the Cross-Sectional Area of the Combustion Chamber

The CAI system has two combustion chambers. The lower chamber (primary chamber) dimensions are 4 feet 10 inches inside diameter by 6 feet inside length. The upper chamber (secondary combustion chamber) dimensions are 3 feet 10 inches inside diameter by 6 feet inside length. The rectangular duct between the two chambers has internal dimensions of 1 foot by 3 feet and is 2 feet long. This duct contains the secondary air injectors and therefore functions as part of the secondary combustion chamber. The dimensions of the high-temperature duct between the secondary combustion chamber and the quench tower are 1 foot 8 inches inside diameter by 13

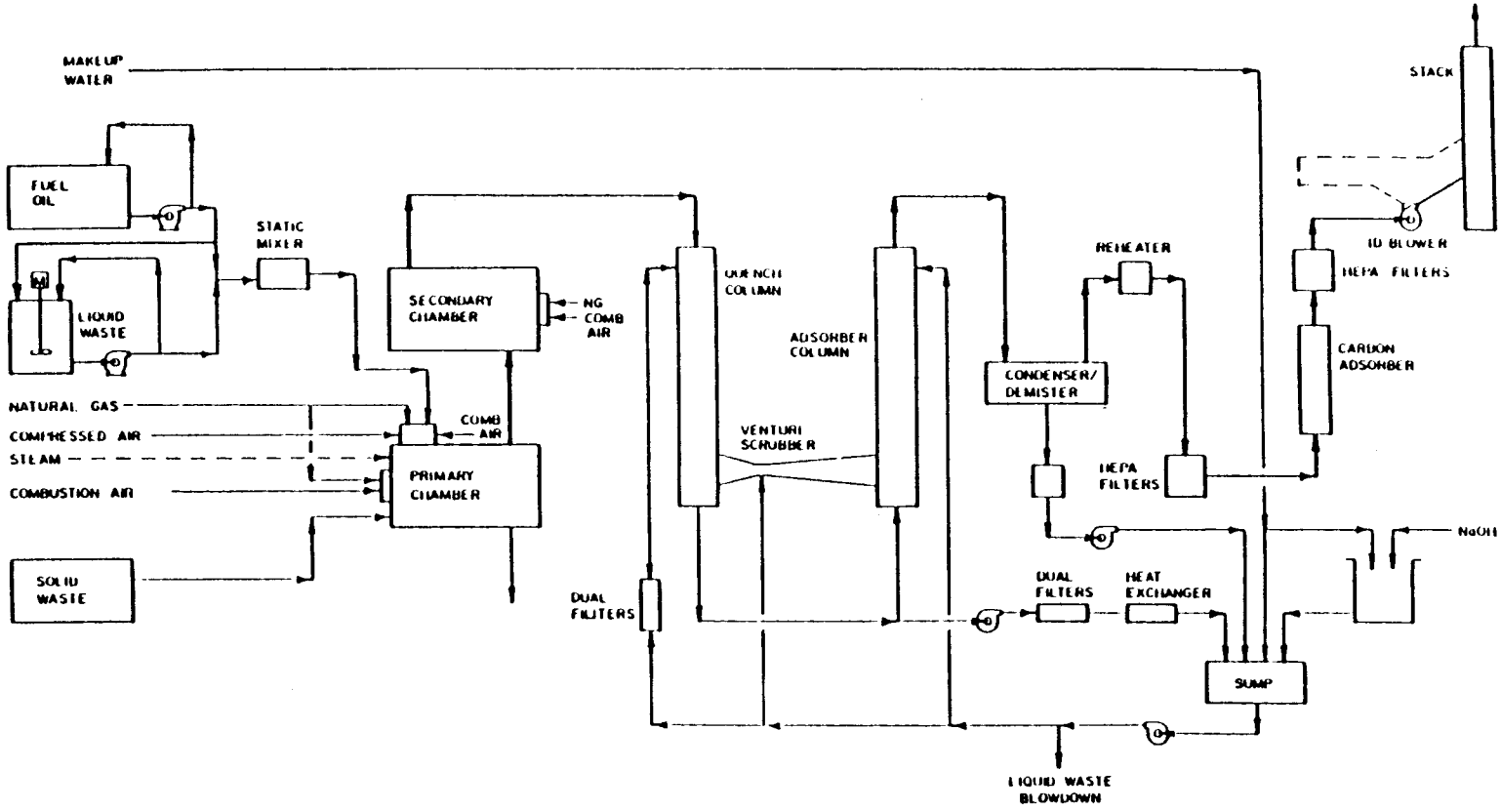


Fig. 1. Block Flow Diagram of CAI System

feet 7 inches long. The duct functions as an extension of the secondary combustion chamber. The volumes of the individual chambers are then approximately 110 ft^3 for the primary chamber, and 105 ft^3 for the secondary combustion chamber.

4. Description of the Auxiliary Fuel Burner System

The auxiliary fuel burner systems in the primary chamber and secondary chamber consist of gas burners. The primary and secondary chamber auxiliary fuel burners are identical. The primary chamber burner is located on the side of the primary chamber, and the SCC burner is located at the entrance to the SCC. Both of the auxiliary fuel burners are rated at 1,500,000 Btu per hour maximum output and are adjustable to suit operational requirements. The gas burners develop maximum rating with 3 inch W. G. gas pressure at the burners. All fittings, regulators, and control valves are Underwriters Laboratory, Chicago, Illinois, approved and assembled to meet the standards of Industrial Risk Insurers, Illinois, or other authority where applicable. Each of the auxiliary fuel burners is temperature controlled and is run with a preset combustion air to fuel ratio. The combustion air for both burners is supplied by a forced draft fan. Both burners are a pre-mix type manufactured by Pyronics, Inc., Cleveland, Ohio.

When fuel oil is used as an auxiliary fuel, it is either (1) injected through the liquid burner instead of waste liquid; or (2) batch-blended with the waste liquid and subsequently injected through the liquid burner as a mixture. An in-line static mixer has been installed to ensure dispersion of the fuel oil in the waste liquid as the mixture is being pumped to the liquid burner.

Method 1 is used to maintain heat in the lower chamber when operating the liquid burner and not feeding liquid waste. Method 1 is also used to flush the liquid feed lines following the completion of a liquid waste burn. Method 2 is used when the heating value of the liquid waste is too low to ensure proper operation of the liquid burner.

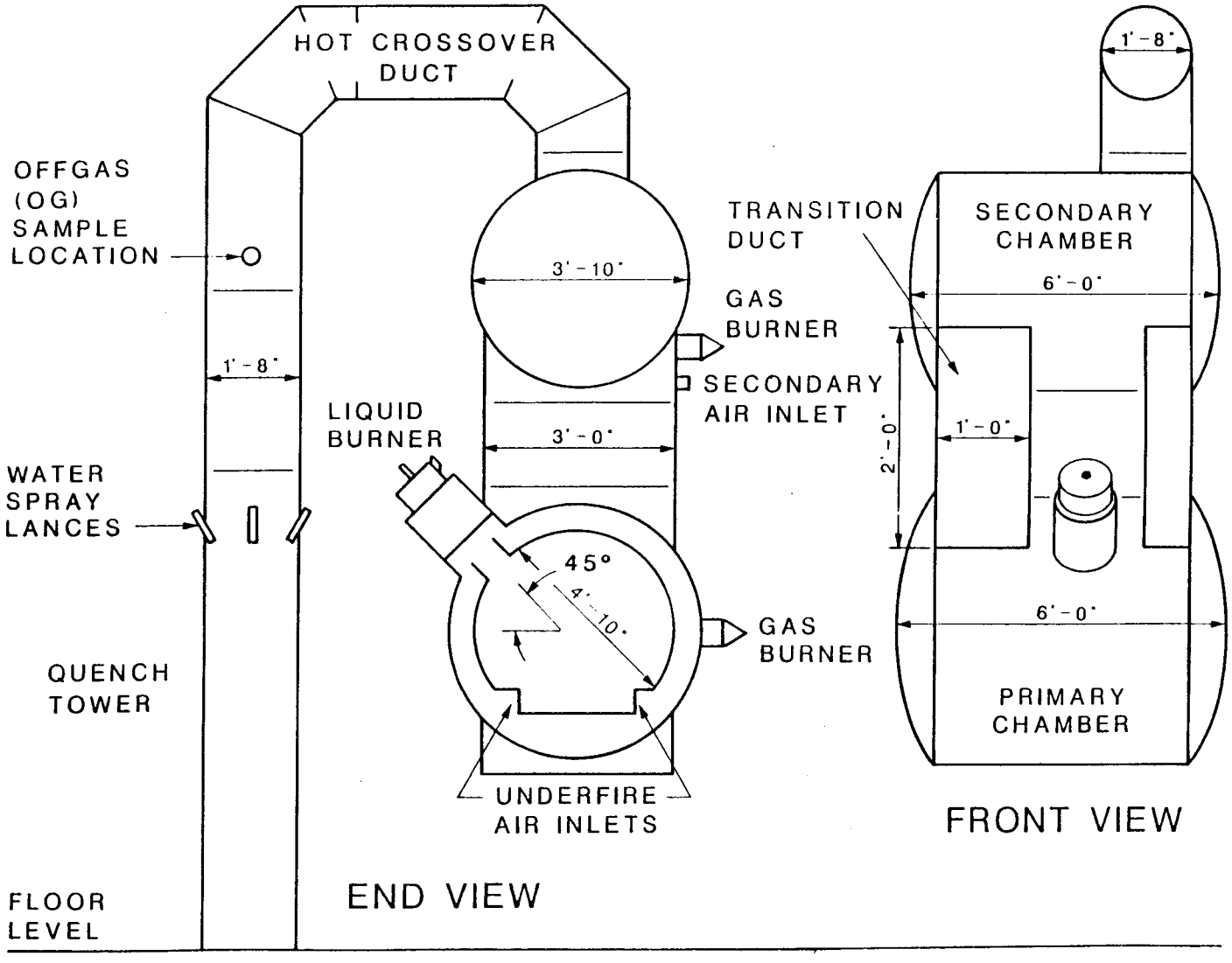


FIGURE 2. SCHEMATIC OF CAI

5. Capacity of Prime Mover

The CAI system prime mover is a Spencer Model G-3040-H-Spec turbine blower which operates as an induced draft (ID) fan. The ID fan is capable of producing an incineration negative pressure of 110 inch W.C. at a flow of 1900 cfm with a discharge pressure of 11.31 psia to accommodate the 7300 feet elevation at Los Alamos. The ID fan has a 40 hp, 3500 rpm motor.

6. Description of Automatic Waste Feed Cutoff

The primary function of the waste feed cut-off interlocks is to prevent the feeding of material at incineration conditions that are inadequate to assure destruction of the materials. During the startup and shutdown of the incinerator or during process upsets, the interlock system automatically stops all waste feed systems and prevents their restart until the incinerator is at proper operating conditions and the interlock is manually reset.

The process parameters identified in Table 1 are tied into an alarm panel and will also cut off the waste feed if the permit conditions for these parameters, as stated in 40 CFR 264.345(e), are exceeded. If any parameter is exceeded, a block valve in the waste liquid feed line to the liquid burner will automatically close, and the initiation signal to the solid waste feeding mechanism will automatically be deactivated. When permit conditions are within limits, neither the waste liquid block valve nor the solid waste feeding mechanism will be prevented from operating. The waste feed cut-off parameter permit condition values for permitted operation under 40 CFR Subpart O will be negotiated between EPA Region VI and Los Alamos based on the results of the RCRA trial burn. A discussion of the automatic waste feed cut-off parameters follows:

- Primary Chamber and SCC Temperatures -- The primary chamber and SCC temperatures are normally controlled to within 50`F below the temperature set-point. It is expected that the 50`F temperature variation will be encountered during normal operation and should not be cause for automatic waste feed cut-off.

- Carbon Monoxide -- Carbon monoxide (CO) concentrations are measured in the HEPA filter plenum and are discussed in Section D-5b(2)(b)7. Based on previous experience with the CAI, Los Alamos suggests that the

Table 1. Automatic Liquid and Solid Waste Feed Cut-Off Parameters

Parameter	
Minimum primary chamber temperature	1550°F
Minimum SCC temperature[a]	1550 or 1750°F
Maximum CO concentration	75 ppm by volume dry basis as measured by the continuous recording CO analyzer, except that for a period not to exceed 9 minutes, the system can continue to burn waste if the CO concentration does not exceed a maximum of 500 ppm.
Minimum scrub solution pH	4.0
Maximum combustion gas velocity[b]	To be determined during test run
Minimum HEPA filter pressure drop	0.1 inch W.C.
Maximum HEPA filter pressure drop	5.0 inch W.C.

[a]The trial burn is designed to determine the performance of the CAI while operating the SCC at two temperatures.

[b]Estimated to be less than 1500 SCFM.

CO automatic waste feed cut-off system be a two-tier system. The two-tier CO system is suggested as an approach to reducing waste feed cut-off situations which are caused by CO spikes. CO spikes are a common occurrence in incinerators during the feeding of liquid and solid wastes. The two-tier CO approach has previously been accepted by EPA Regions III and IV. The two-tier CO approach allows the use of a delay timer which starts if the CO level exceeds the first tier level, but not the second tier level. If at the end of a negotiated time the CO has not dropped below the first tier level, the waste feeds are automatically cut off. If, however, the CO drops below the first tier level before the time period has elapsed, the waste feeds are not cut off. If the second tier, however, is exceeded, the waste feeds are instantaneously cut off.

- Combustion Gas Velocity Indicator (CGVI) -- The CGVI will be measured during the trial burn and during permitted operation using a Fluidics HHR flow tube [see Section D-5b(2)(b)7 and Attachment D]. The CGVI permit condition for permitted operation will be based on the trial burn using the Fluidics flow tube.

- HEPA Filter Pressure Drop -- The pressure drop across each bank of the primary HEPA filters will be continuously monitored. If the filter pressure drop falls below the lower limit, the control system will automatically initiate a fast shutdown of the CAI. If the filter pressure drop exceeds the upper limit, the control system will automatically initiate a controlled shutdown of the CAI.

- Scrub Solution pH -- The acidity of the recycled scrub solution will be controlled by the addition of an alkali solution as required. The pH of the recycled solution will be continuously monitored. Operation of the CAI with a recycle scrub solution pH less than the limit will result in an automatic cutoff of the waste feed.

Three control logic sequences are provided to shut down the process in a safe and orderly manner.

- Controlled Shutdown -- initiated when there is potential for significant damage to minor process components. This is also the normal shutdown mode at the completion of a run. When controlled shutdown is initiated, feeding of waste to the incinerator is stopped, and a programmable set-point generator is activated that directs remote set-point inputs to the temperature controllers, causing a gradual decrease in

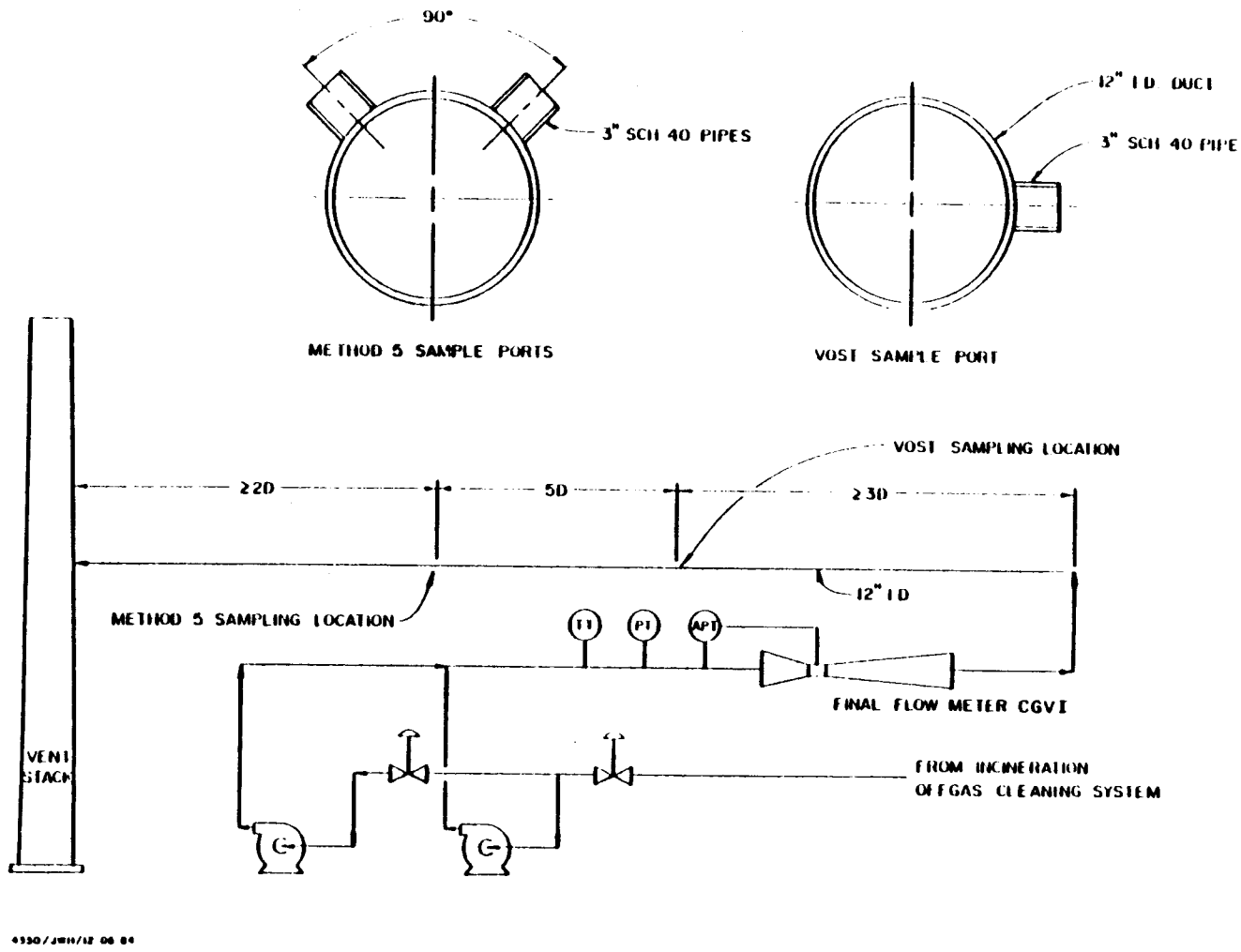


Fig. 3. Location of CGVI Flowmeter

chamber temperatures. Switches internal to the set-point generator cause an orderly timed shutdown of process components.

- Fast Shutdown -- initiated for conditions that could likely result in loss of containment or damage to major process components. Waste feeding is stopped. Following a two-minute timed interval following the last feeding of solid waste (immediately, if feeding liquid waste), the upper and lower chamber burners are shut down and the system valves and dampers are positioned so as to maintain a negative pressure in the system while minimizing flow through the system. Snuffing steam is introduced into the lower chamber. The two-minute delay when feeding solid waste allows for the ignition of pyrolytic gases formed immediately after feeding.

- Scram Shutdown -- initiated at the discretion of an operator. The chain of events are identical to the fast shutdown except that the sequence is not delayed when feeding solid waste. Scram buttons are located at the incinerator and in the control room.

The last two shutdown modes are potentially destructive to the incinerator refractory and are initiated only when the consequences of not shutting down are greater than the consequences to the incinerator during a scram or fast shutdown. It is the responsibility of the operating personnel and the process lead engineer to assess any situation and initiate the proper process shutdown sequence.

7. Stack Gas Monitoring and Pollution Control Equipment

Continuous monitoring of the off gas will be conducted for the combustion gas velocity indicator (CGVI) and CO. A single gas sample stream will be continuously withdrawn from the duct downstream of the reheater and just upstream of the HEPA filter inlet plenum for the CO analyses. Concentrations will be measured using a Foxboro-Wilks Miran II infrared (or equal) analyzer. Levels of CO will be recorded continuously on a strip chart in the control room.

The continuous CGVI monitoring will be recorded in the control room and measured by a Fluidic's HHR flow tube located in a straight run of duct between the ID fan outlet and the combustion gas stack. The CGVI

flowmeter information is supplied in Attachment D and the flowmeter location is shown in Figure 3.

The Los Alamos CAI Pollution Control Equipment (PCE) is shown in Figure 1. The PCE includes the following equipment.

- Quench column
- Venturi scrubber
- Packed absorber column
- Condenser/demister
- Reheater
- High efficiency particulate air (HEPA) filters
- Carbon bed adsorber
- Induced draft fan
- Recycle water system

In the quench column, combustion gases are cooled from the incinerator exit temperature to approximately 160°F by evaporation of scrub solution. Excess solution collects in the separator in the base of the column while the saturated gas phase is routed to the inlet of the venturi scrubber. The outlet temperature of the gas phase is monitored and a system limit of 250°F is imposed to protect the quench column from structural damage. Exceeding the temperature limit causes a waste feed shutoff and initiates an automatic controlled shutdown of the CAI.

The variable-throat venturi scrubber, located between the quench column and the absorber column, removes up to 99 weight percent of the offgas particulates. The intent and use of the venturi scrubber is to prolong the service life of the HEPA filters located further downstream in the PCE by reducing the particulate loading on the filters. The venturi assembly consists of converging and diverging cones with a clamp valve throat to allow the pressure drop to be varied. Venturi pressure drop normally is controlled in the 40 to 60 inch W.C. range. Recycled scrub solution is injected through a nozzle located upstream of the venturi throat.

Hydrochloric acid (HCl) is removed from the gas phase by counter-current contact with recycled scrub solution (or recycled condensate and fresh water) in the packed column absorber. The flow rate of the recycled solution is monitored and a low flow limit of 4.0 GPM is imposed to ensure

proper scrubbing of the HCl from the off gas. Operating below the flow rate limit causes a waste feed shutoff and initiates an automatic controlled shutdown of the CAI.

The condenser, mist eliminator, and reheater are included to condition the process exhaust gases before final HEPA filtration. The intent and use of the offgas conditioning system is to prolong the service life of the HEPA filters located further downstream in the PCE by minimizing blinding of the filters with condensate. The condenser lowers offgas temperature, removing water vapor from the scrubbed gas stream. The mist eliminator reduces the amount of water mist that is entrained in the offgas as the offgas leaves the downstream face of the condenser. The offgas is then reheated to a temperature above saturation temperature to avoid condensation and attendant plugging of the HEPA filters.

HEPA filtration is required for final removal of particulates. HEPA filters provide positive assurance that significant amounts of particulates are not vented in the stack gas. The filter module houses two frames (bank) in series, the first consisting of a prefilter and two HEPA filters in parallel, the second being similar but without the prefilter. Each bank of HEPA filters is tested in place for a minimum efficiency of 99.97 percent capture of particles with diameters >0.3 micrometer. The prefilter is rated at 85 percent efficiency. The pressure drop across each bank is monitored with a limit of >0.1 and <5.0 inch W.C. imposed. The lower limit ensures that a HEPA is properly in place (has not "sucked-through"), and the higher limit indicates a loaded filter bank. Operating below the lower limit causes a waste feed shutoff and initiates an automatic fast shutdown of the CAI. Exceeding the higher limit causes a waste feed shutoff and initiates an automatic controlled shutdown of the CAI.

The activated carbon bed adsorber serves as a final removal system for trace organic compounds. The housing for the activated carbon includes a third HEPA filter downstream of the carbon bed, which serves to remove any entrained carbon from the offgas stream. This third bank of HEPA filters is rated at the same capacity and is tested in place to the same efficiency as the primary HEPA filters located upstream of the carbon bed.

The induced draft fan is the prime mover which pulls the combustion gas through the air pollution control equipment.

The scrub solution recycle system is used to minimize liquid blowdown from the offgas cleaning system. Scrub solution usage ranges from 20-40 gal/min depending on the discharge pressure of the scrubber liquid pump and whether or not fresh water is being used in the absorber column. An alkaline solution is added at the process sump tank to maintain the scrub solution pH near the desired level. The addition rate is controlled by a pH sensor on the outlet of the process sump tank. The purge stream from the recycle water system goes to the Los Alamos liquid wastewater treatment system.

8. Liquid Burner Design

The details of the two auxiliary fuel burners are given in Section D-5b(2)(b)4 and Attachment B. A liquid waste burning nozzle and burner system is also located in the primary chamber. The burner is a commercial high intensity vortex liquid injection-type. The burner, a Trane Thermal model LV-2 vortex burner, is mounted on the side of the primary chamber firing downward at a 45° angle from horizontal directly into the chamber (Figure 2). The unit is equipped with its own natural gas pilot and natural gas supply for supplemental heat. Atomization of the liquid feed stream is accomplished with either air or steam through an internal mix nozzle. Details of the Trane burner are given in Attachment B.

9. Construction Materials

The construction materials for the CAI system components are as follows:

COMPONENT	CONSTRUCTION MATERIAL
Primary chamber, secondary chamber and high temperature duct	Carbon steel shell Internal mastic membrane Internal fiberboard insulation (refractory fiber) Internal high density refractory (40% Al_2O_3)

Quench tower, venturi scrubber, absorber tower, duct to condenser	FRP shell (ATLAC 382 resin, with with 5% antimony oxide fire retardant) Hastelloy C-276 Polypropylene
Condenser/demister, duct to HEPA filter plenum	304L stainless steel shell with phenolic resin internal coating and Plasite® paint coating
HEPA filter plenum, absorption tower	Carbon steel shell, Plasite® paint coating
Induced-draft blower, ductwork to blower and from blower to vent stack, vent stack	Carbon Steel

10. Location of Temperature, Pressure, and Flow Indicating and Control Devices

The discussion in this section is based on Figure 4. The numbers given at the end of each heading refer to the equipment location in Figure 4.

a. Primary Chamber and Secondary Combustion Chamber Combustion Temperatures (1,2) -- The combustion gas temperatures of the primary chambers and the secondary combustion chamber are each measured with a type S (platinum/10% rhodium) thermocouple. The primary chamber thermocouple is located in the hot duct between the primary and secondary combustion chambers. The SCC thermocouple is located downstream of the SCC at the entrance to the high temperature duct.

b. Waste Liquid Flow (3) -- Waste liquid flow is measured by a Micro-Motion®, Model C25, gyroscopic/coriolis mass flowmeter. The Micro-Motion flowmeter provides a measurement of instantaneous mass flowrate of the waste liquid being fed to the Trane burner. A detailed description of this flowmeter is given in Attachment D.

c. Solid Waste Flowrate (4) -- Solid waste is typically fed to the CAI in preweighed 1 foot X 1 foot X 2 foot cardboard boxes. These boxes are than transferred to the side ram feeder, which feeds the main ram feeder. The main ram feeder pushes boxes of solid waste into the primary chamber on a timed cycle which can be manually or automatically overriden when necessary. Each time a box of solid waste is fed to the primary chamber, the incinerator operator records the event on a log sheet.

   The solid waste feed rate will be monitored, as is presently done, by the operator entering on a logsheet the weight and time each box of solid waste is fed to the primary chamber. Most of the solid wastes fed to the primary chamber are not RCRA hazardous wastes.

d. Combustion Gas Flowmeter (5) -- The combustion gas flowrate will be measured at a location between the ID fan and the stack by a Fluidic's HHR flow tube. This combustion gas flowrate will be the combustion gas velocity indicator (CGVI) (see Section D-5b(2)(b)7 and Attachment D).

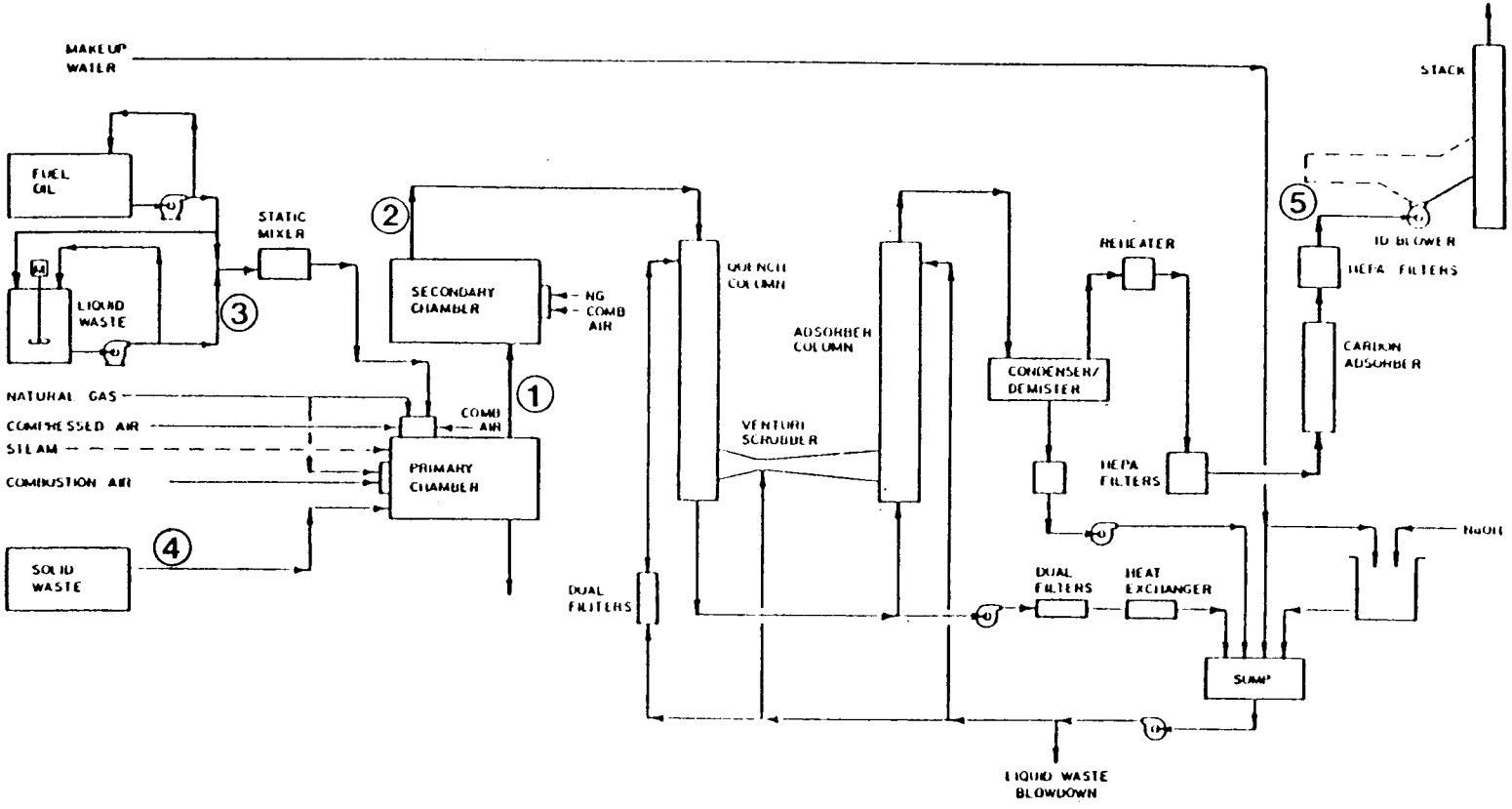


Fig. 4. Location of Temperature, Pressure, and Flow Indicating Control Devices

e. Research Parameter Measurement -- Because the CAI is used and will be used partly as an incineration research system, it is more highly instrumented than typical industrial hazardous waste incinerators. The CAI has many temperature, pressure, and flow indicating instruments not mentioned in this section. These instruments are necessary from the research point of view, but are not necessary to meet the requirements of the 40 CFR 264 Subpart O and 40 CFR 270.62 RCRA incineration and trial burn regulations.

D-5b(2)(c) Sampling, Analysis, and Monitoring Procedures

The objective of a trial burn test is to obtain process data that will:

- Permit calculation of Principal Organic Hazardous Constituent (POHC) destruction and removal efficiency, HCl removal efficiency, and particulate emission concentrations
- Confirm the fate of POHCs treated by the system; that is, destroyed by thermal oxidation, and removed by the air pollution control system, or emitted in the stack gases, ash residues or scrubber water purge stream
- Document the test process feed and operating conditions that will be used in establishing operating permit conditions

The sampling and analysis procedures included in this section are therefore selected to determine the physical-chemical characteristics of the incinerator feed materials (especially the POHC concentrations), material feed rates, the composition and flow rates of the stack gases, and the amounts of POHC discharged in the incinerator ash, the stack gases and the quench-scrubber purge water. The monitoring procedures are selected to measure concentrations of O_2 in the combustion gases and CO in stack gases.

The following sampling and analysis procedures are based on carbon tetrachloride (CCl_4) being used as the POHC. The rationale for selection of CCl_4 as the POHC is presented in Section D-5b(2)(d).

1. Sampling Locations and Procedures

The locations where solid, liquid, and gaseous samples are collected from the incineration system are shown in Figure 5. All of the materials supplied to the incineration and air pollution control processes including fuel oil, liquid and solid waste feeds, and makeup water are sampled at

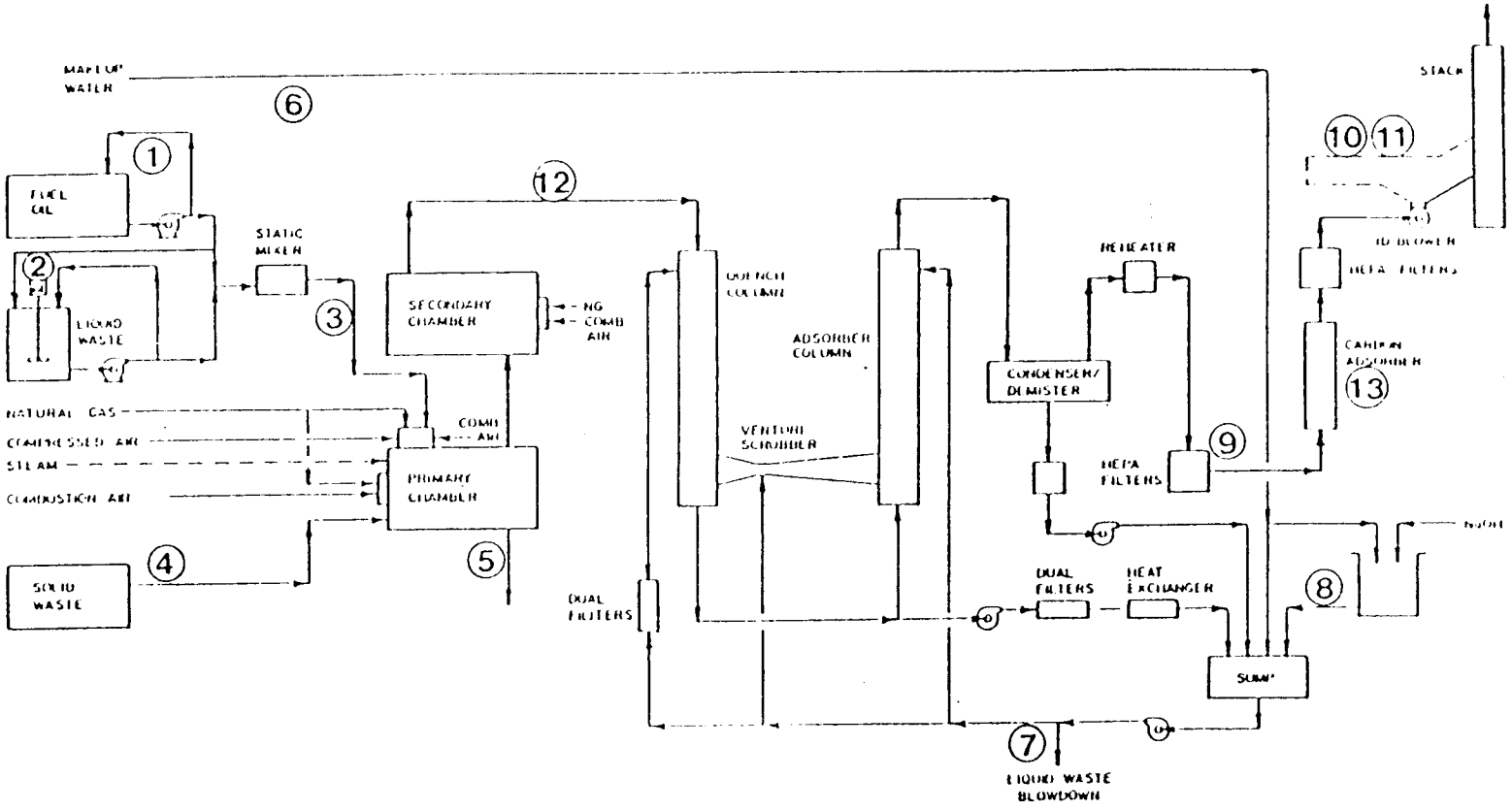


Fig. 5. Location of Sampling Points

locations 1, 2, 3, 4, 6, and 8. Samples of process solids (ash and carbon) and liquid (blowdown water) effluents are collected at locations 5, 13, and 7, respectively. POHC, HCl, and particulate emission samples are collected from the stack gases at locations 10 and 11. The O_2 concentration of the combustion gases is continuously monitored at location 12; CO_2 and CO concentrations are monitored at location 9.

The sampling equipment and the procedures for collecting samples at each location are summarized in Table 2. Sampling frequency and reference methods are included in that table. Additional details regarding each sampling location are discussed below.

a. Fuel Oil (1) -- A representative sample of fuel oil will be collected just before each test sampling run either by taking grab samples from a tap in the fuel oil recirculation line, or by using a coliwasa at an access port in the top of the tank. This sample will be retained for future analysis in case there are problems with analysis of the blended liquid sample taken at location 3.

b. Liquid Waste (2) -- A representative sample will be collected just before each test sampling run either by taking grab samples from the liquid waste recirculation line or by using a coliwasa at a access port in the top of the tank. This sample will also be retained for future analysis in case there are problems with analysis of the blended liquid sample taken at location 3.

c. Liquid Waste Blend (3) -- The organic liquid waste will be prepared in the liquid waste tank and either fed directly to the incinerator or blended with fuel oil in an inline static mixer before being fed to the incinerator. A flow diagram of the waste feed system is shown in Figure 6. Grab samples will be collected from a sample tap in the feed line to the incinerator at the beginning, middle, and end of each replicate sampling run and composited.

d. Solid Waste Blank (4) -- All solids materials will be prepared before the trial burn and stored in sealed containers. A scoop will be used to collect equal size samples from each bulk solids container before

the actual waste feed containers are prepared. The samples will be composited to provide a blank of solids matrix material and placed in a wide-mouth glass bottle with Teflon-lined lid.

e. Incinerator Ash (5) -- Small and possibly negligible amounts of ash are expected to be accumulated during each test sampling run. The ash drop doors will be operated at the end of each test period allowing any accumulated ash to fall into the drop-out hopper where it will be pneumatically conveyed to the ash collection hopper located above the glove box. The sample (if any) will be collected from the double valve drop chute inside the glove box. The ash drop doors and the pneumatic system will be operated before each test run to remove ash accumulated since the previous test.

f. Makeup Water (6) -- Grab samples will be collected from a supply line tap at the beginning and end of each replicate sampling run and composited.

g. Blowdown Water (7) -- Grab samples will be taken from a tap in the liquid waste discharge line to the industrial (radioactive) waste treatment plant. Before each sampling run, two grab samples will be collected 30 minutes apart and composited to provide a blank sample. Grab samples will be taken every 60 minutes during each replicate sampling run and composited for the run.

h. Aklaline Solution (8) -- Sample tank contents after preparing new batch.

i. HEPA Plenum Exhaust Gas (9) -- A gas sample is continuously extracted for carbon monoxide analysis. (CO_2 analysis will be used to confirm stack gas Orsat analyses).

j. Stack Gases (10, 11) -- Samples of the particulates, acid gases, and volatile organics in the offgas will be collected from the exhaust duct at locations 10 and 11 shown in Figure 7. The exhaust duct is designed for isokinetic sampling.

Table 2. Sample Collection Locations, Equipment, and Methods

ocation	Description	Access	Equipment	General Procedures/Frequency	Reference Methods[a]
1.	Fuel oil recirculation line	Tap	Glass bottle	Grab sample at beginning and end of each run; composite for each replicate test run	S004,SW846
	Alternate: Fuel oil tank	Top port	Coliwassa; glass bottle	Grab sample prior to each replicate test run	S001,SW846
2.	Liquid waste recirculation line	Tap	Glass bottle	Mix tank contents, collect grab sample at beginning and end of each replicate run and composite	S004,SW846
	Alternate: Liquid waste tank		Coliwassa; glass bottle	Mix tank contents, collect sample prior to each test run	S001,SW846
3.	Liquid waste feed line	Tap	Glass bottle	Grab sample at beginning, middle, and end of each run; composite for each run	S004,SW846
4.	Solids storage containers	Open top	Scoop; glass bottle	Prior to loading waste feed boxes, collect sample from each bulk solids container; composite all samples to obtain blank of solids feed matrix	S007,SW846
5.	Ash drop chute	Valve	Glass bottle	Collect samples from valve at end of each run	S006,SW846
6.	Makeup water supply line	Tap	Glass bottle	Composite grab samples collected at beginning and end of run	S004,SW846
7.	Liquid waste blowdown	Tap	Glass bottle	Collect blank before run; composite hourly grab samples	S004,SW846
8.	Alkaline solution tank	Top port	Dipper, plastic bottle	Sample tank contents after preparing each batch	S002,SW846
9.	HEPA plenum exhaust	Port	Instrument vacuum pump	Continuously extracts and transports gas sample to instrument for CO/CO_2 analysis	
10.	Stack inlet duct	Port	VOST sampling train	Six pairs of sorbent cartridges collected over 3-hour period	S012
11.	Stack inlet duct	Port	EPA M5 sampling train	Collect integrated samples of particulates, moisture, and acid gases; measure stack gas velocity pressure and temperature over 3-hr sampling time; collect from the exhaust of the train integrated bag samples of stack gases for CO_2 and O_2 analysis every 30 min	S008, EPA Methods 1-5
12.	Secondary chamber	Port	Instrument aspirator pump	Continuously extracts and transports combustion gases to instrument for O_2 analysis.	
13.	Adsorber carbon	Port	Thief, glass bottle	Take core sample about 1/2 in. dia. X 6 in. long from inlet side of adsorber after each test	

[a] Prefix S refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002. SW refers to Test Methods for Evaluating Solid Waste, SW 846, Sec. Ed., July 1982

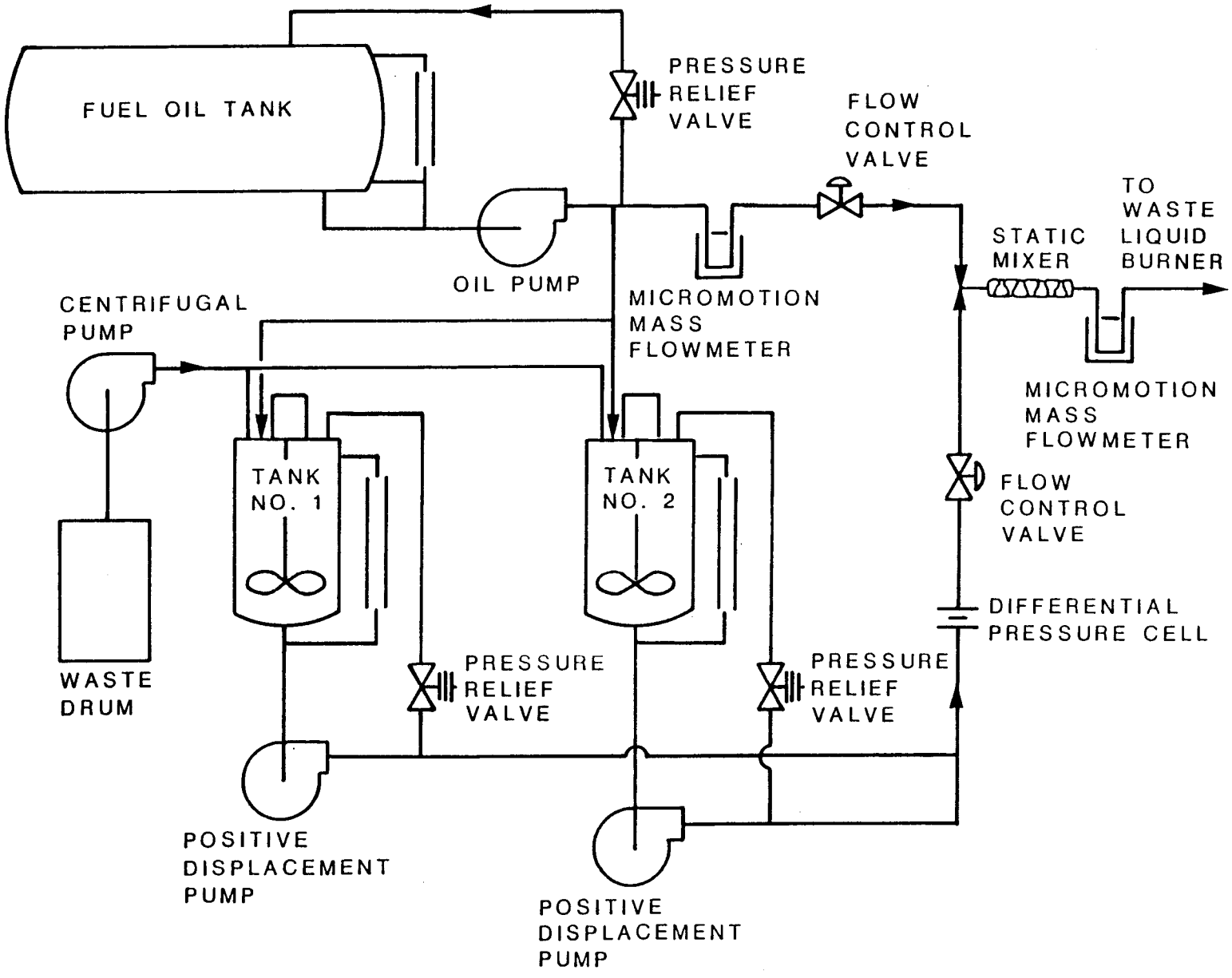


FIGURE 6. CAI LIQUID FEED SYSTEMS

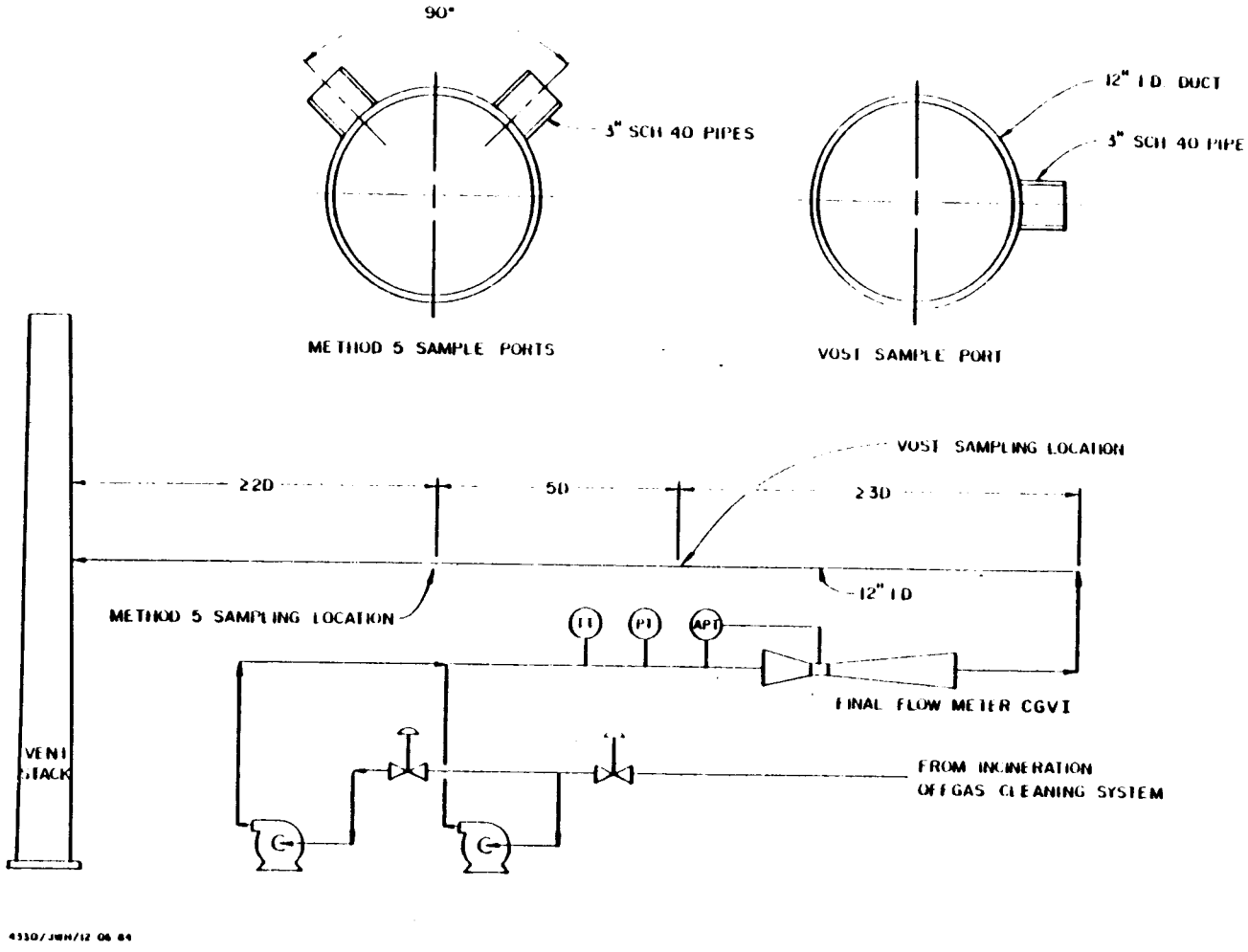
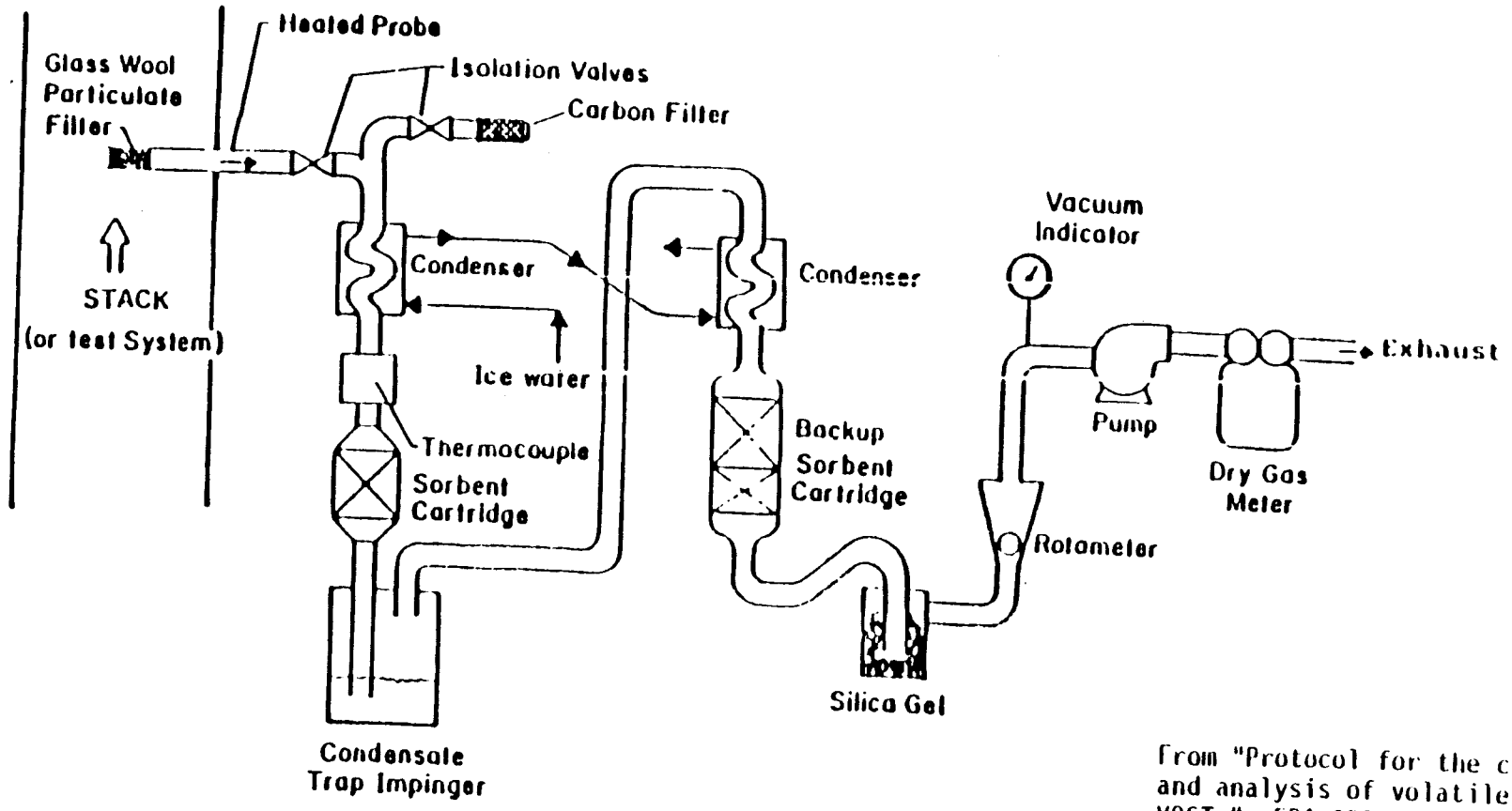


Fig. 7. Stack Gas Sampling Locations



From "Protocol for the collection and analysis of volatile POHC using VOST." EPA-600/8-84-007.

FIG. 8. Schematic of Volatile Organic Sampling Train (VOST)

A volatile organic sampling train (VOST, Figure 8) will be used at location 10 to collect CCl_4 and other volatile organics on sorbent resin according to procedures given in Attachment E. The VOST will be operated for approximately three hours during each test duplicate sampling run. The VOST cartridges will be capped immediately upon removal from the train, wrapped in aluminum foil, placed in glass tubes, and sealed.

An EPA Method 5 (M5, Fig. 9) sampling train will be used at location 11 for collection of particulate and HCl acid gas. The M5 procedures include measurement of the stack gas flow rate and temperature according to EPA Methods 1 and 2. Approximately every 30 minutes, integrated samples will be collected in gas bags from the M5 train exhaust for O_2 and CO_2 determinations by an Orsat analyzer according to EPA Method 3. The M5 train will be operated for approximately three hours to collect approximately 3.5 m^3 stack gas during each replicate sampling run.

k. Combustion Gas (12) -- A sample will be continuously extracted from the hot gas for O_2 concentration analysis.

l. Adsorber Carbon (13) -- A thief will be used to take a core sample (approximately 1/2-inch diameter X 6 inches long) from the inlet gas side of the absorber after each test. The sample will be placed in a glass container with a Teflon-lined lid.

There are three other process wastes that can potentially contain small amounts of CCl_4 in accumulated solids. These wastes are the offgas HEPA filters, the quench recycle liquid filters, and the absorber discharge liquid filters. These filters are not included in the sampling program for the following reasons:

- The amount of solids that will be accumulated in the filters during a 3-hour run is believed to be insignificant because the systems are designed for long term (weeks, months) of service before the filters are removed for disposal.

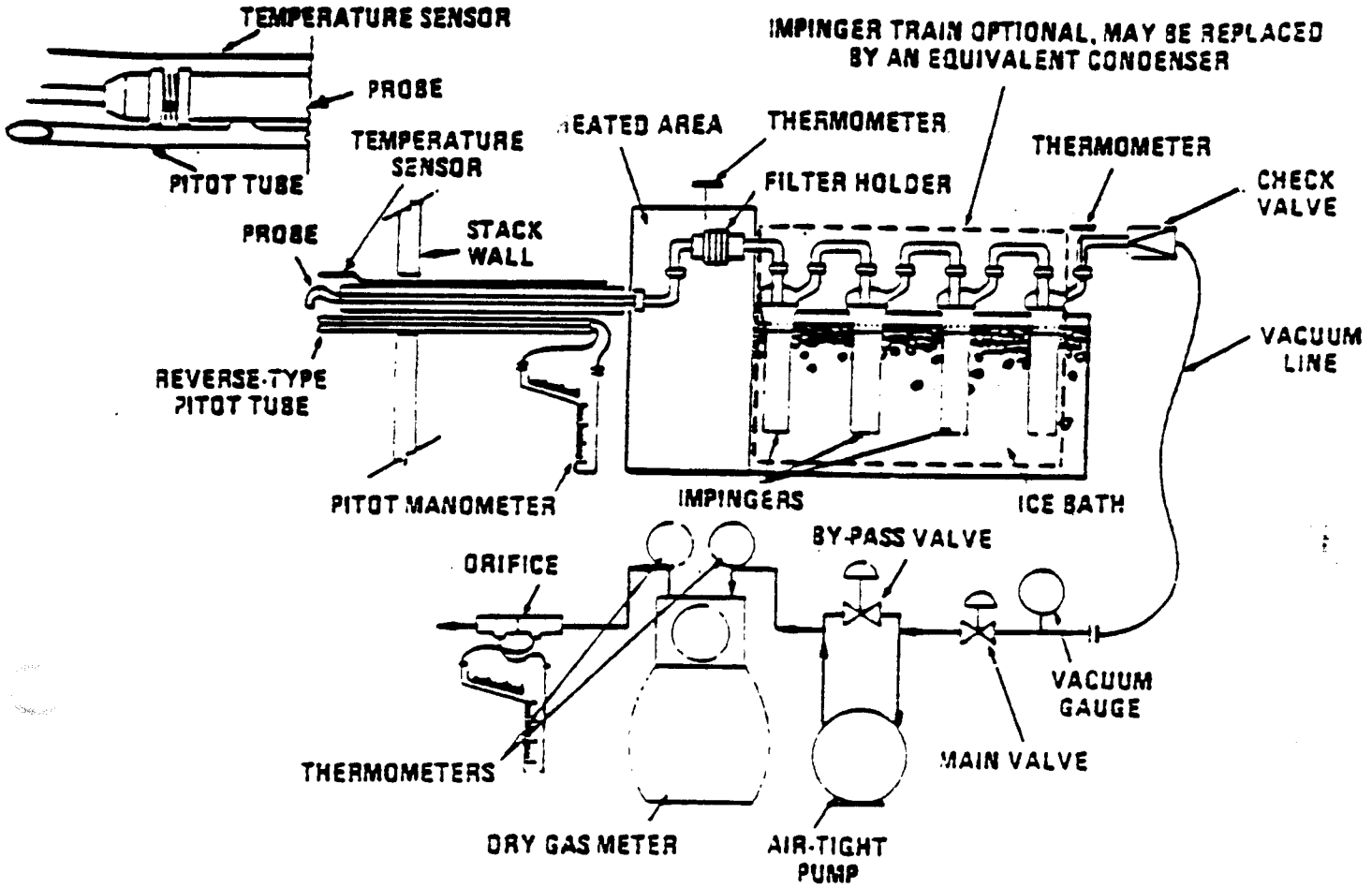


Fig. 9. EPA Method 5 Sampling Train

- The total amount of CCl_4 retained by the solids during a sampling run is believed to be negligible because the gas and liquid streams are at elevated temperatures and because CCl_4 has low solubility in water. At the proposed process conditions, residual CCl_4, if any, will tend to remain in the gas streams rather than be retained in the liquids or the small amount of accumulated solids.

- The filter media will probably contain radioactive particulates, complicating cartridge removal, recovery of accumulated solids, extraction and analysis of CCl_4. Removal of the air and liquid filter cartridges after each of the twelve sampling runs would cause extension of the test schedule and significantly increase trial burn costs.

All sample containers and organic sorbent traps for the above sampling program will be prepared by the laboratory having primary responsibility for analyzing all samples. At the test site a sample manager will be responsible for distributing sample containers and traps, monitoring sample collection, taking custody of samples from the sampling team, and preserving the samples. The sample manager will be responsible for shipping and for transferring sample custody to analysis coordinators in the primary and reference laboratories.

2. Sample Recovery Procedures

The laboratory analysis coordinators will inspect the samples as received and accept custody. Sample aliquots will be taken for the required analyses. Surrogate and/or reference compounds will be added to these samples before any preparation steps. The specific compounds and the amounts to be added will be as called for in the analytical procedures. Typically, the spike amounts will be near the analysis detection level. The laboratories will be responsible for implementing their own instrument calibration and QA/QC procedures.

The procedures for recovering compounds from the major sample groups are briefly summarized below.

Organic Liquids -- This group includes the fuel oil and the liquid waste blend samples. The fuel oil and liquid waste samples will be shaken to minimize stratification before removing aliquots for specific analyses.

For organic analyses, small aliquots will be diluted in hexane for direct analysis or processed through cleanup, as required by the analytical procedures identified in the next section.

Solids -- This group includes solid waste blanks, incinerator ash, and adsorber carbon. The samples will be dispersed in methanol or polyethylene glycol for analysis using purge and trap procedures (Attachment E).

Aqueous -- This sample group includes makeup water, blowdown water, alkaline solution and VOST condensate. Sample recovery procedures are not required for these samples because they will be direct injected according to procedures referenced in the next section for volatile organic analysis.

Sorbent Resins -- This sample group will include the VOST resin cartridges (Tenax® and Tenax-charcoal). Each pair of VOST resin cartridges will be thermally desorbed to an analytical trap according to the protocol detailed in EPA-600/8-84-007.

M5 Train Components -- The samples will be recovered from the M5 train as follows:

- Particulate filter -- Will be removed from holder, placed in a glass petri dish, wrapped in aluminum foil, placed in a plastic bag and sealed.

- Probe rinse -- The nozzle, probe, and front half of the filter holder and any connecting glassware will be brushed and rinsed with acetone followed by a rinse with hexane. The rinses will be placed in glass jars with Teflon-lined lids.

- Impinger water -- The contents of the impingers will be volumetrically measured and placed in a glass sample bottle with a Teflon-lined lid. The impingers will be rinsed with distilled water and the rinse added to the sample.

- Silica gel -- The cartridge will be returned to its original container and sealed.

Table 3. Analyses Planned for Trial Burn Samples

Sample Name	Analyses
	Tests 1 and 2 (Liquids)
Fuel oil	(Archive)[a]
Raw liquid waste	(Archive)[a]
Liquid waste blend	Density, heat content, ash content, elemental (C,H,N,O,S, organic Cl), matrix constituents, CCl_4
Incinerator ash	(Archive)[b]
Makeup water	CCl_4
Blowdown water	CCl_4, pH, total chlorides
Alkaline feed	CCl_4
Adsorber carbon	CCl_4
Stack gas VOST	CCl_4
Stack gas M5	Particulates, moisture, HCl, O_2, and CO_2
Combustion gas monitor	O_2
Absorber gas monitor	CO and CO_2
	Tests 3 and 4 (Solids)
Fuel oil	Density, heat contnt, ash content, elemental (C,H,N,O,S, organic Cl), CCl_4
Solids feed blank	Density, heat content, ash content, elemental (C,H,N,O,S, organic Cl), moisture, CCl_4
Incinerator ash	(Archive)[b]
Makeup water	CCl_4
Blowdown water	CCl_4, pH, total chlorides
Alkaline feed	CCl_4
Adsorber carbon	CCl_4
Stack gas VOST	CCl_4
	Tests 3 and 4 (solids) (Continued)
Stack gas M5	Particulate, moisture, HCl, O_2, and CO_2
Combustion gas monitor	O_2
Absorber gas monitor	CO and CO_2

[a]Retain for same analysis as liquid waste blend if needed.
[b]Retain for CCl_4 analysis if needed.

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Table 4. Summary of Analytical Procedures and Methods

Analysis	Sample Name	Test No.	Sample Matrix	No. of Samples	Procedure Description	Reference Methods[a]
ensity	Fuel oil	3,4	No. 2 fuel oil	6	Gravimetric/volumetric	
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Gravimetric/volumetric	
	Solids feed blank	3	Sawdust	1	Gravimetric/volumetric	
eat Content	Fuel oil	3,4	No. 2 fuel oil	6	Bomb calorimeter	A006, ASTM D240
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Bomb calorimeter	A006, ASTM D240
	Solids feed blank	3	Sawdust	1	Bomb calorimeter	A006, ASTM D2015
sh Content	Fuel oil	3,4	No. 2 fuel oil	6	Residue after combustion in muffle furnace	A001, ASTM D482
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Residue after combustion in muffle furnace	A001, ASTM D482
	Solids feed blank	3	Sawdust	1	Residue after combustion in muffle furnace	A001, ASTM D3174
lemental Composition (C, H, N, O)	Fuel oil	1,2	No. 2 fuel oil	6	Analyze combustion products and residue	A003, ASTM 3176
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Analyze combustion products and residue	A003, ASTM 3176
	Solids feed blank	3	Sawdust	1	Analyze combustion products and residue	A003, ASTM 3176
rganic Chlorine	Fuel oil	1,2	No. 2 fuel oil	6	Halide titration of combustion residue	A004, ASTM D2361
	Liquid waste blend	1,2	Fuel oil, CCl_4	6	Halide titration of combustion residue	A004, ASTM D2361
	Solids feed blank	3,4	Sawdust	1	Halide titration of combustion residue	A004, ASTM D2361
oisture	Solids feed blank	3	Sawdust	1	Heating under controlled conditions	A001, ASTM D3173
otal suspended solids	Blowdown water	1,2,3,4	Water	12	Filtration residue	EPA M160.1
otal dissolved solids	Blowdown water	1,2,3,4	Water	12	Filtrate residue	EPA M160.2
otal organic carbon	Blowdown water	1,2,3,4	Water	12	Oxidation/IR detection	EPA M415.1

Table 4. (Continued)

Analysis	Sample Name	Test No.	Sample Matrix	No. of Samples	Procedure Description	Reference Methods[a]
Organics						
CCl_4	Fuel oil	3,4	No. 2 fuel oil	6	Dilution, purge and trap, GC/MS	A101, SW 8240
	Liquid waste blend	1,2	Fuel oil	6	Dilution, purge and trap, GC/MS	A101, SW 8240
	Solids feed blank	3	Sawdust	1	Extraction, purge and trap, GC/MS	A101c, A101
	Incinerator ash	1,2,3,4	Combustion residue	0-12	Extraction, concentration, GC/MS	A101c, A101
	Makeup water	1,2,3,4	Water	4	Purge and trap, GC/MS	A101a, A101
	Blowdown water	1,2,3,4	Water	12	Purge and trap, GC/MS	A101a, A101
	Alkaline solution	1,2,3,4	20% NaOH	1-4	Purge and trap, GC/MS	A101a, A101
	Adsorber carbon	1,2,3,4	Carbon	12	Purge and trap, GC/MS	A101a, A101
	Stack gas VOST	1,2,3,4	Sorbent resins	36	Thermal desorption, trap, GC/MS	A101a
		1,2,3,4	Condensate	12	Purge and trap, GC/MS	A101a, A101
HCl	Stack gas M5	1,2,3,4	Condensate H_2O combined with impinger NaOH solution	12	Ion specific electrode	Orion Manual
Particulates	Stack gas M5	1,2,3,4	Probe rinse residue, filter	12	Gravimetric	EPA Method 5
O_2, CO_2	Stack gas M5	1,2,3,4	Stack gas	-	Integrated bag samples for ORSAT analysis every 30 min	EPA Method 3
O_2	Secondary Chamber	1,2,3,4	Combustion gas	b	Gas analysis by electrochemical cell (Thermox WDG-III)	
CO_2, CO	Adsorber exit gas	1,2,3,4	Combustion gas	b	Gas analysis by IR detector (Foxboro-Wilks Miran II)	

[a]"A" refers to Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, February 1984.
"ASTM" refers to American Society for Testing Material Standards.
"SW" refers to Test Methods for Evaluating Solid Waste, SW 846, Second Edition, July 1982.
"EPA" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
"EPA M" refers to Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
[b]Continuous monitoring.

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3. Analytical Procedures

The analyses planned for each trial burn sample are listed in Table 3. The procedures and reference methods for these analyses are summarized in Table 4. The standard methods referenced for heat content, ash content, elemental composition, organic chlorine, and stack gas O_2, CO_2, and particulates are self-explanatory. Analysis of samples for CCl_4 will be by the methods referenced in EPA-600/8-84-002. These methods involve the use of standard purge-and-trap, gas chromatography (GC/MS) techniques for identification and quantification of volatile organics. Copies of referenced procedures are included as Attachment E.

4. Monitoring

Monitoring for CO will be done during the trial burn tests using a Foxboro-Wilks Miran II Infrared analyzer [See Section D-5b(2)(b)7].

D-5b(2)(d) Detailed Trial Burn Protocol

1. Waste Characterization

The CAI will be used to incinerate the Los Alamos laboratory waste. The laboratory wastes are a mixture of liquid and solid hazardous wastes composed of various organic solvents and liquids as well as chemically contaminated paper, wood, and plastics. The liquids are basically small quantity lab chemicals which will be transferred from lab size containers into larger containers and stored until ready to be incinerated. Laboratory liquids can contain either ignitable or U or P listed wastes containing Appendix VIII constituents.

Because the laboratory liquid wastes include numerous small bottles which are generated in a random fashion it is impossible to identify and quantify the Appendix VIII constituents by a sampling program. The POHC has therefore been selected based on an approach suggested by the EPA and discussed in the next section.

2. POHC Selection Rationale

In selecting the principal organic hazardous constituent (POHC) to be used in the CAI solids and liquids trial burn, several criteria were considered

important for various reasons. Trade-offs or constraints imposed by these criteria were carefully evaluated in selecting the compound.

Thermal stability of organic compounds must be considered in examining the behavior of organic compounds in a combustion unit. EPA's approach to trial burns is to specify POHCs of high thermal stability so that results can be extrapolated to compounds of similar or lower thermal stability. According to the EPA's Guidance Manual for Hazardous Waste Incinerator Permits, heat of combustion is the EPA's preferred indicator of thermal stability.[1] Accordingly, compounds with low heats of combustion (ΔHc) were given priority consideration in the POHC selection process. Since it is important to obtain as flexible a permit as possible, artificial wastes containing carbon tetrachloride (CCl_4) are proposed as the POHC during the trial burn. This option is suggested in the March 1983 draft of the EPA's Guidance Manual for Hazardous Waste Incinerator Permits. The Guidance Manual makes the following statement relative to the use of artificial wastes[2]:

> "Using an artificial waste feed has the advantage of simplifying the analytical procedures because interference by organics other than the POHCs is greatly reduced. This approach also allows the applicant to create waste feed that is very difficult to burn. A successful trial burn conducted with such a waste feed results in permit conditions allowing the operator to accept a wide variety of wastes for treatment, perhaps eliminating any future need for permit modifications and additional trial burns."

Carbon tetrachloride has a very high rank (fourth highest) on the EPA's ranking list of the incinerability of organic hazardous constituents on the basis of heats of combustion. Carbon tetrachloride has also been shown by the University of Dayton Research Institute to have a very high vapor phase thermal oxidation stability[3]. Therefore, CCl_4 is proposed for use as the POHC in both the solids and liquid trial burns.

Spiking the waste with CCl_4 will also provide a source of organic chlorine which will give maximum permit flexibility relative to the HCl performance standard. Los Alamos therefore recommends that CCl_4 be designated as the trial burn POHC.

The approximate composition and analytical parameters of the trial burn liquid and solid wastes are given in Tables 5 and 6. The values in Tables 5 and 6 are estimates.

3. Trial Burn Protocol and Operating Conditions
The trial burn will consist of four tests. Each trial burn will include triplicate sampling runs. A total of 12 sampling runs will be done. Table 7 presents the test protocol and schedule for each of these trial burn tests and 12 runs.

4. Waste Constituents

a. Liquid Wastes -- Trial burn tests 1 and 2 will involve the incineration of a liquid blend of fuel oil and carbon tetrachloride (CCl_4) as a suggested POHC in the primary chamber waste burner. The liquid blend will also be spiked with an ash surrogate which will generate particulate during incineration. The liquid waste will be spiked with an ash surrogate in order to obtain a more flexible RCRA liquid incineration permit relative to waste ash content. [See D-5b(2)(d) 8.] The viscosity of the liquid blend will be dependent on the characteristics of the blend of #2 fuel oil, CCL_4, and the ash surrogate. The ash surrogate may increase the viscosity of the blend substantially. Los Alamos will not burn material with a viscosity greater than 500 SSU at in injection temperature in order to ensure proper atomization. The approximate characteristics of the liquid waste blend are summarized in Table 5. The trial burn operating conditions are summarized in Table 8.

b. Solids Wastes -- Trial burn tests 3 and 4 will involve the incineration of sawdust and CCl_4. The CCl_4 was selected as a suggested POHC for the solids trial burn tests because of its commercial availability and high ranking on the EPA's heat of combustion hierachy. Because of CCl_4's high volatility, however, the CCl_4 will be fed to the incinerator in sealed containers. The sealed containers of CCl_4 and the sawdust will be placed in 1 foot X 1 foot X 2 foot cardboard boxes, weighed, and fed

Table 5. Approximate Estimated Composition of Trial Burn Waste Liquid[a]

	Wt%	
Composition		
Carbon tetrachloride	60-65	
Fuel oil	35-40	
Heat value		~7,000 Btu/lb
Organic chlorine content	55-60	
Ash content	2[b]	
Viscosity	< 500 SSU[c]	

[a]This is the CCl_4 spiked waste liquid which will be incinerated during the trial burn.

[b]An ash-producing material, aluminum stearate or other organometallic compound, will be added to the liquid waste blend as an ash surrogate.

[c]At injection temperature.

Table 6. Approximate Estimated Composition of Trial Burn Solid Waste

	Wt%
Composition	
Carbon tetrachloride	20-25
Sawdust	75-80
Organic chlorine content	20-25

Table 7. Test Protocol and Schedule

Trial Burn Test	Run No.	Sampling[a] Run Duration(hr)	Waste Feeds/POHCs Trial Burn Tests: Liquid[b] Waste	Solid[c] Waste	Natural[d] Gas	Stack Testing: DRE	Particulate	HCl
1	1 - 1	5 - 6	CCl_4		X	X	X	X
	1 - 2	5 - 6	CCl_4		X	X	X	X
	1 - 3	5 - 6	CCl_4		X	X	X	X
2	2 - 1	5 - 6	CCl_4		X	X	X	X
	2 - 2	5 - 6	CCl_4		X	X	X	X
	2 - 3	5 - 6	CCl_4		X	X	X	X
3	3 - 1	5 - 6		CCl_4	X	X	X	X
	3 - 2	5 - 6		CCl_4	X	X	X	X
	3 - 3	5 - 6		CCl_4	X	X	X	X
4	4 - 1	5 - 6		CCl_4	X	X	X	X
	4 - 2	5 - 6		CCl_4	X	X	X	X
	4 - 3	5 - 6		CCl_4	X	X	X	X

[a]Includes incinerator equilibration time and equipment change-over time between runs.

[b]Blend of fuel oil and CCl_4.

[c]Sawdust and CCl_4.

[d]As required to maintain primary and SCC temperatures.

Table 8. Trial Burn Operating Conditions[a]

Trial Burn Test	Physical Forms	Waste Feed Rates Solid (lb/hr)	Waste Feed Rates Liquid (lb/hr)	Heat Value (Btu/lb)	HCl (lb/hr)	Temperatures (°F) Primary	Temperatures (°F) SCC
1	Liquid		250-300	~ 7,000	150-185	1,600	1,800
2	Liquid		250-300	~ 7,000	150-185	1,600	2,000
3	Solid	250-300		-	60-75	1,600	1,800
4	Solid	250-300		-	60-75	1,600	2,000

[a]The values given in this table are estimates which may vary during actual operation.

to the incinerator by a ram feed or on a timed cycle. This is the present procedure for feeding most solid wastes to the CAI C [see Section D-5b(2)(b)10C]. The approximate composition of the solid waste in shown in Table 6. The trial burn operating conditions are shown in Table 8. The CCl_4 in plastic bottles simulates a lab solid waste which contains CCl_4 in a plastic bottle.

5. Combustion Temperature Ranges

The combustion temperatures for the tests will be 1600°F for the primary, and 1800 and 2000°F for the SCC as indicated in Table 8. Combustion temperatures are normally controlled to within 50°F. It is expected that this range will prevail for the trial burn.

6. Waste Feed Rates

The waste feed rates for trial burn test runs 1 through 4 are summarized in Table 8.

7. Combustion Gas Velocity

The measured indicator of combustion gas velocity during the trial burn will be the combustion gas flow through the Fluidics HHR flowmeter [See Section D-5b(2)(b)7C].

8. Waste Feed Ash Content

In order to obtain permit flexibility relative to the waste liquid ash content, an ash-producing material, aluminum stearate or other organo-metallic compound, will be added to the waste liquid before it is fed to the incinerator.

9. Auxiliary Fuel

Natural gas will be used as an auxiliary fuel as required to maintain temperatures, in both the primary and secondary combustion chambers.

10. Scrubber Water

Recycle water sumps will be sampled after each sampling test and will be flushed clean within practical limits before the next sampling test.

D-5b(2)(e) Trial Burn Schedule

1. Schedule

The trial burn is planned to begin within 6 months of the time that Los Alamos receives EPA approval for the Part B Permit application. The schedule for the test is shown in Table 9.

2. Duration of Each Trial Burn Test

Four trial burn tests are planned, each consisting of three replicate sampling runs. Each sampling run will last about 3 hours for a total of 9 hours per trial burn test. The incinerator will be fed test wastes for 2 to 3 hours before each sampling run for a total of 5 to 6 hours per test. This will establish steady operating at process test conditions. Sampling will be done 24 hours per day using two sampling shifts. Assuming minimal interruption of incinerator operation, the incinerator is therefore expected to operate on test waste feeds for 24 hours per day for about 3 days.

3. Quantity of Waste to Be Burned

Test waste liquids and test waste solids will each be fed to the incinerator for an estimated 30 to 36 hours. Allowing a 25 percent safety factor the consumption of test wastes is expected to be about 1,250 gallons of waste liquid and 13,500 pounds of waste solids. The CAI will be operating on normal wastes under interim status prior to and following the tests. It is expected that the unit will be equilibrated at test conditions with normal waste or auxiliary fuel and switched to the test waste two to three hours before the start of each sampling run. A surplus of test waste will be prepared in case operational problems require a longer testing period. Unused waste will be incinerated at the conclusion of the tests. The amount of POHC (CCl_4) present in the liquid and solid wastes is expected to be about 12,150 pounds.

Table 9. Test Schedule

Test	Sampling Run No.[a]	Day
1	1-1	1
	1-2	1
	1-3	1
2	2-1	1
	2-2	2
	2-3	2
3	3-1	2
	3-2	2
	3-3	3
4	4-1	3
	4-2	3
	4-3	3

[a]Each sampling run will be about 3 hrs long, preceded by a 2 to 3 hr equilibration period and equipment change-over period.

D-5b(2)(f) Trial Burn Permit Objectives

If the RCRA DRE, particulate, and HCl performance standards (40 CFR 264.343) are achieved during the trial burn as outlined in Table 8, the RCRA incineration operating permit should allow the Controlled Air Incineration System to be used to incinerate RCRA hazardous solid and liquid wastes at the rates and conditions discussed in this section [D-5b(2)(f)].

The expected RCRA incineration permit conditions discussed in this section are based on the March 1983 "Guidance Manual for Hazardous Waste Incinerator Permits," prepared by the U.S. EPA's Office of Solid Waste.

The expected RCRA permit conditions are discussed in the following pages and summarized in Table 10.

1. Anticipated RCRA Permit Conditions for Solid Wastes
   The following expected permit conditions will be based on waste characteristics:

   a. Appendix VIII Constituents -- Since the solids in trial burn tests 3 and 4 will contain CCl_4, the system permit should allow the incineration of wastes containing CCl_4 and any other Appendix VIII Constituent lower on the EPA's Ranking of Incinerability List. Only three Appendix VIII Constituents at levels above 1000 ppm would not be allowed: $CFCl_3$, $CHBr_3$, and CF_2Cl_2.

   b. Minimum Heat Value -- There should be no permit requirement that specifies a maximum or minimum solids, sludge or slurry heat value. The minimum heat value concept, while relevant to organic liquid, is not relevant to low heat value solids such as contaminated soils. To quote the March 1983 Guidance Manual:

      "However, in the case of solids fed to rotary kilns, hearths and other solids handling incineration equipment, a different approach to specifying a heating value for waste is needed. Many solid wastes, by their very nature, are subject to wide variations in heating value, and rotary kiln, hearth, and similar incinerator designs attempt to deal with this problem. Such designs provide

Table 10. Summary of Expected Permit Conditions

Content/Physical Form	Type of RCRA Permit: Solid	Type of RCRA Permit: Liquid	Comments
POHCs	CCl_4	CCl_4	
Trial burn tests	3-4	1-2	
Appendix VIII constituents	CCl_4	CCl_4	NPC = Not permit condition
Minimum Btu/lb	NPC	7000	
Max. organic chlorine (lb/hr)	180[a]	180	Total for liquid/solid and aqueous wastes
Maximum ash content (wt%)	NPC	2	Total ash for liquid and aqueous
Temperature			
Primary (°F)	1550-1600	1550-1600	
SCC (°F)	1750-1800	1750-1800	
Maximum primary chamber thermal duty (MM Btu/hr)	2	2	
Maximum primary chamber natural gas (MM Btu/hr)	NPC	NPC	
Water injection rate	NPC	NPC	
Liquid feed rate	NPC	NPC	
Solid waste feed rate	NPC	NPC	

[a]- All numerical values are estimates which will be finalized by the trial burn results.

for the volatiles in the solids to be vaporized and subsequently destroyed in an afterburner or secondary combustion chamber. Thus in specifying heating values for solid waste feeds, a lower heating value limit may not be required if the incinerator is equipped and operated to maintain sufficient temperature by addition of liquid waste or auxiliary fuel."

Since the CAI has auxiliary fuel firing capability in both the primary and SCC chambers, the CAI should not have a heat value permit condition for solids incineration.

c. Maximum Organic Chlorine Content of Waste -- The maximum permitted pounds per hour of waste organic chlorine should be based on the trial burn results. If the CAI's air pollution control system for example removes 185 pounds of HCl per hour, then the permit condition should allow the CAI to incinerate up to 180 pounds of organic chlorine per hour in the combined liquid and solid waste feeds. Since the source of the HCl is irrelevant to the performance of the air pollution control equipment, the permit should allow 180 pounds of organic chlorine per hour to be incinerated either as all liquid or solid or any combination of liquid and solid.

d. Maximum Ash Content of Waste -- There should be no solids ash content permit condition for the CAI. Particulate emissions will be measured during both solids trial burn tests. If the particulate emissions are at or below RCRA regulations, this testing should be considered as an acceptable particulate test for all solid wastes and sludges. When considering particulate emissions, it should be realized that for the CAI, the ash content of the liquid wastes is more important to particulate generation and emissions than is the ash content of the solid wastes being incinerated.

e. Physical Form -- The physical form given in the RCRA solid hazardous waste permit should specify solids, sludges, and slurries.

f. Incinerator Operating Permit Conditions -- The following permit conditions are anticipated to be based on the incinerator operating conditions during the trial burn tests:

- Temperature - Table 8 summarizes the temperature conditions for the solids trial burn tests.

- Maximum Thermal Duty - A maximum primary chamber thermal duty permit condition based on the trial burn results is desirable so that the permit will allow the incineration of any combination of aqueous, liquid, and solid/sludge wastes with a total thermal duty equal to the maximum permitted duty. The March 1983 version of the Guidance Manual covers this situation in Section 5, Example 2. On page 5-10, the Guidance Manual discusses a case in which 1MM Btu/hr of solid wastes and 1.2 MM Btu/hr of liquid wastes are successfully incinerated. The Guidance Manual then goes on to state that hazardous wastes containing more readily incinerated Appendix VIII Constituents than those tested may be fed in greater amounts, provided that the total thermal input is less than 2.2 MM Btu/hr and the other permit restrictions on waste composition are satisfied. Since no waste will be fired in the secondary combustion chamber (SCC), the maximum thermal duty should only apply to the primary chamber.

- Natural Gas Feed Rate - During the incineration of solid wastes, the only permit limit on natural gas feed rate should be the maximum thermal duty. Natural gas feed rate can vary from near zero up to the maximum permitted thermal duty. When incinerating solids, the rate of liquid fuel or liquid waste fired in the primary chamber is not the important criterion. What is important is the outlet temperature of the primary chamber combustion gas, which is controlled by a permit condition at a minimum level. This situation is covered on page 4-6 of the March 1983 Guidance Manual. The Manual states that the net effect of specifying the total thermal input is to permit the substitution of easily incinerated waste (higher waste heat value) for auxiliary fuel when specified operating conditions, such as combustion zone temperature and air feed rate, are maintained.

- Liquid Waste Feed Rate - As previously stated for the natural gas feed rate, the Guidance Manual states on page 4-6 that more easily incinerated wastes (constituents lower than CCl_4 and waste heat values greater than 7000 Btu/lb) can be permitted at rates up to the maximum permitted thermal duty of the primary chamber.

- Solid Waste Feed Rate - The only permit conditions related to the solid waste feed rate should be the maximum allowable primary chamber thermal duty and the primary chamber and SCC temperatures. As long as these

permit conditions are met, organic solid wastes should be destroyed at the DRE levels specified in the RCRA regulations.

g. Other Permit Conditions -- Other expected permit conditions such as stack carbon monoxide concentration and combustion gas velocity indicator are not discussed in this section. These conditions will be established when the results of the trial burn tests are evaluated.

2. Anticipated RCRA Permit Conditions for Liquid Wastes
The following anticipated permit conditions will be based on waste characteristics:

a. Appendix VIII Constituents -- Since the liquid waste trial burn tests 1 and 2 will contain CCl_4, the incineration system should be permitted to incinerate CCl_4 and all other Appendix VIII Constituents lower on the EPA's Ranking of Incinerability List. Only three Appendix VIII Constituents at levels above 1000 ppm would not be allowed: $CFCl_3$, $CHBr_3$, and CF_2Cl_2.

b. Minimum Heat Value -- A minimum heat value of about 7000 Btu/lb (see Table 10) for the liquid waste mixture is an anticipated permit condition.

c. Maximum Organic Chlorine Content of Waste -- The maximum permitted pounds/hour of waste organic chlorine should be based on the trial burn results. If the CAI's air pollution control system removes 185 pounds of HCl per hour, then the permit condition should allow the CAI to incinerate up to 180 pounds of organic chlorine per hour in the combined liquid and solid waste feeds. Since the source of the HCl is irrelevant to the performance of the air pollution control equipment, the permit should allow 180 pounds of organic chlorine per hour to be incinerated in either all liquid wastes or all solid wastes or any combination of liquid and solid wastes.

d. Maximum Ash Content of Waste -- The maximum permitted liquid waste ash content should be based on the ash content of the liquid wastes incinerated during trial burn tests 1 and 2.

e. Physical Form -- The physical form specified in the RCRA liquid hazardous waste permit should be liquid organic and aqueous wastes.

f. Incinerator Operating Permit Conditions -- The following anticipated permit conditions are based on the proposed incinerator operating conditions during the liquid trial burn tests:

- Temperature - Table 8 summarizes the temperature conditions for each liquid trial burn test.

- Maximum Thermal Duty - Los Alamos expects to obtain a maximum thermal duty permit condition based on the trial burn results that allows the incineration of any combination of liquid, aqueous, and solid/sludge wastes with a total thermal duty equal to the maximum permitted duty (see previous discussion on maximum thermal duty).

- Water Feed Rate - There should be no special permit restriction on the feeding of contaminated or non-contaminated water into the primary chamber. The previously quoted statement from page 4-6 of the Guidance Manual covers water injection. The statement " . . . specified operating conditions, such as combustion zone temperature and air feed rate, are maintained." indicates that as long as the total thermal duty and CAI combustion zone temperature are maintained, the water feed rate is irrelevant. When too much water is injected, it will be impossible, for example, to maintain combustion temperature at a specified thermal duty.

  Relative to the destruction of hazardous constituents in contaminated water, volatilization of CCl_4 from the solid waste in the primary chamber and volatilization of CCl_4 from a contaminated water are essentially equivalent processes. The CCl_4 that is volatilized from solid wastes or injected water would be subjected to essentially the same combustion temperature, gas mixing, and residence time in the SCC. Since CCl_4 volatilized from both matrices will be subjected to the same SCC combustion conditions, both the RCRA solid and RCRA liquid permits should allow the incineration of contaminated water that is injected into the primary chamber. Permit justification will be the successful

demonstration of the flameless oxidation of CCl_4 in the solids trial burn tests 3 and 4. Contaminated water means a liquid containing no less than 90 weight percent of water in which the organic contaminant, if any, is CCl_4 or falls below CCl_4 on the RCRA Ranking of Incinerability List.

- Natural Gas Feed Rate - During the incineration of liquid wastes, the only limit on natural gas feed rate should be the maximum thermal duty. Natural gas feed rate can range from zero to the maximum permitted thermal duty.

- Liquid Waste Feed Rate - As previously stated for the natural gas feed rate, the Guidance Manual states on page 4-6 that more easily incinerated wastes (constituents lower than CCl_4 and waste heat values greater than 7000 Btu/lb) can be permitted at rates up to the maximum permitted thermal duty of the primary chamber.

g. Other Permit Conditions -- Other expected permit conditions such as stack carbon monoxide concentration and combustion gas velocity indicator are not discussed in this section. These will be established when the results of the trial burn tests are evaluated.

D-5b(2)(g) Description and Planned Operating Conditions for the Emissions Control Equipment

The emissions control equipment is described in Section D-5b(2)(b)7. The operating condition ranges for normal operation and the trial burn are summarized in Table 11. During operation the system water flow rates and pressure drops typically fluctuate over a normal range, and these fluctuations are also expected to occur during the trial burn.

D-5b(2)(h) Shutdown Procedures

Procedures for shutting down the waste feed are described in Section D-5b(2)(b)(6).

These procedures will be in effect during trial burn tests 1 through 4 while feeding the waste liquid and solids.

D-5b(2)(i) Site Clean-Up

After the trial burn program is completed, all residual wastes or POHC that remain will be destroyed. Assuming that incineration operations went smoothly

based on on-site observations, and that preliminary analytical results are positive (e.g., as indicated by low CO values), Los Alamos will destroy any trial burn residual wastes in the CAI system. The unit will be operated at a primary temperature of 1600°F and a SCC of 1800°F during the incineration of any residual wastes.

D-5b(2)(j) Quality Assurance Plan

The Quality Assurance Project Plan is given in Attachment A.

D-5c Data in Lieu of Trial Burn

Los Alamos seeks an operating permit by way of an additional trial burn of a principal organic hazardous constituent with a high degree of difficulty of incineration, and will not submit results of earlier successful trial burns of hazardous wastes as justification for the permit.

D-5d Post Trial Burn Operation

The interim period between completion of the trial burn and receipt of final approval from EPA for full operating authority could be several months. During this time, Los Alamos intends to continue operating the incineration system on a full-time basis, operating under all state and federal requirements as per 40 CFR 265. All appropriate operating records will be maintained for documentation of operating conditions during this interim period.

D-5e Incinerator Inspection

The incinerator will be visually inspected daily during operation for fugitive emissions, leaks, and associated equipment, spills, and signs of tampering, as per 40 CFR 264.347(b).

D-5f Emergency Waste Feed Cut-Off Testing

During permitted operation the emergency waste feed cut-off system and associated alarms as described in D-5b(2)(b)6 will be tested, as per 40 CFR 264.347(c) on a monthly basis during periods of operation in order not to unduly restrict or upset operations. If the CAI is not routinely operating, the emergency waste feed cut-off system will be tested before start-up of the CAI, but not necessarily on a monthly basis.

Table 11. Planned Operating Conditions for the Emissions Control System During the Trial Burn

Equipment	ΔP Range (in. w.c.)
Quench chamber	0-2
Venturi	40-70
Packed bed	1-8

D-5g Record Keeping

A written operating log will be kept at the CAI facility as per Appendix I of 40 CFR Part 264 and 40 CFR 264.73(b).

Appendix J, Section D-5h:

PERFORMANCE TEST DETERMINATION

Note:
For a more detailed discussion of the trial burn results, see "RCRA Trial Burn Final Report for the Los Alamos Controlled Air Incinerator," Volumes I and II, submitted to the State of New Mexico Environmental Improvement Division, Santa Fe, New Mexico, March, 1987.

1.0 RESULTS

The trial burn was comprised of four test conditions, two of liquid feed and two of solid feed, during which the primary variable was combustion chamber temperature. During conditions 1 and 2 (liquid feed), a total of 1269 lb of CCl_4 and 558 lb of TCE were fed to the incinerator. Total CCl_4 and TCE fed to the incinerator during conditions 3 and 4 (solid feed) was 964 lb and 442 lb, respectively. For the whole of the trial burn, a total of 2233 pounds of CCl_4 and 1000 pounds of TCE was fed to the incinerator.

Principal Organic Hazardous Constituents

The test conditions and results of analysis for the destruction and removal efficiency of the principal organic hazardous constituents in the incinerator feed are presented in Tables 1 through 4.

Particulate Emissions

The test conditions and results of analysis for particulate emissions are presented in Tables 5 through 8.

Carbon Monoxide and Chloride Emissions

The test conditions and results of analysis for carbon monoxide and chloride emissions are presented along with the particulate emissions results in Tables 5 through 8.

TABLE 1A
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 4, 1986
Condition 1

Run No.	1-1	1-2	1-3
Start Time (Approx.)	1:10pm	2:00pm	2:43pm
Organic Feed Rate			
CCl_4, (lbm/hr)	65.91	74.80	74.80
TCE, (lbm/hr)	28.50	32.34	32.34
Gas Conditions			
Temperature, (^oF)	209	209	209
Moisture, (Volume %)	35.20	35.20	35.20
O_2, (Volume %)	9.2	9.2	9.2
CO_2, (Volume %)	8.6	8.6	8.6
Density, (lbm/ft^3)	0.0407	0.0407	0.0407
Excess Air, (%)	73.60	73.60	73.60
Gas Flow Rates			
Volume Basis			
acfm	1475	1475	1475
dscfm	586	586	586
Mass Basis			
lbm/hr	3604	3604	3604
Organic Emissions			
CCl_4, (ppbv)	[1]>1.88	65.09	56.14
CCl_4, (lbm/hr)	[1]>2.64E-5	9.14E-4	7.88E-4
TCE, (ppbv)	[1]***	1.81	<0.129
TCE, (lbm/hr)	[1]***	2.17E-5	<1.54E-6
Destruction & Removal Efficiency			
CCl_4, (%)	[1]***	99.99878	99.99895
TCE, (%)	[1]***	99·99993	>99.99999

[1] Analytical detector quenched-
results possibly underestimated.

TABLE 1B
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 4, 1986
Condition 1

Run No.	1-4	1-5	1-6
Start Time (Approx.)	3:25pm	6:54pm	7:38pm
<u>Organic Feed Rate</u>			
CCl_4, (lbm/hr)	76.39	76.92	76.92
TCE, (lbm/hr)	33.04	33.30	33.30
<u>Gas Conditions</u>			
Temperature, (^oF)	209	213	213
Moisture, (Volume %)	35.20	36.52	36.52
O_2, (Volume %)	9.2	9.2	9.2
CO_2, (Volume %)	8.6	8.6	8.6
Density, (lbm/ft^3)	0.0407	0.0401	0.0401
Excess Air, (%)	73.60	73.60	73.60
<u>Gas Flow Rates</u>			
Volume Basis			
acfm	1475	1521	1521
dscfm	586	585	585
Mass Basis			
lbm/hr	3604	3654	3654
<u>Organic Emissions</u>			
CCl_4, (ppbv)	[1]>59.18	[1]>52.57	52.43
CCl_4, (lbm/hr)	[1]>8.30E-4	[1]>7.37E-4	7.35E-4
TCE, (ppbv)	[1]***	[1]***	1.588
TCE, (lbm/hr)	[1]***	[1]***	1.90E-5
<u>Destruction & Removal Efficiency</u>			
CCl_4, (%)	[1]***	[1]***	99.99904
TCE, (%)	[1]***	[1]***	99.99994

[1] Analytical detector quenched-
results possibly underestimated.

TABLE 2A
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 5, 1986
Condition 2

Run No.	2-1	2-2	2-3
Start Time (Approx.)	9:50am	10:44am	12:16pm
Organic Feed Rate			
CCl_4, (lbm/hr)	78.63	78.63	77.84
TCE, (lbm/hr)	33.17	33.17	32.78
Gas Conditions			
Temperature, (^oF)	216	216	226
Moisture, (Volume %)	32.45	32.45	31.96
O_2, (Volume %)	10.4	10.4	10.4
CO_2, (Volume %)	8.0	8.0	8.0
Density, (lbm/ft^3)	0.0405	0.0405	0.0400
Excess Air, (%)	93.34	93.34	93.34
Gas Flow Rates			
Volume Basis			
acfm	1351	1351	1356
dscfm	550	550	548
Mass Basis			
lbm/hr	3283	3283	3255
Organic Emissions			
CCl_4, (ppbv)	0.62	[1]***	[2]***
CCl_4, (lbm/hr)	8.16E-6	[1]***	[2]***
TCE, (ppbv)	<0.115	[1]***	[2]>0.155
TCE, (lbm/hr)	<1.30E-6	[1]***	[2]>1.29E-6
Destruction & Removal Efficiency			
CCl_4, (%)	99.99999	[1]***	[2]***
TCE, (%)	>99.99999	[1]***	[2]***

[1] Analytical detector quenched-
[2] Sample broken by analytical laboratory-
results possibly underestimated.

TABLE 2B
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 5, 1986
Condition 2

Run No.	2-4	2-5	2-6
Start Time (Approx.)	1:02pm	2:48pm	3:27pm
Organic Feed Rate			
CCl_4, (lbm/hr)	77.84	78.37	78.37
TCE, (lbm/hr)	32.78	33.04	33.04
Gas Conditions			
Temperature, (^oF)	226	229	229
Moisture, (Volume %)	31.96	31.99	31.99
O_2, (Volume %)	10.4	10.4	10.4
CO_2, (Volume %)	8.0	8.0	8.0
Density, (lbm/ft^3)	0.0400	0.0398	0.0398
Excess Air, (%)	93.34	93.34	93.34
Gas Flow Rates			
Volume Basis			
acfm	1356	1345	1345
dscfm	548	541	541
Mass Basis			
lbm/hr	3255	3214	3214
Organic Emissions			
CCl_4, (ppbv)	11.98	44.99	62.91
CCl_4, (lbm/hr)	1.57E-4	5.83E-4	8.15E-4
TCE, (ppbv)	1.93	1.32	1.43
TCE, (lbm/hr)	2.17E-5	1.46E-5	1.58E-5
Destruction & Removal Efficiency			
CCl_4, (%)	99.99979	99.99925	99.99896
TCE, (%)	99.99993	99.99996	99.99996

TABLE 3A
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 6, 1986
Condition 3

Run No.	3-1	3-2	3-3
Start Time (Approx.)	10:36am	11:17am	5:09pm
Organic Feed Rate			
CCl_4, (lbm/hr)	49.30	49.30	55.77
TCE, (lbm/hr)	24.19	24.19	27.22
Gas Conditions			
Temperature, (^oF)	225	225	216
Moisture, (Volume %)	35.40	35.40	39.47
O_2, (Volume %)	10.1	10.0	10.2
CO_2, (Volume %)	8.0	7.6	7.6
Density, (lbm/ft^3)	0.0396	0.0396	0.0392
Excess Air, (%)	87.66	87.66	85.08
Gas Flow Rates			
Volume Basis			
acfm	1543	1543	1654
dscfm	596	596	604
Mass Basis			
lbm/hr	3669	3669	3888
Organic Emissions			
CCl_4, (ppbv)	22.05	22.46	57.68
CCl_4, (lbm/hr)	3.15E-4	3.20E-4	8.34E-4
TCE, (ppbv)	2.75	2.77	14.80
TCE, (lbm/hr)	3.35E-5	3.38E-5	1.83E-4
Destruction & Removal Efficiency			
CCl_4, (%)	99.99937	99.99935	99.99851
TCE, (%)	99.99986	99.99986	99.99933

TABLE 3B
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 6, 1986
Condition 3

Run No.	3-4	3-5	3-6
Start Time (Approx.)	5:56pm	7:24pm	7:57pm
Organic Feed Rate			
CCl_4, (lbm/hr)	55.77	54.05	54.05
TCE, (lbm/hr)	27.22	26.17	26.17
Gas Conditions			
Temperature, (^oF)	216	210	210
Moisture, (Volume %)	39.47	27.36	27.36
O_2, (Volume %)	10.0	10.2	10.2
CO_2, (Volume %)	7.6	7.6	7.6
Density, (lbm/ft^3)	0.0392	0.0418	0.0418
Excess Air, (%)	85.08	88.69	88.69
Gas Flow Rates			
Volume Basis			
acfm	1654	1565	1565
dscfm	604	692	692
Mass Basis			
lbm/hr	3888	3922	3922
Organic Emissions			
CCl_4, (ppbv)	46.01	2.41	29.14
CCl_4, (lbm/hr)	6.65E-4	4.00E-5	4.83E-4
TCE, (ppbv)	6.59	0.066	0.091
TCE, (lbm/hr)	8.14E-5	9.30E-7	1.29E-6
Destruction & Removal Efficiency			
CCl_4, (%)	99.99881	99.99992	99.9991
TCE, (%)	99.99969	99.99999	99.99999

TABLE 4A
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 7, 1986
Condition 4

Run No.	4-1	4-2	4-3
Start Time (Approx.)	1:49pm	2:30pm	3:53pm
Organic Feed Rate			
CCl_4, (lbm/hr)	57.36	57.36	58.68
TCE, (lbm/hr)	28.28	28.28	28.41
Gas Conditions			
Temperature, (^oF)	213	213	211
Moisture, (Volume %)	25.37	25.37	25.59
O_2, (Volume %)	12.3	12.3	11.0
CO_2, (Volume %)	5.9	5.9	7.0
Density, (lbm/ft^3)	0.0419	0.0419	0.0421
Excess Air, (%)	132.33	132.33	103.31
Gas Flow Rates			
Volume Basis			
acfm	1468	1468	1538
dscfm	666	666	698
Mass Basis			
lbm/hr	3685	3685	3886
Organic Emissions			
CCl_4, (ppbv)	54.73	5.96	27.23
CCl_4, (lbm/hr)	8.73E-4	9.50E-5	4.55E-4
TCE, (ppbv)	0.595	<0.118	0.441
TCE, (lbm/hr)	8.10E-6	<1.61E-6	6.31E-6
Destruction & Removal Efficiency			
CCl_4, (%)	99.99848	99.99983	99.99922
TCE, (%)	99.99997	>99.99999	99.99998

TABLE 4B
Summary of Results
Principle Organic Hazardous Constituents
Destruction and Removal Efficiency
(Volatile Organic Sampling Train)
September 7, 1986
Condition 4

Run No.	4-4	4-5	4-6
Start Time (Approx.)	4:38pm	6:09pm	6:46pm
Organic Feed Rate			
CCl_4, (lbm/hr)	58.68	61.59	61.59
TCE, (lbm/hr)	28.41	30.13	30.13
Gas Conditions			
Temperature, (^oF)	211	202	202
Moisture, (Volume %)	25.59	26.07	26.07
O_2, (Volume %)	11.0	10.2	10.2
CO_2, (Volume %)	7.0	8.0	8.0
Density, (lbm/ft^3)	0.0421	0.0427	0.0427
Excess Air, (%)	103.31	89.51	89.51
Gas Flow Rates			
Volume Basis			
acfm	1538	1536	1536
dscfm	698	701	701
Mass Basis			
lbm/hr	3886	3933	3933
Organic Emissions			
CCl_4, (ppbv)	61.56	59.11	49.36
CCl_4, (lbm/hr)	1.03E-3	9.93E-4	8.29E-4
TCE, (ppbv)	2.910	1.808	1.368
TCE, (lbm/hr)	4.16E-5	2.59E-5	1.96E-5
Destruction & Removal Efficiency			
CCl_4, (%)	99.99824	99.99839	99.99865
TCE, (%)	99.99985	99.99991	99.99993

TABLE 5
Summary of Results
Particulate, CO and HCl Emissions
(EPA Method 5)
September 4, 1986
Condition 1

Run No.	1-1	1-2	1-3
Start Time (Approx.)	1:10pm	6:52pm	9:25pm
Organic Feed Rate			
CCl_4, (lbm/hr)	70.36	76.92	76.92
TCE, (lbm/hr)	30.42	33.30	33.30
Total Chloride (as HCl), (lbm/hr)	92.01	100.63	100.63
Gas Conditions			
Temperature, (^oF)	209	213	212
Moisture, (Volume %)	35.20	36.52	36.60
O_2, (Volume %)	9.2	9.2	9.2
CO_2, (Volume %)	8.6	8.6	8.6
Density, (lbm/ft^3)	0.0407	0.0401	0.0401
Excess Air, (%)	73.60	73.60	73.60
Gas Flow Rates			
Volume Basis			
acfm	1475	1521	1467
dscfm	586	585	565
Mass Basis			
lbm/hr	3605	3654	3528
Particulate Emissions			
gr/dscf	0.0093	0.0056	0.0087
gr/dscf (corr. to 7% O_2)	0.0110	0.0066	0.0103
lbm/hr	0.0466	0.0280	0.0422
Carbon Monoxide Emissions			
ppmv	5	6	7
ppmv (corr. to 12% CO_2)	7	8	17
ppmv (corr. to 50% Excess Air)	6	7	14
lbm/hr	0.013	0.015	0.030
Chloride Emissions (as HCl)			
ppmv	<0.485	<0.489	<0.477
lbm/hr	<0.0016	<0.0016	<0.0015
Chloride Removal Efficiency (%)	>99.998	>99.998	>99.998
Percent Isokinetic (%)	103.91	104.11	104.94

TABLE 6
Summary of Results
Particulate, CO and HCl Emissions
(EPA Method 5)
September 5, 1986
Condition 2

Run No.	2-1	2-2	2-3
Start Time (Approx.)	9:50am	12:20pm	2:40pm
Organic Feed Rate			
CCl_4, (lbm/hr)	78.63	77.84	78.37
TCE, (lbm/hr)	33.17	32.78	33.04
Total Chloride (as HCl), (lbm/hr)	102.14	101.08	101.78
Gas Conditions			
Temperature, (^oF)	216	226	229
Moisture, (Volume %)	32.45	31.96	31.99
O_2, (Volume %)	10.4	10.4	10.4
CO_2, (Volume %)	8.0	8.0	8.0
Density, (lbm/ft^3)	0.0405	0.0400	0.0398
Excess Air, (%)	93.34	93.34	93.34
Gas Flow Rates			
Volume Basis			
acfm	1351	1356	1345
dscfm	550	548	541
Mass Basis			
lbm/hr	3283	3255	3214
Particulate Emissions			
gr/dscf	0.0104	0.0086	0.0116
gr/dscf (corr. to 7% O_2)	0.0137	0.0114	0.0153
lbm/hr	0.0488	0.0405	0.0537
Carbon Monoxide Emissions			
ppmv	5	6	7
ppmv (corr. to 12% CO_2)	8	9	11
ppmv (corr. to 50% Excess Air)	6	8	9
lbm/hr	0.012	0.014	0.017
Chloride Emissions (as HCl)			
ppmv	<0.447	19.76	137.5
lbm/hr	<0.0014	0.0614	0.422
Chloride Removal Efficiency (%)	>99.998	99.939	99.585
Percent Isokinetic (%)	98.60	102.24	101.27

TABLE 7
Summary of Results
Particulate, CO and HCl Emissions
(EPA Method 5)
September 6, 1986
Condition 3

Run No.	3-1	3-2	3-3
Start Time (Approx.)	10:35am	5:07pm	7:27pm
Organic Feed Rate			
CCl_4, (lbm/hr)	49.30	55.77	54.05
TCE, (lbm/hr)	24.19	27.22	26.17
Total Chloride (as HCl), (lbm/hr)	67.01	75.52	72.88
Gas Conditions			
Temperature, (^oF)	225	216	210
Moisture, (Volume %)	35.40	39.47	27.36
O_2, (Volume %)	10.1	10.0	10.2
CO_2, (Volume %)	8.0	7.6	7.6
Density, (lbm/ft^3)	0.0396	0.0392	0.0418
Excess Air, (%)	87.66	85.08	88.69
Gas Flow Rates			
Volume Basis			
acfm	1543	1654	1565
dscfm	596	604	692
Mass Basis			
lbm/hr	3669	3888	3922
Particulate Emissions			
gr/dscf	0.0120	0.0165	0.0183
gr/dscf (corr. to 7% O_2)	0.0154	0.0210	0.0237
lbm/hr	0.0611	0.0852	0.1086
Carbon Monoxide Emissions			
ppmv	[3]	5	5
ppmv (corr. to 12% CO_2)		8	8
ppmv (corr. to 50% Excess Air)		6	6
lbm/hr		0.013	0.015
Chloride Emissions (as HCl)			
ppmv	74.68	33.00	50.40
lbm/hr	0.253	0.113	0.198
Chloride Removal Efficiency (%)	99.623	99.850	99.728
Percent Isokinetic (%)	104.74	105.65	97.96

[3] Data out of range of the upper limit.

TABLE 8
Summary of Results
Particulate, CO and HCl Emissions
(EPA Method 5)
September 7, 1986
Condition 4

Run No.	4-1	4-2	4-3
Start Time (Approx.)	1:50pm	3:57pm	7:10pm
Organic Feed Rate			
CCl_4, (lbm/hr)	57.36	58.68	61.59
TCE, (lbm/hr)	28.28	28.41	30.13
Total Chloride (as HCl), (lbm/hr)	77.93	79.25	83.36
Gas Conditions			
Temperature, (^oF)	213	211	202
Moisture, (Volume %)	25.37	25.59	26.07
O_2, (Volume %)	12.3	11.0	10.2
CO_2, (Volume %)	5.9	7.0	8.0
Density, (lbm/ft^3)	0.0419	0.0421	0.0427
Excess Air, (%)	132.33	103.31	89.51
Gas Flow Rates			
Volume Basis			
acfm	1468	1538	1536
dscfm	666	698	701
Mass Basis			
lbm/hr	3685	3886	3933
Particulate Emissions			
gr/dscf	0.0055	<0.0001	0.0188
gr/dscf (corr. to 7% O_2)	0.0089	<0.0001	0.0244
lbm/hr	0.0315	<0.001	0.1132
Carbon Monoxide Emissions			
ppmv	5	5	7
ppmv (corr. to 12% CO_2)	10	9	11
ppmv (corr. to 50% Excess Air)	8	7	9
lbm/hr	0.015	0.015	0.021
Chloride Emissions (as HCl)			
ppmv	13.0	71.2	82.0
lbm/hr	0.049	0.282	0.326
Chloride Removal Efficiency (%)	99.937	99.644	99.609
Percent Isokinetic (%)	96.30	101.63	103.11

1.1 SUMMARY OF TEST RESULTS

Destruction and Removal Efficiency (DRE) of POHCs

Destruction and Removal Efficiencies are based on the inlet mass flow rate calculated from waste feed material and the outlet measured mass flow rate.

A. Carbon Tetrachloride (CCl_4)

1) The DRE of CCl_4 during condition 1 exceeded 99.99% for VOST sample periods 1-2, 1-5 and 1-6. The DRE of CCl_4 for periods 1-1, 1-3 and 1-4 can only be expressed as "less than" values and are, therefore, not reported.

2) The DRE of CCl_4 during condition 2 exceeded 99.99% for VOST sample periods 2-1, 2-4, 2-5 and 2-6. The DRE of CCl_4 for periods 2-2 and 2-3 can only be expressed as "less than" values and are, therefore, not reported.

3) The DRE of CCl_4 during condition 3 exceeded 99.99% for all six VOST sample periods.

4) The DRE of CCl_4 during condition 3 exceeded 99.99% for all six VOST sample periods.

B. Trichloroethylene (TCE)

1) The DRE of TCE during condition 1 exceeded 99.9999% for VOST sample periods 1-2, 1-3 and 1-6. The DRE of TCE for periods 1-1, 1-4 and 1-5 can only be expressed as "less than" values and are, therefore, not reported.

2) The DRE of TCE during condition 2 exceeded 99.9999% for VOST sample periods 2-1, 2-4, 2-5 and 2-6. The DRE of TCE for periods 2-2 and 2-3 can only be expressed as "less than" values and are, therefore, not reported.

3) The DRE of TCE during condition 3 exceeded 99.9999% for VOST sample periods 3-5 and 3-6. The DRE of TCE for periods 3-1, 3-2, 3-3 and 3-4 was greater than 99.999% but did not achieve 99.9999%.

4) The DRE of TCE during condition 4 exceeded 99.9999% for five of the six VOST sample periods. The DRE of TCE for period 4-4 was 99.99985%.

Exhaust Stack Particulate Emissions

1) Particulate concentrations (corrected to 7% O_2) were no greater than 0.0110 gr/dscf for all three EPA Method-5 sample periods during condition 1.

2) Particulate concentrations (corrected to 7% O_2) were no greater than 0.0153 gr/dscf for all three EPA Method-5 sample periods during condition 2.

3) Particulate concentrations (corrected to 7% O_2) were no greater than 0.0237 gr/dscf for all three EPA Method-5 sample periods during condition 3.

4) Particulate concentrations (corrected to 7% O_2) were no greater than 0.0244 gr/dscf for all three EPA Method-5 sample periods during condition 4.

Chloride Removal Efficiency

1) The chloride removal efficiency during condition 1 was >99.998% for all three EPA Method-5 sample periods.

1) The chloride removal efficiency during condition 2 was >99.939% for all three EPA Method-5 sample periods.

1) The chloride removal efficiency during condition 3 was >99.623% for all three EPA Method-5 sample periods.

1) The chloride removal efficiency during condition 4 was >99.609% for all three EPA Method-5 sample periods.

Carbon Monoxide (CO) Concentration at the Stack

1) The CO concentration during condition 1 averaged 8 ppmv over the three EPA Method-5 sampling periods.

2) The CO concentration during condition 2 averaged 6 ppmv over the three EPA Method-5 sampling periods.

3) The CO concentration during condition 1 averaged 5 ppmv over EPA Method-5 sampling periods 2 and 3.

4) The CO concentration during condition 1 averaged 6 ppmv over the three EPA Method-5 sampling periods.

2.0 DISCUSSION OF RESULTS

Destruction and Removal of Carbon Tetrachloride

During analysis of VOST cartridges from condition 1, results from periods 2, 3 and 6 yielded DREs in excess of 99.99%. The samples obtained during runs 1, 4 and 5 quenched the flame in the analytical detector. Emissions for these periods were reported as "greater than" values in the analytical report. Due to this, DREs calculated for these periods can only be reported as "less than" values, and their validity is subject to question. Hence, they are not reported.

During analysis of VOST cartridges from condition 2, analysis of samples from periods 1, 4, 5 and 6 yielded DREs in excess of 99.99%. The sample obtained from run 2 quenched the flame in the analytical detector. The sample container used from run 3 was broken at the analytical laboratory and the sample was lost. Due to this, DREs for these two periods are not reported.

All samples taken during conditions 3 and 4 were analyzed without problems and DREs for CCl_4 calculated for these conditions exceeded 99.99% in all cases.

Destruction and Removal Efficiency of Trichloroethylene

For condition 1, only the analytical results from runs 2, 3 and 6 were used to calculate DREs. DREs for TCE exceeded 99.9999% for these periods. The samples obtained from runs 1, 4 and 5 quenched the flame in the analytical detector.

For condition 2, only the analytical results from runs 1, 4, 5 and 6 were used to calculate DREs. DREs for TCE exceeded 99.9999% for these periods. The sample obtained from run 2 quenched the flame in the analytical detector and the sample from run 3 was broken and could not be analyzed.

Results were obtained from the analysis of all the samples from condition 3. DREs of TCE exceeded 99.9999% for runs 5 and 6. DREs for runs 1, 2, 3 and 4 fell near, but below, 99.9999%.

Results were obtained from the analysis of all the samples from condition 4. The only run for which the DRE of TCE did not exceed 99.9999% was period 4.

Problems with DRE of TCE During Condition 3

In comparing differences in the CAI process behavior during conditions 3 and 4 to determine why DRE performance standards were not met in runs 1-4 of condition 3, the following observations can be made:

a) Primary chamber temperatures averaged ca. 1675°F for day 3 and 1460°F for day 4;

b) Secondary chamber temperatures were steady at 2200°F for day 3 and 2000°F for day 4.

c) The percentage of O_2 in the secondary chamber offgas averaged ca. 7% on day 3 and 10% on day 4.

The lower temperatures in the primary combustion chamber during condition 4 might have served to allow smoother, less energetic volatilization of the organics in the solid feed matrix than was the case in condition 3. In addition, the lower temperatures in both primary and secondary chambers would have allowed a longer residence time for more complete destruction of the TCE.

A higher percentage of excess air during condition 4, and hence a higher SCC O_2 level, would also be expected to produce a favorable shift towards complete combustion of the solids.

Process conditions during run 4 of condition 4 did not differ significantly from those of the other periods during that day, when DRE performance standards of >99.9999% were met. No explanation presents itself for this anomaly.

Particulate Emissions at the Stack

The EPA Method 5 sample train was modified by replacing the water in the impingers with 0.1 N sodium hydroxide to enhance the collection of chlorides from the gas stream. For this reason, the condensed moisture was measured gravimetrically and not volumetrically.

The first and last traverse points were adjusted to 1 inch away from the duct wall. The volume of gas metered during run 1, condition 1, was adjusted down by 0.12 ft^3 because of a leak check run on the sample train between points 1-1 and 1-2.

Carbon Monoxide Concentrations at the Stack

During conditions 1, 2 and 4, the CO concentrations averaged 10 ppmv when corrected to 12% CO_2 in the stack gas. During

run 1, condition 3, the CO concentration exceeded the upper limit of the detector and chart recorder. This corresponded to, and was a result of, an inadvertent reduction in the amount of steam injection into the primary chamber during this period (see Appendix B of the RCRA Trial Burn Final Report). The chart recorder system was calibrated so that the upper limit was approximately 500 ppmv CO. Following renewal of steam injection, the CO concentration dropped to an average of about 10 ppmv when corrected to 12% CO_2 during runs 2 and 3. During run 2, two peaks were noted. At actual stack conditions, the first peak of 70 ppmv occured at 5:16 pm and the second peak of 63 ppmv occured at 5:29 pm.

These results were determined by continuous gas sample analysis employing the NDIR and procedures outlined in EPA Method 10. Problems in the operation and calibration of the FID instument made its results somewhat suspect and no assessment of comparative accuracy of the two instruments or methods is possible at this time.

Gaseous Chloride Emissions

During condition 1, gaseous chloride concentrations were below the detectable limit of 0.5 ppmv. During condition 2, gaseous chloride concentrations rose from <0.5 ppmv during run 1 to 137 ppmv during run 3.

During condition 3, gaseous chloride concentrations averaged 53 ppmv over the three runs. During condition 4, gaseous chloride concentrations went from 13 ppmv during run 1 to 82 ppmv during run 3.

The scrubber discharge liquid (process sump) pH during the trial burn varied between peaks of 1.4 to 12.6. Mean pH during sampling periods ranged from 2.6 to 8.8. The average pH over the total of all trial burn sample periods was 4.7. In all cases, gaseous chloride emissions were well below 4 lb/hr and scrubber HCl removal efficiency exceeded 99%.

3.0 PROPOSED PERMIT CONDITIONS

Based on the foregoing Trial Burn Results, the following operating conditions and parameters have been shown to achieve or exceed the performance standards of 40 CFR 264.343 and are recommended as conditions for permitted operation of the Los Alamos Controlled Air Incinerator when burning RCRA hazardous wastes (see Table 9):

Table 9. Recommended Permit Conditions

Parameter	Type of RCRA Permit Solid	Liquid	
CO in Offgas (ppm @ 10% CO/CO_2)	90/500	90/500	Timed/Immediate (Feed Cutoff)
Max. Thermal Input (MM BTU/hr)	1.51	1.51	
Temperature (°F):			
Primary Chamber	>1400	>1400	
Secondary Chamber	1950-2050	1950-2050	(Feed Cutoff)
Max. Combustion Gas Flow (lb/hr)	3654	3933	(Feed Cutoff)
Minimum O_2 in SCC (%)	7.5	6.0	(Feed Cutoff)
Minumum Scrubber pH	1.0	1.0	(Feed Cutoff)
Venturi Pressure Drop (in. WC)	NPC	NPC	
Waste Feed:			
Appendix VIII Constituents	CCl_4 & Lower	CCl_4 & Lower	
Minimum BTU/lb	NPC	8418	
Waste Feed Rate (lb/hr)	NPC	NPC	
Maximum Organic Chlorine (lb/hr)	81.1	99.4	Total for liquid solid & aqueous
Max. Ash Content (wt%)	NPC	<0.3	Total for liquid and aqueous
Max. Viscosity (SSU)	---	200	
Max. Natural Gas in Primary Chamber (MM BTU/hr)	NPC	NPC	
Water Injection Rate	NPC	NPC	

NPC=Not a Permit Condition

3.1 Solid Wastes Permit Conditions

a) Maximum Allowable CO Emissions

The maximum allowable CO concentration in the CAI offgas in ppmv should be 10 times the percent CO_2 concentration. Above this level, the automatic waste feed cutoff will be actuated, timed to suspend waste feed should the CO levels not decrease below this limit within a five (5) minute period. Should CO emissions exceed 500 ppm at any time, waste feed will be automatically stopped without timed delay. This is consistent with the shutoff requirements during PCB incineration at Los Alamos.

Based on trial burn CO_2 levels, the maximum CO concentration would thus be allowed to vary up to a maximum of 90 ppm. Although average CO emissions during the trial burn were much less than these levels, CO "spikes" typically occur during normal incinerator operation. If permitted conditions restrict CO concentrations to the lower levels seen in the trial burn, normal operation can be expected to result in frequent and unnecessary controlled shutdowns of the CAI.

Because the accuracy of the FID could not be certified for CO detection during the trial burn, Los Alamos agrees to employ an NDIR type analyzer for determination of CO concentrations in incinerator offgas when burning RCRA wastes. We intend, however, to gather comparative NDIR and FID data to determine the relative effectiveness of the FID as a process monitoring instrument. Should results appear favorable, substitution of the FID will be submitted for review to the NMEID.

b) Maximum Thermal Duty

The maximum thermal input to the primary chamber of the CAI while achieving performance standards during the trial burn was 1.51 MM BTU/hr. This is the total of waste and auxiliary feeds to the incinerator, and should be the maximum thermal duty permitted for the CAI during RCRA hazardous waste incineration. Hazardous wastes containing more incinerable Appendix VIII Constituents than CCl_4 should be allowed to be fed to the CAI in greater amounts than CCl_4, provided that the total thermal input does not exceed the maximum permitted thermal duty and any other restrictions on waste composition are satisfied.

c) Combustion Chamber Temperature

Based on trial burn results, it is recommended that an operating range of 1950-2050°F be set for the Secondary Combustion Chamber temperature. Primary Combustion Chamber temperature should be allowed to vary, as long as a minimum of 1400°F is maintained in the PCC.

d) Combustion Gas Flowrate

The maximum stack gas flowrate established while achieving performance standards during solids incineration was 3933 lb/hr (65.55 lb/min). It is recommended that this be set as the upper limit for permitted operation.

e) Minimum Scrubber pH

Chloride removal efficiencies in the offgas were unaffected by swings in the pH of the process scrubber liquid, which varied from a pH of 1.0 to 10.3 (by analysis). Building sump pH levels were controlled at all times between a pH of 3.0 and 6.5. Thus, the CAI demonstrated effective control of system wastewater pH and gaseous chloride removal efficiency. Based on these results the minimum scrubber liquid pH allowed should be 1.0.

f) Venturi Pressure Drop

Venturi pressure drop should not be specified as a permit condition for particulate control due to the presence of the HEPA filtration system (see the discussion in Appendix G of the RCRA Trial Burn Final Report).

g) Appendix VIII Constituents

Since the DREs for CCl_4 in the solids trial burn tests 3 & 4 exceeded 99.99%, the permit should allow incineration of all wastes containing CCl_4 and any Appendix VIII Constituents lower than CCl4 on the EPA Ranking of Incinerability List. Since DREs for TCE in solids trial burn 4 were shown to exceed 99.9999%, all F027 compounds lower than CCl4 on the EPA Ranking of Incinerability List should also be allowed when operating at those same conditions. Thus, all Appendix VIII Constituents at levels above 1000 ppm, with the exception of $CFCl_3$, $CHBr_3$, and CF_2Cl_2, should be allowed. Discussion in Section D-5b(2)(d)(2) of the trial burn plan supports this position.

h) Minimum Heating Value

Per the discussion in Section D-5b(2)(f) of the trial burn plan, since the CAI has auxiliary fuel firing capability in both chambers, no permit requirement should be made which specifies a minimum solids, sludge or slurry heating value. The maximum heat value allowed would be such that the sum total of all feed streams would not exceed the maximum thermal duty of the primary chamber.

i) Solid Waste Feed Rate

The only permit conditions related to the solid waste feed rate should be the maximum allowable primary chamber thermal duty and the primary and secondary chamber temperatures. As long as these permit conditions are met, organic solid wastes should be destroyed at the DRE levels specified in the RCRA regulations.

j) Liquid Waste Feed Rate

As stated in the 1983 Guidance Manual for Hazardous Incinerator Permits, EPA-PB85-100577, on page 4-6, wastes more easily incinerated than CCl_4 should be permitted at rates up to the maximum thermal duty of the primary chamber.

k) Water Feed Rate

Per the discussion on page 46 of the Trial Burn Plan, both RCRA solid and liquid permits should allow the injection into the primary chamber of contaminated water for incineration. Justification is the successful demonstration of flameless oxidation of CCl_4 in the solids trial burn tests. Contaminated water means a liquid containing no less than 90 weight percent of water in which the organic contaminant, if any, is CCl_4 or falls below CCl_4 on the EPA Ranking of Incinerability List.

l) Maximum Organic Chlorine Content of Waste

The permit should allow the maximum organic chlorine feed rate shown by the trial burn results to occur while achieving HCl removal greater than 99.9%, i.e.- 99.34 lb/hr (102.14 lb/hr as HCl). Since the source of HCl is irrelevant to the performance of the CAI's air pollution control equipment, either all solid or all liquid or any combination of solid and liquid feed should be allowed.

m) Maximum Ash Content of Waste

There should be no ash content permit condition for incineration of solids in the CAI. Since particulate emission rates were well below the maximum allowed in all periods of the trial burn, this testing should be considered an acceptable particulate test for all solid wastes and sludges.

n) Physical Form of Wastes

The physical form given in the RCRA solid hazardous waste permit should specify solids, sludges, and slurries.

o) Natural Gas Feed Rate

The only permit limit on natural gas feed rate should be the maximum thermal duty. This will allow the substitution of easily incinerated wastes (higher waste heat value) for auxiliary fuel as long as specified operating conditions are maintained. This situation is discussed on page 4-6 of the 1983 Guidance Manual for Hazardous Waste Incinerator Permits, EPA-PB84-100577.

3.2 Liquid Waste Permit Conditions

a) Maximum Allowable CO Emissions

See previous discussion for solid wastes.

b) Maximum Thermal Duty

The incineration of any combination of liquid, aqueous, and solid/sludge wastes with a total thermal duty equal to the maximum permitted duty should be permitted (see previous discussion on maximum thermal duty in Section 3.1.b.).

c) Combustion Chamber Temperature

Based on trial burn results, it is recommended that an operating range of 1950-2050°F be set for the Secondary Combustion Chamber temperature. Primary Combustion Chamber temperature should be allowed to vary, as long as a minimum of 1400°F is maintained in the PCC.

d) Combustion Gas Flowrate

The maximum stack gas flowrate established while achieving performance standards during liquids incineration was 3654 lb/hr (60.90 lb/min). It is

recommended that this be set as the upper limit for permitted operation.

e) Minimum Scrubber pH

See discussion under Solid Wastes Permit Conditions, Section 3.1.e.

f) Venturi Pressure Drop

See discussion under Solid Wastes Permit Conditions, Section 3.1.f.

g) Appendix VIII Constituents

Since the liquid feed for trial burn tests 1 and 2 contained CCl_4, the permit should allow incineration of CCl_4 and all wastes containing any Appendix VIII Constituents lower than CCl4 on the EPA Ranking of Incinerability List. Since DREs for TCE in solids trial burn 4 were shown to exceed 99.9999%, all F027 compounds lower than CCl4 on the EPA Ranking of Incinerability List should also be allowed when operating at those same conditions. Thus, all Appendix VIII Constituents at levels above 1000 ppm, with the exception of $CFCl_3$, $CHBr_3$, and CF_2Cl_2, should be allowed. Discussion in Section D-5b(2)(d)(2) of the trial burn plan supports this position.

h) Minimum Heating Value

A minimum heating value of 8418 MM BTU/lb, based on liquid feed analyses, should be set as a liquid feed permit condition.

i) Liquid Waste Feed Rate

As stated in the 1983 Guidance Manual on page 4-6, wastes more easily incinerated than CCl_4 and higher than the minimum heat value should be permitted at rates up to the maximum thermal duty of the primary chamber.

j) Water Feed Rate

Per the discussion on page 46 of the Trial Burn Plan, both RCRA solid and liquid permits should allow the injection into the primary chamber of contaminated water for incineration. Justification is the successful demonstration of flameless oxidation of CCl_4 in the solids trial burn tests. Contaminated water means a liquid containing no less than 90 weight percent of water in which the organic contaminant, if

any, is CCl_4 or falls below CCl_4 on the EPA Ranking of Incinerability List.

k) Maximum Organic Chlorine Content of Waste

The permit should allow the maximum organic chlorine feed rate shown by the trial burn results to occur while achieving HCl removal greater than 99%, i.e.- 99.34 lb/hr (102.14 lb/hr as HCl). Since the source of HCl is irrelevant to the performance of the CAI's air pollution control equipment, either all solid or all liquid or any combination of solid and liquid feed should be allowed.

l) Maximum Ash Content of Waste

The maximum permitted liquid waste ash content should be that demonstrated during the trial burn, <0.3 weight percent of the feed.

m) Maximum Liquid Feed Viscosity

The CAI employs a National Air Oil Burner Co. model S.A.R. No. O atomizing oil burner for injection of liquid feed into the primary chamber. This burner will accomodate many grades of oils, tars, pitches and asphalts up to a viscosity of 150-200 Saybolt Seconds Universal (SSU). Therefore, the maximum viscosity of liquid waste feed to the CAI allowed should be no greater than 200 SSU (see Appendix H of the RCRA Trial Burn Final Report).

n) Physical Form of Wastes

The physical form given in the RCRA liquid hazardous waste permit should specify liquid organic and aqueous wastes.

o) Natural Gas Feed Rate

The only permit limit on natural gas feed rate should be the maximum thermal duty. This will allow the substitution of easily incinerated wastes (higher waste heat value) for auxiliary fuel as long as specified operating conditions are maintained. This situation is discussed on page 4-6 of the 1983 Guidance Manual.

REFERENCES

1. Guidance Manual for Hazardous Waste Incinerator Permits, U.S. EPA, Office of Solid Waste, Washington, D.C., March 1983 Draft, page 2-15.

2. Ibid, pages 2-37 and 2-38.

3. Dellinger, B., J. Torres, W. Rubey, D. Hall, J. Graham, and R. Carnes, "Determination of the Thermal Stability of Selected Hazardous Organic Compounds," paper presented at the Ft. Mitchell, Kentucky Hazardous Waste Conference, April 1984.

ATTACHMENT A
QUALITY ASSURANCE PROJECT PLAN

ATTACHMENT A

QUALITY ASSURANCE

The Los Alamos National Laboratory will conduct the trial burn for its Controlled Air Incinerator System and will subcontract to selected qualified firms the stack sampling and the sample analysis operations. The selected firms will be required to submit the Quality Control procedures they will use for their activities.

A. Stack Sampling

An EPA Method 5 train will be used for determining particulates and acid gas. A volatile organic sampling train (VOST) will be used to collect the samples for the POHC, carbon tetrachloride, analysis. All EPA quality assurance requirements specified for these methods (pitot tube and gas meter calibrations, glassware cleaning, sample bottle and trap preservations; and reagent source) will be in effect.

B. Monitoring Equipment

The incineration and offgas systems are equipped with extensive monitoring and control devices. The critical elements will be checked regularly and calibrated to assure operability and reliability.

Prior to the run, on-line monitors, including analyzers for O_2, CO_2, and CO, will be zeroed and calibrated using the appropriate techniques. CO-CO_2 monitors will be calibrated with a zero gas, full-span gas, and a mid-range gas and the calibration will be checked at least daily during the burning of test materials.

C. Analytical

Extraction efficiency for carbon tetrachloride from the VOST resin and water condensate will be established. The precision and accuracy for the instrumental analysis for carbon tetrachloride will be established.

A comprehensive program, about 10 percent of the analytical samples, will be developed for split samples and for field and laboratory blanks. Standard grade chemicals will be obtained and used to spike samples for procedure verification and instrument standardization.

D. Records

Sample records will be maintained in a bound pre-numbered notebook. The records consist of the unique sample identification number, the sample type (impinger solution, ash, etc.), sample location, date, time, and initials of the operator who collected the sample. Analytical results were entered in the notebook when received.

Sample chain of custody procedures will be followed. Figures 1, 2, and 3 are examples of the type of records that will be maintained.

(NAME OF SAMPLING ORGANIZATION)

SAMPLE DESCRIPTION _____

_____

PLANT: _____ LOCATION: _____

DATE: _____ _____

TIME: _____ _____

MEDIA: _____ STATION: _____

SAMPLE TYPE: _____ PRESERVATIVE: _____

SAMPLED BY: _____

SAMPLE ID NO.: _____ - _____ - _____ - _____

LAB NO. _____

REMARKS

Figure 1. Example of General Sample Label

W/O No. _____ Page ____

FIELD TRACKING REPORT: ____-____
(LOC-SN)

FIELD SAMPLE CODE (FSC)	SAMPLE DESCRIPTION	DATE	TIME(s)	SAMPLER

Figure 2. Sample of Field Tracking Report Form

W/O No. _____ Page ____

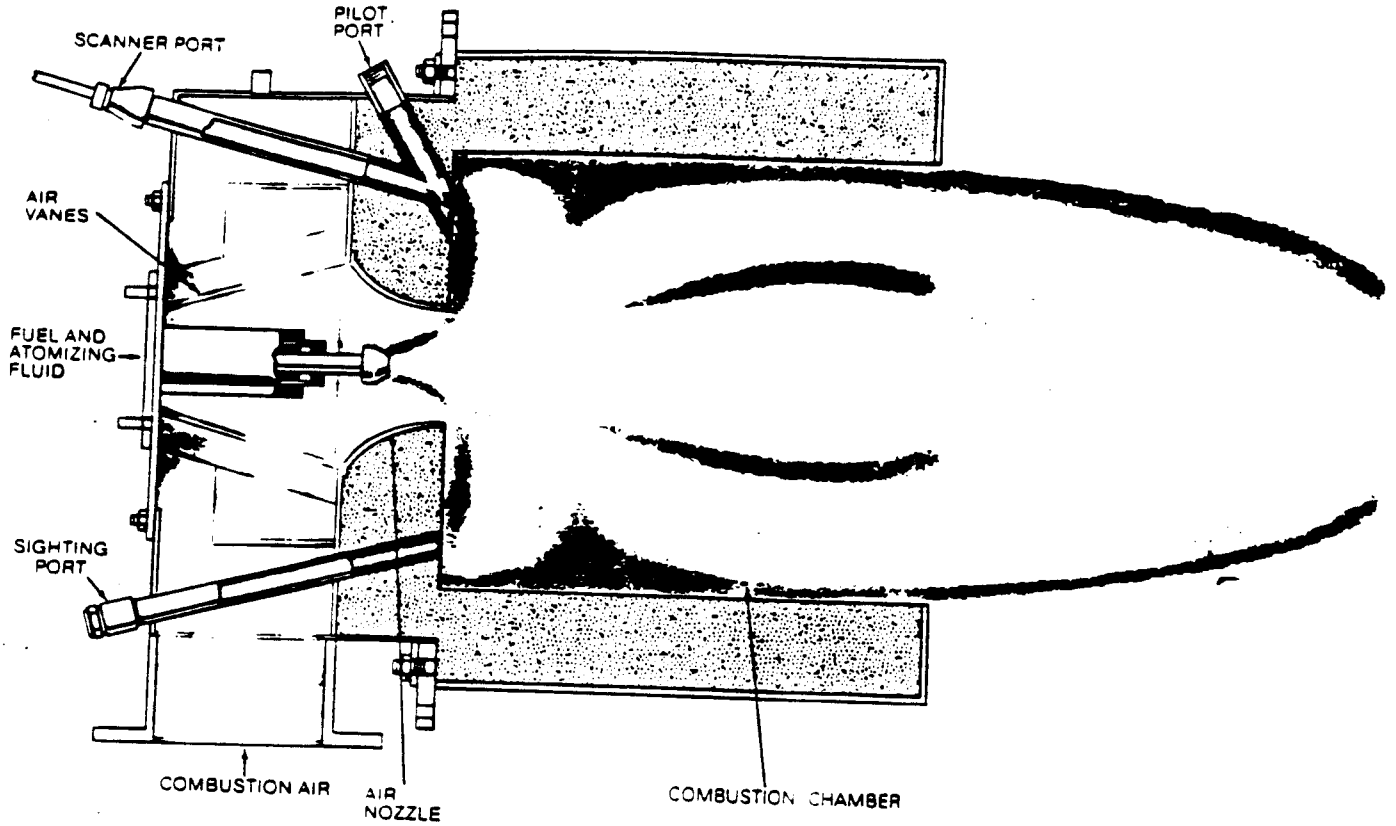
LAB TRACKING REPORT: _____ - _____ - _____
(LOC-SN-FSC)

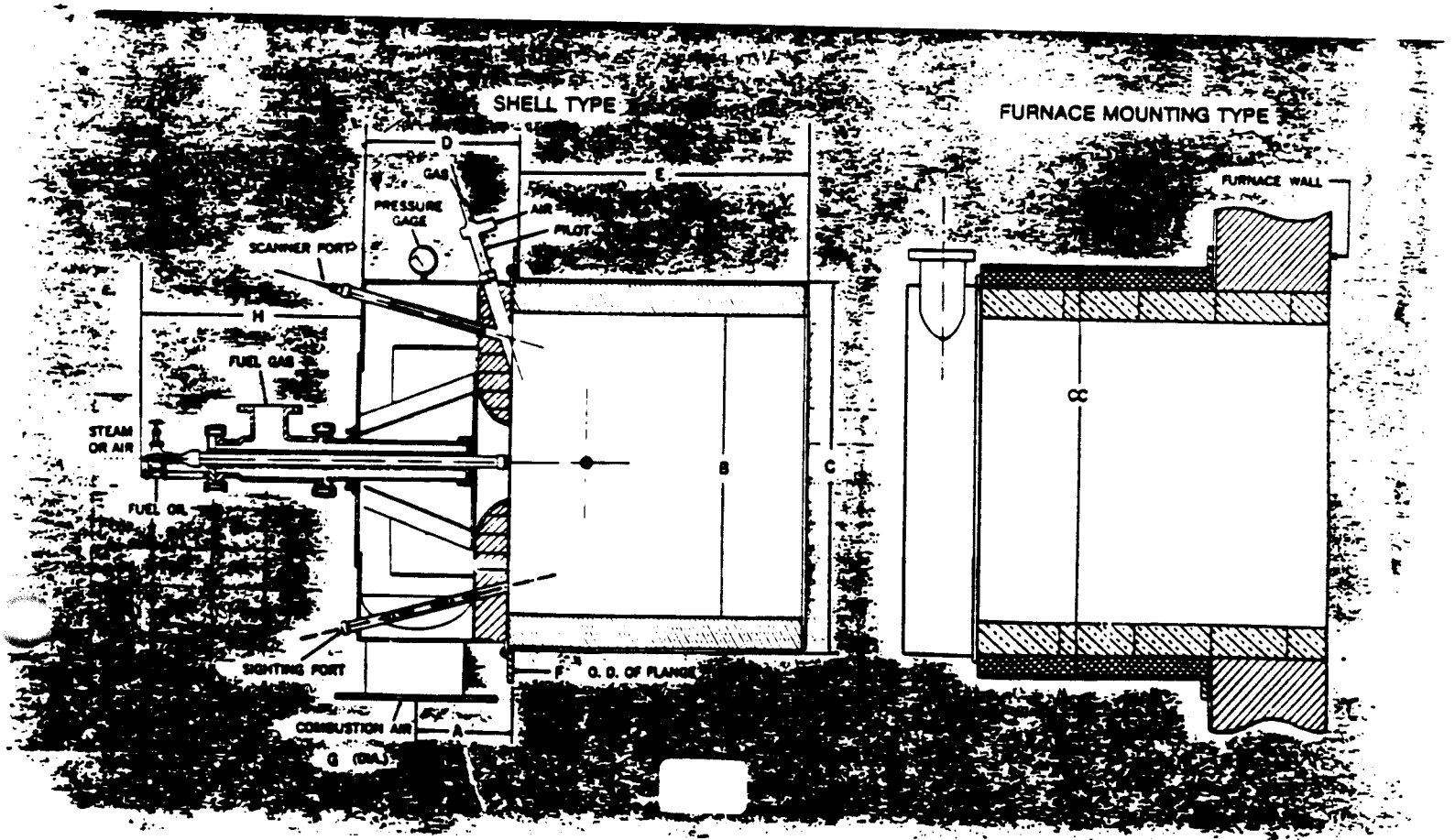
FRACTION CODE	X	PREP/ANAL REQUIRED	RESPONSIBLE INDIVIDUAL	DATE DELIVERED	DATE COMPLETED

Figure 3. Sample of Lab-Tracking Report Form

ATTACHMENT B
BURNER INFORMATION

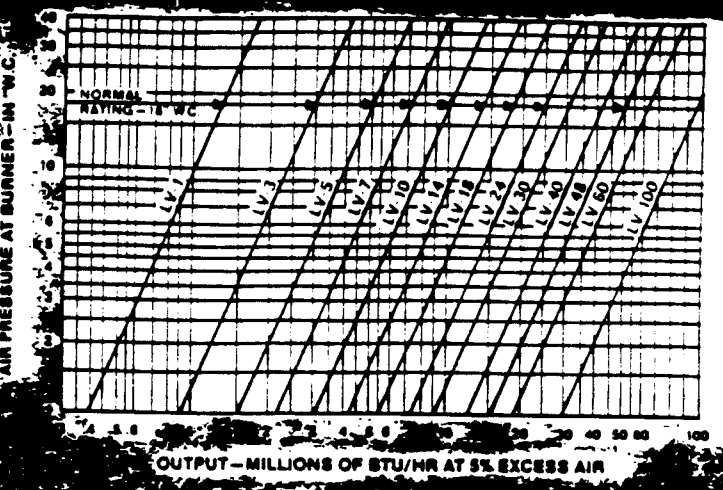
LV VORTEX combination burner





TRANE

Standing downstream looking into the flame produced the inspiration for the name Vortex burner. The whirling vortex of flame is awesome. Vortex action begins where combustion air is blown tangentially into the burner windbox. High rotational energy is imparted as the air accelerates through swirl vanes, whirls its way through the air nozzle and bursts like a cyclone into the combustion chamber. Fuel, either gas or finely atomized liquid, is injected through the burner gun centered in the air nozzle. Extreme turbulence in the nozzle area provides excellent mixing of fuel with air. Mixing is intensified as hot gases recycle into the low pressure zone which exists along the centerline of the vortex flame. This recycle mixing also brings heat to the liquid fuel injection area and helps to speed up vaporization. Thus liquid fuel is vaporized, mixed with combustion air and recycled gases, and heated to ignition temperature almost instantaneously.

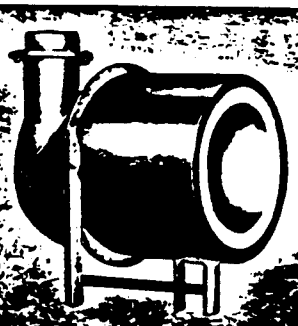


OUTPUT DATA — Trane Thermal Vortex burners are available in 13 standard models as shown. Turndown on liquid fuels is 3.5 to 1 from nominal high fire rating: Turndown on gaseous fuels is about 4 to 1. Burner curves shown are based upon furnace operation at standard atmospheric pressure with 5% excess air. Special designs may be supplied for unusual applications.

TRANE THERMAL VORTEX BURNER — High Outputs, Compact Design — Versatile Trane Thermal Vortex burners deliver outputs up to 100 MM Btu/hr. firing any liquid or gaseous fuel, separately or in combinations. Flame length is extremely short, about 1 to 1½ times the chamber diameter, with heat release rates upwards of one million Btu/hr. per cubic foot in the standard units. The Vortex can be fired horizontally or vertically. The high firing rates of single burners means that fewer burners are needed on some multiple burner applications simplifying and reducing the cost of controls. The compact design of the Vortex often permits space savings.

CHARACTERISTICS — Multi-Fuel — Vortex burners are capable of firing with fuel oils, all combustible gases (as low as 100 Btu/ft³.) and with combustible liquids (as low as 4500 Btu/lb.). These may be fired separately or in combination such as dual liquid, liquid-gas, or gas-gas. Special nozzle designs are available.

APPLICATIONS — Vortex burners are in service firing kilns, many types of dryers, process heaters and fired heat exchangers, incinerators and boilers. Where clean, really efficient combustion is mandatory, Vortex burners do the job.



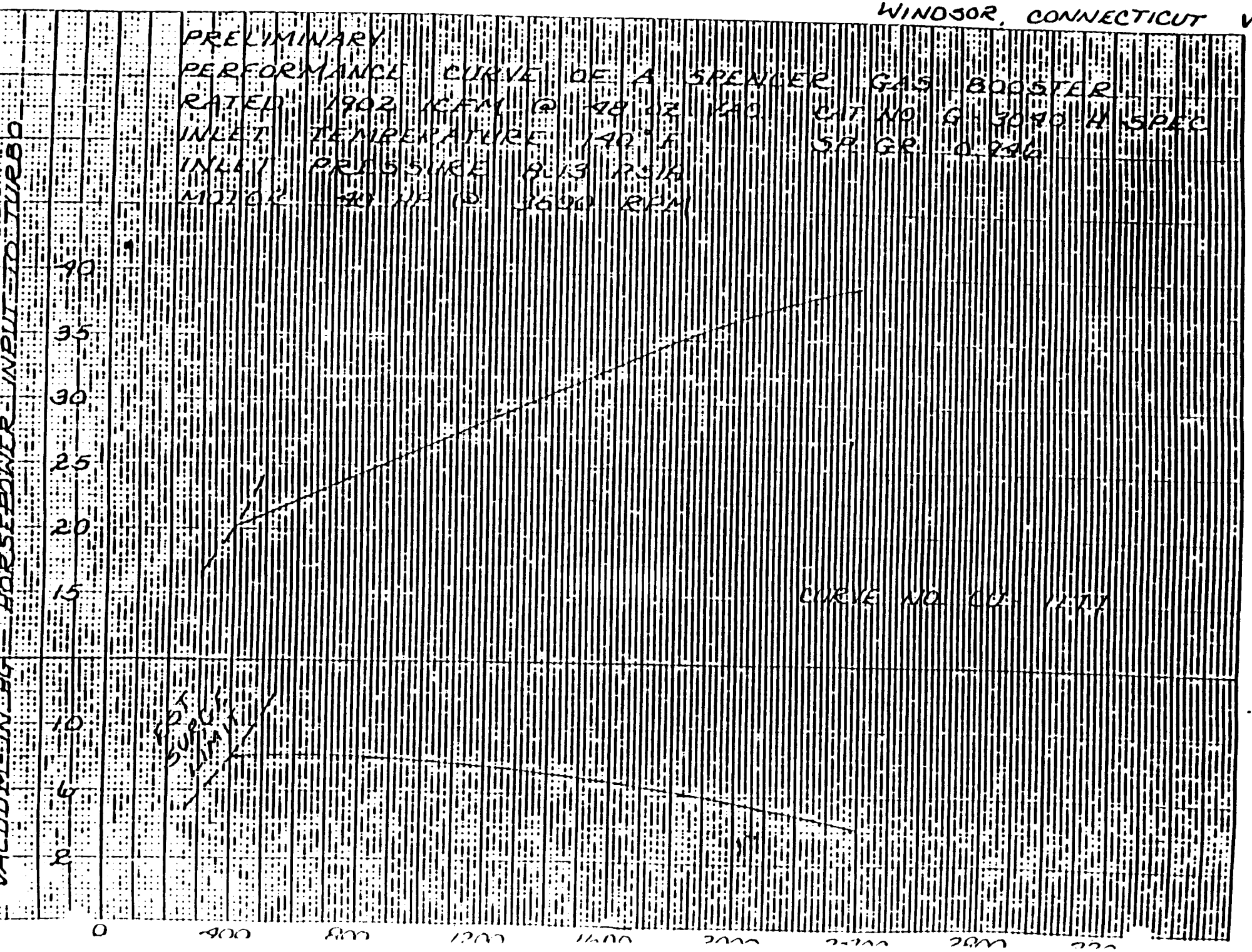
VORTEX BURNER

MODEL	MIL. of BTU/H	A	B	C	CC	D	E	F	G	H*	WT. LBS.
LV-1**	1.3	5¼	8½	12½	17	7 1/16	13⅛	16½	3	12½	161
LV-3	3	7⅛	15	24½	30¼	10¼	18 3/16	28	6	18⅛	900
LV-5	5	8 1/16	17¾	27	33	11 7/16	23 11/16	30½	6	20 3/16	1300
LV-7	7	8⅞	21	30¼	38¼	13¼	22 11/16	34	8	19¼	1316
LV-10	10	9⅞	26	35¼	41¾	15¼	27 3/16	39	10	19⅞	1626
LV-14	14	12¼	32	41¼	47¾	19¼	30⅞	49¾	12	20¾	2621
LV-18	18	12¼	32	41¼	47¾	19¼	30⅞	49¾	12	28¾	2822
LV-24	24	13	36	45¼	51¾	20¾	36	55	14	30¾	3800
LV-30	30	13	42	51¼	57½	22 9/16	40	60½	16	30¾	4250
LV-40	40	15¾	48	57¼	63¾	25¾	48¾	66½	20	32	7130
LV-48	48	15¾	56	69½	75½	29¾	48¾	66½	20	32	8660
LV-60	60	21¾	63	82½	82½	34½	63	88½	24	38¾	18108
LV-100	100	30	84	102	108	48	84	108	36	42	24000

*Allow 24" for gun removal
**LV-1 air atomized only

ATTACHMENT C
FAN CURVE

THE SPENCER TURBINE CO.
WINDSOR, CONNECTICUT VLD

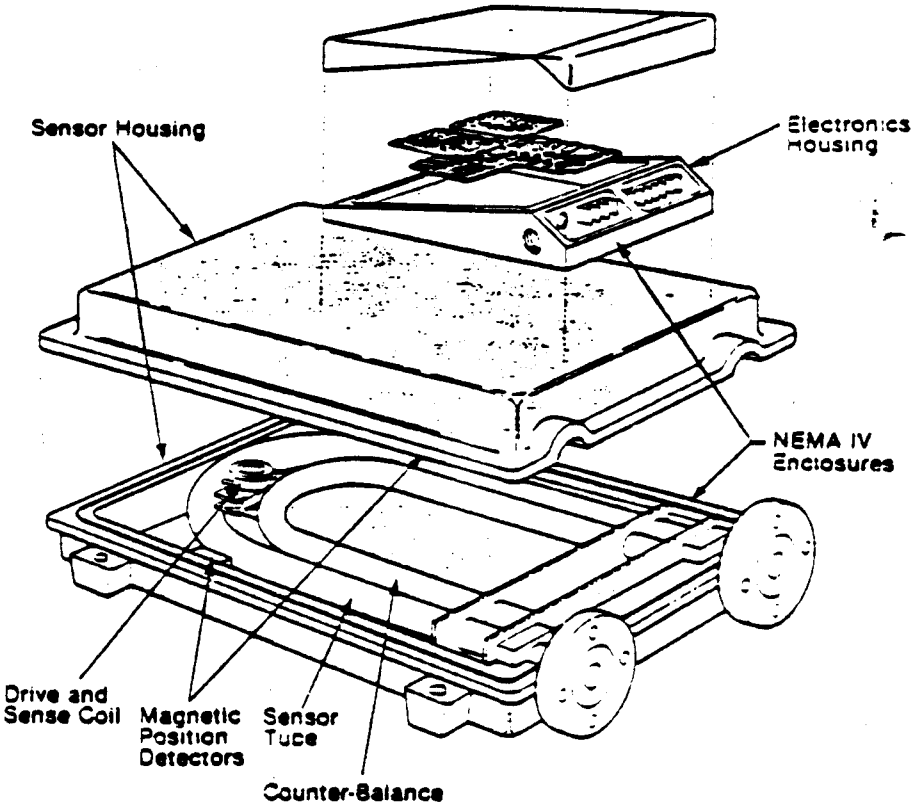


ATTACHMENT D
LIQUID WASTE AND CGVI FLOW METERS

Mass Flow Measurement by Micro Motion

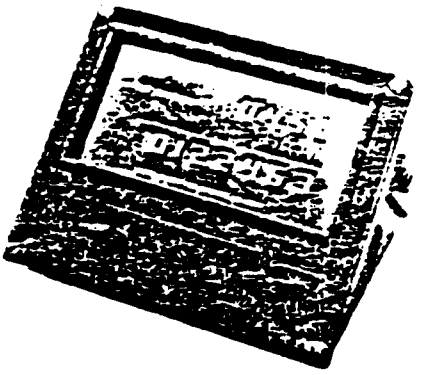
The flow sensor consists of a U-shaped tube which is vibrated at its natural frequency. The angular velocity of the vibrating tube in combination with the mass velocity of the flowing fluid causes the tube to twist. The amount of twist is measured with magnetic position detectors, producing a linear signal which is proportional to the mass flow rate of every particle passing through the U-shaped tube. The output of the meter is linearly proportional to mass flow rate and virtually unaffected by variations in fluid properties.

Physical Characteristics



Remote Flow Indicator D10-RT

The Micro Motion Model D10-RT is a digital flow indicator designed for use with Micro Motion Model C mass flow meters.



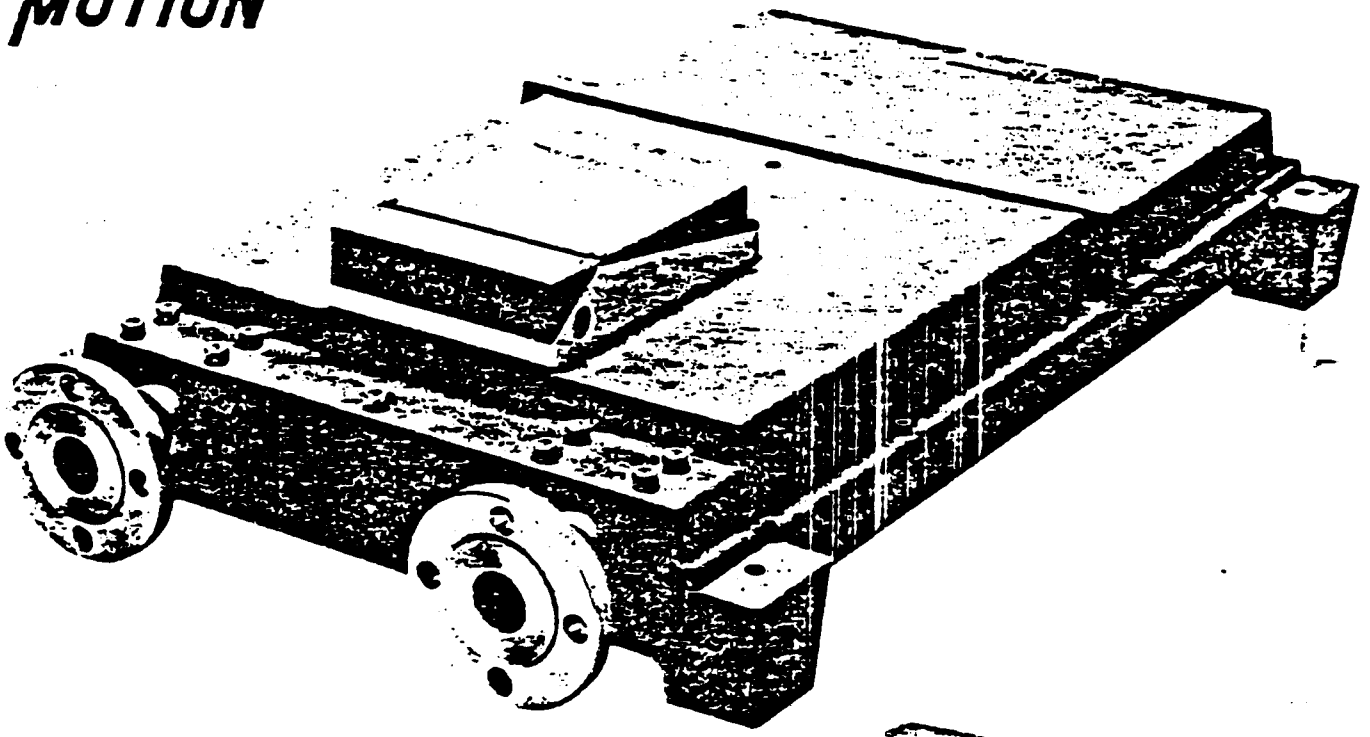
It converts the frequency of the meter output to a 4-digit flow rate indication, and a resettable, 7-digit totalizer displays the total flow. This compact and rugged instrument has a NEMA IV enclosure and can be operated on either AC or DC power.

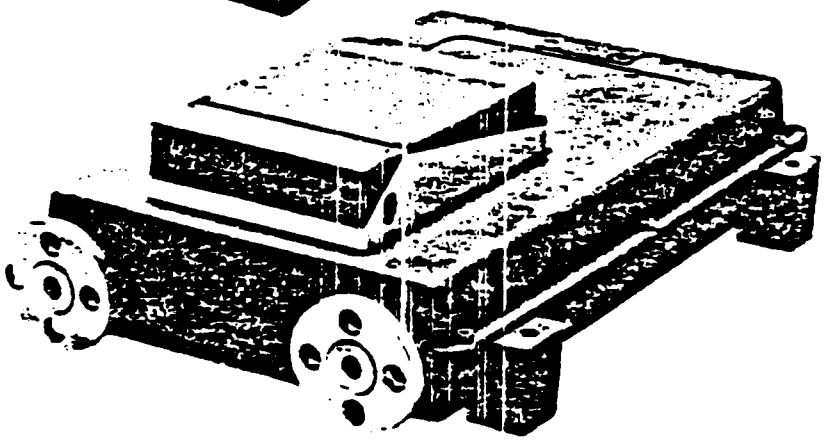
It may be set on a table top, mounted on a wall, or installed in a panel.

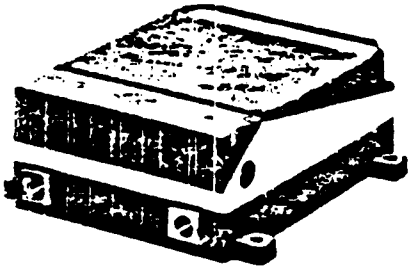
MICRO MOTION

Model C Mass Flow Meters

MICRO® MOTION







Features

- Direct Mass Flow Measurement
- Non-Intrusive Sensor
- No Moving Parts
- Universal Calibration

Advantages

- Superior Accuracy
- Wide Range of Applications
- Reliable, Durable
- Simple Maintenance and Operation
- Factory Calibrated
- Easily Reranged in the Field

MICRO® MOTION

General Specifications

Accuracy	±0.4% of rate, ± zero stability*
Fluid Temperature Range	−67 °F to 257 °F (−55 °C to 125 °C)
Ambient Temperature Range	−40 °F to 185 °F (−40 °C to 85 °C)
Wetted Parts	316L stainless steel
Output Signal	
Analog:	0-20 mA or 4-20 mA, 500 Ω max load 0-5 VDC or 1-5 VDC, 100 kΩ min input
Frequency:	Max output adjustable 3-15,000 Hz Solid state switch, 30 VDC, 1 amp capability
Response Time	Adjustable 0.1 to 1.1 sec
Power	110 VAC, 220 VAC ± 10% or 24 VDC ± 20%, ≈8 watts

*Zero set at process temp. ±20 °F

Detail Specifications

	Flow Range lb/min (kg/min)	*Zero Stability lb/min (kg/min)*	*Max Line Pressure Psi (bars)*	*Process Connections*	*Shipping Weight lb (kg)*	*Case Dimensions in (mm)*
Model C6	0-2.2 (0-1.0)	.0002 (.00009)	2000 (138)	¼" FNPT	11 (5)	*Models C6, C12 and C25* 8.63 (219) *L* 8.0 (203) *W* 3.48 (88) *H*
Model C12	0-13.5 (0-6.1)	.002 (.0009)	2000 (138)	¼" FNPT	11 (5)	
Model C25	0-90 (0-41)	.01 (.0045)	1000 (69)	¼" FNPT	11 (5)	
Model C50	0-440 (0-200)	.05 (.02)	2000 (138)	½" Flange*	53 (24)	*Models C50 and C100* 31.0 (787) *L* 15.0 (381) *W* 6.3 (100) *H*
Model C100	0-1600 (0-726)	.15 (.07)	1500 (103)	1" Flange*	53 (24)	
Model C150	0-2020 (0-916)	.2 (.09)	1500 (103)	1½" Flange*	175 (79)	*Models C150 and C200* 31.0 (787) *L* 21.5 (546) *W* 8.28 (210) *H*
Model C200	0-3200 (0-1450)	.31 (.14)	750 (52)	2" Flange*	185 (84)	

*Flanges are ASA 150 lb raised face slip ring

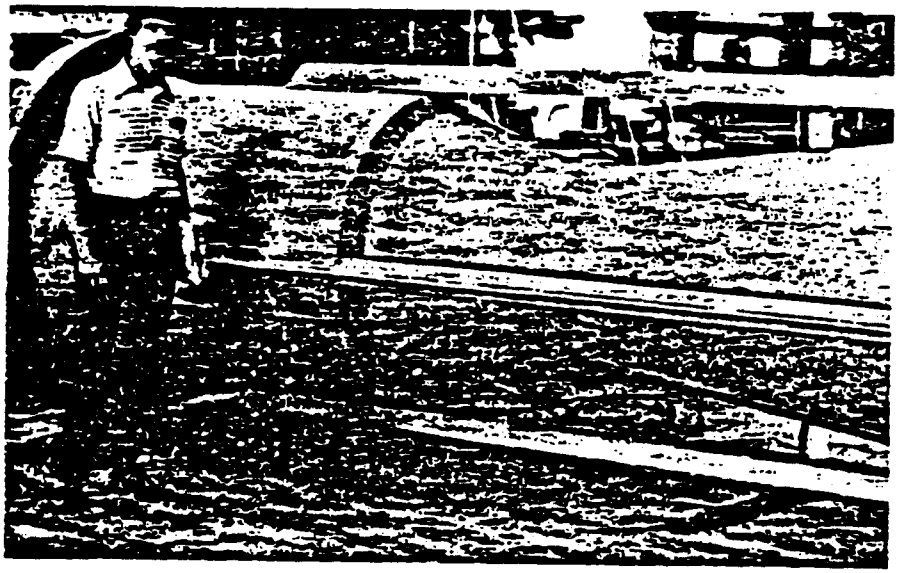
Options

Consult your local representative for information about the following options:

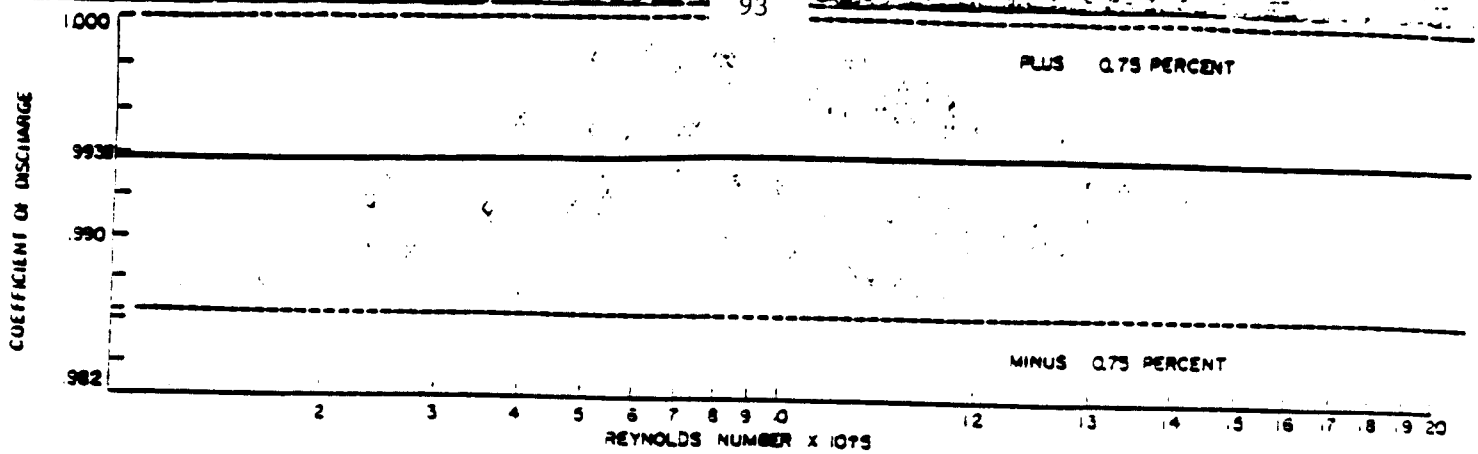
Expanded temperature range
Remote electronics
Corrosion resistant tubes
Abrasion resistant tubes
Expanded pressure ratings
Other process fittings
Intrinsically safe design, C6 - C200
(UL-Approved Models C12 - C200)

FLUIDIC'S HHR FLOW TUBE

- LOWEST OPERATING COST
- HIGHEST HEAD RECOVERY
- MORE EFFICIENT THAN AN ASME NOZZLE
- LOWEST UNCALIBRATED ERROR
- RUGGED FABRICATED CONSTRUCTION



The Fluidic Techniques, Inc. (FTI) High Head Recovery (HHR) Flow Tube is the most efficient differential producing flow measuring device available. The HHR Flow Tube provides significant savings in recurring operating costs over any other type primary flow element including the Venturi tubes. In addition to the low permanent loss, the HHR Flow Tube is probably the most efficient primary device available in terms of passing flow with an average coefficient of discharge of .9938. Calibration reports on the HHR Flow Tube consistently show less error than is present in the flow calibration of any other type of differential pressure producing primary flow element. These characteristics, combined with superior fabricated construction, make the HHR Flow Tube an ideal choice for flow measurement where accuracy, long life and low operating costs are important.



PLOT OF ACTUAL COEFFICIENT OF DISCHARGE VERSUS REYNOLDS NUMBER AS TAKEN FROM FLOW CALIBRATIONS OF THE ELLIPTICAL INLET FLOW TUBE AT BETA RATIOS VARYING FROM .4 TO .65 - THIS DATA REPRESENTS 127 FLOW CALIBRATION RUNS.

COEFFICIENT OF DISCHARGE

Shown above are the results of over 120 flow calibration runs of the FTI HHR Flow Tube. The chart shows that all points from 200,000 pipe reynolds number and up are within .75 of 1% of .9938. This coefficient of discharge is a measure of efficiency of a primary flow element and represents the actual flow rate versus the theoretical flow rate. A coefficient of discharge of 1.0 would be the most efficient possible. This high coefficient of discharge allows the HHR Flow Tube to be used with the lowest differential pressure ranges of any primary element device. The data shown above represents tests from 8" to 48" line size in beta ratios from .4 to .65.

OPERATING COSTS COMPARISONS

The following are two examples of actual operating situations comparing the Orifice Plate, the Venturi, and the HHR Flow Tube:

24 INCH STEAM LINE

Condition	Value
Line Size	24 in. (23.25 in. ID)
Flowing Material	Steam
Maximum Flow Rate	500,000 PPH
Normal Flow Rate	250,000 PPH
Flowing Pressure	164.73 psia
Flowing Temperature	550 deg F
Density	0.2293 lb/cu ft
Power Costs	$0.05/kWhr
Beta Ratio	0.6566

Device	Differential Pressure (in. wc)	Discharge Coefficient	Loss (%)	Power Loss at Normal Flow (HP)	Operating Cost at Normal Flow ($/year)
Orifice Plate	235.0	0.6625	58.5	670.0	219,000.
Venturi	75.0	0.985	12.5	44.0	14,406.
HHR Flow Tube	74.0	0.9938	3.6	13.0	4,273.

16 INCH AIR LINE

Condition	Value
Line Size	16 in. (15.250 in. ID)
Flowing Material	Air
Maximum Flow Rate	70,000 SCFM
Normal Flow Rate	49,000 SCFM
Flowing Pressure	164.73 psia
Flowing Temperature	60 deg F
Specific Gravity	0.8550
Power Costs	$0.05/kWhr
Beta Ratio	0.6446

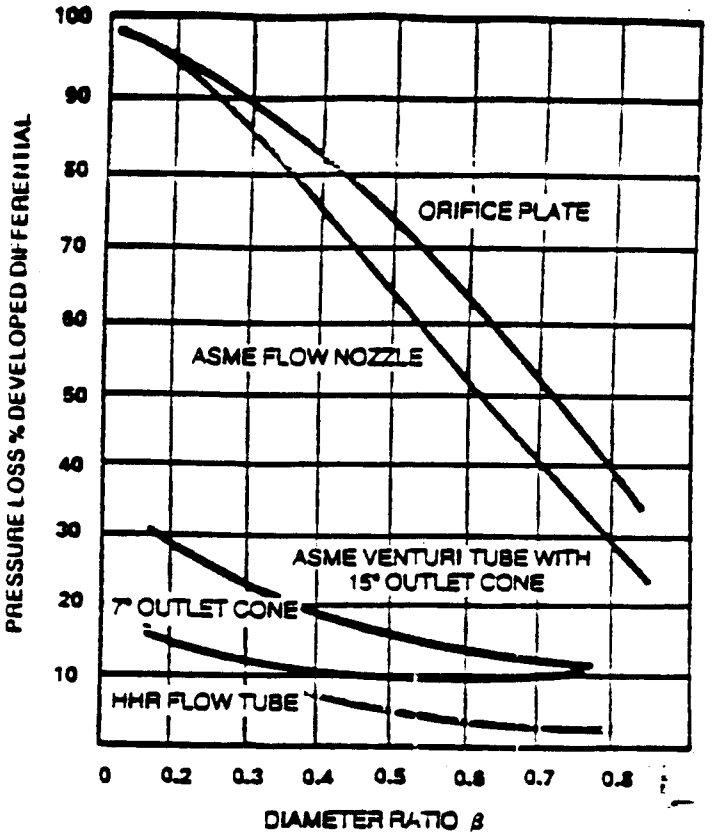
Device	Differential Pressure (in. wc)	Discharge Coefficient	Loss (%)	Power Loss at Normal Flow (HP)	Operating Cost at Normal Flow ($/year)
Orifice Plate	275.02	0.6667	57.1	295.5	96,540.
Venturi	101.59	0.9850	12.1	23.13	7,558.
HHR Flow Tube	99.74	0.9938	3.7	7.00	2,287.

PERMANENT PRESSURE LOSS

The permanent pressure loss of the HHR Hi-Head Recovery Flow Tube is a well documented feature. The chart at right illustrates the permanent loss which can be expected versus Beta (bore/pipe I.D.) ratio.

For comparison, the permanent pressure loss of several other head type meter devices are given. In all cases, the percent loss shown is in percent of developed differential pressure.

As shown, the HHR Flow Tube has the lowest permanent loss of the primary elements shown, regardless of Beta ratio. This lowest loss combines with the HHR's high coefficient of discharge to achieve the lowest operating cost available.



DETAILS OF FTI HHR FLOW TUBE CONSTRUCTION

ENTRANCE SECTION

The HHR Tube inlet portion consists of a cylindrical section at least one diameter in length. This enables proper location of the high pressure meter tap at the proper distance from the beginning of the entrance nozzle.

ENTRANCE NOZZLE

An ASME elliptical nozzle is provided between the entrance section and the throat. This nozzle is machined from a one piece forging and is furnished with a smooth finish to assure efficiency.

ONE PIECE THROAT

Each HHR Tube is manufactured with a machined one piece stainless steel throat as standard. The transition from the throat bore to the cone angle is also machined to eliminate deformation of the bore due to welding and grinding of the throat-cone weld. Throats fabricated from rolled plate and throat liners are not recommended due to their effect on accuracy and repeatability. The machined HHR throat is furnished with better than 50 micro-inch finish to assure optimum performance.

EXIT CONE

The exit cone is attached to the discharge end of the HHR throat and is either fabricated or machined with all welds and protrusions ground smooth. HHR Flow Tubes are furnished with 15° exit cones.

EXIT SECTION

To facilitate field welding and installation, a cylindrical straight section matching the adjacent piping is furnished on all weld-in style HHR Tubes.

FLANGES

Flanged HHR Tubes are provided with raised face slip-on 150# flanges on each end of the tube as standard. Raised face weld neck flanges and flanges of other ratings are also available.

DIFFERENTIAL PRESSURE CONNECTIONS

All FTI HHR Tubes are furnished with one high pressure and one low pressure ½" NPT 3000# half coupling as standard. Full penetration weld adaptors, socket weld connections, higher ratings, and other sizes of threaded connections are available.

HHR Tubes are also available with multiple taps

MATERIALS OF CONSTRUCTION

Both fabricated and machined HHR Tubes are available in carbon steel, stainless steel, or other metals. When required, materials can be furnished as required by the ASME Boiler and Pressure Vessel Code or other piping codes.

METHOD OF CONSTRUCTION

In line sizes up to and including 5", all FTI HHR Tubes are machined from round bar material with flanges (if required) welded to each end. All HHR Tubes in line sizes from 6" and above are of fabricated construction.

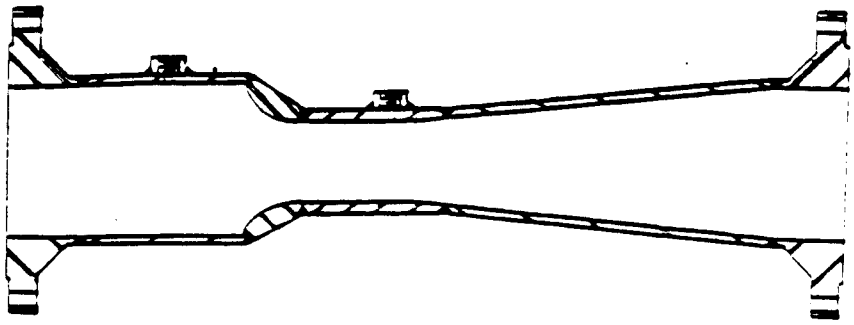
QUALITY CONTROL

HHR Flow Tubes are manufactured to exacting standards in a modern manufacturing facility under strict quality control. All welding is accomplished by code certified welders.

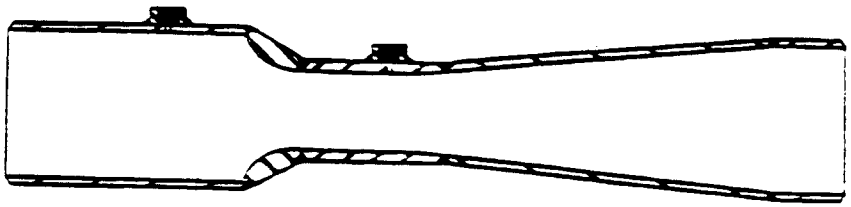
FTI's in-house testing capability includes radiography, hydrostatic, and other nondestructive tests. FTI holds both ASME Pressure Piping (PP) and ASME Pressure Vessel (U) Certificates of Authorization.

Special welding and quality procedures are available as required.

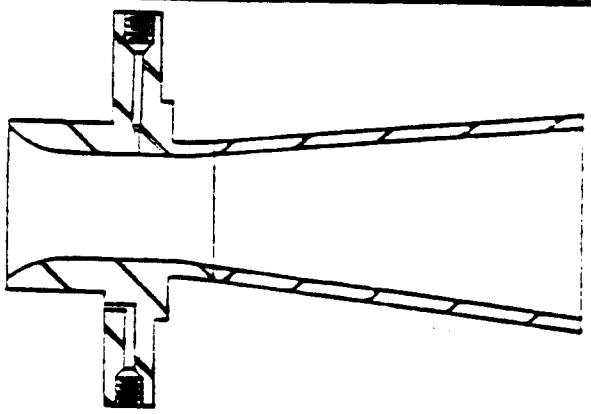
FTI Model HHR-F
Flanged Flow Tube

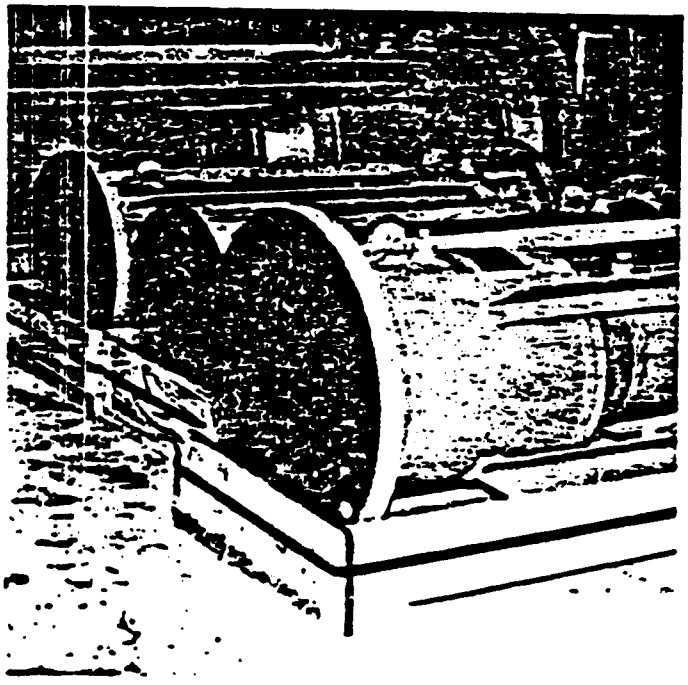


FTI Model HHR-W
Weld-In Flow Tube



FTI Model HHR-I
Insert Flow Tube





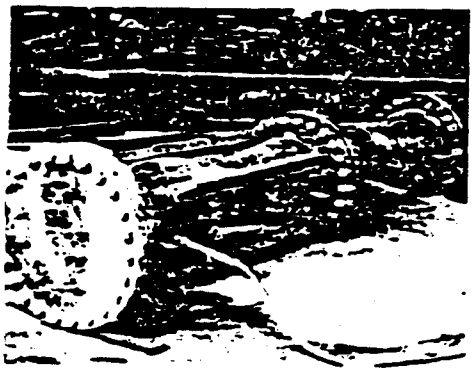
FLOW TUBE ACCURACY

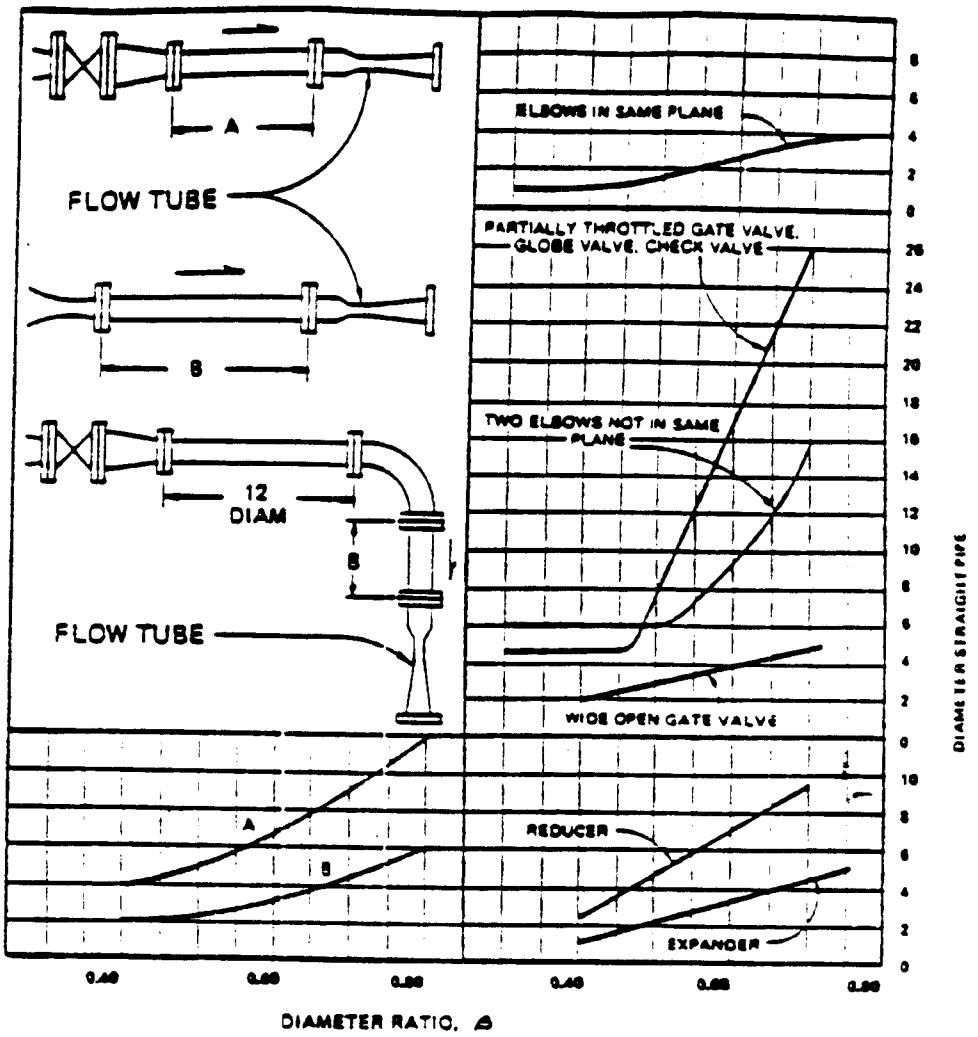
The uncalibrated HHR Flow Tube is accurate to within ± 0.75% of actual flow rate. This accuracy can only be maintained when FTI recommendations are used with regard to upstream piping requirements. Each FTI HHR Flow Tube throat section is machined to provide the smoothness and roundness necessary to assure that these accuracy limits are met. Throat forgings are lengthened to allow machining of the transition angle from the throat to the cone, eliminating the possibility of error due to the grinding of the cone throat weld.

When a higher degree of accuracy is desired, the Flow Tube can be flow calibrated after manufacture to establish an exact differential pressure range for the flow range desired. The accuracy of this data is dependent on the flow laboratory used. FTI recommends the use of laboratories traceable to the NBS who can certify their data to ± 0.25% .

UPSTREAM PIPING RECOMMENDATIONS

As with all head type metering devices, the accuracy of the HHR Flow Tube is in part, dependent on a well developed velocity profile of the flowing medium which contains a minimum of vortices and swirls. Such upstream piping effects can be reduced to an acceptable level by installing the metering device immediately after a length of straight pipe. The HHR Flow Tube offers a considerable savings in recommended upstream piping when compared to the orifice plate or the flow nozzle. The chart at right shows FTI's recommended minimum piping lengths for several typical piping configurations when used with a HHR Flow Tube.





SAMPLE SPECIFICATION

FLOW TUBES

The Flow Tube shall be a differential pressure producer sensing pure static pressure at the inlet and throat. Primary elements which amplify the differential by using velocity pressure shall not be considered.

The Flow Tube shall consist of an inlet straight section, a curved transition section, a straight throat section and a diffuser cone. The inlet straight section shall be of the same internal diameter as the mating piping and contain the high pressure tap. The curved transition section shall be machined to smoothly transition the flow from the internal pipe diameter to the throat diameter. The throat section shall be machined cylindrical in shape with a minimum length of two-thirds of the throat diameter and include the low pressure connection plus the start of the diffuser cone. The diffuser cone weld shall not be made at the back of the throat. The diffuser cone shall extend to the outlet flange or pipe section without truncation.

The Flow Tube shall be constructed of the following material (examples):

Flanged Ends - 150# RF - ANSI
Inlet Straight Section - A106 Gr. B pipe
Inlet Curved Section - A105 Carbon Steel
Throat Section - A182 F304SS
Diffuser Cone - A515-Gr. 70 Carbon Steel

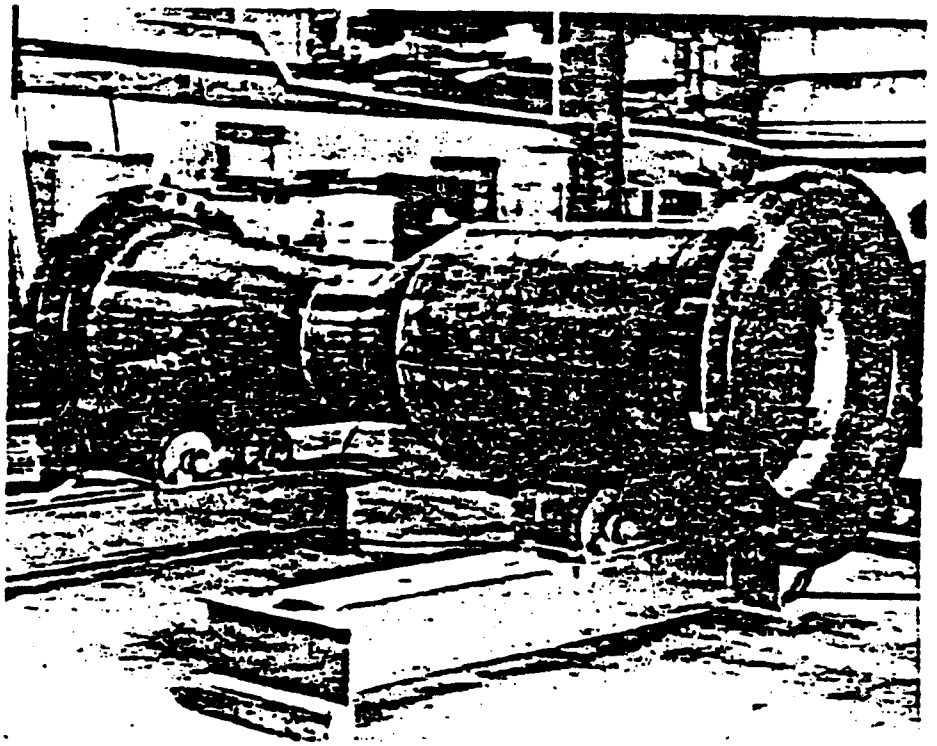
APPROXIMATE DIMENSIONS FOR FTI HHR FLOW TUBES

LINE SIZE	PIPE I.D. (INCH)	BETA RATIO	HHR-F LENGTH INCHES	HHR-W LENGTH INCHES	HHR-F WT. LBS.	HHR-W WT. LBS.	LINE SIZE	PIPE I.D. (INCH)	BETA RATIO	HHR-F LENGTH INCHES	HHR-W LENGTH INCHES	HHR-F WT. LBS.	HHR-W WT. LBS.
2	2.067	All	15	15	45	40	18	17.250	0.40	89	98	847	682
3	3.068	All	20	20	76	69	18	17.250	0.60	68	77	814	649
4	4.026	All	24	24	103	89	18	17.250	0.75	52	61	719	554
6	6.065	0.40	31	34	104	74	20	19.250	0.40	99	109	1099	869
6	6.065	0.60	24	27	96	66	20	19.250	0.60	76	86	1062	832
6	6.065	0.75	18	21	85	56	20	19.250	0.75	58	68	940	710
8	7.981	0.40	41	45	174	128	24	23.250	0.40	119	131	1645	1332
8	7.981	0.60	31	35	162	116	24	23.250	0.60	91	103	1604	1291
8	7.981	0.75	24	28	145	98	24	23.250	0.75	70	82	1414	1100
10	10.020	0.40	51	56	271	207	30	29.250	0.40	150	165	2737	2276
10	10.020	0.60	39	44	254	191	30	29.250	0.60	115	130	2703	2241
10	10.020	0.75	30	35	225	162	30	29.250	0.75	88	103	2371	1910
12	12.000	0.40	61	67	411	313	36	35.250	0.40	180	198	4249	3563
12	12.000	0.60	47	53	389	292	36	35.250	0.60	138	156	4241	3555
12	12.000	0.75	36	42	347	250	36	35.250	0.75	106	124	3715	3029
14	13.250	0.40	68	75	524	389	42	41.250	0.40	211	232	6251	5243
14	13.250	0.60	52	59	499	365	42	41.250	0.60	162	183	6296	5288
14	13.250	0.75	40	47	447	313	42	41.250	0.75	124	145	5515	4506
16	15.250	0.40	78	86	693	523	48	47.250	0.40	242	266	8581	7362
16	15.250	0.60	60	68	664	494	48	47.250	0.60	185	209	8714	7496
16	15.250	0.75	46	54	593	422	48	47.250	0.75	142	166	7607	6388

NOTES:
1. HHR-F WEIGHTS CALCULATED ON THE BASIS OF USING 150# RFSO FLANGED ENDS.
2. ABOVE FLOW TUBE WEIGHTS AND LENGTHS ARE BASED ON SCHEDULE STANDARD PIPE AND .375" THICK FLOW TUBE WALLS.
3. WEIGHTS AND LENGTHS ARE APPROXIMATE.
4. WEIGHTS AND LENGTHS OF HHR-I INSERT TYPE FLOW TUBES VARY WITH LINE I.D. - CONSULT FACTORY.

FTI FLOW TUBE ORDERING INFORMATION

(1) FTI Model Number
(2) Line Size
(3) Pipe Schedule or Actual I.D.
(4) Differential Pressure at Maximum Flow
(5) Material of Construction for Body and Throat
(6) Flange, Type and Rating (if applicable)
(7) Flowing Medium
(8) Maximum Flow (Specify Units)
(9) Operating Pressure and Temperature at Maximum Flow
(10) S.G. @ 60°F. Base Pressure and Temperature
(11) S.G. @ Flowing Conditions (liquid)
(12) Supercompressability Factor @ Operating Pressure (gas)
(13) Molecular Weight (gas)
(14) Viscosity



ATTACHMENT E
ANALYTICAL METHODS

Method Number: A101

Method Name: Volatiles

Basic Method: GC/MS - Purge and Trap

Matrices: Aqueous Liquids
Organic Liquids (neat or diluted)
Sludges
Solids

Constituents from Appendix VIII to which method may be applied:

Acetonitrile
Acrolein
Acrylamide
Acrylonitrile
Benzene
Bromoacetone
Bromomethane
Carbon disulfide
Carbon oxyfluoride
Chlorinated benzenes, N.O.S.
Chlorinated ethane, N.O.S.
Chlorinated fluorocarbons, N.O.S.
Chloroalkyl ethers, N.O.S.
Chlorobenzene
1-Chloro-2,3-epoxypropane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
Chloromethyl methyl ether
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
Dibromomethane
Dichlorobenzene (meta, ortho, and para isomers)
Dichlorobenzene, N.O.S.
1,4-Dichloro-2-butene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
trans-1,2-Dichloroethene
Dichloroethylene, N.O.S.
1,2-Dichloroethylene
Dichloromethane
Dichloropropane, N.O.S.
1,2-Dichloropropane
Dichloropropene, N.O.S.
1,3-Dichloropropene

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EPA-600/8-84-002 February 1984

1,4-Dioxane
Formic acid
Halomethane, N.O.S.
Hexachloroethane
Hexachloropropene
Hydrazine
Iodomethane
Isocyanic acid, methyl ester
Methanethiol
Methyl ethyl ketone (MEK)
Methyl hydrazine
Tetrachloroethane, N.O.S.
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tetrachloromethane
Tetranitromethane
Toluene
Tribromomethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichloromonofluoromethane
Trichloropropane, N.O.S.
1,2,3-Trichloropropane
Vinyl chloride

Apparatus: Finnigan 4000 GC/MS/DS or equivalent
Purge and Trap Device (Tekmar LSC-1 or equivalent)

Analysis Method Parameters:

Purge and Trap: A 25 cm trap will be prepared which contains 1/3 activated charcoal, 1/3 silica gel, and 1/3 Tenax. A 5 mL sample will be purged onto the trap (Methods A101a, A101b, or A101c) at 40 mL/min with helium or nitrogen for 12 min, and desorbed with backflushing at 180°C with 40 mL inert gas into GC for 4 min.

GC: Column - 6 ft 0.2% Carbowax 1500 on Carbopack C 60/80 mesh

Carrier Gas - He at 30 mL/min

Injector - 160°C

Temperature Program - 30°C for 7 min isothermal (beginning at start of purge); then, 30-160°C at 8°C/min; and 160°C for 15 min isothermal.

MS: Mass Range - 20-260 amu

Scan Rate - 2 s/scan

Ionization - EI, 70 eV

Detection Limit: 10-100 μg/L of each compound on-column.

References: U.S. Environmental Protection Agency, Federal Register, 44, 69464-69575 (December 3, 1979).

U.S. Environmental Protection Agency/Office of Solid Waste, Washington, D.C., "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods," SW-846 (1980).

Method Number: A101a

Method Name: Volatiles

Basic Method: Purge and Trap

Matrix: Aqueous Liquids

Purging Method Parameters:

An aliquot (5 mL) of the aqueous sample will be transferred into the purging device; and purged with helium for 12 min at 40 mL/min.

Reference: U.S. Environmental Protection Agency, Federal Register, 44, 69464-69573 (December 3, 1979).

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Method Number: A101b

Method Name: Volatiles

Basic Method: Purge and Trap

Matrix: Sludges (including gels and slurries)

Purging Method Parameters:

An aliquot of a sludge sample will be diluted to 0.5% solids with reagent grade water. A 5-mL portion of this diluted mixture will then be transferred to the purging device and purged for 12 min with helium at 40 mL/min. If the sludge sample is not readily dispersible, polyethylene glycol (MW 400) will be used to dilute the sample.

Reference: Miller, H.C., R.H. James and W.R. Dickson, "Evaluated Methodology for the Analysis of Residual Wastes," Report prepared for U.S. Environmental Protection Agency/Effluent Guidelines Division, Washington, D.C., by Southern Research Institute, Birmingham, Alabama under Contract No. 68-02-2685 (December 1980).

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EPA-600/8-84-002 February 1984

Method Number: A101c

Method Name: Volatiles

Basic Method: Purge and Trap

Matrix: Solids

Purging Method Parameters:

An aliquot of the solid sample will be diluted to 2% solids with reagent grade water. A 5-mL portion of this diluted mixture will be transferred to the purging device and purged for 12 min with helium at 40 mL/minute. If the solid sample is not readily dispersible in water, polyethylene glycol (MW 400) will be used to dilute the sample.

Reference: Miller, H.C., R.H. James and W.R. Dickson, "Evaluated Methodology for the Analysis of Residual Wastes," Report prepared for U.S. Environmental Protection Agency/Effluent Guidelines Division, Washington, D.C., by Southern Research Institute, Birmingham, Alabama under Contract No. 68-02-2685 (December 1980).

From: Sampling and Analysis Methods for Hazardous Waste Combustion
EPA-600/8-84-002 February 1984

METHOD 5030

PURGE-AND-TRAP METHOD

1.0 Scope and Application

1.1 Method 5030 is used to determine the concentration of volatile organic compounds in a variety of liquid and solid waste matrices.

1.2 This method is applicable to nearly all types of samples, regardless of water content, including aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, groundwater, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments.

1.3 For highly volatile matrices, direct injection preceded by dilution should be used to prevent gross contamination of the instrumentation. For pastes, dilution of the sample until it becomes free-flowing is used to ensure adequate interfacial area. The success of this method also depends on the level of interferences in the sample; results may vary due to the large variability and complicated matrices of solid waste samples.

1.4 Method 5030 is based upon a purge-and-trap, gas chromatographic procedure.

1.5 This method is recommended for use by, or under the supervision of, analysts experienced in the use of purge-and-trap systems and gas chromatographs and skilled in the interpretation of chromatograms.

2.0 Summary of Method

2.1 A portion of solid waste is dispersed in polyethylene glycol (PEG) or distilled-in-glass methanol to dissolve the volatile organic constituents. A portion of the PEG or methanol solution is combined with water in a specially designed purging chamber. For liquid and some semiliquid samples, PEG or methanolic extraction will not be necessary. An inert gas is then bubbled through the solution at ambient temperature and the volatile components are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. (SPECIAL NOTE: For Methods 8020 and 8030, drying of the trap for 4 min under helium flow is required. See Figure 5 for configuration.) The gas chromatographic column is heated to elute the components which are detected by the appropriate detector (Methods 8010, 8020, 8030).

2 / SAMPLE INTRODUCTION TECHNIQUES

3.0 Interferences

3.1 Low molecular weight impurities in PEG can be volatilized during the purging procedure. Thus, the PEG employed in this method must be purified before use as described in Section 5.3.

3.2 Impurities in the purge gas and organic compounds out-gasing from the plumbing ahead of the trap account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks. The use of non-TFE plastic tubing, non-TFE thread sealants, or flow controllers with rubber components in the purging device should be avoided.

3.3 Samples can be contaminated by diffusion of volatile organics (particularly fluorocarbons and methylene chloride) through the septum seal into the sample during shipment and storage. A field reagent blank prepared from reagent water and carried through the sampling and handling protocol can serve as a check on such contamination.

3.4 Contamination by carryover can occur whenever high-level and low-level samples are analyzed sequentially. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of reagent water (PEG or methanol solution) to check for cross contamination. After each use, the purging chamber is cleaned as described in Section 7.12. The trap and other parts of the system are also subject to contamination; therefore, frequent additional bakeout and purging or the entire system may be required.

4.0 Apparatus and Materials

4.1 Purge-and-trap device: The purge-and-trap device consists of three separate pieces of equipment: the purging chamber, trap, and the desorber. Several complete devices are commercially available.

4.1.1 The purging chamber must be designed to accept 5-ml or 25-ml samples with a water column at least 3 cm deep. The gaseous headspace between the water column and the trap must have a total volume of less than 15 ml. The purge gas must pass through the water column as finely divided bubbles with a diameter of less than 3 mm at the origin. The purge gas must be introduced no more than 5 mm from the base of the water column. The purging chamber, illustrated in Figure 1, meets these design criteria.

4.1.2 The sorbent trap consists of a 1/8-in. O.D. (0.105-in. I.D.) x 25-cm-long stainless steel tube packed with the appropriate absorbents as described in Table 1 (see Figures 2 and 3).

4.1.3 The desorber must be capable of rapidly heating the trap to 180° C within 30 sec.

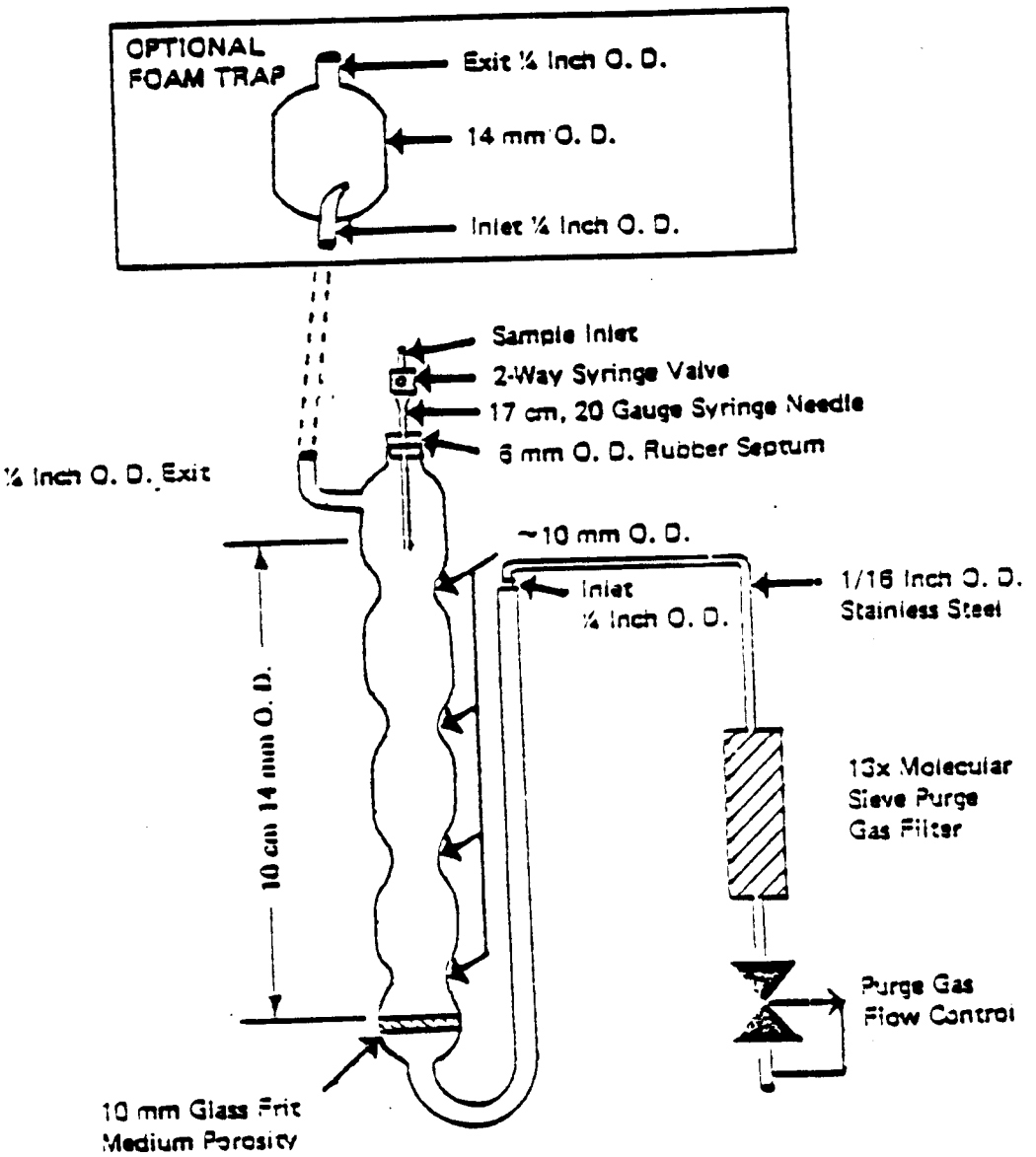

Figure 1. Purging chamber.

SAMPLE INTRODUCTION TECHNIQUES

TABLE 1. PURGE-AND-TRAP PARAMETERS

	Analysis method[a]		
	8010	8020	8030
Purge Gas	Nitrogen or Helium	Nitrogen or Helium	Helium
Purge Gas Flow Rate (ml/min)	40	40	20 ± 1
Purge Time (min)	11.0	12.0	30.0
Purge Temperature	Ambient	Ambient	85° C
Desorb Temperature (°C)	180°	180°	100°
Sorbents to be used in packing tube	A	B	B

[a]Measurement method to be employed for identification and quantification.

KEY: A = Porous polymer packing, 60/80 mesh, chromatographic grade Tenax GC (2,6-Diphenylene oxide).

Three percent OV-1 on Chromosorb-W 60/80 mesh (optional).

Silica gel, 35/60 mesh Davison grade-15 or equivalent.

Coconut charcoal, 6/10 mesh, Barnaby Chaney C.A. - 580-26 lot #M-2649 or equivalent.

Refer to Figure 2 for column packing.

B = Porous polymer packing, 60/80 mesh, chromatographic grade Tenax GC (2,6-Diphenylene oxide).

Three percent OV-1 on Chromosorb-W 60/80 mesh (optional).

Refer to Figure 3 for column packing.

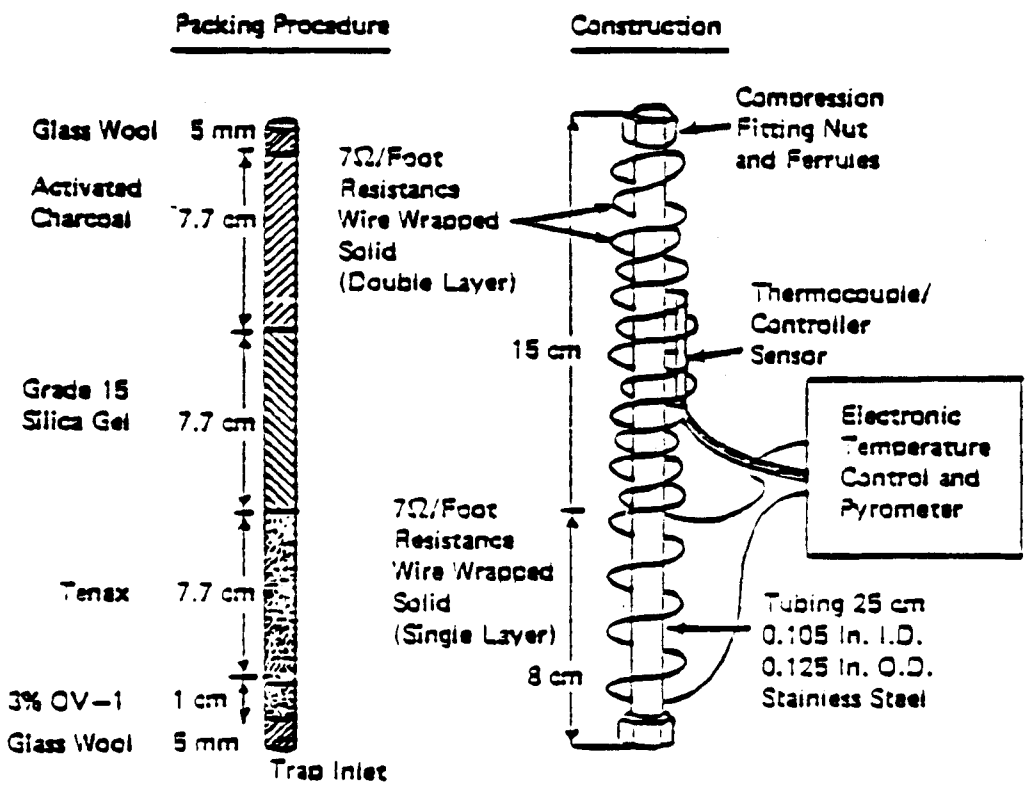

Figure 2. Trap packings and construction for Method 8010.

SAMPLE INTRODUCTION TECHNIQUES

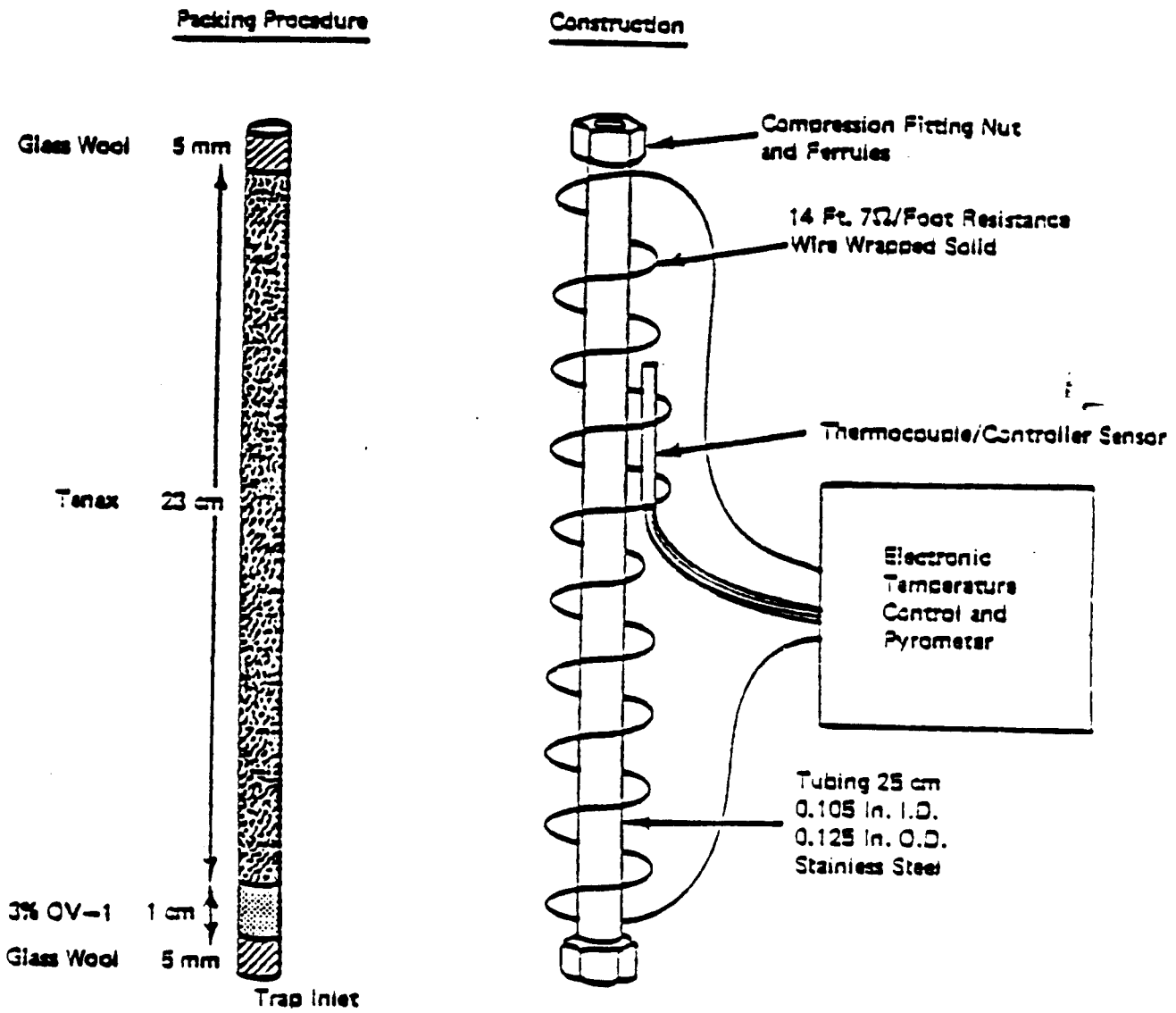

Figure 3. Trap packing and construction for Methods 8020 and 8030.

4.1.4 The purge-and-trap device may be assembled as a separate unit or be coupled to a gas chromatograph as illustrated in Figures 4 through 6.

4.2 Syringes: 5-ml and 25-ml glass hypodermic, equipped with 20-gauge needle, at least 15 cm in length.

4.3 Micro syringes: 10 µl, 25 µl, 100 µl, 250 µl, 500 µl, and 1,000 µl. These syringes should be equipped with 20-gauge needles having a length sufficient to extend from the sample inlet to within 1 cm of the glass frit in the purging device (see Figure 1). The needle length required will depend upon the dimensions of the purging device employed.

4.4 Centrifuge tubes: 50-ml round-bottom glass centrifuge tubes with Teflon-lined screw caps. The tubes must be marked before use to show an approximate 20-ml graduation (Kimble #45212 or equivalent).

4.5 Centrifuge: Capable of accommodating 50-ml glass tubes.

4.6 Syringe valve: 2-way, with Luer ends (2 each; Hamilton #86725 valve equipped with one Hamilton #35033 Luer fitting or equivalent).

4.7 Syringe: 5-ml, gas-tight with shutoff valve.

4.8 Bottle: 15-ml, screw-cap, Teflon cap liner.

4.9 Balance: Analytical, capable of accurately weighing 0.0001 g.

4.10 Rotary evaporator: Equipped with Teflon-coated seals (Buchi Rotavapor R-110 or equivalent).

4.11 Vacuum pump: Mechanical, two-stage.

5.0 Reagents

5.1 Trap materials (see Table 1 and Figures 2 and 3 for configuration).

5.1.1 2,6-Diphenylene oxide polymer: 60/80 mesh Tenax, chromatographic grade or equivalent.

5.1.2 Methyl silicone packing: 3% OV-1 on 60/80 mesh Chromosorb-W or equivalent.

5.1.3 Silica gel, Davison Chemical (35/60 mesh), grade 15 or equivalent.

SAMPLE INTRODUCTION TECHNIQUES

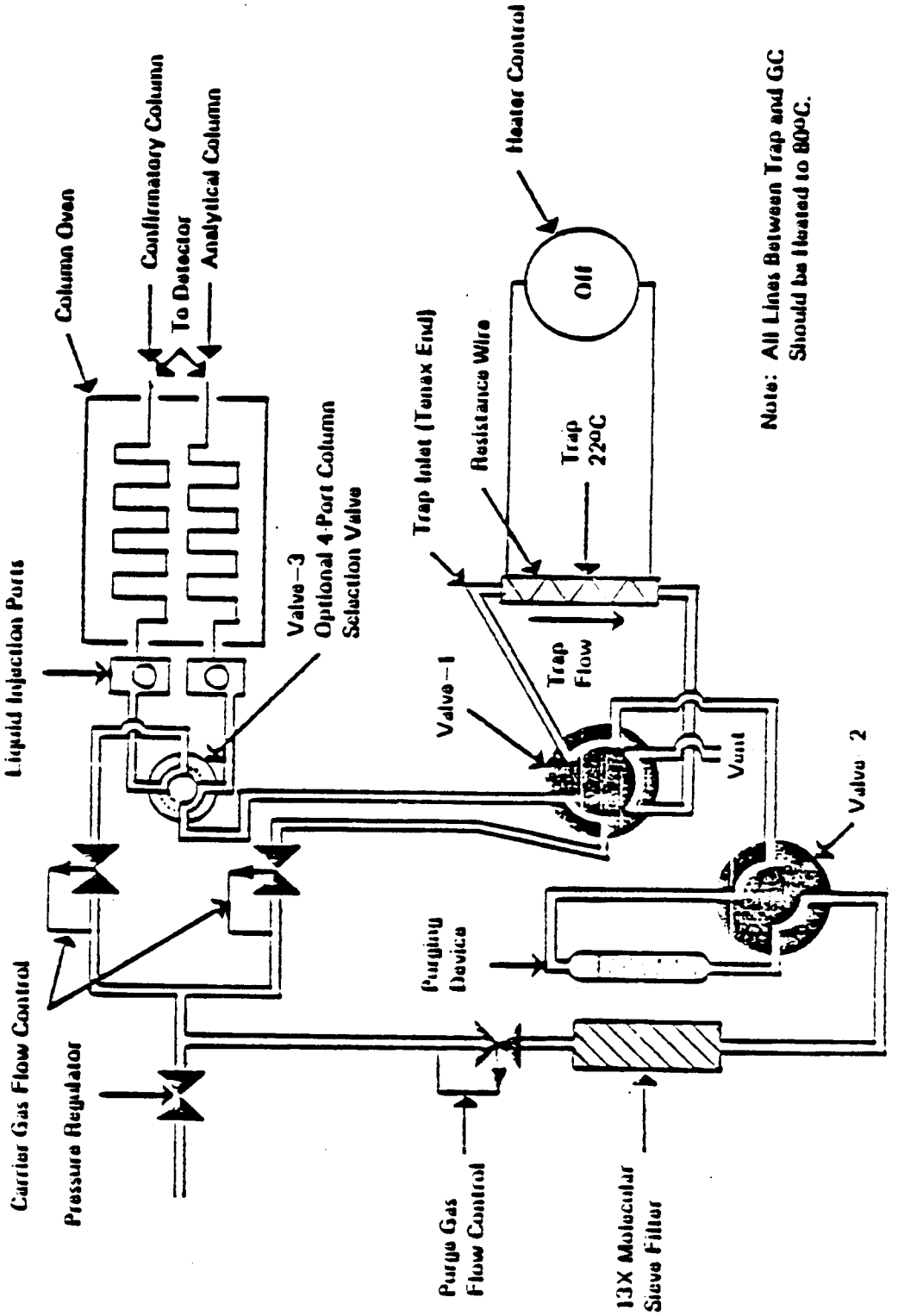

Figure 4. Purge and-trap system, purge sorb mode, for methods 8010, 8020 and 8030.

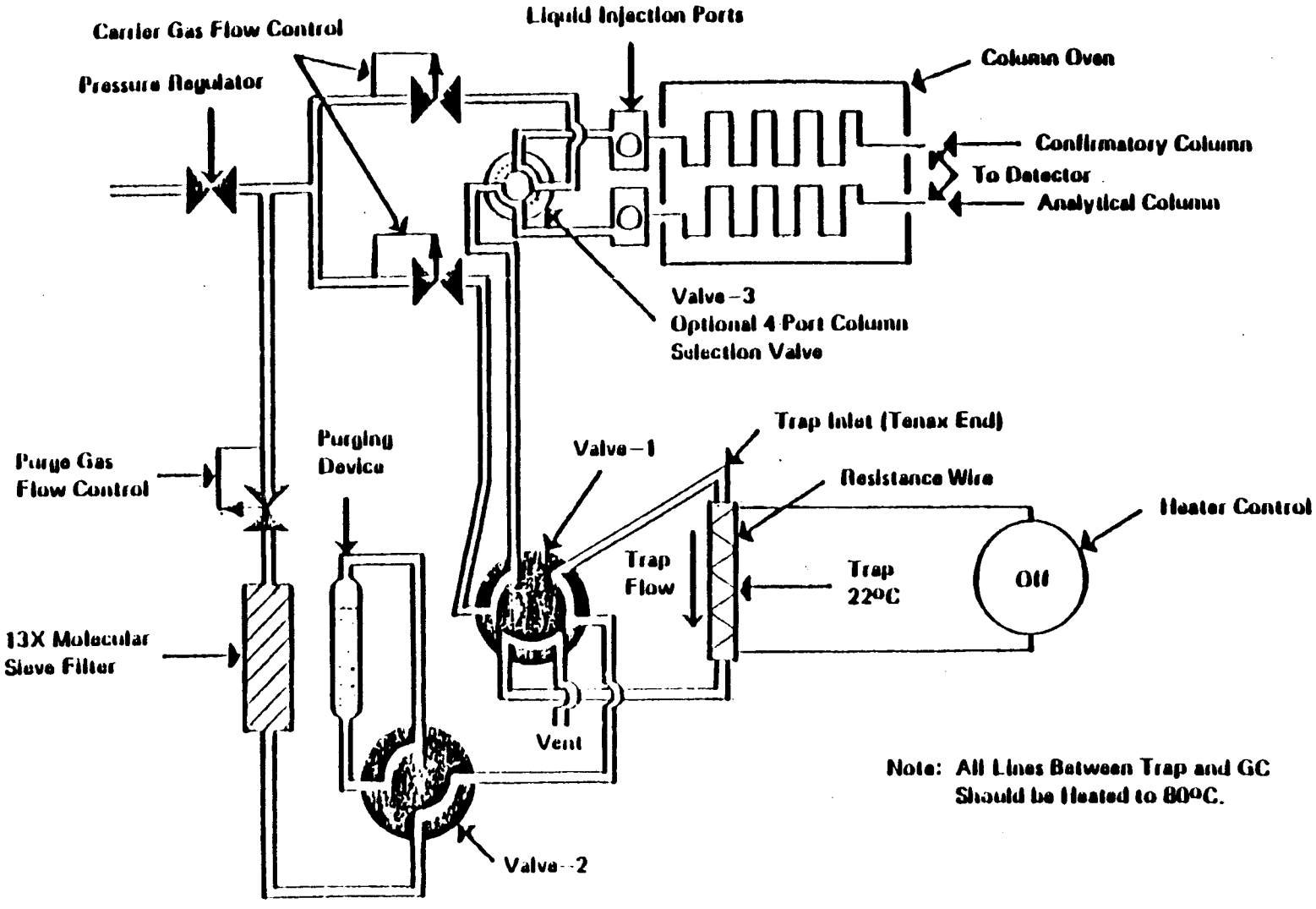

Figure 5. Purge and trap system, trap dry mode, for Methods 8020 and 8030.

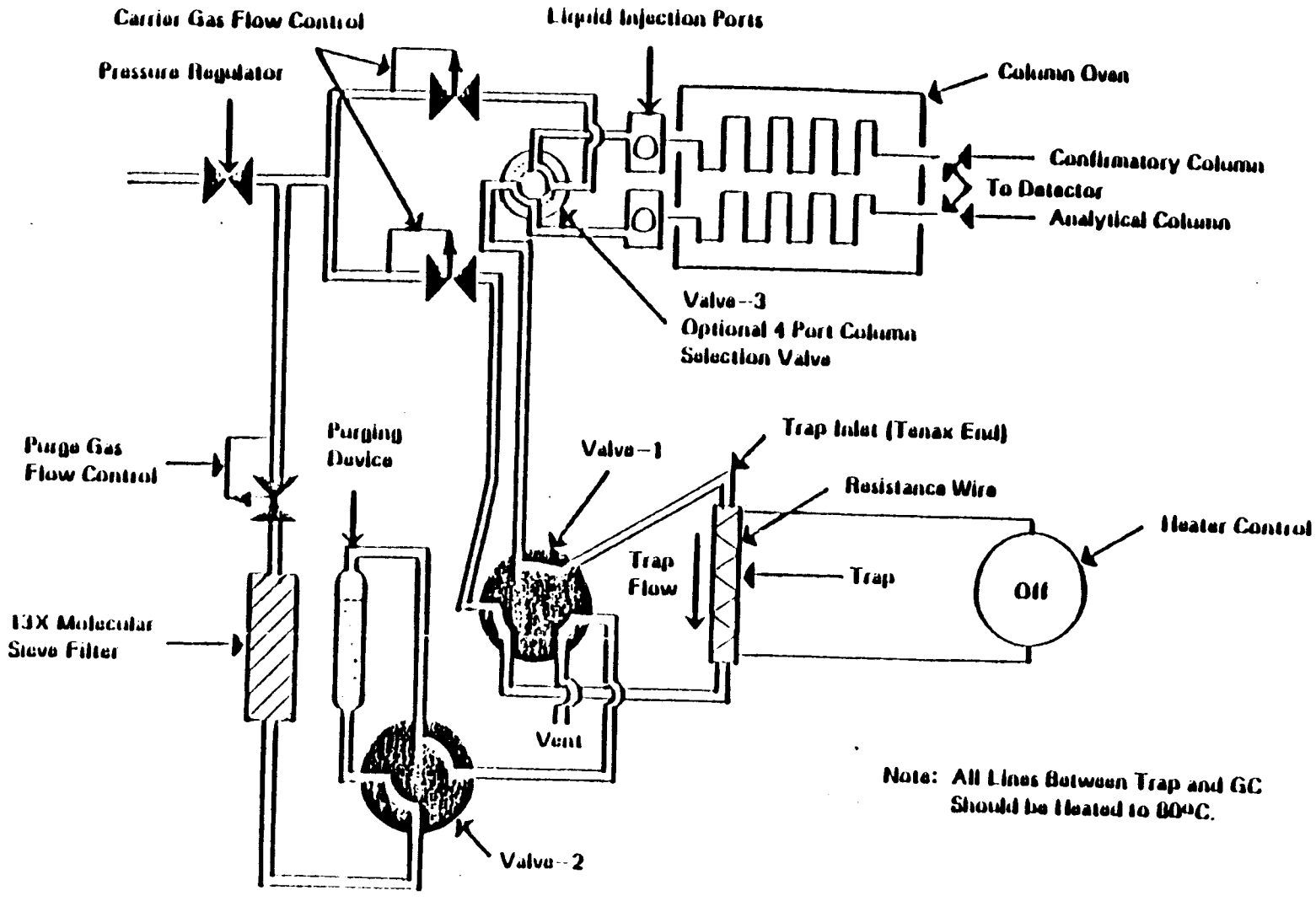

Figure 6. Purge and trap system, desorb mode, for Methods 8010, 8020 and 8030.

5.2 Reagent water: Reagent water is defined as a water in which an interferent is not observed at the method detection limit of the compounds of interest.

5.2.1 Reagent water may be generated by passing tap water through a carbon filter bed containing about 500 g of activated carbon (Calgon Corp., Filtrasorb-300 or equivalent).

5.2.2 A water purification system (Millipore Super-Q or equivalent) may be used to generate reagent water.

5.2.3 Reagent water may also be prepared by boiling water for 15 min. Subsequently, while maintaining the temperature at 90° C, bubble a contaminant-free inert gas through the water for 1 hr. While still hot, transfer the water to a narrow-mouth screw-cap bottle and seal with a Teflon-lined septum and cap.

5.3 Reagent PEG (polyethylene glycol; for solid samples): Reagent PEG is defined as PEG having a nominal average molecular weight of 400, and in which interferents are not observed at the method detection limit for compounds of interest. Methanol which has been distilled in glass can be used as a substitute for PEG.

5.3.1 Reagent PEG is prepared by purification of commercial PEG having a nominal average molecular weight of 400. The PEG is placed in a round-bottom flask equipped with a standard taper joint, and the flask is affixed to a rotary evaporator. The flask is immersed in a water bath at 90-100° C and vacuum is maintained at less than 10 mm Hg for at least 1 hr using a two-stage mechanical pump. The vacuum system is equipped with an all-glass trap, which is maintained in a dry ice/methanol bath.

5.3.2 In order to demonstrate that all interfering volatiles have been removed from the PEG, a reagent water/PEG blank must be analyzed.

6.0 Sample Collection, Preservation, and Handling

6.1 Refer to Method 8010, 8020, or 8030 for pertinent information.

7.0 Procedures

7.1 Assemble the purge-and-trap device (see Figures 4 through 6). Purge parameters to be used depend on the compounds being analyzed for; see Table 1. Pack the trap as shown in Figure 2 or 3 and condition overnight at a nominal 180° C by backflushing with an inert gas flow of at least 20 ml/min. Daily, prior to use, condition the trap for 10 min by backflushing at 180° C.

SAMPLE INTRODUCTION TECHNIQUES

7.2 Remove standards and samples from cold storage (approximately an hour prior to an analysis) and bring to room temperature by placing in a warm water bath at 20-25° C.

7.3 Adjust the purge gas (nitrogen or helium) flow rate according to Table 1.

7.4 Operate the gas chromatograph using the conditions described in the appropriate method, 8010, 8020, or 8030.

7.5 Attach the trap inlet to the purging device, and set the device to the purge mode. Open the syringe valve located on the purging device sample introduction needle.

7.6 Remove the plunger from a 5-ml syringe and attach a closed syringe valve. Open the sample bottle (or standard) and carefully pour the sample into the syringe barrel until it overflows. (NOTE: For pastes it may be necessary to dilute the sample by adding a nonvolatile solvent to the sample. In such cases diluting can be performed in the purging device.)

7.7 PEG extraction procedure for solids (methanol which has been distilled in glass can be used as a substitute for PEG). Sample aliquots for extraction should be transferred as quickly as possible to minimize loss of volatiles from the sample.

7.7.1 To a 50-ml glass centrifuge tube with Teflon-lined cap, add 40 ml of reagent PEG. Weigh the capped centrifuge tube and PEG on an analytical balance.

7.7.2 Using an appropriate implement, transfer approximately 2 g of sample to the PEG in the centrifuge tube in such a fashion that the sample is dissolved in or submerged in the PEG as quickly as possible. Take care not to touch the sample-transfer implement to the PEG. Recap the centrifuge tube immediately and weigh on an analytical balance to determine an accurate sample weight.

7.7.3 Disperse the sample by vigorous agitation for 1 min. The mixture may be agitated manually or with the aid of a vortex-mixer. If the sample does not disperse during this process, sonify the mixture in an ultrasonic bath for 30 min. Allow the mixture to stand until a clear supernatant is obtained as the sample extract. Centrifuge if necessary to facilitate phase separation.

7.7.4 The sample extract may be stored for future analytical needs. If this is desired, transfer the solution to a 10-ml screw cap vial with Teflon cap liner. Store at -10 to -20° C, and protect from light.

7.7.5 Add an aliquot of the sample extract to 5 ml reagent water.

7.8 Replace the syringe plunger and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 5.0 ml. Since this process of taking an aliquot destroys the validity of the liquid samples for future analysis, the analyst should fill a second syringe at this time to protect against possible loss of data.

7.9 Attach the syringe-valve assembly to the syringe valve on the purging device. Open the syringe valve and inject the sample into the purging chamber. Close both valves and purge the sample for the time specified in Table 1. If Method 8020 will be used for analysis of the sample, dry the trap by maintaining a flow rate of 40 ml/min dry purge for 4 min.

7.10 Attach the trap to the chromatograph, and adjust the device to the desorb mode. Introduce the trapped materials to the GC column by rapidly heating the trap to the backflush temperature indicated in Table 1, while backflushing the trap with an inert carrier gas at 20 to 60 ml/min for 4 min. If rapid heating cannot be achieved, the gas chromatographic column must be used as a secondary trap by cooling it to 30° C (or subambient, if problems persist) instead of the initial program temperature of 45° or 50° C.

7.11 Return the purge trap device to the purge mode.

7.12 Allow the trap to cool for 8 min. Replace the purging chamber with a clean purging chamber. The purging chamber is cleaned after each use by sequential washing with acetone, methanol, detergent solution, and distilled water and drying at 105° C.

7.13 Close the syringe valve on the purging chamber after 15 sec to begin gas flow through the trap. Purge the trap at ambient temperature for 4 min. Recondition the trap by heating it to 180° C. Do not allow the trap temperature to exceed 180° C, since the sorption/desorption is adversely affected by heating the trap to higher temperatures. After heating the trap for approximately 7 min, turn off the trap heater. When cool, the trap is ready for the next sample.

7.14 The analysis of blanks is most important in the purge-and-trap technique since the purging device and the trap can become contaminated by residues from very concentrated samples or by vapors in the laboratory. Prepare blanks by filling a sample bottle with organic-free water. Blanks should be sealed, stored at 4° C, and analyzed with each group of samples.

SAMPLE INTRODUCTION TECHNIQUES

8.0 Quality Control

8.1 Before processing any samples, the analyst should demonstrate through the analysis of a distilled water method blank that all glassware and reagents are interference-free. Each time a set of samples is extracted or there is a change in reagents, a method blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of the sample preparation and measurement.

8.2 Standard quality assurance practices should be used with this method. Field replicates should be collected to validate the precision of the sampling technique. Laboratory replicates should be analyzed to validate the precision of the analysis. Fortified samples should be carried through all stages of sample preparation and measurement; they should be analyzed to validate the sensitivity and accuracy of the analysis. If the fortified samples do not indicate sufficient sensitivity to detect less than or equal to 1 µg/g of sample, then the sensitivity of the instrument should be increased or the extract subjected to additional cleanup. Where doubt exists over the identification of a peak on the chromatograph, confirmatory techniques such as mass spectroscopy should be used.

9.0 References

1. Bellar, T.A., and J.J. Lichtenberg. 1974. J. Amer. Water Works Assoc. 66(12):739-744.

2. Bellar, T.A., and J.J. Lichtenberg. 1979. Semi-automated headspace analysis of drinking waters and industrial waters for purgeable volatile organic compounds. In: Van Hall (ed.), Measurement of organic pollutants in water and wastewater. ASTM STP 686, pp. 108-129.

3. Development and application of test procedures for specific organic toxic substances in wastewaters. Category 11 - Purgeables and Category 12 - Acrolein, Acrylonitrile, and Dichlorodifluoromethane. Report for EPA Contract 68-03-2635 (in preparation).

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METHOD 8240

GC/MS METHOD FOR VOLATILE ORGANICS

1.0 Scope and Application

1.1 Method 8240 is used to determine volatile organic compounds in a variety of solid waste matrices. This method is applicable to nearly all types of samples, regardless of water content, including groundwater, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments.

1.2 The detection limit of Method 8240 for an individual compound is approximately 1 µg/g (wet weight) in waste samples. For samples containing more than 1 mg/g of total volatile material, the detection limit is proportionately higher.

1.3 Method 8240 is based upon a purge-and-trap, gas chromatographic/mass spectrometric (GC/MS) procedure. This method is restricted to use by or under the supervision of analysts experienced in the use of purge-and-trap systems and gas chromatograph/mass spectrometers and skilled in the interpretation of mass spectra and their use as a quantitative tool.

2.0 Summary of Method

2.1 The volatile compounds are introduced to the gas chromatograph by direct injection, the Headspace Method (Method 5020), or the Purge-and-Trap Method (Method 5030). Method 5030 should be used for groundwater analysis. The components are separated via the gas chromatograph and detected using a mass spectrometer which is used to provide both qualitative and quantitative information. The chromatographic conditions as well as typical mass spectrometer operating parameters are given.

2.2 If the above sample introduction techniques are not applicable, a portion of the sample can be dispersed in methanol or polyethylene glycol (PEG) to dissolve the volatile organic constituents. A portion of the methanolic or PEG solution is combined with water in a specially designed purging chamber. An inert gas is then bubbled through the solution at ambient temperature and the volatile components are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is heated to elute the components, which are detected with a mass spectrometer.

2.3 An aliquot of each sample must be spiked with an appropriate standard to determine percent recovery and detection limits for that sample.

ORGANIC ANALYTICAL METHODS - GC/MS

2.4 Table 1 lists detection limits that can be obtained in wastewaters in the absence of interferences. Detection limits for a typical waste sample would be significantly higher.

TABLE 1. CHROMATOGRAPHIC CONDITIONS AND METHOD DETECTION LIMITS

Parameter	Retention time (min) Column 1[a]	Method detection limit (µg/l)
Chloromethane	2.3	ND
Bromomethane	3.1	ND
Vinyl chloride	3.8	ND
Chloroethane	4.6	ND
Methylene chloride	6.4	2.8
Trichlorofluoromethane	8.3	ND
1,1-Dichloroethene	9.0	2.8
1,1-Dichloroethane	10.1	4.7
trans-1,2-Dichloroethene	10.8	1.6
Chloroform	11.4	1.6
1,2-Dichloroethane	12.1	2.8
1,1,1-Trichloroethane	13.4	3.3
Carbon tetrachloride	13.7	2.8
Bromodichloromethane	14.3	2.2
1,2-Dichloropropane	15.7	6.0
trans-1,3-Dichloropropene	15.9	5.0
Trichloroethene	16.5	1.9
Benzene	17.0	4.4
Dibromochloromethane	17.1	3.1
1,1,2-Trichloroethane	17.2	5.0
cis-1,3-Dichloropropene	17.2	ND
2-Chloroethylvinyl ether	18.6	ND
Bromoform	19.8	4.7
1,1,2,2-Tetrachloroethane	22.1	6.9
Tetrachloroethene	22.2	4.1
Toluene	23.5	6.0
Chlorobenzene	24.6	6.0
Ethyl benzene	26.4	7.2
1,3-Dichlorobenzene	33.9	ND
1,2-Dichlorobenzene	35.0	ND
1,4-Dichlorobenzene	35.4	ND

ND = not determined.

[a]Column conditions: Carbopack B (60/80 mesh) coated with 1% SP-1000 packed in a 6-ft by 2-mm I.D. glass column with helium carrier gas at a flow rate of 30 ml/min. Column temperature is isothermal at 45° C for 3 min, then programmed at 8° C per minute to 220° and held for 15 min.

3.0 Interferences

3.1 Interferences coextracted from the samples will vary considerably from source to source, depending upon the particular waste or extract being tested. The analytical system, however, should be checked to ensure freedom from interferences under the conditions of the analysis by running method blanks. Method blanks are run by analyzing organic-free water in the normal manner. The use of non-TFE plastic tubing, non-TFE thread sealants, or flow controllers with rubber components in the purging device should be avoided.

3.2 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride) through the septum seal into the sample during shipment and storage. A field blank prepared from organic-free water and carried through the sampling and handling protocol can serve as a check on such contamination.

3.3 Cross contamination can occur whenever high-level and low-level samples are sequentially analyzed. To reduce cross contamination, the purging device and sample syringe should be rinsed out twice, between samples, with organic-free water. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of organic-free water to check for cross contamination. For samples containing large amounts of water-soluble materials, suspended solids, high boiling compounds, or high organohalide levels, it may be necessary to wash out the purging device with a soap solution, rinse with distilled water, and then dry in a 105° C oven between analyses.

3.4 Low molecular weight impurities in PEG can be volatilized during the purging procedure. Thus, the PEG employed in this method must be purified before use as described in Section 5.2.

4.0 Apparatus and Materials

4.1 Sampling equipment

4.1.1 Vial: 25-ml capacity or larger, equipped with a screw cap (Pierce #13075 or equivalent). Detergent wash, rinse with tap and distilled water, and dry for 1 hr at 105° C before use.

4.1.2 Septum: Teflon-faced silicone (Pierce #12722 or equivalent). Detergent wash, rinse with tap and distilled water and dry at 105° C for 1 hr before use.

4.2 Purge-and-trap device: The purge-and-trap device consists of three separate pieces of equipment: the purging chamber, trap, and the desorber. Several complete devices are now commercially available.

ORGANIC ANALYTICAL METHODS - GC/MS

4.2.1 The purging chamber must be designed to accept 5-ml or 25-ml samples with a water column at least 3 cm deep. The gaseous head space between the water column and the trap must have a total volume of less than 15 ml. The purge gas must pass through the water column as finely divided bubbles with a diameter of less than 3 mm at the origin. The purge gas must be introduced no more than 5 mm from the base of the water column. The purging chamber, illustrated in Figure 1, meets these design criteria.

4.2.2 The trap must be at least 25 cm long and have an inside diameter of at least 2.5 mm. The trap must be packed to contain the following minimum lengths-of-adsorbents: 1.0 cm of methyl-silicone-coated packing (Section 5.3.2), 15 cm of 2,6-diphenylene oxide polymer (Section 5.3.1), and 8 cm of silica gel (Section 5.3.3). The minimum specifications for the trap are illustrated in Figure 2.

4.2.3 The desorber must be capable of rapidly heating the trap to 180° C within 30 sec. The polymer section of the trap should not be heated higher than 180° C and the remaining sections should not exceed 220° C. The desorber design, illustrated in Figure 2, meets these criteria.

4.2.4 The purge-and-trap device may be assembled as a separate unit or be coupled to a gas chromatograph as illustrated in Figures 3 and 4.

4.3 Gas chromatograph/mass spectrometer system

4.3.1 Gas chromatograph: An analytical system complete with a temperature-programmable gas chromatograph and all required accessories including syringes, analytical columns, and gases.

4.3.2 Column: 2-m x 2-mm I.D. stainless steel or glass, packed with 1% SP-1000 on 60/80 mesh Carbopack B or equivalent.

4.3.3 Mass spectrometer: Capable of scanning from 40 to 250 amu every 3 sec or less, utilizing 70 volts (nominal) electron energy in the electron impact ionization mode and producing a mass spectrum which meets all the criteria in Table 1 when 50 ng of 4-bromofluorobenzene (BFB) is injected through the GC inlet or introduced in the purge-and-trap mode.

4.3.4 GC/MS interface: Any GC-to-MS interface that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria (see Section 9) may be used. GC-to-MS interfaces constructed of all glass or glass-lined materials are recommended. Glass can be deactivated by silanizing with dichlorodimethylsilane. The interface must be capable of transporting at least 10 ng of the components of interest from the GC to the MS.

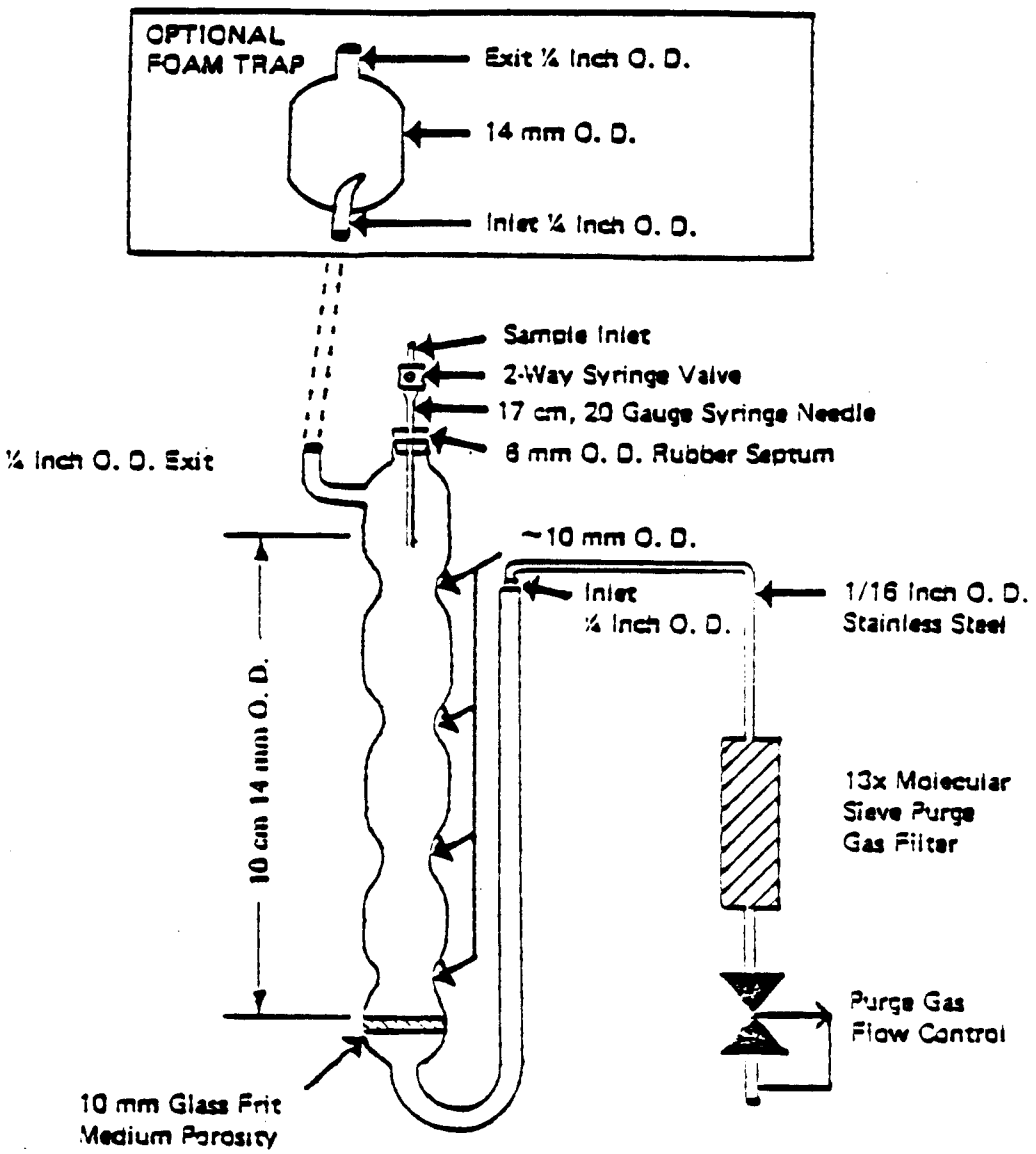


Figure 1. Purging chamber.

ORGANIC ANALYTICAL METHODS - GC/MS

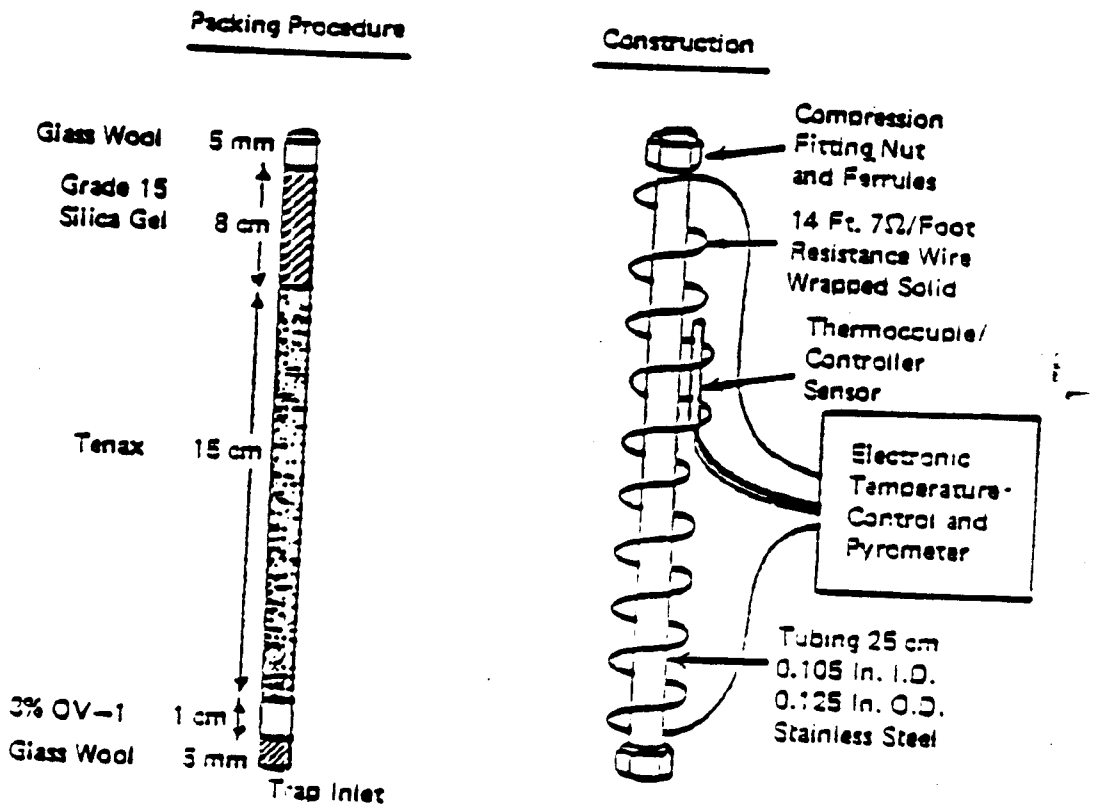


Figure 2. Trap packings and construction to include desorb capability.

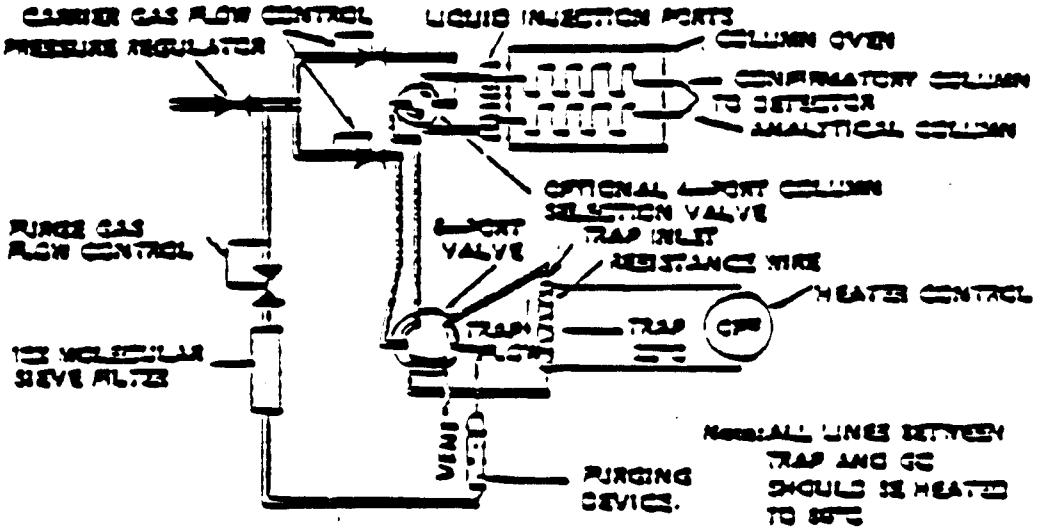


FIGURE 1. Schematic of purge and trap device – purge mode

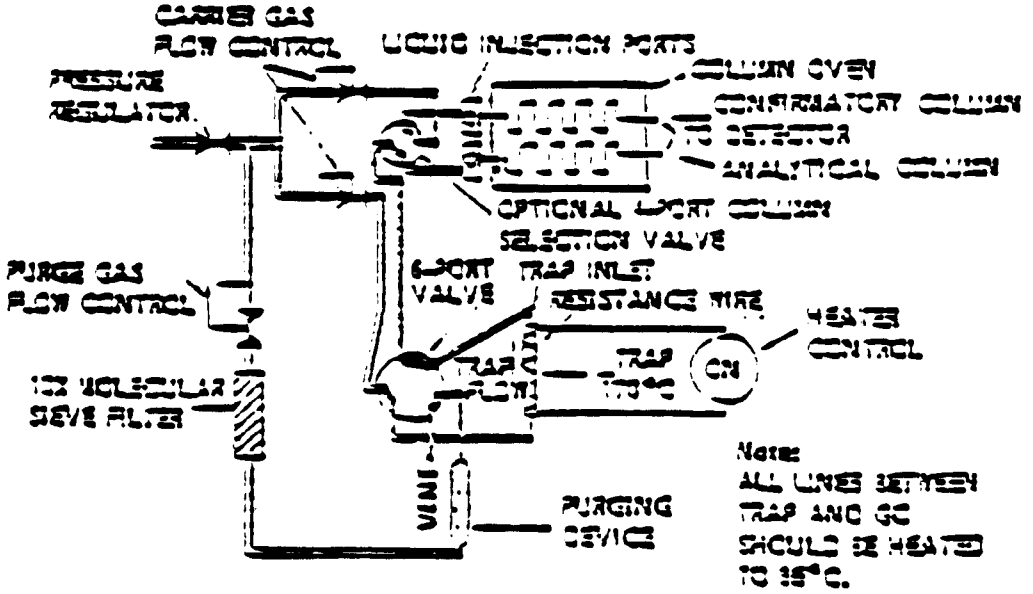


Figure 4. Schematic of purge and trap device - desorb mode

4.3.5 Data system: A computer system must be interfaced to the mass spectrometer that allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that allows searching any GC/MS data file for ions of a specific mass and plotting such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundance in any EICP between specified time or scan number limits. Hardware and software must be available to transform the data into a compatible format. These generally consist of a 9-inch, 800-bpi tape drive and the associated software.

4.4 Sample transfer implements: Implements are required to transfer portions of solid, semisolid, and liquid wastes from sample containers to laboratory glassware. The transfer must be accomplished rapidly to avoid loss of volatile components during the transfer step. Liquids may be transferred using a hypodermic syringe with a wide-bore needle or no needle attached. Samples should be introduced into the syringe by (1) removing the plunger from the syringe, (2) pouring the sample into the barrel, and (3) replacing the barrel and inverting the syringe to remove any air trapped in the syringe. Do not draw the sample up into the syringe. Solids may be transferred using a conventional laboratory spatula, spoon, or coring device. A coring device that is suitable for handling some samples can be made by using a glass tubing saw to cut away the closed end of the barrel of a glass hypodermic syringe.

TABLE 2. BFB KEY ION ABUNDANCE CRITERIA

Mass	Ion abundance criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	Base Peak, 100% Relative Abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 100% of mass 174
177	5 to 9% of mass 176

4.5 Syringes: 5-ml and 25-ml glass hypodermic, equipped with 20-gauge needle, at least 15 cm in length.

4.6 Micro syringes: 10-µl, 25-µl, 100-µl, 250-µl, and 1000-µl. These syringes should be equipped with 20-gauge needles having a length sufficient to extend from the sample inlet to within 1 cm of the glass frit in the purging device (see Figure 1). The needle length required will depend upon the dimensions of the purging device employed.

4.7 Centrifuge tubes: 50-ml round-bottom glass centrifuge tubes with Teflon-lined screw caps. The tubes must be marked before use to show an approximate 20-ml graduation.

4.8 Centrifuge: Capable of accommodating 50-ml glass tubes.

4.9 Syringe valve: 2-way, with Luer ends (2 each) (Hamilton #86725 valve equipped with one Hamilton #35033 Luer fitting, or equivalent).

4.10 Syringe: 5-ml, gas-tight with shut-off valve.

4.11 Bottle: 15-ml, screw-cap, Teflon cap liner.

4.12 Balance: Analytical, capable of accurately weighing 0.0001 g.

4.13 Rotary evaporator: equipped with Teflon-coated seals (Buchi Rotavapor R-110, or equivalent).

4.14 Vacuum pump: mechanical, two-stage.

5.0 Reagents

5.1 Reagent water: Reagent water is defined as a water in which an interferent is not observed at the method detection limit of the compounds of interest.

5.1.1 Reagent water may be generated by passing tap water through a carbon filter bed containing about 500 g of activated carbon (Calgon Corp., Filtrasorb-300, or equivalent).

5.1.2 A water purification system (Millipore Super-Q or equivalent) may be used to generate reagent water.

5.1.3 Reagent water may also be prepared by boiling water for 15 min. Subsequently, while maintaining the temperature at 90° C, bubble a contaminant-free inert gas through the water for 1 hr. While still hot, transfer the water to a narrow-mouth screw-cap bottle and seal with a Teflon-lined septum and cap.

5.1.4 Reagent water may also be purchased under the name "HPLC water" from several manufacturers (Burdick and Jackson, Baker and Waters, Inc.).

5.2 Reagent PEG: Reagent PEG is defined as PEG having a nominal average molecular weight of 400, and in which interferents are not observed at the method detection limit for compounds of interest.

5.2.1 Reagent PEG is prepared by purification of commercial PEG having a nominal average molecular weight of 400. The PEG is placed in a round-bottom flask equipped with a standard taper joint, and the flask is affixed to a rotary evaporator. The flask is immersed in a water bath at 90-100° C and vacuum is maintained at less than 10 mm Hg for at least 1 hr using a two-stage mechanical pump. The vacuum system is equipped with an all-glass trap, which is maintained in a dry ice/methanol bath.

5.2.2 In order to demonstrate that all interfering volatiles have been removed from the PEG, a reagent water/PEG blank must be analyzed.

5.3 Trap materials

5.3.1 2,6-Diphenylene oxide polymer: 60/80-mesh Tenax, chromatographic grade or equivalent.

5.3.2 Methyl silicone packing: 3 percent OV-1 on 60/80 mesh Chromosorb-W or equivalent.

5.3.3 Silica gel, Davison Chemical (35/60 mesh), grade-15 or equivalent.

5.3.4 Prepared trapping columns may be purchased from several chromatography suppliers.

5.4 Methanol: Distilled-in-glass quality or equivalent.

5.5 Calibration standards; stock solutions (2 mg/ml): Stock solutions of calibration standards may be prepared from pure standard materials or purchased as certified solutions. Prepare stock standard solutions of individual compounds in methanol using assayed liquids or gases as appropriate. Because of the toxicity of some of the organohalides, primary dilutions of these materials should be prepared in a hood. A NIOSH/MESA-approved toxic gas respirator should be worn by analysts when handling high concentrations of these materials.

5.5.1 Place about 9.8 ml of methanol in a 10-ml ground-glass-stoppered volumetric flask. Allow the flask to stand, unstoppered, for about 10 min or until all alcohol-wetted surfaces have dried. Weigh the flask to the nearest 0.1 mg.

5.5.2 Add the assayed reference material as described below.

5.5.2.1 Liquids: Using a 100-µl syringe, immediately add 2 drops of assayed reference material to the flask, then reweigh. The liquid must fall directly into the alcohol without contacting the neck of the flask.

5.5.2.2 Gases: To prepare standards for any compounds that boil below 30° C (e.g., bromomethane, chloroethane, chloromethane, or vinyl chloride), fill a 5-ml valved gas-tight syringe with a reference standard to the 5.0-ml mark. Lower the needle to 5 mm above the methanol meniscus. Slowly introduce the reference standard above the surface of the liquid. The heavy gas rapidly dissolves in the methanol.

5.5.3 Reweigh, dilute to volume, stopper, then mix by gently inverting the flask several times. Calculate the concentration in µg/µl per microliter from the net gain in weight. When compound purity is assayed to be 96% or greater, the weight may be used without correction to calculate the concentration of the stock standard. Commercially prepared stock standards may be used at any concentration if they are certified by the manufacturer or by an independent source.

5.5.4 Transfer the stock standard solution into a Teflon-sealed screw-cap bottle. Store, with minimal headspace, at -10 to -20° C and protect from light.

5.5.5 Prepare fresh standards weekly for gases or for reactive compounds such as 2-chloroethylvinyl ether. All other standards must be replaced after one month, or sooner if comparison with check standards indicates a problem.

5.6 Calibration standards; secondary dilution solutions: Using stock solutions described in Section 5.5, prepare secondary dilution standards in methanol that contain the compounds of interest, either singly or mixed together. The secondary dilution standards should be prepared at concentrations such that the methanol or aqueous PEG calibration solutions prepared as described in Section 6.3.2 will bracket the working range of the analytical system. Secondary dilution standards should be stored with minimal headspace and should be checked frequently for signs of evaporation, especially just prior to preparing calibration standards from them.

5.7 Surrogate standards: Surrogate standards may be added to samples and calibration solutions to assess the effect of the sample matrix on recovery efficiency. The compounds employed for this purpose are 1,2-dibromotetrafluoroethane, bis(perfluoroisopropyl) ketone, fluorobenzene, and m-bromobenzotrifluoride. Prepare methanolic solutions of the surrogate standards using the procedures described in Sections 5.5 and 5.6. The

concentrations prepared and the amount of solution added to each sample should be those required to give an amount of each surrogate in the purging device that is equal to the amount of each internal standard added, assuming a 100% recovery of the surrogate standards.

5.8 Internal standards: In this method, internal standards are employed during analysis of all samples and during all calibration procedures. The analyst must select one or more internal standards that are similar in analytical behavior to the compounds of interest. The analyst must further demonstrate that the measurement of the internal standard is not affected by method or matrix interferences. Because of these limitations, no internal standard can be suggested that is applicable to all samples. However, for general use, D_4-1,2-dichloroethane, D_6-benzene, and D_5-ethylbenzene are recommended as internal standards covering a wide boiling point range.

5.9 4-Bromofluorobenzene (BFB): BFB is added to the internal standard solution or analyzed alone to permit the mass spectrometer tuning for each GC/MS run to be checked.

5.10 Internal standard solution: Using the procedures described in Sections 5.5 and 5.6, prepare a methanolic solution containing each internal standard at a concentration of 12.5 µg/ml.

5.11 Sodium monohydrogen phosphate: 2.0 µ in distilled water.

5.12 n-Nonane and n-dodecane, 98+% purity.

5.13 N-Hexadecane, distilled-in-glass (Burdick and Jackson, or equivalent).

6.0 Sample Collection, Handling, and Preservation

6.1 All samples must be collected using a sampling plan that addresses the considerations discussed in Section One of this manual.

6.2 All samples must be stored in Teflon-lined screw cap vials. Sample containers should be filled as completely as possible so as to minimize headspace or void space. Vials containing liquid sample should be stored in an inverted position.

6.3 All samples must be iced or refrigerated from the time of collection to the time of analysis, and should be protected from light.

7.0 Procedure

7.1 Calibration

7.1.1 Assemble a purge-and-trap device that meets the specifications in Section 4.2 and connect the device to a GC/MS system. Condition the trap overnight at 180° C by backflushing with an inert gas flow of at least 20 ml/min. Prior to use, condition the trap daily for 10 min while backflushing at 180° C.

7.1.2 Operate the gas chromatograph using the conditions described in Section 7.3.5 and operate the mass spectrometer using the conditions described in Section 7.3.2.

7.1.3 Calibration procedure

7.1.3.1 Conduct calibration procedures using a minimum of three concentration levels for each calibration standard. One of the concentration levels should be at a concentration near but above the method detection limit. The remaining two concentration levels should correspond to the expected range of concentrations found in real samples or should define the working range of the GC/MS system.

7.1.3.2 Prepare the final solutions containing the required concentrations of calibration standards, including surrogate standards, directly in the purging device. To the purging device, add 5.0 ml of reagent water or reagent water/PEG solution. This solution is prepared by taking 4.0 ml of reagent water or reagent PEG and diluting to 100 ml with reagent water. The reagent water/PEG solution is added to the purging device using a 5-ml glass syringe fitted with a 15-cm 20-gauge needle. The needle is inserted through the sample inlet shown in Figure 1. The internal diameter of the 14-gauge needle that forms the sample inlet will permit insertion of a 20-gauge needle. Next, using a 10-µl or 25-µl microsyringe equipped with a long needle (see Section 4.6), take a volume of the secondary dilution solution containing appropriate concentrations of the calibration standards (see Section 5.6). Add the aliquot of calibration solution directly to the reagent water or reagent water/PEG solution in the purging device by inserting the needle through the sample inlet. When discharging the contents of the micro-syringe be sure that the end of the syringe needle is well beneath the surface of the reagent water or water/PEG solution. Similarly, add 20 µl of the internal standard solution (see Section 5.10). Close the 2-way syringe valve at the sample inlet.

7.1.3.3 Carry out the purge and analysis procedure as described in Section 7.3.4. Tabulate the area response of the primary characteristic ion against concentration for each compound

including the internal standards. Calculate response factors (RF) for each compound as follows:

$$RF = (A_s C_{is})/A_{is} C_s)$$

where:

A_s = Area of the primary characteristic ion for the compound to be measured

A_{is} = Area of the primary characteristic ion of the internal standard

C_{is} = Concentration of the internal standard

C_s = Concentration of the compound to be measured.

The internal standard selected for the calculation of the RF of a compound and subsequent quantification of the compound is generally the internal standard that has a retention time closest to that of the compound. It is assumed that a linear calibration plot will be obtained over the range of concentrations used. If the RF value over the working range is a constant (less than 10% relative standard deviation), the RF can be assumed to be invariant, and the average RF can be used for calculations. Alternatively, the results can be used to plot a calibration curve of response ratios, A_s/A_{is}, versus RF.

7.1.3.4 The RF must be verified on each working day. The concentrations selected should be near the midpoint of the working range. The response factors obtained for the calibration standards analyzed immediately before and after a set of samples must be within ±20% of the response factor used for quantification of the sample concentrations.

7.2 Daily GC/MS performance tests

7.2.1 At the beginning of each day that analyses are to be performed, the GC/MS system must be checked to see that acceptable performance criteria are achieved for BFB (see Table 2).

7.2.2 The BFB performance test requires the following instrumental parameters:

Electron Energy:	70 volts (nominal)
Mass Range:	40 to 250 amu
Scan Time:	to give approximately 6 scans per peak but not to exceed 3 sec per scan.

7.2.3 Bleed BFB vapor into the mass spectrometer and tune the instrument to achieve all the key ion criteria for the mass spectrum of BFB given in Table 1. A solution containing 20 ng of BFB may be injected onto the gas chromatographic column in order to check the key ion criteria.

7.2.4 The peak intensity of D_6-benzene is used to monitor the mass spectrometer sensitivity. The peak intensity for D_6-benzene observed during each sample analysis must be between 0.7 and 1.4 times the D_6-benzene peak intensity observed during the applicable calibration runs. For example, if the peak intensity of D_6-benzene observed during calibration was 355,000 area counts, then each subsequent sample or blank must give a D_6-benzene peak intensity of between 250,000 and 500,000 area counts. If the D_6-benzene peak intensity is outside the specified range, the sample must be reanalyzed. If the peak intensity is again outside the specified range, the analyst must investigate the cause of the variability in sensitivity and correct the problem.

7.3 Sample extraction and analysis

7.3.1 The analytical procedure involves extracting the non-aqueous sample with methanol or polyethylene glycol (PEG) and analyzing a portion of the extract by a purge-and-trap GC/MS procedure. The amount of the extract to be taken for the GC/MS analysis is based on the estimated total volatile content (TVC) of the sample. The TVC is estimated by extracting the sample with n-hexadecane and analyzing the n-hexadecane extract by gas chromatography.

7.3.2 The estimated TVC is based on the total area response relative to that of n-nonane for all components eluting prior to the retention time of n-dodecane. The response factor for n-nonane and the retention time of n-dodecane are determined by analyzing a 2-µl aliquot of an n-hexadecane solution containing 0.20 mg/ml of n-nonane and n-dodecane.

7.3.2.1 The GC analyses are conducted using a flame ionization detector and a 3-m x 2-mm I.D. glass column packed with 10% OV-101 on 100-200 mesh Chromosorb W-HP. The column temperature is programmed from 80° C to 280° C at 8°/min and held at 280° for 10 min.

7.3.2.2 Determine the area response for n-nonane and divide by 0.2 to obtain the area response factor. Record the retention time of n-dodecane.

7.3.2.3 Add 1.0 g of sample to 20 ml of n-hexadecane and 2 ml of 2.0 M Na_2HPO_4 contained in a 50-ml glass centrifuge tube and cap securely with a Teflon-lined screw cap. Shake the mixture vigorously for one minute. If the sample does not disperse

during the shaking process, sonify the mixture in an ultrasonic bath for 30 min. Allow the mixture to stand until a clear supernatant is obtained. Centrifuge if necessary to facilitate phase separation.

7.3.2.4 Analyze a 2-µl aliquot of the n-hexadecane supernatant using the conditions described in Section 7.3.2.1. Determine the total area response of all components eluting prior to the retention time of n-dodecane and subtract the corresponding area of an n-hexadecane blank. Using the area response factor determined for n-nonane in Section 7.3.2.2, calculate the TVC as follows:

$$TVC = \frac{TAR_{sample} - TAR_{blank}}{\text{n-Nonane Area Response Factor}} \times 20$$

where:

TVC = total volatile content of the sample in mg/g

TAR_{sample} = total area response obtained for the sample

TAR_{blank} = total area response obtained for a blank.

7.3.3 The transfer of an aliquot of the sample for extraction with methanol or PEG should be made as quickly as possible to minimize loss of volatiles from the sample.

7.3.3.1 To a 50-ml glass centrifuge tube with Teflon-lined cap, add 40 ml of reagent methanol or PEG. Weigh the capped centrifuge tube and methanol or PEG on an analytical balance.

7.3.3.2 Using an appropriate implement (see Section 4.4), transfer approximately 2 g of sample to the methanol or PEG in the centrifuge tube in such a fashion that the sample is dissolved in or submerged in the methanol or PEG as quickly as possible. Take care not to touch the sample-transfer implement to the methanol or PEG. Recap the centrifuge tube immediately and weigh on an analytical balance to determine an accurate sample weight.

7.3.3.3 Disperse the sample by vigorous agitation for 1 min. The mixture may be agitated manually or with the aid of a vortex-mixer. If the sample does not disperse during this process, sonify the mixture in an ultrasonic bath for 30 min. Allow the mixture to stand until a clear supernatant is obtained as the sample extract. Centrifuge if necessary to facilitate phase separation.

7.3.3.4 The sample extract may be stored for future analytical needs. If this is desired, transfer the solution to a 10-ml screw cap vial with Teflon cap liner. Store at -10 to -20° C, and protect from light.

7.3.4 Reagent water, internal standard solution, and the sample extract are added to a purging chamber that is connected to the purge-and-trap device and that has been flushed with helium during a 7-min trap reconditioning step (see Section 7.3.4.4). The additions are made using an appropriately sized syringe equipped with a 15-cm 20-gauge needle. Open the syringe valve of the sample inlet (shown in Figure 1) and insert the needle through the valve.

7.3.4.1 Add 5.0 ml of reagent water or aqueous sample to which 20.0 µl of the internal standard solution has been added (see Section 5.10) to the purging chamber. Insert the needle of the syringe well below the surface of the water for the addition of the internal standard solution. If the sample is aqueous go to Section 7.3.5.

7.3.4.2 Add an aliquot of the sample extract from Section 7.3.3.4. The total quantity of volatile components injected should not exceed approximately 10 µg. If the total volatile content (TVC) of the sample as determined in Section 7.3.1.4 is 1.0 mg/g or less, use a 200-µl aliquot of the sample extract. If the TVC is greater than 1.0 mg/g, use an aliquot of the sample extract that contains approximately 10 µg of total volatile components; the volume (in µl) of the aliquot to be taken can be calculated by dividing 200 by the TVC. If the TVC is greater than 20 mg/g, take a 500-µl aliquot of the sample extract and dilute to 10 ml with PEG. In this case calculate the aliquot volume (in µl) of the undiluted extract to be taken by dividing 4,000 by the TVC. If the TVC is less than 1.0 mg/g and greater sensitivity is desired, use a large purging chamber containing 25 ml of reagent water and use a 1.0-ml aliquot of the sample extract.

7.3.4.3 Close the 2-way syringe valve at the sample inlet.

7.3.5 The sample in the purging chamber is purged with helium to transfer the volatile components to the trap. The trap is then heated to desorb the volatile components which are swept by the helium carrier gas onto the GC column for analysis.

7.3.5.1 Adjust the gas (helium) flow rate to 40 ± 3 ml/min. Set the purging device to purge, and purge the sample for 11.0 ± 0.1 min at ambient temperature.

7.3.5.2 At the conclusion of the purge time, adjust the device to the desorb mode, and begin the GC/MS analysis and data acquisition using the following GC operating conditions:

Column: 6-ft x 2-mm I.D. glass column of 1% SP-1000 on Carbo-pack B (60-80 mesh).

Temperature: Isothermal at 45° C for 3 min, then increased at 8° C/min to 220° C, and maintained at 220° C for 15 min.

Concurrently, introduce the trapped materials to the GC column by rapidly heating the trap to 180° C while backflushing the trap with helium at a flow rate of 30 ml/min for 4 min. If this rapid heating requirement cannot be met, the GC column must be used as a secondary trap by cooling it to 30° C or lower during the 4-min desorb step and starting the GC program after the desorb step.

7.3.5.3 Return the purge-and-trap device to the purge mode and continue acquiring GC/MS data.

7.3.5.4 Allow the trap to cool for 8 min. Replace the purging chamber with a clean purging chamber. The purging chamber is cleaned after each use by sequential washing with acetone, methanol, detergent solution and distilled water, and then dried at 105° C.

7.3.5.5 Close the syringe valve on the purging chamber after 15 sec to begin gas flow through the trap. Purge the trap at ambient temperature for 4 min. Recondition the trap by heating it to 180° C. Do not allow the trap temperature to exceed 180° C, since the sorption/desorption is adversely affected when the trap is heated to higher temperatures. After heating the trap for approximately 7 min, turn off the trap heater. When cool, the trap is ready for the next sample.

7.3.6 If the response for any ion exceeds the working range of the system, repeat the analysis using a correspondingly smaller aliquot of the sample extract described in Section 7.3.2.3.

7.4 Qualitative identification

7.4.1 Obtain an EICP for the primary characteristic ion and at least two other characteristic ions for each compound when practical. The following criteria must be met to make a qualitative identification.

7.4.1.1 The characteristic ions of each compound of interest must maximize in the same or within one scan of each other.

7.4.1.2 The retention time must fall within ±30 sec of the retention time of the authentic compound.

7.4.1.3 The relative peak heights of the characteristic ions in the EICP's must fall within ±20% of the relative intensities of these ions in a reference mass spectrum. Reference spectra may be generated from the standards analyzed by the analyst or from a reference library. All reference spectra generated from standards must be obtained from an appropriately tuned mass spectrometer.

7.5 Quantitative determination

7.5.1 When a compound has been identified, the quantification of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. In general, the primary characteristic ion selected should be a relatively intense ion, as interference-free as possible, and as close as possible in mass to the characteristic ion of the internal standard used. Generally, the base peak of the mass spectrum is used.

8.0 Quality Control

8.1 Each laboratory that uses this method is required to operate a formal quality control program. The minimum requirements of this program consist of an initial demonstration of laboratory capability and the analysis of spiked samples as a continuing check on performance. The laboratory is required to maintain performance records to define the quality of the data that are generated. Ongoing performance checks must be compared with established performance criteria to determine if the results of analyses are within the accuracy and precision limits expected of the method.

8.1.1 Before performing any analyses, the analyst must demonstrate the ability to generate acceptable accuracy and precision with this method. This ability is established as described in Section 8.2.

8.1.2 The laboratory must spike all samples including check samples with surrogate standards to monitor continuing laboratory performance. This procedure is described in Section 8.4.

8.1.3 Before processing any samples, the analyst should daily demonstrate, through the analysis of an organic-free water method blank, that the entire analytical system is interference-free. The blank samples should be carried through all stages of the sample preparation and measurement steps.

8.2 To establish the ability to generate acceptable accuracy and precision, the analyst must perform the following operations using a representative sample as a check sample.

8.2.1 Analyze four aliquots of the unspiked check sample according to the method in Section 7.3.

8.2.2 For each compound to be measured, select a spike concentration representative of twice the level found in the unspiked check sample or a level equal to 10 times the expected detection limit, whichever is greater. Prepare a spiking solution by dissolving the compounds in methanol at the appropriate levels.

8.2.3 Spike a minimum of four aliquots of the check sample with the spiking solution to achieve the selected spike concentrations. Spike the samples by adding the spiking solution to the PEG used for the extraction. Analyze the spiked aliquots according to the method in Section 7.3.

8.2.4 Calculate the average percent recovery, R, and the standard deviation of the percent recovery, s, for all compounds and surrogate standards. Background corrections must be made before R and s calculations are performed. The average percent recovery must be greater than 20 for all compounds to be measured and greater than 60 for all surrogate compounds. The percent relative standard deviation of the percent recovery, s/R x 100, must be less than 20 for all compounds to be measured and all surrogate compounds.

8.3 The analyst must calculate method performance criteria for each of the surrogate standards.

8.3.1 Calculate upper and lower control limits for method performance for each surrogate standard, using the values for R and s calculated in Section 8.2.4:

Upper Control Limit (UCL) = R + 3s
Lower Control Limit (LCL) = R - 3s

The UCL and LCL can be used to construct control charts that are useful in observing trends in performance.

8.3.2 For each surrogate standard, the laboratory must maintain a record of the R and s values obtained for each surrogate standard in each waste sample analyzed. An accuracy statement should be prepared from these data and updated regularly.

8.4 The laboratory is required to spike all samples with the surrogate standards to monitor spike recoveries. The spiking level used should be that which will give an amount in the purge apparatus that is equal to the amount of the internal standard assuming a 100% recovery of the surrogate standards. If the recovery for any surrogate standard does not fall within the control limits for method performance, the results reported for that sample must be

qualified as being outside of control limits. The laboratory must monitor the frequency of data so qualified to ensure that it remains at or below 5%. Four surrogate standards, namely 1,2-dibromodifluoroethane, bis(perfluoro-isopropyl) ether, fluorobenzene, and m-bromobenzotrifluoride, are recommended for general use to monitor recovery of volatile compounds varying in volatility and polarity.

8.5 Each day, the analyst must demonstrate through the analysis of a process blank that all glassware and reagent interferences are under control.

8.6 It is recommended that the laboratory adopt additional quality assurance practices for use with this method. The specific practices that are most productive depend upon the needs of the laboratory and the nature of the samples. Field replicates may be analyzed to monitor the precision of the sampling technique. Whenever possible, the laboratory should perform analysis of standard reference materials and participate in relevant performance evaluation studies.

8.7 Standard quality assurance practices should be used with this method. Field replicates should be collected to validate the precision of the sampling technique. Laboratory replicates should be analyzed to validate the precision of the analysis. Fortified samples should be carried through all stages of sample preparation and measurement; they should be analyzed to validate the sensitivity and accuracy of the analysis. If the fortified waste samples do not indicate sufficient sensitivity to detect less than or equal to 1 µg/g of sample, then the sensitivity of the instrument should be increased or the extract subjected to additional cleanup. Detection limits to be used for groundwater samples are indicated in Table 1. Where doubt exists over the identification of a peak on the chromatograph, confirmatory techniques such as mass spectroscopy should be used.

8.8 The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The MDL concentrations listed in Table 1 were obtained using reagent water. Similar results were achieved using representative wastewaters. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.

8.9 In a single laboratory, using reagent water and wastewaters spiked at or near background levels, the average recoveries presented in Table 3 were obtained. The standard deviation of the measurement in percent recovery is also included in Table 3.

ATTACHMENT F

EXCEPTIONS TO THE TRIAL BURN PLAN

The following exceptions were noted to the Trial Burn Plan and Quality Assurance Project Plan, Appendix J of the Los Alamos Part B application of November 1986, during the RCRA Trial Burn of September, 1987 conducted at the Los Alamos Controlled Air Incinerator:

EXCEPTIONS TO THE TRIAL BURN PLAN

The following are exceptions to the Trial Burn Plan for a Modular Incinerator at the Los Alamos National Laboratory in Los Alamos, New Mexico, Revision 1.0, of October 1985, Appendix J of the Los Alamos Part B Application of November 1986:

a) Trichloroethylene (TCE), added as a dioxin precursor surrogate, was introduced as a secondary POHC during the trial burn. Wherever Carbon Tetrachloride (CCl_4) is referred to in the Trial Burn Plan, TCE should be added.

b) Page 7, Table 1--Automatic feed cutoff parameters have been changed to include Minumum SCC temperature, Maximum CO concentration, Minimum SCC O_2 (%), Minimum scrub solution pH, and Maximum combustion gas velocity. Minimum and maximum values for automatic feed cutoff parameters have been adjusted as discussed in Section 7 of the RCRA Trial Burn Final Report (March, 1987).

   Minimum Primary Combustion Chamber temperature varies with the feed rate and excess O_2 and should not be a feed cutoff parameter. Minimum and maximum HEPA filter pressure drop are nuclear safety concerns and it is therefore not appropriate to address this parameter in chemical operations. HEPA filters must be certified through DOP testing by an independent auditing organization at LANL before the CAI is allowed to operate; therefore, permit restrictions on HEPA filter pressure drop would be unnecessary and redundant.

c) Page 10, #7 and Page 31, #4--CO monitoring was performed with a Horiba NDIR analyzer using EPA Method 10 technique. The offgas sample point was at the duct prior to the stack (App.J, Fig. 5, page 17, point #10) rather than between the reheater and HEPA filter banks.

d) Page 19, i.--Problems with the FID analyzer did not allow confirmation of ORSAT stack gas analysis.

e) Page 24, j. and Page 33, #3--Twelve EPA Method 5

sampling runs were made (80 min./ea.), 3 replicates for each of the four test conditions. A total of 24 VOST sampling runs were made (20 min./ea.), 6 replicates for each test condition.

f) Page 33, #4b and Page 35, Table 6--Pel-E-Cel, a commercial cellulosic absorbent made from corncob, was substituted for sawdust.

g) Page 34, Table 5--CCl_4 and TCE accounted for about 65% by weight of the liquid feed. Ash content was approx. 0.25 % by weight.

h) Page 36, Table 7 & Page 39, #2--Sampling run duration was 80 minutes for EPA Method 5 and 20 minutes for VOST.

i) Page 39, #3--Actual consumption of test wastes totaled 2233 lb of CCl_4 and 1000 lb of TCE for all four test conditions.

j) Page 40, Table 9--The actual test schedule took four days, each day corresponding to a new test condition.

EXCEPTIONS TO THE QUALITY ASSURANCE PLAN

The following exceptions were noted to the Quality Assurance Project Plan for a Controlled Air Incinerator Trial Burn of March 1986, Attachment A of Appendix J of the Los Alamos Part B Application of November 1986:

a) Section 3.0--Final combustion temperature in conditions 1 and 3 was 2200 ^{o}F. TCE was added as a POHC in the feed mixtures.

b) Table 6-1.--Scrubber discharge liquid samples were taken at the beginning, middle and end of each EPA Method 5 run and composited. Since POHC and HCl emission rates were integrated over their entire sample periods, it was felt that the scrubber discharge liquid samples should be a composite of samples taken over the total sample period, and thus be as representative of the average value as possible.

c) Section 11.0--As discussed in section 3.3 of the RCRA Trial Burn Final Report for the Los Alamos Controlled Air Incinerator (March, 1987), no surrogate spiking of VOST cartridges before analysis was performed. In accordance with section 12.0 of the Quality Assurance Project Plan (Attachment A to Appendix J), in place of replicate analyses of composited samples, replicate standard reference materials were submitted for analysis to monitor instrument precision and accuracy.

APPENDIX J-1

ENGINEERING DESCRIPTION OF THE LOS ALAMOS CONTROLLED AIR INCINERATOR SYSTEM

Detailed Engineering Description of Incinerator

1. Manufacturer's Name and Model Number

The Los Alamos Controlled Air Incinerator (CAI) system was manufactured by Environmental Control Products (now Ecolaire) of Charlotte, North Carolina. The model number is ECP 500-T.

2. Type of Incinerator

The CAI system consists of a waste feed system, a dual chamber controlled air incinerator, and pollution control equipment. The Los Alamos CAI was developed through extensive modification and integration of commercially available and custom fabricated equipment. Components of the system include a ram feeder for solids feed to the lower chamber, a primary combustion chamber (PCC) for initial combustion and volatilization of organics, a secondary combustion chamber (SCC) to provide complete combustion of volatiles, an ash handling system, a water spray quench column, a high-energy venturi scrubber, a packed-column acid gas absorber with demister, a gas reheater, high efficiency particulate air (HEPA) filters, an activated carbon absorber, and a final HEPA filter.

The small production-scale CAI system at Los Alamos was originally designed for the demonstration of volume reduction of combustible solid radioactive wastes. One of the primary purposes of the CAI has been incineration research. As part of this effort, the incinerator was modified to include a high intensity vortex liquid injection burner, firing into the primary chamber, for injection of liquid wastes to the CAI. Research studies which have been completed in the CAI have included the incineration of various radioactively contaminated solid wastes, liquid PCBs, and pentachlorophenol contaminated wood. In anticipation of incineration of larger volumes of radioactive and chemical combustible wastes, several equipment modifications are underway to provide for safer and more reliable operation of the CAI during production-scale incineration campaigns.

A block flow diagram of the CAI is shown on Figure 1. The block flow diagram begins where the waste and auxiliary fuel is injected into the primary chamber and then traces the flow of the hot combustion gases to the secondary chamber, quench tower, and other pollution control devices with all discharge points noted. This diagram incorporates equipment modifications to improve system safety, reliability and performance.

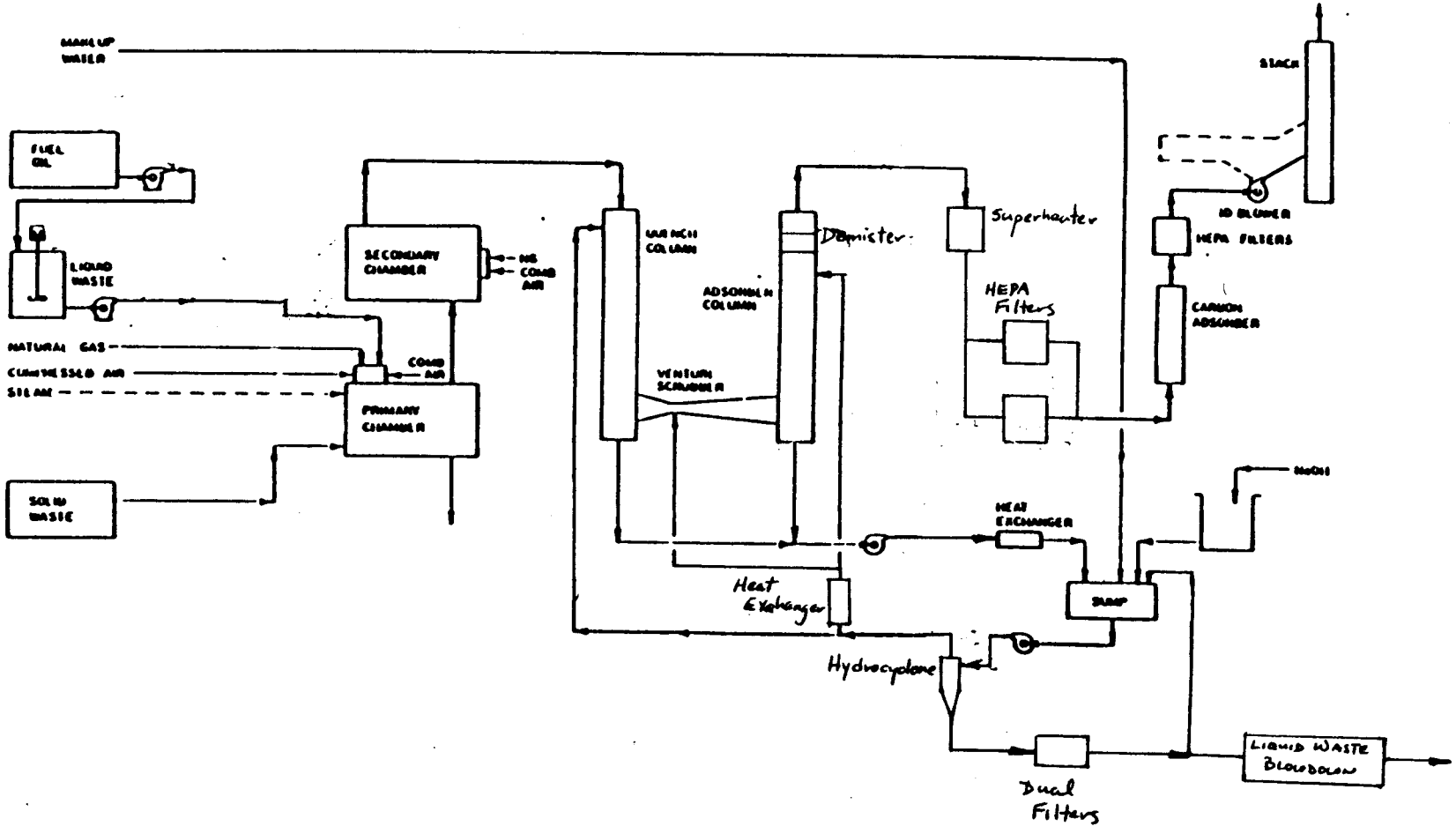


Fig. 1. Block Flow Diagram of CAI System

3. Linear Dimensions of the Incinerator Unit Including Cross-Sectional Area of the Combustion Chambers

The CAI system has two combustion chambers. The lower (primary) chamber dimensios are 4 feet 10 inches inside diameter by 6 feet inside length. The upper (secondary) chamber dimensions are 3 feet 10 inches inside diameter by 6 feet inside length. The rectangular duct between the two chambers has internal dimensions of 1 foot by 3 feet and is 2 feet long. This duct contains the secondary air injectors and therefore functions as part of the secondary combustion chamber (SCC), The dimensions of the high-temperature cross over duct between the SCC and the quench tower are 1 foot 8 inches inside diameter by 13 feet 7 inches long. This duct fuctions as an extension of the SCC. The volumes of the individual chambers are then approximately 110 ft^3 for the primary chamber and 105 ft^3 for the secondary chamber. A schematic of the CAI, showing chamber dimensions and burner locations, is shown in Figure 2.

4. Description of the Auxiliary Fuel Burner System

The auxiliary fuel burner system employs separate burners for each of the two combustion chambers. The primary combustion chamber (PCC) utilizes a liquid injection type burner capabile of firing natural gas, fuel oil, or liquid waste feed blends, while the secondary combustion chamber (SCC) burner fires on natural gas only. Combustion air to each burner is supplied by a dedicated forced draft fan. Each of the auxiliary fuel burners is temperature controlled and is run with a preset combustion air to fuel ratio. All fittings, regulators, and control valves are Underwriters Laboratory, Chicago, Illinois, approved and are assembled to meets the standards of Industrial Risk Insurers, Illinois, or other authority, where applicable.

The primary chamber burner, a Trane LV-2 high-intensity vortex liquid injection burner, is located on the side of the PCC, firing down at a 45° angle into the chamber. This burner is equipped with its own natural gas pilot and natural gas supply. This unit, rated at 2,000,000 BTU per hour, is configured to fire in three modes: 1) on natural gas, 2) on fuel oil, and 3) on waste liquid or waste liquid/fuel oil blends. Methods 1 or 2 are used to maintain heat in the lower chamber when not feeding liquid waste and while flushing the liquid feed lines following completion of a liquid waste burn. Method 3 is used when actually firing liquid wastes. In the event that the heating value of the liquid waste is too low to ensure proper operation of the liquid burner, fuel oil is batch-blended with the waste which is subsequently injected through the liquid burner as a mixture. Atomization of the liquid feed stream is accomplished with either air or steam through an internal mix nozzle.

The secondary auxiliary fuel burner, a pre-mix type Pyronics model 1501NM gas burner, is located at the entrance to the SCC,

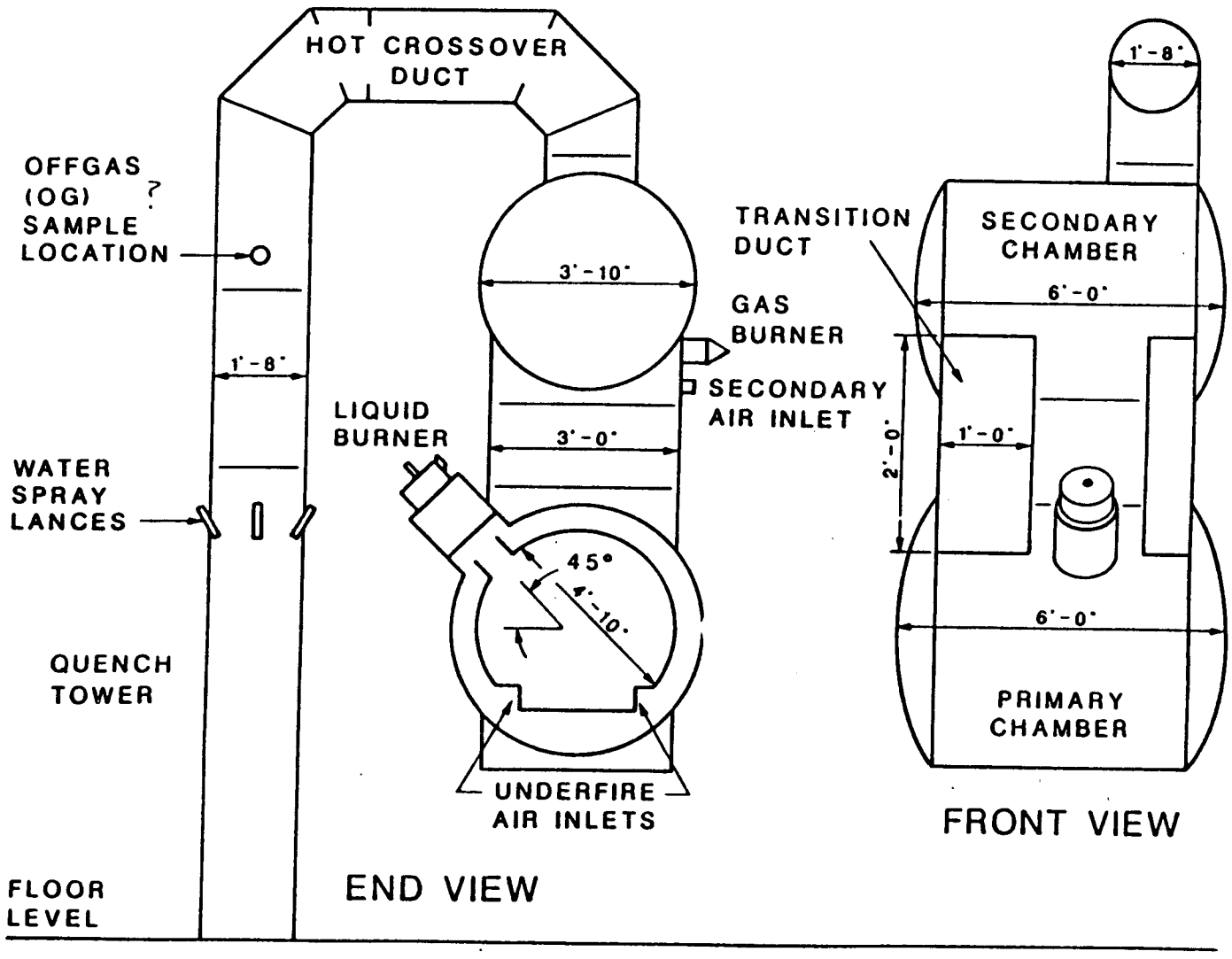


FIGURE 2. SCHEMATIC OF CAI

and fires on natural gas only. This unit is rated at 1,500,000 BTU per hour maximum output and develops maximum rating at 3 inch W.G. pressure at the burner.

5. Capacity of Prime Mover

The CAI system prime mover is a Spenser Model G-3040-H-MOD turbine blower which operates as an induced draft (ID) fan. Two of these units are located in parallel, with one unit serving as an off-line backup. The ID fan is capable of producing a negative pressure of 110 inch W.C. at a flow of 2200 ICFM with a discharge pressure of 11.31 psia to accommodate the 7300 feet elevation at Los Alamos. The ID fan has a 50 hp, 3500 rpm motor.

6. Description of Automatic Waste Feed Cutoff

The primary function of the waste feed cut-off interlocks is to prevent the feeding of material at incineration conditions that are inadequate to assure destruction of the materials. During the startup and shutdown of the incinerator or during process upsets, the interlock system automatically stops all waste feed systems and prevents their restart until the incinerator is at proper operating conditions and the interlock is manually reset.

The process parameters identified in Table 1 are tied into an alarm panel and will also cut off the waste feed if the permit conditions for these parameters are exceeded. These waste feed cutoff parameters are based on results of the RCRA trial burn, during which the Los Alamos controlled air incinerator met or exceeded the performance standards of 40 CFR 262.343. If any parameter is exceeded, a block valve in the waste liquid feed line to the liquid burner will automatically close, and the initiation signal to the solid waste feeding mechanism will automatically be deactivated. When permit conditions are within limits, neither the waste liquid block valve nor the solid waste feeding mechanism will be prevented from operating. A discussion of the automatic waste feed cut-off parameters follows:

- <u>Primary and Secondary Chamber Temperatures</u>--
  Secondary chamber temperatures are normally controlled within +/- 50°F of the setpoint. Performance standards were achieved at a setpoint of 2000°F in the SCC and as low as 1400°F in the PCC. It is expected that the 50°F temperature variation in the SCC will be encountered during normal operation and should not be a cause for automatic waste feed cutoff. Since temperature variation in the PCC is dependent on waste feed and excess O_2 feed rates, the primary chamber temperature variation should not be restricted, with a minimum PCC temperature of 1400°F set as a waste feed cut-off.

TABLE I. AUTOMATIC LIQUID AND SOLID WASTE FEED CUT-OFF PARAMETERS

Parameter	
Minimum PCC Temperature	1400°F
Minimum SCC Temperature	1950°F
Maximum CO Concentration	90 ppm by volume dry basis as measured by the continuous recording CO analyzer, except that for a period not to exceed 5 minutes, the system can continue to burn waste if the CO concentration does not exceed a maximum of 500 ppm.
Minumum SCC Excess O_2	7.5% for solids feed, 6.0% for liquid
Max. Combustion Gas Velocity	3,654 lb/hr during solids feed; 3,933 lb/hr during liquids feed
Minimum Scrub Solution pH	1.0

- Carbon Monoxide--
  Carbon monoxide (CO) concentrations are measured in the offgas stack ductwork, downstream of the induced draft fans. The maximum allowable CO concentration in the CAI offgas (in ppmv) should be ten times the percent CO_2 concentration. Based on RCRA trial burn experience, the CO level would thus be allowed to vary up to a maximum of 90 ppmv. Above this level, the automatic waste feed cut-off will be actuated, timed to suspend waste feed should the CO level not decrease below this limit within a five minute period. Should CO emissions exceed 500 ppmv at any time, the waste feed will be automatically stopped without timed delay. This is consistent with the shutoff requirements during TSCA regulated PCB incineration at Los Alamos.

- Combustion Gas Velocity Indicator (CGVI)--
  The CGVI will be measured and recorded during permitted operation using a Fluidics HHR flow tube and Foxboro flow totalizer to determine offgas flow rate in pounds/hour. Performance standards were met during the RCRA trial burn with an offgas flow of 3,654 lb/hr during solids incineration and a flow of 3,933 lb/hr during liquids incineration. These are the maximum offgas flowrates allowed for waste feed cut-off.

- Secondary Chamber Excess Oxygen--
  Excess O_2 levels in the secondary combustion chamber are measured at the exit from the SCC in the cross-over ductwork to the quench column. Excess O_2 levels in the SCC during the RCRA trial burn in which performance standards were met were 7.5% during solids incineration and 6.0% during liquids incineration. These levels are the minimum percent O_2 allowed in the SCC for waste feed cut-off during permitted operation.

- Scrub Recycle Solution pH--
  Process scrub solution pH is continuously monitored at the process sump tank exit. The acidity of the recycled scrub solution is controlled by the addition of a sodium hydroxide (NaOH) solution to the process sump tank, as required. Offgas chloride removal efficiencies during the RCRA trial burn were unaffected by a scrub solution pH as low as 1.0. Building sump pH levels were controlled at a pH between 3.0 and 6.5. Based on these results, the minimum scrub recycle solution pH allowed should be 1.0.

Three control logic sequences are provided to shut down the process in a safe and orderly manner:

- Controlled Shutdown--
  Initiated when there is potential for significant damage to minor process components. This is also the normal shutdown mode at the completion of a run. When controlled shutdown is initiated, feed of waste to the incinerator is stopped,

and a programmable set-point generator is activated that directs remote set-point inputs to the temperature controllers, causing a gradual decrease in chamber temperatures. Switches internal to the set-point generator cause an orderly timed shutdown of process components.

- Fast Shutdown--
  Initiated for conditions that could likely result in loss of containment or damage to major process components. Waste feeding is stopped. Following a two-minute timed interval following the last feeding of solid waste (immediately, if feeding liquid waste), the upper and lower chamber burners are shut down and the system valves and dampers are positioned so as to maintain a negative pressure in the system while minimizing flow through the system. Snuffing steam is introduced into the lower chamber. The two-minute delay when feeding solid waste allows for the ignition of pyrolytic gases formed immediately after feeding.

- Scram Shutdown--
  Initiated at the discretion of the operator. The chain of events are identical to the fast shutdown except that the sequence is not delayed when feeding solid waste. Scram buttons are located at the incinerator and in the control room.

The last two shutdown modes are potentially destructive to the incinerator refractory and are initiated only when the consequences of not shutting down are greater than the consequences to the incinerator during a scram or fast shutdown. It is the responsibility of the operating personnel and the process lead engineer to assess any situation and initiate the proper process shutdown sequence.

7. Stack Gas Monitoring and Pollution Control Equipment--

Continuous monitoring of the offgas is conducted for O_2, CO, and CO_2, as well as the offgas flow rate (CGVI). Excess oxygen levels in the secondary combustion chamber are monitored in the SCC exit duct using a Thermox WDG-3 O_2 analyzer. CO and CO_2 concentrations are monitored downstream of the ID fan outlet just upstream of the CGVI using Foxboro-Wilks Miran II infrared (or equal) analyzers. Strip chart recorders continuously record this data.

The Los Alamos CAI Pollution Control Equipment (PCE) is shown is Figure 1. The PCE includes the following equipment:

- Quench Column
- High Energy Venturi Scrubber
- Packed Column Absorber/Demister
- Offgas Reheater
- High Efficiency Particulate Air (HEPA) Filters

- Carbon Bed Adsorber
- Induced Draft Fans
- Scrub Solution Recycle/Cooling System

The quench column, through evaporation of atomized, cooled recycle scrub solution injected into the column, cools the offgas from incinerator exit temperature (2200°F) to around 160°F. The saturated gas phase is routed to the venturi scrubber inlet, while excess scrub solution flowing to the base of the column is returned to the process sump tank for recycling. The outlet temperature of the gas phase is monitored and a system limit of 350°F is imposed to protect nearby equipment from radiant heat damage. Exceeding the limit causes a waste feed shutoff ansd initiates an automatic controlled shutdown of the CAI.

Particulate in the cooled exhaust gas exiting the quench column is removed by the high energy variable-throat venturi scrubber located between the quench and absorber columns. Up to 99 weight percent of the particulate in the offgas is removed by the venturi scrubber. The venturi assembly consists of converging and diverging cones with a clamp valve throat to allow the pressure drop, normally controlled in the 40 to 60 inch W.C. range, to be varied. Cooled recycle scrub solution is injected through a nozzle located upstream of the venturi throat. The intent and use of the venturi scrubber is to prolong the service life of the downstream HEPA filters by reducing the particulate loading.

Acids in the saturated gas phase exiting the venturi are removed by counter-current contact with a cooled mixture of recycled scrub solution and fresh water in the packed column absorber. The absorber column utilizes a 6 foot section of high surface area structured packing for intimate liquid-gas contacting. Offgas leaving the packing flows through a 6 inch thick demister pad, which captures entrained water mist. By direct liquid-gas contact cooling of the saturated offgas stream in the absorber packing, a significant portion of the water content is removed, resulting in a reduction of total offgas volume. This reduction in water content and offgas volume eases the operating loads on the offgas superheater, HEPA filters, and process induced draft fans.

The flow rate of the absorber scrub solution is monitored and a low flow limit of 10.0 GPM is imposed to ensure proper acid gas scrubbing and cooling of the offgas. Operating below the flow rate limit causes a waste feed shutoff and initiates an automatic controlled shutdown of the CAI.

Further offgas conditioning is performed by the offgas reheater. Saturated scrubbed and cooled exhaust gas leaving the absorber/demister at around 130°F is reheated prior to entering the HEPA filters. By heating the exhaust gas above the dew point, condensation of moisture in the HEPA filters is avoided. This helps prevent blinding of the HEPA filters with condensate.

The CAI employs High Efficiency Particulate Air (HEPA) filtration for offgas polishing downstream of the wet offgas treatment system. Although the wet offgas treatment system effectively removes particulate from the offgas stream, radiological concerns arising from TRU incineration dictate the need for HEPA filtration. HEPA filters provide positive assurance that significant amounts of particulates are not vented in the stack gas. The HEPA filtration system is made up of eight individual HEPA enclosures which form four separate filter modules, each module consisting of a prefilter and a primary and secondary HEPA filter in series. Two of these modules (a total of four HEPA filters) are operated in parallel at all times. Thus, offgas flow is split between the two modules (banks) of four filters. The remaining two modules serve as a completely redundant backup for use during filter changeouts. The system is configured so that any two of the modules may be used at any one time to provide adequate filtration capacity.

The activated carbon bed adsorber serves as a final removal system for trace organic compounds. The housing for the activated carbon bed includes a downstream HEPA filter, which serves to remove any entrained carbon fines from the offgas stream. This third bank of HEPA filters is rated at the same capacity, and is tested in place to the same efficiency, as the primary HEPA filters located upstream of the carbon bed (1000 SCFM, 99.97% removal for particles >0.3 micron).

The induced draft fans are the prime mover which provide a negative draft on the system and pull the combustion gas through the pollution control equipment.

The scrub solution recycle/cooling system is used to minimize liquid blowdown from the offgas cleaning system. This system consists of five main components:
1) A plate type process liquid heat exchanger to cool quench column, venturi scrubber, and absorber column scrub solution as it returns to the process sump tank; 2) a second plate type heat exchanger to further cool scrub solution supplied from the sump tank to the venturi and absorber column; 3) a third plate type heat exchanger which provides a secondary coolant water loop to the process heat exchangers from the cooling towers; 4) a hydrocyclone to remove particulate from scrub solution drawn from the sump tank; and 5) dual bag filters for filtration of process liquid blowdown.

Process scrub solution leaving the process sump tank will enter the hydrocyclone before being pumped to the quench and absorber columns. Approximately 58 gpm of "filtered" scrub solution goes overhead to the process, while approximately 2 gpm of particulate-laden slurry becomes hydrocyclone blowdown. Prior to discharge to the building sump tank, and from there to the industrial waste water treatment plant, the hydrocyclone blowdown will be filtered through a polypropylene felt bag filter.

8. Construction Materials

The construction materials for the CAI system components are as follows:

COMPONENT	MATERIAL
Primary and secondary chamber, and high temperature duct	Carbon Steel Shell Internal mastic membrane Internal fiberboard insulation (refractory fiber) Internal high density refractory (40% Al_2O_3)
Quench column	Hastelloy C-22 column, upper section of 12 spray cooling nozzles
Venturi scrubber, Absorber column	Hastelloy C-22
Absorber column structured packing	Hastelloy C-276
Offgas ducting	AL-6XN (superaustenitic SS)
HEPA filter enclosures	316L Stainless Steel
Carbon Bed Adsorber	Carbon Steel Shell, Plasite paint coating
Induced-draft blowers, ductwork to blowers and from blowers to vent stack, vent stack.	Carbon Steel
Scrub solution recycle system:	
Piping	Hastelloy C-276
Shutoff valves	Teflon-lined steel
Sump tanks	Kynar-lined carbon steel
Process heat exchangers	Hastelloy C-276 plate type
Secondary heat exchanger	304L SS plate w/316L nozzles
Hydrocyclone	Kynar-lined carbon steel shell

9. Location of Temperature and Flow Indicating and Control Devices

The discussion in this section is based on Figure 3. The numbers given at the end of each heading refer to the equipment location in Figure 3.

a. Primary and Secondary Combustion Chamber Temperatures (1,2)-- The combustion gas temperatures of the primary and secondary combustion chambers are each measured with a type S (platinum/10% rhodium) thermocouple. The primary chamber thermocouple is located in the hot duct betrween the primary and secondary chambers. The secondary chamber thermocouple is located downstream of the SCC at the entrance to the high temperature duct.

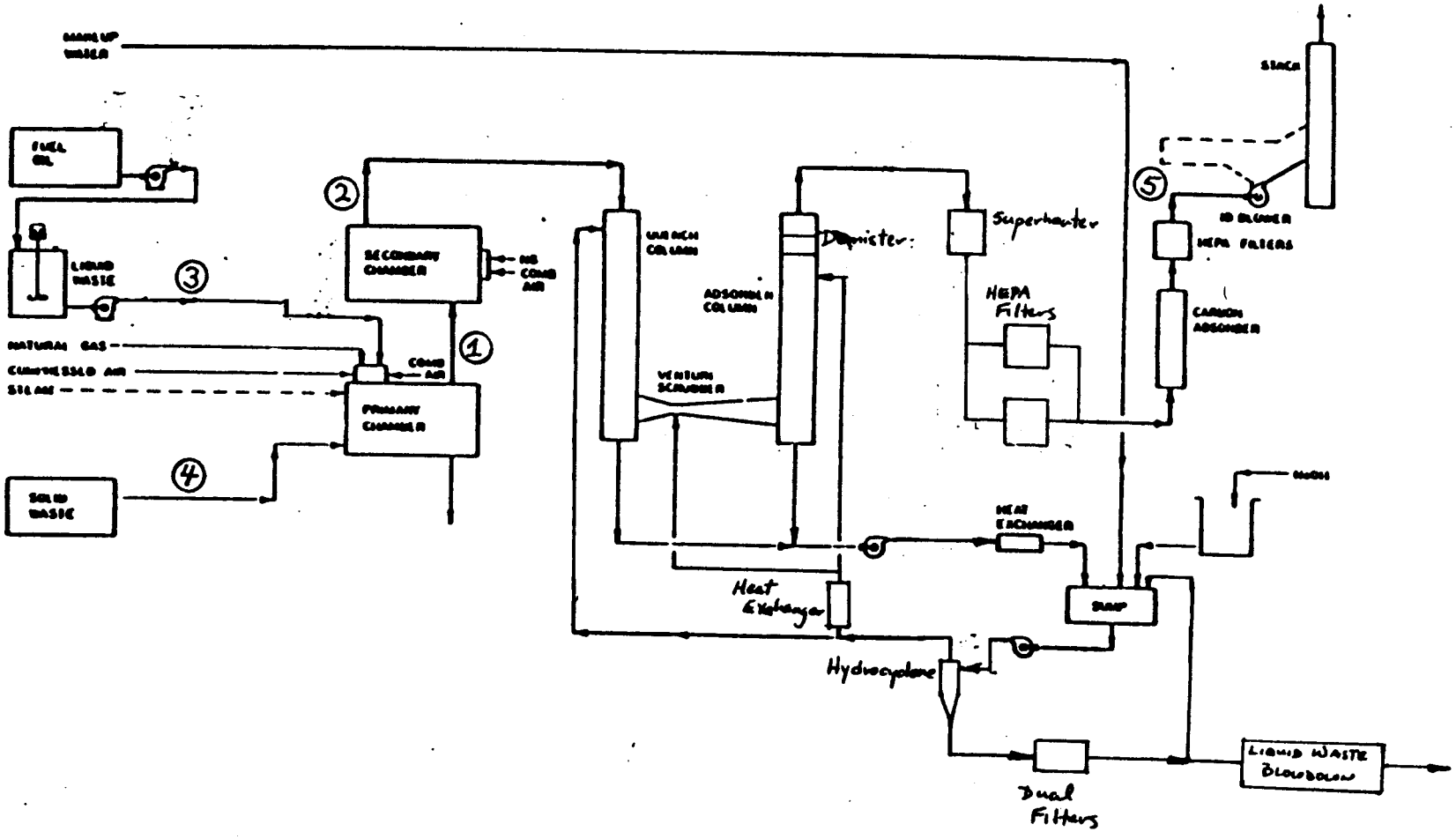


FIGURE 3. LOCATION OF TEMPERATURE AND FLOW INDICATING AND CONTROL DEVICES

b. Waste Liquid Flow (3)--
Waste liquid flow is measured by a MicroMotion Modle C25 gyroscopic/coriolis mass flowmeter. The Micro Motion flowmeter provides a measurement of instantaneous mass flowrate of the waste liquid being fed to the Trane burner. A detailed description of this flowmeter is given in Attachment D to Appendix J.

c. Solid Waste Flowrate (4)--
Solid waste is typically fed to the CAI in preweighed 1 foot by 1 foot by 2 foot cardboard boxes. These boxes are then transferred to the side ram feeder, which feeds the main ram feeder. The main ram feeder pushes boxes of solid waste into the primary chamber on a timed cycle which can be manually or automatically overriden when necessary. Each time a box of solid waste is fed to the primary chamber, the incinerator operator records the weight and time each box is loaded on a log sheet.

d. Combustion Gas Flowmeter (5)--
The combustion gas flowrate is measured at a location between the ID fan and the stack by a Fluidic's HHR flow tube. The differential pressure signal from the Fluidic's flow tube is converted and totalized by a Foxboro Model 75 TCA computing totalizer, to yield flowrate in pounds per hour. The flow tube and associated electronics thus serve as the CAI combustion gas velocity indicator (CGVI). A description of the flow tube is given in Attachment D to Appendix J.

e. Research Parameter Measurement --
Because the CAI is and will be used partly as an incineration research system, it is more highly instrumented than typical industrial hazardous waste incinerators. The CAI has many temperature, pressure, and flow indicating instruments not mentioned in this section. These instruments are necessary from the research point of view, but are not necessary to meet the requirements of the 40 CFR 264 Subpart O and 40 CFR 270.62 RCRA incineration regulations.

LOWER BURNER-COMBUSTION AIR/FLOWMETER UPGRADE

The existing Controlled Air Incinerator (CAI) has employed three burners: 1) two 1.5 MMBTU/hr upper and lower chamber natural gas burners for heatup and auxiliary heat input, and 2) a 2 MMBTU/hr high-intensity vortex, liquid injection burner for liquid and slurry feed. The liquid burner can also fire fuel oil or natural gas for auxiliary heat input to, and heatup of, the lower chamber. Thus, lower chamber heatup and temperature control may be obtained through the use of either the dedicated lower chamber burner or the liquid injection burner.

The liquid injection burner was originally added as part of R&D activities at the HSE-7 Treatment and Development Facility (TDF). With its addition, there is no need to continue use of the gas-fired lower burner. As part of upgrade efforts in anticipation of production-level incineration of TRU and chemical wastes, we are removing the lower burner from the CAI and will be firing the lower chamber with the liquid injection burner, using natural gas or fuel oil during heatup or when incinerating solids. This change will provide several benefits by: 1) simplifying the process control system through removal of a redundant control loop, 2) making space available within the combustion air glovebox for installation of improved flow monitoring and control devices, and 3) thereby improving system reliability.

Present combustion air and natural gas flow indicating elements are hot wire anemometers using Datametrics electronics. Reliability of these units is a concern because of the outdat[illegible] electronics used and the need for periodic calibration [illegible] ts themselves. We are [illegible] ent with venturi flow tubes a[illegible] . This equipment upgrade wi[illegible] se flow data but more reliab[illegible] flow measurement system i[illegible] xhaust flow measurement and [illegible]

Did the TB use the 2 gas burners which were removed?

INDUCED DRAFT BLOWER REPLACEMENT

Following the RCRA Trial Burn in September 1986 the process Induced Draft Blowers were inspected and found to be severely corroded. This damage was apparently the result of condensation buildup in the offline (spare) blower during and after system operation. These two units, rated at 1900 ICFM (inlet cubic feet per minute), are being replaced with similar blowers rated at 2200 ICFM. By increasing draft capacity, the new blowers will not work as hard to provide the same draft, thereby increasing service life. The addition of blower drains and modification of operating procedures should help prevent the damage seen in the present units.

VACUUM ASH REMOVAL SYSTEM/ASH REMOVAL UPGRADE

The original lower chamber ash removal system utilized a pneumatic conveyance system for removal of cold ash from beneath the hearth. This ash was pneumatically transferred to a cyclone separator and sintered metal filter system for accumulation and bagout. For the small amounts of ash produced during R&D and/or infrequent incineration campaigns this system worked well. However, this system was never intended for production-level incineration and presents a particular concern, both operationally and with regard to maintenance, when high volumes of TRU waste are being incinerated. "Clinkers" formed during incineration and noncombustibles (e.g. nails) inadvertently fed to the system were often too heavy to be conveyed overhead and would require dismantling of the alpha-contaminated pipeline for their removal.

To improve system reliability, as well as ease of operation and maintenance, we are modifying the ash removal system to a complete gravity-dump operation. This will require the construction of a pit beneath the ash drop-out port below the lower hearth and the addition of two sliding knife-gate valves to facilitate staging the ash prior to bagout. The ash will then be gravity dumped into a drum for later cementation and disposal. Modifications to the ash removal system are external to the incinerator process and will not impact incinerator operation or performance. This system change will provide for increased ash-handling capacity, lower maintenance, ease of operation, and greater operator safety.

QUENCH COLUMN, ABSORBER & PIPING UPGRADE

Combustion gases exiting the CAI secondary chamber are cooled and scrubbed by a fiberglass reinforced plastic (FRP) quench column, venturi scrubber and packed column absorber. The quench column, through injection of atomized, cooled recycle scrub solution, cools the offgas from incinerator exit temperature (2200° F) to around 180°F. Particulate in the cooled exhaust gas exiting the quench column is removed by the high energy venturi scrubber between the columns. Acid gases in the offgas stream are then scrubbed out by a countercurrent liquid flow in the packed column absorber.

Because the system was originally intended for R&D use only, frequent and sustained operation of the CAI was not a design concern. Therefore, the FRP construction of these system components was acceptable from a materials reliability standpoint. However, for the anticipated production-level incineration of TRU and chemical wastes, these components present a substantial operational and safety concern. Auxiliary and emergency backup cooling systems have failed during equipment and power outages in the past, resulting in damage to the quench column and melting of the absorber packing. We feel that more reliable materials of construction are necessary in a system which will be operated for longer and more frequent intervals, and which will be highly contaminated with ^{239}Pu. For this reason, replacements for these components, and their associated piping, are being fabricated of Hastelloy C-22. This materials change will greatly extend the service life and safety of the offgas cleanup system.

Physical dimensions and performance of the new quench column and venturi scrubber will be identical to the FRP units, with the exception that total cooling liquid flow to the quench column will be increased from an average of 16 gpm to 20 gpm. The packed column absorber will be .5 feet larger in diameter and will utilize a more efficient packing. The current packing is a structured polypropylene type with a surface area of 75 ft^2/ft^3. The new packing is a similar structured type, but is constucted of Hastelloy C-276 and has an inceased surface area of 170 ft^2/ft^3. Liquid flow to the absorber will be increased from 7 gpm to 20 gpm. These modifications to the absorber will enhance gas-to-liquid mass transfer and thus, acid gas removal efficiency.

Gas scrubbing efficiency in a packed column absorber is basically a function of four variables: 1) concentration gradient of the desired species in the gas and liquid (driving force), 2) liquid-to-gas flow ratio within the column, 3) gas residence time in the column (liquid-gas contacting) and, 4) surface area available for liquid-gas mass transfer interface. All these factors are interrelated. The solubility of a gas in a liquid is fixed

for a given temperature and pressure. When this limit is reached, the concentration of the solute in the gas and liquid is said to be in equilibrium. At equilibrium, no net mass transfer (i.e- absorption) takes place between the phases. The driving force for absorption of the gas by the liquid is thus the distance from equilibrium (concentration gradient) of the solute in these two phases. The further the liquid phase is from the equilibrium concentration, the higher the rate of, and capacity for, absorption.

For a given gas flow rate to the absorber, increasing the liquid flow rate results in a lower concentration of absorbed solute per unit liquid volume, thus increasing the concentration gradient between the gas and liquid phases and increasing the driving force for mass transfer. The larger volume of liquid has to absorb less gas per unit volume to achieve the same net removal of solute. The rate of mass transfer increases as the L/G ratio (Liquid/Gas) increases.

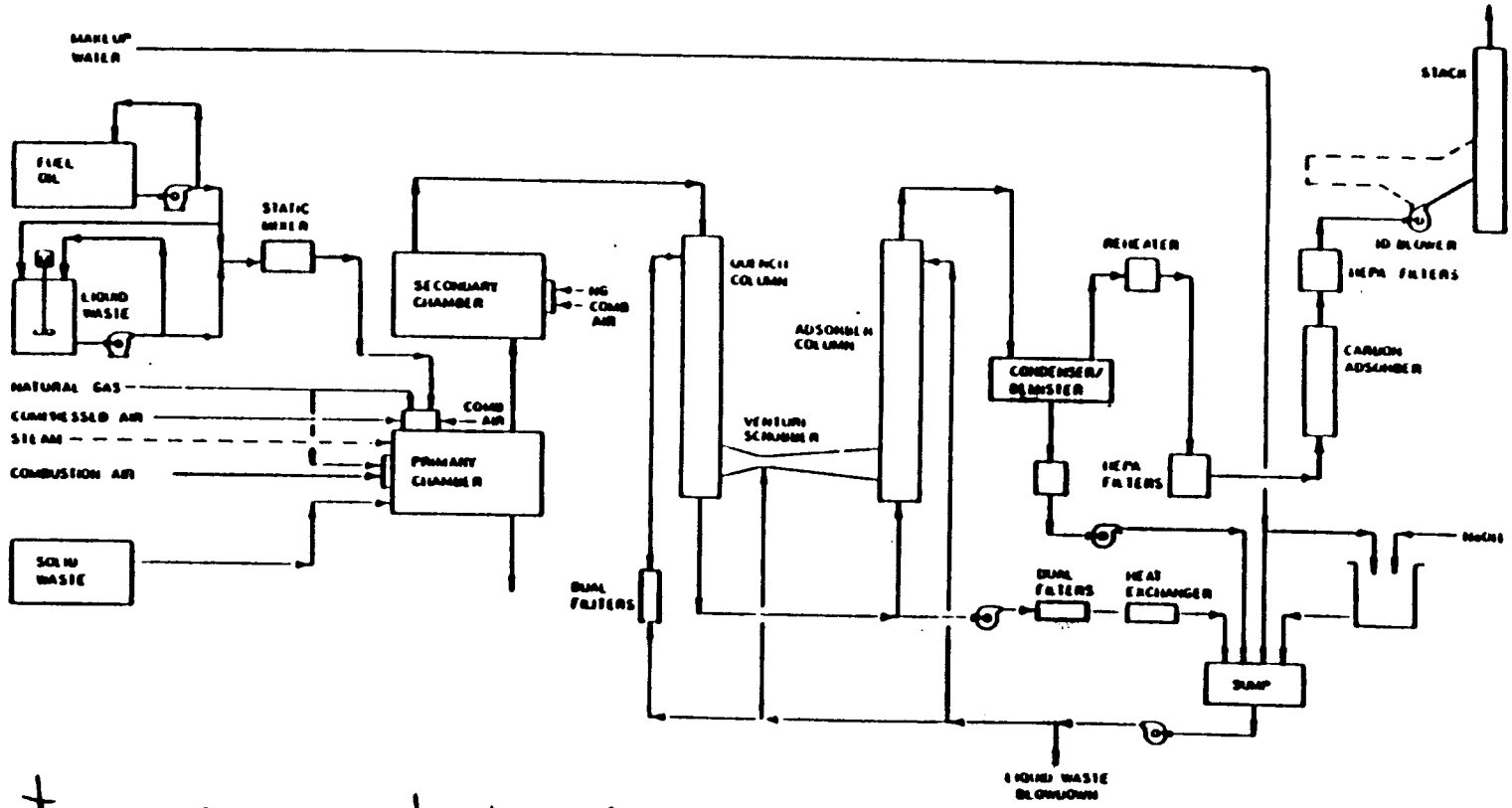
Rate of mass transfer is also effected by the length (time) of liquid-gas contacting. This is determined by the gas velocity and packing surface area. The longer a given volume of gas and liquid are in contact, the more solute gas which will be absorbed into the liquid phase. Increasing column diameter results in a lower superficial gas velocity and a longer gas residence time in the column packing, thus increasing column absorption efficiency. Decreasing the gas flow velocity through the absorber column will also help to minimize salt entrainment problems experienced when high chlorine feeds are incinerated. Increasing the surface area per unit volume of packing in the column increases the amount of liquid-gas interface available for mass transfer to occur.

The following table summarizes the improvements to the existing absorber tower:

ABSORBER TOWER UPGRADE

PARAMETER	OLD SYSTEM	NEW SYSTEM
Tower Material	FRP	Hastelloy C-22
Packing Material	Polypropylene	Hastelloy C-276
Packing Type	Koch Flexipac, Type 2-PP-24	Koch Flexipac, Type 1
Packing Surface Area, (ft^2/ft^3)	75	170
Packing Height, ft	6	6
Packing Volume, ft^3	18.8	29.4
Packing Void Fraction	0.93	0.91
Tower Diameter, ft	2.0	2.5
Tower Cross-section, ft^2	3.14	4.91
Inlet Gas Flowrate		
lb-mole/hr (dry)	54.86	54.86
lb-mole/hr (sat'd)	127.88	127.88
ACFM (sat'd @ 165°F)	1,515.9	1,515.9
lb/hr-ft^2 (G)	929.8	594.6
Gas Density, lb/ft^3 (165°F, 11.1 psia)	0.0321	0.0321
Liquid Flowrate		
GPM	7.0	20.0
lb/hr-ft^2 (L)	1,115	2,039
Superficial Gas Velocity (Inlet, Empty), ft/sec	8.05	5.15
L/G Ratio	1.20	3.43
Gas Residence Time, sec (Based on inlet ACFM)	0.69	1.06
K_Ga, lb-mole/ft^3-Atm-hr (Approximate)	2.3	5.9
Demister:	---	Koch Fleximesh
Material	---	Hastelloy C-276
Thickness, inches	---	6

It can be seen from this discussion that the proposed upgrades to the wet offgas cleanup system can only result in improvements in system reliability, safety, and performance.



old system - components in yellow are those to be removed &/or replaced

Fig. 1. Block Flow Diagram of CAI System

OFFGAS CONDENSER-PROCESS LIQUID HEAT EXCHANGER UPGRADE

Offgas leaving the packed column absorber, typically around 150°F, is saturated with moisture from having passed through the wet offgas treatment system. At this temperature a saturated gas stream contains approximately 40% moisture by volume. This moisture represents a substantial fraction of the total offgas volume seen downstream of the wet offgas system. By cooling this offgas stream to around 130°F, a significant portion of the water content is removed, and thus the total offgas volume is reduced. This reduction in water content and offgas volume eases the operating loads on the offgas superheater, HEPA filters, and process induced draft fans.

The CAI system previously employed a fin-tube condenser/ demister to provide cooling of the offgas stream. The amount of moisture condensed was controlled by varying the cooling water flow rate in response to gas outlet temperature. A plate-type heat exchanger provided cooling water to the tube side of the condenser. The condenser/ demister shell was constructed of carbon steel. Aluminum fin and tube internals were externally coated with a phenolic resin, as was the interior of the shell, to reduce corrosion. Chemical attack caused by high levels of chloride in incinerator feedstock has degraded this phenolic resin, causing it to peel from condenser surfaces and leave condenser internals unprotected. As a result, condenser efficiency under heavy loading has not been up to design levels.

In order to improve system performance and to simplify the process, we are substituting direct liquid-gas contact cooling of the offgas stream in the absorber in place of the condenser. This will be accomplished by using a dedicated plate type heat exchanger for cooling scrub solution fed to the absorber tower (and venturi scrubber). The larger surface area available for liquid-gas contacting in the new column packing provides an effective interface not only for absorption, but for heat transfer, and thus offgas cooling, as well. Reduction of offgas temperature through the absorber in this manner is feasible and sufficient to adequately reduce offgas volume. Replacement of the old condenser/demister system with a cooled absorber liquid inlet stream provided by a dedicated heat exchanger, in conjunction with absorber tower modifications employing a new demister packing, will result in 1) more efficient system operation, 2) considerably less expense than replacement of the existing condenser/demister with one of new Hastelloy construction, and 3) will consolidate scrub recycle solution system components and streams.

The plate type secondary heat exchanger, used in conjunction with the cooling towers to provide cooling liquid to the

condenser, also provided cooling water to the process liquid heat exchanger. The process liquid heat exchanger, a graphite shell-and-tube type, was used to cool process scrub solution liquid on its return to the process sump tank from the quench and absorber columns. Graphite was originally chosen because it represented a cost savings over other materials of construction. Compared to other types of materials, however, graphite is very fragile and has poor heat transfer characterisics. Thus, a larger size unit was required for a given heat duty. As part of our process upgrade efforts, we are replacing this unit with a plate-type heat exchanger of Hastelloy C-276 construction. This new unit will save space in the process area and will not be as subject to damage as the fragile graphite unit.

DUAL LIQUID FILTER/HYDROCYCLONE & BLOWDOWN FILTER UPGRADE

The CAI process originally employed a bank of dual (online and spare) liquid filters for particulate/sludge removal from the quench and absorber column scrub solution. To avoid quench column and venturi nozzle fouling, scrub solution liquid provided via the process sump tank was refiltered prior to injection through the nozzles. Particulate-laden process scrub solution leaving the quench and absorber columns was filtered prior to its return to the process sump tank. Each separate filter element was composed of a bank of 8-12 spun polypropylene fabric filter tubes, rated for removal of $\geq$100 micron size particles at a 40-50 gpm flow rate. These filter element housings were located in a glovebox enclosure to reduce any radiological hazard (alpha activity resulting from incineration of TRU combustibles, i.e. ^{239}Pu).

Although particulate capture with this system was satisfactory, several changes were desirable from an operational standpoint. Removal and replacement of the tube filters from their housing within the enclosure was an awkward, messy and time consuming job. In addition, the large volume of TRU-contaminated filter tubes generated by this system (and which required subsequent incineration) presented an undesirable waste handling and storage problem.

To alleviate this situation, it was decided to replace the existing filter system with a hydrocyclone and bag filter system. The hydrocyclone is rated at 95% removal efficiency of particles $\geq$35 microns at a 60 gpm flow rate. Process scrub solution leaving the process sump tank will enter the hydrocyclone before being pumped to the quench and absorber columns. Approximately 58 gpm of "filtered" scrub solution goes overhead to the process, while approximately 2 gpm of particulate-laden slurry becomes hydrocyclone blowdown.

Prior to discharge to the building sump tank, and from there to the industrial waste water treatment plant, the hydrocyclone blowdown will be filtered through a polypropylene felt bag filter. This type of filter system has the following advantages: 1) less physical space is required for the filter housing and associated glovebox, 2) individual filter elements are easier to change out, and 3) a rated filter capacity of 100 gpm versus actual flow of around 2 gpm should provide for high removal efficiency and blowdown "polishing" prior to discharge.

The overall system performance will in no way be compromised by this modification. Previously, supplemental liquid filtration was needed to avoid the possibility of plugging the atomizing nozzles in the quench column and venturi. Higher removal efficiency of the hydrocyclone, in conjunction with a small increase in atomizing nozzle bore

HEPA FILTER PLENUM UPGRADE

The CAI employs High Efficiency Particulate Air (HEPA) filtration for offgas polishing downstream of the wet offgas treatment system. Although the wet offgas treatment system effectively removes particulate from the offgas stream, radiological concerns arising from TRU incineration dictate the need for HEPA filtration. The original HEPA filter housing was a single plenum holding two side-by-side roughing filters and two banks of two side-by-side HEPA filters. Thus, offgas flow was split in half between each filter in a side-by-side bank, with the secondary HEPA bank acting as a backup to the primary HEPA bank, for breakthrough protection.

This system presented several problems from an operational and safety standpoint: 1) the lack of a backup HEPA filter plenum necessitated placing the CAI in an idle mode during filter changeout, 2) filter changeout was difficult because of the physical location of the plenum in the process (floor level), and 3) removal of the interior filter was difficult to accomplish while maintaining an alpha seal on the plenum, thereby presenting a radiological hazard. To facilitate filter changeout during incineration runs, and to provide a system backup, we are replacing the single plenum with eight individual filter enclosures, providing two separate banks of four HEPA filters each (eight HEPA filters, total). Each bank will be equivalent in filtration capacity and efficiency to the previous plenum (two roughing, two primary, and two secondary HEPA filters per bank).

This modification will allow continued system operation during filter changeout through use of the backup filter bank. Relocation and use of individual filter enclosures will make filter changeout safer, less tedious, and will minimize the possibility of alpha release. In addition, the use of liquid condensate indicators and alarms on individual filter housings will alert operators to possible system problems and help improve system reliability. This modification represents an improvement over the old system in safety and operability, while maintaining filtration capability and efficiency.

diameter, removes this requirement. Scrub solution filtration will be maintained, with an increase in particulate removal efficiency, by the hydrocyclone and process blowdown filter. Thus, this process scrub solution filtering system will provide superior service to that previously in use.

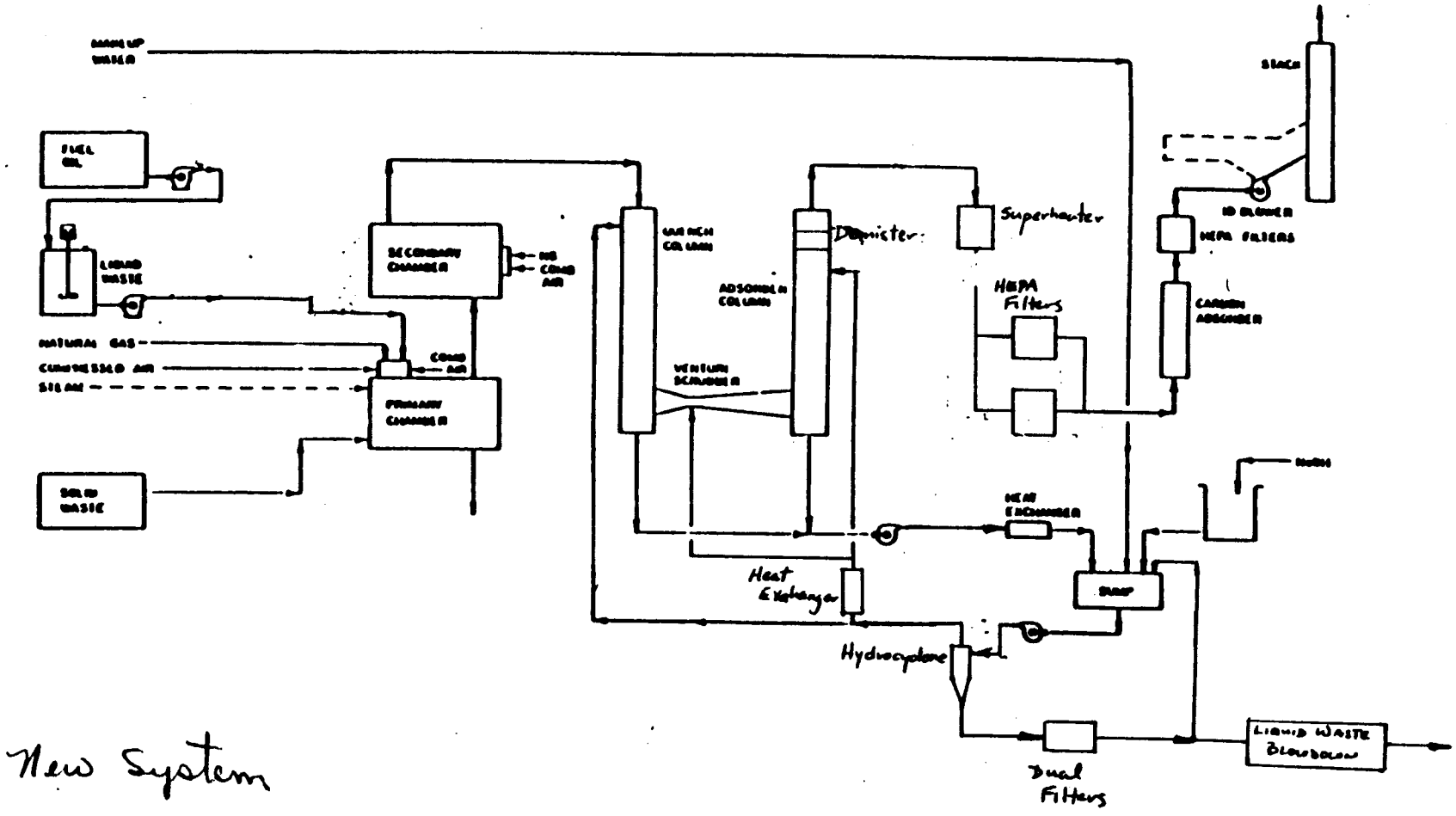


Fig. 1. Block Flow Diagram of CAI System

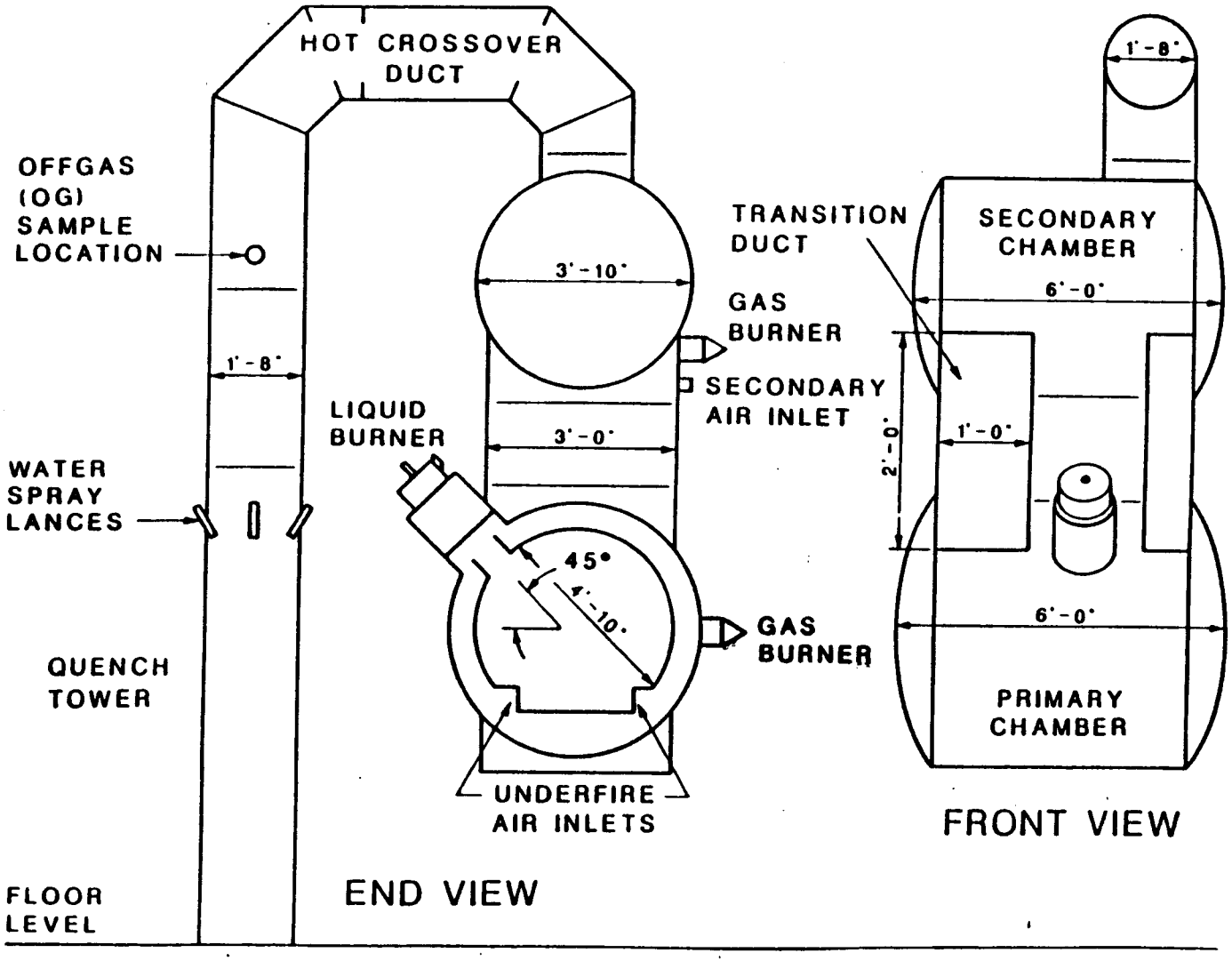
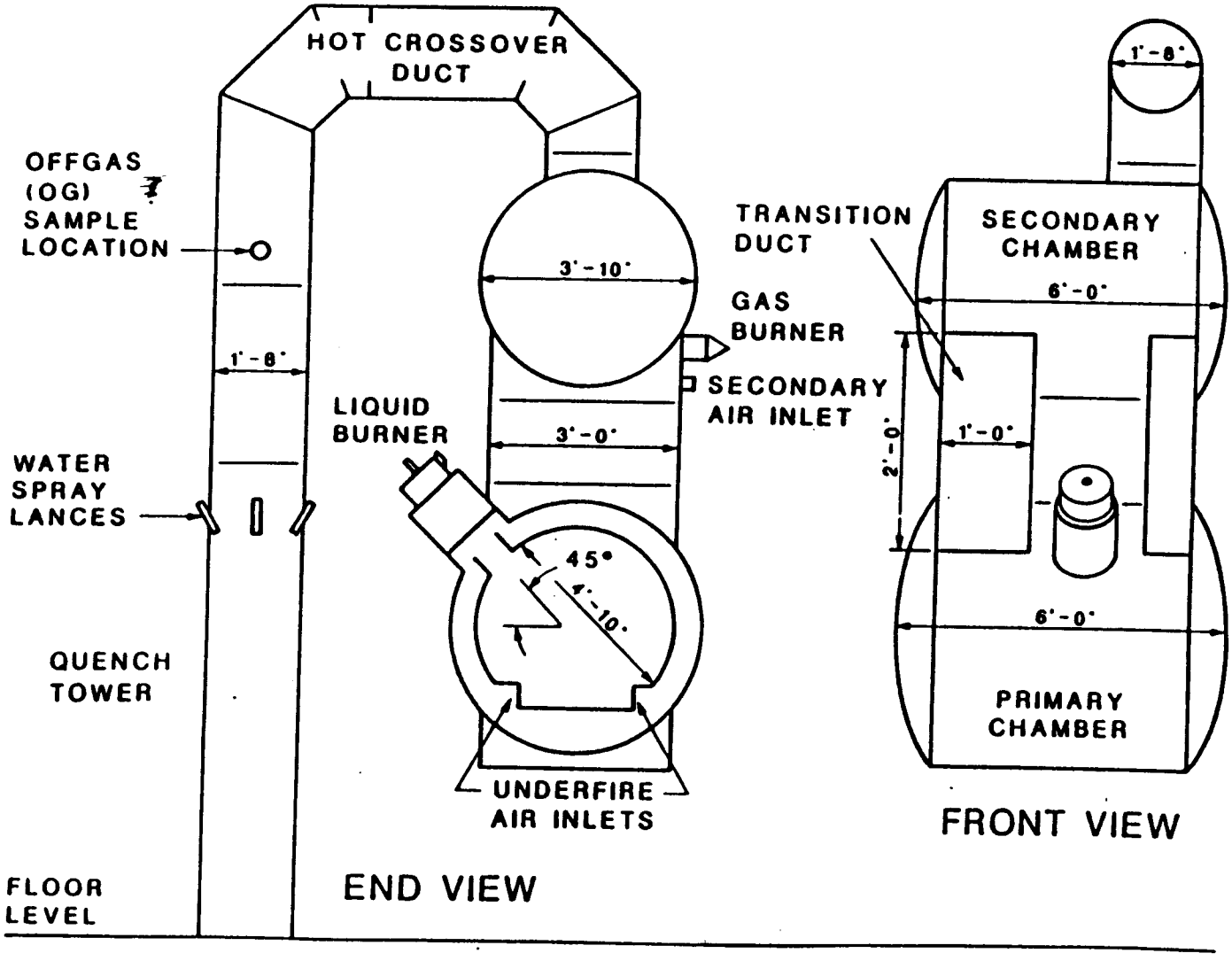


FIGURE 2. SCHEMATIC OF CAI

old System component in yellow is to be removed



New System

FIGURE 2. SCHEMATIC OF CAI

APPENDIX K

MANUFACTURERS INFORMATION ON PORTABLE PUMPS

Got from Dave Mace & Dave Salazar on 5/1/85

Explosion Proof Motor w/S.L. Polypropylene Tubes

DRUM & BARREL PUMPS

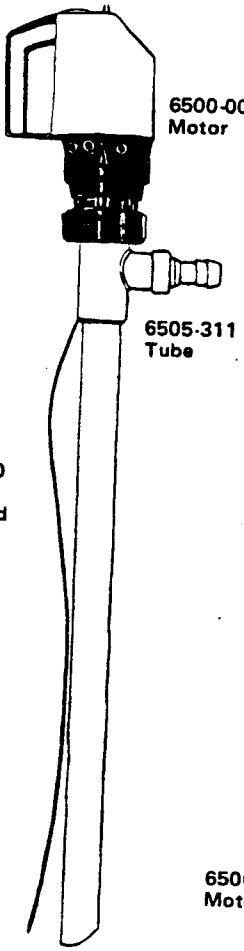
HOW TO ORDER: Motor and pump tube must be ordered separately. Any motor listed immediately below will assemble to any standard pump tube or to any S.L. (Seal-Less) pump tube.

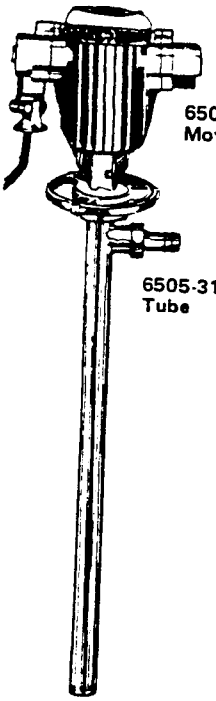
MOTOR PRICES:

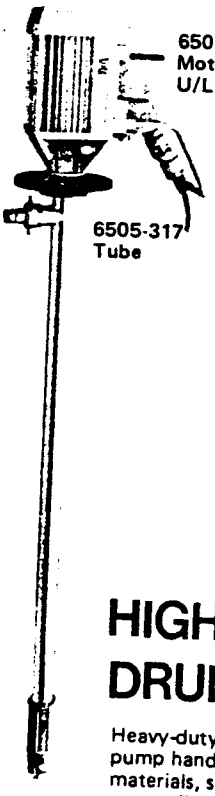
6500-000 PUMP MOTOR, portable electric motor, drip-proof . $220.00
6501-000 PUMP MOTOR, high-volume air motor 340.00
6502-000 PUMP MOTOR, heavy-duty electric motor, explosion-proof construction. 340.00
6503-000 PUMP MOTOR, extra-heavy duty electric motor, explosion-proof construction. 360.00
6504-000 PUMP MOTOR, low-volume air motor. 175.00
6506-000 PUMP MOTOR, heavy-duty electric motor, drip-proof 250.00
6507-000 PUMP MOTOR, extra-heavy-duty electric motor, explosion-proof construction, U/L-listed 525.00

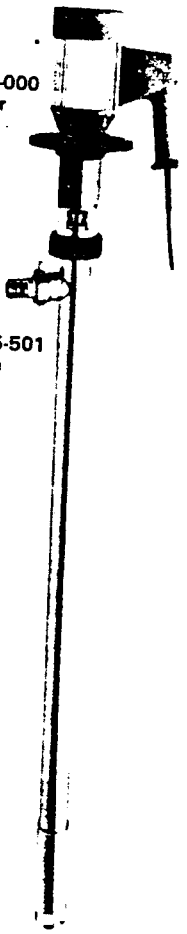
TUBE PRICES: ORDER 6505-(Size No.) PUMP TUBE

Size No.	Price Each	Length (in.)	Material
-216	$235.00	27	S.L. Polypropylene
-316	250.00	34	S.L. Polypropylene
-416	260.00	47	S.L. Polypropylene
-217	340.00	27	S.L. Stainless
-317	370.00	34	S.L. Stainless
-417	380.00	47	S.L. Stainless
-218	460.00	27	S.L. Kynar
-318	475.00	34	S.L. Kynar
-418	500.00	47	S.L. Kynar
-211	215.00	27	Polypropylene
-311	240.00	34	Polypropylene
[illegible]1	250.00	47	Polypropylene
[illegible]	305.00	27	316 Stainless
-312	340.00	34	316 Stainless
-412	370.00	47	316 Stainless
-215	150.00	27	Aluminum
-315	160.00	34	Aluminum
-415	185.00	47	Aluminum









SEAL-LESS DRUM PUMP

- HIGH PERFORMANCE
- RUNS DRY WITHOUT DAMAGE

It's quality and simplicity in engineering that enable the S.L. drum pump to give high performance. It safely and efficiently transfers corrosives and other chemicals from 55-gallon drums, carboys or open tanks. This pump is interchangeable with all the motors listed above and is available in stainless steel and polypropylene. The new S.L. pump can run dry without damage to either pump or motor. A patented Teflon sleeve prevents material from progressing up the pump shaft. A new design of the impeller maximizes performance on high-viscosity material and high-specific-gravity solutions.

EXAMPLE: To order a pump combining a heavy-duty drip-proof motor and a Seal-Less stainless steel tube 34" long, you would specify: **6506-000 PUMP MOTOR**
6505-317 PUMP TUBE, S.L. Stainless

HIGH-VISCOSITY DRUM PUMP

Heavy-duty, progressive-cavity pump handles high-viscosity materials, such as paint, polymers, oils, sucrose, etc. Efficiently pumps any material that will flow to the pump, from water to 100,000 SSU. Flows to 4.5 gpm at 100 psi. All 316 stainless steel pump tube is 2" dia. x 38" long. Stator is Teflon; rotor and all wetted parts 316 stainless. Available with a carbon/ceramic mechanical seal or stuffing box with Teflon packing. 6506-000 motor is recommended, but the tube is interchangeable with any Lutz motor.

ORDER:
6505-501 HIGH-VISCOSITY PUMP TUBE with mechanical seal $1180.00
6505-502 HIGH-VISCOSITY PUMP TUBE with stuffing box 1180.00
MOTORS — order separately from above table.

RH RYAN HERCO
Ryan Herco Products Corporation
P.O. Box 588, Burbank CA 91503

Address Correction Requested

Bulk Catalog Rate
U.S. Postage
PAID
Tempe AZ
Permit No. 209

459451 03 7391
LOS ALAMOS U C NATL LAB
MORT SANDERS BUYER
M/S 518

P O BOX 1663
LOS ALAMOS NM 87544

Your Western Service Centers for Industrial Plastics
Burbank CA 91504–2509 N. Naomi St., (818) 841-1141, (213) 849-1141, (714) 522-1141
San Diego CA 92126–9779 Candida St., (619) 693-1141
San Jose CA 95131–1819 Junction Av., (408) 286-1141, (415) 452-1140
Tempe AZ 85282–1245 W. Geneva Dr., (602) 968-1141
Seattle WA 98188–18200 Olympic Av. South, (206) 575-1141

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Los Alamos National Laboratory

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Harry Patterson	HSE-7	J592	7-6095	2/28/85	

Expense Code	Program Code/J.C.	Capital Equip. Code	Correspondence to	Mail Stop
3707	W57W		Rose Garcia	J592

Deliver to (name)	Area	Building	Room	Telephone	Mail Stop
H. Patterson	TA-54	22	104	7-6095	J592

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Purchase approved by (signature): H. Patterson

Title: Staff Member

Authority Level: 1K

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Invoice Terms	Negotiated Shipping Date	Date of Order	Blanket Purchase Agreement

TO

PURCHASE REQUEST NUMBER: 4723

Quotes By	Telephone	Date	Quote Number	SOCIO ECONOMIC SOURCE
				☐ Yes ☐ No

F.O.B.	Ship Via	Ship From

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
1.	Portable submersible pump Goulds Model SNW S0511B	2	ea.		
	1/2 HP, 115V, 1 phase, 1725 RPM				

Use a plain sheet of paper for continuation pages.

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)	Total Estimated Cost	Previous P.O. No.
GOULD PUMPS INC.	$600.00	
SENECA FALLS, NY 13148	State important handling or delivery information. QA handling?	

Items	Total Cost	Account	Program	Loc.	Sec.	Exp.	Partn.	Job Order	Ord.	Proc.	Wk.	Surp.	Source	Accept

Bids Requested			Bids Received			Bids Requested			Seller's No.	Ex.	Due Date	Ship Date
T	D	W	B	S	W	Disadvantaged	Woman					

PURCHASE REQUEST

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Requested by: H. Patterson	Group: HSE7	Mail Stop: J592	Telephone:	Realistic Date Reqd.: 5/17/85	Date/Time Stamp
Expense Code: 1 07	Program Code/J.O.: W57W	Capital Equip. Code:	Correspondence to:	Mail Stop:	
Deliver to (name):	Area: TA54	Building: 22	Room: 104	Telephone:	Mail Stop:
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	Title:		Authority Level: $ K		

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Invoice Terms	Negotiated Shipping Date	Date of Order	Blanket Purchase Agreement
TO			PURCHASE REQUEST NUMBER: M 4739
Quoted By	Telephone	Date	SOCIO ECONOMIC SOURCE: ☐ Yes ☐ No
F.O.B.	Ship Via		

ITEM	TYPE COMPLETE DESCRIPTION OF REQUIREMENTS OR SPECIFICATIONS	QUAN.	UNIT	UNIT PRICE	EXTENSION
	PUMP MOTOR (EXPLOSION PROOF)	1	EA		
	Cat no 6502-000				
2	PUMP TUBE — S.L. POLYPROPYLENE	1	EA		
	Cat. no → 6505-316				
	(Use a plain sheet of paper for continuation pages.				

SUGGESTED SOURCES (Sole source over $2.5K requires written justification)
RYAN HERCO PRODUCTS CORP.
2509 N. NAOMI St.
Burbank, Calif. 91503
818-841-1141

Total Estimated Cost: $590.00 XX

Previous P.O. No.

State important handling or delivery information. QA handling?

Total Cost	Account	Cost Center	Sub	Sub Exp.	Paren.

Bids Requested				Bids Received				Bids Rejected			
B	S	D	W	B	S	D	W	Small	Disadvantaged		

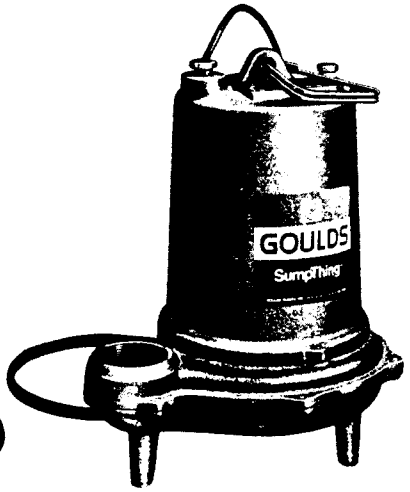
Group	Site	Building	Room	For	ACT

m 838 (2/81)

BUYER FILE/ACT TO MAT-4

Installation Instructions for Submersible Effluent Pumps

Model 3870
WPO311E
WPO312E
WPH1012E
WPH1032E
WPH1034E

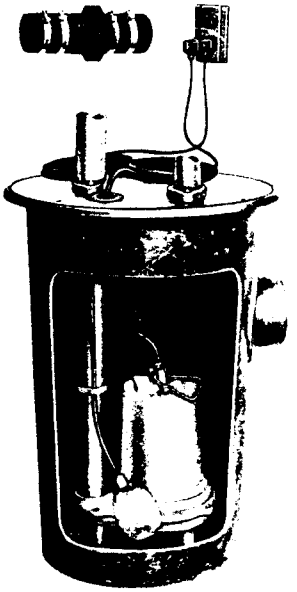


Pump Installation Consideration

The first steps in insuring the proper installation of your submersible effluent pump are to make certain: (1) a suitable receiver, sump, or sewage basin such as those offered in the Goulds Catalog is available; (2) supply voltage and phase matches pump nameplate power requirements; (3) wiring is adequate to carry maximum nameplate amperage, and (4) electrical installation conforms to applicable codes.

Mercury Level Control switch ALS2-5, 6, 7, if used, should be mounted to the discharge pipe.

Diaphragm Level Control Switch ALS2-1, 2, 4, if used, should be bracket mounted.



GOULDS PUMPS, INC.
SENECA FALLS, NEW YORK 13148

Pump & Piping Installation

Thread discharge pipe into discharge flange connection. If a check valve (ALS 9-2) is used in a system handling solids try to avoid installing it vertically, but instead position it horizontally or at a 45° angle with the valve pivot on top. This will guard against solids lodging on to the valve preventing it from opening. Drill a 3/16" hole in discharge pipe approximately 2" above the pump discharge connection to prevent air locking the pump. A gate valve should be installed in the system after the check valve, if used, to permit removal of pump and/or check valve for servicing. A union should be installed between the check valve and the pump so that the pump can be removed without disturbing too much of the piping.

Three-phase pumps must be checked for proper rotation after wiring is complete. Rotation must be counterclockwise looking into the suction of the pump. **Caution:** Do not attempt to feel for the rotation with fingers. Rotating impeller can cause severe body injury.

Single phase pumps have built-in thermal overload protection with automatic reset. Three-phase units must be protected by means of a starter having the appropriate overload protection. Consult your Goulds dealer for a recommendation.

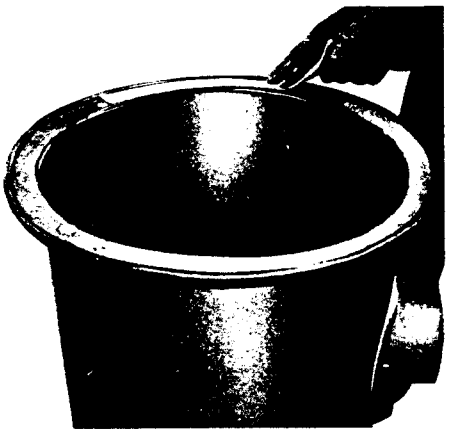
Sewage Basin Installation

The basin should have a hard bottom to give the legs of the pump adequate support. The legs are of sufficient height to elevate the pump above the bottom of the basin to allow wastes to reach the suction opening without clogging around the base of the pump.

When using fiberglass sewage basins supplied by Goulds attach 4" cast iron inlet hubs to sewage and/or drain lines as required. In the case of the duplex basins with two (2) cast iron inlet hubs, seal second inlet hub if it is not used.

Basin Covers

Remove protective strip from gasket material and press onto the recessed portion of the basin rim. See diagram below. With a



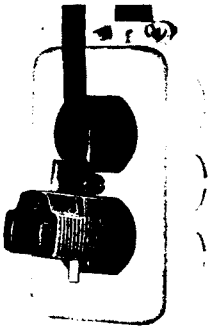
pointed tool, poke holes through the gasket into the tapped holes. Do not damage threads. Route all electrical cords through the appropriate opening in the basin cover.

Fit basin cover onto the protruding discharge pipe. Power cords are sealed with the split rubber stopper. The rubber "O" ring is placed over the discharge pipe and compressed between the pipe and cover by the smooth bore flange (chamfered side down) to form a seal. The vent pipe is threaded into the threaded flange provided with the basin cover.

Switch Operation

1. Diaphragm Level Control Switch (ALS2-1, or ALS2-4)

The diaphragm switch is a pressure activated switch which provides automatic operation with a 6" differential in liquid level. Switch will turn on when liquid level is 10" above bottom of switch unit, and turn off at 4" above bottom of switch.



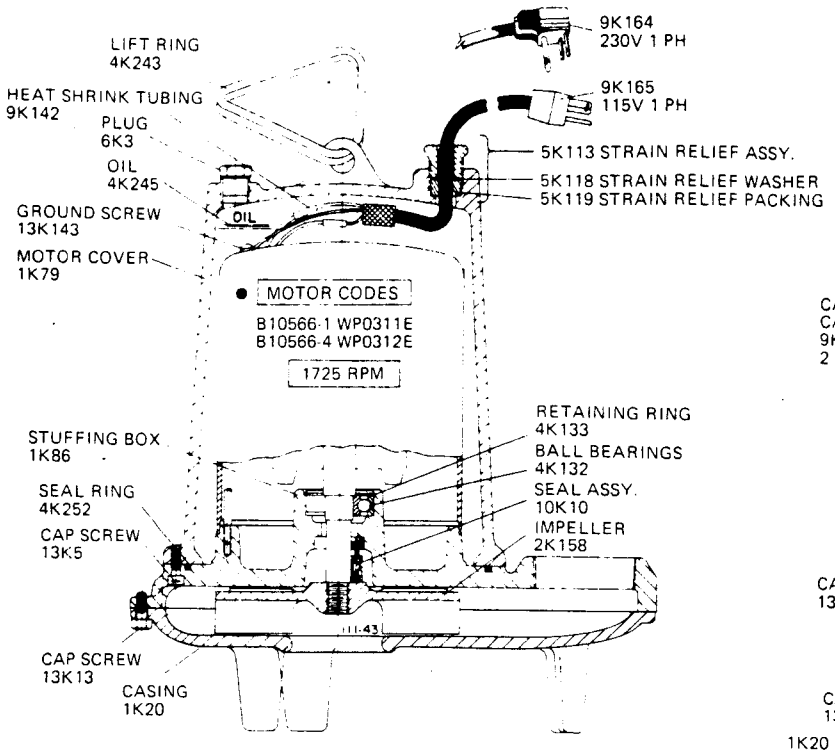
Caution: This type of control switch has a vent which must be left unobstructed and protected from moisture, dirt, or foreign material. Mount electrical cord so that the vent tube is pointed downwards. 1/3 H.P., 115V or 230V, 1 Ø pumps may be controlled directly by the switch. 1 H.P. units, 1 Ø require a contactor, such as ALS 3-1. 1 H.P. 3 Ø units require a starter, such as ALS3-3.

2. Mercury Level Control Switch (PIL)

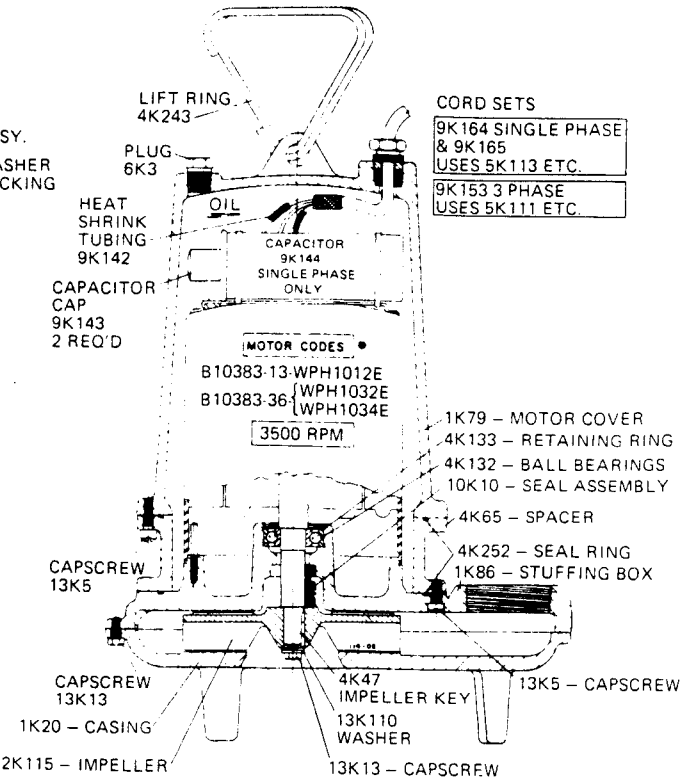
Mercury level control switch is a single float switch with adjustable differential level capability. Turn-on and turn-off levels are determined by how far the power cord is secured from the switch or the lead weight is located.

Caution: Electrical rating is 1/2 H.P. at 115 volts, 60 cycle, or 15 amps. Do not exceed rating.

Model 3870
WPO311E
WPO312E



Model 3870
WPH1012E
WPH1032E
WPH1034E



REPAIRS OR REPLACEMENTS

Before inspecting pump, **disconnect** all electrical power to pump(s) and accessories.

Caution: Motor section of this pump is oiled filled for lubrication and sealed against outside contamination. **Do Not** attempt to remove motor dome from the stuffing box. In the event motor or mechanical seal problems are diagnosed after all other possibilities have been eliminated, return the pump to your Goulds Pump dealer for servicing.

If motor, switch or other parts of this unit need replacement contact the supplier from whom this unit was purchased.

Warranty

1. The Company's standard warranty shall apply to submersible effluent pumps, except as hereinafter stated.

2. The period of one year from date of shipment of the Company's pumps, regarding any defective material or workmanship is enlarged as to submersible pumps to the first occurrence of a period of one year from date of installation or a period of eighteen (18) months from date of purchase.

3. This warranty shall not apply when damage is caused by improper installation, negligent or careless handling, lightning, or improper voltage supply.

Operating trouble chart

PROBLEM	PROBABLE CAUSES	CORRECTIVE ACTION
Pump Will Not Shut Off. **Note:** Before trouble shooting automatic control, check to see that pump operates on manual control. If it does, automatic controls are at fault. If not, fault is in pump or power supply.	Diaphragm Switch Weak rubber diaphragm Plugged vent tube Dirt or sediment lodged between retainer ring and rubber diaphragm causing contacts to remain closed.	Replace switch. Clear vent tube of any obstruction. Clean area around rubber diaphragm.
	Pump is air locked.	Shut power off for approximately 1 minute, then restart. Repeat several times to clear air from pump. If system includes a check valve, a 3/16″ hole should be drilled in discharge pipe approximately 2″ above discharge flange connection.
	Liquid inflow matches pump capacity.	Larger pump required.
Pump Runs But Does Not Discharge Liquid	Check valves installed backwards.	Check flow indicating arrow on check valve body to insure it is installed properly.
	Check valve stuck or plugged.	Remove check valve and inspect for proper operation.
	Lift too high for pump.	Check rating table.
	Inlet to impeller plugged.	Pull pump and clean.
	Pump is air locked.	(See corrective action above)
Pump Does Not Deliver Rated Capacity	Lift too high for pump.	Check rating table.
	Low voltage, speed too low.	Check for proper supply voltage to make certain it corresponds to nameplate voltage.
	Impeller or discharge pipe is clogged.	Pull pump and clean. Check pipe for scale or corrosion.
	Impeller may be rotating in the wrong direction.	**Single Phase Units**—Shut off power and allow impeller to stop rotating. Turn pump on again, and pump should self-correct rotation. Long discharge pipe without check valve allows liquid to drain back to sewage basin, rotating impeller backwards. If pump starts while impeller is rotating in the wrong direction, it will continue to operate in that direction. **Three Phase Units**—Interchange any two (2) power lead connections.
	Impeller wear due to abrasives or corrosion.	Replace worn impeller.
Pump Cycles Continually	No check valve in long discharge pipe allowing liquid to drain back into basin.	Install a check valve in discharge line.
	Check valve leaking.	Inspect check valve for correct operation.
	Sewage basin too small for inflow.	Install larger size sewage basin.

Note: Pump will not handle larger than ¾″ soft solid.

GOULDS PUMPS, INC.
SENECA FALLS NEW YORK 13148

Form No. 9864A-WS

APPENDIX L

LOS ALAMOS PROCEDURE FOR IDENTIFICATION AND SEGREGATION OF HAZARDOUS WASTE

APPENDIX L

LOS ALAMOS PROCEDURE FOR IDENTIFICATION AND SEGREGATION OF HAZARDOUS WASTE

I. IDENTIFICATION

When chemical waste is ready for disposal, personnel at the generating laboratory fill out a Chemical Disposal Request Form and submit it to HSE-7. Since this form lists the chemicals to be disposed of, HSE-7 staff can assign a Reactivity Group Number (RGN) to each container or bottle. The RGN is found from Figure 1 (excerpted from EPA-600/2-80-076). The referenced EPA document, "A Method for Determining the Compatibility of Hazardous Waste," serves as the basis for the Los Alamos procedure. For additional information, the user is referred to the EPA document cited. In addition to assigning a RGN to each container, HSE-7 clearly identifies those wastes which are restricted from land disposal.

II. SEGREGATION

The basic segregation scheme is organics, corrosive acidic waste, corrosive basic waste, oxidizers, reactive materials, and nonreactive metals. Utilizing the RGN assigned to the container and Table 1, an area for storage/packaging of the waste is assigned. The organics and oxidizers have subcategories of segregation that will be followed by packaging/mixing of wastes to ensure that potential incompatibles are not combined together. Wastes restricted from land disposal are clearly marked as such and are stored with other compatible waste.

TABLE 1

STORAGE CATEGORY	PACKAGING CATEGORY	RGN
Organics (1)	A	4, 5, 9, 13, 14, 16, 17, 19, 26, 29, 31, 32, 101
	B	6, 7, 8, 27, 28
	C	12, 20
	D	34, 18
Oxidizers (2)	A	2
	B	104
	C	30
Acids (3)	N/A	1, 3
Bases (4)	N/A	10, 11, 33, 105
Reactives (5)	N/A	21, 22, 25, 102, 107 - ALL STORED INDIVIDUALLY - NO COMBINING ALLOWED
Nonreactive Metals (6)	N/A	11, 15, 23, 24, 33 - 11 and 33 would only be allowed in labpack, solid quantities -
Others		The following must be evaluated on a case-by-case basis to determine which of the above categories is appropriate: 25, 102, 103.

REACTIVITY GROUP NO	REACTIVITY GROUP NAME	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Acids, Mineral, Non-oxidizing	1												
2	Acids, Mineral, Oxidizing		2											
3	Acids, Organic		G_H	3										
4	Alcohols and Glycols	H	H_F	H_P	4									
5	Aldehydes	H_P	H_F	H_P		5								
6	Amides	H	H_{GT}				6							
7	Amines, Aliphatic and Aromatic	H	H_{GT}	H		H		7						
8	Azo Compounds, Diazo Compounds and Hydrazines	H_G	H_{GT}	H_G	H_G	H			8					
9	Carbamates	H_G	H_{GT}						G_H	9				
10	Caustics	H	H	H		H				H_G	10			
11	Cyanides	GT_{GF}	GT_{GF}	GT_{GF}					G			11		
12	Dithiocarbamates	H_{GF_F}	H_{GF_F}	$H_{GF_{GT}}$		GF_{GT}		U	H_G				12	
13	Esters	H	H_F						H_G		H			13
14	Ethers	H	H_F											
15	Fluorides, Inorganic	GT	GT	GT										
16	Hydrocarbons, Aromatic		H_F											
17	Halogenated Organics	H_{GT}	$H_{F_{GT}}$					H_{GT}	H_G		H_{GF}	H		
18	Isocyanates	H_G	$H_{F_{GT}}$	H_G	H_P			H_P	H_G		H_{P_G}	H_G	U	
19	Ketones	H	H_F						H_G		H	H		
20	Mercaptans and Other Organic Sulfides	GT_{GF}	$H_{F_{GT}}$						H_G					
21	Metals, Alkali and Alkaline Earth, Elemental	GF_{H_F}	GF_{H_F}	GF_{H_F}	GF_{H_F}	GF_{H_F}	GF_H	GF_H	GF_H	GF_H	GF_H	GF_H	GF_{GT_H}	GF_H
22	Metals, Other Elemental & Alloys as Powders, Vapors, or Sponges	GF_{H_F}	GF_{H_F}	GF					$H_{F_{GT}}$	U	GF_H			
23	Metals, Other Elemental & Alloys as Sheets, Rods, Drops, Moldings, etc.	GF_{H_F}	GF_{H_F}						H_{F_G}					
24	Metals and Metal Compounds, Toxic	S	S	S			S	S			S			
25	Nitrides	GF_{HF}	H_{F_E}	H_{GF}	GF_{H_E}	GF_H			U	H_G	U	GF_H	GF_H	GF_H
26	Nitriles	$H_{GT_{GF}}$	$H_{F_{GT}}$	H							U			
27	Nitro Compounds, Organic		$H_{F_{GT}}$			H					H_E			
28	Hydrocarbons, Aliphatic, Unsaturated	H	H_F			H								
29	Hydrocarbons, Aliphatic, Saturated		H_F											
30	Peroxides and Hydroperoxides, Organic	H_G	H_E		H_F	H_G		H_{GT}	H_{F_E}	$H_{F_{GT}}$		$H_{E_{GT}}$	$H_{F_{GT}}$	
31	Phenols and Cresols	H	H_F						H_G					
32	Organophosphates, Phosphothioates, Phosphodithioates	H_{GT}	H_{GT}						U		H_E			
33	Sulfides, Inorganic	GT_{GF}	HF_{GT}	GT		H			E					
34	Epoxides	H_P	H_P	H_P	H_P	U		H_P	H_P		H_P	H_P	U	
101	Combustible and Flammable Materials, Miscellaneous	H_G	$H_{F_{GT}}$											
102	Explosives	H_E	H_E	H_E					H_E		H_E			H_E
103	Polymerizable Compounds	P_H	P_H	P_H					P_H		P_H	P_H	U	
104	Oxidizing Agents, Strong	H_{GT}		H_{GT}	H_F	H_F	$H_{F_{GT}}$	$H_{F_{GT}}$	H_E	$H_{F_{GT}}$		$H_{E_{GT}}$	$H_{F_{GT}}$	H_F
105	Reducing Agents, Strong	H_{GF}	$H_{F_{GT}}$	H_{GF}	H_{GF_F}	GF_{H_F}	GF_H	H_{GF}	H_G				H_{GT}	H_F
106	Water and Mixtures Containing Water	H	H						G					
107	Water Reactive Substances	← EXTREMELY REACTIVE!												
		1	2	3	4	5	6	7	8	9	10	11	12	13

Figure 1. Hazardous waste compatibility chart.

Reactivity Code	Consequences
H	Heat generation
F	Fire
G	Innocuous and non-flammable gas generation
GT	Toxic gas generation
GF	Flammable gas generation
E	Explosion
P	Violent polymerization
S	Solubilization of toxic substances
U	May be hazardous but unknown

Example:

$H_{F_{GT}}$	Heat generation, fire, and toxic gas generation

	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	101	102	103	104	105	106	107
14																												
15																												
16																												
17																												
18																												
19																												
20				H	H	H																						
21				H_E	GF_H	GF_H	GF_H																					
22				H_E	GF_H		H_{GF_F}																					
23				H_F																								
24																												
25				GF_H	U	GF_H	GF_H	E																				
26								H_P			S	GF_H																
27								H_{GF_E}				H_{GF_E}																
28									H_E																			
29																												
30				H_E	H	E	$H_{F_{GT}}$	H_E	P_U		H_G	H_{GF_E}	$H_{P_{GT}}$		H_P													
31					H_P			GF_H				GF_H					H											
32								H									U											
33					H												H_{GT}											
34							H_P	H_P	H_P		H_P	H_P					H_P	H_P	U	H_P								
101								H_{G_F}				H_{GF_F}					$H_{F_{GT}}$											
102								H_E	H_E	H_E	E	E					H_E	H_E		H_E	H_E	H_E						
103								P_H	P_H	P_H	P_H	P_H					P_H	P_H		P_H			H_E					
104	H_F		H_F	H_{GT}	$H_{F_{GT}}$	H_F	$H_{F_{GT}}$	H_{F_E}	H_{F_E}	H_F		H_{F_E}	$H_{F_{GT}}$	H_E	H_F	H_F	H_G	H_F	$H_{F_{GT}}$	$H_{F_{GT}}$	H_{F_G}	H_{F_G}	H_E	$H_{F_{GT}}$					
105				H_E	GF_H	GF_H	GF_H						H_{GF}	H_E			H_E	GF_H	GT_{GF_H}	H	GF_H	H_E	$H_{P_{GF}}$	H_{F_E}				
106					H_G			GF_H	GF_H		S	GF_H							GT_{GF}						GF_{GT}			
107																												

DO NOT MIX WITH ANY CHEMICAL OR WASTE MATERIAL! EXTREMELY REACTIVE! →

Figure 1. Hazardous waste compatibility chart (continued).

APPENDIX M
BULGING DRUM PROCEDURE

LOS ALAMOS PROCEDURE FOR HANDLING BULGING OR LEAKING DRUMS

Bulging Drums

1. Identify the material inside the drum, based on drum log or inventory records.

2. Based upon the hazardous characteristics of the material in the drum, select appropriate personnel protective, emergency equipment and new receiving time.

3. After donning personnel protective equipment and securing emergency equipment, carefully and slowly open a bung to relieve the internal pressure.

4. Use a portable hand-pump (see Appendix K for vendor information) to transfer the material from the bulging drum to the new receiving drum. Properly mark new receiving drum.

5. Be certain that the contents of the bulging drum have been emptied into the new receiving drum.

6. If the material is an acutely hazardous waste, rinse the bulging drum three times with an appropriate solvent and handle rinsate as a hazardous waste.

7. Clean up any material that spilled during the transfer.

8. Remove or cover labels and send the empty bulging drum to the TA-54, Area L container storage area.

9. Promptly complete an inspection log and record details of transfer on the log.

Leaking Drums

1. Identify the material inside the drum, based on drum log or inventory records.

2. Based on the hazardous characteristics of the material in the drum, select appropriate personnel protective, emergency equipment and new receiving drum.

3. After donning personnel protective equipment and securing emergency equipment, spread absorbent material around the drum to absorb the leak.

4. Use a portable hand-pump to transfer the material from the leaking drum to the new receiving drum. Properly mark new receiving drum.

5. Be certain that the contents of the leaking drum have been emptied into the new receiving drum.

6. If the material is an acutely hazardous waste, rinse the leaking drum three times with an appropriate solvent and handle rinsate as a hazardous waste.

7. Remove or cover labels and send the empty leaking drum to the TA-54, Area L container storage area.

8. Containerize the contaminated absorbent material and treat as a hazardous waste.

9. Promptly complete a weekly inspection log and record transfer and clean-up actions on the log.

AMENDED PAGES FOR

APPENDIX M-1

APPENDIX M-1

SOP FOR THE TREATMENT TANKS AT AREA L, TA-54

SOP FOR THE TREATMENT TANKS AT AREA L, TA-54

I. INTRODUCTION

This SOP establishes the operational and general health and safety procedures for the use of the treatment tanks at Area L, TA-54. Individuals responsible for the overall operations under this SOP are the HSE-7 Section Leader and Associate Group Leader for Solid Waste Operations. They must approve any deviations from this SOP.

II. DESCRIPTION OF OPERATIONS

A. General

1. A minimum six-inch freeboard must be maintained in the tanks at all times.
2. If a snow or rainstorm is pending, the tanks shall be covered. The covers consist of four-inch rigid foam with removable plastic slip covers. They are held in place with elastic straps. Since the solutions in the tanks are agrieous and neutral, there is not a problem of incompatibility with the covers.
3. The tanks will be lined in the following manner except when reactives are treated.
   a. A cargo net is laid in the tank. This aids in the removal of the liner.
   b. Two plastic liners are placed in the tank, the excess brought to the outside of the tank and tied in-place with rope. This minimizes the wind causing the liner to billow.

B. Chemical Treatment of Ammonium Bifluoride

1. The waste shall be pumped into the lined tank by use of the submersible pump if delivered by tank truck or drum pump if delivered in drums.
2. While agitating the waste, lime and calcium chloride will be added. This binds the free fluoride as calcium fluoride.
3. Solution is left in tank to evaporate free liquid.
4. When solution has evaporated to a slurry, cement is added. The cement mix is placed in 55-gallon drums for disposal.
5. Liner is removed and disposed of at Area G since this is a non-RCRA waste.

C. Evaporation of Treated Salt Solutions

1. Treated cyanide, chromium or metal acid/base solutions can be transported from the TA-50 batch treatment system to Area L in drums.
2. The drums will be emptied with the drum pump into the lined tank.
3. Solution will remain in tank to evaporate.
4. When the solution has evaporated to a slurry, cement will be added. The cement mix and the liner will be placed in 55-gallon drums for storage at Area L and disposal at a permitted landfill.

D. Treatment of Radioactive Lithium Hydride

1. A liner will not be used during the treatment of reactives.
2. The tank will be filled to the halfway mark with water.
3. The chunks of lithium hydride will slowly be added to the tank. No more than five pounds of LiH should be in the tank reacting at any time.
4. When treatment is complete and the waste is no longer reactive, the caustic solution will be pumped into drums and transported to TA-50 for neutralization in the industrial wastewater treatment system.

III. HEALTH AND ENVIRONMENTAL CONCERNS

A. Chemical exposure of personnel.

B. Leak from a tank/release of tank contents.

C. Fire from lithium hydride treatment.

IV. PROCEDURES FOR SAFE OPERATIONS

A. Personal protective equipment/measures.

1. Safety glasses/face shields, gloves, and labcoats or coveralls are required to be worn.
2. Safety shoes shall be worn during all waste handling operations.
3. Respirators, either full-face or SCBA, will be used as necessary per instructions from HSE-5.
4. The emergency shower and eyewash must be checked to assure that it is operative prior to starting any treatment operations.
5. Two people must be present during treatment operations.

B. Spill control measures

Any release from a treatment tank will be contained within the concrete containment. A major release from a tank would initiate the procedures of the Hazardous Waste Contingency Plan. A minimum of the following materials will be maintained at Area L for emergency draining of a tank:

- Ten 55-gallon metal drums
- Ten drum liners
- Ten bags of vermiculite

The submersible pump would be used to draw down the liquid in the tanks. It would also be used for pumping any solution from within the containment area. The drums would be stored at Area L.

C. Fire protection measures

1. Smoking is prohibited inside the Area L enclosure at all times.
2. The quantity of lithium hydride to be treated at any one time is limited to five pounds because of hydrogen production. Only large pieces and incidental fines of lithium hydride will be treated by this method. TREATMENT OF LARGE QUANTITIES OF LiH FINES IS NOT

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PROVIDED FOR BY THIS SOP.

3. In case of a fire, the emergency procedures listed below and the Hazardous Waste Contingency Plan will be instituted.

V. RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT ACTIVITIES

HSE-7 uses the expertise and guidance of HSE-3 (Safety), HSE-5 (Environmental Surveillance) in the use of the treatment tanks. If the tanks were to be used for other waste streams, a Special Work Permit would be written and approved by these groups.

VI. TRAINING

The training requirements for personnel involved in this operation are covered in SOP CW-1. In addition, personnel shall read this SOP at least semi-annually. The Site Supervisor shall periodically review the tank performances of the technical personnel to insure understanding and compliance with these procedures.

VII. EMERGENCY PROCEDURES

A. Fire, explosion, or a major chemical release at Area L.

1. Evacuate immediate vicinity.
2. Call 9-911 and furnish information.
3. Notify HSE-7 Group Office (7-4301) and Site Supervisor.
4. Call the HSE-DO emergency number (7-7878).
5. Report to the muster area at Building 22.

B. Personnel injury

1. If toxic fumes are suspected, DO NOT ENTER AREA WITHOUT RESPIRATORY PROTECTION.
2. Render assistance to the injured party.
3. Remove any chemically contaminated clothing and keep party warm.
4. Call 9-911 for ambulance.
5. Notify HSE-7 Group Office and Site Supervisor.

VIII. RESPONSIBILITIES

The HSE-7 Section Leader for Solid Waste Disposal Operations has the overall responsibility for all operations at Area L. The Section Leader reports directly to the Associate Group Leader.

The Area L Supervisor is responsible for assuring that all personnel involved in the treatment of chemical wastes know and understand these procedures. All

instances of non-compliance will be reported by the Site Supervisor to the Section Leader, who is responsible for initiating appropriate corrective action.

CALL LIST

		Work	Home
Site Supervisor			
Section Leader	Karen Balo	7-6095	672-1369
Asso. Group Leader	John Warren	7-5397	662-9639
Deputy Group Leader	Lud Emelity	7-5839	753-7737
Group Leader	Ray Garde	7-4301	753-7737

APPENDIX M-2

STANDARD OPERATING PROCEDURE FOR THE CHEMICAL BATCH TREATMENT PLANT

STANDARD OPERATING PROCEDURE
FOR
THE CHEMICAL BATCH TREATMENT PLANT

1.0 INTRODUCTION

2.0 DESCRIPTION

3.0 HEALTH, SAFETY and ENVIRONMENTAL CONCERNS

4.0 PROCEDURES FOR SAFE OPERATIONS

- 4.1 Cyanide Destruction
- 4.2 Ammonia Destruction
- 4.3 Chromate Reduction and Heavy Metal Removal
- 4.4 General Safe Operating Regulations

5.0 RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT

- 5.1 HSE-2
- 5.2 HSE-3
- 5.3 HSE-5
- 5.4 HSE-7
- 5.5 HSE-9

6.0 TRAINING

7.0 EMERGENCY PROCEDURES

8.0 RESPONSIBILITIES

APPENDIX A RESPIRATORY PROTECTION EQUIPMENT PRACTICES

/Approved

1.0 INTRODUCTION

The Chemical Batch Treatment Plant(CBTP) is located at TA-50-1-24B (Figs 1 and 2). The process treats hazardous non-radioactive wastes and converts them to non-hazardous wastes. Two trained personnel are required to operate the CBTP.

2.0 DESCRIPTION

The waste is analyzed as received for pH, Cl^-, NH_3, CN^- metals content and density to determine the type of treatment required. It is also counted to insure the absence of any radionuclides. The main component of the CBTP is a 500 gallon Kynar-lined, jacketed reactor. The reactor is water heated and water cooled. Liquids and slurried solids may be charged from a feed tank or drum either directly into the bottom of the reactor or through a recycle loop. A four sq. ft cartridge and bag filter for removing solids is a part of the reactor system. Gases from the reactor pass through a a double-pipe heat exchanger to condense any vapors present. The vapor line goes to the top of building WM-1 or to the hood in Room 24B which goes into exhaust system FE-2. The reactor is under a negative pressure when the vent line goes to the hood.

Four gas sensors continually monitor the CBTP area for the presence of H_2S, HCN, Cl_2 and NH_3.

3.0 HEALTH, SAFETY AND ENVIRONMENTAL CONCERNS

3.1 The Health, Safety and Environmental concerns are personnel contact with the hazardous chemicals which are being handled during the operation of the CBTP. The chemicals can be toxic and/or corrosive and reactive. No combustible chemicals are processed or handled.

The chemicals and some of their properties are listed here. For a more complete description see the Manufacturers Safety Data Sheets (MSDSs) attached to this SOP:

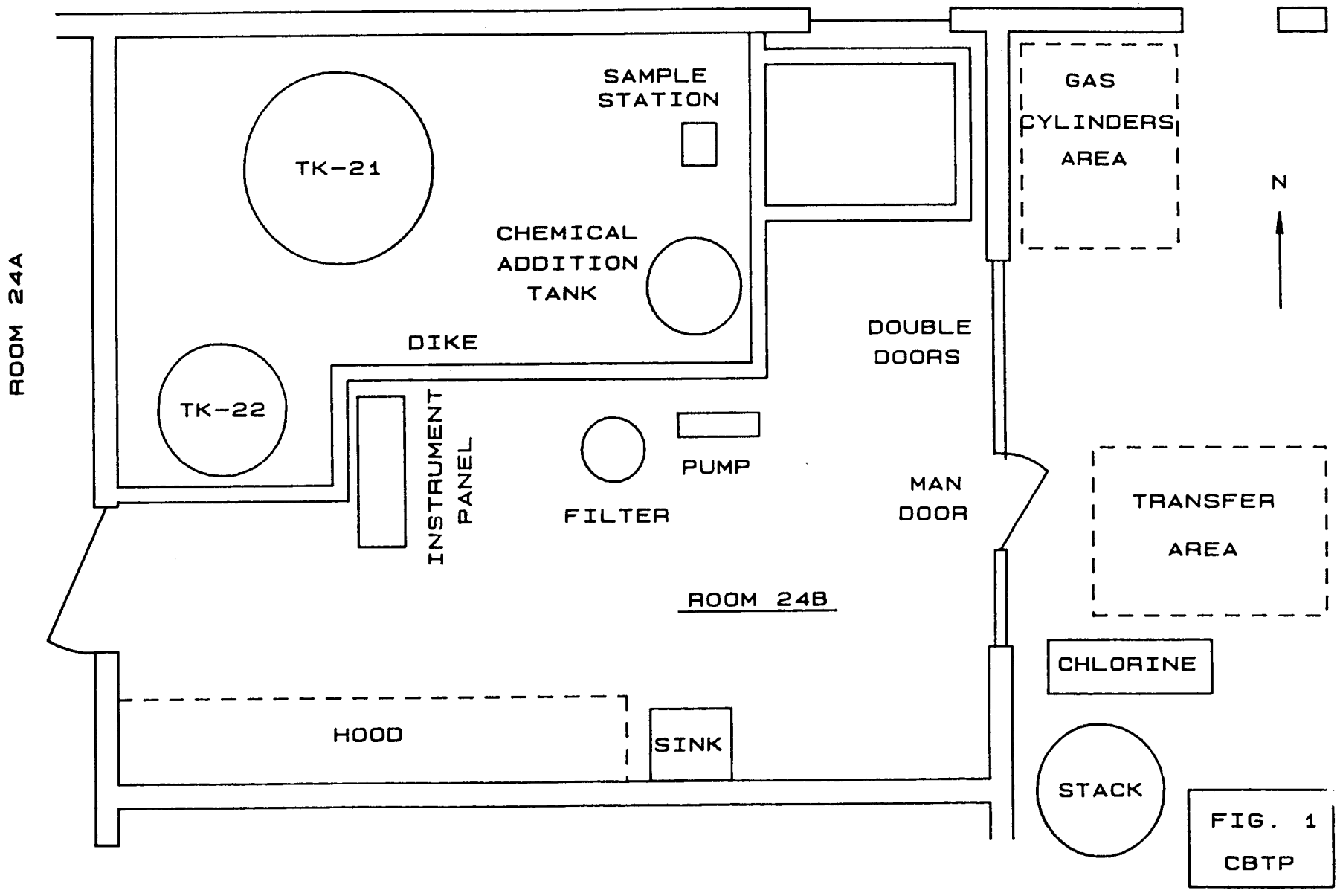

ROOM 24A
TK-21
TK-22
SAMPLE STATION
CHEMICAL ADDITION TANK
DIKE
INSTRUMENT PANEL
FILTER
PUMP
ROOM 24B
DOUBLE DOORS
MAN DOOR
GAS CYLINDERS AREA
N
TRANSFER AREA
CHLORINE
HOOD
SINK
STACK

FIG. 1
CBTP

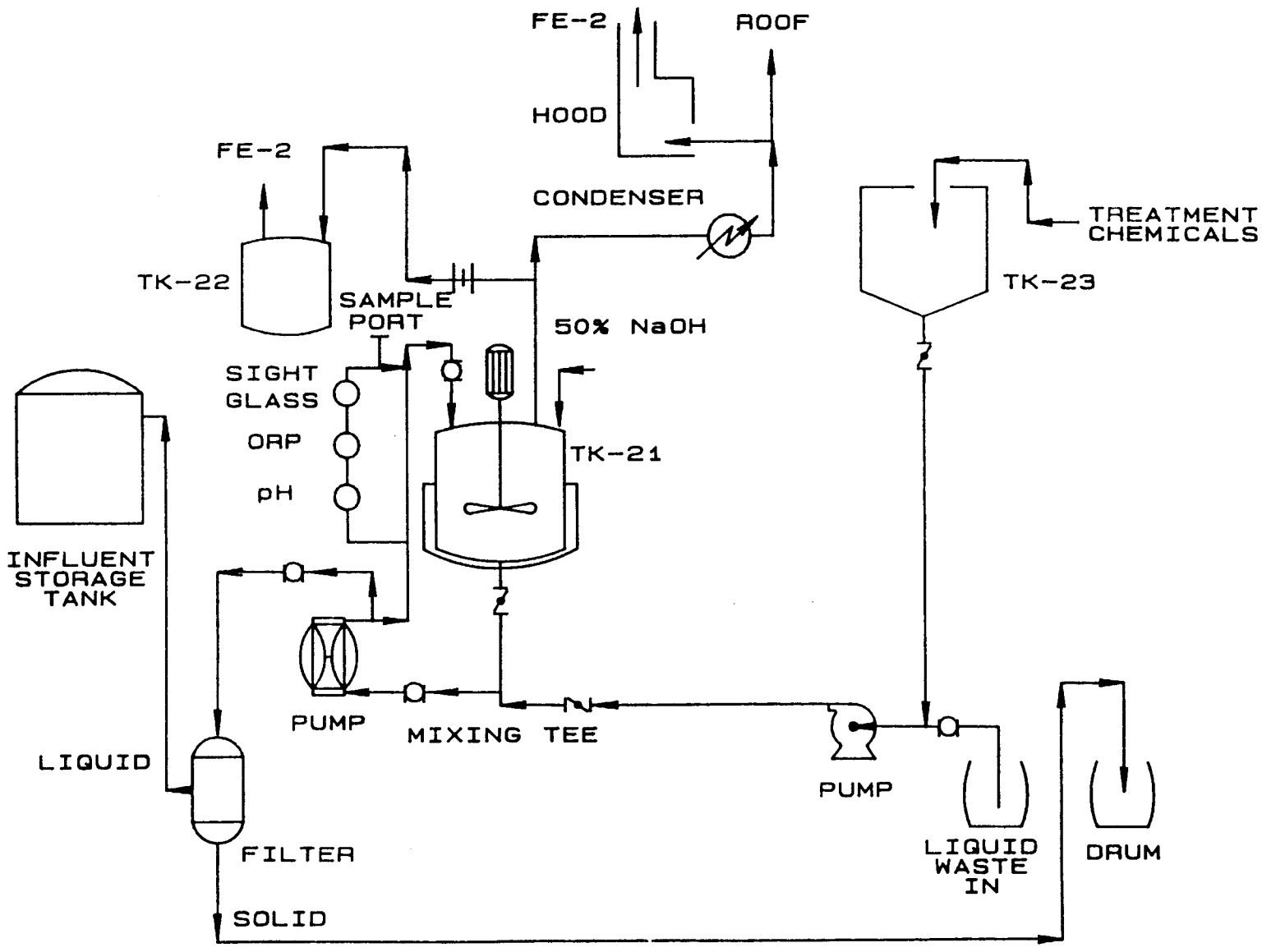


FIG. 2 CBTP - PROCESS FLOW SHEET

3.1.1 Calcium Hypochlorite: A powerful oxidant and a stable chlorine carrier.

3.1.2 Hydrogen Cyanide: An extremely toxic gas. TLV 10 ppm, IDLH 50 ppm.

3.1.3 Hydrogen Peroxide:Strong oxidizing agent. Concentrated solutions are toxic and strongly irritating. TLV 1 ppm, IDLH 75 ppm.

3.1.4 Potassium Permangate:Strong oxidizing agent.

3.1.5 Sodium Bisulfite: Irritating to skin and tissue. TLV 5mg/M^3, IDLH 100 mg/M^3.

3.1.6 Sodium Hypochlorite: Strong oxidizing agent, strong irritant to tissue, disagreeable sweet odor. Toxic by ingestion.

3.1.7 Sodium Hydroxide: Corrosive to tissue. TLV 2 mg/M^3, IDLH 200 Mg/M^3 .

3.1.8 Sodium Sulfide: Strong irritant to skin and tissue, liberates toxic H_2S on contact with acids.

3.1.9 Nitric or Sulfuric Acid: Strong oxidizers. May react violently when in contact with organic chemicals. Very corrosive to skin and eyes.

4.0 PROCEDURES FOR SAFE OPERATION

4.1 Cyanide Destruction

Cyanide is destroyed by an oxidation process using calcium hypochlorite $Ca(OCl)_2$ or sodium hypochlorite (NaOCl) as the oxidant. The cyanide contaminated material is charged to the reactor and the pH is adjusted to between 9.5 and 12 by adding sodium hydroxide or sulfuric acid as needed. As the oxidant is added the pH/ORP is monitored (Fig.3). Cyanide is oxidized to cyanate. Periodic addition of caustic is required during the processing to keep the pH up. When the ORP is between +350 and +400

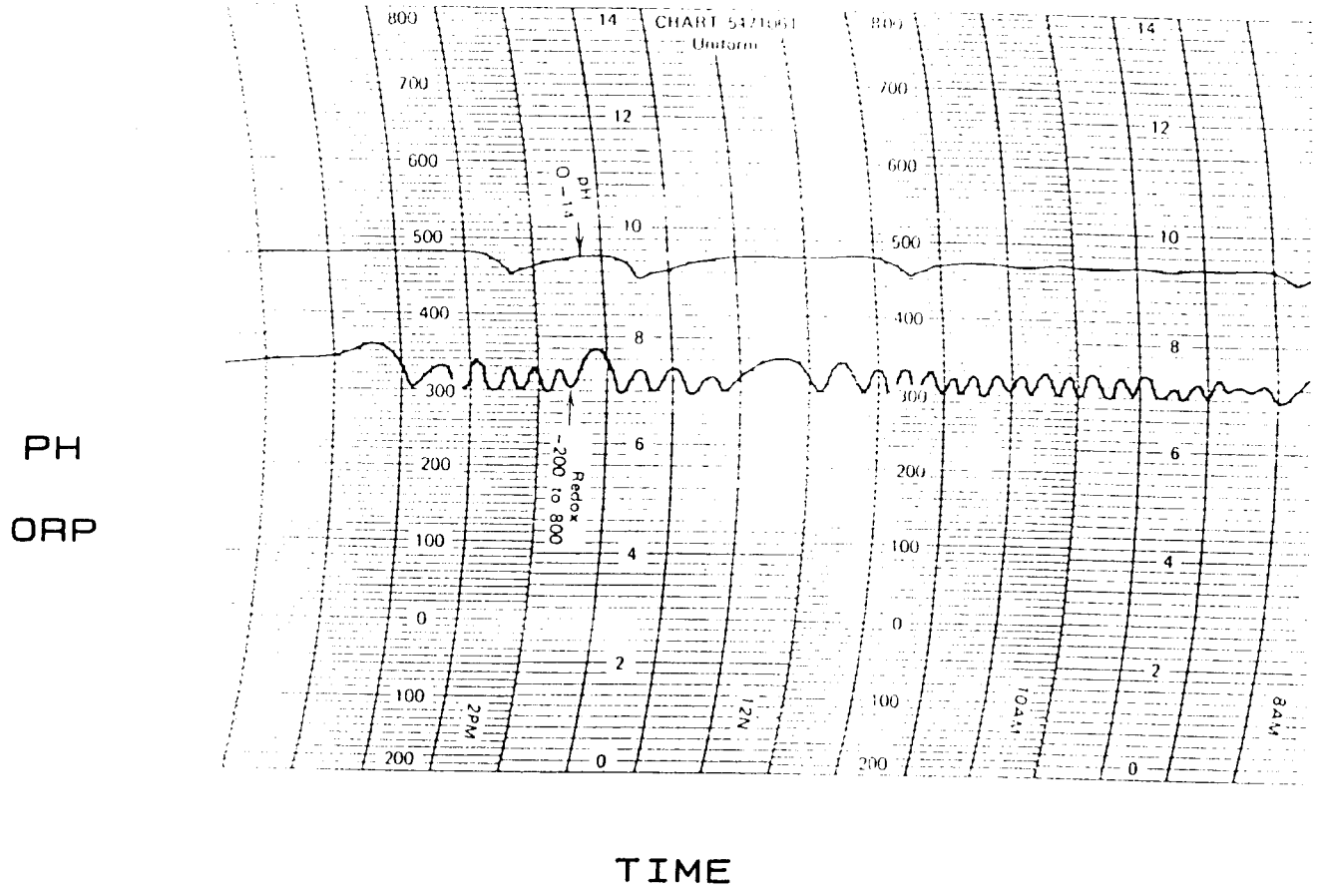


FIG. 3 PH/ORP VS TIME

mV, the total cyanide level is less than 0.2 mg/L. Further oxidation then converts the cyanate to carbon dioxide and nitrogen. When the cyanate level is determined to be below 0.5 mg/L by lab analysis, the destruction is considered complete.

4.2 Ammonia Destruction

Ammonia wastes are also destroyed by oxidation with hypochlorite, peroxide, or permangate. Any solution which has been treated for cyanide will also have destroyed any ammonia present. Periodic addition of caustic is required during the processing to keep the pH up. Hypochlorite is continued until a reading of +600 mV is obtained on the ORP meter. If a batch sample is less than 10 mg/L NH_3, the destruction is considered complete.

4.3 Chromate Reduction and Heavy Metal Removal

Hexavalent chrome is reduced to the +3 state by the addition of sodium bisulfite to the batch tank containing the cr^{+6}. Sodium hydroxide is then added slowly to the waste solution to precipitate out the chrome and any other heavy metals present as the hydroxide.

4.4 General Safe Operating Regulations

4.4.1 Any time the reactor temperature exceeds 120°F, cooling water is turned on to the jacket until the temperature is less than 90°F.

4.4.2 The pH/ORP meter is calibrated before each batch.

4.4.3 A safety shower, eye wash sink and a hose bib are kept in the CBTP area.

4.4.4 All valves, lines and connections are checked before and during operations for leaks.

4.4.5 While chemicals are being added or during sampling the reactor is vented to the hood.

4.4.6 The mixer is always turned on whenever chemicals are being added.

4.4.7 Chemical charging lines are rinsed after each new chemical is added.

4.4.8 The reactor and associated piping are rinsed with water after each batch.

4.4.9 Two trained operators are present during treatment.

4.4.10 All personnel wear protective clothing and equipment whenever they are performing an acid or caustic transfer. The gear consists of:

- A Saranex suit,
- Close-fitting safety goggles , face shield and a hard hat,
- Rubber gloves,
- Rubber boots or rubber coverings over shoes.

4.4.11 Detailed operating instructions(OI's) are written for each specific operation. The following OI's must be followed for the appropriate operation:

- Transfer of sodium hydroxide solutions.
- Operation of the Chemical Batch Waste Treatment Plant.
- Transfer of Batch Waste to the 75,000 gal(285,000 L) Influent Tank.

4.4.12 If another chemical not mentioned in this SOP is to be processed in the CBTP, a Special Work Permit (SWP) is prepared and approved for that chemical before processing.

5.0 RELATIONSHIPS BETWEEN OPERATIONS AND SUPPORT

5.1 HSE-2 Occupational Medicine:

Provide emergency or first aid care in the event of any corrosive or toxic chemical contact on personnel.

5.2 HSE-3 Safety:

Provide support for operations by review of this SOP and by inspection of the process for any industrial safety considerations.

5.3 HSE-5 Industrial Hygiene:

Provide support for operations by review of this SOP, by recommendations for personal protective equipment, and by inspection of the process for any industrial hygiene considerations.

5.4 HSE-7 Waste Management:

Responsible for all operations involving the Chemical Batch Treatment Plant not specifically assigned to another Group.

5.5 HSE-9 Analytical Chemistry:

Perform analytical chemical analysis as required, on the waste before, during and after processing.

6.0 TRAINING

All HSE-7 personnel involved will initial the Section Leaders Training forms to indicate:

6.1 They have read and understood the requirements of this SOP.

6.2 They have read and understood the operating instructions referenced in section 4.4.9.

6.3 They have discussed with their supervisor the hazards involved in the handling of corrosive, reactive and toxic chemicals.

6.4 They have received on-the-job training by a qualified operator.

6.5 They have a HSE-5 Respirator card showing they have had the following training:

- Full Face Mask
- SCBA

6.6 They have personal copies of the HSE-7 Safety Policy and the HSE-7 Site Emergency Plan.

6.7 They have had Fork Lift Vehicle Operation training.(optional)

6.8 They have received Hazard Communications training.

7.0 EMERGENCY PROCEDURES

7.1 If any **CORROSIVE** chemical contacts the skin or eyes:

7.1.1 The affected areas must be flushed immediately with large volumes of low pressure water from an emergency shower or a hand-held eye wash.

7.1.2 Contaminated clothing or shoes must be removed and disposed of.

7.1.3 If contact appears to be minor, personnel receiving *any* burns should still report to HSE-2 for an examination.

7.1.4 If burns are extensive or if any **TOXIC** chemicals are inhaled, ingested or are contacted with the skin or eyes remove the contaminated person from the area and:

- *Call an ambulance at 9-911.*
- *Notify the HSE-2 Group Leader at 7-0660.*
- *Meet the ambulance outside at the site and direct the medical personnel to the patient.*
- *Direct the ambulance to take the victim to the HSE-2 emergency entrance at TA-3-409.*
- *Notify the HSE-7 Group Leader or Deputy as soon as possible.*

7.2 If there is an **ACCIDENT** or **SPILL** of chemicals that could be hazardous to personnel in the building operators are to:

7.2.1 Pull the nearest fire alarm lever, or use the building paging system to notify occupants to evacuate.

7.2.2 Close any chemical feed valves.

7.2.3 Leave the area by the shortest and safest route.

7.2.4 Evacuate to the muster area.

7.2.7 Re-enter the area with caution and only with the approval of the Group Leader.

7.2.6 Consult HSE-5 for recommendations if personal protective equipment might be needed to re-enter the CBTP .

7.3 If there is a **POWER LOSS** while treating a batch:

7.3.1 Stay calm,

7.3.2 Close feed lines,

7.3.3 Adjust the operation to a safe "standby" **IF IT WILL ONLY TAKE A FEW SECONDS,**

7.3.4 Leave the building through the nearest exit door,

7.3.5 Go to the muster area,

7.3.6 Do not re-enter the building or CBTP without the approval of the Group Leader.

7.4 If one of the **HAZARDOUS GAS ALARMS** goes off:

7.4.1 Leave the area immediately.

7.4.2 Each operator put on a Saranex suit and a SCBA.

7.4.3 One operator go back into the area and check the alarm while the other stays outside in standby.

7.4.4 If the alarm is verified as true:

- Leave the area.
- Announce over the pager for all personnel to evacuate the building or pull the nearest fire alarm.
- Go to the muster area.
- Do not re-enter the building or the CBTP area without the approval of the Group Leader.

8.0 RESPONSIBILITIES

The Liquid Waste Operations Section of Group HSE-7 has the responsibility for the Chemical Batch Treatment Plant and for enforcing this SOP. The line management is as follows:

Brian Myers	Staff Member	MS E518	7-4301
Mort Sanders	Staff Asst	MS E518	7-4301
Jerry Buchholz	Section Leader	MS E518	7-4301
(New One)	Dep. Gp. Leader	MS E518	7-4301
Ralph Koenig	Group Leader	MS E518	7-4301

APPENDIX A
RESPIRATORY PROTECTION EQUIPMENT PRACTICES FOR THE CHEMICAL BATCH TREATMENT PLANT

1. INTRODUCTION

The use of respiratory equipment is necessary for the safety and well-being of Group HSE-7 employees engaged in certain waste treatment operations. Respiratory protection equipment is required where effective engineering controls are not yet feasible or where equipment failures or malfunctions could cause hazardous work environments. The Group HSE-7 Plant Operations Section Respiratory Practices Program is in accordance with ANSI Standard Z88.2-1969, Practices for Respiratory Protection and the respirator training program of Group HSE-5.

2. SCOPE

These respiratory protection procedures shall pertain to all Group HSE-7 liquid waste facilities, equipment and operations which may generate potentially hazardous atmospheres involving toxic materials or oxygen deficiencies.

3. RESPONSIBILITIES

The Section Leader for Liquid Waste Operations or the Alternate is responsible for assuring that respiratory protection practices are performed in accordance with the respiratory protection practices outlined in this SOP and any incidents involving the use of respiratory equipment must be reported immediately to Group HSE-5.

HSE-7 personnel shall inspect the self-contained breathing apparatus (SCBA's) periodically; the interval between inspections can be as individually desired, but must not exceed one month. Each inspection must be signed and dated with the breathing air cylinder PSI marked on the inspection sticker. A SCBA inspection form must be completed and sent to HSE-5 - MS486. An inspection and donning procedure is available in each SCBA carrying case. SCBA's shall also be inspected after each use. Group HSE-5 shall be notified immediately of any respirator defects, and the SCBA unit shall be replaced. HSE-5 shall also be notified when the SCBA has been used so that the breathing air tank is immediately replaced.

The HSE-1 HPT shall insure that each respirator user has a current respirator authorization card for the type of respirator that is worn. The HSE-1 HPT shall examine the photo on the respirator authorization card to determine if additional facial hair is present. Additional facial hair voids the respirator authorization card. If this situation occurs, the employee shall not be allowed to wear the respirator or enter any hazardous environment and Group HSE-5 shall be notified immediately to pick up the respirator authorization card.

Each employee shall comply with all health and safety regulations (verbal or written) and shall report any incident involving the improper utilization of respiratory protective equipment immediately to the supervisor.

4. MATERIAL, OPERATION AND EQUIPMENT CONTROLS

Full facepiece air-purifying respirators with high efficiency filter are are not approved for emergency situations or in environments containing toxic gases/vapors or in oxygen deficient environments (< 19.5% oxygen by volume). The respirator and canister shall be suited to the contaminant. If there are any questions, contact Group HSE-5.

SCBA's are approved for use in oxygen deficient environments and hazardous concentrations of toxic materials. If the environment contains materials which may be readily absorbed through the skin, an impervious suit is also required. Possible emergencies would include:

- chemical leaks or spills
- smoke
- emergency entry into a confined space

The MSA Model 401 utilizes a high pressure portable air tank which provides a high air flow rate to meet breathing demands during extreme exertion. Generally these units supply breathing air for up to 30 minutes of activity and are equipped with an audible alarm to indicate when the breathing supply is low. The air used for SCBA's must meet the strict purity requirements of the Compressed Gas Association Specification G7.1 for Type I, Class D Breathing Air. Group HSE-5 has facilities available for filling these air tanks with air that meets these purity requirements.

5. PERSONNEL CONTROLS

Each respirator user shall have completed the comprehensive respirator training program (including quantitative fitting for air-purifying respirators) conducted by Group HSE-5 and have in his/her possession a current respirator authorization card for the type of respiratory equipment that is worn.

To prevent accumulation of dirt on the respirator, it should be cleaned after each use with the packets provided at the respirator fitting office. Always inspect air purifying respirators before and after use. Any deterioration shall be reported to the supervisor, and the respirator shall be replaced.

Respirators shall be returned to the TA-50 respirator laundry periodically for professional inspection, cleaning and testing. Frequent users shall return the respirator on a monthly basis, infrequent users shall return respirators on a semi-quarterly basis, and emergency equipment shall be inspected monthly and returned periodically.

Specific indications for canister replacement include:

- high breathing resistance
- leakage, indicated by smell, taste, eye, nose or throat irritation
- canister shelf life has been exceeded

Replacement canisters shall be obtained from Group HSE-5. Spent canister shall be returned to Group HSE-5 for disposal to prevent accidental re-use.

Any sign of nausea or dizziness while wearing a respirator requires an immediate return to uncontaminated air.

The air-purifying respirators shall be stored in a plastic bag with the lens or canister side down to prevent distortion of the sealing surface. Respirators shall be stored away from other equipment, sunlight and excessive heat or cold.

6. EMERGENCY

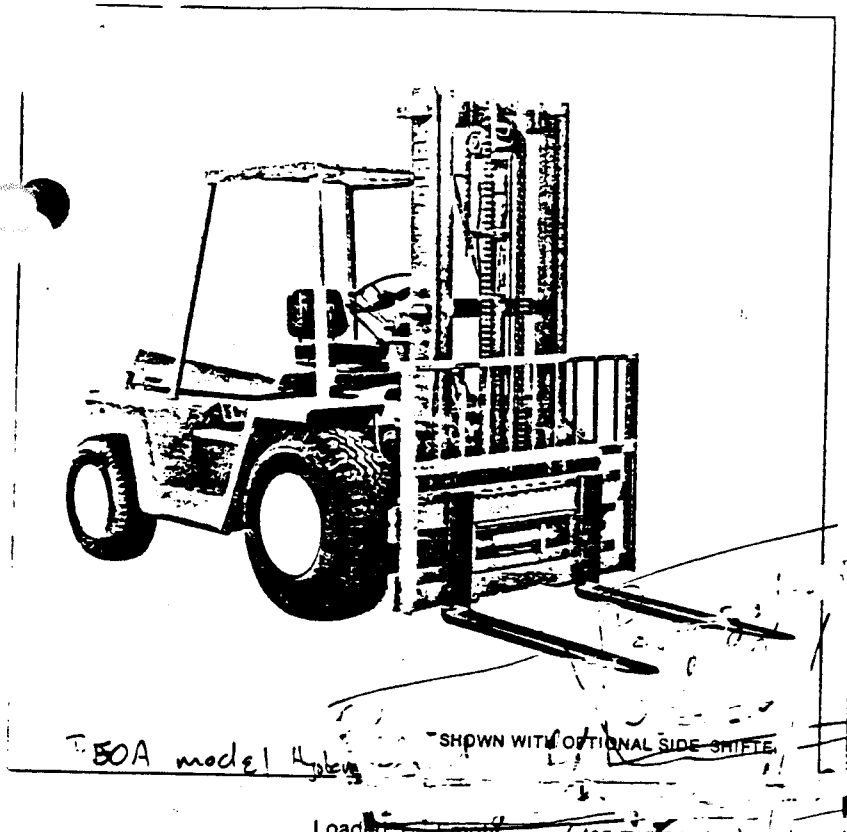
Dial 9-911 for emergency assistance. The buddy system shall be used with SCBA's, i.e., at least two individuals shall be suited-up and voice and/or visual communication shall be maintained.

7. REFERENCES

- Los Alamos Health and Safety Manual, AR12-1.
- Health and Safety Newsletter No. 75-4.
- Practices for Respiratory Protection, ANSI Z88.2-1969
- Occupational Safety and Health Standards, 29 CFR 1910, 1976

APPENDIX M-3

MANUFACTURERS SPECIFICATIONS ON DRUM HANDLING EQUIPMENT USED AT TA-54



T 50A model Hybrid

*SHOWN WITH OPTIONAL SIDE SHIFTER

Clark
Rough Terrain Truck

TT 60

Internal Combustion
2 Wheel Drive Towable Truck

6000 lbs. Rated Capacity
at 24-in. (600 mm) Load Center

2720 kg Rated Capacity
at 500 mm (20-in.) Load Center

Gasoline

SPEED ON GRADE:	Loaded mi/h	Loaded km/h	Empty mi/h	Empty km/h
0%	35.7	57.4	36.5	58.7
5%	12.2	19.6	20.6	33.1
10%	7.7	12.4	11.3	18.2
15%	5.5	8.9	8.9	14.3
4[illegible].2% @	1.0	1.6	—	—

MAX. GRADEABILITY %:	Loaded	Empty
(.9 cf)	49.6	33.4

MAX. DRAWBAR PULL:	lbs.	N
Rated Load	8168	36 331
Empty 0.9 cf	6082	27 053

	Standard ft/min	Standard m/s	Triple Stage ft/min	Triple Stage m/s
LIFTING SPEEDS:				
Loaded	63	0.32	75	0.38
Empty	65	0.33	80	0.41
LOWERING SPEEDS:				
Loaded	84	0.43	80	0.41
Empty	39	0.20	75	0.38

ENGINE: Ford 300, in-line, 6 cylinder overhead valve industrial engine. The engine incorporates cast iron cylinder block and head with 7 main bearing crankshaft, chrome plated piston rings, hard faced exhaust valves and valve seat inserts, positive exhaust valve rotators, full pressure lubricating system, and a sealed maximum velocity governor. 7 PSI *(48 kPa)* cooling system has 15 quart *(14 L)* capacity.

Model	300
Bore	4.00 in *(102 mm)*
Stroke	3.98 in *(101 mm)*
Displacement	300 cu in *(4.9 L)*
Max. No Load Governed Speed	2600 RPM
Crankcase Capacity	7 quarts *(6.6 L)*
Fuel Tank Capacity	20 gallons *(76 L)*

FILTERS: Spin-on engine oil filter with pleated paper element. Filtered crankcase breather. Donaldson Cyclopac, two stage, air cleaner with replaceable cartridge. Gasoline filter in a metallic bowl on inlet side of pump. Gas filler equipped with strainer. Spin-on transmission oil filter with a built-in bypass valve. Hydraulic system has ten micron *(ten micrometer)* replaceable filter at inlet side of pump, 30 mesh screen in filler neck, and replaceable fiber disc type filler cap breather.

ELECTRICAL SYSTEM: 60 amp hour battery and 37 amp Delco alternator with built-in electronic regulator. Enclosed electric starter with positive pinion engagement. Gauges for reading engine hours, engine oil pressure, engine temperature, battery charging rate and fuel level.

HYDRAULIC SYSTEM: Lift, lower, tilt and auxiliary control levers are mounted on steering column pylon for right hand operation. Full feathering spool type valves. Main hydraulic pump is direct driven. System fluid capacity is 17 gallons *(64 L)*. Sump tank of 25 gallon *(95 L)* capacity is integral with truck frame.

DRIVE TRAIN: Clark full floating drive axle driven by a double universal joint propeller shaft. Axle reduction ratio 6.3:1.

TRANSMISSION: Powershift forward and reverse transmission coupled to a four speed, fully synchronized gear case to provide 4 speeds in forward and reverse. A torque converter multiplies engine torque 2:1. Transmission fluid oil cooler located in the engine radiator. Equipped with neutral start switch. Left foot transmission release pedal, and right foot auxiliary throttle mounted on brake pedal that enables simultaneous operation of engine speed, brakes and transmission engagement. Left hand directional control lever and right hand floor mounted speed selector lever with latch to hold lever in neutral while towing.

STANDARD UPRIGHT: Interlocking "I" beam and channel rails that are reinforced with heavy tie bars. Four canted, variable retainment upright rollers and six canted load rollers on the carriage. Four lateral thrust carriage rollers that bear on the inner rails to resist deflection due to off-center loading. Upright rollers are shim adjustable without major upright disassembly. Non-rigid lift cylinder and tilt cylinder mounts minimize size loading on cylinder rods, seals and packings. Lift and tilt cylinders are serviceable without cylinder removal. Tilt cylinders are key locked to yokes for positive adjustment. Cylinder rods are chrome plated. The upright is mounted to a heavy tubular cross member with greaseable steel backed bushings. Urethane rod wipers and double 'U' cup packings on tilt cylinders. Anti-cavitation valve in tilt circuit. Hook mounted forks are upset forged for full section strength at fork heel. Pivot type forks are optional.

FRAME: Heavy, precision aligned, one-piece structure with integral fuel and hydraulic tanks of .25 in. *(6.3 mm)* plate. First step to operators compartment is open grating to reduce dirt and snow accumulation.

BRAKES: Hydraulic brakes with two stage master cylinder and dual wheel cylinders. Brake shoes are 4.0 in. *(102 mm)* wide and operate in 16.25 in. *(413 mm)* diameter drums. Equipped with Orschein adjustable lever and cable that actuates drum and band type parking brake at rear of transmission.

POWER STEERING SYSTEM: Fully fluid linked hydrostatic steering for positive hand wheel control. Dual steering cylinders provide constant steering rate. Cast steer axle is mounted on center pivot pin and two semi-elliptical leaf springs that allow up to 10 in. *(254 mm)* variation in tire height. Inclined king pins and axle caster promote improved tracking and towing characteristics. Pressure lubricant fittings on king pins and other steering components.

OVERHEAD GUARD: Meets ANSI B56.1 safety standards and has been subjected to an impact test of 16 000 ft-lbs *(21 693 N·m)*.

ADDED ADVANTAGES: 48 in. *(1220 mm)* high load backrest extension; protectoseal fuel tank cap; couple provision for towing auxiliary equipment; and multipass muffler. Standard bolts are SAE Grade 5, and are zinc phosphate coated or cadmium plated to resist corrosion.

OPTIONAL ACCESSORIES: Towing equipment, pivoting forks, block handling forks, lights, and tires for varied operating surfaces.

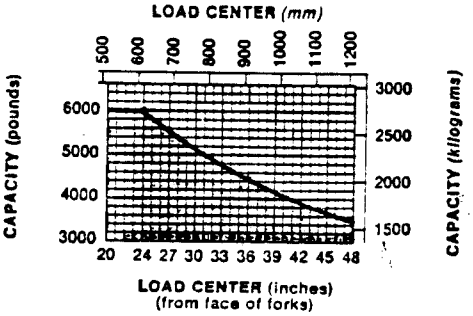
PAINT: Exposed surfaces have been shot blasted, primed, and painted with weather-

IT 60

6000 lbs. Rated Capacity at 24.00 (600 mm) Load Center
2720 kg Rated Capacity at 500 mm (21.5 in) Load Center

GENERAL DATA

CAPACITY CHART



NOTE: Capacities shown above are computed with upright in vertical position. Capacity up to 6,000 lbs. applies to uprights with maximum fork height up to 184 inches. Capacity up to *2720 kg* at *500 mm* load center applies to uprights with maximum fork heights to *3300 mm*. For trucks equipped with uprights above these maximum fork heights, contact a Clark representative. Specific capacities will be shown on truck nameplates.

UPRIGHT DIMENSION TABLE

TYPE	MAXIMUM FORK HEIGHT		OVERALL HEIGHT LOWERED		FREE LIFT	
	in	mm	in	mm	in	mm
STANDARD	*136	*3454*	104	*2642*	5.5	*140*
	148	*3760*	110	*2794*	5.5	*140*
	160	*4064*	116	*2946*	5.5	*140*
	184	*4674*	128	*3251*	5.5	*140*
TRIPLE STAGE	*288	*7315*	145	*3683*	112	*2845*
	360	*9144*	162	*4115*	129	*3277*

*Preferred standard heights.

Other upright heights available, contact Clark representative.

SERVICE WEIGHTS:	136 in. (3454 mm) Std.		288 in. (7315 mm) TSU	
	lb	kg	lb	kg
IT 60	12 400	*5625*	13 400	*6078*

UNDERCLEARANCES:

With Rated Load
- Upright ..... 9.2 in *(234 mm)*
- Drive Axle ..... 9.1 in *(231 mm)*

With No Load
- Steer Axle ..... 10.0 in *(254 mm)*
- Frame ..... 12.0 in *(305 mm)*
- Counterweight ..... 11.3 in *(287 mm)*

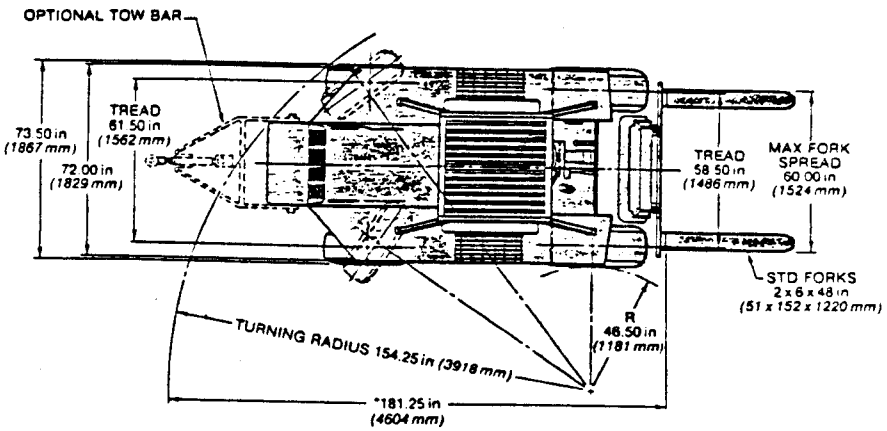
INSURANCE CLASSIFICATIONS: Classified by Underwriters' Laboratories, Inc. as to fire hazard only; type G industrial trucks. See UL Index of Classified Products.

PERFORMANCE CRITERIA . . .
Performance values based on full power engine operating conditions in accordance with SAE Standard J816 [85°F and 500 ft. altitude *(29°C and 152 m)*].

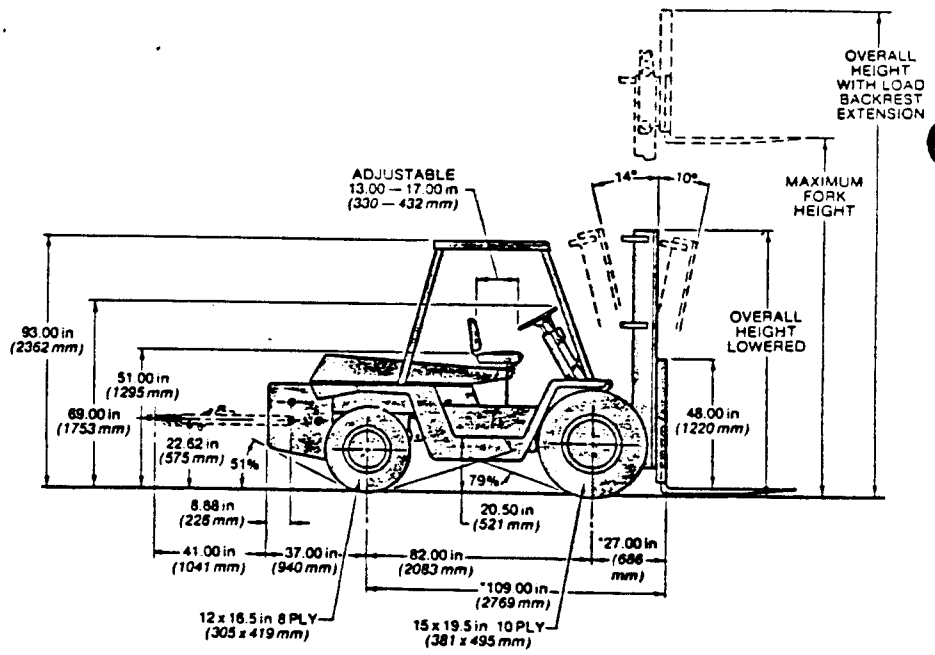
NOTE: Production engine driveline components may vary in output and/or efficiency by ± 5%. The performance shown represents nominal values which may be obtained under typical operating conditions of a standard machine. Slight variations may be expected due to local temperature and altitude and/or individual machine accessory and loaded weight conditions.

Metric specifications shown are equivalents of U.S. dimensions.

Clark products and specifications are subject to improvements and changes without notice.



FOR BASIC RIGHT ANGLE STACKING AISLE ADD LOAD LENGTH



*ADD 1.50 in *(38 mm)* FOR FULL FREE LIFT TRIPLE STAGE UPRIGHT

SERIAL NUMBER	IT581-32-4915	BC	MODEL	IT60	
CUSTOMER	Los Alamos Scientific Labs Los Alamos, NM		DEALER/ORDER 0308		S.R. NO. 263155
			JOB/ITEM 1219-11		SHIPPING DATE 28jan82
			DEALER Albuquerque		
			COUNTY Los Alamos		
20.376	187885	DRIVE AXLE SERIAL: 5045583	34.000	249M0798	UPRIGHT
20.287	124444	DIFFERENTIAL GEAR & CASE			PAGE 34-176,536,874
20.248	122574	RING & PINION SET	34.013a	1654614	ROLLER
23.016a	1317603	DRIVE TIRES 15x19.5x14"Ply	34.400	2358012	CYLINDER 34.400VP 358
00.000	2350186	ENGINE - MAKE FORD			PAGE 34-470
		SPEC. 300CID SERIAL: 17789		IN-18735	WIRING DIAGRAM
34.359a	1810170	FORK STOP PIN KIT	53.099	2377223-40	Side Shifter w/Flow
34.999a	2362721	LOAD BACK REST EXTENSION			Control Valve 33-038,
26.100	190996	STEERING AXLE SERIAL: 626979			53-102, 53-206, 53-678
26.142a	840867	KNUCKLE PIN KIT	33.000	2346216	Flow Control Valve
23.006a	1315821	STEER TIRES 12x16.5x8"Ply	33.002	999603	Valve Sub-Assy.
32.000/001	1763793	TILT CYLINDER	33.009	999601	Seal Kit
06.200	995656	TRANSMISSION, FWD & REV MAKE	53.020	2329090	Cylinder Assy.
		MODEL SERIAL: 3157	54.222	1811244	Packing Kit
08.440	1772754	TRANSMISSION (SPEED CHANGE)		2343579	Aux Valve Inst.
34.300	2356049	CARRIAGE PAGE 34-924	30.200	2343270	Aux Valve 30-190,
34.340a	2356048	WELDED ASSEMBLY			75(30)234
34.316a	1654614	ROLLER		2321584	Hose Adapt 50-237,
34.350a	1772403	FORKS 60"			50-191, 50-543

a No Serviceable Parts mb Fold MRC 65 Rev 3

P.I.C.	PARTS MANUAL #	MAINT. MANUAL #	P.M.A. MANUAL # 587.2	OP. MANUAL # 6V387
DATE 1 FEB 1982	DATE 1-100-19	DATE	DATE FEB 1 - 1982	DATE FEB 1 - 1982

DIVERSIONS	Los Alamos Scientific Labs,Los Alamos	PER NM 2z 22 Feb 82 342734
		PER
		PER
		PER
MODIFICATIONS AND CHANGES		PER
		PER
		PER
		PER

Dealer Use Only

MANUALS DELIVERED TO NAMES _____ TITLE _____

COMPANY _____

REMARKS

for Fonkenn

254574

PRODUCT IDENTIFICATION CARD FOR SERIALS STARTING [T581-1-4915

02.225	1615458	AIR CLEANER
02.242a	886525	ELEMENT
12.200	2365377	ALTERNATOR
12.234a	999307	BRUSH W/HOLDER
12.316a	994381	VOLTAGE REGULATOR
12.372a	2345324	ALTERNATOR BELT
13.043a	949286	AMMETER
12.010a	1310125	BATTERY - DRY
14.026a	784751	BATTERY GROUND CABLE
14.025a	1314543	BATTERY STARTER CABLE
23.245	119089	BRAKE - L.H.
23.214	894305	WHEEL CYLINDER
23.216a	863668	CYLINDER REPAIR KIT
23.244	119088	BRAKE - R.H.
23.215	894305	WHEEL CYLINDER
23.217a	363668	CYLINDER REPAIR KIT
23.247a	120450	SHOE & LINING - AXLE SET
23.150	2348867	BRAKE MASTER CYLINDER
23.159a	857349	REPAIR KIT
02.100		CARBURETOR GAS: 997411 LPG:
02.102a	992730	GASKET KIT
02.101a	992731	REPAIR KIT
11.201a	881097	COIL
11.300	1810871	DISTRIBUTOR
11.319a	899850	CAP
11.388a	996396	POINTS/ROTOR/CONDENSER
23.020	2372560	DRIVE WHEEL
21.001	1772755	DRIVE AXLE PROP SHAFT
21.002a	861452	CENTER CROSS REPAIR KIT
01.307a	899839	ENGINE OIL FILTER
13.052a	2353357	ENGINE OIL PRESSURE GAUGE
13.013a	6000171	ENGINE OIL PRESSURE GAUGE SENDER
13.057a	2353359	ENGINE TEMPERATURE GAUGE
13.011a	2338565	ENGINE TEMPERATURE GAUGE SENDER
01.406a	997412	FAN BELT
01.381a	997413	FAN BLADE
13.023a	947257	FUEL GAUGE
13.070a	1723625	FUEL GAUGE SENDER
02.755	890384	FUEL PUMP
02.760a	890729	REPAIR KIT
02.752a	890335	ELEMENT
02.060a	2344433	FUEL TANK CAP
13.003a	1330006	HORN
25.002a	1810444	HORN BUTTON SET
13.001a	733623	HORN RELAY
13.023a	1743826	HOUR METER
13.015a	740342	HOUR METER PRESSURE SWITCH

29.100	2364603	HYDRAULIC PUMP - MAIN
29.147a	991166	CARTRIDGE KIT
29.146a	888543	SEAL KIT
29.144a	991635	VANE KIT
21.200	2339903	HYDRAULIC PUMP PROP SHAFT
21.205a	992624	CENTER CROSS REPAIR KIT
13.047a	1790936	KEY SWITCH
02.582a	1756435	MUFFLER
13.022a	2345322	NEUTRAL STARTING SWITCH
39.932a	2340572	OVERHEAD GUARD
23.268	888025	PARKING BRAKE SHOE & LINING
23.697	2350027	PARKING BRAKE LEVER
01.550a	2344749	RADIATOR
01.570a	525313	CAP
01.577a	2351286	RADIATOR UPPER HOSE
01.600a	2340777	RADIATOR LOWER HOSE
39.719	995186	SEAT ASSEMBLY
39.721a	995188	BACK REST
39.720a	995187	CUSHION
11.020	992710	STARTER
11.043a	1810864	BRUSH SET
11.033a	991161	DRIVE ASSEMBLY
11.027a	884581	SOLENOID SWITCH
11.001a	215276	STARTER RELAY
26.000	1754228	STEERING CYLINDER
25.003a	885119	ROD SEAL KIT
25.001	2358453	STEERING GEAR
25.004a	1752863	STEERING HANDWHEEL
25.025	1751522	STEER WHEEL
29.738	2344074	SUMP FILTER
29.740a	1810889	ELEMENT
29.728a	2303783	SUMP FILLER CAP
01.596a	890330	THERMOSTAT
32.072a	1811179	TILT CYLINDER PACKING KIT
31.500	233471	TILT LOCK VALVE
10.105a	990937	TRANSMISSION OIL FILTER
05.000a	2342062	TORQUE CONVERTER
29.300a	896467	TORQUE CONVERTER PUMP
30.000	1625336	VALVE - LIFT & TILT
30.032a	892871	SEAL KIT - INLET SECTION
30.116a	892871	SEAL KIT - OUTLET SECTION
01.430	899845	WATER PUMP
14.114a	2340735	WIRING HARNESS

aNO SERVICEABLE PARTS

PU. HASE REQUEST/ORDER

REQUESTER: Retain Pink, Send Original, and Three (3) Copies (with interleaf carbon paper) To SP-D

RQT 017067

For Group H-8 Account Code _____ Program Code _____

Requested by John Warren Phone 5862 Date 1/14/74

SHADED AREAS for Supply & Property use ONLY

INCLUDE WRITTEN EXPLANATION IF DELIVERY TIME IS CRITICAL AND/OR SOLE SOURCE IS REQUESTED.

PLEASE ANSWER THE FOLLOWING QUESTIONS:

HAVE YOU CHECKED LASL STOCK FOR THIS ITEM OR SUITABLE SUBSTITUTE? YES ___ NO ___

SHOULD SP CONSIDER STOCKING THE ITEM(S)? YES ___ NO ___

ESTIMATED ANNUAL USAGE? ___

WILL INSTALLATION COSTS BE INCURRED? YES ___ NO ___

ENG DEPT. EST. $ ___

E-DIV EST. $ ___

Realistic Date Required 3/10/74

Deliver to Area TA-54 Bldg. Area G Room ___ Person John Warren

KNOWN AVAILABLE EXCESS LISTS HAVE BEEN REVIEWED.

Purchase Approved By ___

Group Leader or Authorized Alternate (Date)

FOR SP DEPT. USE ONLY

(Buyer) (Date) Phone Ext.

INV. TERMS From Rcpt of Goods or Invoice – whichever is later.

REQUIRED SHIPPING DATE

DATE OF ORDER

PURCHASE ORDER NO.

TO

BLANKET PURCHASE AGREEMENT

QUOTED BY PHONE DATE QUOTE NO.

F.O.B. SHIP VIA SHIP FROM

ITEM	DESCRIPTION OF REQUIREMENTS (SPECS)	QUANTITY	UNIT	UNIT PRICE	EXTENSION
1.	Forklift, gasoline driven, rough-terrain model, 5000 lb. capacity at 24" load center, new current model, constant mesh transmission, 3 speed forward & reverse, oil clutch, must climb a 25% grade wet, with rated load, 12 volt electrical system, pressure cooling system, full time - full flow hydraulic filter, power steering, hour meter, auxiliary throttle to be operated from brake pedal, telescoping upright, 113" overall lowered height, 168" maximum fork height (to top of forks), minimum tilt either direction 10%, load carriage not to exceed (CONTINUED ON PAGE 2)	1	ea.		
	SUGGESTED SOURCES: Escon 4019 Broadway, S.E. Albuquerque, N.M. 87102 Empire Clarklift, Inc. 3411 Gerard N.E., Albuquerque, N.M. 87107				
	TOTAL EST. COST				

ITEMS	TOTAL COST	ACCOUNT	PROGRAM	LOC.	SOR.	EXP.	PAREN.	JOB ORDER	ORDER	PROC.	WORK	8 BIDS REQ. M/S

BIDS RECD. M/S	M/S	BIDS REJ.	SURPLUS	SOURCE	ACCEPT	SELLERS NO.	EXPEDITE	DUE DATE	SHIP DATE

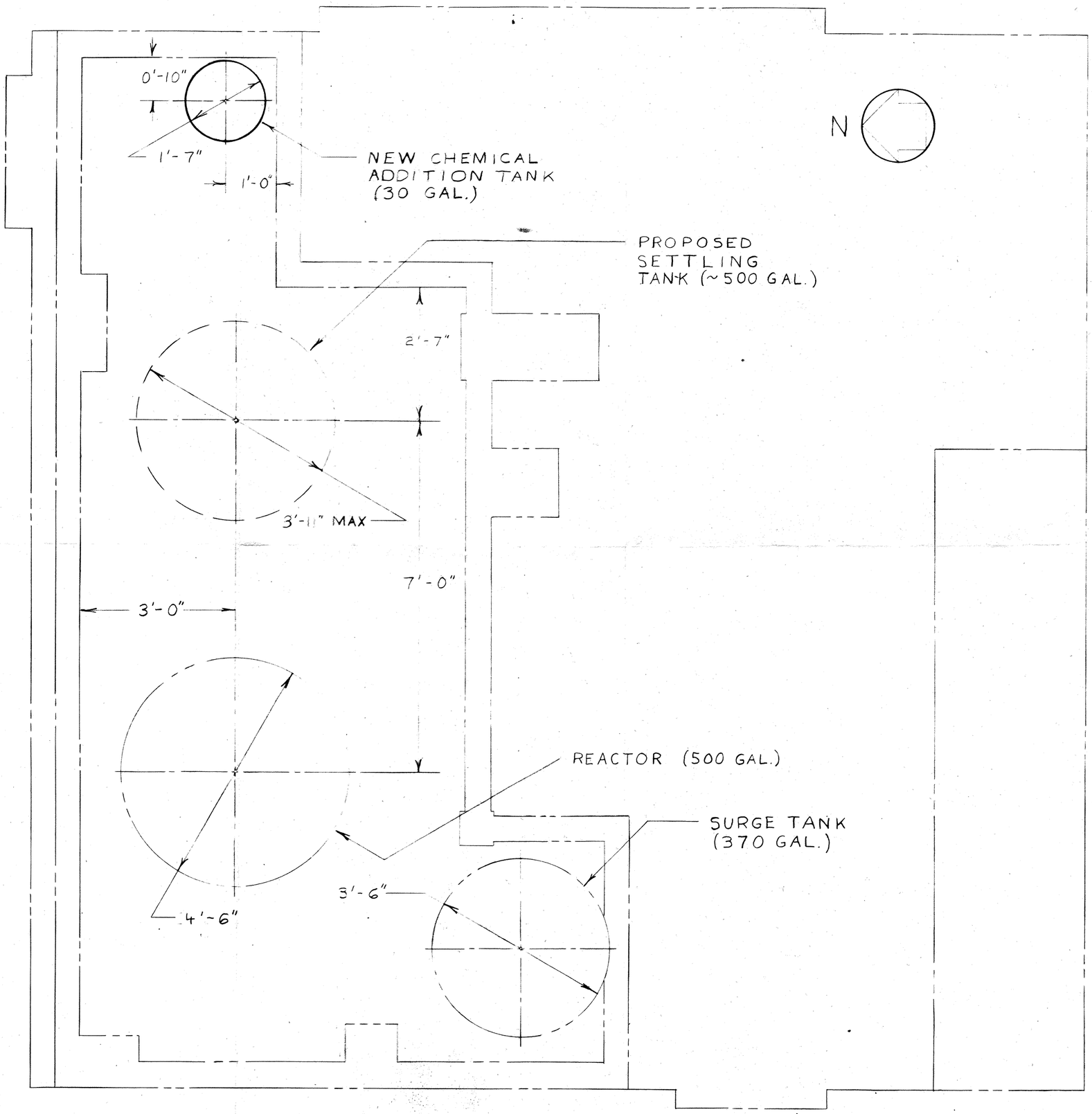
GROUP	SITE	BUILDING	ROOM	FOR	AO 1 USE ONLY

FORM 838 REV. 7/73

width of truck, side shift with 8" travel and to allow load arm to extend to outer edge of truck, to be furnished with load backrest and overhead guard, 48" full taper load arms, flowtation tires, drive wheels 12.00 x 16.5, 10 ply, Off road tread, 11.00 x 15, 6 ply steering tires. Drive wheels must have enough clearance for tire chains, turning radius must not exceed 10 ft. from center of drive axle to rear of truck, to be furnished with 5 lb. dry chemical fire extinguisher and protecto seal fuel cap.

ESTIMATED COST: $11,000.00

PART NUMBER		PARTS LIST	
PREFIX NUMBER	ITEM NUMBER	NUMBER REQD	DESCRIPTION



NOTES:

1. ALL VESSELS ARE SUPPORTED OFF THE GROUND.
2. THE SECONDARY CONTAINMENT BERM HAS A 720 GAL. CAPACITY.
3. THE LIQUID VOLUME IN THE CBWT PLANT IS NOT TO EXCEED 600 GAL.

REVISION LETTER	CLASS. REVIEW	REVISIONS	DATE	CHANGED BY	CHECKED BY	APPROVED BY
—		ORIGINAL ISSUE	—	—	—	—

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

CLASSIFICATION OF DRAWING:

PART: TITLE BLOCK:

TITLE
CBWT PLANT
VESSEL LAYOUT
WM-1 TA-50

	SIGNATURE	DATE	GROUP
ORIGINATED	R.B. Lukens	9/30/87	HSE-7
DRAWN	R.B. Lukens	9/30/87	HSE-7
CHECKED	B.R. [illegible]	10/1/87	HSE-7
PROJ. ENGR.	B.R. [illegible]	10/1/87	HSE-7
APPROVED			
RELEASED			

TOLERANCE - (UNLESS OTHERWISE NOTED)
X = ± 1" O.XX = ± ____ ANGULAR = ± ____
O.X = ± ____ O.XXX = ± ____ FINISH = ____

SCALE	TOTAL SHEETS	DRAWING NO.	SIZE	SHEET NO.
1:20	2		C	1

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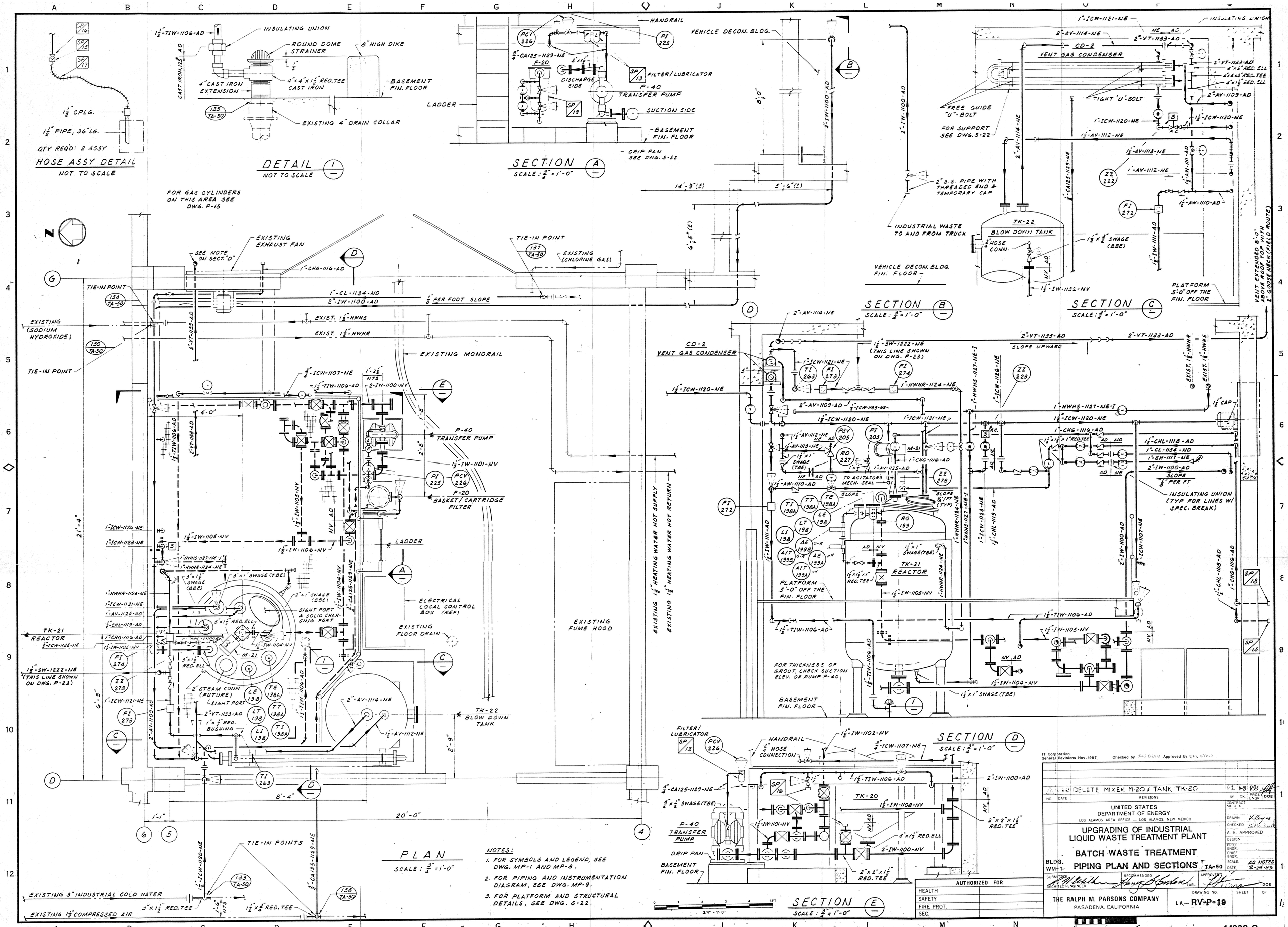
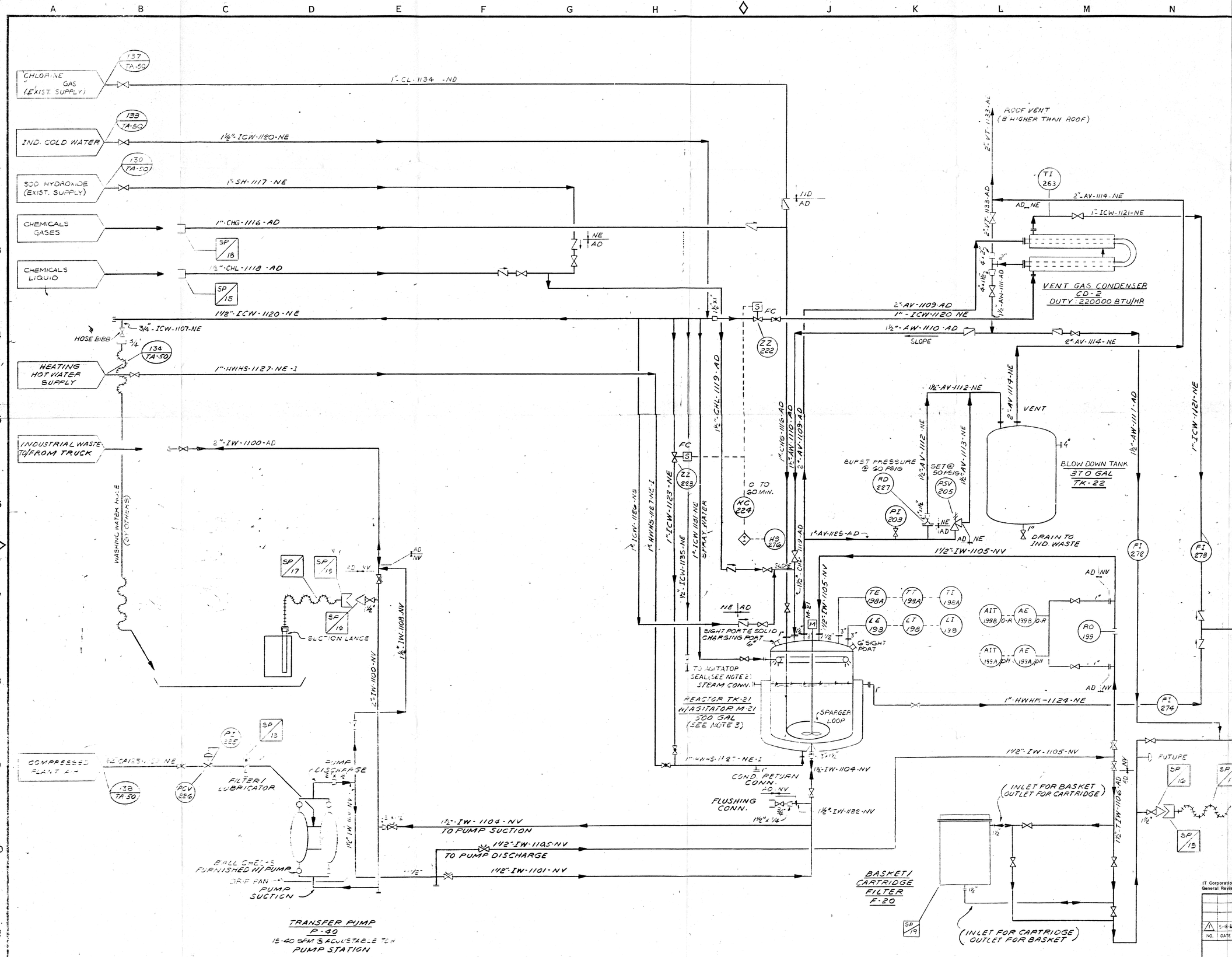

HOSE ASSY DETAIL
NOT TO SCALE
QTY REQ'D: 2 ASSY
1½" CPLG.
1½" PIPE, 36" LG.
DETAIL 1
NOT TO SCALE
INSULATING UNION
ROUND DOME STRAINER
8" HIGH DIKE
4" CAST IRON EXTENSION
4"x4"x1½" RED. TEE CAST IRON
BASEMENT FIN. FLOOR
EXISTING 4" DRAIN COLLAR
SECTION A
SCALE: ¾" = 1'-0"
HANDRAIL
FILTER/LUBRICATOR
P-40 TRANSFER PUMP
DISCHARGE SIDE
SUCTION SIDE
LADDER
DRIP PAN SEE DWG. S-22
VEHICLE DECON. BLDG.
SECTION B
SCALE: ¾" = 1'-0"
SECTION C
SCALE: ¾" = 1'-0"
VENT GAS CONDENSER
FREE GUIDE "U"-BOLT
FOR SUPPORT SEE DWG. S-22
TIGHT "U"-BOLT
2" S.S. PIPE WITH THREADED END & TEMPORARY CAP
INDUSTRIAL WASTE TO AND FROM TRUCK
TK-22 BLOW DOWN TANK
VEHICLE DECON. BLDG. FIN. FLOOR
PLATFORM 5'-0" OFF THE FIN. FLOOR
VENT EXTENDED 4'-0" ABOVE ROOF TOP WITH 2 GOOSE NECK (FIELD ROUTE)
FOR GAS CYLINDERS ON THIS AREA SEE DWG. P-15
EXISTING EXHAUST FAN
SEE NOTE ON SECT. "D"
TIE-IN POINT
EXISTING (CHLORINE GAS)
EXISTING (SODIUM HYDROXIDE)
EXISTING MONORAIL
P-40 TRANSFER PUMP
F-20 BASKET/CARTRIDGE FILTER
LADDER
ELECTRICAL LOCAL CONTROL BOX (REF)
EXISTING FLOOR DRAIN
EXISTING FUME HOOD
EXISTING 1½" HEATING WATER HOT SUPPLY
EXISTING 1½" HEATING WATER HOT RETURN
TK-21 REACTOR
TK-22 BLOW DOWN TANK
SIGHT PORT & SOLID CHARGING PORT
2" STEAM CONN (FUTURE)
TIE-IN POINTS
EXISTING 3" INDUSTRIAL COLD WATER
EXISTING 1½" COMPRESSED AIR
PLAN
SCALE: ¾" = 1'-0"
NOTES:
1. FOR SYMBOLS AND LEGEND, SEE DWG. MP-1 AND MP-8.
2. FOR PIPING AND INSTRUMENTATION DIAGRAM, SEE DWG. MP-9.
3. FOR PLATFORM AND STRUCTURAL DETAILS, SEE DWG. S-22.
SECTION D
SCALE: ¾" = 1'-0"
TK-20
P-40 TRANSFER PUMP
DRIP PAN
BASEMENT FIN. FLOOR
SECTION E
SCALE: ¾" = 1'-0"
IT Corporation
General Revisions Nov. 1987
Checked by
Approved by
DELETE MIXER M-20 & TANK TK-20
REVISIONS
UNITED STATES DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE — LOS ALAMOS, NEW MEXICO
UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT
BATCH WASTE TREATMENT
PIPING PLAN AND SECTIONS
BLDG. WM-1
TA-50
AS NOTED
2-24-83
AUTHORIZED FOR
HEALTH
SAFETY
FIRE PROT.
SEC.
THE RALPH M. PARSONS COMPANY
PASADENA, CALIFORNIA
LA-RV-P-19
14932-C



NOTES:

1. FOR SYMBOLS AND LEGEND SEE LA-RV [illegible]-1 & MP-8.
2. SEE DETAIL 1, DWG. MP-3, EXCEPT FIC TO BE LOCALLY INTERLOCKED WITH AGITATOR MOTOR THRU A TIME DELAY AND HAVE LOCAL INDICATING LIGHT FOR NO SEAL WATER FLOW INDICATION. SOLENOID VALVE NUMBER IS ZZ-278.
3. NOZZLE SIZES SHOWN ARE MINIMUM REQUIRED FOR PROCESS. VENDOR SHALL DETERMINE THE ACTUAL SIZES NEEDED FOR ADEQUATE LINING. ANTICIPATED REDUCERS NEEDED ARE SHOWN ON PIPING DWG. P-18.

IT Corporation
General Revisions Nov. 1987 Checked by [illegible] Approved by [illegible]

NO.	DATE	REVISIONS	BY	CK.	PROJ. ENGR.	DOE
1	5-6-89	DELETE MIXER M-20 & TANK TK-20	[illegible]	[illegible]	[illegible]	[illegible]

UNITED STATES
DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE — LOS ALAMOS, NEW MEXICO

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

PIPING AND INSTRUMENTATION DIAGRAM BATCH WASTE TREATMENT SYSTEM

BLDG. WM-1 TA-50

CONTRACT
A. E.
DRAWN J. SIMON
CHECKED [illegible]
A. E. APPROVED
DESIGN
PROJ. ENGR.
CHIEF ENGR.
SCALE NONE
DATE 2-24-83

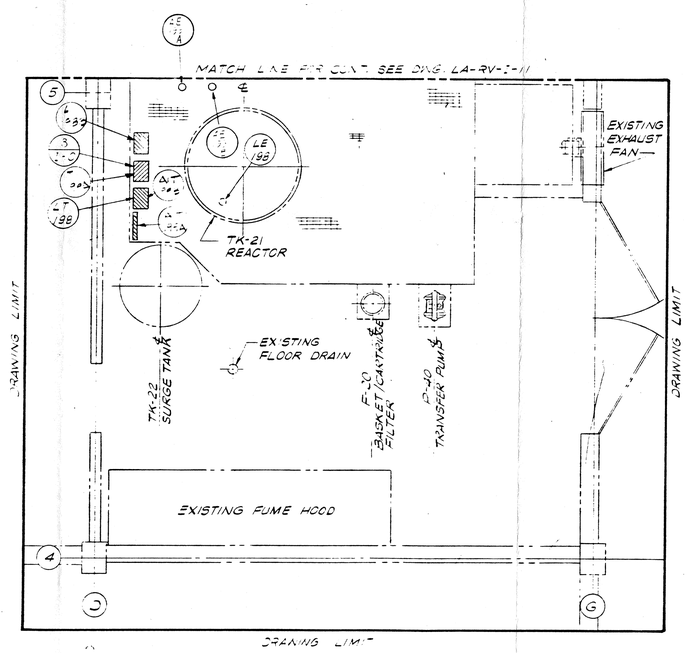
AUTHORIZED FOR	
HEALTH	
SAFETY	
FIRE PROT.	
SEC.	

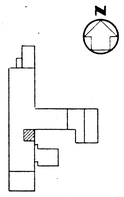
SUBMITTED [illegible] ARCHITECT-ENGINEER
RECOMMENDED [illegible] ASL
APPROVED [illegible] DOE

THE RALPH M. PARSONS COMPANY
PASADENA, CALIFORNIA

DRAWING NO. LA-RV-MP-9 SHEET OF

14932-B





KEY PLAN
NTS

AUTHORIZED FOR	
HEALTH	
SAFETY	
FIRE PROT.	
SEC.	

IT Corporation
General Revisions Nov. 1987 Checked by [illegible] Approved by [illegible]

NO.	DATE	REVISIONS	BY	CK.	PROJ. ENGR.	DOE
		NTS AS BUILT				

UNITED STATES
DEPARTMENT OF ENERGY
LOS ALAMOS AREA OFFICE — LOS ALAMOS, NEW MEXICO

UPGRADING OF INDUSTRIAL LIQUID WASTE TREATMENT PLANT

INSTRUMENT LOCATION PLAN
BATCH WASTE TREATMENT SYSTEM
BASEMENT

BLDG WM-1 TA-50

CONTRACT NO. - E
DRAWN LIU
CHECKED
A. E. APPROVED
DESIGN EBERLY
PROJ. ENGR.
CHIEF ENGR.
SCALE 3/8" = 1'-0"
DATE 2-24-88

SUBMITTED ARCHITECT/ENGINEER
RECOMMENDED
APPROVED DOE

THE RALPH M. PARSONS COMPANY
PASADENA, CALIFORNIA

DRAWING NO. LA-RV-1-13.1 SHEET OF

14932-A