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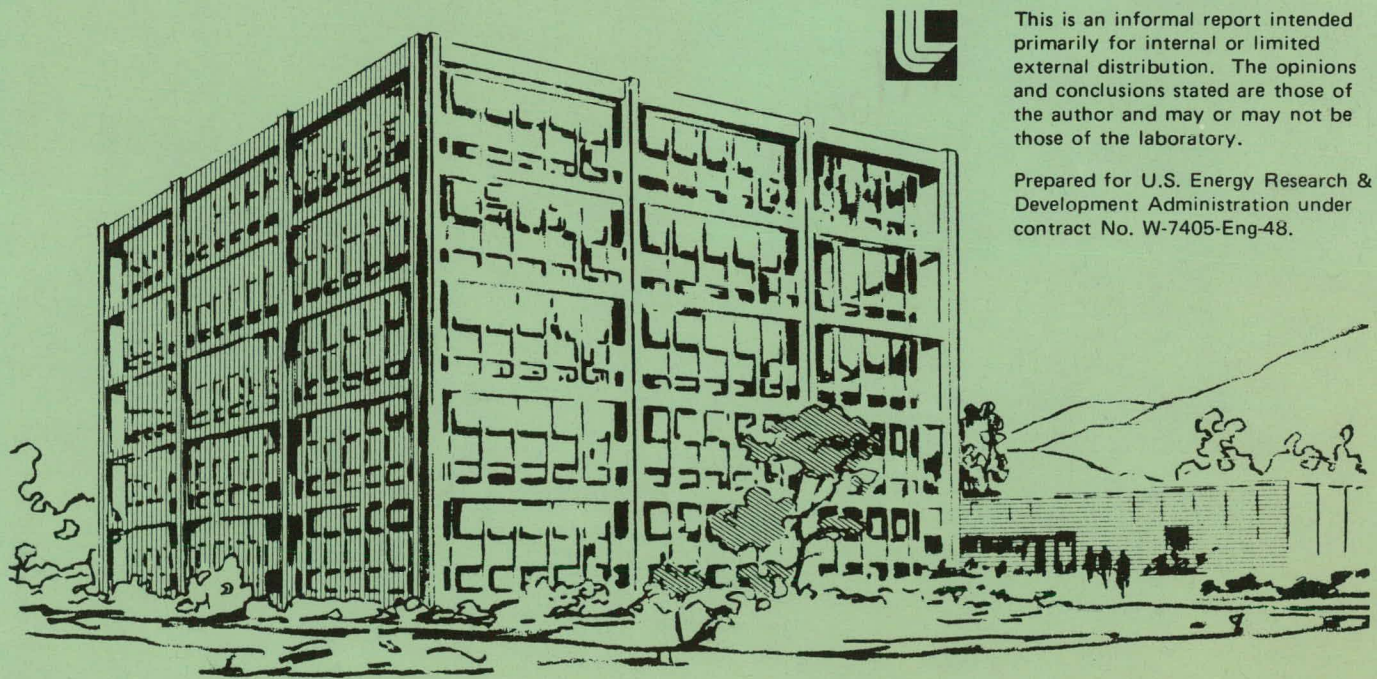
Lawrence Livermore Laboratory

FINAL SAFETY ANALYSIS REPORT (FSAR) FOR BUILDING 332, INCREMENT III

B. N. Odell

A. J. Toy

August 31, 1977



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DISCLAIMER

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FINAL SAFETY ANALYSIS REPORT (FSAR)

FOR

BUILDING 332, INCREMENT III

August 31, 1977

Prepared by Byron N. Odell and Arthur J. Toy, Jr.

Contents

ABSTRACT

This Final Safety Analysis Report (FSAR) supplements the Preliminary Safety Analysis Report (PSAR), dated January 18, 1974, for Building 332, Increment III of the Plutonium Materials Engineering Facility located at the Lawrence Livermore Laboratory (LLL). The FSAR, in conjunction with the PSAR, shows that the completed increment provides facilities for safely conducting the operations as described. These documents satisfy the requirements of ERDA Manual Appendix 6101, Annex C, dated April 8, 1971. The format and content of this FSAR complies with the basic requirements of the letter of request from ERDA SAN to LLL, dated March 10, 1972.

Included as appendices in support of the FSAR are the Building 332 Operational Safety Procedure and the LLL Disaster Control Plan.

SECTION I -- SUMMARY OF EACH SECTION

INTRODUCTION

This Final Safety Analysis Report (FSAR), in conjunction with the Preliminary Safety Analysis (PSAR) dated January 18, 1974, shows that the completed Building 332 Increment III provides facilities for safely conducting the operations as described.

DESCRIPTION OF THE FACILITY AS IT EXISTS - SECTION 2

The description of the facility contained in the PSAR basically reflects the facility as actually constructed. However, some changes occurred during and after the construction phase of this facility. The significant changes are:

- Altering the depth of the underground fuel storage tank to comply with the requirements of National Fire Protection Association specification NFPA No. 37.
- Including a relief valve discharge line from each of the two nitrogen tube banks located in the basement to the roof.
- Rerouting the Zone 20 fire alarm circuit to the emergency generator, adding criticality alarm horns, and relocating the detectors.
- Improving the finish on the interior walls to ease decontamination.
- Filling and leveling the top surface of the first floor.
- Extending the sidewall drains and raising the utility ports so that they match the filled floor grade.
- Sealing the cracks in the basement floor curbs as well as the cracks between the floor curbs and the building walls to minimize

decontamination costs.

- Modifying the sprinkler system so that runoff can be handled by room drains.
- Upgrading the fire sprinklers, pipe, and duct hangers to meet the design base seismic requirements.
- Upgrading the ventilation controls, fire dampers, fire sprinklers, door interlocks, and airlocks to provide a more reliable operation.

DESCRIPTION OF OPERATIONS - SECTION 3

Increment III will be used primarily as a facility for handling plutonium and plutonium-bearing assemblies during various testing operations, for developing and demonstrating improved or unique fabrication techniques, and for fundamental and applied research with plutonium. Handling limits for plutonium to be applied within this facility include 4 kg in solid form and 220 g in dispersible form at each work station; 20 kg for an individual laboratory, and 225 kg in the entire facility. Exceptions to this are allowed only by a Special Operational Safety Procedure (OSP). Nuclear material will enter and leave the facility via the Materials Management Vault, and will be transferred only to persons authorized to receive it inside the facility. Transfers from one work station to another will be made only by building personnel who are specifically authorized by the Building OSP.

The four laboratories in Increment III have been designated for the following general operations: Room 1007 - machining, welding, and assembly of plutonium metal parts. A conveyor line connects this laboratory and Room 1011 where inspection and gaging is performed. Rooms 1006 and 1010

will be used for instrumentation, assembly, and special testing of assemblies that contain plutonium.

The operations that are different from those outlined in the PSAR are summarized below:

- Room 1007 has a design that is now being evaluated for a downdraft room for handling bare plutonium.

ACCEPTANCE PROCEDURES - SECTION 4

Design specifications, acceptance test procedures, and a quality assurance program were designed to assure that this facility has been constructed to meet the requirements given in the ERDA Manual Appendix 6301, Part II, Section I, "General Design Criteria, Plutonium Facilities."

The design specifications and acceptance tests for Increment III were approved jointly by representatives of the architect-engineering firm, LLL, and ERDA. These acceptance tests consist of Construction Component (CC) and System Operating (SO) tests, as well as electrical tests. Passing of these tests signifies that the system components have been installed in accordance with the drawings and specifications as well as establishing that the operating components perform their intended functions.

Signing of the final inspection report, Acceptance Report of Prime Construction Contract for Beneficial Occupancy, and the Final Acceptance Report signifies that the facility has been accepted by ERDA. Post-construction modifications have been reviewed and approved by the LLL Building 332, Increment III QA Organization.

EMERGENCY PLANS AND PROCEDURES - SECTION 5

Plans and procedures have been developed that provide a ready means to correctly identify and control conditions so that an accident can be brought

under control. The LLL Hazards Control Department is responsible for developing and implementing the specific accident control plan. The emergency control procedures for Building 332 are contained in the building's Operational Safety Procedure (OSP). The LLL site disaster plan is contained in the LLL Disaster Control Plan. Both the OSP and Disaster Control Plan are appended.

EMPLOYEE TRAINING - SECTION 6

All personnel in Building 332 are classified as to their training and work experience in the building. These range from Class I personnel (allowed to work with radioactive materials with minimum supervision) to Class IV personnel (must be escorted by Class I, II, or III employees while in this building). The training consists of completing appropriate safety courses conducted by the Hazards Control Department and the Facility Operations staff as well as working under and with more experienced personnel.

ORGANIZATION - SECTION 7

The organizational structure for operations within Building 332 is presented. An organization chart has been included that shows the line of responsibility from the LLL Director down to the various supervisors within the building (including Materials Management and Hazards Control).

CONCLUSIONS - SECTION 8

It is concluded, based on the analyses of the planned operations, design safety features, and results of the acceptance tests, and QA approval, that the Building 332 Increment III addition can be operated safely and will not constitute a hazard to operating personnel or the general public.

SECTION 2 -- DESCRIPTION OF FACILITY AS IT EXISTS

The new Plutonium Engineering Facility, Increment III addition to Building 332, is located on the east side of the original Building 332. Increment III is a one-story, windowless, heavy concrete structure having a full, underground basement. About 90 m^2 of the old building was altered to make a corridor connection to the new facility at ground level. This new structure provides 1950 m^2 of space to house four laboratories and their support facilities: a new central storage vault, control room, emergency generator, and ventilation system.

A number of specific features have been included that enhance the safe operation of the facility such as: (1) ventilation flow control that ensures movement of air from clean areas to areas of potentially increasing contamination, (2) airlocks between the old and new structures, (3) multiple HEPA filtration for all air leaving the process area and glove boxes, (4) fire protection of all areas including filters that are protected by a water spray system and closure dampers, (5) inert gas in glove boxes to reduce fire potential, (6) monitoring and alarm systems to ensure uncontaminated air in work areas and in the ventilation exhaust system, and (7) redundant components and emergency power for all systems considered essential to safe operation of the facility.

Increment III to Building 332 was built to conform to the intent of ERDA Manual Appendix 6301, Part II, Section I, "General Design Criteria, Plutonium Facilities, and all codes and standards listed therein. Compliance of the facility to that document was detailed in matrix form in Section

4B of the Preliminary Safety Analysis Report (PSAR) for Building 332 Increment III (UCRL-51436), dated January 18, 1974. The facility description given in Section 4A of the PSAR reflects the facility as actually constructed. However, some changes occurred during and after construction of the facility. All significant changes in the facility construction (since the PSAR was published) are listed in Tables 2-1 and 2-2. Those changes that might have a bearing on the building's safety or safety of operation are listed in Table 2-1 by ascending change order number. After the final acceptance of the Increment, changes in some of the systems were made to improve reliability. These changes are described in Table 2-2.

The changes listed in Table 2-1 have received a Quality Assurance review and have been approved by the LLL Plutonium Engineering Section, Architect Engineer's firm (Braun), LLL Plant Engineering, LLL Field Inspector (Technical Manager), the Contractor (Ralph Larsen & Son, Inc.), and the LLL Hazards Control Department. For the most part, these changes have been made to correct for error in design, drawing errors, mistakes made during construction, or to improve the original design. All of these changes are described in the Change Order books located in the LLL Technical Manager's Office.

The changes that occured after the acceptance of the facility (listed in Table 2-2), have been reviewed and approved by the LLL portion of the Building 332, Increment III QA organization (described in Section 4).

Table 2-1. Significant changes to Increment III that might bear on the safety of the structure or the operations conducted in it.

Change Order No.	Reason for change and work performed
13	to comply with the requirements of National Fire Protection Association specification NFPA No. 37. This resulted in changing the underground depth of the storage tank from 2 to 4 ft, improving the fuel supply system, and adding a foot valve, piping and valves, and a pump control center.
15	to include a relief valve discharge line from each of the nitrogen tube banks in the basement so that the quantity of nitrogen in one tank would not produce too high a nitrogen concentration in the basement.
16	to make up for design omission by rerouting Zone 20 fire alarm circuit to the emergency generator, adding criticality alarm horns, and relocating detectors.
18	to improve the finish on the internal walls so that it will be easier to decontaminate them.
*21	to match the filled floor grade by extending the sidewall drain and raising the utility ports.
*23	to determine if the floor sag would decrease the floor's seismic response below the design base seismic requirements.
*24	to fill the low sections in the first floor so that the floor surface will meet the minimum design criteria for plutonium facilities.
26	to prevent contamination of the wall interiors at the wall penetrations by installing leak-tight, Class "C" ducting at these penetrations.
28	to repair cracks in the basement floor curbs and to seal cracks between curbs and the building walls. This was due to the plastic vapor barrier installed between the curbs and the walls. This barrier exaggerated the shrinkage in the concrete curbs which resulted in cracks in the curbs and cracks between the curbs and the walls. These cracks had to be sealed to prevent areas from possible contamination by plutonium.
30	to reduce the flow rate of fire sprinklers to that amount which can be handled by the room drain and basement collection system. This will minimize spread of contaminated water and eliminate the criticality potential of ponded water in case of a fire. Sufficient water would still be supplied to quench the fire.
32	to upgrade the fire sprinkler hangers to meet the design base seismic requirements.
35	to upgrade the pipe and duct hangers to meet the design base seismic requirements.

* After the first floor was poured, it was surveyed and found to be low in the center. The design was rechecked by the Architect-Engineer firm (Braun). It was determined that the floor had been designed to code regulations. A finite elements calculation showed that the floor would indeed sag between 1 and 2 inches. Braun's analysis of the poured floor showed that the floor will withstand the design basis earthquake.

Since the upper surface of the floor was low, it was necessary to bring it to grade with an epoxy and sand mixture. This material added to the top of the floor made it necessary to relocate the floor ports for wires and utility lines.

Table 2-2 Significant changes or modifications in Building 322 - Increment III, since acceptance by LLL, that might bear on the safety of the structure or the operations conducted therein.

Job/Purchase Order No.	Reason for change and work performed
J.O. 277690	to protect personnel and reduce heat release to room. The emergency generator turbine exhaust muffler and stack were insulated.
J.O. 277700	to provide pressure equalization between HEPA filter plenum air lock and filter section when the access door between them is opened. Holes were cut in wall of each plenum section and a pipe line ball valve was installed on air lock side.
J.O. 277920	to remove apparent iron oxide from nitrogen tube banks and manifold piping. This helps to prevent critical control instruments from malfunctioning and maintains pressure on fire water tanks when standby instrument air is required. All components involved were cleaned, flushed, and dried,
P.O. 4716503	to provide an investigation, an analysis, and a report by an impartial subcontractor of the ventilation system control deficiencies, as well as, providing recommendations for the modifications to enable the system to operate to meet design criteria.
P.O. 4889003	to correct ventilation control system problems to attain required system operation. (Following completion of work by the Subcontractor, system operation was still unsatisfactory.)
J.O. 279142	to prevent future "freeze-up" of impeller to casing in two sump pumps. The cast iron impellers were replaced with stainless steel impellers. This problem was due to a design deficiency of the cast iron impeller in the cast iron casing of pumps which are operative only under emergency conditions. They might rust together with non-usage.
J.O. 279323	to prevent a false alarm on Increment I control system and continuity of Increment III electric control loops during the 20 to 30 sec time lag from normal to emergency power. An uninterruptable power supply is being installed.

Table 2-2. continued

Job/Purchase Order No.	Reason for change and work performed
J.O. 279497	to prevent clogging (by suspended corrosive materials,) of spray nozzles in HEPA filter plenum, glove box system, spray damper plenums, and room exhaust duct spray dampers. The black steel sprinkler piping beyond the strainers was changed to stainless steel.
J.O. 279582	to provide required building pressure differential operation. The control loops were modified to restore (before P.O. 4889003) lab control reference to atmospheric air. The automatic control was removed from the by-pass dampers, HEPA filter plenum damper operation was restored, and automatic operation was provided in event of supply fan failure.
J.O. 279588	to correct design omission. Time delay relays were installed to start lag building exhaust fan before transferring from normal exhaust air flow control to building pressure differential control, and restarting supply air fan on exhaust fan transfer.
J.O. 279699	to assure safe operation of air lock doors (Air Lock 1000). Damaged hardware was either repaired or replaced.
J.O. 279880	to prevent pressurizing the building upon loss of second (standby) building exhaust fan. Pressure switches were installed to shut off supply fan at pre-set minimum building exhaust air flow.
J.O. 279925	to assure safe operation of air lock doors (Air Lock 1000). Poorly operable electric interlock bolts were replaced with electric magnetic door holders.
J.O. 280018	to provide high-limit pressure differential in building in event of supply fan failer. Control devices were added to partially close damper at building exhaust fan discharge. This replaces operation of exhause fan inlet vanes per original design, which did not provide design requirements.
J.O. 280203	to make up for design omission. Fire dampers were installed in lab by-pass air ducts to protect wall opening between labs and corridor.

SECURITY AND SAFEGUARDS

Building 332 Increment III conforms to the requirements of ERDA Manual Chapter 2401 (Structural Requirements) and 7401 (Nuclear Material Accountability). Increment III meets most but not all of the requirements of ERDA Manual Chapter 2405 (Physical Protection of Unclassified Special Nuclear Materials). However, LLL and ERDA are in the process of developing a total safeguards program for the Laboratory. At present, this new increment conforms more closely to Chapter 2405 than does the rest of Building 332.

SECTION 3 -- DESCRIPTION OF OPERATIONS

INTRODUCTION

Increment III to Building 332 will be operated under the basic Operational Safety Procedures (OSPs) observed in the main building. These procedures will be amended as necessary to cover operations in the new increment. The OSP is reviewed annually and updated, as necessary.

The Plutonium Materials Engineering Facility is intended to provide laboratory capabilities for the safe handling of plutonium and plutonium-bearing assemblies during various testing operations, the development and demonstration of improved or unique fabrication techniques, and fundamental and applied research with plutonium. Increment III provides an increase in actual laboratory area that satisfies the safety objectives to reduce equipment and occupant density in the main building laboratories and distribute the plutonium-in-work over a larger working area by physical separation of work stations and laboratory spaces. In addition, the new increment provides a new vault for plutonium storage that is removed from existing office areas and will eliminate the low-level radiation that has existed in some offices.

Major operations planned for the laboratory spaces (see Fig.3-1) and the equipment capabilities are as follows:

Room 1007 - Machining

There are eight work stations connected to the conveyor line in this room. The conveyor line extends through the wall into Room 1011; normally open fire doors are located in the conveyor line at the wall penetration.

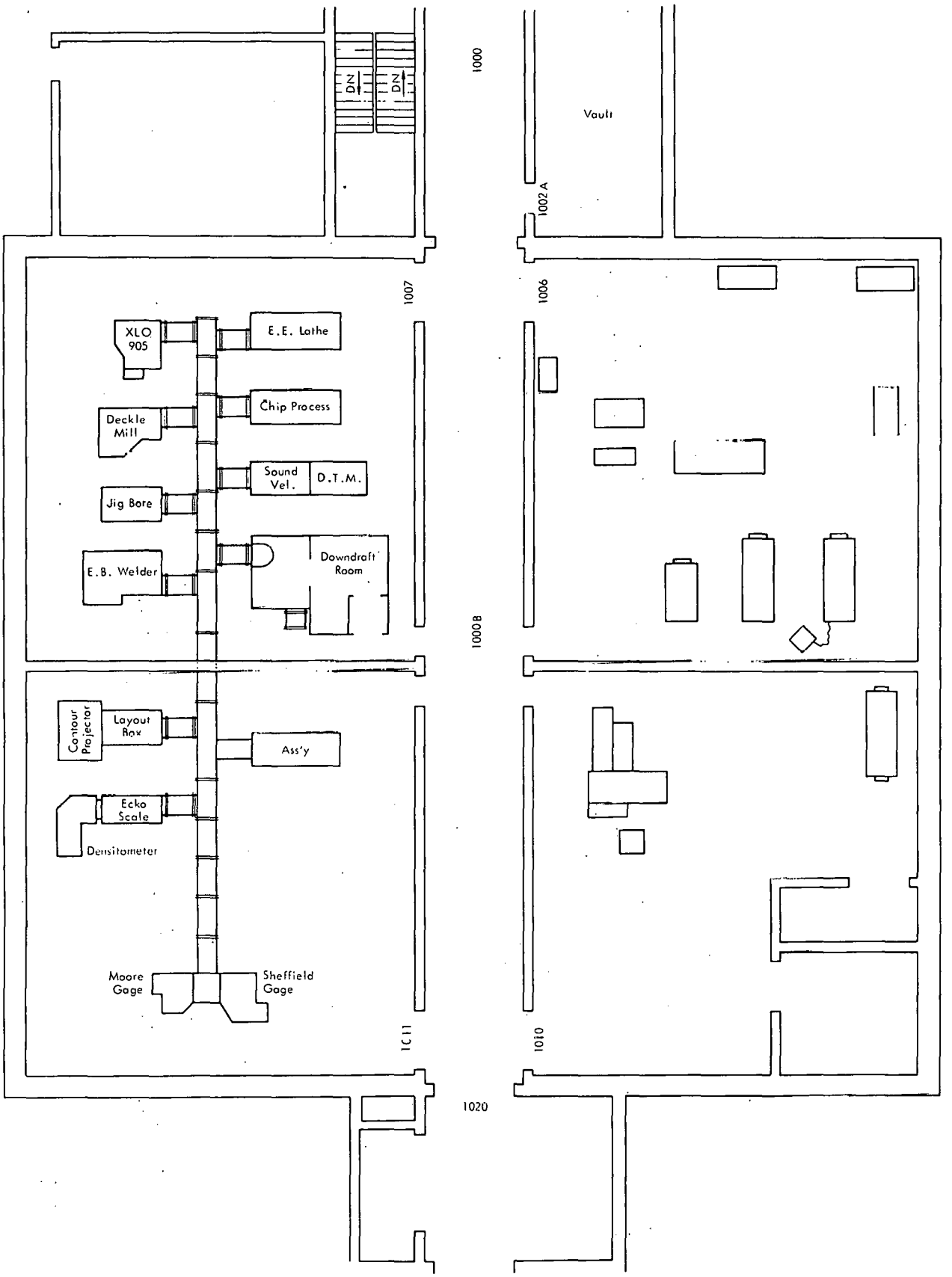


Fig. 3-1. Equipment layout floor plan, Bldg. 332 Incr. III.

These doors will close automatically in case of either fire or power failure.

The major equipment items attached to the line in this room are:

- Numerically controlled Excello 905 turning machine
- Numerically controlled milling machine
- Diamond turning machine
- Monarch EE tracer lathe
- E. B. Welder
- Downdraft room

Room 1011 - Inspection

There are eight work stations planned for the conveyor line located in this room. The major equipment items include:

- A precision Moore sweep-gage
- A Sheffield universal gage
- A contour projector
- A controlled temperature assembly box
- A precision Ecko balance
- A small radius gage
- A Gould surface analyzer

Rooms 1006 and 1010 - Instrumentation and Assembly

Most of the assembly work done in these rooms will begin with the fissionable material enclosed in a metal shell or container. This clean-on-the-outside subassembly will be processed into a buildup of a full-configuration test assembly or into a test canister or capsule. Clean glove boxes will be used for assembly and disassembly work when there is a possibility of a contamination release.

DESCRIPTION OF LABORATORY EQUIPMENT

All new enclosures as well as the older glove boxes that have been relocated in Increment III are constructed of stainless steel. The windows are Plexiglas or polycarbonate with aluminum covers for the glove and bagout ports. Most new glove boxes and the new conveyor line are of modular construction. A fire-stop door is located between the conveyor line and each work station, and where the conveyor line passes through the common laboratory wall between Rooms 1007 and 1011.

The glove box pressure is either air or nitrogen at -250 to -370 Pa with respect to the room. An alarm system sounds a warning when the enclosure pressure rises to -150 Pa. Most glove boxes will have a slow nitrogen flow rate and the capability of being flushed manually at the discretion of the operator at a rate of 5 ℓ/s. The glove box atmosphere is not recirculated but is exhausted through a minimum of two HEPA filters. Nitrogen is supplied to the glove box at 345 kPa pressure through a regulating vacuum breaker module. The exhaust header beyond the valve is at -1250 Pa of water pressure.

QUANTITIES AND TYPES OF MATERIALS TO BE PROCESSED OR STORED

The quantities and types of materials to be processed or stored are covered in detail in the Operational Safety Procedures for Building 332 (Section 6.0, Operational Controls and in Appendix L, Material Control and SS Materials Accountability), which is appended.

The Plutonium Materials Engineering Facility operates within the limit of 225 kg of plutonium for the building and 20.0 kg for an individual laboratory. The work-station mass limit is 4.0 kg of plutonium in solid

form or 220 g of readily soluble or easily dispersed chips. The conveyor-line enclosure is not a work station by definition; therefore, no fissile material will be stored in the actual conveyor portion of the line. However, plutonium may be stored in the special, criticality approved storage wells in the floor of the line. Exceptions to these regulations are allowed only under the provisions of an approved operating safety satellite procedure.

The fissile material normally involved in Building 332 operations is plutonium but some units assembled or tested will contain uranium. These materials are usually handled in solid and chip form. Occasionally, very small amounts of oxides of uranium and plutonium are handled.

Any plutonium that is in-work and cannot be returned to the vault at the end of the day will be stored in a closed metal container within a glove box, and all glove ports and bagout ports will be covered with metal covers. Whenever a piece of plutonium that is in-work cannot be packaged during the off-shifts, Hazards Control (LLL Fire Department) will be notified of the situation and the location.

In recent years, the average quantity of fissile material stored in the vault has been approximately 140 kg. The average quantity of fissile material in-process has been about 40 kg. It is estimated that both of these quantities will increase slightly when Increment III is activated.

Radiation levels at specific areas within the facility will vary with the amount of plutonium handled and the operations being performed. The history of Building 332 has shown that current operating practices have kept personnel exposures well below current guidelines (i.e., <1 rem/yr). These same practices will be followed in Increment III to assure compliance with minimum personnel exposure limits.

MATERIAL FLOW

All material must enter the Plutonium Materials Engineering Facility via the Materials Management storage vault. The vault custodian will issue plutonium only to those persons authorized to receive it. These procedures are covered in detail in Appendix L of OSP-332.

Within the Plutonium Materials Engineering Facility, fissile material is only moved from one work station to another by a member of the Plutonium Facility Engineering Staff. The movement of plutonium from one laboratory space to another must be authorized by the Deputy Manager of the building or the Mechanical Technician Supervisor. The mass limit for each work station is posted at the station.

SECTION 4 -- ACCEPTANCE PROCEDURES

GENERAL

Design specifications, acceptance test procedures, and a quality assurance program were designed to assure that this facility would be constructed to meet the requirements given in ERDA Manual Appendix 6301, Part II, Section I, "General Design Criteria, Plutonium Facilities."

Successful completion of the acceptance procedures assures that the equipment has been properly installed and that it operates within specifications.

The acceptance tests are the final part of the Quality Assurance (QA) Program used during design and construction. This QA Program was reviewed to ensure that all structures, systems, and components — as installed — had received treatment commensurate with original QA specifications.

The QA Program and acceptance tests are summarized in the following paragraphs.

QUALITY ASSURANCE PROGRAM

LLL Quality Assurance

Representatives of LLL (Plant Engineering, Plutonium Materials Engineering, and Hazards Control) established a Quality Assurance Program for the Increment III addition to Building 332 that included a detailed QA matrix, which identified those structures, systems, components, and operations having a potential for accidents that could cause risks to LLL personnel and/or the public. The Architect-Engineering firm

(C. F. Braun and Co.) wrote the design specifications, which were reviewed and approved by LLL and ERDA. These design specifications are identified as Project 4775-P, dated February 28, 1974. Acceptance Test Procedures were written by Braun, approved by LLL, and included as Amendment No. 1 to the design specifications. Detailed drawings of the building were compiled and approved by Braun, LLL, and ERDA. The prime contract was then awarded to Ralph Larsen & Son, Inc.

Contractor Quality Assurance

As a contractual obligation, the prime contractor was required to provide an effective quality-assurance program that complied with the LLL quality-assurance program. As a result, the contractor established a quality-assurance organization, consisting of a quality-assurance manager and other personnel, to assure the appropriate quality of workmanship and materials on the job and to fully document the quality control procedures, inspections, and tests utilized on the project. (Figure 4-1 is the Construction Organization Chart.) The contractor furnished the LLL Technical Manager contracting officer with a quality-assurance plan which included the following procedures, instructions, and reports:

- The quality assurance organization
- Number and qualifications of quality assurance personnel
- Authority and responsibilities of quality assurance personnel
- Methods of quality control, including those for subcontractors' work
- Methods for documenting quality control operations, inspections, and tests

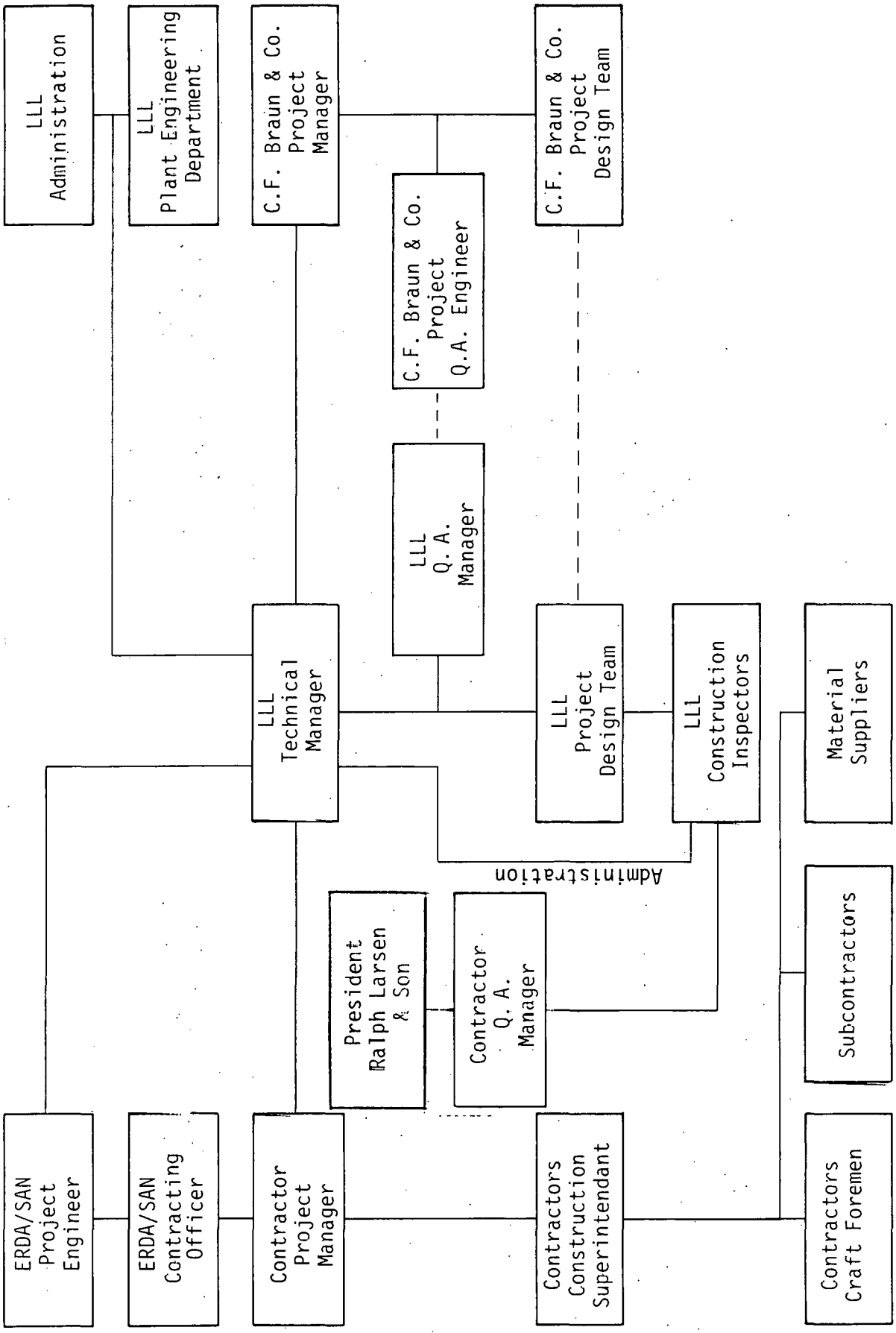


Fig. 4-1. Building 332 Increment III Construction Organization.

- A copy of the letter of direction (signed by a responsible officer of the contractor's firm) to the contractor's quality assurance manager, outlining his duties and responsibilities and specifically delineating the manager's independence from the construction superintendent and defining his direct line of communication to the top management of the contractor's firm.

The contractor's quality assurance manager was responsible for the control of all required submittals from the contractor and subcontractors to the contracting officer. Although all of the items were not required in every case, the following list includes data which were required:

- Vendor qualifications
- Shop drawings
- Sample submittals
- Material specification
- Material traceability and control
- Seismic analysis, testing, or verification submittals
- Operating and maintenance data
- Spare parts list
- Test certification
- ASME Code documentation
- Manufacturers' instructions
- Inspection certification
- As-built drawings

The detailed specifications and acceptance test procedures to be observed and met by the contractor and subcontractors on this project are delineated in United States Atomic Energy Commission, Lawrence Livermore Laboratory, Plutonium Materials Engineering Building 332 Construction Specifications, Project 4775-P, C. F. Braun & Co., Alhambra, Calif. (Feb. 28, 1974).

As various phases of construction were completed by the contractor and subcontractors, LLL construction inspectors tested and/or examined the particular structures or components for compliance with the detailed construction and performance specifications. These inspectors certified such compliance as appropriate to the contractor's quality assurance manager, LLL's project design team, and LLL's technical manager for the project, who in turn reported such compliance to the ERDA-SAN project engineer.

Quality Assurance Plan

Appendix M of the current Building 332 OSP outlines the quality assurance (QA) plan for the operation of the entire facility including Increment III. The QA actions and criteria specified in ERDA Manual Appendix 6301, Part II, Section I for operation, maintenance, and audit functions are being performed, but Appendix M does not adequately describe these procedures. A revised version of Appendix M has been written and approved that does provide the quality assurance details for the operation, maintenance, and audit functions of the facility and will be included in the next revision of the OSP.

Audits of quality assurance practices are performed by specially appointed groups that report directly to the Plant Manager (Fig. 7-1).

Description of Acceptance Procedures

The acceptance tests are listed in Table 4-1 and include both Construction Component (CC) and System Operating (SO) tests, as well as electrical tests. These tests established that the system components were installed in accordance with the drawings and specifications as well as establishing the capability of operating components to perform their function in the intended manner.

Immediately upon completion of the electrical tests, the contractor submitted to the LLL Technical manager copies of all test results which were certified in writing, witnessed, signed, and dated. Any unsatisfactory construction was corrected by the contractor to the satisfaction of the LLL technical manager.

The Construction Component (CC) and System Operating (SO) tests were performed by either the contractor or an independent testing agency. These tests were prepared by the contractor and approved by the LLL technical manager. All CC and SO tests were witnessed by the LLL technical manager (or his designated alternate) unless the contractor was notified to the contrary. All required acceptance test data sheets were either signed by the contractor or the independent testing agency as applicable. Any system components that did not meet the test requirements were either repaired, reworked, or replaced and then retested. All test instruments were provided by the contractor or the independent testing agency as appropriate. All test instruments were calibrated and certified within 6 months preceding the test. All tests are fully documented by the contractor data sheets. After testing was completed, all systems were returned to their normal operating condition, unless otherwise indicated.

Table 4-1. Construction Component (CC) and System Operating (SO) acceptance test procedures.*

Section	Test
15-50	Hot Water System and Chilled Water System Construction Component and System Operating Tests
15-51	Piping System Construction Component and System Operating Tests
15-52	Building Supply and Exhaust Air Systems Construction Component and System Operating Tests
15-53	Nitrogen Supply and Glove Box Exhaust System Construction Component and System Operating Tests
15-54	Control Room and Emergency Generator Room HVAC Systems Construction Component and System Operating Tests
15-55	Dehumidification System Construction Component and System Operating Tests
15-56	Fire Protection System Construction Component and System Operating Tests
16-6	Fire Alarm System Construction Component and System Operating Tests
16-6	Door Interlock System Operating Tests
16-6	Intrusion Alarm System Construction Component and System Operating Tests
16-6	Public Address System - System Operating Tests
16-6	Emergency Power System Construction Component and System Operating Tests
16-6	Local Annunciator Alarm System Operating Tests

*These acceptance test procedures are included as Section 15-50 through 15-56 and 16-6 of Project File 4775-P (dated February 28, 1974).

Signing of the final acceptance report by representatives of ERDA, Larsen, and LLL signified that all work, including acceptance testing, had been satisfactorily completed in accordance with the plans and specifications of the contract.

Inspection and Certification Process

The inspection and certification process involved the contractor, architect-engineer, vendor(s), the LLL technical manager, and the on-site ERDA-SAN representative with signature authority to certify satisfaction of acceptance procedures. Although any or all of the above parties participated, the ultimate responsibility for satisfying the prescribed requirements resided in the contractor and the final authority for acceptance of the complete project rested with ERDA. Copies of the Final Inspection Report, the Acceptance Report of Prime Construction Contract for Beneficial Occupancy, and the Final Acceptance Report are included as Fig. 4-2, 4-3, and 4-4.

After the building was accepted, certain modifications were made to improve the reliability of several building systems. Figure 4-5 is a copy of the Quality Assurance Approval of these modifications.

U. S. ATOMIC ENERGY COMMISSION
LAWRENCE LIVERMORE LABORATORY
LIVERMORE, CALIFORNIA

Contr. Main Office
Contr. Field Office
A-E Representative
A-E Home Office
LLL

FINAL INSPECTION REPORT OF PRIME CONSTRUCTION CONTRACT

AT(04-3)-998	PLUTONIUM MATERIALS ENGINEERING BLDG. 332 INC. III
Contract No.	Facility
Ralph Larsen & Son, Inc.	1849 Bayshore Highway - Suite 321 Burlingame, Ca. 94010
Contractor	Address

Description of work inspected:
All major and minor work features of the subject addition.

The undersigned representatives jointly inspected the work performed under the referenced contract on _____, and found the work satisfactorily completed in accordance with the plans and specifications of the contract, with the following exceptions listed below:

1. Exceptions: (if none, state none):
Electrical malfunctions of glove box fans. Complete air balancing requirements.
Install bolt on lightning rod arrester on roof.

2. The exceptions listed above are hereby acknowledged and it is agreed that corrections will be completed by _____

Hans Larsen, President of Ralph Larsen & Son, Inc.
Authorized Contractor's Representative — Date: 7/26/76

3. If no exceptions are noted in subparagraph 1 above, a final acceptance report of prime construction contract will be issued. If exceptions are noted in subparagraph 1, they shall be completed before a final acceptance report will be issued by the Commission.

Hans Larsen, President of Ralph Larsen & Son, Inc.
Authorized Contractor's Representative — Date: 7/26/76

Thomas Mason
Authorized Commission Representative — Date:

James M. Replogle
Authorized LLL Representative — Date: 7-26-76

Not Applicable
Authorized A-E Representative — Date:

Form 1

Fig. 4-2. Final inspection report of prime construction contact.

AEC Oakland 2
AEC Field 1
Contractor 1
LLL 2

U. S. ATOMIC ENERGY COMMISSION
LAWRENCE LIVERMORE LABORATORY
LIVERMORE, CALIFORNIA

ACCEPTANCE REPORT OF PRIME CONSTRUCTION CONTRACT FOR BENEFICIAL OCCUPANCY

AT(04-3)- 998	PLUTONIUM MATERIALS ENGINEERING BLDG. 332 INC. III
Contract No.	Facility
Ralph Larsen & Son, Inc.	1849 Bayshore Highway - Suite 321 Burlingame, Ca. 94010
Contractor	Address

Description of Accepted Work:

Effective at 5:00 PM 7/22/74, the Commission conditionally accepts from the contractor, the above-described components of the contract and assigns these facilities to LLL for beneficial occupancy, including operation and normal maintenance consistent with the terms of the contract guarantee.

Exceptions as listed on the Final Inspection Report, for the above-described work, dated 7/22/74, shall be completed as indicated thereon.

Areas involving deficiencies in work will be made available to the contractor until all remaining contract work is completed and final acceptance made by the Commission.

Thomas P. Mason
Authorized Commission Representative

Hans Larsen
Authorized Contractor's Representative

James M. Replogle 7-22
Authorized LLL Representative

Form 1

Fig. 4-3. Acceptance report of prime construction contract for beneficial occupancy

Contractor 1
LLL 2

U. S. ATOMIC ENERGY COMMISSION
LAWRENCE LIVERMORE LABORATORY
LIVERMORE, CALIFORNIA

FINAL ACCEPTANCE REPORT OF PRIME CONSTRUCTION CONTRACT

AT(04-3)-998	PLUTONIUM MATERIALS ENGINEERING BLDG. 332 INC. III
	Facility
Ralph Larsen & Son, Inc.	1849 Bayshore Highway - Suite 321 Burlingame, Ca. 94010
Contractor	Address

The above facility has been finally inspected and the work satisfactorily completed in accordance with the plans and specifications of the contract. It was accepted by me on behalf of the Commission as of 0800 7/22/76, and assigned to LLL, including operation and normal maintenance, consistent with the terms of the contract guarantee.

Thomas Mason
Authorized Commission Representative

Hans Larsen
Authorized Contractor's Representative

James R. Replogle
Authorized LLL Representative

Form M

Fig. 4-4. Final acceptance report of prime construction contract.

August 16, 1977

Subject: B. 332, Inc. III - Quality Assurance Program

After completion of the construction of the subject building, a stack monitor was installed and modifications were engineered to improve the reliability of several building systems including:

1. Ventilation Control System
2. Exhaust Duct Fire Dampers
3. Fire Sprinkler Charging System
4. Door Interlocks
5. Air Locks

The undersigned reviewed the modifications as described in purchase orders and job orders and found that the above modifications are in accordance with the QA Program.

Terry T. Witharm, Project Administrator

William L. Martz, Inspection

for Eugene C. Draney, Client

James M. Reploge, Technical Manager

W.L. Martz, Quality Control Mgr.

Ralph W. Chase 8/16/77
Ralph W. Chase, Quality Assurance Manager

M. H. Chew / w Encl
Melton H. Chew, Hazards Control

Fig. 4-5. Quality assurance approval of modifications

System Safety Evaluation

In addition to the acceptance tests discussed above, the ability of the facility and staff to begin work in Increment III was tested by using the Occupancy-Use Readiness Manual.[4-1] Safety discipline members and the Deputy Facility Supervisor were questioned so that the Basic Occupancy-Use Readiness Tree and the Management Oversight Risk Tree from the above manual could be filled in. Table 4-2 lists those items identified by this analysis which indicated the facility was not ready for use. Each discrepancy has been recognized and has been or will be corrected before plutonium is handled in Increment III.

Table 4-2. Items found.

	Comment
Industrial Safety	
Fire & evacuation action not posted	Now posted
Other signs and warnings not posted	Now posted
Hazards not color coded	Now color coded
Electrical interlock and guards not installed	Asking for more lockout devices
Fire Protection	
First aid fire suppression not installed	Now installed
Emergency Preparedness	
Monitors/Sensors not installed	Now installed
Alarms not installed	Now installed
Criticality Safety	
Evaluation not approved	Now approved
Area not posted	Now posted
Criticality alarms not installed	Now installed
Equipment not procured	Now procured
Written Procedures	Now being modified

Reference

4-1. R. J. Nertney, J. L. Clark, and R. W. Eicher, "Occupancy Use Readiness Manual — Safety Considerations," Aerojet Nuclear Company SSDC-1, Sept. 1975.

SECTION 5 -- EMERGENCY PLANS AND PROCEDURES

Emergency plans and procedures have been developed that provide a ready means to correctly identify and control abnormal conditions so that an accident can be brought under control. The LLL Hazards Control Department has the responsibility for developing and implementing the accident control plan at the Laboratory. Every accident, other than a very minor one, is reported to the LLL Fire Department. The firefighting team promptly responds to the scene of the accident, evaluates the accident, and usually begins control action. Whenever the nature of the accident warrants it, the Hazards Control Area Support Team also responds. If the accident cannot be controlled by the initial response, additional firefighters and other Hazards Control personnel are called. If the accident is severe, the entire Disaster Control Organization can be mobilized and all the Laboratory resources can be made available to control the situation.

The basic accident plan is as follows:

- The first employee to become aware of an accident must either report the accident immediately or have someone else report it.
- The Deputy Manager, or a designated alternate, will direct activities of personnel during emergencies. He will also provide guidance to all Emergency Response Groups reporting to the incident.
- Once the Fire Department arrives, the Senior Fire Officer coordinates the control efforts of all personnel present. He relinquishes this responsibility to an Emergency Control Coordinator when he arrives at the scene.

- If the Emergency Control Coordinator considers the accident to be a disaster, the head of the Hazards Control Department is called and serves as the Deputy Disaster Control Director to coordinate all field activities and takes administrative control of the entire operation.
- All Laboratory scientific and technical departments are required to assist as requested by the individual coordinating the action of the Disaster Control Team at the scene of the accident.

The LLL Disaster Control Plan (appended to this FSAR) outlines the organization of the Disaster Control Team, assigns responsibilities to specific team members, describes how and under what circumstances the Disaster Control Organization is mobilized, and describes the equipment available for use during emergencies. This plan is augmented by a number of supplements that describe in detail the equipment and disaster control systems available during emergencies.

An Emergency Call List, Appendix A in the attached OSP 332, identifies the personnel who are knowledgeable with respect to Building 332 operations and who may be called upon to perform specific operations and provide information in the event of an emergency. The emergency procedures for Building 332 are contained in Section 9 of OSP 332 (Appended to this FSAR). Copies of this OSP are in wide distribution to ensure its availability in an emergency.

SECTION 6 -- EMPLOYEE TRAINING

GENERAL

All personnel having security access to the Radioactive Materials Area (RMA) of Building 332 are placed in one of four safety classifications. These classifications limit access to contaminated equipment and radioactive materials to those personnel whose training and experience are commensurate with the tasks they perform in the facility.

This section of the FSAR describes the qualifications necessary for each safety classification, and the topical content of the training courses required.

In addition to the courses described in this section, personnel are encouraged to, and may be required to, take additional safety training for specific job assignments. Up-to-date computer records of safety training are maintained for each building resident and Class II nonresident. The Building Operations Staff is responsible for this training and for keeping the computer training records current. These safety training records are monitored by the Facility QA administrator to ensure that these people have adequate and documented safety training to work safely in the building.

SAFETY CLASSIFICATION OF PERSONNEL

Personnel working in Building 332 are grouped into safety classification categories commensurate with their safety indoctrination, experience, and job assignment as follows:

Class I

Class I personnel are allowed to work with radioactive materials or on contaminated equipment without direct supervision. To qualify for this classification, the person must be a building resident, must have

considerable time and experience in Class II work, and must be recommended by his immediate supervisor and approved by the Building Operations Staff.

All Class I personnel must attend an annual safety and criticality lecture (Course HS-603, Building 332 Annual Review) that covers all aspects of safety both on routine operations and how to respond to abnormal building occurrences.

It is the responsibility of each Class I person who supervises any Class II and Class III operators to know the safety classification of each person responsible to him and to provide the required level of supervision and instruction.

Class II

Class II personnel are allowed to work with radioactive materials or contaminated equipment under minimal supervision of a Class I building resident. It is the responsibility of the Class II operator to be sure that the appropriate Class I resident is fully aware of the scope of work and the planned work schedule. This classification also includes those non-building residents who, because of special skills and job assignments, must work with radioactive materials or contaminated equipment.

To qualify for this classification, the person must have considerable time and experience as a Class III worker and must be recommended by a Class I building resident and approved by the Building Operations Staff.

All Class II personnel must attend an annual safety and criticality lecture (Course HS-603, Building 332 Annual Review) that covers all aspects of safety both on routine operations and how to respond to abnormal building occurrences. In addition, each new applicant for this rating must successfully complete the ten week course "Working Safely with Plutonium in Building 332" or must demonstrate competence and safety awareness at an equivalent level to that obtained from course completion.

Class III

Class III is the starting category for each building resident or regular worker or visitor. Class III personnel are allowed RMA access without an escort but normally cannot work with radioactive materials or contaminated equipment.

In special situations and only with approval of building management, a Class III worker may be allowed to perform limited and specific operations in a contaminated enclosure or on contaminated equipment. However, this work may be performed only with a Class I building resident in attendance.

Class III personnel are given an annual safety indoctrination sufficient for the safe performance of their specific assignment and includes instructions on how to respond to any abnormal building condition or emergency alarm.

Class IV

The Class IV classification is limited to the infrequent visitor who will be escorted all the time they are in the RMA. This category would normally provide for visits by laboratory management, project supervisors, visitors, and workers with specialized skills that are required only rarely. This category is not intended to be used as a temporary substitute for the normal safety training a worker or frequent visitor must have.

It is the responsibility of the person who authorizes Class IV access into the RMA to arrange for an escort, a temporary respirator fitting, and to be sure the visitor is aware of the potential hazards and building emergencies and knows how to respond to the building alarm signals.

BUILDING 332 TRAINING COURSES

Building 332 Safety Indoctrination Course

All persons entering the RMA must either have completed the Building 332 Safety Indoctrination Course or be accompanied by an authorized escort. An outline of the Safety Indoctrination Course is included as Appendix K of OSP 332, which is appended to this FSAR.

Working Safely with Plutonium in Building 332 - HS-621

This 10 week safety training program is administered by the Materials Engineering Division of the Mechanical Engineering Department. It has been tailored to meet the needs of the scientific and technical personnel within the plutonium facility and is normally required for all new building residents and individuals requiring Class II status. A description of the program follows.

Purpose

The primary purpose for certification is safety. It is intended that the employee completing this program will have demonstrated an understanding of plutonium, its general handling problems, and have an awareness of its associated potential hazards, particularly with regard to Building 332 operations and procedures. It is also intended that the employee will become familiar with rules relevant to the work situations in which he will be involved.

Limitation

Certification by completion of this program is not be be construed to mean that the employee is expert in the handling of plutonium, plutonium-contaminated apparatus, and/or the construction of glove boxes

and other facility equipment. Rather, such completion will be the first step in enabling the employee to work with plutonium and plutonium-associated apparatus under supervision.

Course Outline

- A general indoctrination is given by Building Operations Staff/Pu Engineering Group personnel. The indoctrination includes a discussion of the importance and function of the Plutonium Building and its general safety features.
- Self-study material is distributed, including the Building 332 OSP, ME Safety Manual Section VI on Gloved Boxes, the Health and Safety Manual Supplement on Workplaces for Radionuclides, and reference materials on the history and hazards of plutonium.
- The Building 332 Safety Indoctrination Course is reviewed, particularly as it pertains to containment and hazards of alpha-emitters and the use of monitoring equipment and possible emergencies and their alarm signals; criticality and industrial accidents such as those associated with plutonium and with mechanical equipment of the kind found in Building 332 are discussed.
- A lecture/demonstration of how to use an alpha meter and how and when to properly wear protective clothing and masks when working with contaminated enclosures.
- Two actual laboratory sessions where each participant is allowed to work with plutonium in both a glove box and in the downdraft room.
- A final written examination is given on both the class work and the reference reading material.

Building 332 Annual Review - HS-603

Every resident of Building 332 and all Class II nonresidents are required to complete this retraining course once a year as a condition of maintaining their safety classification. The content of HS-603 will be determined each year by the Facility Operations Staff and the Hazards Control Field Support Team Leader to keep the staff current on varying aspects of safety in Building 332. However, each presentation will stress criticality hazards and other hazards associated with plutonium.

SECTION 7 -- ORGANIZATION

Figures 7-1 and 7-2 show the organization of LLL as it relates to Building 332 operational, support, and safety staff. For clarity, these figures omit positions reporting to common supervison that are not pertinent to the operation of Building 332. The pointed boxes connect Fig. 7-1 with Fig. 7-2.

The dotted line in Fig. 7-2 connects the Operations Staff. They have the responsibility and authority to make certain that all work in Building 332 is performed according to the guidelines of the Building 332 Operational Safety Procedure, which is appended to this FSAR.

The dot-dashed line in Fig. 7-2 shows the advisory responsibility from the Hazards Control Operational Support Team to the Facility Operations staff. Safety services in Building 332 are provided by the Hazards Control Operational Support Team and the Building 322 Health and Safety Technician Supervisor.

The organizational structure of Building 332 is consistent with LLL policy as define in the LLL Health and Safety Manual, Procedure 1.03, Safety Responsibility. Procedure 1.03 places ultimate responsibility for safety with the Director of the Laboratory; responsibility for the Safety Program in an area with that area's supervisor; and responsibility for safety guidance and services with Hazards Control.

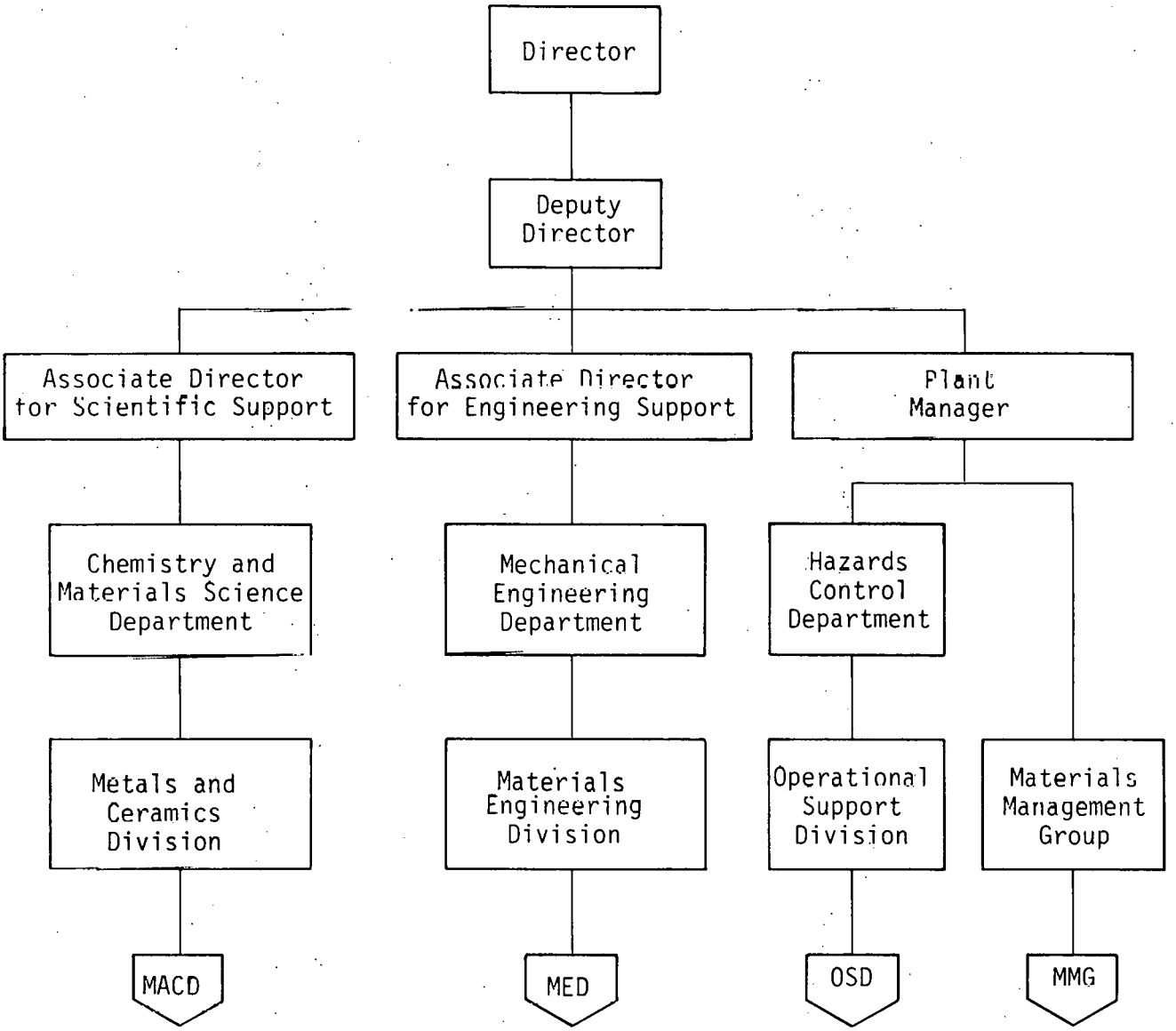


Fig. 7-1. Organization of LLL for safety from Building 332 to Director.

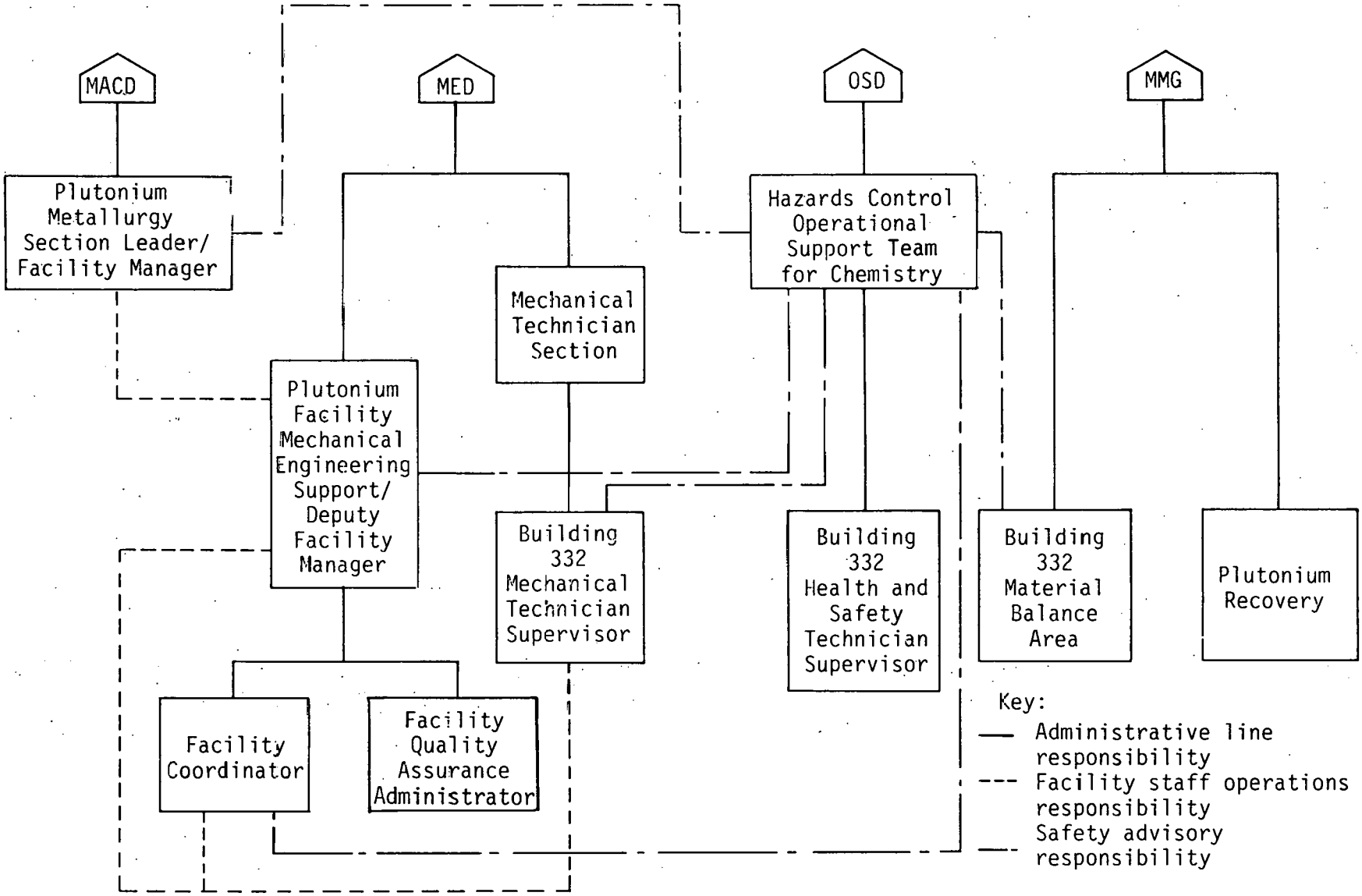


Fig. 7-2. Organization of LLL for safety.

SECTION 8 -- CONCLUSIONS

The facility was designed and built to comply with the requirements of the ERDA Manual Appendix 6301, Part II, Section I, "General Design Criteria, Plutonium Facilities." All design specifications, acceptance test procedures, and change orders were approved by authorized personnel for the Architect-Engineering Firm (Braun and Co.), the contractor (Ralph Larsen & Son, Inc.), ERDA, and/or LLL (Plant Engineering and Hazards Control) where appropriate. The operations to be conducted within this building conform with the original intent. Therefore, it is concluded that after the Building 332 Operational Safety Procedure is modified to include Increment III, Building 332 Increment III can be operated safely and will not constitute a hazard to operating personnel or the general public.

Interdepartmental letterhead

Mail Station L- 471

Ext: 8130

August 10, 1976

M E M O R A N D U M

TO: Building 332 OSP Distribution

FROM: E. C. Draney

SUBJECT: Revision of OSP for Building 332, Dated 6-1-76

The General Procedure section of the Operational Safety Procedure (OSP) for Building 332 has been revised. This revision includes some corrections, clarifications, and updated personnel assignments; no major changes to the General Procedures were considered necessary.

Please replace the current first section of the OSP with the attached revision.

The Appendices to the OSP will be revised when Increment III has been incorporated into the plutonium facility and laboratory assignments have been fully decided.

E. C. Draney
Deputy Manager for Mechanical Engineering
Plutonium Facility

ECD:nc

Attachment

PLUTONIUM METALLURGY AND ENGINEERING FACILITY BUILDING 332

PREFACE

The Laboratory's basic safety policy is that operations must be planned and conducted in a manner that will prevent injury to personnel or damage to property. The minimum safety rules and practices necessary in Building 332 for achieving an accident-free work environment are stated in this Operational Safety Procedure as a supplement to the general safety guidance of the LLL Health and Safety Manual.

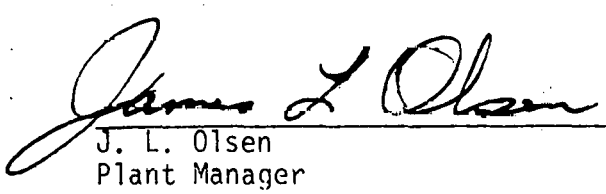
Everyone in this building; i.e., visitor, maintenance and service employee and regularly assigned employee, is required to abide by this procedure and the LLL Health and Safety Manual to protect himself and other personnel from injury. Regular building personnel are responsible for assisting others in the building to understand the safety regulations relating to what they are doing and to abide by the safety requirements.

This procedure was prepared by building management assisted by Hazards Control. Confer with the building Operations Staff and the Hazards Control safety team assigned to this building for interpretation of this procedure and for planning your operations.

This Operational Safety Procedure was reviewed by:

J. W. Frazer	Chemistry & Materials Science Department
W. F. Arnold	Mechanical Engineering Department
J. R. Hauber	Plutonium Metallurgy & Engineering Facility
M. Knezevich	Criticality Safety Committee
J. F. Tinney	Hazards Control Department

This Operational Safety Procedure is approved by:



J. L. Olsen
Plant Manager

CONTENTS

GENERAL PROCEDURE

APPENDICES

SATELLITE OPERATIONAL SAFETY PROCEDURES

Satellite OSP's expand the Facility OSP to cover specific long term operations and are reviewed annually. Satellite OSP's are identified by adding a decimal number to the Facility OSP number. Example: "OSP 332.5, Plutonium Waste Recovery and Packaging, Room 1378". These OSP's are handled as separate documents and are distributed to persons having a direct interest in the specific operation.

SUPPLEMENTAL OPERATIONAL SAFETY PROCEDURES

Supplemental OSP's expand the Facility OSP to cover specific short-term operations. Supplemental OSP's are identified by adding the work "Supplement" and a sequential number to the Facility OSP number. Example: "OSP 332 - Supplement 48, Detector Calibration". These OSP's are handled as separate documents. Many are classified and have limited distribution.

1.0 INTRODUCTION

The Building 332 Plutonium Metallurgy and Engineering Facility was designed specifically for the safe and efficient handling of plutonium-based materials and plutonium-bearing assemblies. The facility is administered by the Chemistry and Material Science Department through the Metallurgy Division. The facility is occupied by sections of the Metallurgy Division and the Research Engineering Division of the Mechanical Engineering Department. The facility provides a viable interdisciplinary (Metallurgy, Physics, Chemistry, and Engineering) capability for the solution of plutonium and plutonium-related problems. The facility provides the capability to (1) further both basic and applied plutonium research; (2) develop advanced metallurgy, chemistry, and engineering techniques to respond to program needs; and (3) provide safe handling of assemblies containing plutonium or other fissile materials during various testing operations.

2.0 OPERATION RESPONSIBILITIES

The following people comprise the Operations Staff and are given the responsibility and the authority to make certain that all experimental, service, or support work is performed in accordance with the general instructions in this procedure and its approved appendices and satellites or with the specific requirements of individually approved Supplemental Procedures. The facility Operations Staff is as follows:

J. R. Hauber	Facility Manager
E. C. Draney	Deputy Manager for Mechanical Engineering
V. G. McIntosh	Facility Coordinator
W. R. Wade	Mechanical Technician Supervisor

The Operations Staff can, in turn, delegate secondary responsibilities for safe work conduct to specific individuals having a prime interest in various unit operations. All such designated personnel will be held directly responsible for observing building regulations and procedures, and for safe and efficient operation of their project. All personnel, while in this facility, are directly responsible to Building 332 Operations Staff.

3.0 SCOPE

This procedure describes the necessary control policies for the safe conduct of work and services performed in Building 332. This procedure applies to all persons who enter the building-- operating staff, visiting research personnel, and support and service personnel.

This procedure must necessarily be general in scope to include controls appropriate for the most obvious hazards anticipated and will be reviewed annually to ensure that its contents are appropriate and adequate for current work performance. The general control procedures outlined here are minimum controls and must be observed for all material-handling operations.

Explosives or electro-explosive devices are not covered or authorized for use or handling under the scope of this general building OSP. The use of such devices requires a special OSP.

Individual Mock HE parts must be certified by LLL analysis to be nondetonating before they are permitted in this facility. Mock HE assembled with fissile materials requires a special OSP and must be verified before assembly with the fissile material.

All work operations will be performed in accordance with the safety policy, guidance and standards of the Health and Safety Manual.

All proposed unit operations exceeding the limits of this OSP or not specifically covered by this OSP will require a Satellite or Supplemental Operating Safety Procedure, which will provide specific instructions and the necessary approvals for the proposed operation (refer to Health and Safety Manual Section 2.00, Planning for Potentially Hazardous Operations).

If any changes are required in the operations described and approved in this procedure or approved appendices, they must be accomplished as follows:

3.1 Any change that alters the scope, or significantly increases the potential hazard of the work, will not be made until a formal revision to the current appropriate procedure (General or Special) has been submitted and approved by those whose signature appear on the approval sheet.

3.2 Any change believed by a member of the Operations Staff, the designated unit operation leader, and the Hazards Control Support Team Leader, to decrease the potential hazards involved or leave them unchanged, may be made with their approval.

3.3 Any question arising from a proposed action that bears directly on this procedure will be referred to the Criticality Safety Committee for resolution regarding the relative hazard and the possible need for revising the procedure.

4.0 GENERAL BUILDING CONTROL

To assist personnel in maintaining a safe working place, the building is divided physically and operationally into zones of relative potential hazard (see Building 332 Floor Plan, Appendix B). Work with (and the storage of) radioactive material is limited to the Radioactive Materials Area (RMA). The corridor of the RMA, normally uncontaminated, acts as a buffer between the "hot" laboratory and "cold" areas. The RMA with its adjoining corridor is an Exclusion Area and is normally open only during regular working hours (7:30 a.m. to 5:00 p.m. Monday through Friday). Special regulations apply to all persons and objects entering or leaving the RMA. The rest of the building is open at all times and access is governed by security rules.

Plutonium is a very hazardous material for four main reasons: its radioactivity is higher than for most other weapon materials; it contaminates exposed surfaces quickly; it is a fissile material which, if mishandled, can lead to a criticality accident; it is extremely pyrophoric in some forms. Therefore, users or handlers of plutonium must learn and observe special handling procedures.

5.0 ADMINISTRATIVE CONTROLS

The following administrative controls are stated as an aid to experimenters in planning or conducting operations in Building 332.

5.1 Access Controls

5.1.1 Security Access

The Vault (RMA) area of Building 332 operates as an Exclusion Area. Personnel access controls and protection of classified components must comply with the procedures and requirements of the LLL Security Manual. Additional requirements for CAIN access as determined by the Security Department include a weight check and a unique 5-digit identification code to be certain that CAIN access to the RMA cannot be circumvented.

For the protection of classified information, a "need to know" is required before an individual can gain access to an Exclusion Area. The "need to know" is determined by supervisory personnel who are on an approved list maintained by the Security Department. To authorize a person into the RMA, an authorized requestor must initiate an access request with an Exclusion Area Access card, RL-2538, for quarterly access or RL-2538-1 for access of less than 90 days. To arrange a one-day access to the RMA, an authorized requestor must call Ward Miller (X5152) or Virgil McIntosh (X7131) who will check that all safety requirements are satisifed before relaying the security request to the badge office.

In addition to security access, each individual must satisfy ERDA and LLL requirements for an annual safety briefing and annual respirator fitting before qualifying for admission to the RMA. All security access cards are reviewed by the Deputy Manager for safety access classification before they are approved by the badge and pass office.

5.1.2 Safety Access

For protection while working in the RMA, personnel are grouped into one of four classifications (see Paragraph 5.2, Safety Classification of Personnel) by the Deputy Manager or his alternate. The judgement of which safety access classification is required is determined for each individual based on their function in the facility and their safety indoctrination and experience. Without an "X" badge or an "X" safety access classification indicated on the access list, authorization by an approved building contact (see Authorized Building Contacts, Appendix C) must be obtained before safety access is permitted. The Building Contact is responsible for the safety supervision of the individual while in the RMA. All Class IV personnel must be continuously escorted while within the RMA. The Building Contact may assign an escort but is still personally responsible for any individual he allows in the RMA.

5.1.3 Off-Shift Access

The RMA is routinely opened every 2 hours (20 minutes after the even hours, 1820 hours, 2020 hours, etc.) for access by the maintenance machinists and left open for approximately 20 minutes. During this interval, personnel with an "X" safety access classification will be allowed to enter to check experiments or adjust apparatus as long as there is no handling of radioactive materials or glovebox work involved and the task can be accomplished while the vault is open. Other personnel will be allowed the same privilege if they have obtained prior approval from a member of the Building Operations Staff. All persons entering the vault must have an "X" badge, and "X" following their safety access classification indicated on the access list, or must have been previously signed in for a limited-time access by an Authorized Building Contact (see Appendix C). Any operation that cannot be accomplished in accordance with the above conditions must be reviewed by the Deputy Manager and a procedure established.

5.2 Safety Classification of Personnel

Personnel who work in Building 332 are grouped into safety classification categories based on their training, type and length of work experience with plutonium and demonstrated competence in building operations.

5.2.1 Class I

Class I personnel are allowed to work with radioactive materials or on contaminated equipment without direct supervision. To qualify for this classification, the person must be a building resident, must have considerable time and experience in Class II work and must be recommended by his immediate supervisor and approved by the Building Operations Staff.

All Class I personnel must attend an annual safety and criticality lecture that covers all aspects of safety both on routine operations and how to respond to abnormal building occurrences.

It is the responsibility of each Class I person who supervises any Class II and Class III operators to know the safety classification of each person responsible to him and to provide the required level of supervision and instruction.

5.2.2 Class II

Class II personnel are allowed to work with radioactive materials or contaminated equipment under minimal supervision of a Class I building resident. It is the responsibility of the Class II operator to be sure that the appropriate Class I resident is fully aware of the scope of work and the planned work schedule. This classification also includes those non-building residents who, because of special skills and job assignments, must work with radioactive materials or contaminated equipment.

To qualify for this classification, the person must have considerable time and experience as a Class III worker and must be recommended by a Class I building resident and approved by the Building Operations Staff.

All Class II personnel must attend an annual safety and criticality lecture that covers all aspects of safety both on routine operations and how to respond to abnormal building occurences. In addition, each new applicant for this rating must successfully complete the Mechanical Technician Certification Program for Building 332 or must demonstrate competence and safety awareness at an equivalent level to that obtained from course completion.

5.2.3 Class III

Class III is the starting category for each building resident or regular worker or visitor. Class III personnel are allowed RMA access without an escort but normally cannot work with radioactive materials or contaminated equipment.

In special situations and only with approval of building management, a Class III worker may be allowed to perform limited and specific operations in a contaminated enclosure or on contaminated equipment. However, this work may be performed only with a Class I building resident in attendance.

Class III personnel are given an annual safety indoctrination sufficient for the safe performance of their specific assignment and includes instructions on how to respond to any abnormal building condition or emergency alarm.

5.2.4 Class IV

The Class IV classification is limited to the infrequent visitor who will be escorted all the time they are in the RMA. This category would normally provide for visits by laboratory management, project supervisors, visitors and workers with specialized skills that are required only rarely. This category is not intended to be used as a temporary substitute for the normal safety training a worker or frequent visitor must have.

It is the responsibility of the person who authorizes Class IV access into the RMA to arrange for an escort, a temporary respirator fitting and to be sure the visitor is aware of the potential hazards and building emergencies and knows how to respond to the building alarm signals.

5.3 Respirators

In order to have access to the Radioactive Materials Area (RMA), each person must carry an approved and fitted respirator, equipped with a high efficiency filter for radioactive and toxic dust. Each respirator must be removed from its plastic bag and adjusted to fit the user's face before entering the RMA.

Approved half-face respirators are stocked in Building 332. Anyone who has not had a fit for a respirator within the previous year, should call a Building 332 Health and Safety Technician for a respirator fit before entering the RMA.

Facial hair is permitted if it does not interfere with the rapid and efficient use of your respirator. No facial hair is allowed in the area where the respirator seals to your face. Mustaches must be trimmed short enough so that they cannot be caught under the respirator seal. Bearded persons who cannot be fit with a half-face respirator may carry a full-face respirator. Again, the beard must be trimmed so that no facial hair lies under the respirator seal. The full-face, like the half-face, must be carried whenever you are within the RMA.

An exception is made for bearded persons who visit the RMA on a very infrequent basis, who do not handle radioactive materials, and who are continuously escorted. These persons will be allowed to use a mouth-type respirator, available from the Building 332 Health and Safety technicians. The mouth-type respirator is for "one-time" visitors. Anyone who wants to continue to visit the building, must be fitted with either a half-face or a full-face respirator.

5.4 General Safety Rules

For the protection of all personnel, the following general safety rules will be observed by everyone entering the RMA.

5.4.1 Minimum protective clothing--orange laboratory coats and shoe covers--must be worn in the RMA and must not be worn in the nonradioactive ("cold") areas of the building beyond the air locks or change room exits.

5.4.2 Each person must wear a personnel radiation monitoring packet while in the RMA.

5.4.3 Individuals who enter the RMA must carry an approved respirator on their person at all times. (See Paragraph 5.3 above.)

5.4.4 The number of people present in any area at any time should be limited to the minimum required to perform the operations. The number permitted will be determined by the experimenter in consultation with a member of the Operations Staff. Additional observers or participants may be permitted with due consideration to the potential risk.

5.4.5 Equipment in the work area must not be handled or changed by any individual unless he is completely familiar with its operation and has the cognizant supervisor's permission.

5.4.6 Access to the crash doors leading from any of the laboratories to the outside of the building must be unobstructed but the doors are not to be used unless there is a criticality alarm (continuous Klaxon). An alarm at the Security Police Building sounds when any crash door opens, however, they may be opened for a valid reason by making prior arrangements through the Operations Staff and the Security Police.

5.4.7 Smoking is not permitted in the laboratories, but is permitted in the corridor of the RMA after a radiation survey indicates that no radioactive contamination is present on the individual's hands or protective clothing.

5.4.8 Eating or drinking--except for drinking water from the fountain in the corridor--is not permitted in the RMA.

5.4.9 Individuals must perform a contamination survey of their person before leaving any laboratory, before leaving the RMA, and before leaving the change room.

5.4.10 All materials and equipment must be surveyed for contamination before removal from the RMA. Hand tools and other small items may be checked by Class I or Class II personnel. Large items, such as racks of electrical equipment, and all equipment which has been used in conjunction with a contaminated enclosure must be checked by a Health and Safety Technician. A Hazards Control Survey Tag must be fixed to the item before it leaves the RMA.

5.5 Criticality Safety

Within the RMA, a work station is defined as an enclosure, hood, assembly table, or specific item of process equipment designed for a series of operations on a single material system. A box line may contain several work stations. In every case the boundaries of each work station must be clearly defined and posted. (Contact a Health and Safety Technician for the necessary materials.) Each work station will be permanently established and physically isolated from other work stations to obtain a true geometric separation not dependent upon administrative control. Temporary work

stations that do not meet the above requirements are not permitted under the scope of this General Procedure but may be authorized, as the need arises, under a Special Operating Procedure. The boundaries of adjacent work stations must be physically separated by at least 300 mm (12 inches). Work stations not meeting the above minimum requirements must be approved by the Criticality Safety Committee.

Maximum mass batch limits are established for each work station, depending on material form and work performed, and only one maximum batch may be processed at a work station at one time. The limits recommended in this section are based on the Nuclear Safety Guide, TID-7016, Rev. 1. Introduction or removal of fissile material at a work station is dependent on administrative control for maintenance of criticality safety. See Appendix L for detailed explanation of controls.

The criticality safety limits given below apply to the total mass of fissile material present in a work station at any time regardless of the number of containers involved.

5.5.1 Batch Limits for Work Stations

5.5.1.1 Plutonium in any form that is readily soluble, in solution, easily dispersed (e.g.: machine turnings) or a compound or mixture where the H:Pu ratio is greater than 2 is limited to a maximum of 0.220 kg per batch. This mass limitation includes the scrap or unaccounted-for plutonium in the box at the time.

Under these conditions, values of other materials are:

Material	Maximum Batch (kg)
^{233}U	0.250
^{235}U	0.350

Any combination of the above materials is limited to a maximum batch of 0.220 kg total for the combination.

NOTE: A Special Procedure is required for any unit operation involving material quantities exceeding these batch limits.

5.5.1.2 Plutonium that is not readily soluble, or easily dispersed (such as metal) is limited to a maximum of 2.6 kg per batch. Under these same conditions, values for other materials are:

Material	Maximum Batch (kg)
^{233}U	3.2
^{235}U	10.0

Any combination of the above materials is limited to a maximum batch of 2.6 kg total for the combination.

NOTE: A Special Procedure is required for any unit operation involving material quantities in excess of these batch limits.

5.5.1.3 When dispersible and nondispersible forms exist in the work station, the mass of the dispersible form shall not exceed the mass limits given in Paragraph 5.5.1.1 above and the total mass in the work station shall not exceed the mass limits in Paragraph 5.5.1.2 above.

5.5.2 Maximum Mass Limit Per Room

Any process or laboratory room that contains several work stations is limited to a maximum mass of 20 kg of any combination of fissile material.

5.5.3 Mass Limits for Storage in Birdcages

Birdcages used for storage and shipping shall not exceed the mass limits listed in Table 5.5.3-1 (unless specifically approved by the Criticality Safety Committee). The vault area storage inventory is limited to a maximum of 50 birdcage or storage units.

Storage containers or similar type shipping containers can be loaded to the limits in Table 5.5.3-1 for storage in vault shelf compartments that are provided with approved modular spacers. Under these conditions, storage in a storage container is considered equivalent to a birdcage.

However, a storage container that is not provided with a modular spacer is not considered equivalent to a birdcage for delivery and handling within the building. All such deliveries shall be made under direct and continuous administrative control to ensure that only one storage container at a time is delivered or handled.

TABLE 5.5.3-1 Birdcage Mass Limits (kg)

	^{235}U	^{239}Pu	^{233}U	Any Combination
Metal, oxides, or dry degreased chips, kg	18.5	4.5	4.5	4.5
Solutions, hydrogenous compounds, or mixtures, chips under oil, kg	0.35	0.22	0.25	0.22

5.5.4 Work Area Criticality Safety

5.5.4.1 Unattended storage of fissile material is permitted only in gloved or inert atmosphere enclosures, or birdcages not dependent upon administrative control for isolation. Overnight storage of plutonium samples in gloved boxes will be in closed metal containers.

One exception to the requirement of closed metal containers for overnight storage is the Analytical Facility (Rms. 1313, 1321 and 1329). Samples can be stored inside glove boxes as solutions in flasks, beakers, etc. or in small glass or plastic vials as metal or oxide.

Once in a while, plutonium will be in work such as machining where it is not feasible to place the material in a closed metal container. If a member of the operating staff approves, the plutonium may be left "as is" and covered with aluminum foil. Hazards Control personnel must be informed of this condition and its location.

Whenever possible, return material to the Building 332 MBA Vault for storage until work or processing is to be resumed. Post each work station properly and conspicuously during all periods of storage. The minimum information posted will show the type, form, and amount of materials contained.

5.5.4.2 All work stations at which material is to be processed, or changed in shape or form, will include these additional controls:

All material must be weighed before and after processing, and a material balance achieved. If the chemical form is changed, material will be analyzed when necessary.

All scrap, chips, turnings, solution, or residue generated from processing operations must be accounted for after each job. Plutonium that accumulates at each work station in the form of scrap or residue should be limited to a maximum of 0.220 kg of ^{239}Pu (0.250 kg of ^{233}U; 0.350 kg of ^{235}U). If this level is reached, stop all work and remove and package the residue for subsequent recovery. (See Appendix L for handling details.)

Maintain and post inventory sheets at each work station. Keep a running record of material processed and material losses accumulating in the enclosure. Operational personnel are responsible for maintaining this control.

5.5.4.3 Where fissile materials in any form exceed 0.220 kg for plutonium (0.250 kg for ^{233}U; 0.350 kg for ^{235}U) moderating liquids within the work station are limited to 1.0 litre. Water is not permitted in cooling systems unless specifically approved by an Operational Safety Procedure.

5.6 Fire Prevention

Many of the most costly incidents at laboratories handling radioactive materials have resulted from the unfortunate combination of fire and radioactivity. Each experimenter must remember that his actions can affect more than just his own immediate area. Plutonium in its various forms and compounds presents special fire hazards that must be learned and understood by each experimenter in order to conduct safe operations. If unsure of the pyrophoric nature of the materials being handled, contact the Lead Health and Safety Technician, and he will supply this information. The rules given below will help reduce the fire risk while working in Building 332.

5.6.1 Plutonium as chips, turnings or plutonium hydride is extremely pyrophoric. These forms must always be handled in inert atmospheres. Special packaging instructions for transportation and storage are given in Paragraph 6.3.3.

5.6.2 Good housekeeping is good insurance in both preventing and keeping fires small and controllable. If combustible trash cannot be removed immediately, store it in closed metal cans.

5.6.3 Frequently inspect all areas for improper electrical connections and frayed cords. These are excellent sources of ignition.

5.6.4 Flammable solvents (such as acetone and MEK) should be used very sparingly. Limit their quantity and store them outside the box in closed containers when not in use. Each container shall be labeled to correctly identify its contents.

5.6.5 Flammable gases are generally prohibited in the Radioactive Materials Area (RMA). Operations Staff approval is required before flammable gases can be brought into the RMA and if a satellite procedure is requested, any temporary or permanent facilities for flammable gases should be fully described.

6.0 OPERATIONAL CONTROLS

6.1 Individual Experimenter's Responsibilities

6.1.1 Individual experimenters who plan to work in Building 332 must contact the Facility Manager, Deputy Manager, or a designated alternate, before starting work. The

Hazards Control Support Team Leader should be consulted before new experiments are initiated. It will be determined at that time whether the proposed work is appropriate for the facility and fits within the scope of this OSP.

6.1.2 The experimenter is responsible for the safety of all work performed in his assigned area including the safety of his co-workers and the protection of Laboratory equipment.

6.1.3 The experimenter must realize that he is handling a potentially hazardous material. The experimenter is encouraged to ask questions and seek advice and guidance from his supervisor especially if there is any doubt in his mind that he does not adequately understand the materials and the process on which he is working.

6.1.4 All persons are responsible for the condition of their work areas and the equipment therein. Responsibilities of the experimenter include eliminating safety hazards in the area; for example, disposing of trash, minimizing combustible material, strapping gas bottles, and maintaining equipment. The persons listed in Group B of Appendix A are responsible for the safety and housekeeping practices of the individual laboratories.

6.1.5 All work operations must be performed in accordance with this OSP or a Supplemental or Satellite Procedure established for Building 332.

6.2 Working with Radioactive Materials

6.2.1 Work is not permitted in a contaminated enclosure unless it has a negative differential pressure of at least 0.6 in. (15.5 mm) of H_2O. All new gloved enclosures will be leak tested and approved by the building quality assurance (QA) administrator. All modifications to QA approved enclosures must also be reviewed and approved.

6.2.2 Potentially hazardous work that involves radioactive materials will not be performed unless two or more persons are present in the area. (Refer to Health and Safety Manual Section 1.07, "Working Alone"). In many operations where the work is fairly routine, permission for an experimentor to work alone may be authorized by the Operations Staff if the worker has a one-man-alarm to request immediate assistance from nearby co-workers.

6.2.3 All persons who work in the RMA must be instructed by a Health and Safety Technician in the correct use of radiation detection instruments while performing their job.

6.2.4 An appropriate radiation survey instrument must be at hand in the room before starting work with radioactive materials. The instrument must be checked before and after use by the experimenter to ensure that it is in operating condition. A check source is attached to each instrument.

6.2.5 Gloves on enclosures must be surveyed by the person using the enclosure before starting work.

6.2.6 Surgeon's gloves must be worn while working inside the gloves of a contaminated enclosure.

6.2.7 Surgeon's gloves, and forearms of protective clothing, must be surveyed each time the experimenter removes his hands from the enclosure gloves.

6.2.8 Respirators and surgeon's gloves must be worn while bagging material into or out of a contaminated enclosure.

6.2.9 Persons with open cuts or wounds are not permitted to work in the RMA without medical approval.

6.2.10 Personal effects, such as watches, jewelery, and rings should not be worn while working with radioactive materials.

6.2.11 When opening a storage freezer, survey the door as it is opened, and survey the containers before removing them.

6.2.12 Metal covers must be placed over all glove ports and bagout ports at the end of the workday.

6.3 Material Transport and Control

6.3.1 The Materials Management Group is responsible for all shipments of radioactive and SS Materials, contaminated equipment, and waste to and from Building 332 and controls storage of these materials within the Building 332 Vault. A Materials Management representative is available to provide information about regulations governing accountability, packaging, labeling, shipping, and vault storage. For more about accountability and vault storage, see Appendix L.

6.3.2 The authorization to withdraw plutonium from the vault storage is established for each individual whose name is listed in Attachment A, Appendix L. Each individual is responsible for the correct handling, packaging, and movement of his own radioactive and SS materials within the Plutonium Facility.

6.3.3 For purposes of defining packaging requirements, plutonium and other radioactive materials are divided into three basic groups: solid (oxides, thick metals, etc.), pyrophoric (thin metal shapes, turnings, hydrides), and solutions. Normally, material from any of these groups will be placed in a primary vessel (plastic, glass, metal) before removing from the enclosure. In each instance, the material will be placed in a metal can (provided by a Health and Safety Technician) immediately after the bagout.

When a primary vessel is not used (e.g. a large piece of plutonium), sharp edges should be covered to facilitate handling.

Material in the pyrophoric group must be placed in a metal can and sealed before bagout. Every effort should be made to provide a dry inert atmosphere for the packaged part. The evolution of gaseous products from radiolysis is one of the primary hazards in packaging radioactive solutions. To avoid overpressuring, either provide continuous filtered venting or use a vessel specially designed to withstand the expected pressure buildup. Any vessel used for this purpose must have the prior approval of the Deputy Manager or the Mechanical Technician Supervisor.

Properly packaged plutonium may be stored in the Building 332 Vault, or in the freezers designated for storage. These freezers are designated Temporary Work Stations and must be padlocked when left unattended.

7.0 MAINTENANCE, REPAIR, AND SERVICE PERSONNEL CONTROLS AND RESPONSIBILITIES

All service personnel assigned to perform maintenance, repair, modification, installation, service work, etc., are subject to the same personnel access controls as research personnel. Specific additional regulations are:

7.1 All work requires prior authorization and approval by a member of the Operations Staff. Authorization also includes approval of the time period that work is scheduled.

7.2 Supervisors of service groups are directly responsible for ensuring that all building procedures and regulations are followed by service personnel who have work assignments in Building 332.

7.3 All work done in the RMA is subject to a prior safety evaluation and approval of a member of the Operations Staff.

7.4 All work must be coordinated through the Facility Coordinator.

8.0 HAZARDS CONTROL SUPPORT

Hazards Control Area Support Teams provide the various programs of the Laboratory with assistance to help achieve and maintain a safe and accident-free work environment. The team supporting Building 332 operations is identified in Appendix A. The Hazards Control Support Team Leader coordinates the team efforts. He will work with the building Operations Staff and project leaders to provide safety advisory and support services.

8.1 Stopping Hazardous Operations

Hazards Control personnel have the responsibility and authority to request the stopping of operations they witness and believe are, or may become, imminently hazardous. In this sense, a hazardous operation is one where accepted and established LLL or Building 332 safety practices or procedures have been overlooked, ignored, or misinterpreted, and where the probability is high that an employee will be injured or property damage will occur. (Refer to the Health and Safety Manual, Section 1.06.)

8.2 Specific Responsibilities

The Support Team is specifically responsible for performing the following actions and, where appropriate, reporting them to the supervisor concerned:

8.2.1 Establish the standards and limits necessary to control hazards.

8.2.2 Evaluate safety methods, techniques, equipment, and practices in current use, or as proposed for future operations.

8.2.3 Assist in preparing special operating procedures.

8.2.4 Assist in providing safety indoctrination and training for building personnel.

8.2.5 Survey the working environment and maintain the files of such survey records.

8.2.6 Assist in planning to achieve appropriate response in the event of emergencies.

8.2.7 Comply with the written instructions in the Lead Health and Safety Technician's Building Book.

8.3 Bioassay Program

A bioassay program shall be maintained in Building 332. This program will be administered by Hazards Control who will maintain a list of those who are to submit bioassay samples. This list is sent to the Medical Department and copies are posted in Building 332. The determination to add or delete individuals from the list is made by the Deputy Manager with the assistance of the Lead Health and Safety Technician according to the nature and duration of the work to be performed. Ordinarily, the frequency for individual sampling has been set at once every six months. Additional samples may be required if a significant exposure is suspected. Empty bottles are provided at Building 332 for each person on the list. When sampling is complete, filled bottles are to be returned to the Building 332 change room. If internal deposition is indicated, the Hazards Control Health Physics Group, the affected individual, his supervisor, and the Deputy Manager are notified. In such instances, the Medical Department usually requests another sample.

9.0 EMERGENCY PROCEDURES

9.1 General

During an emergency situation, the prime objective is to act promptly and correctly to control conditions so that the incident is arrested and does not escalate. Generally, in all but very minor emergencies, the most prudent first action is to declare the emergency on the emergency paging system. This action serves the very important dual function of calling for assistance and notifying the building supervision of the emergency.

The EMERGENCY CALL LIST, Appendix A, identifies personnel who are knowledgeable with respect to Building 332 operations and who may be called to provide specific operational and process information in the event of an emergency.

TABLE 9-II. Summary of Emergency Procedures

	EMERGENCY	ALARM	ACTION	ALL CLEAR
1.	High Radiation Level/Criticality	Continuous Klaxon	Evacuation by nearest exit.	Verbal
2.	General Evacuation	Verbal	Follow instructions given over paging system.	Verbal
3.	Radioactive Spill	Verbal	Follow instructions given over paging system.	Verbal
4.	Fire	Fire bell	Follow instructions given over paging system.	Verbal
5.	One Man Alarm (Call for Assistance)	Hi-Lo Tone and red light over door to lab.	Respond to the call for assistance and give aid.	Verbal
6.	Continuous Air Monitor	High pitched intermittent sound.	Call Health and Safety Technician after leaving Lab.	Verbal

9.2 Response of Personnel Discovering Emergency

The responses given below are listed in their preferred order. However, it may be prudent to respond in some other order. Nevertheless, in all but very minor emergencies, always dial Ext. 7333 and report the emergency.

9.2.1 Respond to the emergency without risking personal injury.

9.2.2 Declare the emergency on the emergency paging system and obtain further assistance as follows:

Dial 7333 and give the following information:

Your name.

Emergency location (Building 332, Room ___).

An appraisal of the situation, especially if there are any injuries.

Take remedial action:

Give emergency aid to the injured.

Isolate the affected area.

Assist the emergency response groups.

Verify that the building supervision is aware of the emergency.

9.3 Responsibility

The Deputy Manager, or a designated alternate, will direct activities of personnel during emergencies. He will also provide guidance to all Emergency Response Groups reporting to the incident. Responsibilities will then be assumed by the Senior Fire Officer until relieved by the Emergency Coordinator. (Health and Safety Manual, Section 3.00, Accident Control.)

9.4 Criticality Accident

An area detection and alarm system is installed to detect a criticality accident. This system is installed in accordance with the criteria contained in the Health and Safety Manual, Section 11.04, "Evacuation Alarm Systems", and it is detailed in OSP 332, Appendix N, "Criticality Alarm System".

In the event of a criticality accident, the evacuation alarm (Klaxon horn) will sound continuously throughout the building and the surrounding area. Personnel working in or around the building, upon hearing the Klaxon, shall leave immediately by the nearest exit (including the crash doors) and assemble for instructions and identification at the nearest Police Post in the area of Building 332. Keep as far away from the building as possible while proceeding to the Police Post. Rapid response to the Klaxon alarm is essential. Do not stop to secure classified documents or parts.

9.5 Radioactive Spills

A release of plutonium is usually accompanied by finely divided oxide particles which may become airborne. Every practicable means must be taken to prevent inhalation or ingestion of this airborne particulate matter. Act rationally during a spill to protect yourself and others and to prevent the spread of contamination. The protective actions you take must depend on circumstances and cannot be specified in advance. Use the following suggestions to guide your actions:

9.5.1 If at all reasonable, put on your respirator, but use common sense. If your respirator is contaminated, don't put it on. If your face is contaminated, hold your breath as long as you can while you wipe off as much contamination as possible.

9.5.2 Many of the radioactive spills will be of the nature of a contaminated hand, because of a glove failure, or a contaminated bootie. In these cases, minimize the spread of contamination as much as possible. If someone else is in the room, have them call a Hazards Control technician. If you are alone, go directly to the nearest paging system phone and call for assistance.

9.5.3 If a Continuous Air Monitor (CAM) alarm sounds in a laboratory, this may indicate a high air count of particulate contamination. Put on your respirator, get out of the room and call for a Hazards Control technician at the nearest paging system phone. To avoid any further spread of possible contamination, wait for a Hazards Control representative to come to you.

9.5.4 If a solution or suspension containing plutonium is spilled, the plutonium particles may become airborne if the solution evaporates. This possibility makes it advisable to don your respirator immediately. However, if your face or hands are contaminated use good judgement as to the best course of action. (Safety glasses are required when working with chemical solutions.)

9.5.5 In the event of a major spill, each person in the room should don their respirator, if it can be done safely, and assemble in the corridor just outside of the doorway of the contaminated room. Remain in the area until released by Hazards Control. One person should go to the nearest paging system phone and request assistance so that Hazards Control and building management may respond as appropriate. After evaluating the situation, the respondent may do some or possibly all of the following which in his judgment are appropriate:

Dial 7333 to obtain outside assistance. Notify building occupants of the situation and advise them of the required action.

Survey all persons who were in the vicinity of the incident for contamination.

Restrict access to the affected area.

Establish the boundaries of the contaminated, intermediate, and the uncontaminated areas.

9.6 Decontamination

Decontamination of personnel is performed in Room 1306 and must be done under the supervision of a Hazards Control technician via the following procedure:

9.6.1 Wash with lukewarm water and a mild detergent such as "Radcon". CAUTION : Hot water increases the possibility of absorbing plutonium through the skin. The horny layer of the skin protects the underlying living cells. It is important in this stage of decontamination not to damage or remove this protective layer.

9.6.2 If the above procedure is not successful, wash the contaminated area with a filtered solution of four percent potassium permanganate in water. This solution removes the horny layer of skin without abrading it.

Only the above two steps will be performed in this facility. If they are not successful, the contaminated person will be sent to the Hazards Control Decontamination Facility in Building 419, or to the Medical Department, Building 310.

Notify Hazards Control of equipment that needs decontamination. An evaluation will be made as to where the decontamination work will be done. Minor decontamination work will be done in Building 332 and major decontamination jobs will be sent to Building 419.

9.7 Fires

9.7.1 For the purpose of defining emergency action, fires in Building 332 are of two categories: those that may involve radioactive material and those that are clearly free of radioactive contamination. The basic assumption is that any fire in the RMA or the equipment loft area may involve radioactivity and escalate into a release of contamination. In these two areas no one is to assume that a fire is controllable and act independently to suppress the fire. The response of a person discovering a fire is outlined in Paragraph 9.2 and is repeated here for emphasis:

The responses given below are listed in their preferred order. However. it may be prudent to respond in some other order. Nevertheless, in all but very minor emergencies, always dial Ext. 7333 and report the emergency.

9.7.2 Respond to the emergency without risking personal injury.

9.7.3 Declare the emergency on the emergency paging system and obtain further assistance as follows:

Dial 7333 and give the following information:

Your name.

Emergency location (Building 332, Room ___).

An appraisal of the situation, especially if there are any injuries.

Take remedial action:

Give emergency aid to the injured.

Isolate the affected area.

Assist the emergency response group.

Verify that the building supervision is aware of the emergency.

9.7.4 Burning plutonium cannot normally be extinguished. The two measures which reduce the combustion rate are reducing the temperature of the reaction and denying the reaction a supply of oxygen. Actions which achieve these objectives in a practical approach without compromising the confinement barrier are acceptable. In most cases the best course of action is to isolate combustible materials from the reaction and direct your efforts toward maintaining the integrity of the confinement barriers, the glove box, the laboratory room, and the building.

In fires that are clearly free of radioactive contamination, the person discovering the fire responds as outlined above. After assistance has been summoned, he may act independently to suppress the fire if he is fully confident that he can do so without personal risk.

9.8 One-Man Alarm

A special alarm has been installed in several of the RMA laboratories where it is permissible for one person to be working alone in a contaminated enclosure. This alarm system consists of a portable switch, a loud oscillating warning sound, a flashing red light outside of the laboratory and a light and bell on the central alarm console in room 1236.

The purpose of the alarm is to request assistance when the operator working alone can not leave his work station to use the paging system without risking a possible spill or injury. For instance, a glove that is torn during use may release contamination into the room when the operator removes his hand and arm in the normal manner.

Anyone hearing the alarm should respond immediately and provide the assistance necessary to minimize the spread of any contamination and render just aid, if required.

EMERGENCY CALL LIST
BUILDING 332

This call list identifies personnel who are knowledgeable concerning Building 332 Operations and who may be called to provide operational and process information in the event of an emergency. During regular working hours (8:00 a.m. to 4:45 p.m. Monday through Friday) Building 332 personnel may be contacted on Ext. 5141. Home telephone numbers are included if information is required during off-shift hours.

NOTE: This is not an automatic call list for response to an emergency. A separate response list is maintained by the Fire Dispatcher.

GROUP A - FACILITY RESPONSIBILITY

			Home Telephone No. Area Code	Lab Code	Phone No.
1.	J. R. Hauber	Plutonium Metallurgy & Engineering Facility Mgr.	415	68	881-8616
2.	E. C. Draney	Deputy Manager	209	**	835-3164
3.	V. G. McIntosh	Facility Coordinator	209	**	835-0919
4.	W. R. Wade	Technician Supervisor	415	69*6*	933-6090

GROUP B - OPERATING RESPONSIBILITY

The people listed below are responsible for the general safety and operating practices in their individual laboratories.

Room No.	Name	Dept.	Home Telephone No. Area Code	Lab Code	Phone No.
1255/60	F. J. Wittmayer	Chem.	415	9	447-6739
1256	C. J. Echer	Chem.	415	9	447-0989
1305	W. R. Wade	M.E.	415	69*6*	933-6090
1313	P. L. Wallace	Chem.	415	9	447-9647
1314	J. K. Harter	H.C.	415	9	351-9152
1314A	J. H. Shannon	Mtls. Mgt.	415	9	443-9096
1321	J. C. Walden/	Chem.	415	9	443-2057
	J. W. Magana	Chem.	209	**	466-8810
	R. E. Stone	Chem.	415	9	447-7280
1322	R. A. Pereyra	Chem.	209	**	823-2382

* Wait for dial tone.

**Please note that there is no laboratory access code for Tracy, or Stockton. To call someone in this area during off-shift hours, dial "12" and ask the police operator to place your call.

EMERGENCY CALL LIST
BUILDING 332 Cont'd

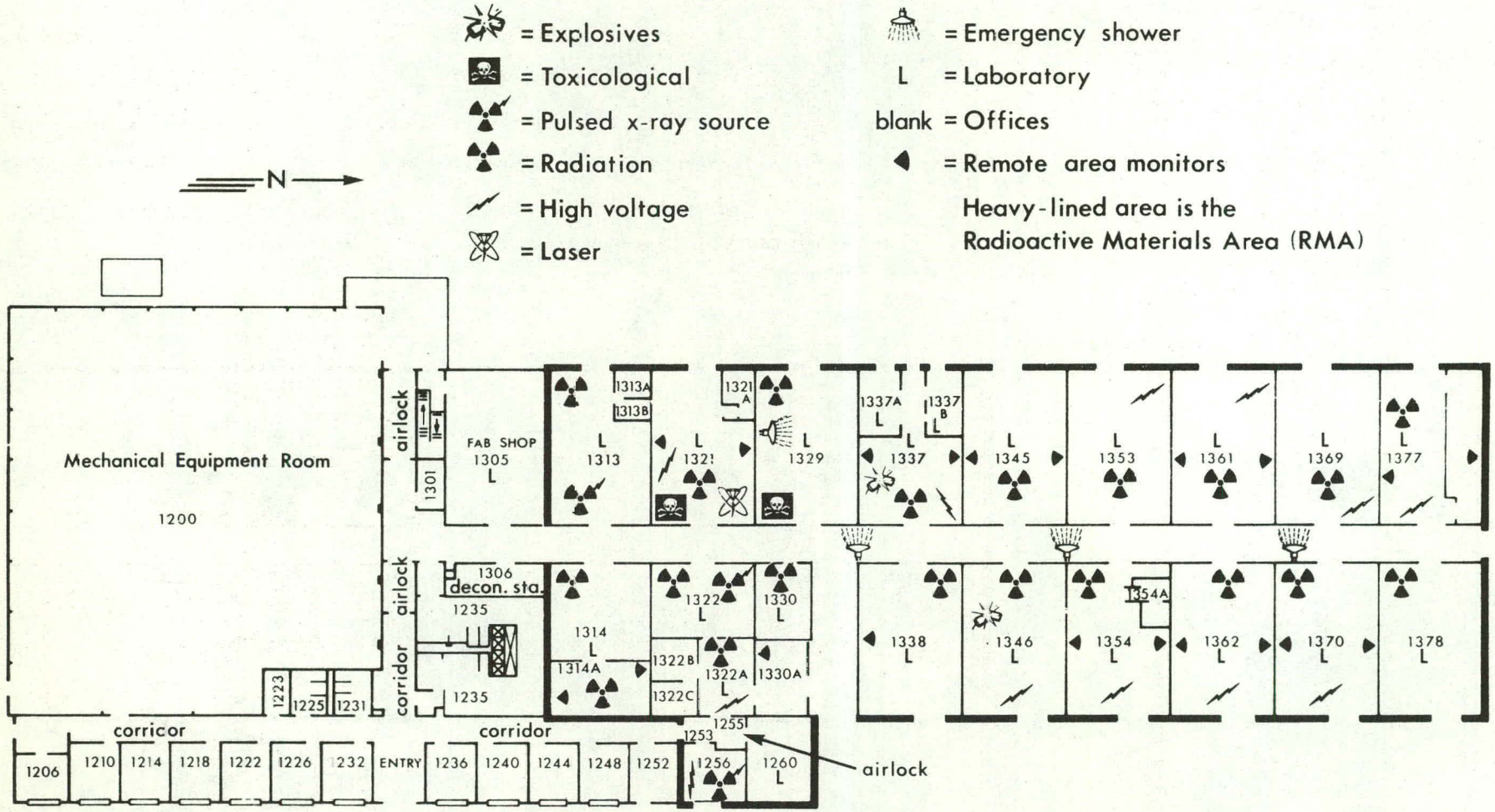
Room No.	Name	Dept.	Home Telephone No. Area Code	Lab Code	Phone No.
1329	J. C. Walden/	Chem.	415	9	443-2057
	J. W. Magana	Chem.	209	*	466-8810
	R. E. Stone	Chem.	415	9	447-7280
1330	W. D. Ludemann	Chem.	415	9	443-1639
1330A	J. K. Harter	H.C.	415	139	351-9152
1337	W. R. Wade	M.E.	415	69*6*	933-6090
1338	W. D. Ludemann	Chem.	415	9	443-1629
1345	W. R. Wade	M.E.	415	69*6*	933-6090
1346	R. E. Kelley	Chem.	415	9	443-3775
1353	W. R. Wade	M.E.	415	69*6*	933-6090
1354	W. R. Wade	M.E.	415	69*6*	933-6090
1361	W. R. Wade	M.E.	415	69*6	933-6090
1362	W. R. Wade	M.E.	415	69*6	933-6090
1369	W. L. Thayer	Chem.	415	68	656-4545
1370	R. L. Rose/	Chem.	209	**	835-8153
	B. A. Kuhn	Chem.	415	9	447-7078
1377	R. E. Kelley	Chem.	415	9	443-3774
1378	J. V. Kaufman	Mtls. Mgt.	415	68	656-7125

GROUP C - HAZARDS CONTROL RESPONSIBILITY (Building 332 Area Team)

Function	Name	Ext.	Home Telephone No. Area Code	Lab Code	Phone No.
HC Support Team Ldr.	M. H. Chew	8861	415	9	447-3184
Off-Shift HS Tech.	--	7222			-
Lead HS Tech.	C. K. Koivu	5151	415	68	886-1420
Health Physics	D. E. Hankins	3856	415	9	455-5379
Industrial Safety	O. R. Van Dyke	3339	415	9	443-0262
Industrial Hygiene	W. L. Eneidi	3848	415	9	447-7584
Fire Safety	M. W. McGee	3834	415	9	443-7913
Criticality Safety	T. J. Powell	3826	415	139	835-9675
Explosives Safety	R. E. Henry	11-289	415	9	447-7975

* Wait for dial tone.

**Please note that there is no laboratory access code for Tracy, or Stockton. To call someone in this area during off-shift hours, dial "12" and ask the police operator to place your call.



Building 332 Floor Plan

AUTHORIZED BUILDING CONTACTS

A system of Building Contacts has been set up to control the safety access to Building 332. Building Contacts are responsible personnel who know of the operations performed in the building and have the following limitations and responsibilities:

1. Can only authorize access for individuals with whom they will have direct contact in the building.
2. Must know the reason for access and what the individual plans to do in the Radioactive Materials Area (RMA).
3. Are responsible for the actions of the authorized individual while in the RMA.
4. Must determine if the individual has sufficient knowledge to do the job safely. The individual must have had a safety briefing and respirator fit within the past year.
5. Must determine escort requirements and, if required, supply an escort.
6. Have the option to refuse access if any of the above are not fulfilled.

The following is a list of Building Contacts who can authorize safety access into Building 332:

Chemistry Department

J. L. Robbins (Metallurgy Div. Leader)
J. R. Hauber (Facility Manager)
R. E. Kelley, Jr.
B. A. Kuhn
R. P. Link
W. D. Ludemann
J. W. Magana
R. A. Pereyra
R. L. Rose
T. W. Schroeder
R. E. Stone
P. L. Studt
W. L. Thayer
J. C. Walden
P. L. Wallace

Mechanical Engineering Department

E. C. Draney (Deputy Manager)
V. G. McIntosh (Building Coordinator)
W. M. Miller (Engineer)
W. R. Wade (Technician Supervisor)
W. L. Haugen
R. W. Kahle
R. A. Ramos
G. P. Vayer
L. B. Noecker
A. D. Wheeler

Support

C. K. Koivu (Hazards Control)
J. K. Harter (Hazards Control)
P. J. Kearns (Electrical Coord)
J. H. Shannon (Materials Mgmt)

AUTHORIZATION REQUIRED FOR PERMITTING EMERGENCY EXPOSURES

The designated emergency response personnel can authorize exposure for emergency situations in any area of the Laboratory within the limitations and for the purposes indicated.

Maximum dose limits are given in rem.

Emergency Response Personnel	Rescue Personnel	Protect Community Property	Protect LLL Property
Disaster Director	150	150	100
Deputy Disaster Director	150	100	100
Emergency Coordinator with a Health Physicist	100	100	25
Shift or Building Monitor with a Senior Fire Officer	100	25	25
Any H.C. Health Physicist	100	25	25
Facility Manager	100	25	25
Deputy Manager	100	25	3
Facility Technician Supervisor	100	25	3
Any H.C. Area Representative	25	25	25
Emergency Coordinator without a Health Physicist	25	25	25
Shift or Building H. & S. Tech.	25	3	3
Senior Fire Officer	25	3	3
Facility Coordinator	25	3	3

NOTE: In arriving at the upper limit of 150 rem, consideration was given to the fact that an underestimation of the radiation fields could differ as much as 35 percent from instrument readings. If such an underestimation were made, the maximum exposure would be 200 rem. This should be the upper limit received by any rescuer under any circumstances.

POWER FAILURE IN BUILDING 332 EMERGENCY POWER SUPPLY

Building 332 is serviced by two emergency generators--Generator GDE-1 (200 kW, transfer Panel 500A6) and Generator GDE-2 (200 kW, transfer Panel 500 A8).

Generator GDE-1 handles the prime load in the building and supplies power to the following:

1. Exhaust fans FE-3 (work area), FHE-3 (fume hoods), FGBE-1 and FGBE-4 (glove box), FGE-5 (downdraft table), FGE-6 (fume hood 1378), and FHE=8 (fume hood 1330A).

2. Supply fans ACU-3-A1 (corridor) and ACU-4-A1 (work area).

3. Liquid argon converter.

4. Positive pressure cooling water system. RCH-3-2 (RCH-2-2 is not on emergency power) and PCHW-3-2 and PCHW-4-2.

5. Building service alarm and criticality alarm panels in Room 1236 and the fire alarm panels.

6. Emergency lights in the fan loft, equipment room, and work area corridor.

7. Telephone bells and lights.

8. Security lights, security alarms, page system amplifier, and battery powered lights.

9. BLV-1, air sampling blower.

Generator GDE-2 supplies power to the following:

1. Exhaust fans FE-2 (work area), FHE-2 (fume hoods), FGBE-2 and FGBE-3 (glove box) FHE-4 (downdraft table) and FHE-7 (fume head 1330A).

2. Downdraft room air-handling equipment.

3. Laboratory emergency lights and emergency powered wall plugs.

4. Experimental equipment requiring emergency power.

5. Stack alpha monitors.

6. Paging system amplifier.

7. Laboratory 1255, 1256, 1260

8. One man alarm system

BUILDING PERSONNEL INSTRUCTIONS

If a power outage occurs, the battery powered lights will come on immediately. The emergency generators will start, and should pick up the load in approximately 11 seconds. The emergency lights in the office area, equipment room, fan loft, and hallway of the RMA are on Generator GDE-1 and the emergency lights in the laboratories are on Generator GDE-2. If either generator comes on and transfers the load, the building should be in a safe operating condition. The following actions should be taken:

1. Wait until the emergency generators come on and transfer the load. If they do not come on within 30 seconds, leave the RMA via the change room.

2. After the emergency lights come on, check glove box pressure.

3. Assume there will be an extended power outage and secure equipment.

4. Leave the RMA in the normal manner.

MAINTENANCE MACHINISTS' INSTRUCTIONS

Go to the emergency power transfer switch panel located on the west wall of the equipment room. If the generators have started and the switches have transferred, perform duties listed in Procedure (A) below.

If any generator fails to start or any transfer switch fails to operate, perform duties listed in Procedure (B) below.

Upon restoration of normal power, perform duties listed in Procedure (C) below.

PROCEDURE (A)

1. Check glove box exhaust fans FGBE-1, 2, 3 and 4 and confirm that the selected fans are operating.

2. Check downdraft table exhaust fans FHE-4 and FHE-5 and confirm that the selected fan is operating.

3. Check work area exhaust fans FE-2 and FE-3 and confirm that the selected fan is operating.

4. Check fume hood exhaust fans FHE-2 and FHE-3 and confirm that both fans are operating.

5. Check fume hood exhause fan FHE-6 and confirm that it is operating. If it is not operating, open both room exhaust dampers in Room 1378.

6. Check fume hood exhaust fans FHE-7 and FHE-8 and confirm that the selected fan is operating.

7. Check work area supply fan ACU-4 and confirm that it is operating.

8. Check work area corridor supply fan ACU-3 A1 and confirm that it is operating.

9. Check positive pressure water pumps PCHW-3-2 and -4-2 and confirm that one is operating.

10. Check that RCH-3-2 is operating. If LCW supply is off, transfer to city water cooling. Be certain that city water does not enter LCWR line.

11. Check the criticality alarm power supply and, if necessary, push the reset button.

12. After all the above operating conditions are met, press the reset button on the Alarm Panel in Room 1236. This panel will now indicate the condition of critical equipment and corrective action can be taken.

13. Check each individual readout meter on the criticality monitoring panel and, if needed, press the reset buttons.

14. Rebalance building ventilation since the soldering bench exhaust fan FHE-1 is not on emergency power. This will be done only as directed by the Facility Coordinator or Deputy Manager.

15. Notify the shift foreman (Ext. 7391).

PROCEDURE (B)

Normal working hours

1. Call Electric Shop (Ext. 7751).

2. Call Maintenance Machinists' Office (Ext. 7391).

3. Turn the switch on the transfer switch panel to TEST for the generator that has not started or transferred. If both generators have failed, work on Generator GDE-1 first.

4. If the above actions or the electrician answering your call rectify the malfunction, follow the steps in Procedure (A).

Off-Shift

1. Turn the switch on the transfer switch panel to TEST for the generator that has not started or transferred. If both generators have failed, work on Generator GDE-1 first.

2. Call the shift foreman (Ext. 7391).

3. After both generators are operating, follow the steps in Procedure (A).

4. Stand by until the Health and Safety Technician arrives. Under no condition should anyone enter the Radioactive Materials Area unless accompanied by a Hazards Control Monitor if both the normal and the emergency power have failed.

PROCEDURE (C)

1. Check the transfer switches and confirm that they have returned to normal.

2. Check emergency power panels 500A6 and 500A8 for tripped breakers.

3. Perform steps 1 through 13 in Procedure (A).

4. Check and start, if necessary, soldering bench exhaust fan FHE-1. (Rebalance building ventilation--Procedure A-14).

5. Check and start fan loft supply fan AWU-1A.

6. Check and start selected fan loft exhaust fan FE-4 or FE-5.

7. Check and start Trane air conditioner RCH-1-A1.
8. Check and start office area supply fan ACU-2-A1.
9. Check and start office area exhaust fan FE-1.
10. Check and start equipment room supply fan HV-1-A.
11. Check and start hot water supply pumps PHW-1A and PHW-3A.
12. Check and start ventilation fans in 1252C (FE-6 and ACU-1A).

BUILDING 332 FIRE ALARM-EQUIPMENT OPERATION AND RESET PROCEDURE FOR MAINTENANCE MACHINISTS

The Building 332 fire detection and alarm system consists of: (1) Fire Alarm Control Panel located in the equipment room, (2) Fire Alarm Remote Monitor located in Room 1236, and (3) heat-actuated detectors (rate-of-rise and fixed temperature, 160°F) located in each room, the hallways, and the fan loft.

The Fire Alarm Control Panel in the equipment room has batteries to supply sufficient current to operate the system for several hours after normal and emergency electrical power has failed. This alarm panel indicates by lights only and has no local alarm device. Normal condition is positive and negative ground lights ON and no sound. The Fire Alarm Remote Monitor in Room 1236 consists of: (1) a trouble-indicating light and switch, (2) alarm-indicating light and switch, (3) indicating lights for each of the seven fire zones, (4) a buzzer, and (5) a reset button. The normal condition of this panel is no sound, no lights, and both switches in the "Normal" position.

Either an alarm or trouble light in the Remote Monitor will initiate a signal in the Fire Alarm Panel at Building 323.

Building 332 has been divided into the following Fire Alarm Zones:

Zone No. 1--Fan Loft area and fan loft stairwell
2--Equipment room area
3--Offices, Change Rooms, Air Locks, Rooms 1301, 1035, 1306 and Labs 1255, 1256 and 1260
4--East labs in Radioactive Materials Area
5--West labs in Radioactive Materials Area
6--Room 1314 and Vault
7--Hallway in Radioactive Materials Area

Trouble that occurs in the alarm circuit or a signal from a heat-actuated detector is monitored by both the panel in the equipment room and the Remote Panel in Room 1236. All resets are located in Room 1236.

A. When a trouble signal is received by the Remote Panel:

1. The trouble-indicating light will illuminate and the buzzer will sound.

2. To silence the buzzer, move the Trouble Switch down.

3. The trouble-indicating light will remain illuminated until the circuit trouble is corrected. (During normal work hours call Electric Shop, Ext. 7751. During off-shift hours call the Maintenance Machinist Foreman, Ext. 7391).

4. When the circuit trouble is corrected, the trouble-indicating light will extinguish and the buzzer will sound.

5. To silence the buzzer move the Trouble Switch to "Normal".

B. When an alarm signal is received by the Remote Panel:

1. The alarm-indicating light will illuminate and the buzzer will sound.

2. The zone-indicating light will illuminate.

3. An alarm signal will be sent to the Fire Station.

4. The power to the following fans will be shut off: the loft supply and exhaust; the office supply and exhaust; and the equipment room supply.

   NOTE: The above four operations occur simultaneously.

5. Make a note of the indicated zone and stand by until the firemen arrive.

6. To silence the buzzer, move the Alarm Switch down.

7. The zone-indicating light will remain on until conditions return to normal (about 160°F or 70°C).

8. When the zone-indicating light extinguishes, the buzzer sounds and the alarm-indicating light remains lit, indicating the panel is not in normal condition.

9. To return panel to normal, press the reset button to extinguish the alarm-indicating light and move the alarm switch up to "Normal" to silence the buzzer.

After alarm conditions have returned to normal, the Maintenance Machinist will restart the fans that were automatically stopped by the alarm signal. They are located in the following areas:

Equipment Room	Fan Loft
Loft Supply Fan--AWU-1-A	Fan Loft Exhaust--FE-4 or FE-5 (Switch in Equipment Room)
Office Supply Fan--ACU-2-A1	
Equipment Room Supply Fan--HV-1-A	
Office Exhaust Fan--FE-1	

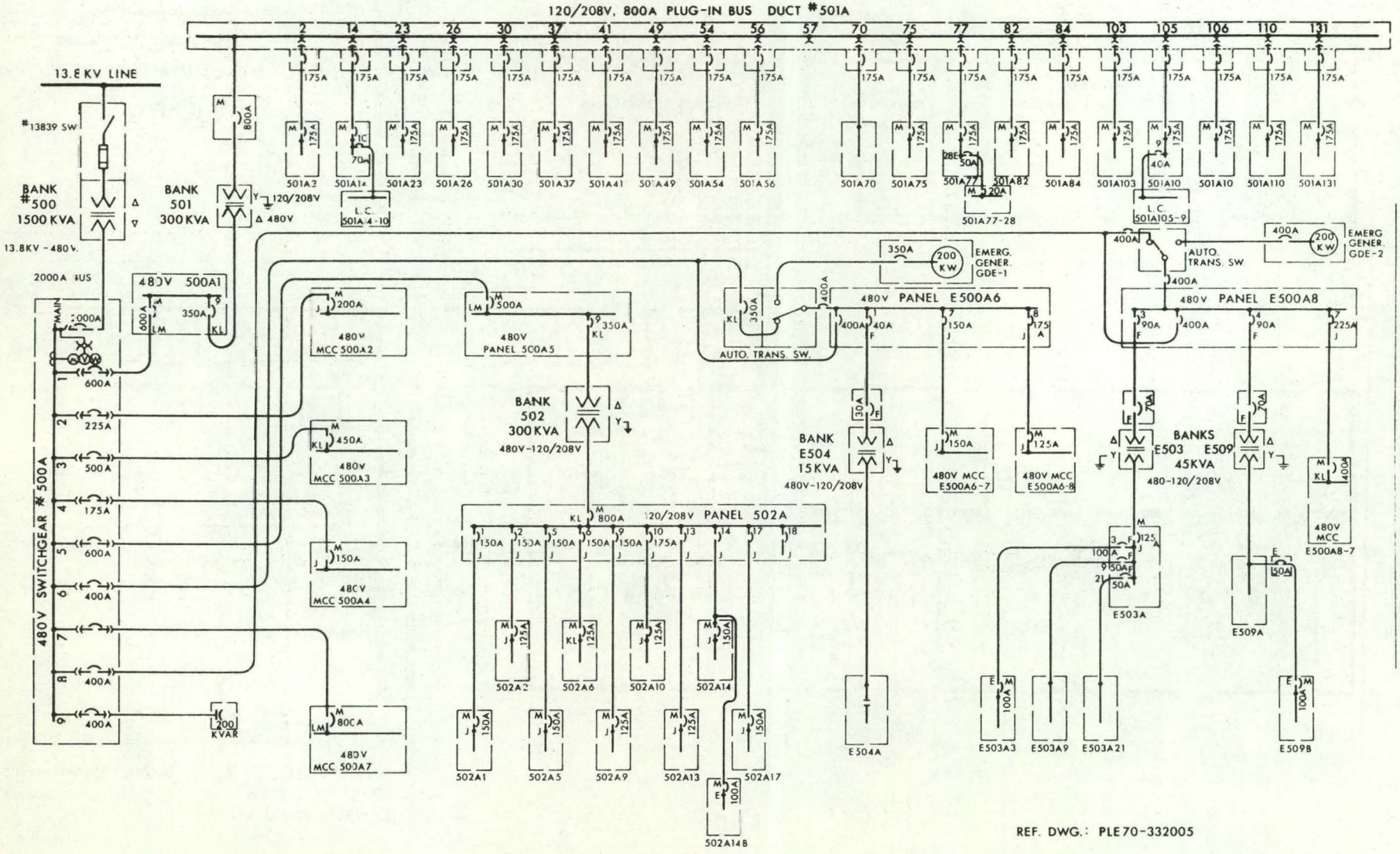
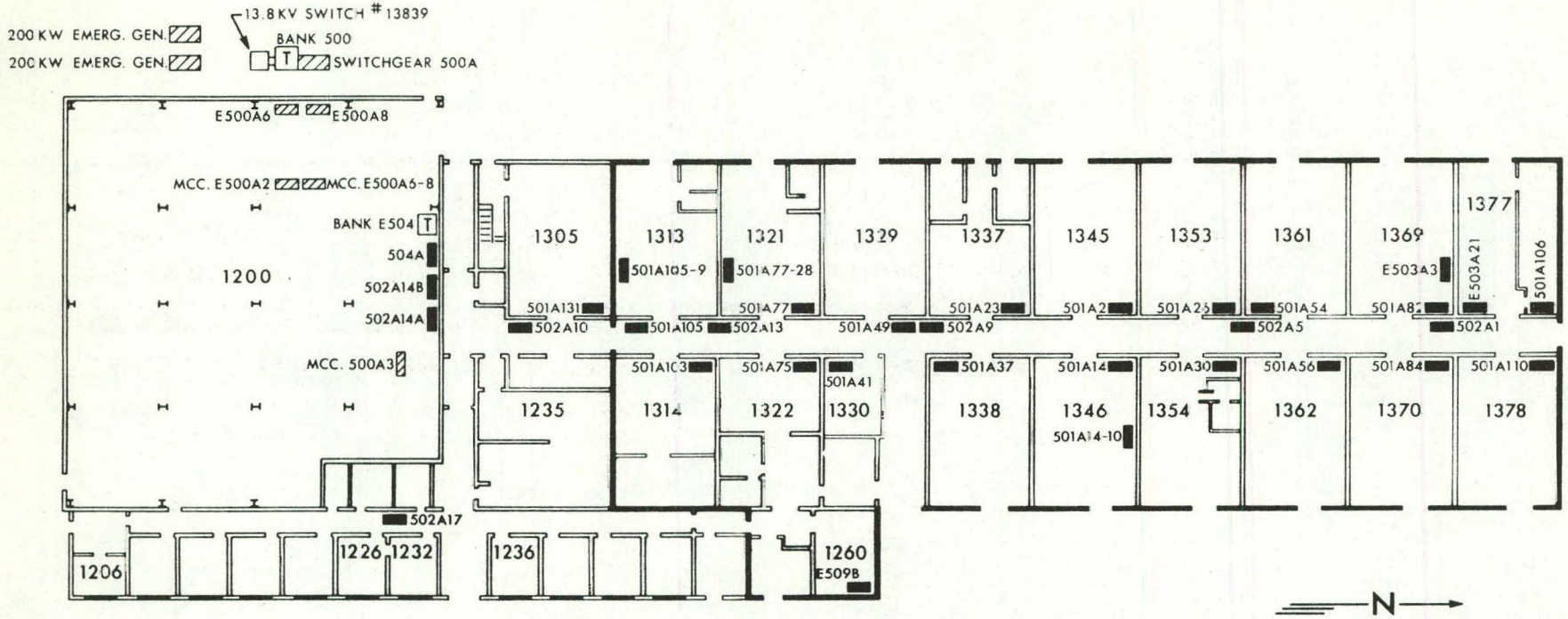
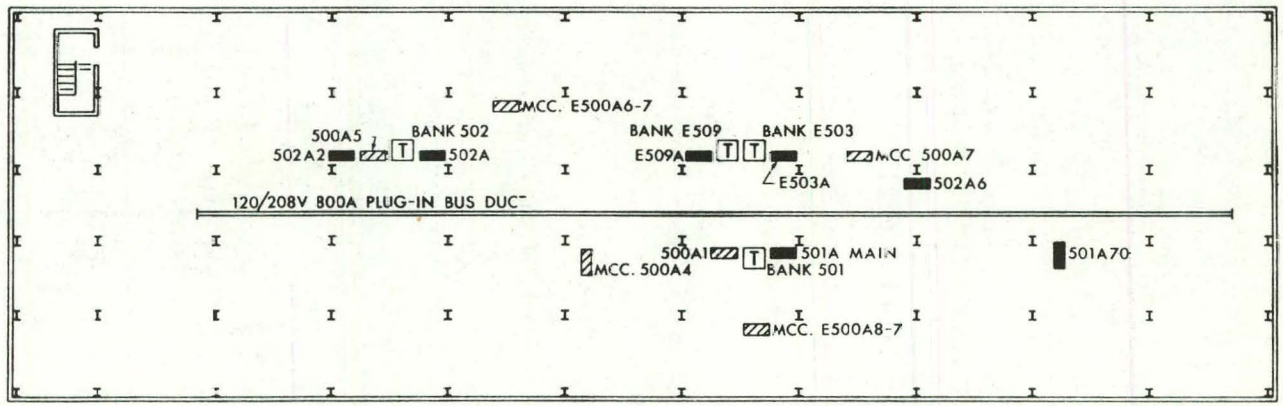


Fig. G-1. Building 332 Power Distribution



FIRST FLOOR PLAN



FAN LOFT PLAN

SYMBOLS

- ▨ = 480V PANEL
- ▬ = 120/208V PANEL
- [T] = TRANSFORMER
- E = EMERGENCY CIRCUIT

Fig. G-2 Building 332 Electrical Panel Locations

VENTILATION SYSTEM

A. INTRODUCTION

The ventilation system in Building 332 is designed to contribute to the control of contamination. Cleaned outside air is moved through areas of minimum contamination potential into areas in which radioactive ma- control. All air leaving potentially contaminated areas is exhausted through high efficiency particulate air filters (HEPA filters).

B. AIR FLOW DESIGN PRINCIPLE

1. Ventilation Zone Control (see Fig. H-1)

a. Zone 1, the Radioactive Materials Area (RMA) corridor, as far as the air locks, is automatically maintained negative to ambient atmosphere. It serves as the base (or reference) pressure for the other zones.

b. Zone 2, the office area, including the hallways as far as the air locks, is maintained at a positive pressure relative to Zone 1. It is essentially at ambient pressure.

c. Zone 3, the RMA, which includes all rooms (most of them laboratories) opening off the RMA corridor, is maintained at a negative pressure relative to Zone 1.

d. Zone 4, the Loft, which houses all the exhausters except from the office area and 1255, 1256, 1260 is maintained at a positive pressure relative to Zone 1. It is essentially at ambient pressure.

e. Zone 5, the Mechanical Equipment Room, at ground level, has no pressure control. A blower supplies ventilation air that is discharged through louvers to the outside of the building.

2. Enclosures

The gloved boxes, in which the radioactive materials are worked, are maintained at a negative pressure relative to the work area.

3. Positive Flow

a. Five chemistry fume hoods are provided to control moderately toxic or noxious chemicals that need not be handled in a gloved box. These hoods are also used as Class II workplaces for handling radioactive materials.

b. A solder bench in the "cold" machine shop operates the same as the chemistry fume hoods.

c. A special down-draft bench in Room 1354A has a separate partial-recirculating (on demand) ventilation system to provide temperature, humidity, and contamination control.

C. CONTROLS (see Fig. H-2)

1. The differential pressures, referred to in B.1--Ventilation Zone Control, are maintained automatically with pneumatic instruments and controls. In most cases the air flow is controlled at constant volume. This is accomplished with a pitot tube, a pneumatic amplifier and an air-operated variable inlet vane damper. When the inlet air volume is constant the exhaust volume is maintained at a specific differential pressure relative to its base, either by constant volume control or differential pressure control.

2. The enclosures are connected to the "Gloved Box Exhaust Manifold." Because many of the materials handled are pyrophoric, inert gas is cases, special sensing-controlling systems on the gas supply and on the exhaust manifold maintain the interior of the box at approximately minus 1 inch water gauge, relative to the work room.

3. Each of the exhaust systems for the hoods (chemical and solder) is controlled for constant volume. Constant volume is required for health protection, and automatic control is necessary to promptly compensate for HEPA filter loading. Automatic control is also required because changes in volume can upset parts of the building differential pressure control.

4. The down-draft table system has interlocking controls. The supply is automatically controlled to maintain the area negative to the work room. Manual volume control on the recirculating system is used to maintain essentially constant volume as the filter load. A manual input to the exhaust controller permits adjustment for filter loading.

D. FILTERS

Each exhaust system that removes air from a potentially contaminated area is filtered at least once through HEPA filters. These are guaranteed by the manufacturer to have a minimum efficiency at 99.97% for 0.3-μ DOP smoke as determined with a forward light-scattering photometer, and are tested by the AEC before delivery to LLL. After the filter is installed (and periodically thereafter), it is checked in-place for leaks or damage.

The exhaust for the chemistry fume hoods in Rooms 1321 and 1329 passes through a bank of prefilters and a bank of HEPA filters.

The exhaust for the hoods in Room 1330A passes through series and parallel HEPA filters.

There is a HEPA filter attached to the exhaust of each gloved box. The manifold gas passes through another bank of HEPA filters ahead of the exhauster.

The area or room exhaust for the RMA and for the loft have a HEPA filter at each exhaust point. A throwaway dust filter is placed over the face of each to reduce the dust load on the HEPA filter.

The down-draft system has series filters in the recirculating system and series-parallel HEPA filters in the exhaust.

E. FILTER CHANGING

When installed air flow measuring instruments or operating conditions appear to indicate a plugged HEPA filter, contact the building Health and Safety Technician, who will in turn request the Industrial Hygiene Group of Hazards Control to evaluate its condition. He will make an air balance survey and equipment check. If the evaluation establishes the need for a new filter, the Building Coordinator makes a request to the Maintenance Machinists for the change.

Hazards Control personnel assigned to the building will assist the Maintenance Machinists by supplying protective clothing and respirators as required, and by surveying personnel, equipment, and surroundings as appropriate.

The room air exhaust system has only one set of filters. To avoid possible release of contamination to the environment, no work with radioactive materials will be allowed in a room where a room exhaust filter is being changed. The replacement filter must be DOP leak-tested in place before work is resumed in the room.

When the change is completed, the Health and Safety Technician will notify the Industrial Hygiene personnel who will perform an in-place DOP leak test and adjust the airflow to the required negative pressure. The Industrial Hygienist will periodically recheck the filter installation for leaks and for proper air flow.

F. SAFETY FEATURES

1. Dual blowers are installed on those systems exhausting air from intermediate- or high-hazard areas. These include room exhaust for the work area and loft; the gloved box manifold system; the down-draft table; and the fume hoods in Rooms 1321, 1220, and 1330A. If one blower fails (or does not maintain its required flow), the parallel blower starts automatically to reestablish the required flow. Appropriate valve changes are also controlled automatically.

2. An alarm next to the chemistry hood in Room 1378 will indicate a lack of flow. The room exhaust dampers must be manually opened to a predetermined setting to maintain the room negative to the corridor until such time as the chemistry hood air flow is returned to an adequate rate. There is no standby fan on this system.

3. Positive shutoff, pneumatically controlled, fail-safe valves are placed in the loft exhaust ductwork and in all exhaust systems from the work area, except the solder bench and lab 1260. They operate as required for parallel blower changeover as indicated. The valves close for flow failure whether it be due to blower failure or power failure. The closing prevents backflow from outdoors to the RMA through potentially contaminated filters, as would occur because the RMA is at a reduced pressure relative to outside.

4. The gloved box manifold in each room rises into the loft area, passes through a bank of HEPA filters, into a collector manifold to the parallel, valved, exhausters. This system is duplicated for the rooms on each side of the RMA corridor. In addition, the two systems are interconnected by ducting and manual, tight shutoff valves. If both exhausters on one system fail, proper manipulation of valves will provide some emergency exhaust ventilation for the highly contaminated gloved boxes. Should power fail to emergency panel 500A6-9, the inert gas supply to the building will be closed off.

5. Emergency power is supplied by automatic-starting, diesel-powered generators to:

   a. Gloved box manifold exhausters.

   b. Chemical fume hood exhausters.

   c. RMA supply and exhaust.

   d. RMA corridor supply.

   e. Down-draft system in Room 1354.

G. ALARMS

An annunciator in Room 1236 will show blower failures. The various alarms and automatic functions are:

1. A fire indication is displayed on the panel, transmits the signal to the fire station and automatically shuts down the supply and exhaust systems for the office area and the fan loft. These areas are controlled at approximately ambient pressure, but the above action prevents possible infiltration of contaminants if the areas are at a negative pressure.

(CAMs) is alarming and if indeed there is a contamination spread to atmosphere. Should this be the case, judgement of Hazards Control and building management will determine what action will be taken. The alarm is relayed to the Fire Department. A silence switch at the annunciator will silence the chime, but the alarm light will stay lit until all CAMs are reset.

2. Supply fans are single units usually controlled for constant volume. Their failure would cause the areas they supply to become more negative, thus not contributing to the spread of contamination. Supply fans monitored by the annunciator system are:

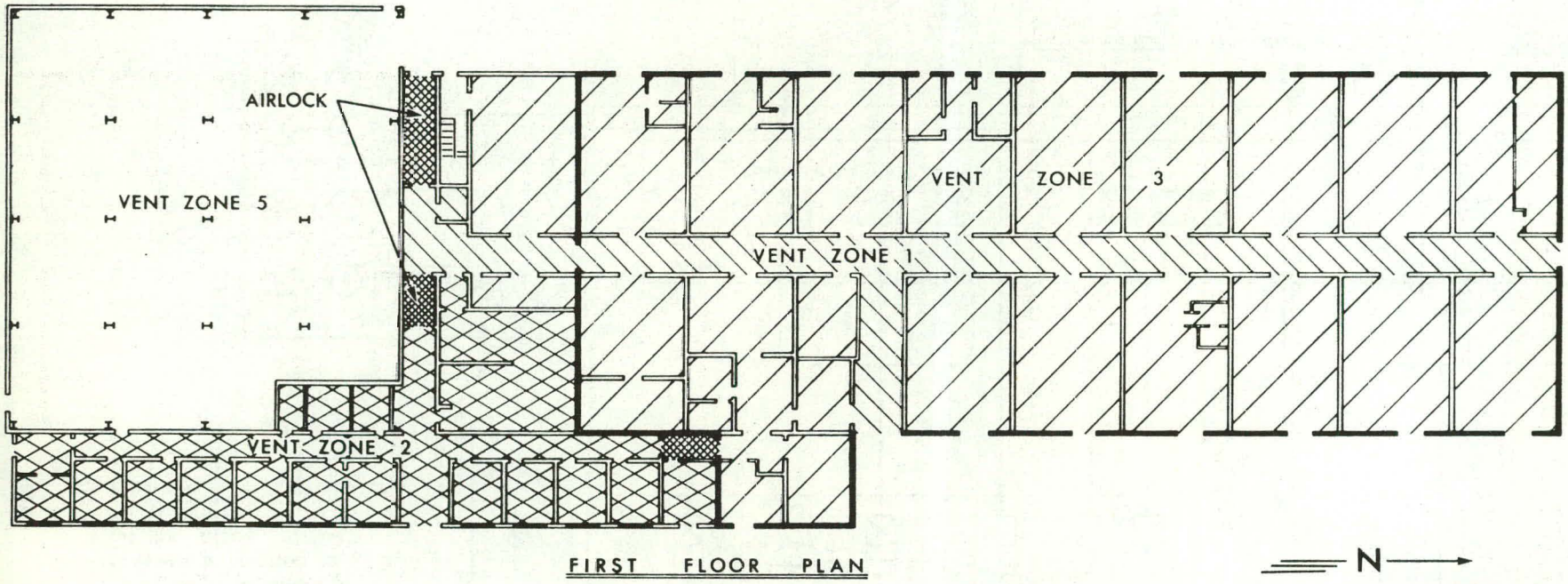
ACU-3A	RMA corridor	Annunciator	Room 1236
ACU-4A	RMA	Annunciator	Room 1236

3. The following table shows the exhaust fans by number; single or parallel installation; and alarm point:

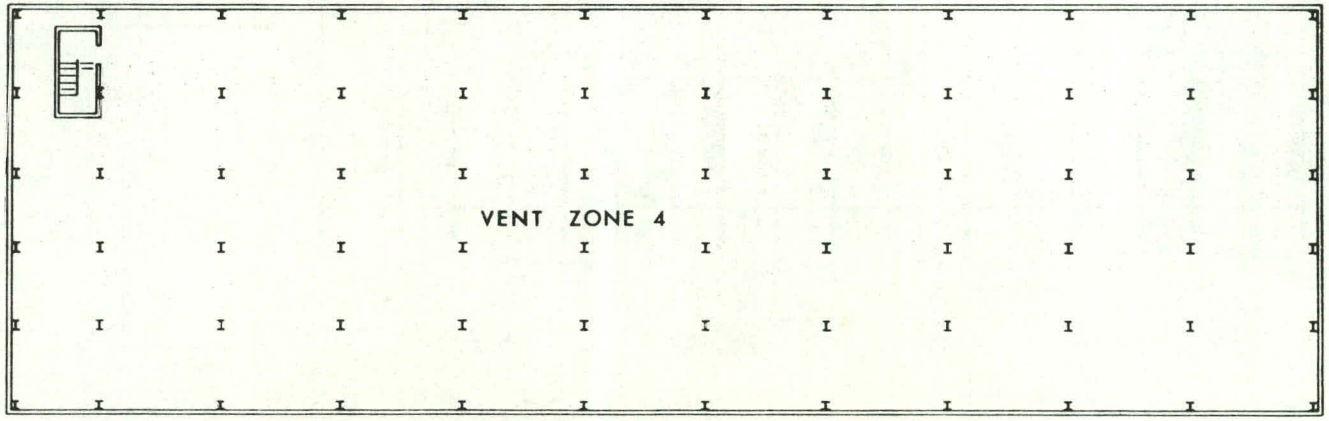
FE-1	Office	Single	No alarm	
FE-2,3	RMA	Dual	Annunciator	Room 1236
FHE-2,3	Fume hoods Rms 1313,1321,1329	Dual	Annunciator	Room 1236
FGBE-1,2,3,4	Gloved box manifolds	Dual	Annunciator	Room 1236
FE-4,5	Loft	Dual	No alarm	
FHE-4,5	Down-draft table	Dual	Annunciator	Room 1236
FHE-1	Solder bench	Single	No alarm	
FHE-6	Fume hood Rm 1378	Single	Alarm beside hood	
FHE-7,8	Sample prep hoods, 1330A	Dual	Annunciator	Room 1236
FE-6	Rm. 1255, 1256, 1260	Single	Light	Room 1256

All of the above failure alarms show up as lights on the annunciator panel, except as noted. In addition, a bell rings at the panel and in the equipment room. When the alarm is noted and understood, pushing the Reset button on the annunciator panel will silence the bells, but the light will continue to burn until the problem is remedied.

4. All exhaust stacks to atmosphere are continuously monitored for alpha and beta radioactivity. A single alarm in 1236 indicates that one or more of ten continuous air monitors in the fan loft has exceeded the alarm set point. Hazards Control will be notified to check the continuous air monitors (CAMs) to ascertain which CAM



FIRST FLOOR PLAN



FAN LOFT PLAN

Fig. H-1 Building 332 Ventilation Zones

LEGEND

AWU = Air wash unit
ACU = Air condition
FE = Fan, exhaust
FHE = Fan, hood exhaust
FGBE = Fan, glove box exhaust
FR = Fan, recirculate
AV = Automatic volume control
MV = Manual volume control
ΔP = Blower with controls to maintain a differential pressure in relation to another place.
□ = HEPA filter
⊠ = Prefilter

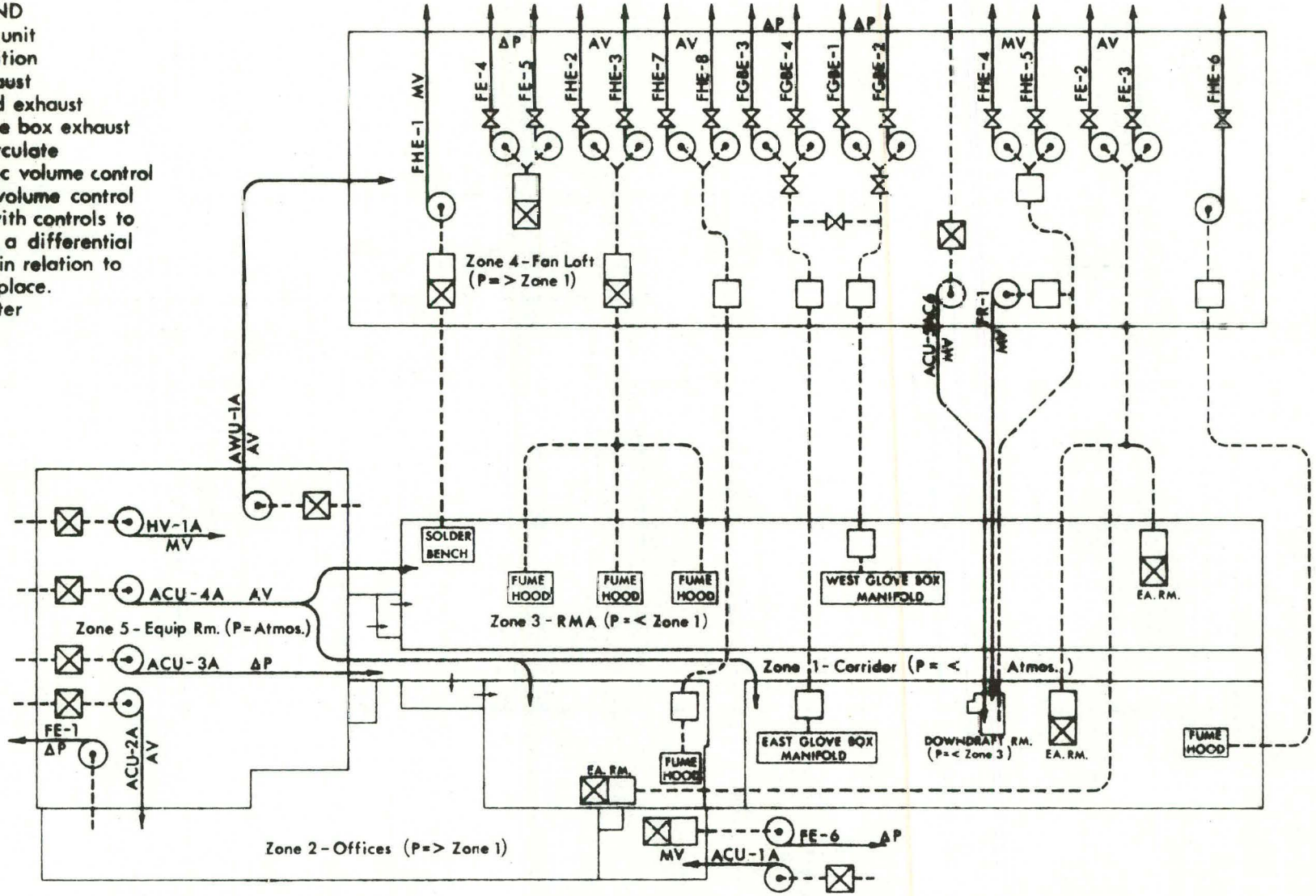
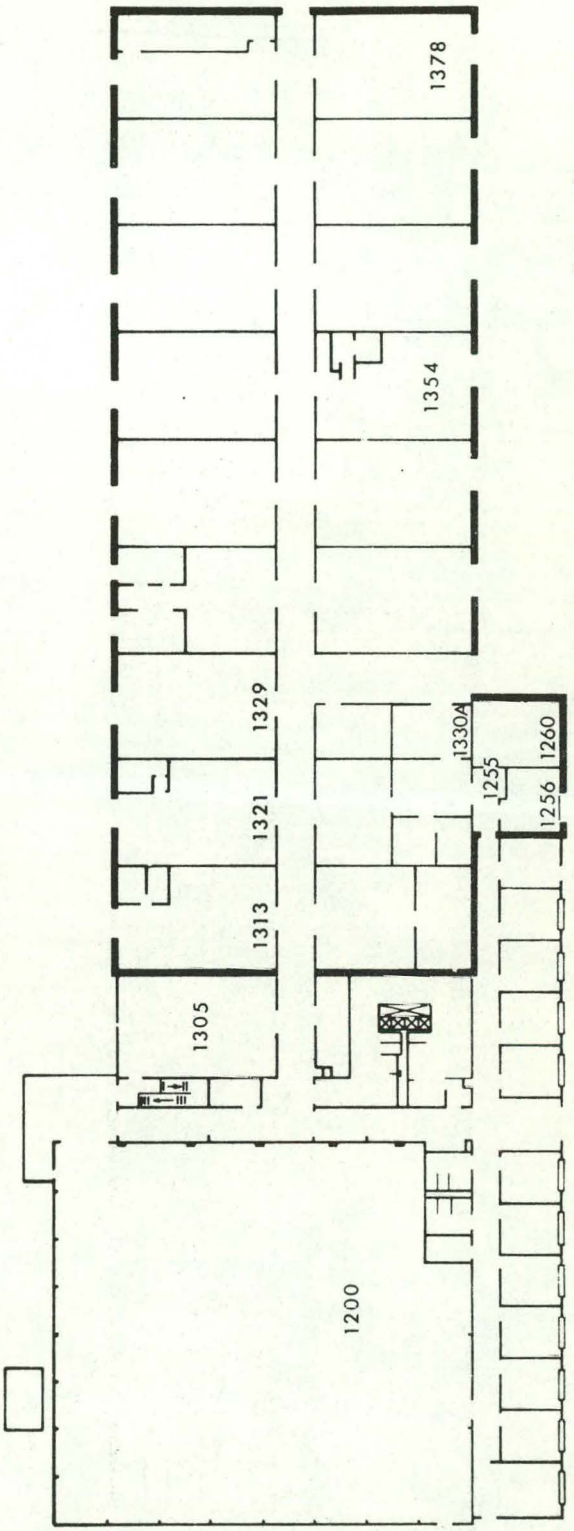


Fig. H-2 Building 332 Schematic of Ventilation System


1378
1354
1329
1330A
1255
1260
1256
1321
1313
1305
1200

RADIATION AND CONTAMINATION SURVEY PROGRAM

Periodic surveys of the building are made to determine the radiation and contamination levels. The information obtained from these routine surveys may help reduce exposures to personnel working in the area.

This schedule is based upon the present building activity. Additional monitoring may be required when spills or other unusual incidents occur.

SURVEY SCHEDULE

Radioactive Materials Area	Type of Survey	Frequency
RMA exits	Alpha, beta contamination (smear technique)	Daily
Enclosure exterior and gloves	Alpha contamination	When used
Labs, Hall, Change Room	Alpha contamination, (floor survey)	Weekly
Labs, Hall, Change Room	Beta-gamma external radiation levels	Weekly
Labs, Hall, Change Room	Alpha, beta contamination (smear technique)	Monthly
Enclosure exterior and gloves	Alpha, beta contamination (smear technique)	Monthly
"Cold" Area		
Fan Loft	Alpha contamination (floor survey)	Weekly
Fan Loft	Alpha, beta contamination (smear technique)	Monthly
Janitor Closet (coffee pot table)	Alpha, beta contamination (smear technique)	Monthly
Secretary Office	Alpha, beta contamination (smear technique)	Monthly

Positive Pressure Water	Liquid sample	Monthly
Offices, Conference Rooms, Trailers	Alpha, beta contamination (smear technique)	Quarterly
Machinery Room	Alpha, beta contamination (smear technique)	Quarterly

MAXIMUM ALLOWABLE CONTAMINATION LEVELS

1. Radioactive Materials Area:

   a. Fixed 5 disintegrations/min/cm^2

   b. Removable 0.5 disintegrations/min/cm^2 alpha, 5 disintegrations/min/cm^2 beta, gamma.

2. Office Area:

   Total alpha activity 0.05 disintegrations/min/cm^2, 0.5 disintegrations/min/cm^2 beta, gamma.

3. Fan Loft and Equipment Room:

   Total alpha activity 0.05 disintegrations/min/cm^2, 0.5 disintegrations/min/cm^2 beta, gamma.

4. Positive Pressure Water (PPW) 2.2×10^5 disintegrations/min/liter ^{239}Pu.

MAXIMUM ALLOWABLE RADIATION LEVELS

Operations shall be conducted so that personnel exposures will not exceed those established in Health and Safety Manual Sections 33.02 and 33.04.

TWO-MAN SURVEILLANCE SYSTEM

A. GENERAL

The Two-Man Surveillance System (TMSS) is a security measure to ensure that the physical location and the movement of a nuclear assembly is authorized and that it is controlled by a minimum of two knowledgeable Q-cleared persons.

B. PURPOSE

The purpose of the TMSS is to maintain a security measure of one individual confirming that the handling of a nuclear assembly by another person is in accordance with security procedures. This system is to deter unauthorized actions, advertent or inadvertent, by a lone individual.

C. RESPONSIBILITY

The following principal supervisors are responsible for the integrity of the TMSS.

Facility Manager: J. R. Hauber

Deputy Manager: E. C. Draney

Facility Technician Supervisor: R. R. Hill

D. KNOWLEDGEABILITY

The basis for determining whether or not an assembly requires the TMSS protection shall be made on the probability of the assembly causing a nuclear yield (four pounds H.E. equivalent) when associated with follow-on components. The person making this determination shall be:

1. One person listed in Paragraph C, and

2. An engineer or physicist associated with the design of the assembly.

E. PROCEDURE

1. Shipments of nuclear assemblies into and from Building 332 will be by the TMSS and in accordance with Procedure 332, Appendix L.

2. Storage of nuclear assemblies in Room 1314A, Vault Storage, will be in the double padlocked storage bins. Movement of assemblies between the vault and work stations will be by the TMSS and Procedure 332.

3. Laboratory space doors will be equipped with double locks, series A and B.

4. No individual may have both Series A and B keys in his possession at any time. The assignment of keys and TMSS responsibilities will be controlled by the supervisors listed in Paragraph C. The following individuals are responsible for the key series assigned to them.

"A" Series Keys	"B" Series Keys
E. C. Draney	W. L. Haugen
J. R. Hauber	W. M. Miller
R. R. Hill	R. L. Rose

These keys must be protected so that no individual has access to keys of both series.

5. The security of a nuclear assembly "in work" will be the responsibility of a minimum of two people, one of whom must have a class I or II (Safety Access) qualification. TMSS parties may be responsible for more than one assembly. The parties need not be in the immediate vicinity of the assembly; having frequent visual access constitutes presence. If one or both parties leave the area of the assembly, both double locks must be locked with each responsible party possessing only one key.

6. During an operation, the knowledgeable persons (see Paragraph D) will determine when an assembly becomes, or ceases to be, a nuclear assembly requiring TMSS protection.

F. EMERGENCIES

Quick and correct action to bring an emergency situation under control supersedes the TMSS security procedures. The emergency procedures in this OSP should be followed. Rapid response to the Klaxon alarm is essential. Do not stop to secure classified documents or parts.

SAFETY INDOCTRINATION

Each person who enters the RMA must have had a safety indoctrination within the past year or must be accompanied by an authorized escort. Building residents are required to take an annual Health and Safety course titled "Criticality Safety Orientation" (HS602). Transient visitors and C&M people are given an annual safety indoctrination as shown in the following outline.

OUTLINE OF SAFETY INDOCTRINATION

I. Introduction

- A. Purpose of indoctrination
- B. Scope of presentation

II. Operation of the Building

- A. Purpose of the facility - scope of work performed
- B. Rules and requirements governing exclusion area access
- C. Building organization
  1. Administration of the building operation
  2. Scientific and support groups
  3. Coordination of all C & M work
- D. Building plan and location of work and support areas
- E. Building ventilation zones and equipment
- F. Communications within the building

III. Building Safety Procedures and Safety Rules

- A. Authority of facility management
- B. Authority of hazards control representatives
- C. Operational safety procedures (OSP's)
- D. Satellite or supplemental OSP's

E. Things to do and not to do while in the building

F. Working with hazardous materials

G. Criticality safety

H. Emergency procedures

IV. Hazards Control

A. Responsibilities and Functions

1. To help building personnel conduct work safely

2. Area Team concept

3. Stopping a hazardous operation

4. Examples of services provided

B. Special Hazards of Plutonium

1. Radioactive properties

2. Biological hazards

a. Internal and external

b. Comparison with other hazardous materials

c. Modes of entry into body

d. Protective measures

3. Pyrophoricity

4. Criticality

C. Routine Monitoring Support

1. Direct monitoring of material handling

2. Air sampling

3. Monitoring of floors, desks, office and hall areas

The Operations Staff is responsible for scheduling safety indoctrinations. Sections I, II, and III of the indoctrination are presented by the Facility Manager or other member of the Operations Staff. Section IV is given by the Hazards Control Health Physicist and Principal Technician.

MATERIAL CONTROL AND SS MATERIALS ACCOUNTABILITY

CONTENTS

MATERIAL CONTROL AND SS MATERIALS ACCOUNTABILITY

A. INTRODUCTION

Two separate programmatic groups conduct operations in Building 332, namely Plutonium Metallurgy-Chemistry and Material Science and Plutonium-Mechanical Engineering. Only one Materials Balance Area (MBA 150) is established for Building 332 to aid both groups in controlling the special materials used in the area.

MBA control functions are performed in Building 332 by a representative of the LLL Materials Management (MM) Group stationed in the Vault (Room 1314). The control of special materials includes receival of all incoming shipments, handling of all outgoing shipments, storage of materials not in use, and issuing materials only to the persons authorized to receive them. The MM representative keeps all records associated with these activities. He also maintains inventory and accountability records on the special materials actually used or processed in the programmatic areas within the building.

The MM Vault is equipped to handle large quantities of fissile, radioactive and certain other special materials, excluding high explosives (except as approved by a special procedure), as required for programmatic operations. All material that will not be used soon will be moved to the Central Vault in Building 231 for long-term storage (see F.3.b.).

The special materials (Controlled Materials) covered by this procedure can be categorized on the basis of levels of control, as in Table L-1. Building 332 operations are concerned mainly with the materials that are underlined. Since the other materials listed in Table M-1 may be used at some time, users should be aware that materials in the same category are subject to the same type of controls as those named in the text.

Table L-1. Special materials (Controlled Materials)

TYPE	MATERIALS
A	Plutonium, any isotope Uranium, enriched in ^{233}U or ^{235}U Lithium, enriched in ^{6}Li Tritium Neptunium, ^{237}Np

TYPE	MATERIALS
B	Uranium, normal or depleted, when CRD or UNC. Thorium, when CRD or UNCLASSIFIED. Deuterium, when CRD or UNCLASSIFIED.
C	Classified parts, level SRD, including: Uranium, normal or depleted, when SRD due to shape or composition. Thorium, when SRD due to shape or composition. Deuterium, when SRD due to shape of container or composition.
D	Classified items, level CRD only.
E	Toxic material, including beryllium or any other material specifically identified by Hazards Control as unusually hazardous for a proposed operation and requiring special handling precautions. Includes contaminated equipment or materials. If classified SRD or above, include controls as for Type C above as an additional requirement.
F	Radioactive Materials--includes all forms and quantities and contaminated articles, but excludes: (1) Survey meter check sources. See note below. (2) Sealed sources containing less than 10 body burdens of radioactivity (see Health and Safety Manual Section 33.45
G	Precious Metals--includes any gold, silver, platinum, rhodium, palladium, iridium, osmium, gallium, and radium. Radium, due to its radioactivity, must also be controlled as a Type F material.
H	Explosives--includes all explosives regardless of quantity. Not authorized in this facility.
I	MOCK HE--See Scope and B-4, O (Appendix L).
J	Hazardous Wastes--includes all dry and liquid, terminal wastes contaminated with radioactivity or beryllium.

Note: The above exempted sources must be shielded to yield less than 10mr/hr at the surface of the shield.

B. RESPONSIBILITY

Consistent with the provisions and requirements of other sections of this procedure, the following additional accountability responsibilities are assigned within the Building 332 MBA:

1. Plutonium Engineering Group

The Group Leader (or his designated assistant) is responsible for the correct handling and packaging and will perform the transfer of all radioactive material and plutonium between the Building 332 Vault and the work stations.

2. Plutonium Metallurgy Group

Individuals in the Pu Metallurgy Group on the approved list (see Attachment A) are responsible for the correct handling, packaging, and transfer of all radioactive material and plutonium between the Building 332 Vault and work stations.

3. Operating Personnel

Individual engineers or experimenters working with plutonium and radioactive material are required:

a. To maintain records and labels in the prescribed form in order to locate all material in their charge.

b. To confirm net weights where possible and serial, part, or batch numbers of plutonium.

c. To record and report results of weighings of plutonium, to the Materials Management Representative as soon as possible.

d. Upon receipt of IBM printout listings of plutonium, to perform physical inventory functions as in Paragraph C.4 of this procedure. Participation, observation, or auditing may be done by a Materials Representative and at times by Materials Management Staff and the AEC.

e. To provide up-to-date information to the Materials Management representative on data changes due to processing including analytical data and results or change in individual responsibility.

f. To package and handle transfers of plutonium, and radioactive materials as required in Paragraph E.2.b. of the main body of this procedure.

g. To make certain that housekeeping within any gloved box, hood or other work area is such that radioactive material is not lost or downgraded if spilled on the gloved box floor, or that it is not discarded with waste debris.

h. To segregate, package, and transfer scrap ^{239}Pu for recovery as described in Section I below. For packaging requirements on other materials, consult the Materials Management representative.

i. To make accurate entries on the Work Station Mass Control Record before changing the work station contents, as regards plutonium, or other fissile material.

4. Materials Management Representative--MBA 150 (Building 332)

In addition to the general provisions of Section 400 of the SS Procedure Manual, the Building 332 Materials Management representative is responsible for the following:

a. Maintaining accurate accounting and inventory records for plutonium and SRD parts, which include controlled material Transfer Forms, Inventory Change Orders, Inventory Locator Card File, Monthly MBA 150 Inventory Printout, Monthly MBA 150 Inventory Locator Card File Printout, Historical Work Station Mass Control Records, Classified Part Receipts, I.D. Tags, Building 332 Operations Procedures, and Supplementary Operating Procedures.

b. Conducting the monthly physics inventory of plutonium as described in Sections B.3.d. and C.4.

c. Reporting changes in inventory listings of plutonium to the Materials Management Records Section via Inventory Change Order, as requested by individuals.

d. Care of the Building 332 Vault (Room 1314A) and its content including labeling of containers.

e. Assure compliance with the special restrictions for Vault Operations (see Section F).

f. Assure that the identification and weight verifications have been done on plutonium transferred to and from MBA 150.

g. Assure adequate packaging of plutonium, depleted uranium, beryllium, and radioactive materials for storage, external transfer to outside facilities.

h. Releasing plutonium only to an experimenter on the approved list of personnel chargeable with controlled materials, in addition, he will expect the experimenter to cite the coverage and approval status of the issuance.

i. Notifying Building 332 Hazards Control personnel that plutonium, beryllium, and/or radioactive materials have been released to building personnel.

j. Supplying the Materials Management Records Section with the required data for transferring materials to other MBA's or to outside facilities.

k. Identification and verification of plutonium, depleted uranium, and SRD parts received into the Building 332 Vault. Packages will not be accepted for vault storage or transfer unless its contents are fully identified.

l. Periodic review, at least semiannually, with operating personnel as to current status of materials stored in the vault.

m. Expedite the scrap and surplus materials return to the Building 231 Central Vault and AEC Production Channels.

n. Processing external receipts and shipments as defined in the Materials Management Procedure for Controlled Materials, Sections: 1.9.1, 1.9.2, and 1.9.3 (Revised).

o. The assurance that MOCK HE has been certified by LLL chemistry (copy of certification) prior to acceptance and release to operating personnel. MOCK HE assembled with fissile materials requires a Hazards Control Special OSP.

C. MBA CONTROL METHODS

Plutonium comprising the inventory of MBA 150 is reassigned to individuals and locations within Building 332 by the Materials Management representative.

1. In-use Transfers

a. All transfers of plutonium between individuals in Pu Metallurgy or between Pu Metallurgy and Pu Engineering require the immediate notification of the Materials Management representative, who will record the transfer on locator cards.

b. Transfers of plutonium between Work Stations in all areas of Building 332 require entries on the Work Station Mass Control Records involved.

c. No special notification is required for transfers of Non-SS Radioactive Materials.

2. Location Change Reporting

a. Plutonium in the Pu Engineering area that has been transferred at an unchanged weight to a subsequent Work Station must have a revised location record made on it daily. The information about such changes will be given verbally by the Plutonium Engineering Group Leader or his alternate to the Materials Management representative. The frequency of this change report will be once a

day, prior to the closing down of operations for the shift. This requirement is separate and distinct from entries on Work Station Mass Control Records.

b. Plutonium in the Pu Metallurgy area will have Work Station location changes noted in logbook or other form by the responsible individual. A monthly location change notification will be accomplished by entry on the appropriate line of the inventory printout returned to the Materials Management representative. This requirement is separate and distinct from entries on Work Station Mass Control Records.

3. Data Changes--Documentation of Plutonium

Complete and current data on individual inventory items are recorded by the Materials Management Records Center. Items that do not appear in these records cannot be transferred. Notification is therefore required when a sample or part is machined, cut, broken, melted, alloyed, or changed in any way. This notification must be provided by the experimenter as soon as the data can be accumulated since he is the only person fully cognizant of the use, disposition, movement, weight changes, etc., that occur to his parts. An Inventory Change Order, or Data Change Form (RL-3105) is used to record that data, and should provide a material balance between the obsolete items and the new items. The Inventory Change Order indicates any inventory differences, includes explanations for the the differences; e.g., process losses, rounding differences, accidental losses, approved inventory write-offs, and "material unaccounted for". Two or more samples taken from the same part or batch may be grouped for recording provided each sample is identified and the group of samples is retained or transferred as a group to some other individual.

4. Inventory Procedure

a. Pu Metallurgy Group

Individuals within the Pu Metallurgy facility in Building 332 charged with plutonium shall take a monthly physical inventory. Less frequent inventories by individuals quarterly, semiannually, or annually--may be authorized after approval by the Building 332 Facility Manager and the LLL Accountability representative. Approval will be granted on the basis of the quantity of material charged to the individual, the number of items changed as to form or composition, frequency of transfers and the effectiveness of material control exercised by the individual. Building 332 individual inventory listings will be produced by a monthly printout of the Building 332 MBA 150 representative's Locator file. The order of listing follows: name, material, line number allotment, location, part/batch serial number. The location will be defined as to the room number [last two numerals of room number; e.g., 69 for Room 1369 and three numerals representing a Work Station within a room and shelf or birdcage location within the Vault (Room 1314A)]. A copy of the printout

will be forwarded to each experimenter, who will take his own monthly physical inventory, sign and date the printout and return it to the Building 332 MBA 150 representative. Because of AEC reporting requirements on combined data, it is imperative that the inventories be taken within three working days. If an individual expects to be absent during the inventory period, special arrangements should be made with the Building 332 MBA 150 representative. Items or batches of material that cannot readily be located shall be reported immediately to the Materials Management Group.

b. Pu Engineering Group

The Building 332 MBA 150 representative will compare and reconcile the Locator File printout and is responsible for inventorying monthly all items in plutonium Engineering areas and in the Vault, Room 1314A, including items stored for individuals. Any questions as to inventory identification and updating of records will be reconciled with the Plutonium Engineering Supervisor, his alternate, or the responsible engineer.

5. Work Station Mass Control Records

To help keep track of plutonium or other fissile material and to be sure that Work Station inventories do not exceed maximum allowable safe limits, each Work Station is posted with a current Work Station Mass Control Record (RL-3098). Any person charged with fissile material who wishes to transfer material in or out of a Work Station must fill out and initial the Record before the transfer is made. (See Annex A.)

Information, even if estimated, is required on the Control Record before the transfer. One additional person must initial the far right column of the Inventory Sheet indicating that the arithmetic is correct and the weights of material seem reasonable to him. His initials also indicate the transfer has been completed. Within Plutonium Metallurgy, the experimenter, or in Mechanical Engineering, the Plutonium Engineering Supervisor is responsible for assuring safe delivery of the material to the next Work Station or the Vault.

The metallographic facility in rooms 1322 and 1330A will be considered a single work station for the purpose of inventory control.

6. Nomenclature

Serial numbers are assigned[1] to items before they arrive in the building, or at the time of creation in the building. These numbers which must be used, consist of an LLL drawing (or phantom) number, a revision, and a three-digit serialization. Samples, specimens,

[1] M. E. Department Procedure 3-3C

and scrap batches created within the building with one assigned LLL serial number are given a serial number by Materials Management Records Center (Building 233) at the time the Inventory Change Order is written.

Occasionally identification numbers assigned at other facilities appear in the description column of controlled Material Transfer Forms. If the experimenter prefers to use this number for primary identification in place of the assigned LLL serial number, the Materials Management Records Center must be informed.

The use of a number assigned by another facility is discouraged unless it is the only one appearing on the Controlled Materials Transfer Form. If sample or specimen numbers are used in addition to the serial number and they appear in the experimenter's notebook, they should be included when writing an MBA Inventory Change Order. Individual identification problems can be worked out with the Accountability Representative.

7. Packaging and Labeling Requirements (within Building 332)

a. Packaging

See Section 6.3 "Material Transport and Control" in the General Procedure.

b. Labeling

Each container of plutonium within Building 332 MBA 150 shall have a label (Fig. L-1) attached to the container. All the information listed must appear on the label. When applicable, the label shall also provide the information listed below, or identify the individual or logbook possessing the information.

SS MATERIAL
CONTROLLED ITEM

Material_____ Isotope_____
Net Weight _____
Hold for _____
Project or Shot _____
Serial No. _____
_____
Classification _____
Date Received _____
Remarks _____

Fig. L-1. Material control label.

(1) Part/batch serial number.

(2) Material Form and/or composition; e.g., metal, PuO_2, alpha or delta, alloy (PuAl), paper, rags, contaminated equipment (identify).

(3) Net, element and isotope weights and how determined; e.g., estimated, by difference, weighed, chemical, calorimeter (with date), mass spectrometer.

(4) Impurities and contaminants by elements and levels.

(5) Irradiated or nonirradiated.

(6) Individual responsible for material history with room and box number where processed.

(7) Status: for Building 332 Recovery; for AEC Recovery; Hold for _____. The labels must be discarded or inked out when no longer applicable to a container. Individuals may use other labels with the material in process for shorter periods.

D. RECEIPT OF CONTROLLED MATERIALS

All receipts and removals of plutonium, depleted uranium, SRD parts, explosives, beryllium, and radioactive materials into and from Building 332 shall be processed through the Materials Management representative, Room 1314. This includes direct receivals (Building 411 to Building 332 or Courier to Building 332) from vendors.

If, for any reason, it is desired to move plutonium into or out of Building 332 without the transfer of accountability, prior authorization must be obtained from the Facility Manager, the Hazards Control Area Representative, and the LLL Accountability Representative.

1. Weight Verification of Plutonium

Prerequisite to good accounting and control is the accurate determination of quantities of plutonium when they are initially received. Rapid processing of such information is necessary if it is to be of maximum use in completion of AEC shipping documents and records entry.

The requester of new received plutonium will be contacted by the Materials Management representative to arrange for the weight verification operation. Opportunity for special handling instructions will be afforded, or the requester may indicate his desire to be present at, or even handle, the weighing operation himself.

2. Identification

At the time of receival, verification, and weighing, a visual check and record of the identifying numbers of the items should be made.

In those instances where it is not feasible to check-weigh a plutonium item, it is even more important to verify it by serial number at the first possible opportunity.

Refer to Paragraph C.6. of this procedure for standard nomenclature and part numbering instructions. Scribing or etching of proper numbers directly on the parts is the most desirable identification, and should be done whenever possible.

3. Packaging

It is recognized that not all newly received items will come packaged according to the standards set forth in Paragraph 6.3 of the General Procedure. Further, the materials may have to be taken out of the Vault to other Work Stations for opening and repackaging.

After the items have once been opened, suitable containers conforming to the referenced standards must be used for any subsequent movement within Building 332. Containers exceeding the mass limits for storage and use as outlined in Paragraph II.2. will not be accepted at MBA 150 unless covered by a Special Procedure.

E. ISSUANCE FROM VAULT

1. Controls and Approvals

While the Materials Management representative is not responsible for determining whether or not plutonium released to an experimenter will be handled in accordance with all applicable procedures, he will expect the experimenter requesting release to be on the Approved List of Personnel Chargeable with Controlled Material* and to cite the coverage and approval status of the issuance. This may be done in a log book, or on a separate card, but must include allowable mass, actual mass, number of the authorizing procedure, material form and type, and signature. Lack of what appears to be a satisfactory reference or unusual circumstance will require supervisory approval prior to issuance. In addition, the Materials Management representative will notify Building 332 Hazards Control personnel that plutonium, beryllium, and/or radioactive material has been released to building personnel.

Refer to Paragraph E.2. for nuclear criticality safety considerations.

*The approved list of personnel will be periodically revised in Attachment A to this appendix.

2. Mass Limitations on Release from Storage

Material quantities that exceed the mass limits per unit operations (at isolated Work Stations or enclosures) stated in Table L-2 tabulated below are not to be released from the 332 Vault for processing in Building 332 unless covered by a Special Operating Procedure.

In all nonroutine instances, a check of the mass limitations of the Special Operating Procedure will be made prior to release. There must be no question that there is conformity between the apparent mass, the labeled quantity, and the applicable limit, or the release will not be made.

Table L-2. Mass Limits of Materials Issued From the Building 332 Vault Without a Special Operating Procedure.

Material	Solution (or readily soluble) (kg)	Metal or compound not readily dispersed (kg)
^{239}Pu	0.220	2.600
^{233}U	0.250	3.200
^{235}U	0.350	10.000
Any combination of the above.	0.220	2.600

3. Records

The primary record of plutonium issued within the Building 332 MBA 150 is the IBM Locator File. This file consists of individual card for each item, keyed with location and custodian codes to which the item is charged when issued.

The Locator File is periodically updated for material under the Pu Metallurgy control, and continually updated to reflect reported changes in the status of Mechanical Engineering material. It is listed and compared with the master SS inventory printouts at the end of each inventory period.

A logbook of all issuances, as well as shipments and receipts to the MBA, is also maintained by the Materials Management representative as an aid to records tracing.

F. RETURN TO VAULT

1. Information and Labeling

Perhaps the most vital process in the maintenance of proper accountability is the checking in of plutonium from use and processing, making necessary data adjustments, and clearing the records on the individual responsible for the material.

The accuracy and completeness of information furnished by the experimenter at this point is obviously most essential. Any deficiencies in internal controls, data change reporting (refer to Section C), or other records show up at the time of return, and must be resolved before acceptance of the items for storage or further processing.

Much of the ordinary information requirements can be met through proper use of the label required to be affixed to the returned item. Basic label use is explained in Paragraph C.7.b. Relabeling of returned parts is the responsibility of the experimenter. Special attention to contaminants, impure or unusual forms, etc., must be given, and material for recovery categorized according to Paragraph I.1.

2. Packaging

See Paragraph 6.3.3 in General Procedure.

3. Temporary Storage

It is sometimes desirable for an experimenter to use a shelf compartment in the Vault (Room 1314A) as a storage point for material, still charged to him, which he will need soon again. This is permissible under the following procedure:

a. Complete labeling of an item to be placed in the vault is always required. (Refer to Paragraph C.7.b.)

b. Items not active within a period of 90 days will be returned (after the chargeable person has been notified) to the Building 231 Vault for long-term storage, unless a specific request is made to retain them.

c. Mass limitation for storage as detailed in Section H.2. must be strictly observed. Location Mass Balance cards record this.

d. Cooperation of the experimenter in physical inventory of items in temporary storage will assist the Materials Management representative in this function.

4. Storage of Non-SS Items

As space is needed in the 332 Vault for SS Material Items, and it is specifically designed to accommodate these items, storage of non-SS items is discouraged, and will only be permitted with the concurrence of the LLL Accountability Representative.

G. SHIPMENT OF MATERIAL FROM BUILDING

1. Weight Information

Actual weight determinations (based on analytical data) made at LLL are the basic requirement for off-site accountability transfer documentation. It is recognized that these are not always practical to obtain, and that fabrication data from other facilities or "by-difference" weights must sometimes be relied upon. The experimenter may expect to supply a reasonable justification for any relaxation of this basic weight determination requirement.

2. Container Requirements

The complexity of shipping container specifications and regulations imposed by outside agencies upon transport of fissile and other radioactive materials demands that each type of shipment be treated as a separate task.

The basic guide for fissile material shipments is the AEC Manual, Chapter 0529. Shipments in containers not meeting these requirements cannot be sent by any means, without obtaining special AEC approval or exceptions. Lead time of six weeks average for such applications should be allowed prior to shipment. While the Materials Management Group can provide much assistance in this area, the experimenter planning off-site shipments should make an early determination of the adequacy and availability of containers for his particular needs.

3. Transfer Documentation

Points of information for AEC Form 741 preparation, in addition to those needed for internal transfers, should be supplied by the experimenters as follows:

a. Measurement methods used, including measurement uncertainties (2σ level)

b. Analytical data, as available, including precision and accuracies

c. Project designation

d. Special handling and/or shipping instructions

e. Reason for shipment

A Request for Shipment (Form 7600-55424, Rev. 7/68) should be filled out by the initiator on shipments.

Avoid classified descriptions and facts on the Request for Shipment.

4. Controlled Materials ID Tags

An Identification Tag for Controlled Materials (RL-3076) will be completed by the sender prior to shipment of any special material included within the definitions in Part A of this Appendix. Further definitions and detailed instructions on the use of these tags are available in the Materials Management Procedures for Controlled Materials.

5. Direct Shipments

The off-site receiving and shipping of Controlled Materials will be processed in accordance with the Materials Management Procedures for Controlled Materials, Section 1.8.

H. VAULT STORAGE OPERATIONS

1. Labeling Information

Use of container labels as outlined in Paragraph C.7.b of this procedure is standard and mandatory for all items to be placed in the Building 332 Vault for storage.

2. Mass Limits

The following rules govern the storage of fissile materials in the 332 Storage Vault, Room 1314A:

a. General

(1) The Building 332 MBA 150 Representative is responsible for maintaining proper storage control (refer to Paragraph D.2.). Use the vault only for all unattended storage of material not actually in process.

(2) Geometry and Spacing Controls--Do not rely on administrative control only for achieving or maintaining safe spacing. Store material in containers having an attached birdcage frame, or on shelves having compartments with at least the minimum birdcage module storage dimensions. The edge- to-edge separation of storage compartments must provide at least 200 mm (8 inches) between containers, and the minimum center-to-center module distance must be at least 500 mm (20 inches). Modular storage not utilizing birdcage frames must contain the modular spacers to ensure physical separation.

b. Vault Area Storage Limits

The maximum total inventory of any combination of fissile material is limited to 50 maximum storage units. Each maximum storage unit is equivalent to the maximum birdcage mass limits shown for each fissile material in Table L-4.

Table L-3 shows variable inventory limits allowable to maintain maximum inventory control.

Table L-3. Vault Area Storage Limits.

^{239}Pu plus ^{233}U (kg)		^{235}U (kg)
225	plus	0
180	plus	185
135	plus	370
90	plus	555
45	plus	740
0	plus	925

The Vault Area includes both the birdcage rack and storage area and the shipment preparation area.

c. Birdcage Storage Limits

Storage and shipping of birdcages shall not exceed the mass limits in Table L-4 unless specifically approved by the Criticality Safety Committee. Pressure cookers and similar vessels are birdcages only when stored in a vault cubicle equipped with approved modular spacers. Outside the cubicle such vessels are not birdcages and must be under strict administrative control to prevent more than one being handled or delivered.

Table L-4. Birdcage Mass Limits. (kg)

	^{235}U	^{239}Pu	^{233}U	Any combination
Metal, oxides, or dry degreased chips, kg	18.5	4.5	4.5	4.5
Solutions, dispersible or hydrogenous compounds or mixtures, chips under oil, kg	0.35	0.22	0.25	0.22

d. Spacer Shelf Compartment Storage Limits

When small quantities of material are to be stored in individual containers (not in birdcages), the quantities for each shelf com-partment (using modular spacers) shall not exceed the mass limits in Table L-5.

Table L-5. Shelf Compartment Storage.

Material	Solutions, dispersible or hydrogenous compounds or mixtures, chips under oil mass limit, kg	Metal, oxides, or dry degreased chips mass limit, kg
^{239}Pu	0.22	2.6
^{233}Pu	0.25	3.2
^{235}U	0.35	10.0

Storage of metal components that exceed the mass limits shown in Table L-5 require birdcage storage.

Storage of solutions that exceed the mass limits shown in Table L-5 is not permitted in birdcages designed to provide safe mass separation only and not safe container dimensions. The maximum mass limitations shown may be exceeded only when using specially designed birdcages incorporating safe geometry dimensions for solutions that have been approved for a specific type of process solutions by the Criticality Safety Committee.

e. Operational Release from Storage

Refer to Section E.2. of this procedure for mass limitations on material to be issued from storage to process areas.

3. Utilization Reviews

It is the responsibility of the individual engineer or experimenter to release materials which are no longer required to the Building 332 Materials Management representative for recovery. The Materials Management representative will periodically review, at least semi-annually, with the operating personnel as to the current status of materials which they hold.

I. MATERIALS RECOVERY

1. Definition

Recoverable scrap as differentiated from waste material (see Section J), is generated in the course of operations in Building 332. It is processed through two stages of work as outlined below:

a. Internal recovery

b. External recovery

2. Internal Recoverable Scrap

a. All internal material recovery operations will be performed only in strict accordance with authorized recovery procedures:

OSP 332.5 "Plutonium Scrap Recovery and Packaging"

b. Plutonium residues containing quantities, either known or suspected, greater than the waste discard limits listed in Paragraph 3. below will be diverted to the Vault storage for internal recovery. Before return to the Vault, the residues must be segregated into the following classes:

(1) Inorganic nonmetallic materials (sweepings, sands, molds, crucibles, other porous ceramics, slag, etc.). Package MgO and SiO_2 individually.

(2) Metals (tools, crucible supports, thermal radiation shields, aluminum foil, etc.).

(3) Broken glass.

(4) Glassware, plastic and rubber sheets, tape, bottles, syringes, tubing, gloves, plastic specimen mounts, etc.

(5) Combustible rags and paper products (masking tape, emery paper, Kimwipes, etc.).

(6) Plutonium metal, alloys, oxides, etc., containing U, Th, Zr, Hf, Ru, Mo, Nb, Be, B, rare earths, and/or greater than 20 weight percent aluminum. List the amount of contaminants and, if possible, keep each type separate.

NOTE: Less than 10 mg of contaminant per 100 g of plutonium need not be listed.

(7) Plutonium that does not contain any of the elements listed in (6).

(8) Material containing more than one gram of reactive materials in metallic form (Na, K, Li, Ca, Cs, Rb, etc.).

(9) Plutonium having special radiation levels other than the usual blend.

(10) Aqueous solutions.

(11) Organic solutions.

(12) Any package containing tin must be clearly identified.

c. Plutonium metal and alloy chips, machine turnings, filings shall be degreased and burned to the oxide as soon as possible after production but no later than 48 hours.

Plutonium solutions must be recovered as soon as possible after receiving from Building 251 or Building 332 operating personnel.

3. Permissible Waste Discard Limits for Internal Recovery

a. All solutions, aqueous and nonaqueous: Less than 0.005 g/litre.

b. Sweepings, MgO and SiO_2 sands, sludge, heels, incinerator ash: Less than 0.007 g/g.

c. Glass, ceramics, molds: Less than 0.0005 g/g.

d. Dry box filters: Less than 10 g/filter (see J.1.a.).

e. Equipment such as tools, supports, shields, Al foil and etc.: Less than 0.0005 g/g after leaching and cleanup.

4. Internal Recovery Batch Consolidation and Processing Plutonium Residue

In order to alleviate the backlog of material held for recovery, and to form a more economical pattern of recovery batching and analyses, certain kinds of residues will be processed together. Combustibles will be handled on a building-wide basis, and work station cleanups will be scheduled on a timely basis, unless criticality safety restrictions dictate more frequent action. This procedure does not change the requirements for batch segregation by isotopic enrichment, contaminants or other factors affecting economic final recovery.

Nomenclature of parts, pieces, samples, or batches produced within Building 332 for internal usage and eventual recovery will be indicative of the origin of the material. However, material with LLL-serial numbering which comes into Building 332 from external suppliers will not be renumbered unless it undergoes some change of form or weight, and parts produced in Building 332 for usage outside of Building 332 will still require LLL-serial numbers obtained from the Mechanical Engineering Print Room if made to an LLL drawing or sketch.

Inventory Change Order Forms, called Data Changes, will form the basis for Materials Management action in assigning the internal control serial number.

5. Packaging for Internal Recovery

a. Tag and identify all containers as to contents, known or estimated plutonium content, category, name of packager, MBA specimen number, date, and any other descriptive items as required (or considered advisable by packager) to assist recovery personnel in their processing operations.

b. Liquid Waste--Neutralized distillates from liquid recovery, Room 1370 containing greater than 3000 disintegrations/min/litre activity will be transferred to liquid recovery tanks (located outside of building). Hazards Control Waste Disposal will pick up and process this solution.

c. If possible, store liquids in ventilated gloved boxes, not in unvented vault containers. Vent liquids at all times during storage.

d. Bag out combustible or solid organic recovery items and place them in a steel can. Tape and identify the can. Rags used to wipe nitric acid solutions are to be leached with water as soon as possible, and dried prior to transfer. Dry and segregate rags used to wipe up solvents, TPS, oil, or other organics. All transferred rags are to be dry and identified as to material

wiped up, number of leaches made (if nitric acid), and condition of rags (powdery, decomposed, essentially unchanged, etc.).

e. Place solid inorganic residues in a steel can; tape it, bag it out, and place it in a secondary steel can. Tape and identify the secondary can.

f. Handle liquid residues as follows: (1) place them in vented 1-litre plastic containers, (2) bag them out, (3) place them in a secondary steel container, and (4) tape and identify the container. A good description of the contents of the solution is necessary. Pay particular attention to solution components such as phosphoric acid, ethanol, glycerine, etc. (See Paragraph 6.3.3, General Procedure, for further packaging details.)

6. Procedure for External Recovery

a. Material to be shipped to Hanford Recovery Facility

(1) Inorganic nonmetallic scrap that has been determined to be economically recoverable and as derived from I.1. prerecovery or Building 332 Recovery Facilities (Satellite 332.5) will be sent to the Hanford Recovery Facility. This scrap is to be blended, weighed and sampled for total plutonium content per container. The scrap is to be segregated as per I.1. and I.2. scrap categories and packaged into standard one-quart cold-rolled black iron cans, and sealed in an externally "cold" plastic bag. These are inserted into a standard shipping container for shipment to Hanford for recovery.

b. Material to be Shipped to Rocky Flats Recovery Facility

(1) The Rocky Flats Material Accountability Representative is to be notified by the LLL Accountability Representative prior to shipping SS material scrap. Notice will include a complete description of the scrap material, including the contaminating SS and non-SS materials.

(2) It is the responsibility of each employee releasing assemblies for recovery to identify the assemblies. Include a description of all components and written disassembly procedures outlining hazardous conditions which might be encountered in disassembly. This information must be supplied to the Building 332 MBA Representative at the earliest possible date. Shipper personnel witnessing disassembly will be acceptable in lieu of written disassembly procedures.

(3) Clean recastable metal (plutonium, enriched uranium, or depleted uranium) is to be packed in separate containers free from other contaminants. Different SS materials are not be be co-mingled in a container. Attach a packing list, identifying the contents, to the outside of each container.

(4) Where practical, remove all non-SS material from SS materials prior to shipment (assemblies excepted). In those cases where non-SS materials cannot be separated, Rocky Flats will evaluate recovery of the SS materials. After such evaluation the shipper will be furnished additional instructions, if conditions warrant. Do not send contaminated non-SS material scrap to Rocky Flats for disposition.

(5) Segregate and pack separately contaminated plutonium and enriched uranium by type of contamination. If plutonium and enriched uranium are cross-contaminated with one another, clearly identify and pack separately from all other materials.

(6) Pack materials in quantity not to exceed the following criticality specifications (this does not apply to assembled units):

(a) Plutonium scrap metal or dry oxide-maximum 4.5 kg per container.

(b) Enriched uranium scrap metal or dry oxide-maximum 18.5 kg per container.

(7) The LLL Materials Management Group will prepare separate SS 741's for each SS material type (assemblies excepted). These will be forwarded with the scrap materials at the time of shipment.

J. TERMINAL WASTE

1. Categories of Residues or Terminal Wastes Transferred from Building 332

a. Solid Waste--Bulk shipping containers (to be specified by Hazards Control are gamma counted to assure a plutonium content of less than 10 g Pu/container before release from the building for routine disposal. (See Paragraph J.4. below.)

b. Liquid Waste--Solutions with a measured radioactivity level greater than 3×10^3 disintegrations/min/litre but less than 3×10^8 disintegrations/min/litre (0.004 g/liter) generated from general building operations and collected in carboys will be transported to the Waste Disposal Facility.

2. Responsibility

Packaging, controlled release, and disposal of terminal waste is the responsibility of Hazards Control. All control records will be available to Materials Management.

3. Significant Quantities

Because of the nature of the research and development work conducted within the Building 332 MBA, a small but continuous amount of SS material is discarded in Hazards Control waste containers. A portion of this material accumulates as inventory assigned to gloved boxes. See I.3. for waste discard limits.

4. Gamma Counting

Gamma counting of solid waste to be discarded is performed by Hazards Control. The current gamma counting technique is sensitive to small amounts of plutonium present in the solid waste. However, since the gamma counter scans only a small section of the waste container at a time, gamma counting only indicates quantities greater than 1 gram of plutonium in cases where the plutonium is finely dispersed and uniformly distributed throughout the waste container. Since the recovery limit for plutonium is as stated in I.3., gamma counting is an attempt to avoid accidentally discarding gross quantities of plutonium. This measurement method also serves to provide a material balance (accountability) on plutonium and waste management (burial) requirements.

ATTACHMENT A

APPROVED LIST OF PERSONNEL CHARGEABLE WITH SPECIAL MATERIALS

Following is the approved list of personnel in the Metallurgy Division who can be charged with plutonium or radioactive materials:

Group I

W. D. Ludemann
R. A. Pereyra/W. J. Steele
S. L. DiGiallonardo

Group II

J. R. Hauber
R. L. Rose
J. C. Walden/J. W. Magana
R. E. Kelley/R. W. Schroeder

Group III

P. L. Wallace
W. L. Thayer

Metallurgy Division personnel will be required to take a physical inventory of the materials charged to them on a three-month basis as determined by the following schedule:

Group I - June, September, December, and March

Group II - July, October, January, and April.

Group III - August, November, February, and May.

This three-month physical inventory, monitored by the Materials Management Representative, does not in any way eliminate the requirements that all personnel keep accurate and current records of the amount and location of their material and that they continue to take a monthly inventory.

The following are the Pu Engineering personnel chargeable with plutonium or radioactive materials:

Initial issuance of any item from vault:

E. C. Draney/R. R. Hill

Subsequent issuances, returns, and transfers between work stations:

E. C. Draney/R. R. Hill
W. E. Biehl
W. L. Haugen
R. A. Ramos
G. P. Vayer
L. B. Noecker

QUALITY ASSURANCE PROGRAM

A. INTRODUCTION

This document specifies elements of a quality assurance (QA) program for containment control of plutonium and any other radioactive materials handled in building 332. This program is intended to prevent an accident involving such material or mitigate the consequences of any possible incident that could expose the operating personnel or the facility to any serious risks.

The procedures presented in this document are based on management policy and directives as expressed in the following references:

1. Minimum Design Criteria for New Plutonium Facilities, AECM Appendix 6301, September 17, 1974.

2. Quality Assurance Plan, Lawrence Livermore Laboratory, June 28, 1972.

3. New Plutonium Handling Facility, Building 332, Increment III, Quality Assurance Plan, Revision I, J. L. Olsen, LLL to D. E. Reardon, USAEC-SAN, September 8, 1972.

4. Design Criteria for Plutonium Materials Engineering Building 332, June, 1973.

5. Safety Analysis Report, Plutonium Materials Engineering Building 332.

B. SCOPE

This QA Program shall apply to all new laboratory experimental equipment and Zone I contamination control barriers consisting of enclosures, auxillary systems and components during design, procurement and assembly. The QA Program will also apply to modifications, additions, replacements and maintenance of existing equipment to the extent of practical and economic limits. The references listed in section A define this type of laboratory equipment as category C. Failure of category C type equipment to perform as required could result in the following:

- Allow an incident to affect the health and safety of operating personnel by failing to prevent or contain it.

- Cause or allow an incident which might result in failure of a project or program to reach its design objective.

C. ORGANIZATION

It shall be the responsibility of the Research Engineering Division, Mechanical Engineering Department, to administer the QA Program through the building resident QA Administrator, Ward M. Miller.

It is the responsibility of the cognizant supervisor of each laboratory in the Building to comply with the intent of the QA Program and submit all plans for equipment installations and changes to the QA Administrator for review and documentation.

D. DESIGN CONTROL

The Research Engineering Division shall have the basic design control and the responsibility for coordination among participating design organizations for the review and approval of documents involving design. The principle documents for design regulations are those referenced under paragraph A and the following documents:

1. Mechanical Engineering Department Policy and Procedure Manual.

2. Mechanical Engineering Department Safety Manual.

3. Electronics Engineering Department Livermore Electronics Procedures.

4. Electronics Engineering Department Electrical Safety, LED 69-9023.

5. LLL Health and Safety Manual.

Design field changes shall be subject to design control measures commensurate with those applied to the original design and shall be submitted to the QA Administrator for review and approval prior to beginning the change.

E. DOCUMENT CONTROL

The QA Administrator shall control the issuance of instructions, procedures, drawings, and sketches, which prescribe any activities affecting quality assurance. Changes to documents shall be reviewed and approved by the same organizations that originated the documents unless the QA Administrator designates another responsible organization.

The QA Administrator shall maintain a file for determining that all quality assurance requirements have been satisfactorily accomplished. This file may contain the basic reference documents or just a record of the identification numbers of instructions, procedures, drawings, sketches, etc. so that the document may be retrieved from the parent filing system; i.e., the Mechanical Engineering Department Print Room.

F. ASSEMBLY AND INSPECTION

The QA requirements for assembly, installation and testing of laboratory experimental equipment shall be prescribed by appropriate instructions and procedures. The actual work shall be performed in accordance with these QA instructions by personnel with training and experience that qualify them for such work.

Inspections and tests which verify quality shall be made by an authorized person other than those engaged directly in the prescribed activity. The QA Administrator shall review all procedural, inspection, and test documents before he gives final approval for the equipment, system, or component for service.

QUALITY ASSURANCE PROGRAM

ZONE I ENCLOSURE SPECIFICATION

A. Definition: A Zone I enclosure is the primary contamination confinement barrier for plutonium or other radioactive materials per AECM 6301 - Category C and the LLL Health and Safety Manual - Supplements 33.30 and 33.42.

B. Scope: The requirements contained in this specification are intended to cover all activities of an enclosure from design criterial through operation, maintenance, modification, and considerations for disposal. The implementation of these requirements should be defined in specifications, drawings, procedures and instructions prepared for zone I confinement enclosures.

C. Enclosure Design Requirements: Enclosures and their atmosphere control systems are the primary contamination confinement system and, therefore, shall be designed to provide confinement during normal operations.

1. Quality Assurance Records: The following information for design and operation shall be provided for the QA files maintained in Building 332.

   The experimenter's statement of operating criteria that describes the work that will be done in the enclosure and the utility services required.

   All electrical and mechanical drawings and specifications shall be in accordance with paragraph D "Design Control" of Appendix M of OSP 332.

2. Construction: Noncombustible or fire resistive and corrosion resistant materials should be used for enclosures and any required radiation shielding. Where feasible, all equipment not functionally required to operate directly with fissile material should be located outside the enclosure. Consideration shall be given to providing safe criticality geometry on enclosures and equipment directly involved with fissile material.

   Design of the enclosures should include standardized features such as windows and glove ports (size, location, and height); ease of cleaning (radius corners, smooth interior and exterior surfaces, minimal protuberances, and accessibility of all parts); adequate interior illumination (from fixtures mounted on the exterior where feasible); connections for service lines, conduits, instrument leads and ductwork; fire-stop and filter installations; pressure differential readouts; and attachments for interconnection of enclosures. Considerations should be given for modular construction, versatility, relocation and incorporation of any necessary shielding.

3. Fire protection. Fire protection shall be required in enclosure systems to meet AEC improved risk requirements. These requirements specify that automatic fire suppression shall be considered when a credible fire can produce a loss (including the cost of decontamination) in excess of $100,000. When the potential loss might exceed one million dollars, an automatic fire suppression system is mandatory. Instead of an automatic fire suppression system to protect against loss from fire originating within the enclosure, an oxygen deficient atmosphere may be provided as the normal operating atmosphere within the enclosure. If it is deemed necessary, provisions shall also be made for manual fire suppression.

   Discrete enclosure work areas separated from each other by fire-stops should be provided to prevent the spread of fire. Generally the fire-stops between enclosures should be such that they are normally closed. Where operations require that the fire-stops be in the open position, they shall be designed to be closed upon activation of the fire detecting system. Manually operated closures shall also be provided for all fire-stops.

4. Atmosphere Control System. An atmosphere control system shall be installed on all enclosures to maintain a negative pressure inside the enclosure with respect to the operating area. Consideration shall be given to the removal of heat, explosive and corrosive gases, and solvent vapors as well as other contaminants. The system shall be designed to automatically assure adequate inflow of air at capture velocity of potential contaminates through a credible breach in the enclosure. The design of the enclosure atmosphere control system shall act to minimize the spread of fire. All enclosures with positive pressure-supplied gases should have positive-acting, pressure-relief valves (connected into the glovebox exhaust system) to prevent pressurization of the enclosure. Consideration shall be given to provisions for all necessary purging and scrubbing equipment for noxious chemicals.

   An enclosure shall provide confinement during the following conditions:

   Earthquake (DBE) - The enclosure is to be secured to withstand any building motion due to a design basis earthquake (DBE) and is to have breakaway connections on the uncontaminated side of the HEPA exhaust filters.

   Fire (DBF) - A few limited items such as gloves must necessarily be made of combustible materials, but a Zone I confinement barrier is to be as fire-resistant as practical to a design basis fire (DBF). Metal covers shall be provided for glove and bagout ports and should be in place when the port is inactive.

Electrical Power Failure - The enclosure is to fail-safe and maintain its integrity as a Zone I confinement barrier during an electrical power failure. The atmosphere control system is to fail-safe and maintain a negative pressure within the enclosure during an electrical supply failure to the equipment installation.

D. Instructions for Zone I Enclosure Record: The following instructions explain how the Zone I Enclosure Record (Attachment B) should be used to originate and maintain a QA history for each Zone I enclosure.

1. I.D. Number: A two-part number consisting of the laboratory room number and sequential enclosure number.

2. Description and Approved Use of Enclosure: A statement that describes the box (i.e. vacuum, inert gas, air with constant flow or static, low humidity, etc.) and defines what operations processes and equipment have been approved for the enclosure. This section is subject to annual review.

3. Operating Safety Procedures (OSP): Reference the Building 332 general OSP or the specific satellite procedure that authorizes the operation of the enclosure.

4. Atmosphere and Type of Atmosphere Control System: List the type of atmosphere such as argon, nitrogen, air or vacuum and the type of control system such as Fisher Porter vacuum regulator with LLL modification and Fisher Porter or Photohelic vacuum breaker.

5. Reference: List assembly drawing, job order or purchase order, engineering notes or specifications and any special engineering documents. See paragraph E "Document Control" of Appendix M of OSP 332. List specifications for equipment or coolants and fluids and any operating instructions or manuals provided by equipment manufacturers or suppliers.

6. Assembly, Test and Approval: The signatures of the person who did the work, the person who tested the enclosure and the QA Administrator who approved the enclosure for use are to be recorded.

   The leak rate (calculated) of enclosures must be less than 0.05 percent of the enclosure volume per hour measured at a differential water column pressure of 4.0 inches before gloves and bagout bags are applied. Exceptions to this leak rate must be more severe or clearly justified in the design specification of the individual enclosure. Enclosures, with all inlets closed, must withstand the full negative pressure that the enclosure exhaust system could generate (minus five inches water column).

7. History: This section is to record all changes made to the enclosure during its service life and indicate its current QA status.

QUALITY ASSURANCE PROGRAM
ZONE I ENCLOSURE RECORD

1. I.D. Number: _____

2. Description and Approved Use of Enclosure: _____

3. Operating Safety Procedures: _____

4. Atmosphere and Type of Atmosphere Control System: _____

5. Reference Dwgs. and Specs: _____

6. Assembled by _____ on _____ Leak tested by _____ on _____
   Approved by _____ on _____ Approved by _____ on _____

7. History: Description of Changes with Record of Ref. Dwgs, Sketches, Documents, Insp. and QA Approvals _____

CRITICALITY ALARM SYSTEM

A. RESPONSIBILITY

It is the responsibility of the Deputy Manager to assure that the criticality alarm system is functional at all times when anyone in the facility may be handling fissile material and that all reasonable steps are taken to prevent false alarms. No maintenance, alteration, or testing procedures which may affect the functioning of the alarm system shall begin without the authorization of the Deputy Manager, or his designated alternate.* All work on the alarm system will be supervised and coordinated by the Building 332 Electronics Coordinator, or his designated alternate.* Only normal checkout procedures specifically stated in Paragraph E may be conducted by authorized Hazards Control Health and Safety Technicians without direct supervision.

In the event of a criticality alarm, all personnel shall leave the building by the nearest exit. The Deputy Manager or the Emergency Control Coordinator shall authorize reentry into the building after facility management and Hazard Control Representative have determined that no hazard exists. No one is to enter the facility without this authorization. The return to normal building operating procedures will be under the direct control of the Deputy Manager. In the absence of the Deputy Manager, his alternate(s) are Facility Manager, Facility Coordinator, and Mechanical Technician Supervisor in the order given.

B. DESCRIPTION

The primary function of this system is to detect a criticality and to make this fact known to the building occupants by an audible alarm. A secondary function is to notify the Fire House.

This system consists of:

1. Detection heads, local alarm bells and lights located in labs containing significant quantities of fissile material.

2. Readout meters located in Room 1236 with a range of 1 to 10,000 mR/hr.

3. An alarm panel with various switches and resets also located in Room 1236.

4. Klaxon horns located throughout the building.

5. Emergency battery system located in the Machinery Room.

Low level alarms, high level alarms, and circuit troubles are monitored by the alarm panel. In addition, low level alarms and circuit troubles are monitored on a supervisory circuit at Building 323 (Fire House). Two simultaneous high level alarms activate the Klaxon horns in the

*Alternates noted in Section D.4

building and also send a signal to Building 323 alarm panel to indicate a Building 332 criticality. This initiates an automatic "crash out" response by the Fire and Police Departments. Power is furnished through a charger and a battery plus inverter so that loss of 117 VAC does not shut down the system. In case of inverter failure, power automatically switches to the 117 VAC line after a short delay. This might cause a supervisory alarm. There is a delay of 0.05 seconds between the time the two probes sense over 100 mr/hr and the activation of the Klaxon horns.

Attachment A is a block diagram of the system. Attachment B shows the location of the detector heads and Klaxons. Attachment C is a list of the drawings of the alarm panel system.

C. OPERATION

1. Normal Operation (Health and Safety Technician daily test)

   a. The meter reads about 10 mr/hr (in the black band on the meter face).

   b. A small pilot light indicates power to the chassis.

   c. Depressing the supervisory alarm light lens will check whether the light is working.

2. High Level Alarm (When one readout meter reads greater than the 100 mr/hr preset alarm level)

   a. The high level indicator lights.

   b. The local alarm bell will sound and the magenta light will flash in the affected lab.

   c. This condition will remain until the gamma radiation drops to less than the preset alarm level and the reset button is pressed.

3. High Level Alarm (When a minimum of two readout meters read greater than 100 mr/hr preset alarm level)

   a. The high level indicators will light.

   b. The local alarm bell will sound and the magenta light will flash in the affected lab.

   c. The building Klaxon will be activated.

d. A signal will be sent to Building 323 to activate the criticality indicator on the alarm panel.

e. The building Klaxon horns may be silenced by turning the key in the Alarm Silence Switch. This will give a Supervisory Light in the Fire House, instead of a Criticality Alarm.

f. The other alarm conditions will remain until the gamma radiation is less than the preset alarm level and reset buttons are pressed.

4. Equipment Malfunctions

a. The Trouble Light and the affected Circuit Lights illuminate.

b. The Alarm Panel Buzzer sounds.

c. A signal is sent to Building 323 to light the Supervisory Indication Lamp.

d. To silence the buzzer, press the Buzzer Silence Button.

e. The lights that have been lit will go out only when the trouble has been corrected.

5. Manual Operation of the Criticality Alarm is activated by pressing the Manual Alarm Button. This action must be authorized by the Deputy Manager.

a. The Klaxon horns will sound.

b. A signal will be sent to Building 323 to light the Criticality Indicator.

c. The above conditions will remain until the Manual Alarm Silent Button is pressed or the Horn Silence Key Switch is turned to the Off position.

6. Indicator Lights

a. RAMS Console Module

(1) The "High Alarm" light goes on if that channel is exposed to a radiation level exceeding the alarm set point. If the radiation intensity is reduced below the alarm level, the light will remain on until the reset button on the module is depressed.

(2) The "Low Alarm" (supervisory) goes on if the low limit is activated. It also remains on until the reset button is depressed.

Some modules have a "Failure Alarm Light" test. Depressing the light assembly will cause the light to come on indicating a good bulb. A supervisory alarm is not sent to the alarm panel during this test.

(3) There is a pilot light on each power supply-master control chassis (Model 712) indicating the presence of AC.

b. RAMS Alarm Panel

(1) The "HORNS OFF" red light goes on if the key operated HORN silencing switch is turned on. The light will go off if switch is turned off (after radiation levels are reduced).

(2) The "LINE POWER TROUBLE" amber light goes on if normal power fails and power to the panel is supplied from inverter. Also a buzzer will sound trouble signal. The buzzer silencing switch will stop the buzzer, but light will go out only if the house power is restored.

(3) The "INVERTER TROUBLE" amber light goes on if inverter fails while floating on line; also the buzzer will sound trouble. The buzzer silencing switch will stop buzzer, but light will remain. If the inverter is restored the light will go out.

(4) The "HORN CIRCUIT #1 TROUBLE", "THE HORN CIRCUIT #2 TROUBLE", and "THE HORN CIRCUIT #3 TROUBLE", amber lights go on if a wire to a horn or a contact is broken, also the buzzer will sound trouble. The buzzer silencing switch will stop the buzzer, but lights will remain on. The lights will go out only if the wires are reconnected and continuity of the circuit restored.

D. MAINTENANCE AND RESPONSIBILITIES

1. Areas of Maintenance Responsibility: All maintenance and alteration procedures must be authorized by the Deputy Manager or his designated alternate, and all work must be performed under the direct supervision of the Building 332 Electronics Coordinator under the following guidelines:

a. Hazards Control Electronic Maintenance

(1) Power supply

(2) Plug-in modules

(3) Detector heads

b. Plant Engineering Support

(1) Alarm panel

(2) All external cabling

(3) Evacuation alarms

(4) System power

c. See Appendices A and B for block diagram and component location.

2. Potential Failure Modes

a. No response or improper response to internal calibration source.

b. Supervisory source reading out of tolerance (outside the black band).

c. Supervisory alarm.

d. One head radiation alarm (not caused by external radiation).

e. Two or more heads radiation alarm.

f. Panel lights improperly lit.

3. Procedure for Rectifying Equipment Failure

a. Failure Mode. Improper response to internal radiation source or incorrect calibration source reading.

(1) Alert the Fire House Dispatcher of possible failure.

(2) Call Hazards Control Electronic Maintenance for service.

b. Failure Mode. Supervisory Alarm

(1) Verify with Fire House that a supervisory alarm was transmitted.

(2) Call Hazards Control Electronic Maintenance.

(3) Call Plant Engineering Support.

c. Failure Mode. One Head Radiation Alarm

(1) Determine that the alarm was not caused by an actual radiation field.

(2) Call Hazards Control Electronic Maintenance.

(3) Call Plant Engineering Support.

d. Failure Mode. Two or more head radiation alarms.

(1) Building will have been evacuated.

(2) Reentry procedures will be established at the time of the incident per Paragraph A.

e. Panel Lights Improperly Lit

(1) Call Plant Engineering Support if the light is on the Alarm panel.

(2) Call Hazards Control Electronic Maintenance if the light is on the power supply chassis or modules.

4. Contact Personnel

a.	Deputy Manager	E. C. Draney	7132
	Alternates	J. R. Hauber	7132
		V. G. McIntosh	7132
		R. R. Hill	7132
b.	Building 332 Electronics Coordinator	P. J. Kearns	7132
	Alternate	A. E. Kirkewoog	7055
	Health and Safety Technicians	J. A. Loftis	7132
		C. K. Koivu	7132
c.	Hazards Control		
	Electronic Maintenance	R. A. Moal	3370
		E. D. Valenzuela	3905
		O. M. Barlow	3803
d.	Plant Engineering Support	G. I. Richardson	7751
		H. VanDeVanter	7751
e.	Criticality Safety Committee	M. Knezevich	3823
		T. J. Powell	3825
		T. Crites	8206

(NOTE: During off-shift hours see Emergency Call List, Appendix A)

5. Requirements for Modifications and Installations

Modifications or installations shall not be implemented without the authorization from each of the following:

a. Deputy Manager

b. Building 332 Electronics Coordinator

c. Hazards Control Electronics Maintenance (HCEM)

d. Plant Engineering Support

e. Criticality Safety Committee

6. Procedure When Changing RAM Detector Heads and Readouts

a. This work shall be approved by the Deputy Manager or Building 332 Electronics Coordinator and Shall be done off-shift with operations suspended.

b. Personnel required to effect change are:

One Health and Safety Technician (HST)

One Hazards Control Electronics Maintenance man (HCEM), Extension 3905.

(If time does not permit calling the HCEM Technician, then a third person knowledgeable of electronics may substitute.)

c. Call Fire House Dispatcher, Extension 7595. Tell them you are going to disable the Building 332 radiation alarms and to expect a "Supervisory Alarm".

d. The HST shall verify that operations are suspended and shall announce over the page system that criticality alarm system is disabled.

e. Silence Horn

(1) Get Horn Silence Key from glass-covered box on the front panel of the console.

(2) Insert key in Horn Silence key switch and turn clockwise to the "Horns Off" position.

f. Replace Defective Channel

(1) Determine defective channel

(a) Look at front panel meters and alarm lights.

(b) A meter reading Hi or Lo, or a channel with alarm lights on indicate the defective channel.

(c) Note the room number of the defective channel. (Marked on frame under defective channel.)

(d) Rotate All Alarm point sets to maximum full scale by turning the black plastic knob on the face of the meter relay.

(2) Roll the console forward slightly. Remove the spare readout module from the bottom rear of the console. The push console to its previous position.

(3) The HCEM Technician shall remove the readout module of the defective channel.

(a) Unscrew knurled knob.

(b) Pull out module and set aside. This may cause other readouts to "alarm".

(c) Do not replace readout module yet.

(4) The HST shall replace the detector of the faulty channel with the spare. The spare detector is located in the Radiation Materials Area in Room 1314 of Building 332.

(5) Insert spare readout module in the chassis and tighten knurled knob.

(6) Depress and release reset push buttons on all channels that are "alarming" (push several at once to save time).

(a) It may be necessary to depress the calibrate push button to speed recovery of some channels.

(b) If all channels do not clear, call Electronics, contact personnel listed in paragraph D-4 of Appendix N.

(7) If all channels reset properly, all meters should read in the black.

(8) Check the calibration.

(a) Depress the Calibrate push buttons (several at once to save time).

(b) Meter readings should be near the calibrate marker.

(c) If Calibrate Reading is significantly off, call Electronic personnel listed in Paragraph D-4 of Appendix N.

(d) Adjust all alarm point sets to 100 m/r.

(9) Reactivate Building Alarm System.

(a) All Radiation Alarm Lights must be off and all trip points set to 100 mr before enabling building alarm. Call EM contact personnel on irregularities.

(b) Turn Horn Silence Key to "Horns On" and remove key from horn silence switch.

(10) Inform Fire Department Dispatcher, X7595, that Building 332 Radiation Alarm System is Normal.

(11) Announce over the building page that the criticality alarm system is operational.

(12) Contact all Disciplines listed in paragraph D-5 of this appendix and relate what was done and why.

NOTE: Alarm circuit prints and copies of the RAMS schematics are located in the side bracket of the console.

E. NORMAL CHECKOUT PROCEDURES

1. A weekly check of the response of each detector head of the RAM system to the ^{90}Sr internal source will be done as follows:

a. Relocate the alarm point from 100 mR/hr to a value to 10 R/hr at the console in Room 1236.

b. Depress the reset button with the left hand and hold this position through steps c and d.

c. Depress the "CAL" button which rotates the shutter between the detector and the ^{90}Sr source with your right hand. (Adjust meter to "calibrate" if necessary).

d. Release the "CAL" button.

e. Release the reset button after the radiation indicator has stabilized.

f. Adjust the alarm point to 100 mR/hr.

g. Record your "before and after" adjustment reading in the log book.

h. Turn the Alarm Silence Key to the "Off" position for a maximum of 10 seconds. This will send a supervisory signal to the Fire House.

i. Call the Dispatcher at the Fire House after the Alarm Silence Key has been turned to the "On" position. Ask these questions: Did you get a supervisory signal from the Building 332 RAM System? Does your monitor indicate normal conditions for the Building 332 RAM System? If either answer is no, call Plant Engineering Support.

2. The RAM System shall be calibrated every four months using an external radiation source.

   a. Notify the Fire House

   b. Shut off the Klaxons.

   c. Calibrate all heads and readouts at 100 mR/hr and 10 R/hr.

   d. Function test each bell and magenta light at each detector.

3. The response of the whole system shall be tested annually. Appropriate steps include:

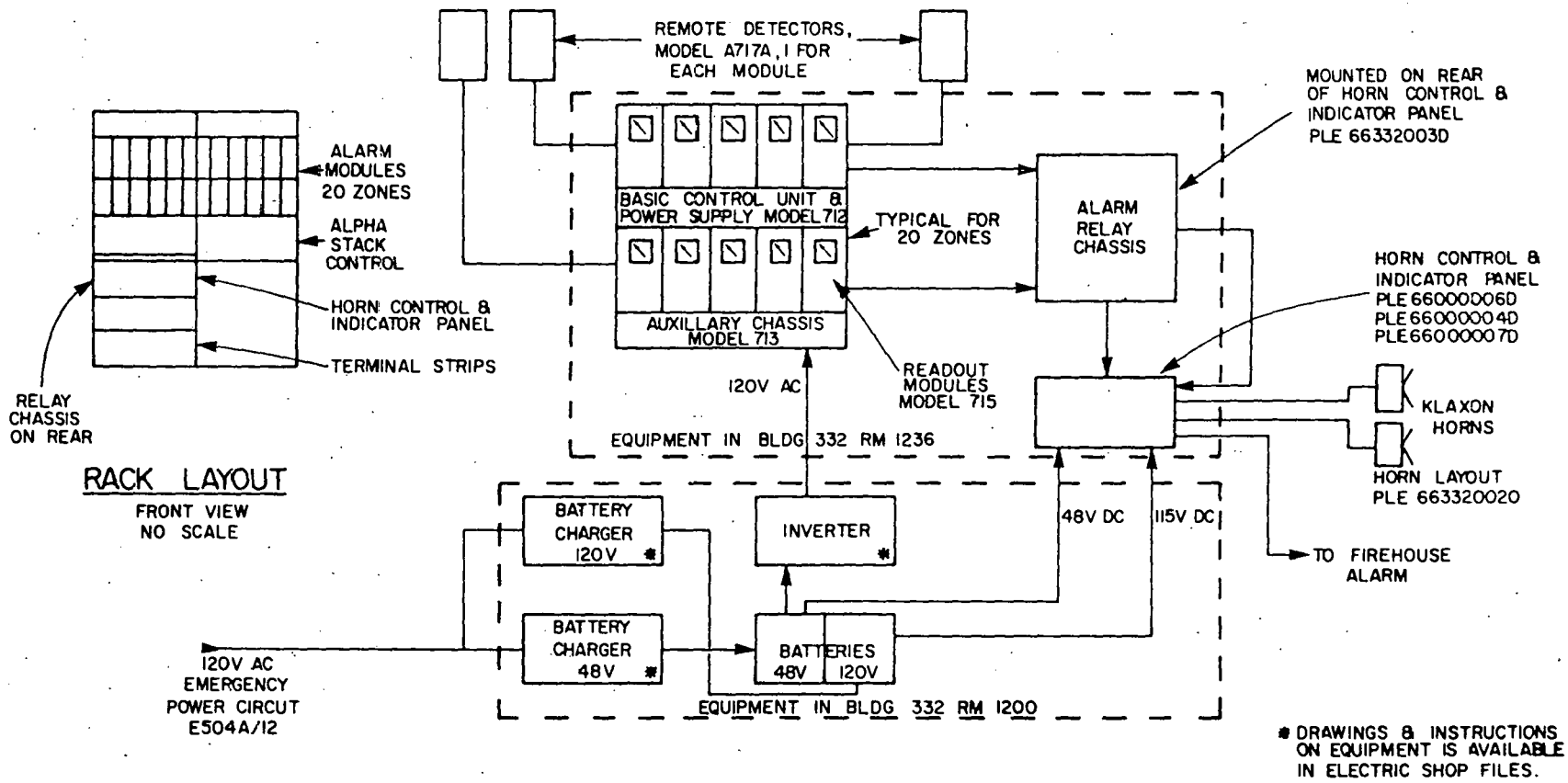
   a. Advise Fire Department before the test.

   b. Announce test over the PA System.

   c. Set off high level alarms on two detector heads.

   d. Determine if Klaxons are audible throughout the building.

   e. Check that Fire House received an alarm signal.

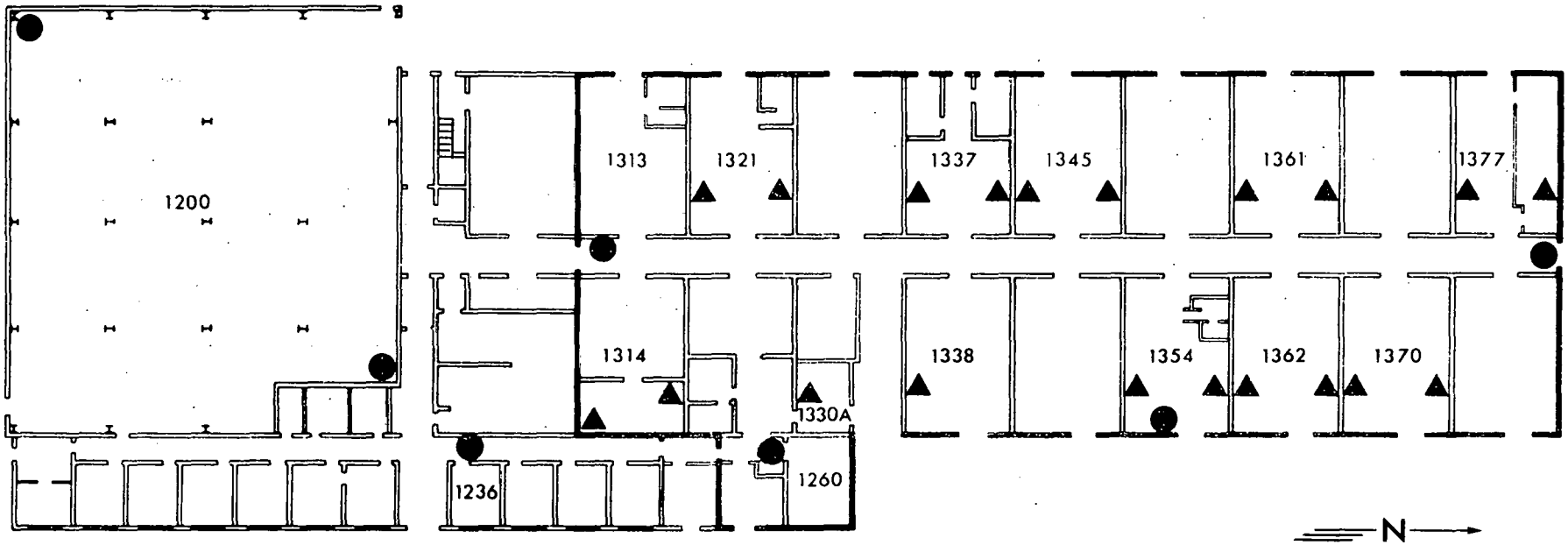


RACK LAYOUT

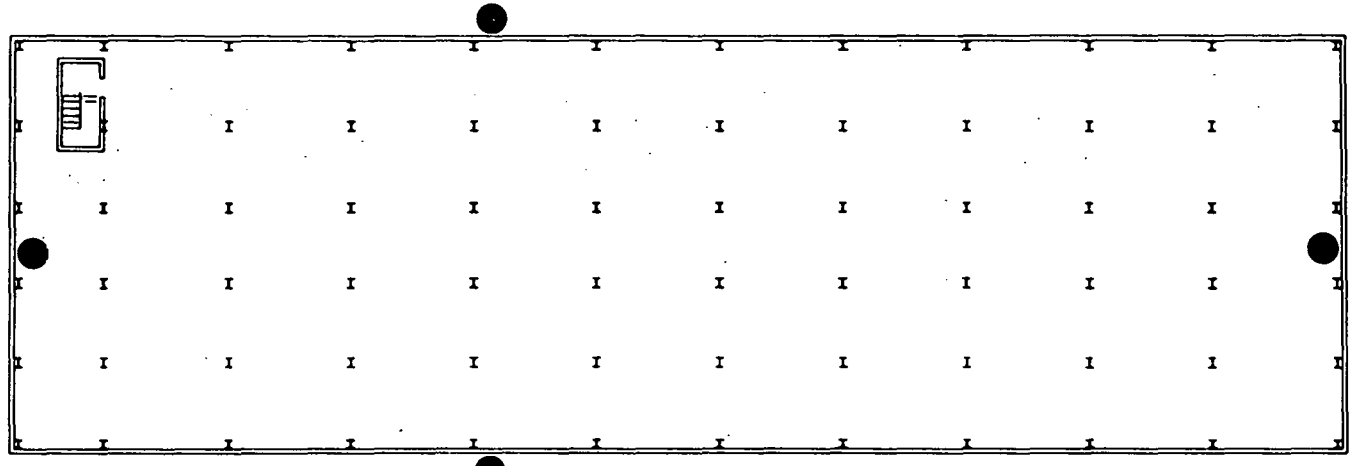
FRONT VIEW
NO SCALE

CRITICALITY ALARM SYSTEM BLOCK DIAGRAM

ATTACHMENT – A



FIRST FLOOR PLAN



FAN LOFT PLAN

● = KLAXON HORN

▲ = R.A.M.

Attachment B - Detector & Klaxon Locations

ATTACHMENT C

Building 332

Klaxon Horn Installation Building 332 Criticality Alarm	Dwg. # PLE 66-332-002DA
Criticality Alarm Building 332 Local and Evacuation Alarms	Dwg. # PLE 66-332-003DA
Criticality Alarm Building 332 Pilot Lights-Switches and Relays for Existing Console	Dwg. # PLE 66-332-004D
Schematic Drawing for Twelve Horn Criticality Alarm	Dwg. # PLE 66000-006DD
Wiring Diagram for Twelve Horn Criticality Alarm	Dwg. # PLE 66000-007DC
Panel Board Eight and Twelve Horn Criticality Alarms Layout and Dimensions	Dwg. # PLE 66000-012D
Criticality Alarm Power Supply Inverter-Primary Source Building Power-Secondary Source	Dwg. # PLE 70-332-003C

DISASTER CONTROL PLAN

Revised 1-15-73

LAWRENCE LIVERMORE LABORATORY I UNIVERSITY OF CALIFORNIA I LIVERMORE, CALIFORNIA

Foreword

The Disaster Control Team has been organized and trained by Hazards Control Department personnel to minimize the effects of any disaster that may strike the Laboratory. This team is responsible for taking whatever action is necessary to protect the lives of LLL employees, control the extent of damage to Laboratory facilities, and to ensure that Laboratory operations will continue once the emergency is passed. Furthermore, all LLL employees are responsible for assisting the Disaster Control Team in every way possible when requested to do so.

This Disaster Control Plan has been prepared primarily for members of the Disaster Control Team to help them cope with emergencies more effectively. It outlines the organization of the Disaster Control Team, assigns responsibilities to specific team members, describes how and under what circumstances the Disaster Control Organization is mobilized, and describes the equipment available for use during emergencies. Supplements to this Plan contain more detailed information concerning available emergency equipment and facilities.

When changes or revisions to this plan are issued the revised material will be marked with change bars.

Contents

DISASTER CONTROL PLAN

Introduction

An extensive hazard evaluation program has been established here at the Laboratory to ensure a safe work environment for all personnel. This program has proved its effectiveness and has significantly reduced the probability of accidents; however, it cannot prevent accidents entirely. And occasionally, mechanical failures and human error do result in accidents.

We have adopted a realistic approach toward safety. We attempt to prevent accidents whenever possible. Moreover, we have taken measures to minimize the consequences of those accidents that do occur. This approach necessitates a trained standby organization that can respond quickly to all accidents. This organization must be prepared to cope with the small and moderate accidents that most frequently demand its services as well as the less frequent but more severe accidents that possibly can occur.

The Disaster Control Plan outlined herein documents our approach toward controlling major and minor accidents. Basic authorization for this plan is set forth in Section 3.00, Accident Control, of the LLL Health and Safety Manual.

This plan has been approved by the California Disaster Office. All members of the Disaster Control Organization are qualified disaster workers and are given the authority set forth in the California Disaster Act of 1943, as amended, and Chapter 6 of the Alameda County Administrative Code.

Accidents are defined as unexpected or unintentional occurrences that result in damage to equipment or injury to personnel. With this broad definition, accidents obviously can vary from very minor ones to those that cause extensive injuries and property damage. To provide a logical basis for planning and applying control measures for accidents spanning this range, accidents are classified according to their relative severity. Thus, accidents are classified as either minor incidents, emergencies, or disasters.

A minor incident is an accident that does not endanger personnel but does cause limited property damage that is not likely to increase. Minor incidents are controlled without notifying the Disaster Control Organization. Examples of such incidental accidents are minor injuries, spills of small amounts of radioactive or toxic materials, and failures of experimental apparatus without fire. All injuries, however minor, are reported to the Medical Department for documentation and to prevent further consequences of the injury.

Other minor incidents are studied for ways to prevent their recurrence. Those that are potentially serious are investigated and documented.

Emergencies are accidents that endanger life and property. Emergencies do not interrupt wide segments of Laboratory operations, and the general public or the local community does not become involved. Emergencies are reported to the Fire Department and are referred, in turn, to the person or persons responsible for controlling the particular type of accident. Examples of emergencies are hazardous spills of water, flammable materials, toxic materials, or radio-nuclides; accidental explosions, fires or suspected fires; and injuries requiring first aid.

Disasters are serious accidents that cause injuries or extensive damage and threaten to cause additional injuries and damage. Generally, accidents that can cause serious off-site effects and create public relations problems with the community are classified as disasters. The entire Disaster Control Organization is available during disasters to control the extent of injuries and property damage.

Disasters result from natural and man-made causes. Earthquakes, floods, and hurricanes are disasters of natural origin. Of these, earthquakes are the most likely to effect Laboratory operations by damaging buildings, spilling hazardous materials, and starting fires from short-circuited electrical equipment. Man-made disasters are caused by explosions, nuclear criticality excursions, widespread fire, and nuclear attack. Conceivably, natural and man-made causes can combine to create disastrous conditions. Lightning, for example, could strike a large explosive mixture or high winds at an off-site fire could carry firebrands to many Laboratory buildings where they could start additional fires.

The plan outlined in this document is concerned with disasters or serious accidents that involve the total Disaster Control Organization.

The following section contains a general outline of the Laboratory Disaster Control Plan and describes the basic Disaster Control Organization. Subsequent sections consider the organization in greater detail and define the actions and responsibilities of groups and key individuals. In addition, the emergency communications system, the equipment available during emergencies, and the fallout shelter plan are described briefly.

More detailed descriptions of the communications systems, equipment available for use during emergencies, and detailed emergency plans, are contained in a number of supplements to this manual. These supplements, when combined with this manual, comprise the total Disaster Control Plan. Titles of the supplements and instructions for obtaining pertinent copies are found in the appendix.

General Operations Plan

The objective of the Laboratory Safety Program is to prevent injury to personnel and damage to property. If an accident occurs, immediate action is needed to prevent further injuries and to limit the damage. Because accidents are unpredictable

and, in many instances, an immediate judgment cannot be made to determine whether the accident will cause more injuries or greater damage, a plan for controlling accidents is needed to ensure prompt response to the degree needed to contain the accident. The Hazards Control Department has been given the responsibility for developing and implementing of such an Accident Control Plan.

The resultant Accident Control Plan devised by the Hazards Control Department is simple. It stipulates that every accident is to be reported immediately to the Fire Department unless it is very minor. Firemen promptly respond to the scene to evaluate the nature and severity of the accident and to begin control actions. Hazards Control Area Teams also respond depending on the nature of the report. If the accident is minor, the firefighting team completes the control actions. If the accident cannot be handled by the firefighters, additional departmental and Hazards Control personnel are called. If the accident is severe, or threatens to become severe, the entire Disaster Control Organization can be mobilized and all Laboratory resources are made available to control the situation.

Although this basic plan is straightforward, the relationship of the various participating groups introduce a complexity that increases with the seriousness of the accident. The responsibilities of the groups and individuals involved must be clearly understood and respected.

- The first employee to become aware of an accident must either report the accident immediately or have someone report it.
- Immediately after an accident occurs, the supervisor of the involved area is responsible for safeguarding his personnel and taking control actions his group can accomplish safely.
- Once the Fire Department arrives, the Senior Fire Officer coordinates the control efforts of all personnel present. He relinquishes this responsibility to an Emergency Control Coordinator when he arrives at the scene.
- If the Emergency Control Coordinator considers the accident to be a disaster, the head of the Hazards Control Department (Site Manager at Site 300) is called and serves as the Deputy Disaster Control Director to coordinate all field activities. The Associate Director for Support takes administrative control of the entire operation.

All Laboratory scientific and technical departments are required to assist as requested by the individual coordinating the actions of the Disaster Control Team at the scene of the accident.

THE DISASTER CONTROL ORGANIZATION

The Disaster Control Organization is divided into an Administrative Group and a Field Group. The Field Group is responsible for performing the control operations necessary to alleviate the effects of a disaster. The Administrative Group develops policy guidelines governing operations of the Disaster Control Organization. In the event of a disaster, the Administrative Group also provides overall control and administrative support

and notifies concerned individuals and off-site agencies including the press.

The Disaster Control Director and his staff comprise the Administrative Group. The Field Group consists of the Deputy Disaster Control Director, the Emergency Control Coordinator, and various supporting teams and personnel. The Deputy Disaster Control Director is responsible to the Disaster Control Director. Figure 1 depicts the organization of the two groups and indicates the supporting teams.

Specific duties and responsibilities of members of the Disaster Control Organization are defined in subsequent paragraphs.

Administrative Group

Participating members of the Administrative Group and their responsibilities during a disaster are described in this subsection.

The Director of the Laboratory is responsible for the overall direction of all Laboratory operations, including disaster control. When the Director is away from the Laboratory (on travel status) he designates an Associate Director to act in his stead. However, the responsibility for directing disaster control operations at any time has been delegated to the Disaster Control Director and his alternates.

Disaster Control Director

The Disaster Control Director is responsible for directing the people, equipment, and operations either directly or indirectly involved in any disaster exercise. He also coordinates the activities between Administrative and Field Groups. He may delegate or assign this authority as he believes appropriate during any emergency control effort or exercise.

During actual disasters, the Director takes charge and assures himself that all Disaster Control Teams are either standing by or have been dispatched to the disaster area. He has the authority to order all personnel to evacuate the project, and he may call upon outside agencies for assistance if he believes this to be necessary.

Business Services Department Head

As a member of the Administrative Group, the head of the Business Services Department provides administrative support to the Disaster Control Director. This support includes advice on legal matters, procurement of off-site supplies, and assistance from outside agencies.

Security Department Head

The head of the Security Department provides administrative support for the security and police teams of the Field Group during a disaster.

Medical Department Head

As a participating member of the Administrative Group, the head of the Medical Department advises the Disaster Control Director on medical matters. He also provides medical assistance to the Field Group.

Plant Engineering Department Head

The head of Plant Engineering also is a participating member of the Administrative Group. In this role, he provides administrative support to Plant Engineering personnel of the Disaster Control Field Group. Plant Engineering personnel

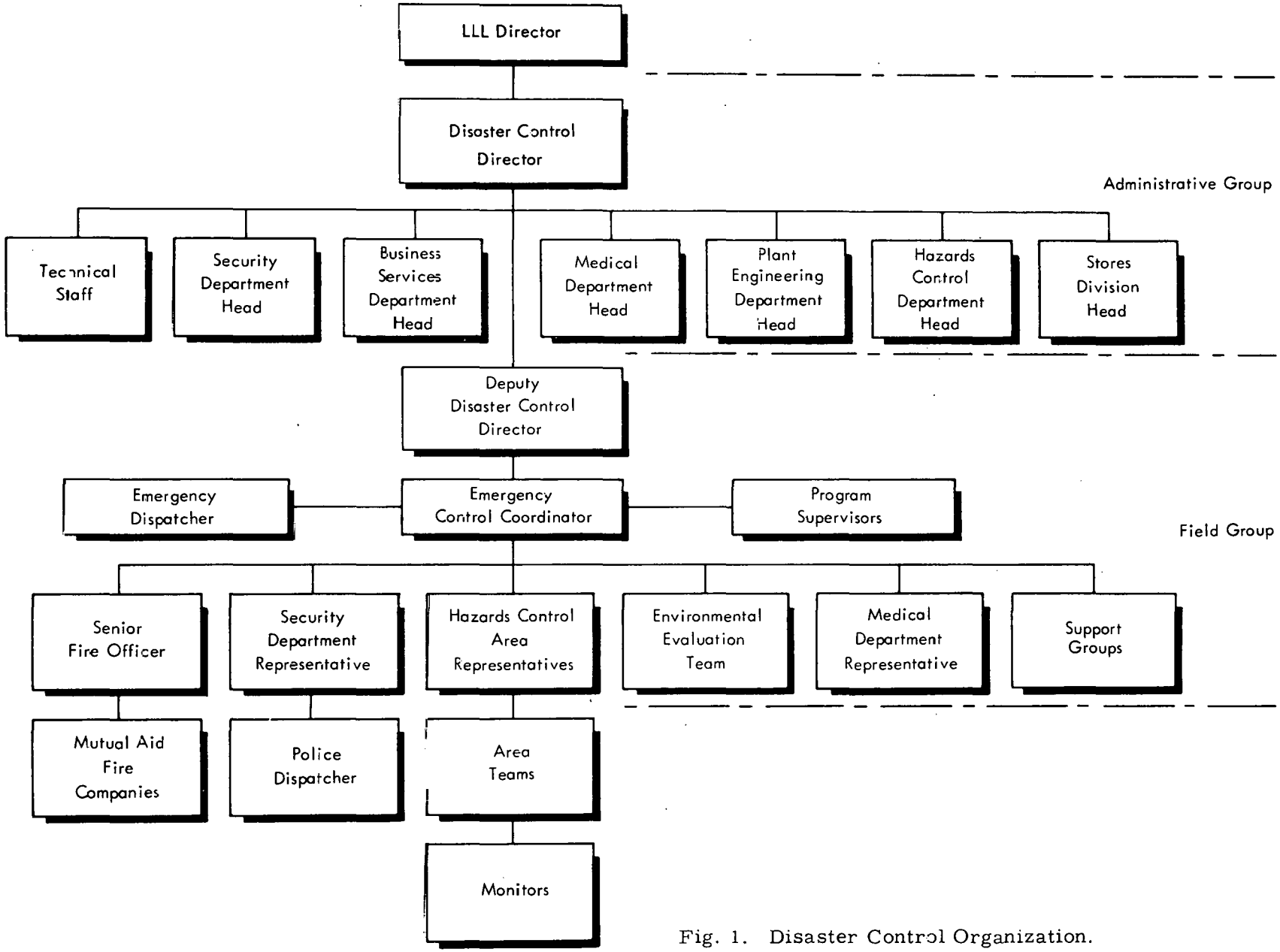


Fig. 1. Disaster Control Organization.

may furnish advice to the Disaster Control Director as well as direct control activities with the Field Group.

Hazards Control Department Head

The head of Hazards Control acts as the Deputy Disaster Control Director during emergencies at the Laboratory but not at Site 300. He also provides administrative direction to Hazards Control Personnel involved in disaster control.

Stores Division Head

As an active member of the Disaster Control Administrative Group, the head of the Stores Division provides administrative support to Stores Division personnel engaged in disaster control activities.

Technical Staff

Experts in the fields of physics, chemistry, and engineering comprise the Technical Staff of the Administrative Group. These experts serve as an advisory body to the Disaster Control Director and advise him of the possible effects or conditions that can arise during a disaster.

Field Group

Personnel of the Disaster Control Field Group and their functions during disasters are defined in the paragraphs that follow.

Deputy Disaster Control Director

The Deputy Disaster Control Director takes charge at the disaster scene and acts to control the disaster in accordance with the Disaster Control Plan. He implements the directions given by the Disaster Control Director and, in turn, informs the Director of the progress made to control the disaster. He also coordinates the return to work of disaster control personnel after the disaster has been controlled.

The Deputy Director also is responsible for keeping the Disaster Control Plan up to date and for supervising the training of emergency control personnel.

Emergency Control Coordinator

The Emergency Control Coordinator assumes the responsibilities of the Deputy Disaster Control Director until he is relieved either by the Deputy Director or his designated alternate. In carrying out these responsibilities, the Emergency Control Coordinator directs the activities of the various emergency groups, decides the general course of action, and establishes a command post. Once relieved, the coordinator assists the Deputy Disaster Control Director as necessary.

The Emergency Control Coordinator has the authority to activate the Disaster Control Plan. He revises the plan as necessary and recommends changes to the Deputy Disaster Control Director. Other duties include the development of training programs and exercises to maintain the proficiency of disaster control personnel, and maintenance of the Disaster Control Organization in a state of constant preparedness. The Emergency Control Coordinator also assists program personnel, Hazards Control area representatives, fire officers, and others in preparation of pre-emergency plans for each critical facility.

Hazards Control Area Representatives

Hazards Control representatives are assigned to specific buildings to advise on the control of hazardous conditions. The assignments of these representatives are listed in Section 1.05 of the LRL Health & Safety Manual.

During a disaster, the Hazards Control representative for the area involved supports the Senior Fire Officer or Emergency Control Coordinator by coordinating all technical assistance necessary from the disciplines of industrial safety, industrial hygiene and toxicology radiation safety, fire safety, and explosives safety. The area representative also directs the activities of monitor and spill teams in designating and maintaining contamination control zones. The area representative also provides additional first-aid and emergency rescue teams. Among his other duties, he assists the Emergency Control Coordinator in development of pre-emergency plans.

Program Supervisors

Supervisors within the individual programs are responsible for initiating control procedures before the Fire Department arrives. They provide information and advise the officer directing the emergency operations.

Program supervisors are also responsible for the safety of their own people.

Emergency Dispatcher

The Emergency Dispatcher is the duty Fire Department dispatcher at Fire Station 1, Building 323. He serves as a focal point for all emergency communications.

Security Department Representative

During disasters, the Security Department representative supports the Emergency Control Coordinator by directing Security Department personnel as needed to preserve the security of the Laboratory, control crowds, set up roadblocks, and open locked doors and windows. The Security Department representative also supervises Laboratory evacuation if this becomes necessary. In addition, the representative also directs emergency activities requested by the Emergency Control Coordinator. The Police dispatcher assists the Emergency Dispatcher with emergency communications using radio Sierra or Mike (Site 300).

Medical Department Representative

The Medical Department representative advises the Emergency Control Coordinator about medical problems, cares for the injured, and assists with the establishment of emergency medical aid facilities.

Senior Fire Officer

The Senior Fire Officer present at the disaster scene assumes command until the Emergency Control Coordinator arrives. He supervises all fire-fighting, rescue, and first-aid operations. He also directs operations required to contain and control hazardous spills of flammable material and water. At the scene of an emergency, the Senior Fire Officer directs the salvage operations necessary for immediate control of an emergency, requests assistance from the Emergency Control Organization if necessary, and coordinates the activities of mutual-aid fire companies. He performs other emergency activities as directed by the Emergency Control Coordinator. He is

also responsible for assisting the Emergency Control Coordinator and Hazards Control area representatives with formulation of plans for controlling emergencies.

Environmental Evaluation Team

The Environmental Evaluation Team, which is responsible for field measurements, sample collection and preparation, and analysis of contamination during a disaster, will inform the Disaster Control Organization of the extent of the contamination. The off-site branch of the team works outside the Laboratory perimeter to establish contamination levels beyond the Laboratory. The team may be given other assignments either by the Disaster Control Director or by the Emergency Control Coordinator.

Support Groups

Various support groups are integrated into the Disaster Organization as needed. These groups included riggers, welders, plumbers, electricians, carpenters, laborers, truck drivers and others.

Mobilization Plan

The Disaster Control Organization is divided into primary and standby response groups. The primary group consists of the Disaster Control Director, and Deputy Disaster Control Director, and representatives from the Security, Stores, Plant Engineering, Medical, Business Services, and Hazards Control Departments. All other groups or teams of the Disaster Control Organization belong to the standby mobilization group.

The distinction between the primary and standby group relates essentially to the way in which they are notified and activated. Individuals of the primary response group are always notified whenever radio code 10-99 is called to signify a disaster or potentially disastrous condition. At the scene of the emergency, the Emergency Control Coordinator, Deputy Disaster Control Director, or the Disaster Control Director can request that elements of the standby response group be notified and activated.

NOTIFICATION

Both the Emergency Dispatcher and the Security Dispatcher are responsible for notifying individuals of the primary response group.

The Security Dispatcher notifies the Disaster Control Director and designated representatives of the Security, Stores, and Plant Engineering Departments. The Emergency Dispatcher at Fire Station 1 notifies the Deputy Disaster Control Director and designated representatives of the Medical, Business Services, and Hazards Control Departments. Other groups or individuals are notified by the Emergency Dispatcher as directed by the Disaster Control Director, the Deputy Director, or the Emergency Control Coordinator.

When notifying the groups, the dispatcher calls the first member of the particular team being activated. The contacted member, in turn, is responsible for notifying other members of his group.

EMERGENCY CALL LIST

Both Security and Emergency Dispatchers have a current Emergency Call List that is kept up to date by the Emergency Control Coordinator. Members of the Disaster Control Organization are responsible for informing the Emergency Control Coordinator of changes to the call list. All changes are coordinated through the Hazards Control Area representatives.

ACTIVATION FOR EMERGENCIES

Fire and Police Departments, as well as the Emergency Control Coordinator, respond to all emergency calls. Hazards Control personnel also respond if needed. Radio codes for various types of emergencies are given in the following table.

Code	Type of Emergency
904	Fire
10-80	Explosion
906	Hazardous spill
11-41	Send ambulance
10-99*	Disaster or potential disaster

*The 10-99 call is originated by the Emergency Control Coordinator.

Refer to Disaster Plan Supplement No. 1, LLL Emergency Communications, for a complete list of radio codes.

The Emergency Control Coordinator in consultation with the Senior Fire Officer, Hazards Control personnel, and others, evaluates the emergency situation and determines if the Disaster Control Organization needs to be alerted using Code 10-99. The Senior Fire Officer may request that either off-duty firemen, mutual-aid fire companies, or both be called before the Emergency Control Coordinator arrives.

ACTIVATION OF DISASTER CONTROL ORGANIZATION

To alert the Disaster Control Organization, the Emergency Control Coordinator contacts radio control "Sierra" (Police Dispatcher) and announces that a 10-99 situation exists. This signal directs both Sierra and Foxtrot (Emergency Dispatcher) dispatchers to notify designated members of the Disaster Control Organization.

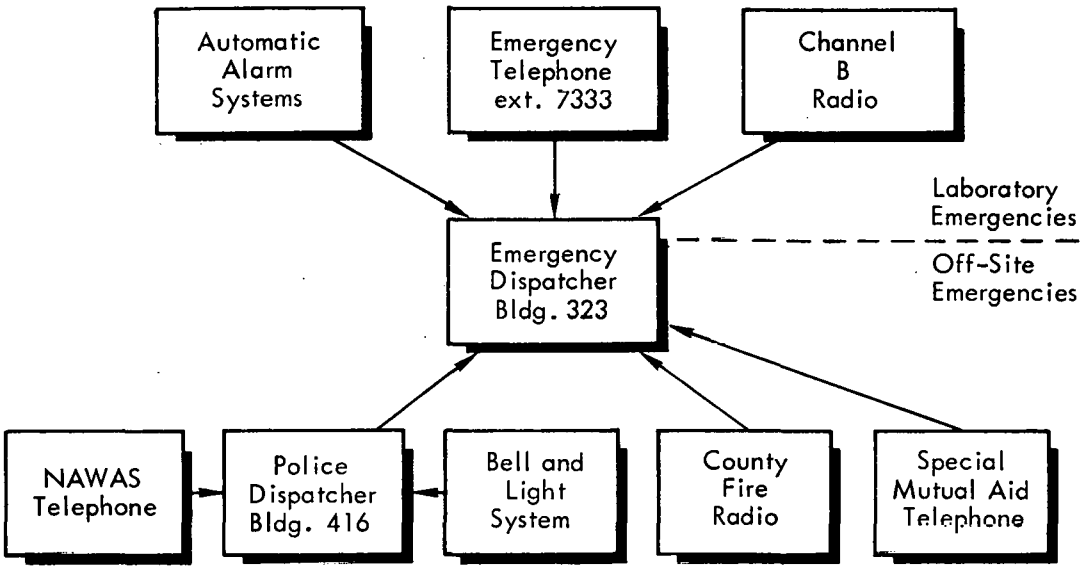
Emergency Communications System

This section contains a general description of the Laboratory Emergency Communications system. Details of the system can be found in Supplement 1 to this Disaster Control Plan, which can be obtained from the Hazards Control Department.

The Emergency Communications System serves three purposes. First, it provides a means for notifying proper authorities that an emergency exists. Second, it is used to alert emergency control forces as well as Laboratory employees. And, third, it provides a tactical communications link between various units and personnel combating the emergency.

The communications system includes ratio, telephone, manual and automatic alarm systems, and messengers.

Livermore



Site 300

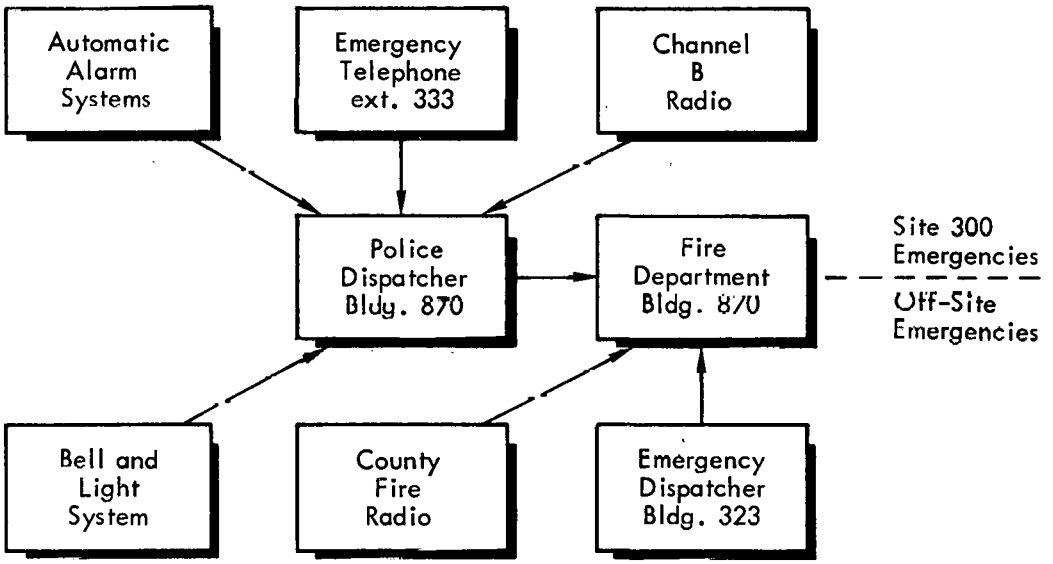


Fig. 2. Emergency alarm systems at LRL and at Site 300.

EMERGENCY ALARMS

Most emergency alarms are received by the Fire Department through emergency telephone extension 7333 (Ext. 333 at Site 300). Other alarms are received through automatic alarm systems.

Warnings of imminent enemy attack are received either through a special telephone connection with the North

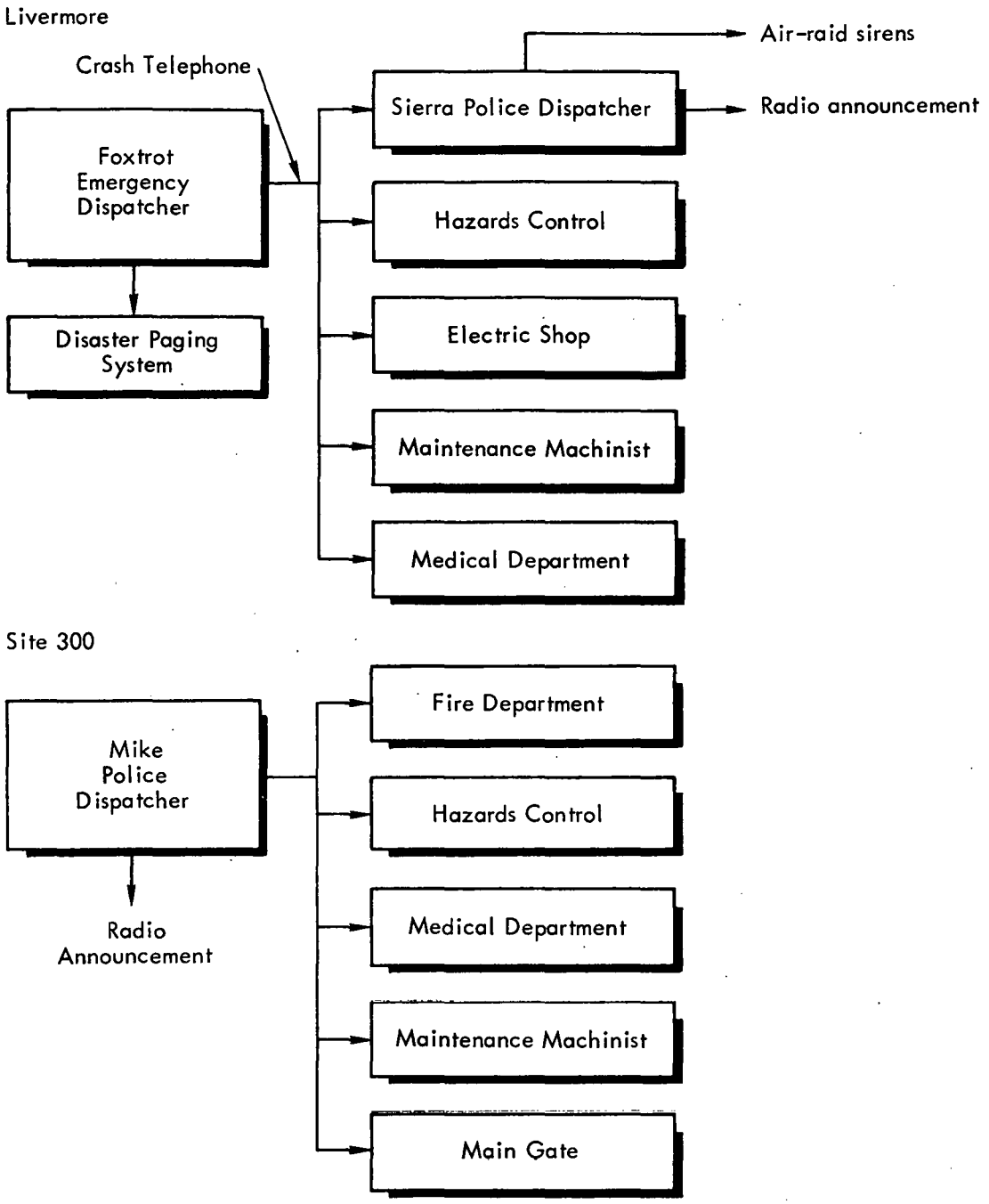


Fig. 3. Alerting schemes for LRL and Site 300.

American Warning Alert System (NAWAS) or through the "Bell and Light" system operated by the California State Disaster Office. A diagram of the emergency alarm systems is presented in Fig. 2. A special telephone communications system is used to alert emergency forces at the Laboratory. In addition, speakers connected to emergency telephone number 7333 permit emergency calls to be monitored. The Channel B radio system also is used to announce emergencies. A disaster paging system at the Livermore Laboratory, air raid sirens, or both,

announce large scale accidents or imminent air raids. Radios and telephones are used exclusively at Site 300 to alert personnel of emergencies. Figure 3 diagrams the systems used to alert Laboratory personnel at Livermore and Site 300.

TACTICAL COMMUNICATIONS

Radios are used for most tactical communications over several frequency ranges. Channel B is an LRL short-range frequency. Channel A is a longer range frequency extended through a repeater atop Mt. Diablo. The Alameda County Fire Frequency provides a link with other Fire Departments in the county.

Many vehicles at the Laboratory are equipped with channel A and B radios. Laboratory fire-fighting apparatus are equipped with channel A and B radios as well as equipment to send and receive on county fire and mutual-aid radio broadcasting frequencies. Figure 4 diagrams the tactical communications network used at the Laboratory.

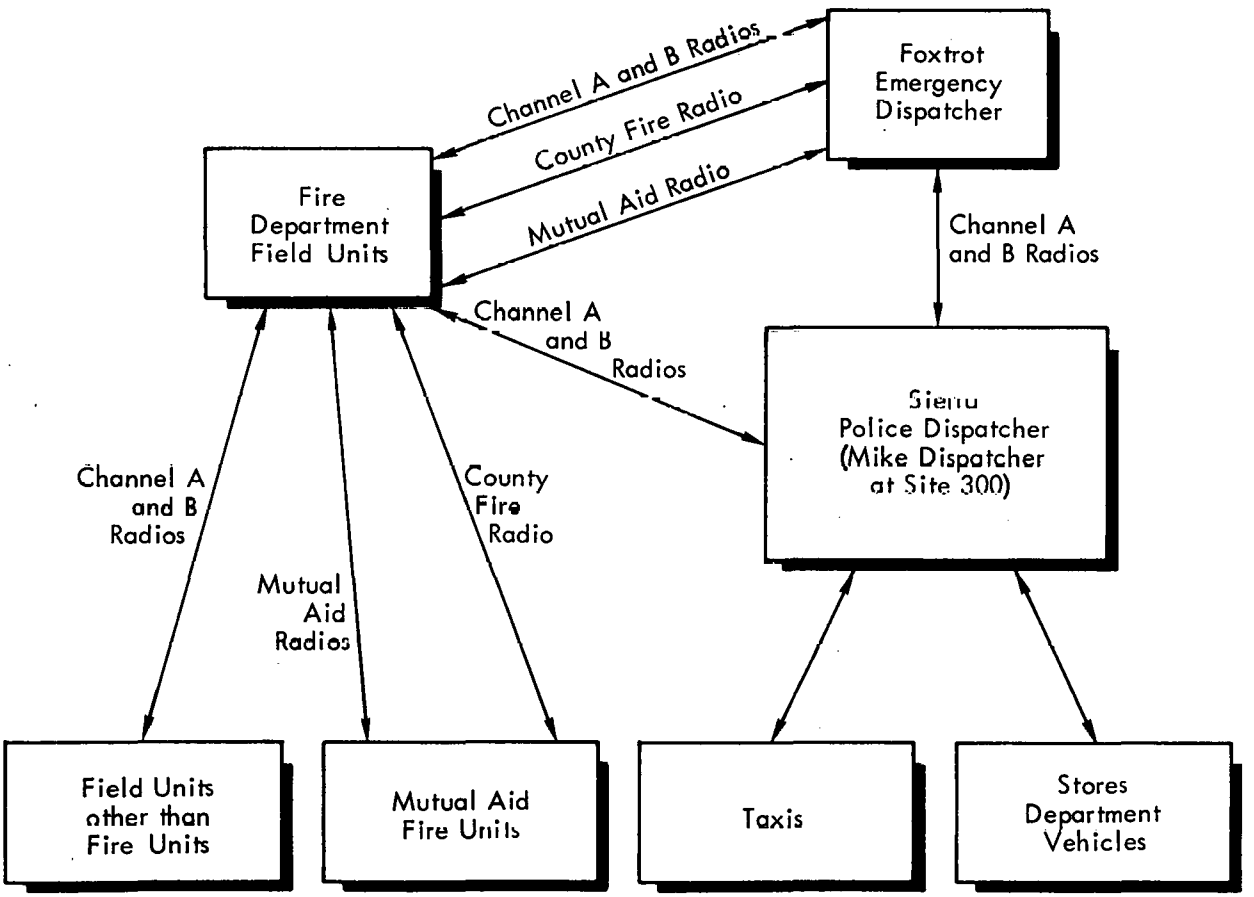


Fig. 4. Tactical communications network between field units and dispatchers.

Emergency Equipment

Many special purpose and common types of vehicles at the Laboratory are available for use during emergencies. The Emergency Control Coordinator maintains a complete inventory of this equipment as Supplement 2 to this Disaster Control Plan. Subsequent paragraphs of this section summarize the types of vehicles available.

FIRE-FIGHTING APPARATUS

The Laboratory Fire Department operates two 750-gpm and one 1000-gpm pumpers, a 50-ft elevated-platform truck (snorkel) equipped with a 1000-gpm pump, and a crash truck with a 1000-gpm pumping capacity. These units carry other emergency equipment such as hoses, nozzles, breathing apparatus, ladders, cutting tools, and radiation-detection instruments.

The Fire Department also operates two ambulances, three pick-up trucks equipped to combat grass fires, an electric-power-generator trailer, and a foam-generator trailer.

PLANT ENGINEERING EQUIPMENT

The Plant Engineering Department operates a variety of heavy equipment and vehicles that are available to the Disaster Control Organization during an emergency. This equipment includes compressors, cranes, cutting torches, fork-lift trucks, emergency power generators, pumps, trucks, automobiles, bulldozers, and other earth-moving equipment. These vehicles and equipment can be dispatched with qualified operators as needed.

STORES DEPARTMENT VEHICLES

During emergencies, the Stores Department can provide vehicles ranging from 1/2-ton pick-up trucks to 2-ton stake trucks. These vehicles are in addition to those ordinarily used by the Fire and Security Departments.

Personnel Protective Equipment

Various types of personnel protection equipment are available from several different groups. Equipment of this category includes breathing apparatus, detection instruments, protective clothing, and smoke and toxic gas removal equipment. A complete listing of this equipment may be found in Supplement 3 to this Disaster Control Plan.

BREATHING APPARATUS

Each fire truck carries several Scott Air-Paks as well as filter-type gas masks. Although this equipment is intended primarily for use by firemen, it can be used by emergency personnel as needed. The Industrial Hygiene Section of the Hazards Control Department maintains a complete

stock of respirator equipment including Scott Air-Paks, McCaa 2-hr oxygen breathing apparatus, Chemox breathing apparatus, and various kinds of gas masks fitted with air respirators. The section also maintains a supply of parts and replacement filters.

DETECTION EQUIPMENT

Fire trucks are equipped with various radiation-detection instruments as well as combustible gas indicators. Additional radiation-detection equipment is available from the Radiation Safety Section of the Hazards Control Department.

The Industrial Hygiene Section has additional combustible-gas indicators, oxygen-deficiency meters, and gas-detection indicators. The Environmental Survey Team also maintains a variety of radiation-detection instruments at Fire Station 1.

PROTECTIVE CLOTHING

All Fire Department emergency vehicles carry protective clothing kits that are available to disaster control personnel. In addition, 36 complete sets of protective clothing, including gas masks, are stored at Fire Station 1, and 24 sets are stored at Fire Station 2 at Site 300. Protective clothing used daily by various program personnel also is available to emergency operations personnel.

SMOKE AND GAS EJECTORS

Both the Fire Department and the Industrial Hygiene Section of the Hazards Control Department have smoke ejectors to remove smoke and toxic gases from work areas. The Industrial Hygiene Section also has a self-contained absorber unit as well as a self-contained particulate filter unit.

Water Supplies

WATER SUPPLY AT THE LABORATORY

Water for the Laboratory is supplied from the Hetch Hetchy aqueduct located south of the Laboratory. The water is pumped from the aqueduct into three storage tanks located above the Sandia Corporation facilities. A 14-in. main supplies water to the Laboratory from these tanks.

The water is distributed to the Laboratory buildings and approximately 85 fire hydrants through a network of 8- and 10-in. pipe. This network also provides water to the automatic sprinkler systems of most buildings.

Additional demands for water can be supplied by a number of different sources. Two pumps located in Building 295, for example, can deliver 4000 gpm directly into the mains from Zone 7 Flood Control District system. One of these pumps is powered by a diesel engine independent of electrical power. The 500,000-gal Laboratory swimming pool also serves as an emergency water supply. Two 500-gpm, gasoline-powered pumps can deliver this water directly into the existing water mains. Water from a 150,000-gal storage tank of the Sandia Corporation can be used by connecting

hose from the 8-in. Sandia main to the 14-in. main at the Laboratory. The South Bay Aqueduct, located about 1200 ft east of the Laboratory main also can supply large quantities of water, limited only by relaying capabilities. Approximately 1000 ft of 6-in. diameter aluminum pipe stored in the drill field, mutual aid hose lines, or a combination of both, could be used to relay water from this aqueduct.

WATER SUPPLY AT SITE 300

Six wells supply water to Site 300. Water from these wells is pumped into eight storage tanks having a total capacity of 617,000 gallons. All pumps are driven by electric motors. Water is gravity-fed to distribution mains and then to buildings, fire hydrants, and automatic sprinklers.

Supplement 4 to this Disaster Control Manual describes these water supply systems in greater detail.

Fallout Shelters

The Laboratory maintains a number of fallout shelters capable of housing 14,000 employees and their families. These shelters are stocked with food, water, sanitation kits, medical kits, and radiological instruments to provide its inhabitants with an austere existence for two weeks.

The shelters were designed as protection against nuclear weapon fallout. Shelter areas include basements and other shielded areas of buildings; therefore, some protection against blast is provided.

The Fire Department is responsible for stocking and marking these shelters. The department also is responsible for preparing plans for the use of the shelters.

Shelter Managers and others are trained by the Education Section of the Hazards Control Department. Each Shelter Manager, who has been assigned this responsibility by the Associate Director for Support, is responsible for developing an individual shelter plan kept within the shelter. This plan delineates operating procedures for the shelter. The Education Section provides Shelter Managers with a Shelter Manager's Handbook to assist them with preparation of the shelter plans. (The Shelter Manager's Handbook is Supplement 5 to this manual and can be obtained from the Hazards Control Department.)

The Fire Department is responsible for preparing procedures governing the coordination and use of the individual shelters. These procedures, known as the EOC Plan, are approved by the Disaster Control Director. Copies of the EOC Plan can be obtained from the Hazards Control Department.

Laboratory personnel are assigned to shelters in proximity to the buildings in which they work. Each Shelter Manager, however, is authorized to direct personnel to other shelters when his shelter reaches its maximum capacity. The Police Department is responsible for developing plans for traffic control during air raids when employees evacuate buildings to take refuge in the shelters. These plans also are approved by the Disaster Control Director. Copies of this plan can be obtained from the Hazards Control Department.

Shelter locations are shown on Fig. 5.

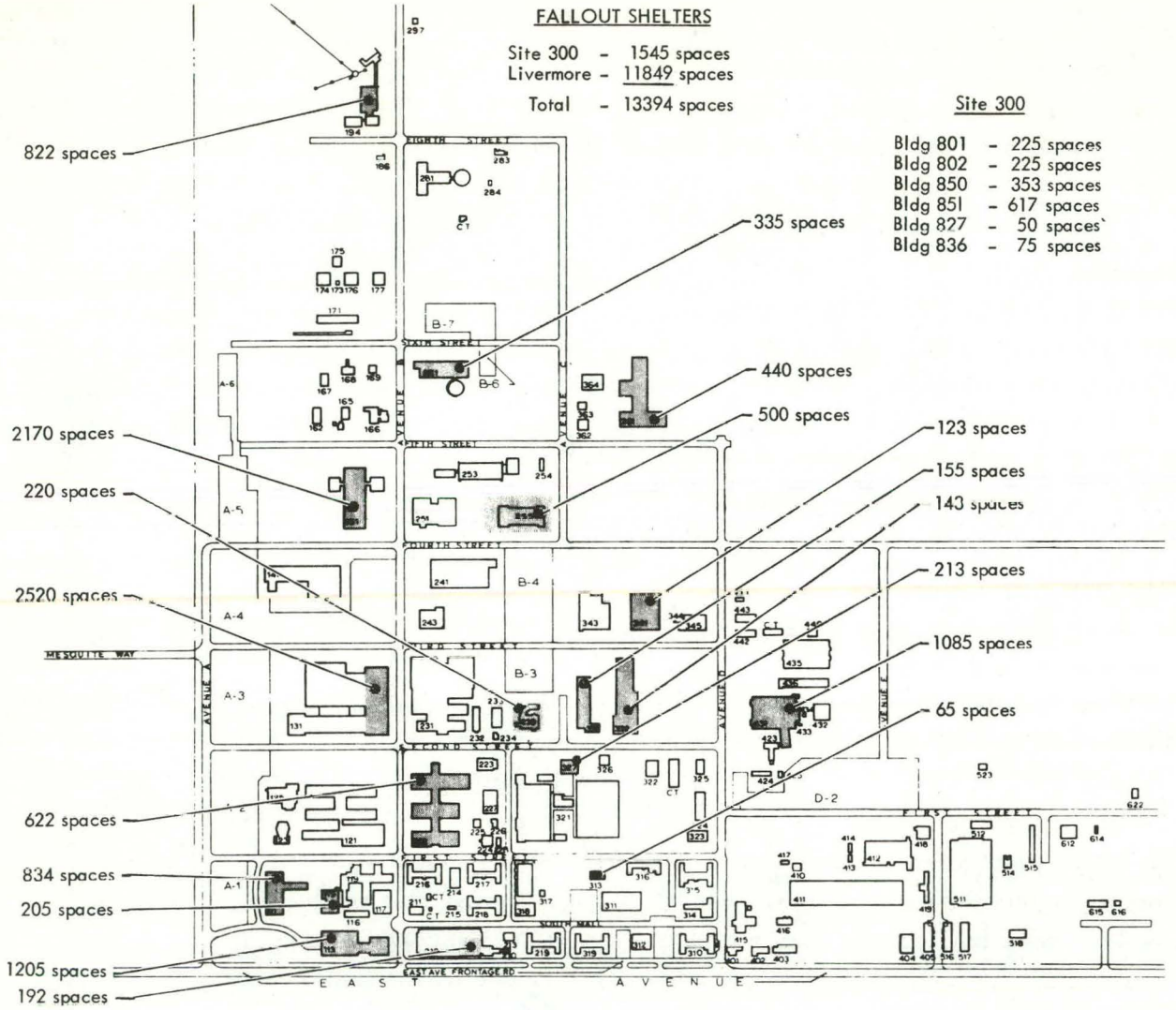


Fig 5. Fallout shelter locations and accommodations.

Appendix

Supplement to the Disaster Control Plan

The basic Disaster Control Plan is augmented by a number of supplements that describe in more detail the equipment and disaster control systems available during emergencies. The following supplements, when combined with this basic manual, comprise the complete Disaster Control Plan.

Supplement	Title
1	LRL Emergency Communications
2	Emergency Callout List
3	Heavy Equipment Available for Emergencies
4	LRL Water Supply System—Emergency Water Supply Plans
5	Respiratory and Other Protective Equipment for Emergencies
6	Emergency Assistance Team
7	Environmental Evaluation Team
8	Operations Plan for Emergency Operations Center
9	Shelter Manager's Handbook
10	Laboratory Shutdown Plan
11	Traffic Control Plan
12	Mutual Aid Response Schedule
13	Fire Department Equipment and Facilities
14	Carco Emergency Procedures
15	Response Plan for Fire in an Explosives Area
16	Bomb Threat Response Procedure
17	Medical Emergency Plan

Copies of these supplements may be obtained from the Fire Safety Section of the Hazards Control Department (Ext. 7781).

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