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ID 762743

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GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO (SEE SUMMARY OF CHG)	NUMBER
95744	10002	49	49	new	773TI000012

PROGRAM TITLE
Fuel Decladding Program

[redacted]

DE-AC03-86SF16021

DOCUMENT TITLE
Annual Report Rockwell International Hot Laboratory Decommissioning - GFY 1993

DOCUMENT TYPE
Technical Information

KEY NOUNS
Hot Laboratory, Decommissioning, Decontamination

ORIGINAL ISSUE DATE

REL. DATE
4-26-95 CW

APPROVALS — DATE
J.R. Rohlfs (signature) 4.20.95
P. Horton (signature) 4/24/95

PREPARED BY/DATE — DEPT — MAIL ADDR
L.D. Felten (signature: Loren D Felten) 4-21-95 — 635 — FA88

IR&D PROGRAM? YES ☐ NO ☒
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ABSTRACT

This document presents a summary of the activities conducted during GFY 1993 on decontamination and decommissioning of the Rockwell International Hot Laboratory (RIHL). This is a multi-year program to decontaminate the RIHL facility to levels that allow release for unrestricted use. During GFY 1993 the following major tasks were accomplished:

1. The remaining hot cell steel liners and decontamination room liners were removed;
2. Removal of contaminated concrete from floors of cells and decontamination rooms was completed;
3. The two remaining shield doors (80K lb and 90K lb) were removed;
4. 80% of the radioactive drain system in the cells and decontamination rooms was removed; and
5. A revised cost proposal was submitted in response to the new requirements for waste shipment to the Nevada Test Site (NTS).

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Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

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ACRONYMS AND ABBREVIATIONS

ANSI-AGA	American National Standards Institute - American Gas Association
ASME	American Society of Mechanical Engineers
CDHS	California Department of Health Services.
D&D	Decontamination and Decommissioning
DOE	Department of Energy
DOE-SAN	Department of Energy - San Francisco Field Office
DOS	Dioclyl Sebacate
DOT	Department of Transportation
EPA	Environmental Protection Agency
GFY	Government Fiscal Year
HEPA	High Efficiency Particulate Air
LLW	Low Level Waste
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
OSHA	Occupational Safety and Health Administration
QA	Quality Assurance
R/A	Radioactive
RCRA	Resource Conservation Recovery Act
RIHL	Rockwell International Hot laboratory
RMDF	Radioactive Material Disposal Facility
TRU	TRansUranic

ANNUAL REPORT ROCKWELL INTERNATIONAL HOT LABORATORY DECOMMISSIONING GFY 1993

1.0 INTRODUCTION AND SUMMARY

This document presents a summary of the activities conducted during GFY 1993 on decontamination and decommissioning (D&D) of the Rockwell International Hot Laboratory (RIHL). This is a multi-year program to decontaminate the RIHL facility to levels that allow release for unrestricted use and subsequent demolition of the structure. The facility consists of four rectangular hot cells, abutted by decontamination rooms. These areas are surrounded by a building structure that provides an operating gallery in front, a service gallery in the rear, and contiguous operation support, mockup, and administrative offices. The hot cells and decontamination rooms are constructed of dense and reinforced concrete, respectively. All surfaces of the hot cells, and the floors and east walls of the decontamination rooms are clad with steel. The original layout of the facility is shown in Figure 1-1. In-cell equipment was remotely operated from the operating gallery using manipulators and other remote controls. Access into the cells is from the service gallery, located at the rear of the hot cells. The decontamination rooms are located between the cells and service gallery. In these rooms, equipment was decontaminated and packaged. The decontamination rooms also serve as contamination control areas between the cells and the service gallery. Connected with the service gallery was a hot manipulator repair room for servicing low-level, radioactively contaminated equipment. The facility ventilation system causes air to flow from the radioactively uncontaminated areas toward the areas of highest contamination potential, through roughing filters and high-efficiency particulate air filters (HEPA), and finally out a 54-in. outside diameter, 73-ft high stack (above grade). The ventilation ducts are installed in the basement directly below the hot cells.

All areas of the RIHL facility will require decontamination and/or verification that radiation levels are below limits for release for unrestricted use. Completion of this effort constitutes the primary activities of the decommissioning program. The RIHL was last used in GFY1987 and all Special Nuclear Material, tools and equipment were removed prior to GFY 1992. GFY1992 was the beginning of the major decontamination effort in the cells. The basic approach has been to decontaminate the areas of highest contamination levels first to minimize personnel exposure and to reduce the background radiation which will allow detection of lower level contamination areas.

The following decontamination methods were or are being utilized. Foam cleaning is used in conjunction with localized brushing with detergent to remove surface contamination. The liquids are drained off through the facility drain system to the facility hold up tank. When the liquids in the

Rockwell International Hot Laboratory, Building 020

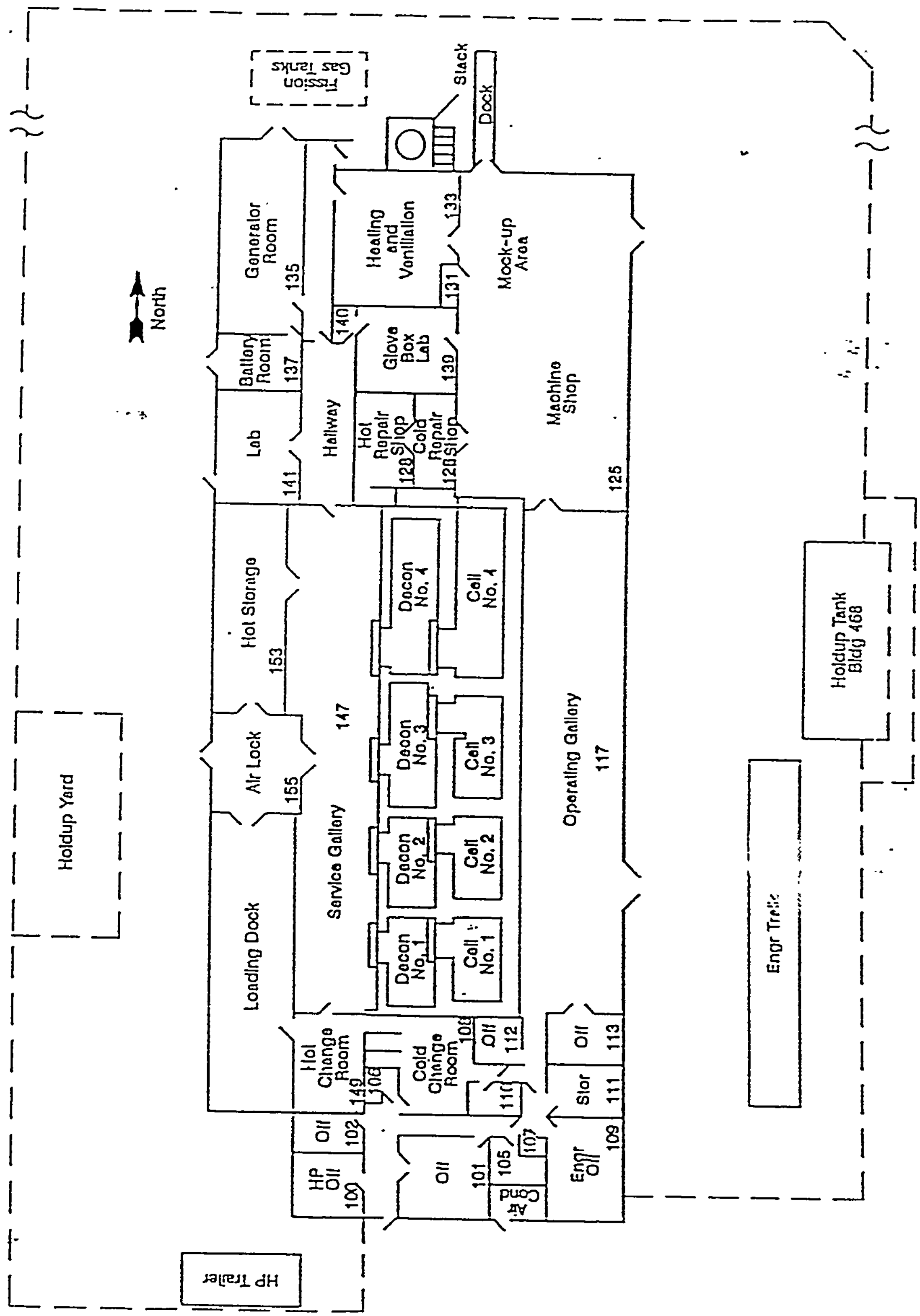

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Figure 1-1

holdup tank reach 50% full level, the liquids are pumped out and transported to an evaporator at the Radioactive Material Disposal Facility (RMDF). The solids are packaged and disposed as R/A waste. Scabbling or grit blasting is used to remove contaminated epoxy paint. The grit blasting material is then cleaned-up and the area is vacuumed. The material is put into 55-gallon drums and disposed as R/A waste. The steel liners are further decontaminated by grit blasting and hand grinders to remove residual surface contamination and paint. The steel liners are cut with oxyacetylene torch and removed as sections. Any areas of concrete that have contamination will have the surface layer removed by chipping hammers, scabblers, and/or grinders as deemed best. Any deep penetration of contamination requires scarfing, core drilling, or jack hammering to reduce the contamination to allowable limits. An expansive grout is also used to fracture the concrete around components to reduce the concrete removal effort. For removal of the concrete to expose the R/A drains in the cell structure a tractor and hydraulic hammer were purchased to help recover the decommissioning schedule. In general, methods are being selected to minimize the quantity of waste generated and personnel radiation exposure.

During GFY1993 the following major tasks were accomplished:

1. The remaining hot cell steel liners and decontamination room liners were removed;

2. Removal of contaminated concrete from floors of cells and decontamination rooms was completed;

3. The two remaining shield doors (80K lb and 90K lb) were removed and transported to RMDF for final decontamination;

4. 80% of the radioactive drain system in the cells and decontamination rooms was removed; and

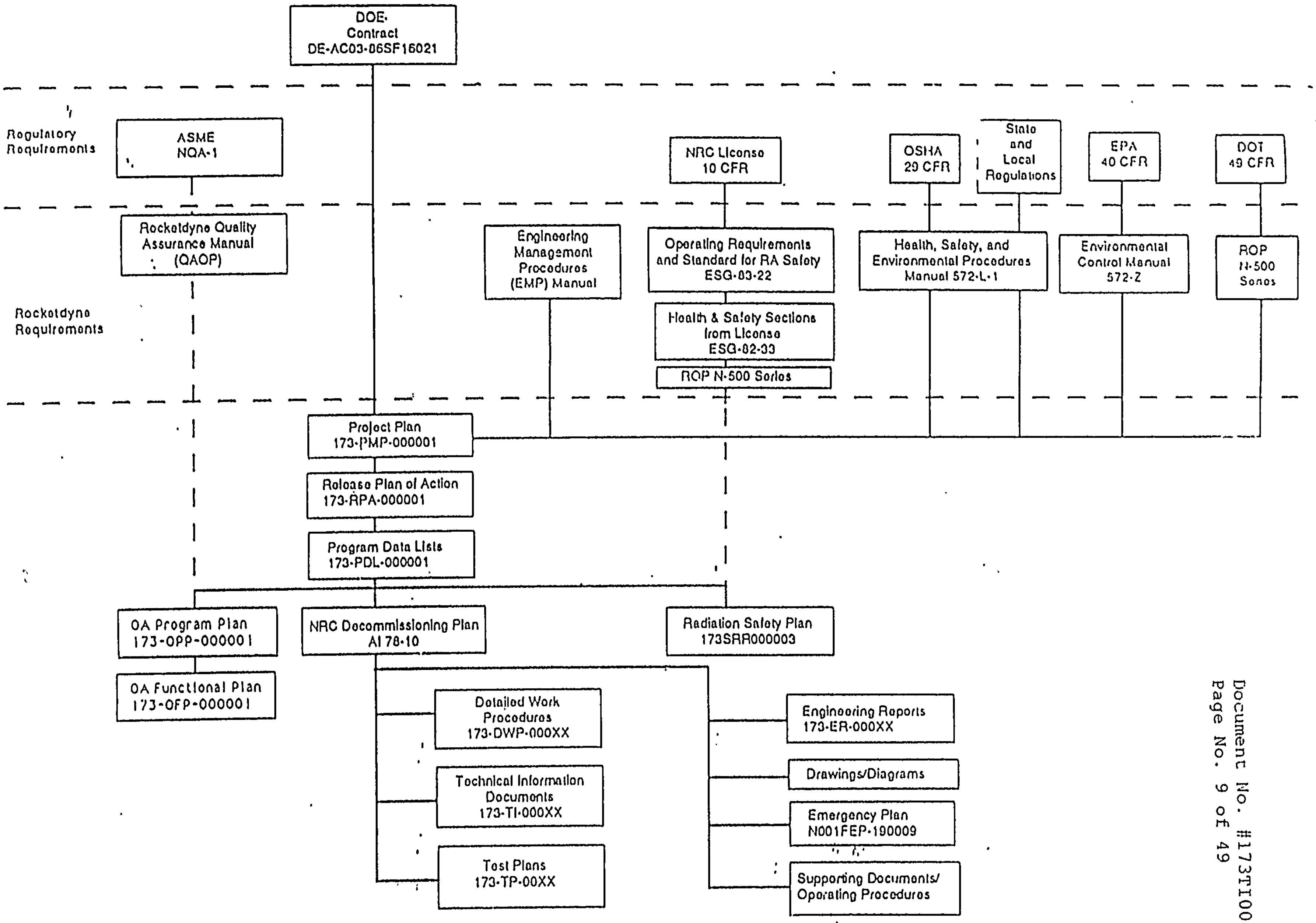
5. A revised cost proposal was submitted in response to the new requirements for waste shipment to the Nevada Test Site (NTS).

2.0 PROGRAM PLANNING ACTIVITIES

Regulatory requirements that must be met on the program include: Nuclear Regulatory Commission (NRC), Occupational Safety and Health Agency Administration (OSHA), Environmental Protection Agency (EPA) (including clean air and water acts), Department of transportation (DOT), American Society of Mechanical Engineers (ASME) Quality Assurance, and California Department of Health Services (CDHS) and local regulations. The hierarchy of documents which have been prepared in response to these requirements is presented in Figure 2-1. Prior to August 1991, RIHL D&D planning assumed the NRC was going to reduce their criteria on acceptance levels for surface contamination, based on NRC draft NUREG/CR-5512 "Residual R/A Contamination from Decommissioning", January 1990. NUREG/CR-5512 specified a dose based pathway analysis criteria instead of a surface contamination criteria, the effect of which would have significantly reduced the RIHL decontamination effort. However, NRC instructed Rockwell to disregard the NUREG/CR-5512 criteria in August 1991. This, along with a better knowledge of the extent of contamination in the RIHL and other regulatory changes, resulted in major changes in the RIHL decontamination effort. Table 2-1 lists the subjects of major changes which have occurred in the planned decommissioning effort. Substantial effort in GFY 1993 was spent on preparing to meet the requirements of the new waste acceptance criteria for the Nevada Test Site (NTS).

Table 2-1
Changes in Decommissioning Plan

1.	New NTS Waste Acceptance Criteria
2.	Removal of Radioactive Drain System
3.	Removal of Through Tubes and Storage Tubes by Core Drilling
4.	Removal of Shield Doors
5.	Removal of Steel Liners
6.	Recycling of Lead Shielding
7.	Handling Mixed Wastes
8.	Hot Laboratory Demolition



Document Chart for Hot Laboratory D&D

FIGURE 2-1

2.1 Program Changes

The effect of the program changes listed in Table 2-1 are described below.

2.1.1 New NTS Waste Acceptance Criteria

Rockwell has been shipping waste to the DOE Nevada Test Site (NTS) for over 30 years. The NTS has, however, now issued a new set of requirements for accepting radioactive waste from other sites. These new criteria are reflected in the Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Document, NVO-325 Revision 1, dated June 1, 1992. The new criteria require that he R/A waste be treated like a manufactured product which requires extensive quality assurance, environmental, health physics oversight and inspection of the process during generation of the product. This required activity is over and beyond that previously required for the decommissioning effort.

Rockwell submitted Revision A to the Application to Ship Radioactive Waste to the Nevada Test Site on March 24, 1992. This application was structured to meet our interpretation of the NVO-325 Revision 1 document. In response to our submission, DOE-NTS conducted a Pre Audit Visit to the Hot Laboratory on August 4-6, 1992. During the pre audit, NTS pointed out numerous defects in our old procedures in meeting the new NVO-325 Revision 1 requirements. NTS required that the waste records be easily retrievable and protected from damage or loss. The records must be filed by shipment and container number to improve retrievability and a fireproof vault must be used to store records. Waste must be handled, stored, and shipped in a manner that will not alter the certification status, which requires more independent overview. Individual waste bags must be tagged, identified and controlled prior to loading into shipping containers. Waste bags must be segregated and controlled as to radioactivity, mixed, and non-radioactive/hazardous waste pending chemical analysis and/or characterization.

Previously packaged waste containers do not meet all of the requirements of NVO-325 and will probably all have to be opened, resorted, and repackaged to the new requirements prior to shipment to NTS.

Lot followers/travelers must accompany each waste container. All process documents must be revised to reflect Resource Conservation Recovery Act Environmental Protection Agency (RCRA-EPA) requirements. Current RI shipping containers being used do not meet new NTS size requirements. The lot followers for each container must contain the volume percent, weight percent, and isotope type in mCi. Each individual shipping container must be tracked from the time it is purchased to when it is shipped full of RA waste to NTS by a traveller/lot follower. Log books must be kept for maintaining records of samples, the location of collecting, date, time of collection, personnel taking samples, and sample number.

All records produced during waste generation and characterization must be traced and verified.

Calibration and quality control procedures for gamma spectrometers must be fully implemented. All personnel must be trained in meeting the requirements of NVO-325.

In response to these new requirements Rockwell prepared and submitted a cost change proposal to DOE on March 2, 1993. Cost estimates for rewriting procedures to meet NVO-325 Revision 1, for training of personnel, for packaging of new R/A waste to the new procedures, and for repackaging of R/A waste already packaged in accordance with previous requirements were included in the change proposal. The cost change proposal was negotiated in May 1993 and a contract modification for meeting the NTS shipping requirements was issued June 2, 1993 by DOE-SAN.

The application for shipment of R/A waste to NTS was revised to reflect DOE comments and the application was forwarded by DOE to NTS for their review. The NTS review was expected to be completed in September and an NTS audit of RIHL was scheduled for November 1993. A pre-audit by Rocketdyne QA was performed to prepare for the NTS audit. All planned shipments of R/A waste were re-scheduled into GFY 1994 after formal NTS approval of the application.

2.1.2 Effect of Having to Remove the RA Drains System

RIHL D&D Planning assumed that the radioactive (R/A) drains and support drains could be decontaminated in-situ using mechanical honing followed by electropolishing. Final survey of the drains was to have been conducted using a special radiation probe which fits inside the drains. The approach was in final demonstration when it was concluded that the acid being used for electropolishing had been added to the EPA hazardous materials list and the process would generate mixed hazardous waste. Also, the in-situ R/A survey results would not be acceptable because of the inability for 100% verification as claim ; the person conducting the in-situ R/A survey would not be able to verify the absence of cracks or penetrations through the surface being surveyed. In order to insure no contamination remains the drains must be removed from the concrete (and re-bar structure) and disposed of as R/A waste at a considerable increase in costs. The drains are buried 3 to 4 feet under the concrete floor as well as being underneath the 3 1/2 foot thick cell walls.

2.1.3 Removal of Through Tubes & Storage Tubes by Core Drilling

RIHL D&D Planning assumed that the through tubes that penetrate the thick concrete structure of the hot cell faces and the storage tubes buried in the cell floors and support pillars could be decontaminated in situ using electropolishing similar to that proposed for the drain systems. Since the electropolishing process would generate mixed waste, an alternate means of removing the contamination had to be found. The most cost effective alternative was to use diamond core drilling to remove the entire tube.

2.1.4. Removal of Heavy Shielding Door

RIHL D&D Planning assumed that the 9 heavy shielding doors to the hot cells and decontamination rooms could be cleaned in situ. The doors are, however, on tracks which are close to the walls with limited access to door jams, wheels and some portions of the back of the door. This prevents the doors, jams and wheels from being decontaminated to NRC release requirements and also restricts visual access during survey. Therefore, it was decided to remove the heavy doors from the facility and transport them to the RMDF where they would have unrestricted access for decontamination and surveying, see Section 3.2 for a description of the removal process.

2.1.5. Removal of Steel Liners from Hot Cell

RIHL D&D Planning assumed that the 1/4 inch thick steel liners in the hot cells could be decontaminated in situ and left for removal during demolition. However, the liners had been breached during the hot cells operating life and significant contamination was found behind the liners in selected areas during decontamination in Cell 1. In order to meet the requirement that any area suspected of being contaminated be completely exposed for meter survey requires that the steel liner be completely removed from the hot cells. The contaminated concrete behind the liners must also be removed and shipped to burial. The steel liners, which were used as the forms for pouring the concrete are welded to heavy steel stiffeners which make liner removal very difficult, see Section 3.1 for a description of this process.

2.1.6. Recycling Lead Shielding

RIHL D&D Planning assumed that the radioactive contaminated lead could be disposed of as normal radioactive waste. The EPA has designated lead as a hazardous material and when contaminated with radioactive material it becomes a mixed waste which requires special treatment. Over 80,000 pounds of lead was used in the hot laboratory as shielding. All lead must now be separated into R/A contaminated and non-contaminated waste streams. The contaminated lead must then be sent to a certified reprocesser to decontaminate the lead before disposal.

2.1.7. Handling Mixed Waste

The EPA and Californi[illegible] (which has the EPA responsibilities in California) continues to add materials to the list of designated hazardous materials, reduce the concentration levels of compounds specified as toxic and modify the methods that must be used to sample and analyze for hazardous materials. The hazardous waste list ha[illegible] been expanded to include paint, oils, asbestos, etc. that are found in many [illegible]er commercial items. These items become mixed waste when removed from R/[illegible]taminated areas in the RIHL. Special planning must be established as each [illegible] item is encountered.

2.1.8. Hot Laboratory Demolition

The RIHL will be demolished to assure there is no activity remaining in or under the building. The RIHL will be demolished by a subcontractor once the building has been decontaminated, all surveys have been completed, and the building has been released for unrestricted use by the NRC. NRC release is scheduled to occur at the end of February, 1995. Prior to facility release, Facilities Engineering and Purchasing will award a subcontract for the actual demolition and the subcontractor will start mobilization. Demolition is scheduled to begin in March 1995, and to be completed in June. Once the building debris has been removed from the site, a final survey by an independent source from Oak Ridge will be conducted. When the site has been released the remaining hole will be filled with clean dirt and the site will be graded.

2.2 External Meetings and Reviews

Table 2-2 presents a listing of external meetings and reviews related to D&D activities.

Table 2-2 External Meetings and Reviews

Oct./Nov. 1992	DCAA audit of June 24 and August 27 change proposals
August 5, 1993	Familiarization tour for DOE-SAN and DOE-HQ personnel
August 30, 1993	Facility tour for UAW International Office of Health and Safety personnel sponsored by DOE grant.
September 22, 1993	Familiarization tour for DOE-SAN personnel
September 1993	RIHL attended a one week NTS workshop on LLW acceptance criteria

3.0 DECONTAMINATION ACTIVITIES

This section presents a summary of the decontamination activities performed during GFY1993. Figure 1-1 shows the relative location of the cells and areas within the RIHL.

3.1 Hot Cell and Decon Room Liner Removal

Entering GFY 1993 the steel cell lirer had been removed from the walls and ceiling of cells 1, 2, and 3, and from part of cell 4. In October 1992 the remaining steel liner was removed from the walls and ceiling of cell 4. The liner removal was a slower than expected process. The liner was used as the forms for pouring the concrete shield wall behind the liner. The liner, which served as a gas barrier to limit nitrogen leakage during hot cell operation, is welded to horizontal and vertical stiffeners embedded in the concrete, see Figures 3-1 and 3-2. Removal requires the torch cutting of individual pieces the size of the stiffener spacing, 1'3" x 2'6", out of the liner. (See Figure 3-3.)

A construction specification was prepared for removal of the cell and decon room floor liners and the decon room east wall liners. A liner removal contract was issued to Lopez Refinery Co. and five subcontractor personnel were trained in Radiation Safety, Respirator Use, Fire Extinguishers, and Facility Familiarization. In preparation for floor liner removal the openings in the R/A drain system in the decon rooms and cells were sealed by welding a cover plate over them and the four storage holes in the cells were also seal welded. The subcontractors removed the steel liners using oxygen/propane torches in January 1993 (see Figures 3-4 and 3-5). This completed the liner removal.

3.2 Hot Cell Door Removal

There were 5 large (64,000 to 90,000 lb.) shield doors within the hot cell complex; four doors were between the hot cells and decon rooms and the fifth was between Cell 4 and the tool and mockup area (see Figure 1-1). The doors (Figure 3-6), were contaminated and needed to be removed from the cells but they were too big to pass through any existing doorways. Therefore, the decon room door openings were enlarged Figure 3-7, by diamond saw cutting, (Figure 3-8). Shield doors from cells 1, 2, and 3 were removed in GFY 1992.

In GFY 1993 the west door of decon room 4 was enlarged by removal of a 48" wide X 41" high section from the wall to provide clearance to remove the cell 4 main shield door. The west wall of the service gallery was also opened up. The north doorway of the mockup area was enlarged to provide clearance to remove the cell 4 north shield door (Figure 3-9). The lead shield plug from the cell 4 north shield door was removed and transported to RMDF for decontamination. Rigging contractors supported by Rockwell personnel removed the cell 4 main shield door (~80,000 lb) and the north shield door (~90,000 lb) and transported them to RMDF for decontamination (See Figures 3-10 to 3-13).

3.3 Concrete Floor Removal

Concrete under the floor liners in the cells and decon rooms was found to be contaminated. A layer of high density concrete 5"-6" deep was removed from the floors of all 4 cells and all 4 decon rooms with scabblers and jackhammers and was packaged as R/A waste (See Figures 3-14 and 3-15). R/A contamination found in the expansion joint between the cell 4 wall and the mockup area concrete floor around the north shield doorway was removed by "chasing" with jackhammers.

3.4 Radioactive Exhaust System Removal

Work was started early on the R/A exhaust system to gain access to the R/A drain system. Reinforced concrete was removed from around the north cell 1 and the south cell 2 R/A exhaust ducts and the ducting was removed. The exhaust duct elbows were removed from all 4 cells (Figures 3-16 and 3-17). The basement was set up for exhaust duct size reduction. The exhaust duct penetration in cell 2 was removed. The exhaust duct valves and ducting in the basement below all 4 cells was removed, downsized, packaged, and loaded out of the basement to complete the exhaust duct removal for this phase of the work (Figure 3-18). The exhaust ducting and air drop system in the decon rooms remained in service for all 4 cells.

3.5 Radioactive Drain System Removal

A Takeuchi mini-track excavator and a bobcat compact skiploader equipped with a hydraulic concrete hammer were purchased and received to support the removal of the R/A drains embedded in the hot cell structure (See Figures 3-19 and 3-20).

The radioactive support drain systems in Room 141, the Lab; Room 128, the Hot Repair Shop; and Room 139, the Glove Box Lab were exposed, removed, and size reduced (see Figure 3-21 & 3-22). The removed sections were packaged and shipped to RMDF for inspection and removal of any hazardous waste.

The concrete was removed from the floors and basement ceilings to expose the drains in the cells and decon rooms (Figures 3-23 to 3-25). Additionally concrete was removed to expose the drain line under the wall between cells 1 and 2 (Figure 3-26). Drain piping removed had radiation contact readings from up to 1R/hr high from cell 2 to 5R/hr high from cell 3. The high readings were caused by debris inside the piping. After removal of the radioactive debris inside, the drain piping had contact readings of 20-25 mR/hr and could be packaged as low level radioactive waste, which was shipped to RMDF (Figures 3-27 and 3-28). The debris, which has gamma radiation readings of up to 20R/hr is being put into vented one gallon cans, which are then placed into shielded drums with HEPA filter vents. Some of the debris is suspected of containing transuranic (TRU) material and is being transferred to RMDF for interim storage.

The weir from the inlet of the R/A Liquid Drain Tank in Bldg 468 was removed, packaged and shipped to RMDF for interim storage. A special on-site shipping container had to be fabricated to accommodate the as-built modifications to the weir support flange. The liquid R/A drain line at the inlet to the drain tank was cut just inside the west wall of Bldg 468. Since the drawings did not indicate any physical connection between the 4" drain line and the large outer casing, an attempt was made to pull the drain line through its casing into the Bldg 020 basement with a come-along. The attempt was unsuccessful and action was initiated to prepare to dig down the 10 ft necessary to expose the casing and drain line.

At the end of GFY 1993 all high radiation drain piping had been removed from the building except for a section in the northeast corner of cell 3 which is to be removed from the basement (Figure 3-29).

3.6 Other Decontamination Activities

In addition to the major decontamination tasks described above, the following tasks were also performed:

1) Approximately 34,000 lb (46%) of the shielding lead from the cell/decon room and cell/cell transfer locks was removed (See Table 3-1). About 15,000 lb surveyed as non-radioactive was transferred to Bldg 055 for use as shielding around a test laser. The radioactive contaminated lead must be handled as a mixed low level hazardous waste.

2) The facility exhaust system was shut down 4 times to allow HEPA filter replacement. Following filter replacement the system was reactivated and DOS (Dioclyl Sebacate) tested.

3) Surplus equipment, including 3 shielding windows and 6 manipulators, was packed and shipped to the University of Missouri - Columbia.

4) Beginning in GFY 1993 contaminated waste boxes were packaged in accordance with procedures that meet the new NTS requirements. Some previously packaged waste was overpacked [illegible] NTS qualified containers. During GFY 1993, 1369 Cu. Ft. of packaged solid waste was shipped to RMDF, and 4800 gallons of R/A water was transferred to RMDF for processing.

5) The hydraulic oil in the three manlifts was changed to non-hazardous oil. None of the removed oil was R/A contaminated.

6) The inactive sump pump in R/A Liquid Holdup Tank Bldg 468 was removed and size reduced to await environmental inspection. An inactive sump pump in RIHL was removed and disassembled for inspection (Figure 3-30).

7) Required semi-annual breathing air samples verified that the breathing air in RIHL is acceptable per ANSI-AGA G-1 specifications.

8) Removal of the high radiation material from the facility allowed core drilling of penetrations in the cells and decon rooms to be resumed by the subcontractor at the end of GFY 1993.

Table 3-1. Lead Shielding in Bldg 020.

Location	Mass of Lead	Status
Cell Transfer Locks	11,180 lb	Removed
Decon Transfer Locks	40,712 lb	700lb removed
OMRE Transfer Lock	2311 lb	Removed
SRE Transfer Lock	19,873 lb	Removed

4.0 BUDGET AND SCHEDULE

The GFY 1993 planning budget for RIHL decontamination was $3,100K. The program ended the year slightly under the planned budget with actual costs of $2,965K, not including $100K in outstanding commitments. The schedule, shown in Figure 4-1 shows the R/A drain system removal and the hot cell and decon room cleanup slightly behind, caused mainly by the difficulty in liner removal discussed in Section 3.1. The basement cleanup and R/A exhaust system removal were started ahead of schedule in order to access the R/A drain system for removal.

Cell 1 Wall After Liner Removal

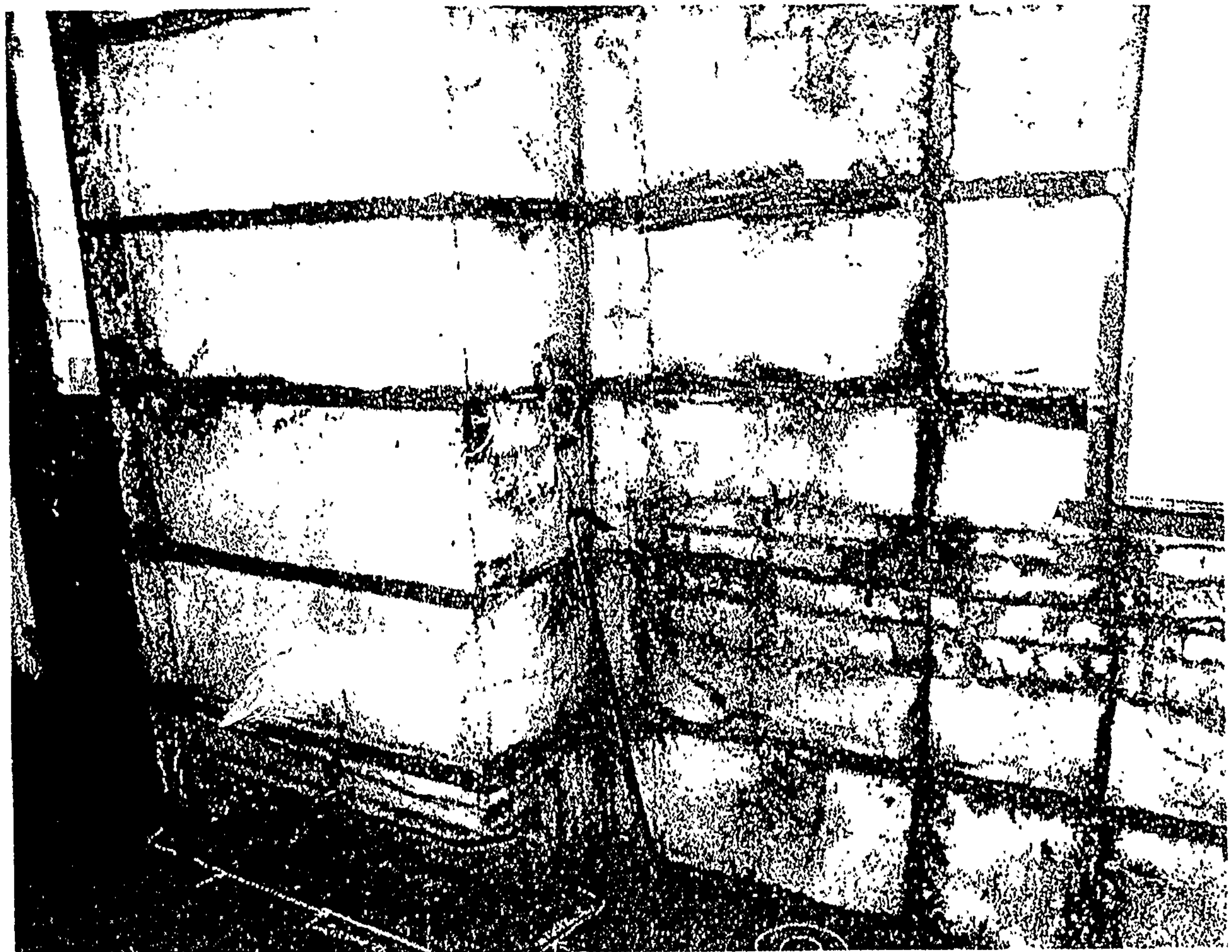


Figure 3-1

Cell 2 Front Wall After Liner Removal

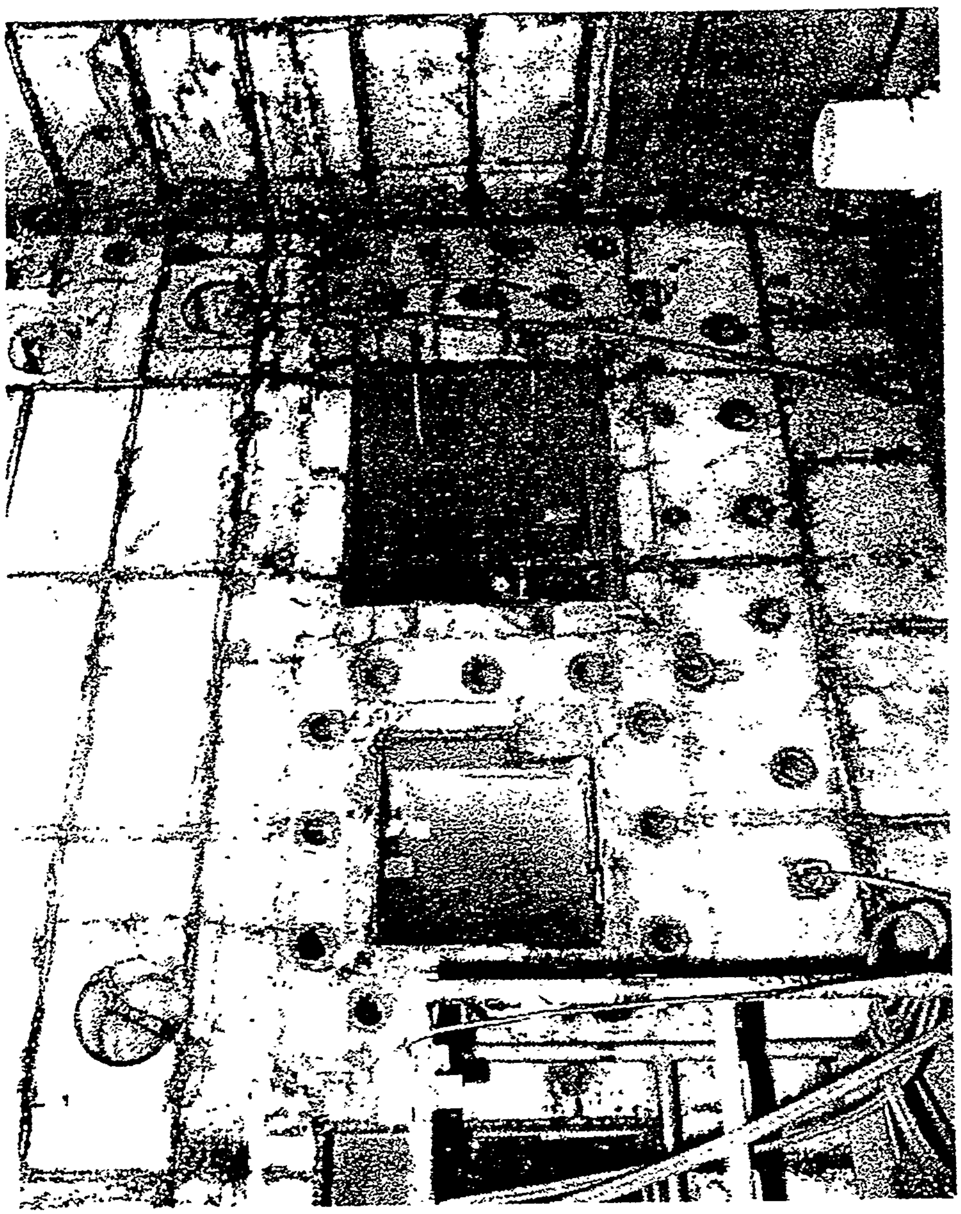


Figure 3-2

Liner Partially Removed from Cell 2 Ceiling

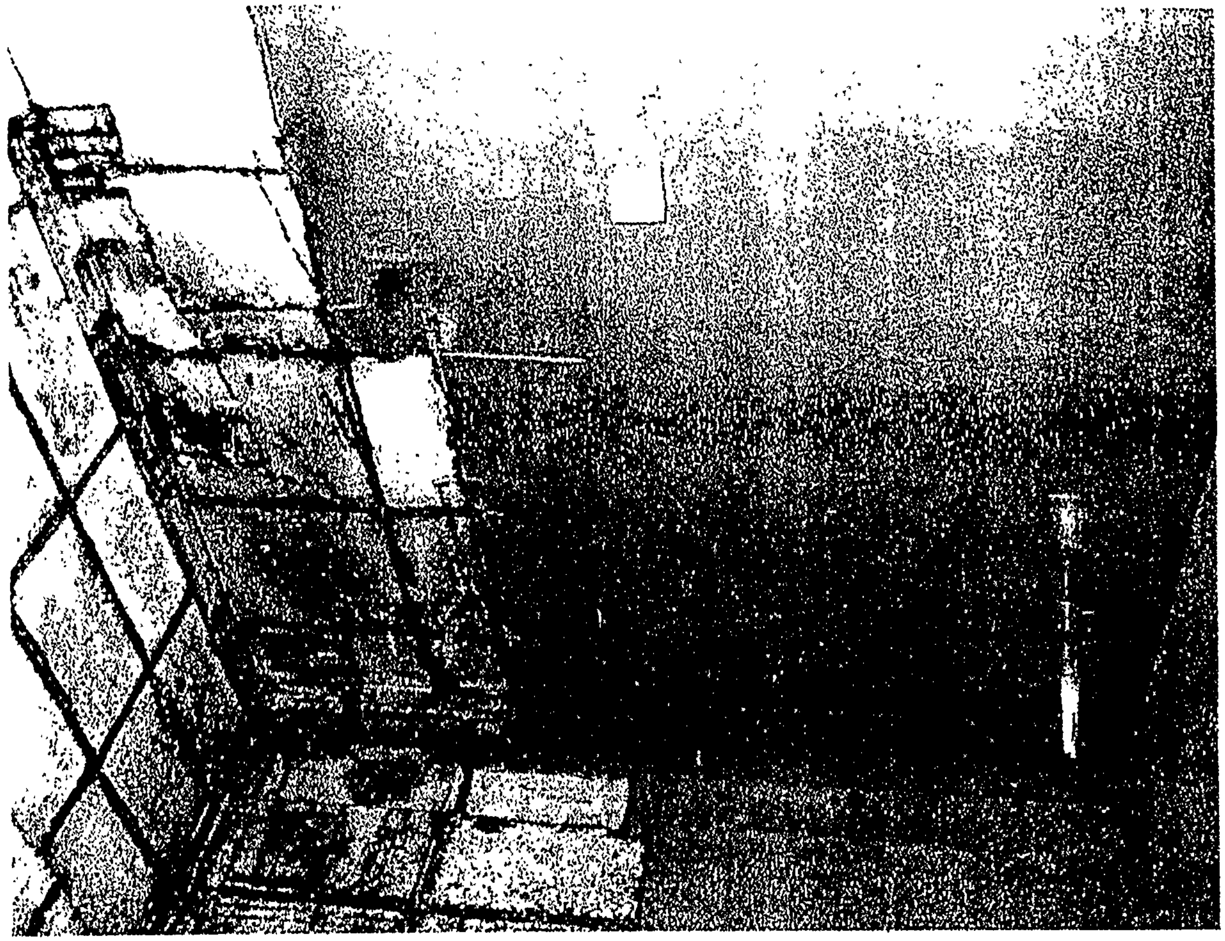


Figure 3-3

Cell Floor Liner Removal

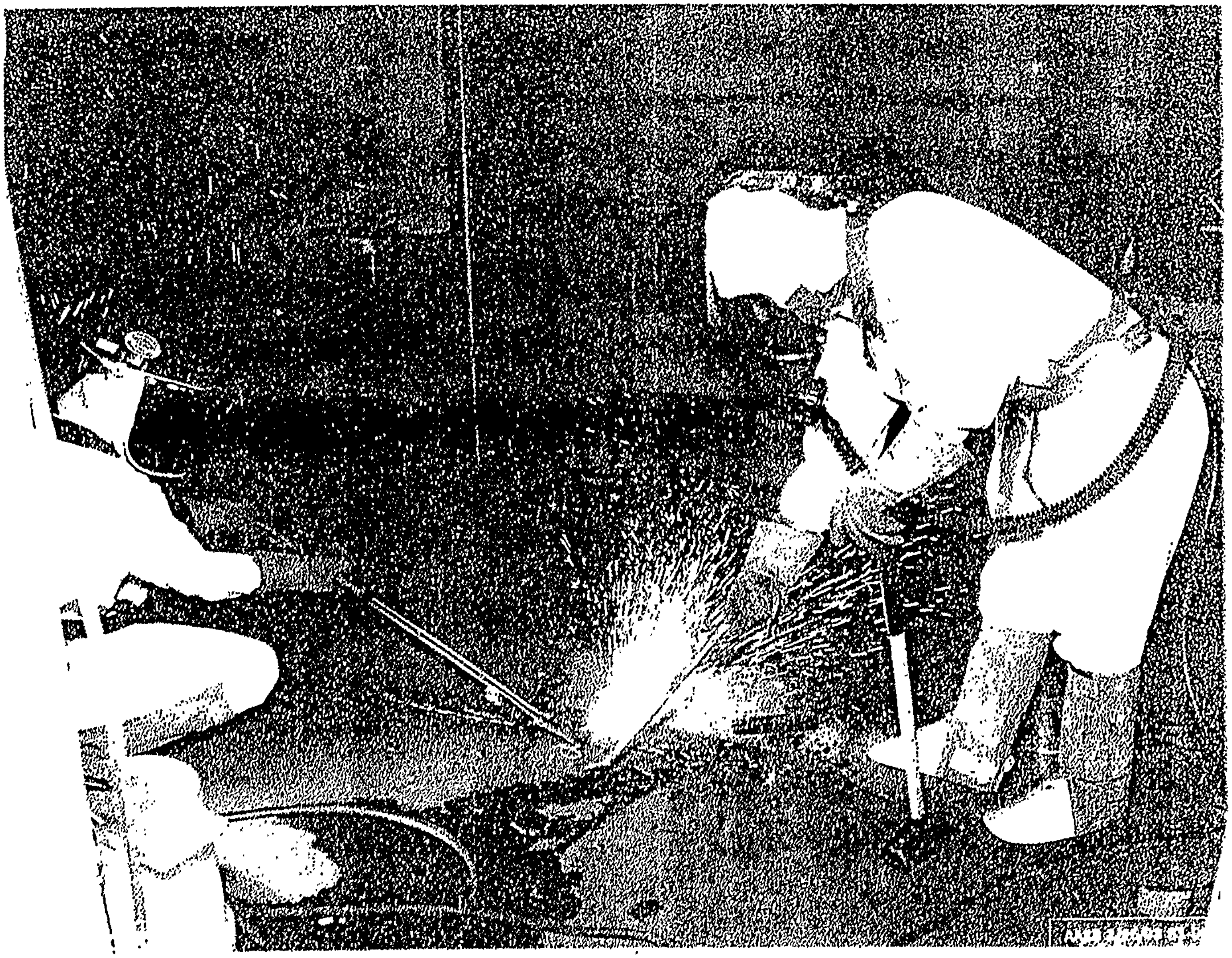


Figure 3-4

East Decon Room Liner Removal

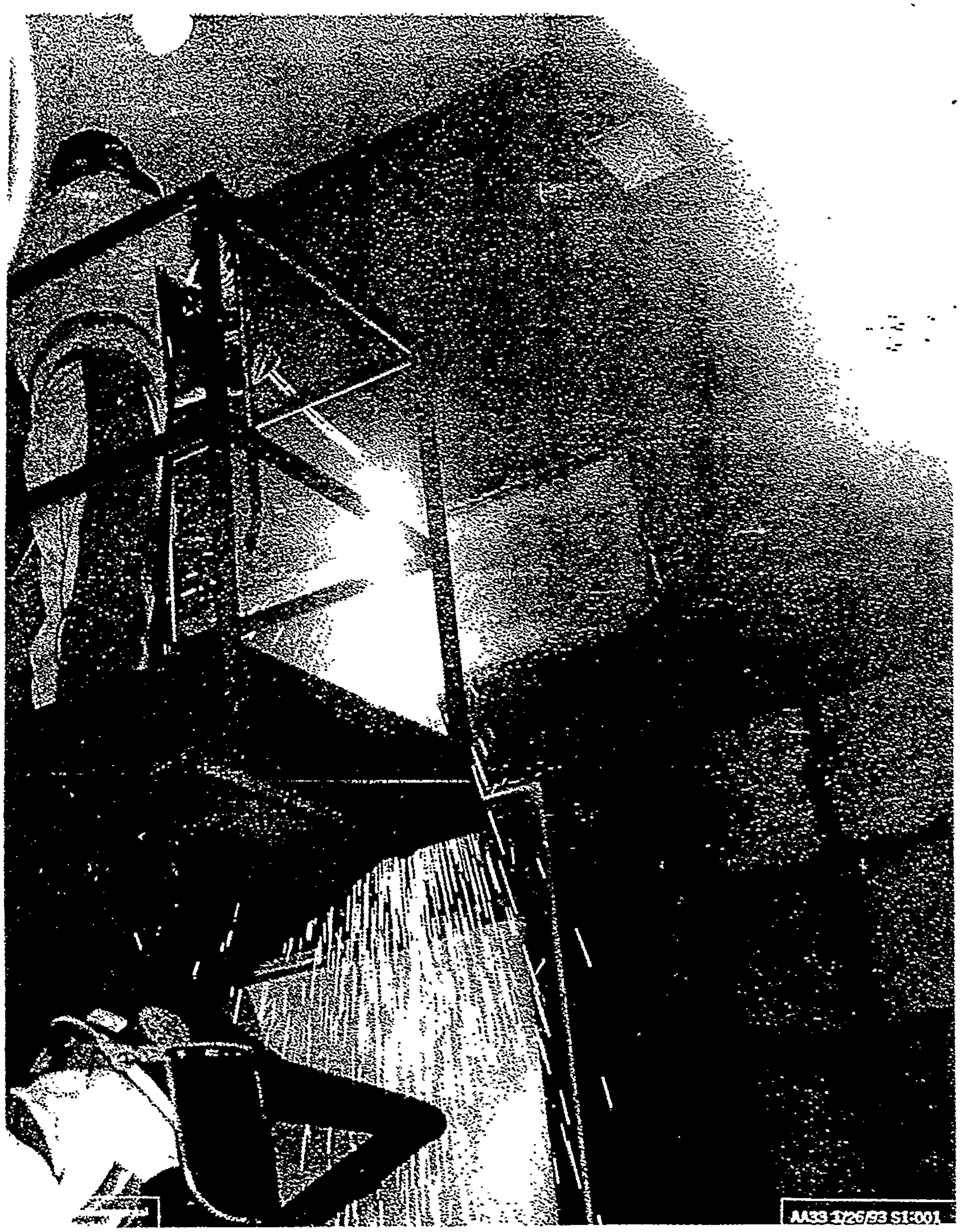


Figure 3-5

Cell Door Showing Contaminated Areas (White) After Removal

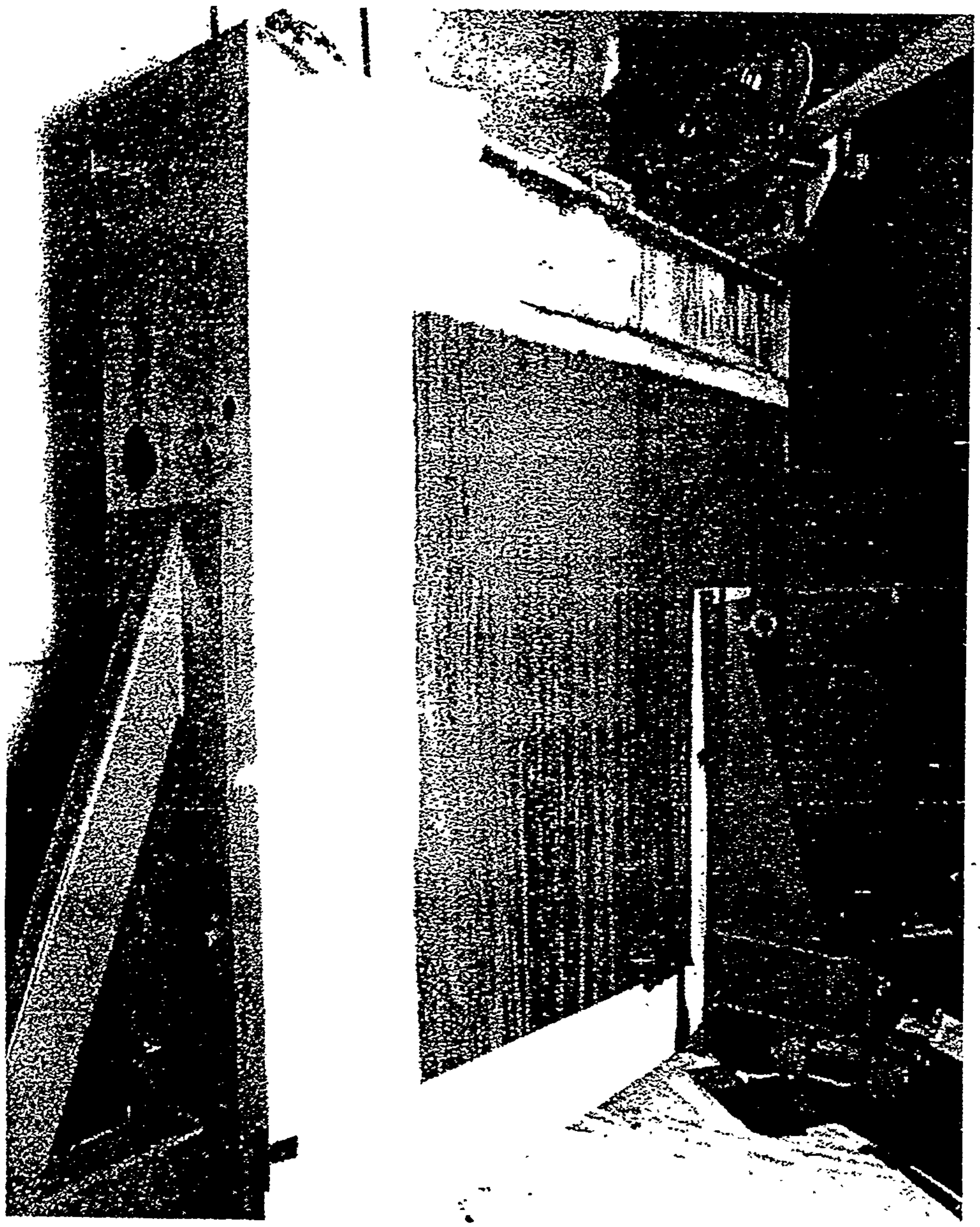


Figure 3-6

Passage for Hot Cell Door Removal

Figure 3-7

Saw Cutting Doorway in Cell Wall

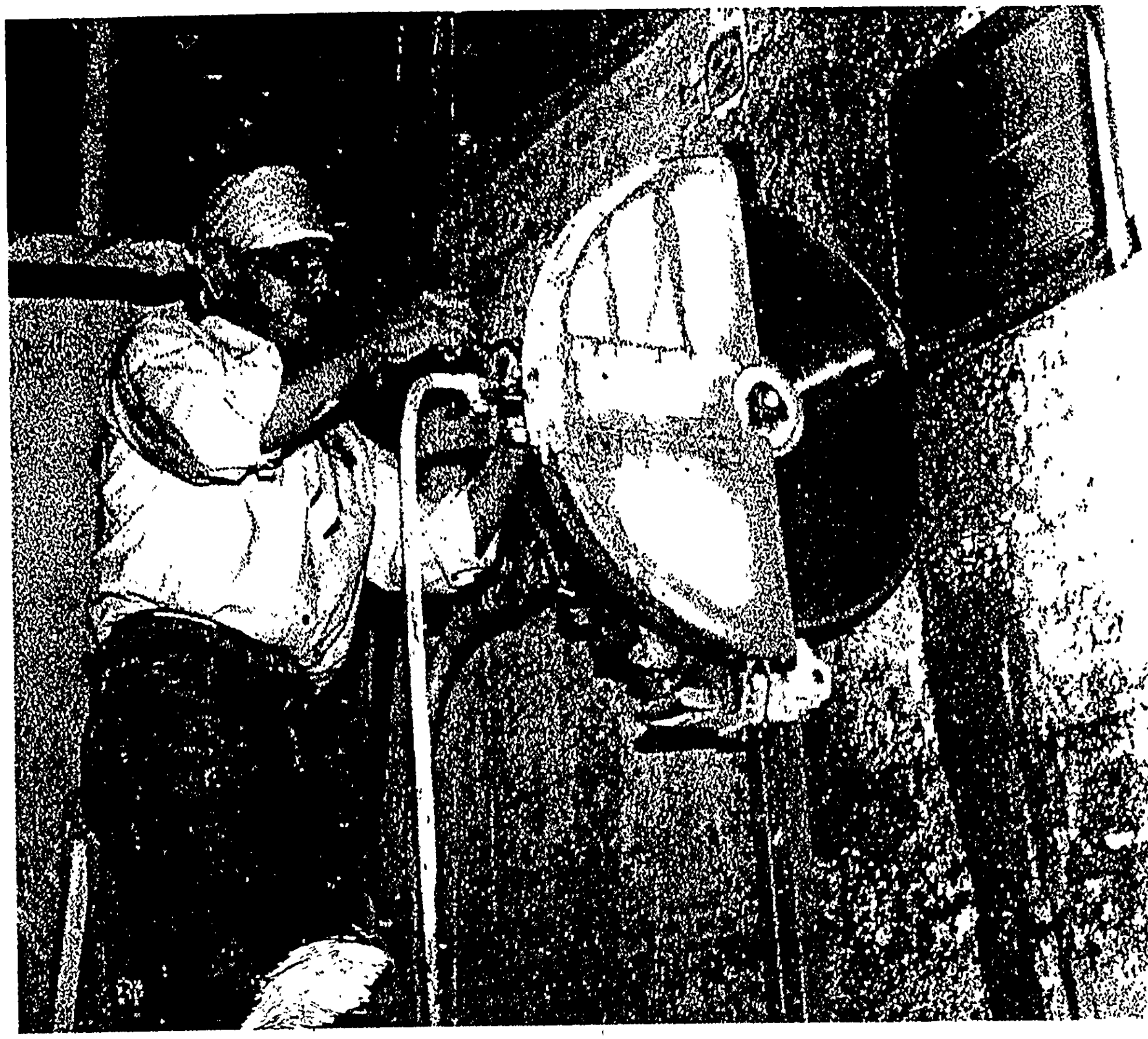


Figure 3-8

North Doorway Opening For Shield Door Removal

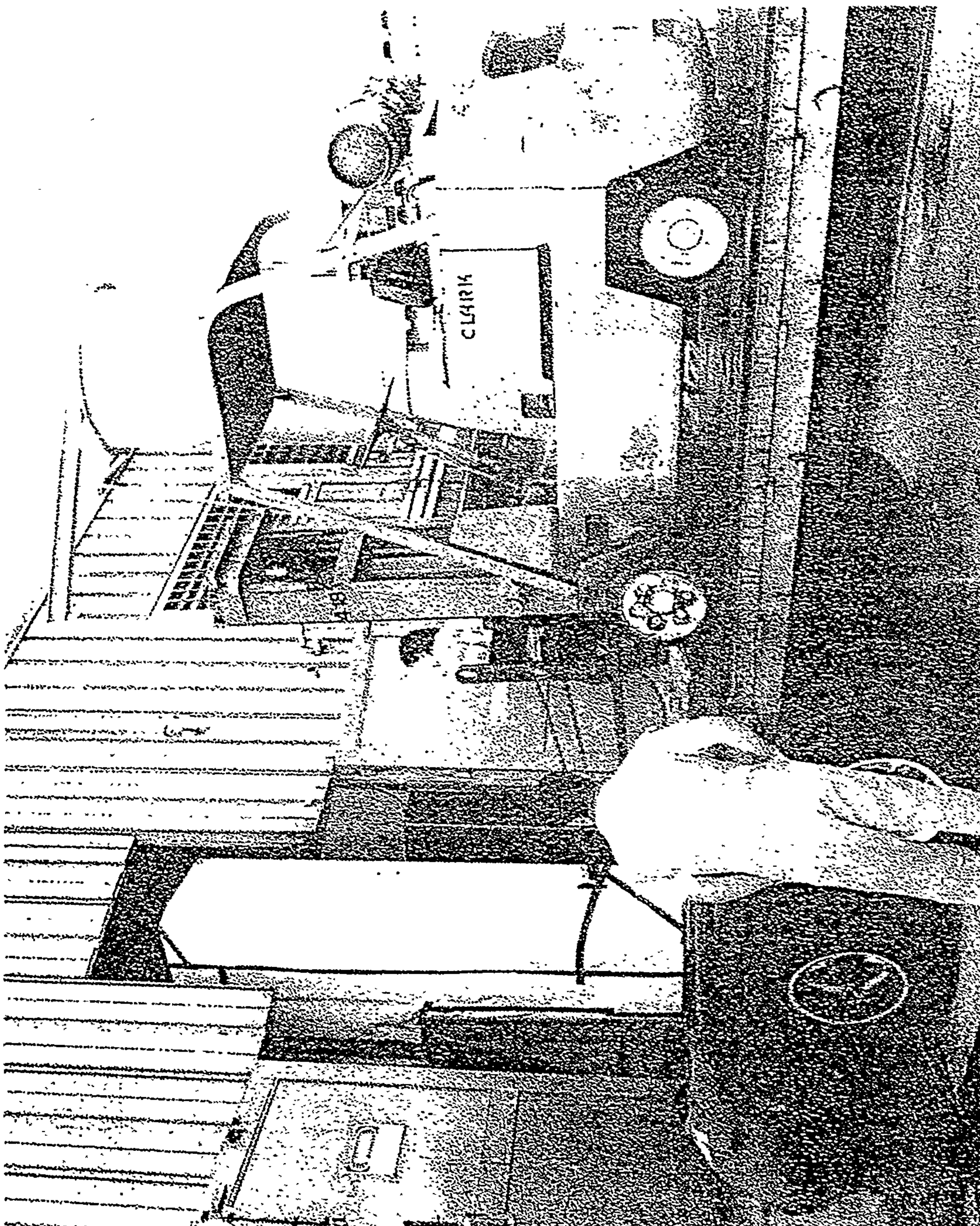


Figure 3-9

Cell 4 North Shield Door

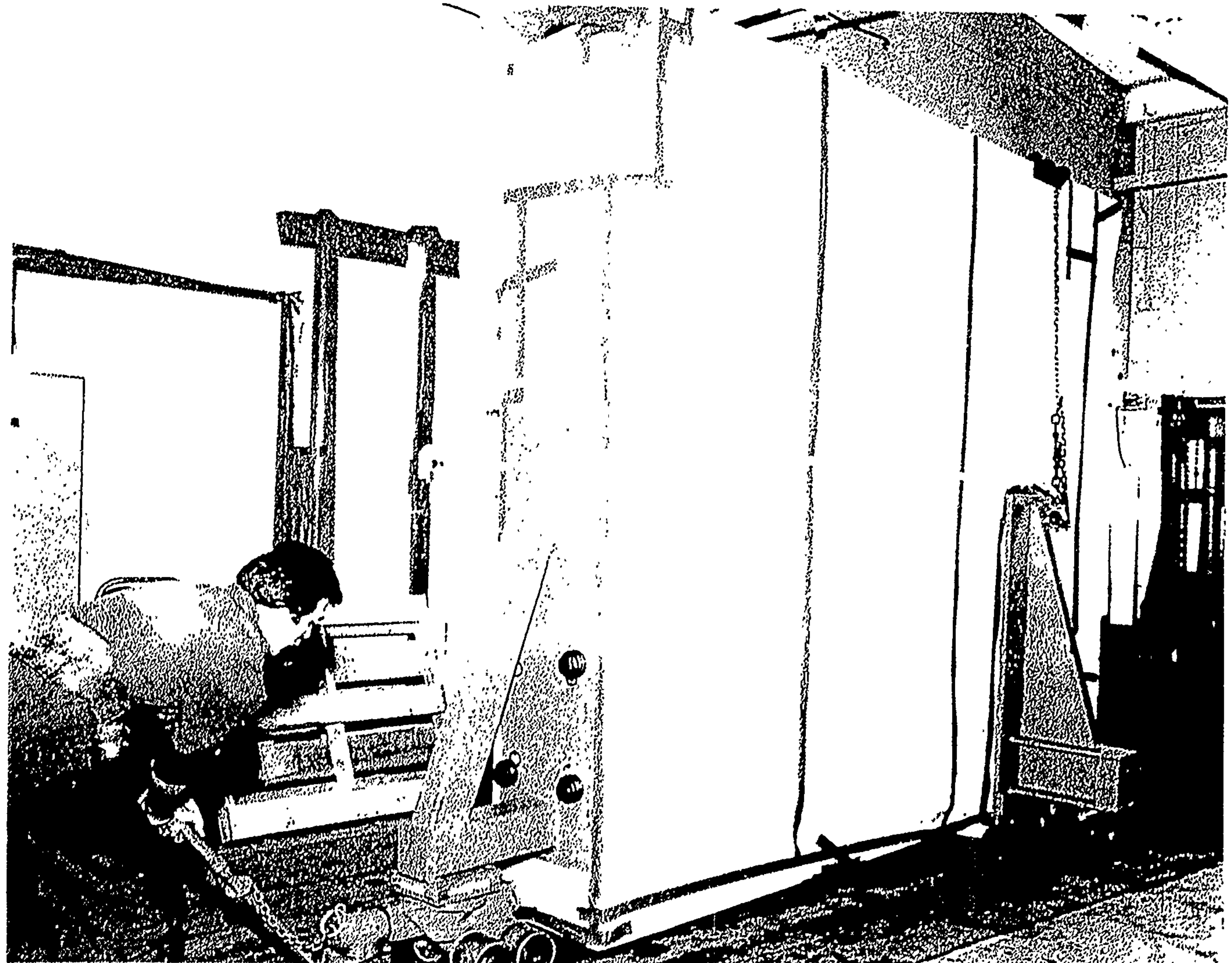


Figure 3-10

Bagging The Shield Door For Shipment

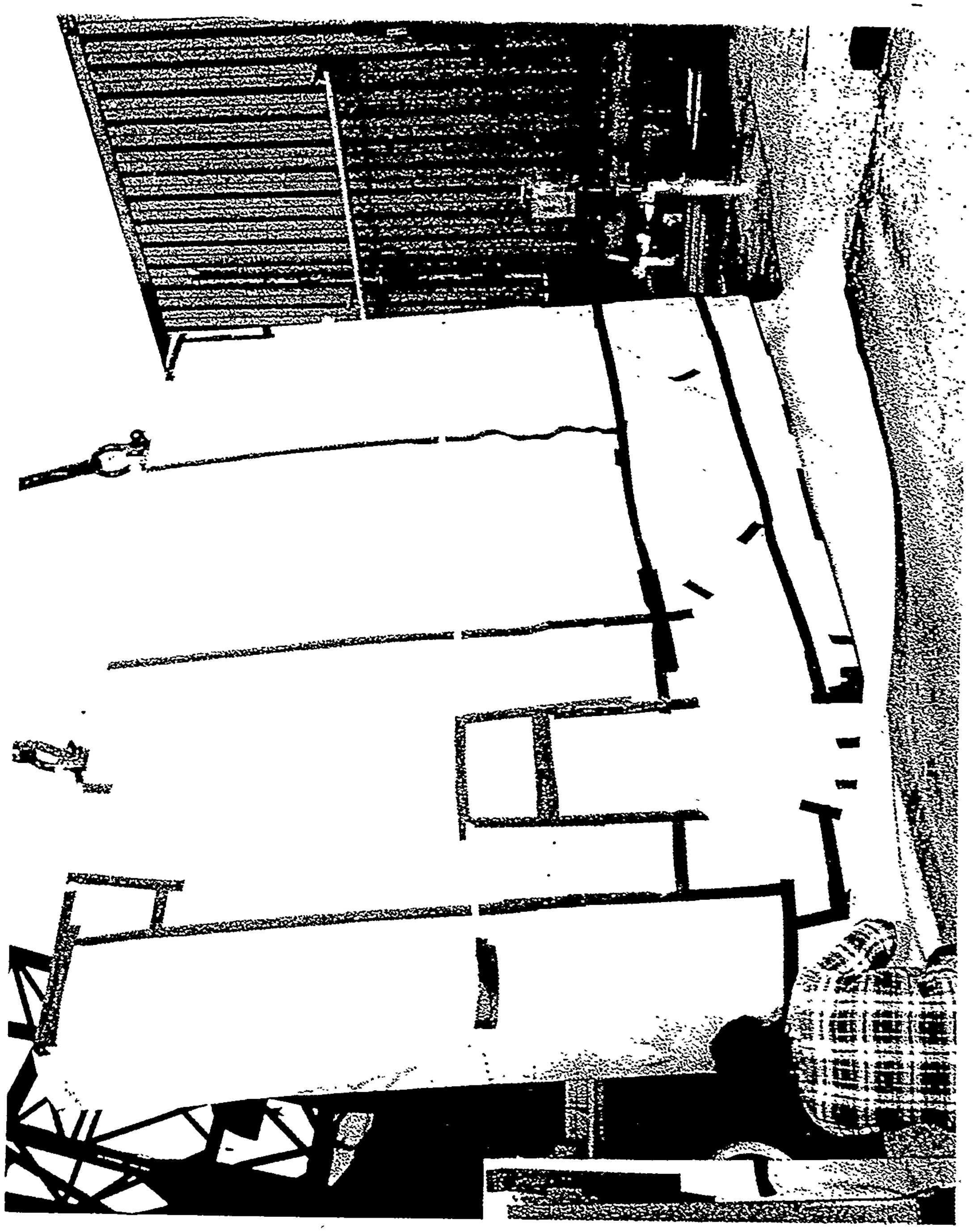


Figure 3-11

Placing Shield Door on Truck For Shipment

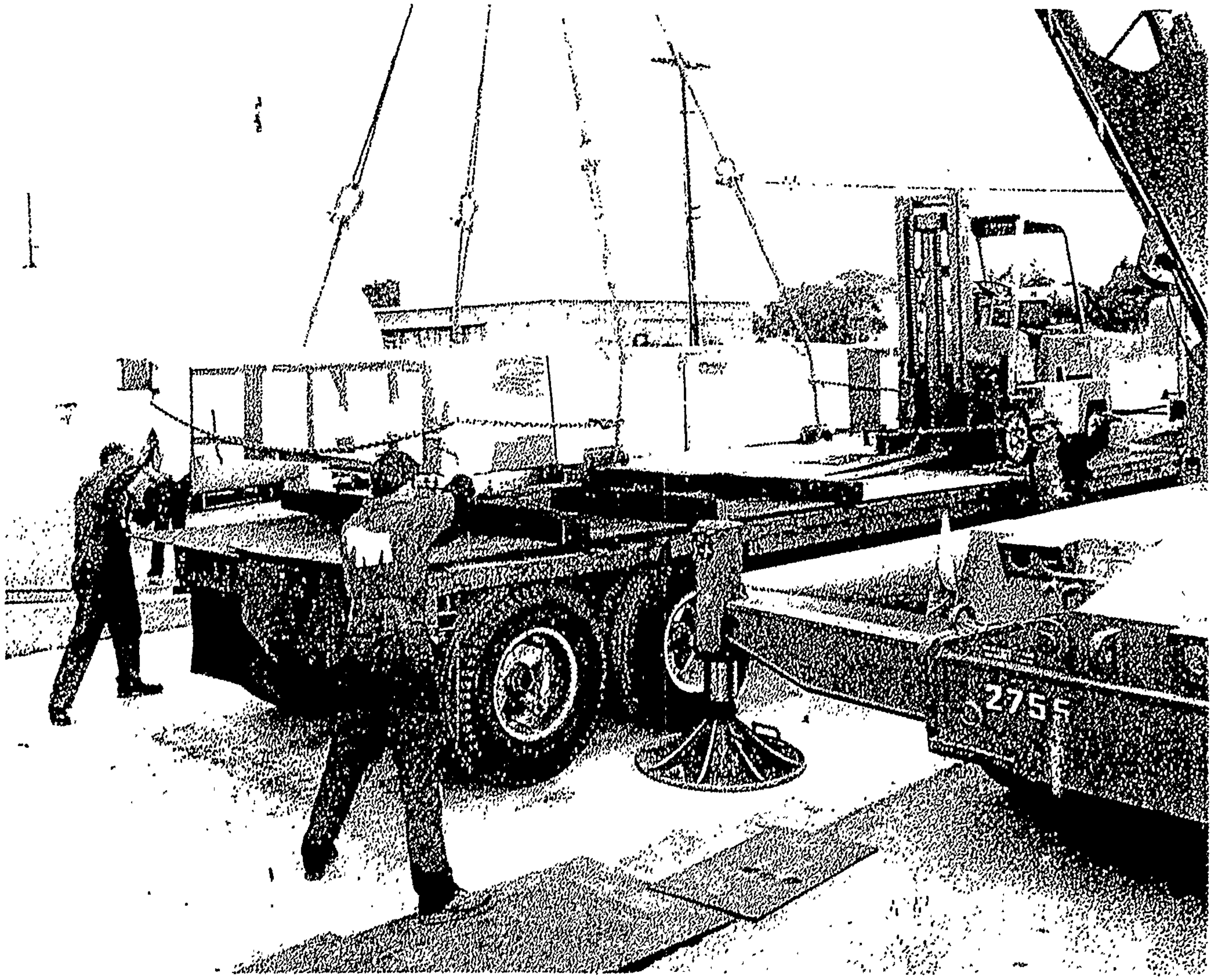


Figure 3-12

Cell 4 North Shield Door at RMDF

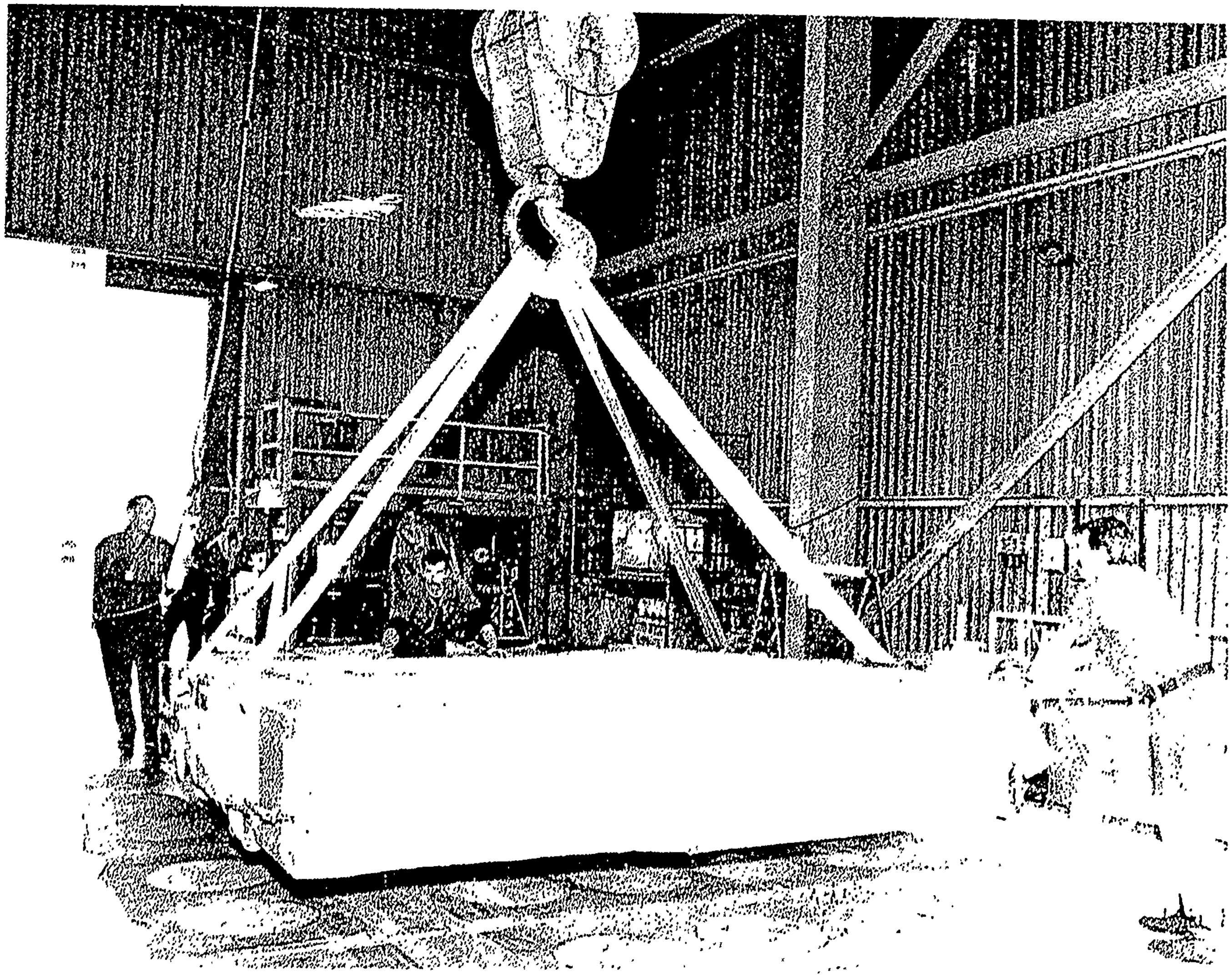


Figure 3-13

Concrete Removal From Cell Floor Under Liner

Figure 3-14

Concrete Rubble From Cell Floors

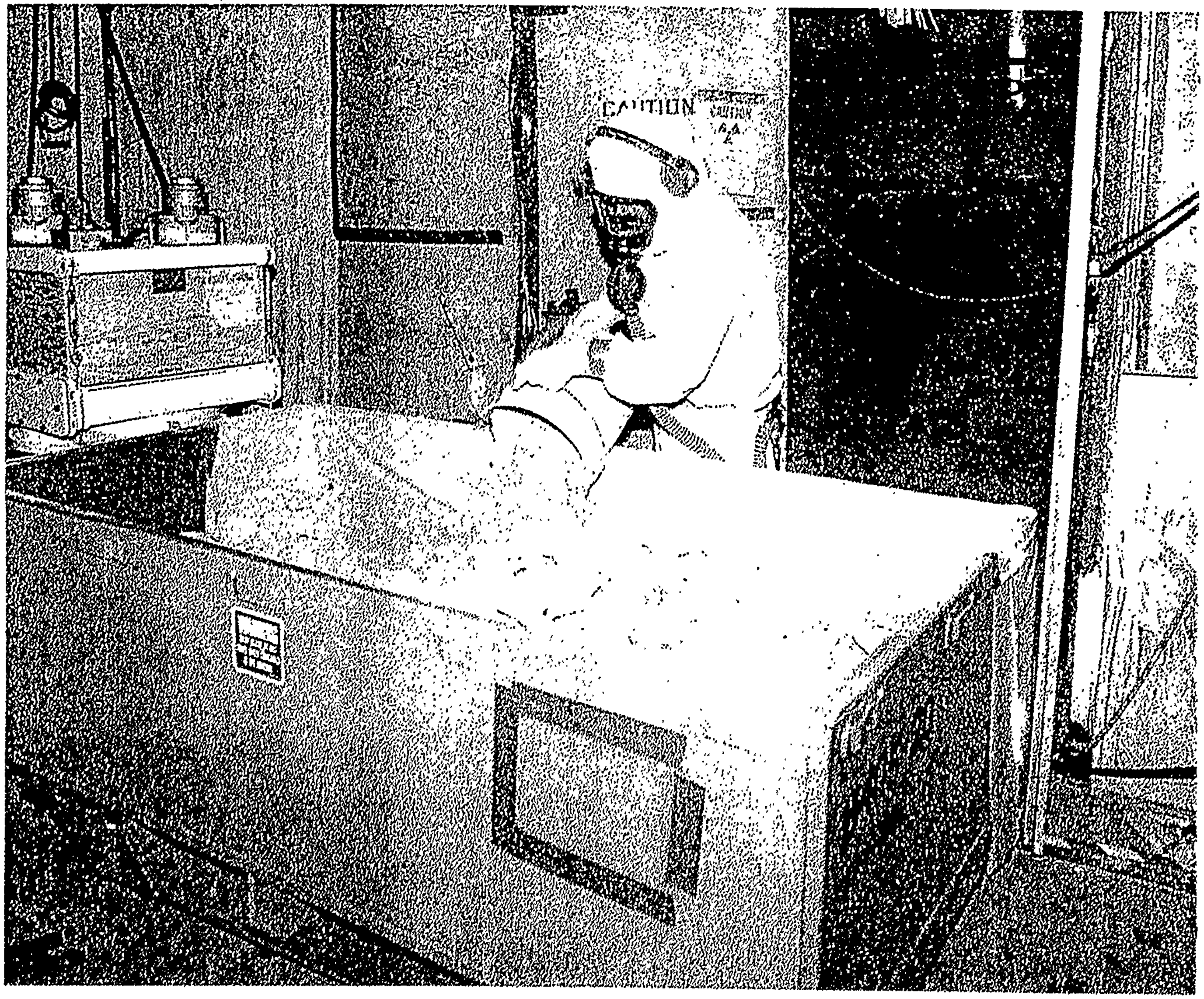


Figure 3-15

Cell Exhaust Duct to be Removed

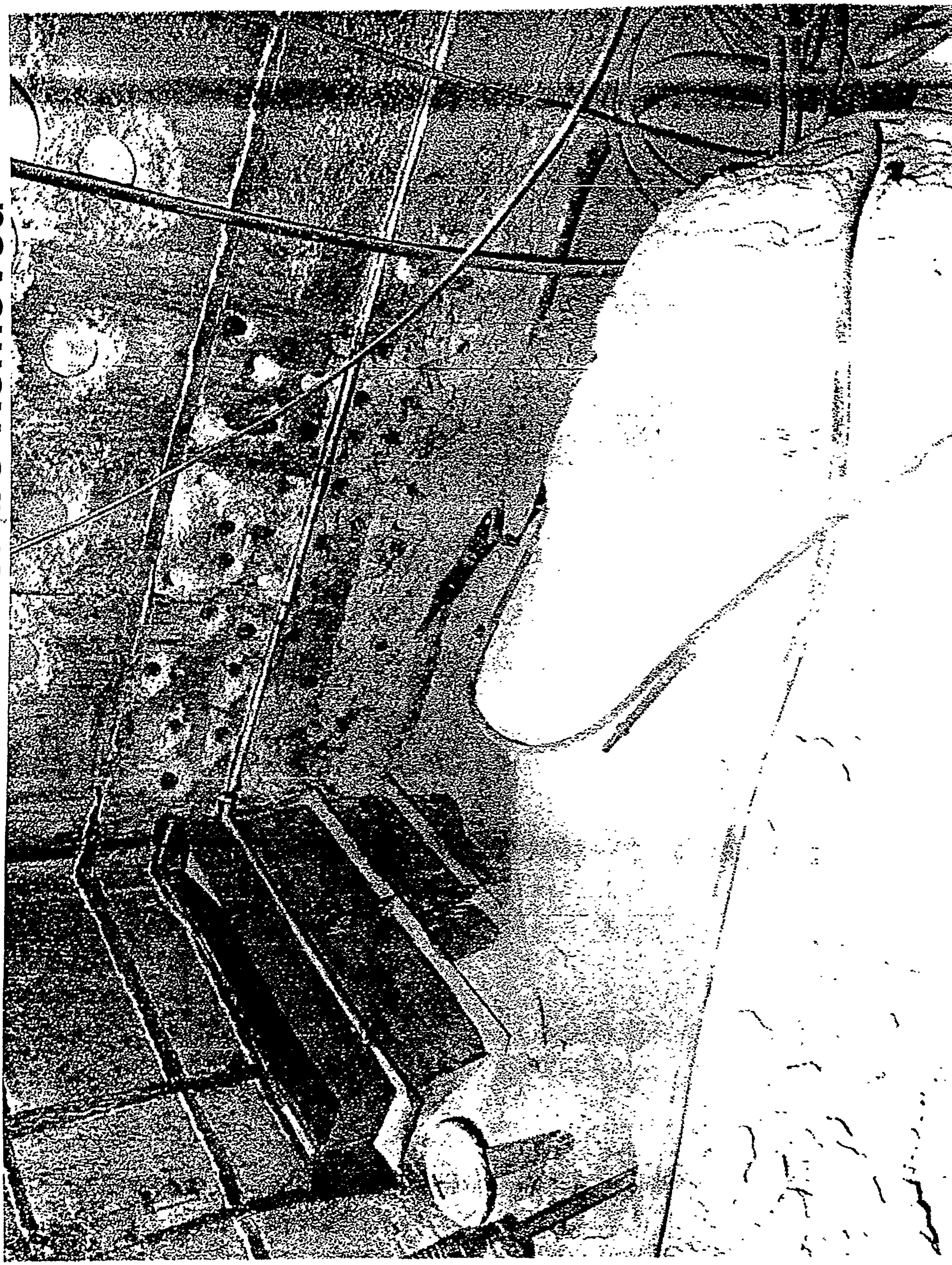


Figure 3-16

Cell Exhaust Duct Removed

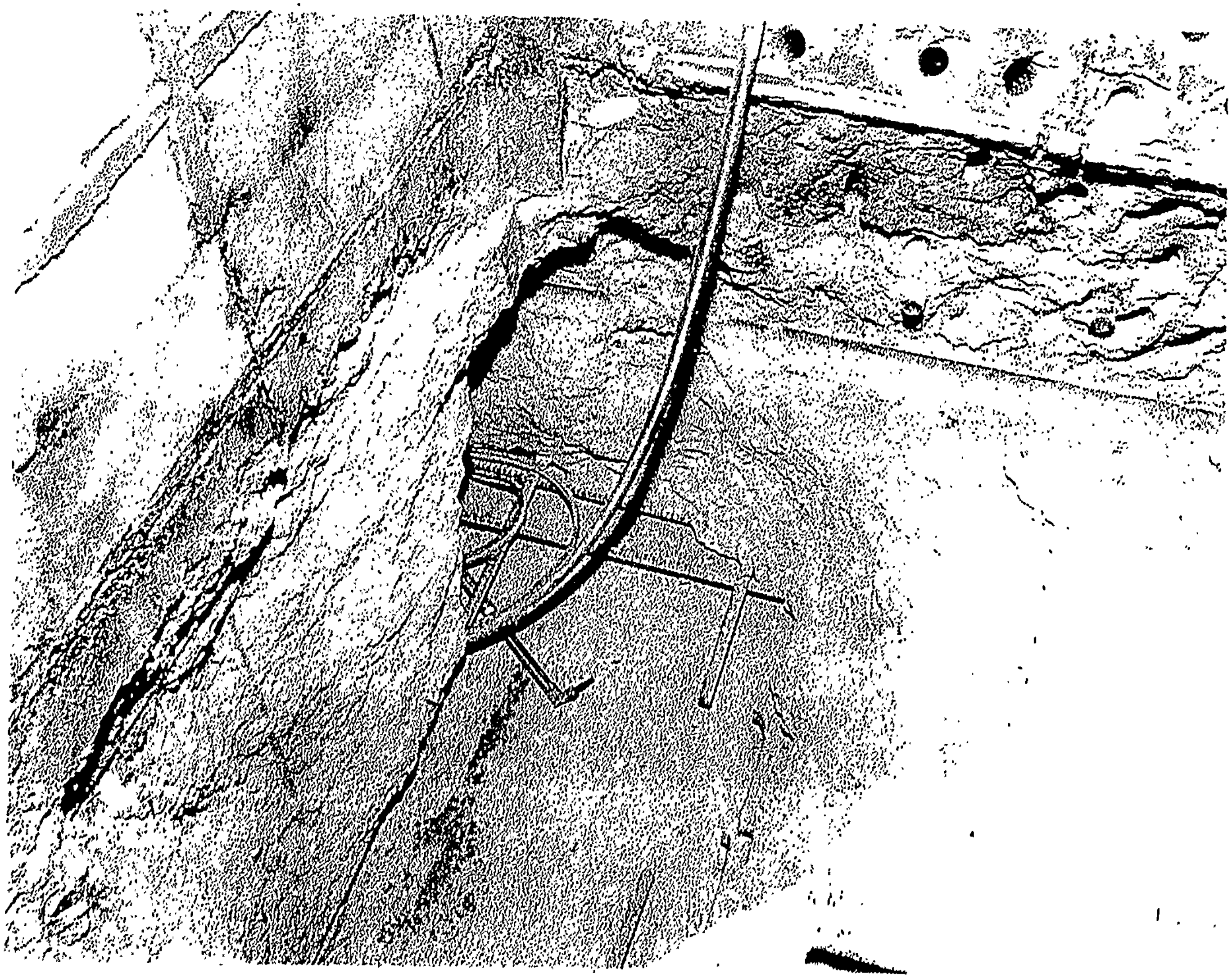


Figure 3-17.

Exhaust Ducts in Basement

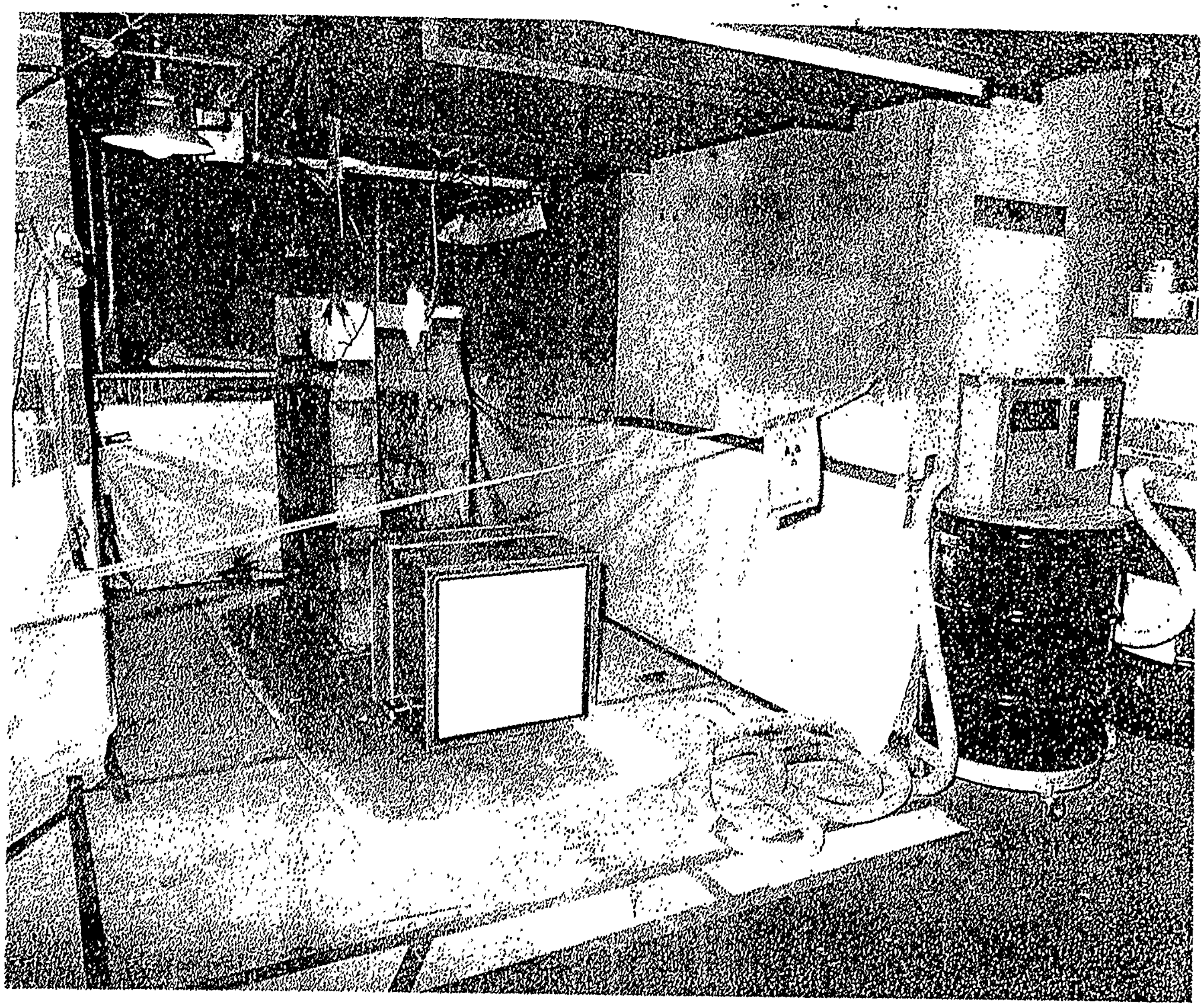


Figure 3-18

Mini-Track Excavator

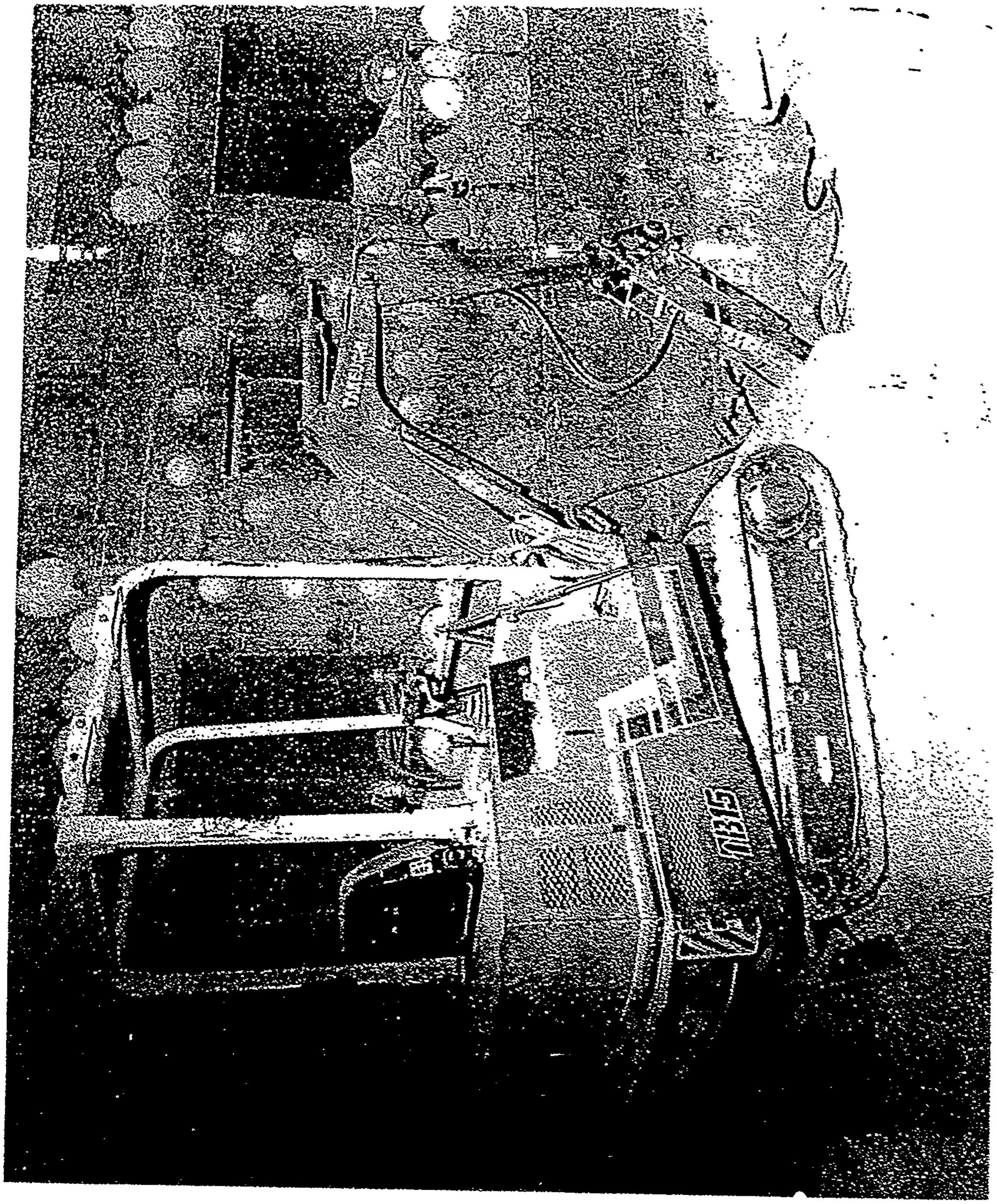


Figure 3-19

Bobcat Skiploader For Concrete Removal

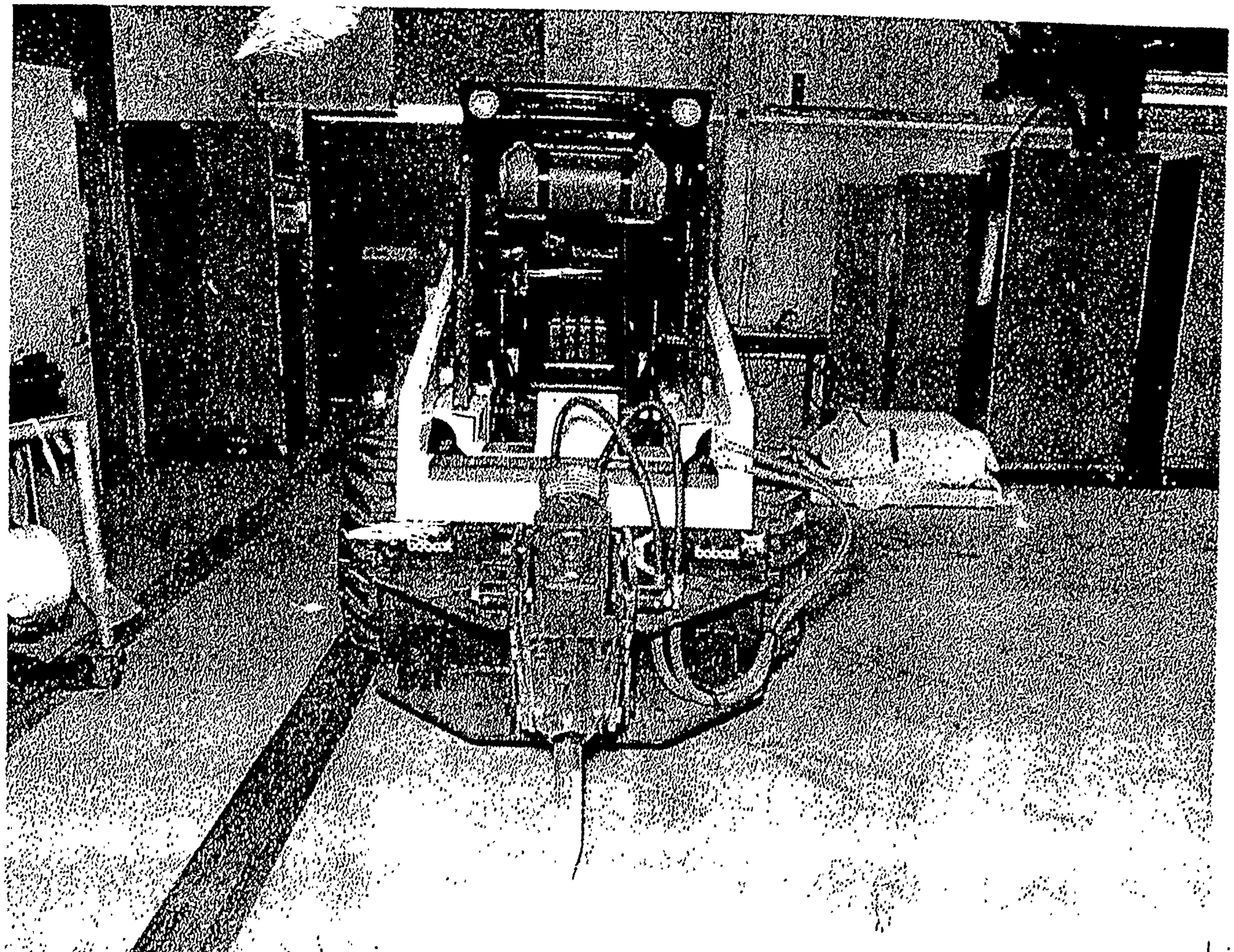


Figure 3-20

R/A Drain Removal in Support Rooms

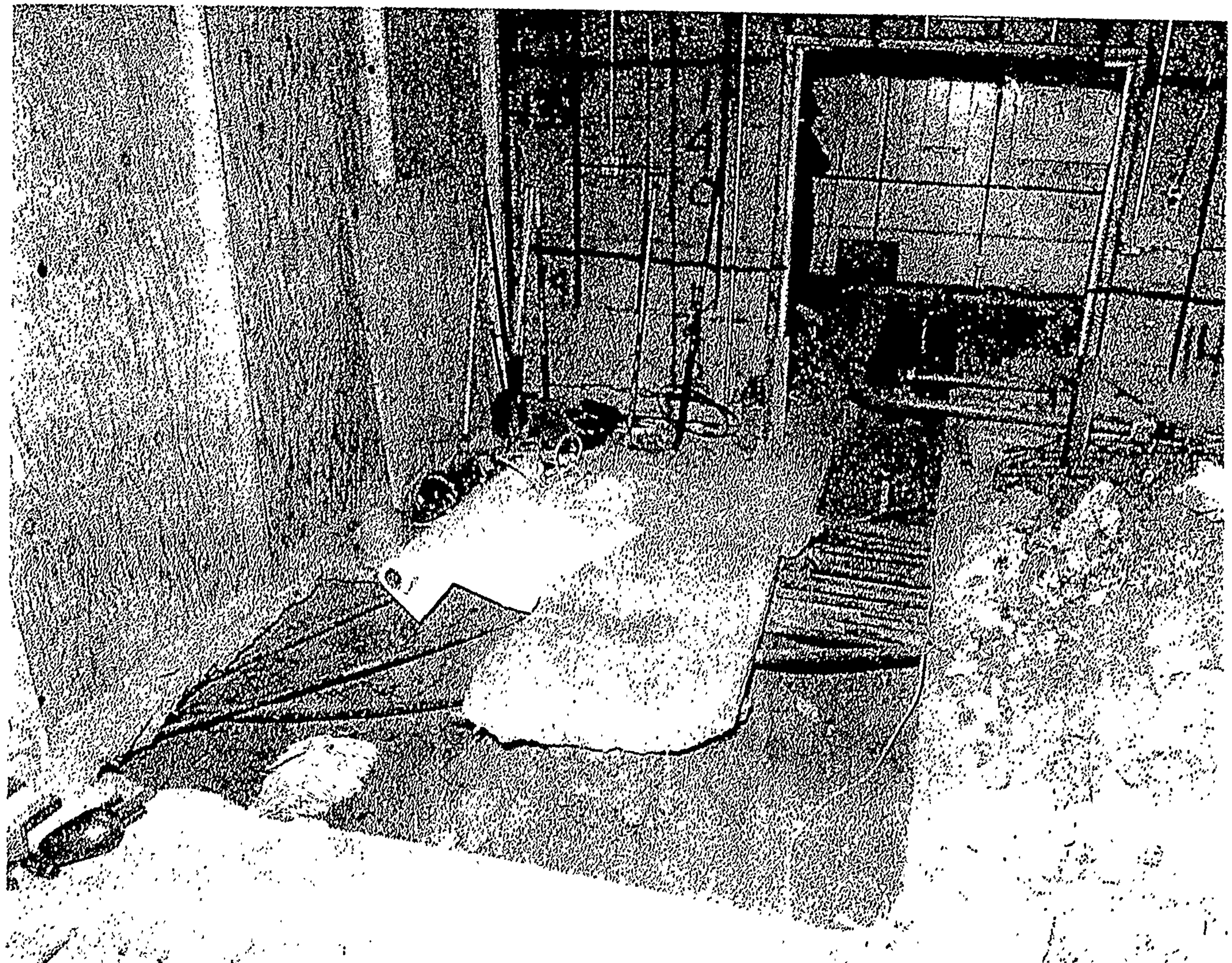


Figure 3-21

Downsizing Drain Lines

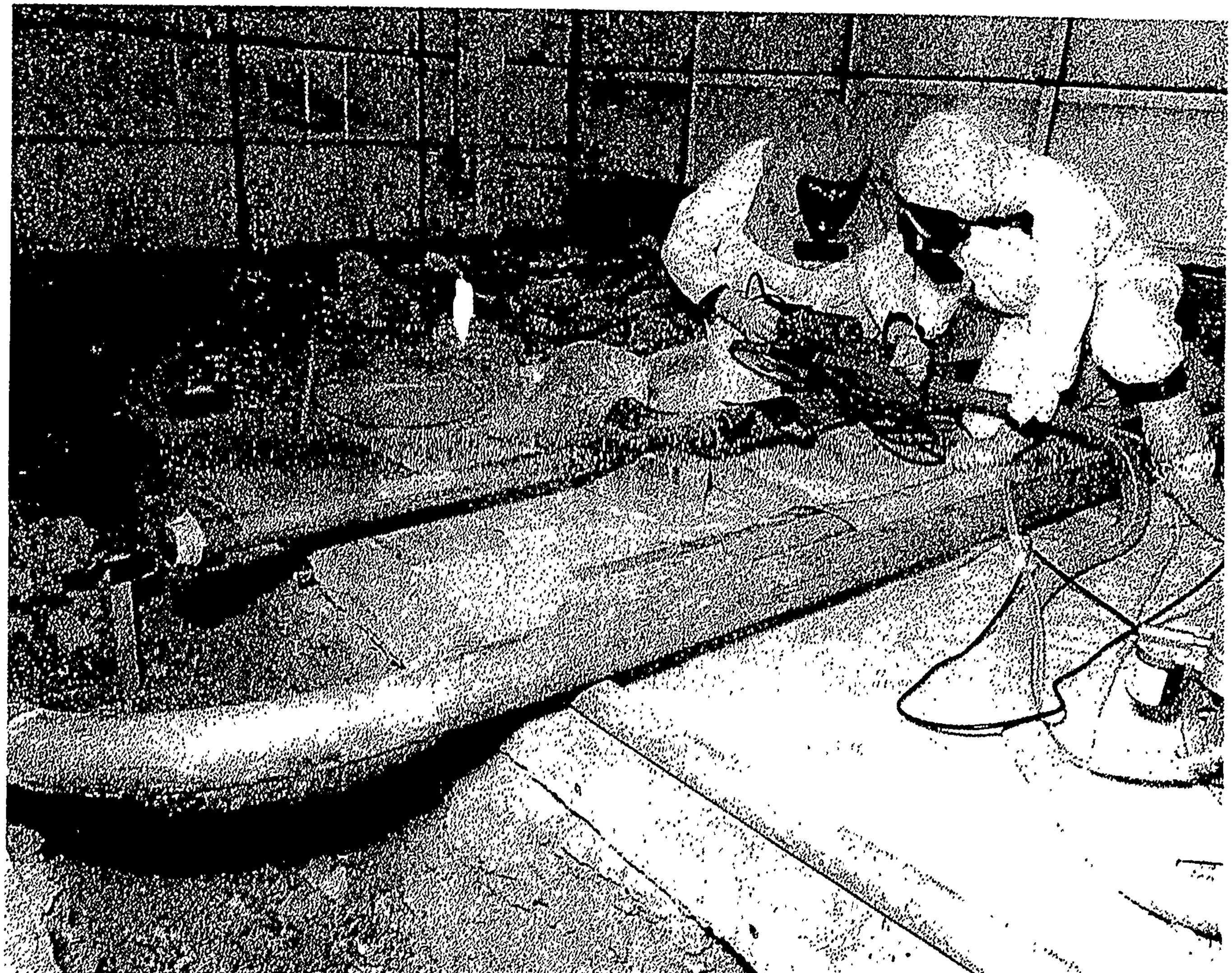


Figure 3-22

Concrete Removal Around Drains

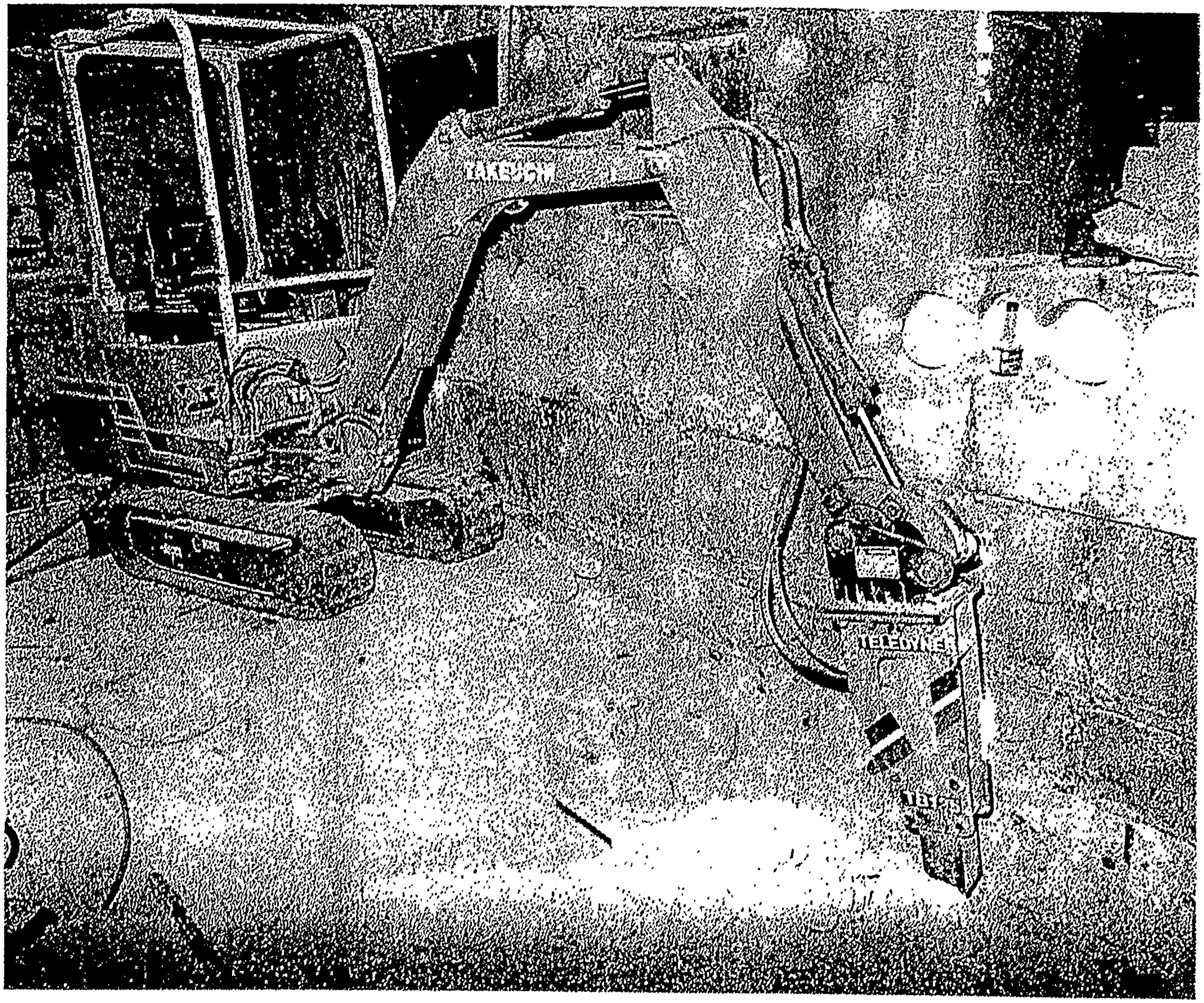


Figure 3-23

R/A Drain Line Uncovered

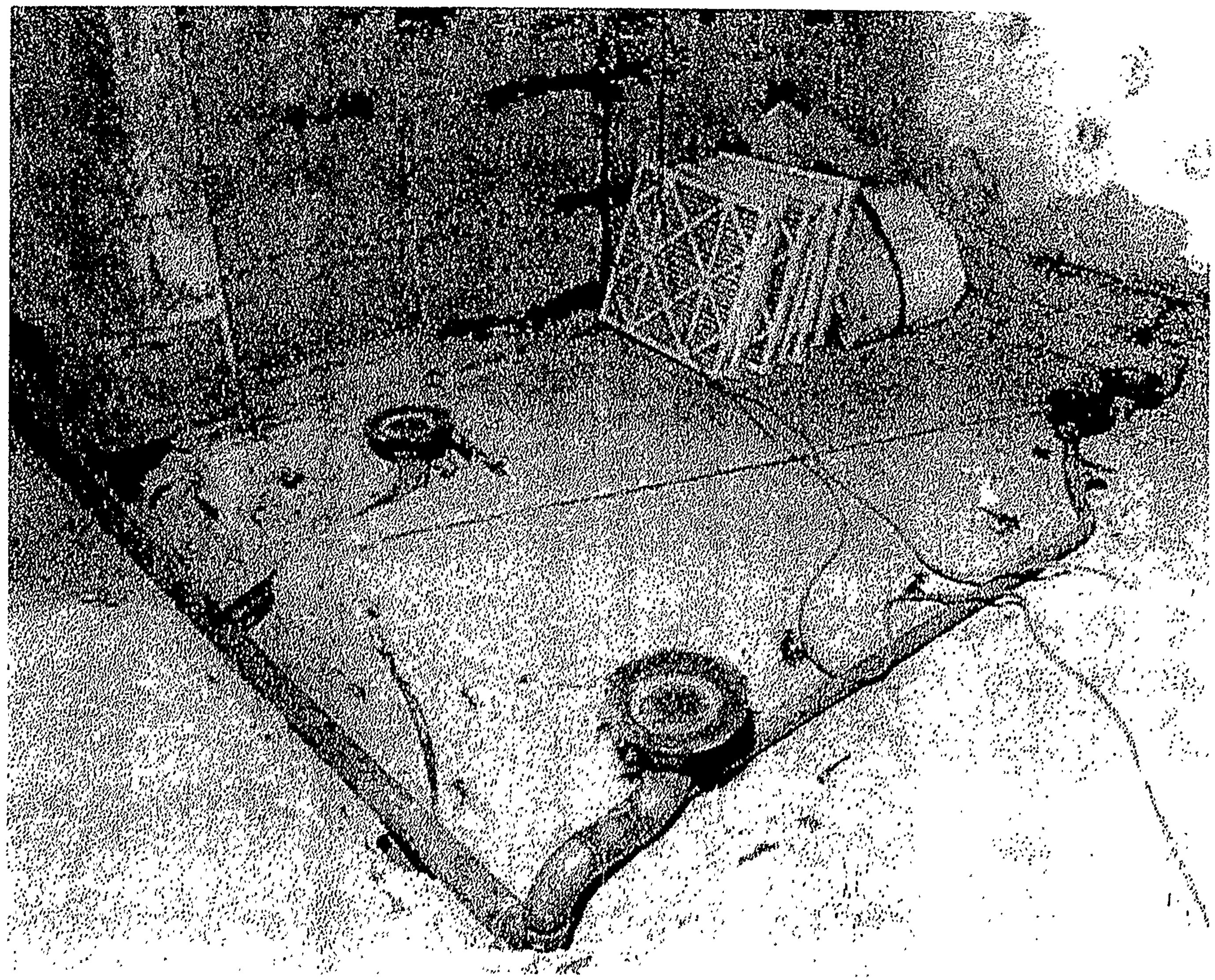


Figure 3-24

R/A Drain Line Under Wall

Figure 3-25

R/A Drain Line Through Wall

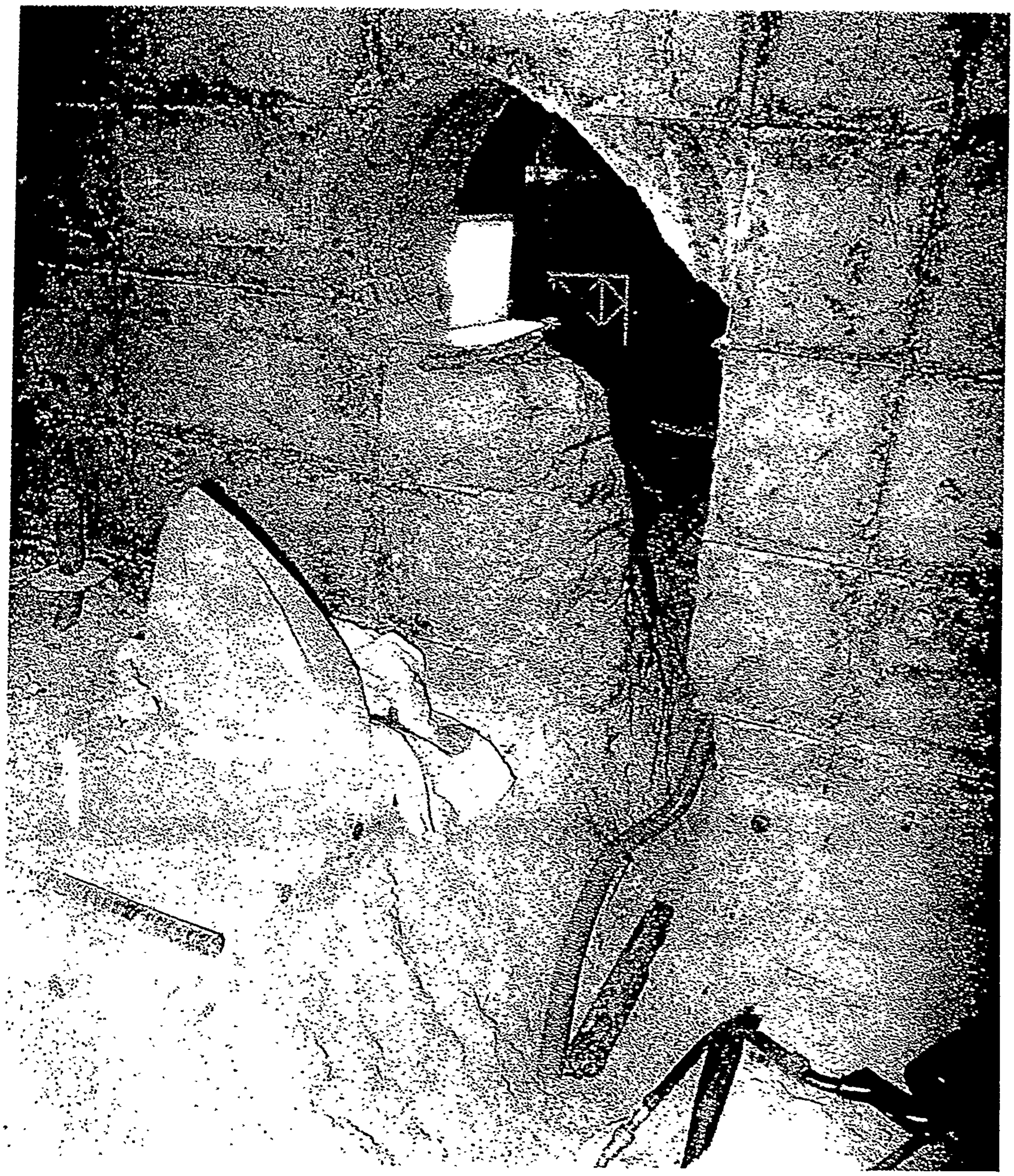


Figure 3-26

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Bagging Drain Line For Cutting

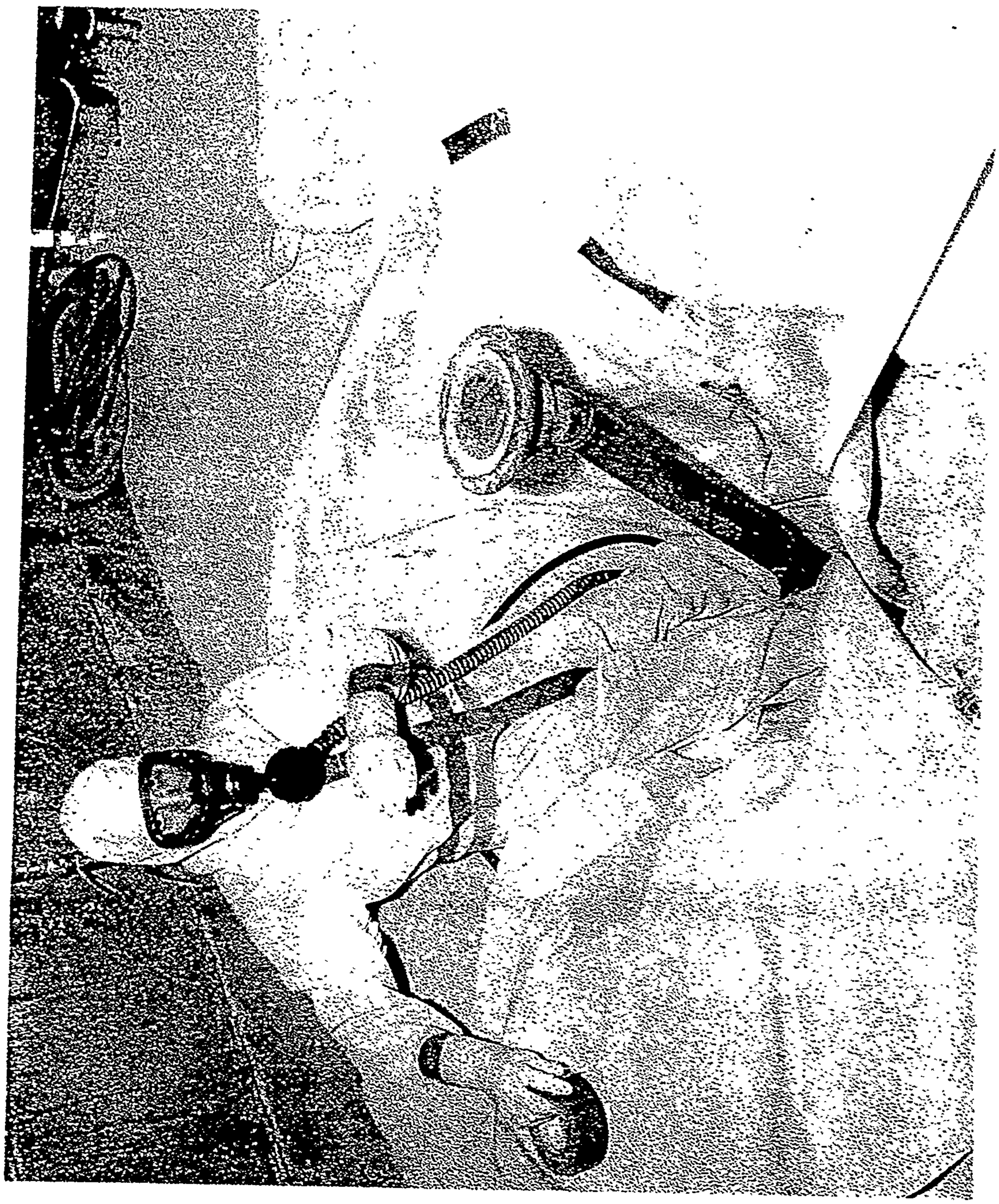

Figure 3-27

Downsize Cutting of Drain Line

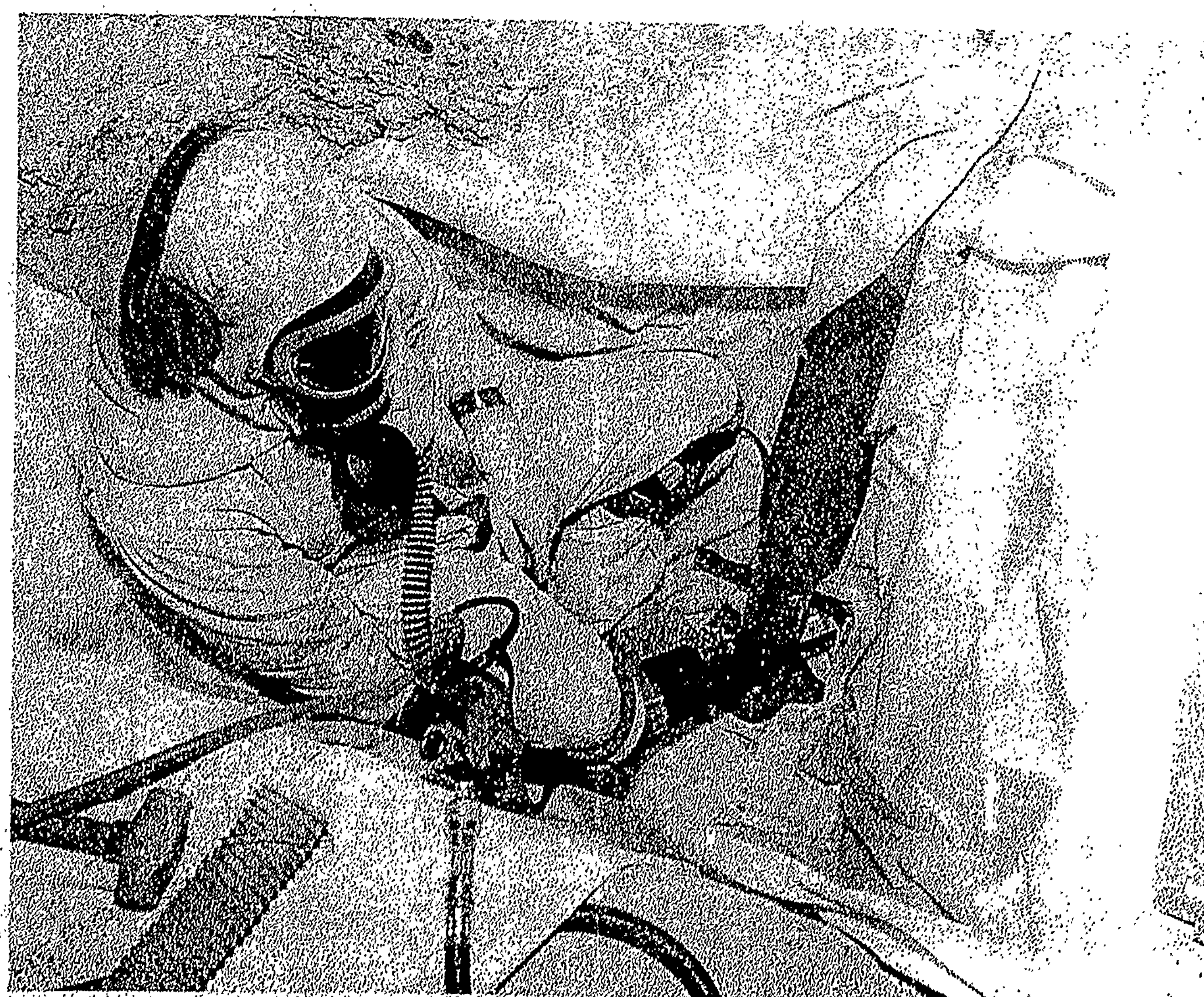

Figure 3-28

Cell After Surface Concrete and Drain Line Removal

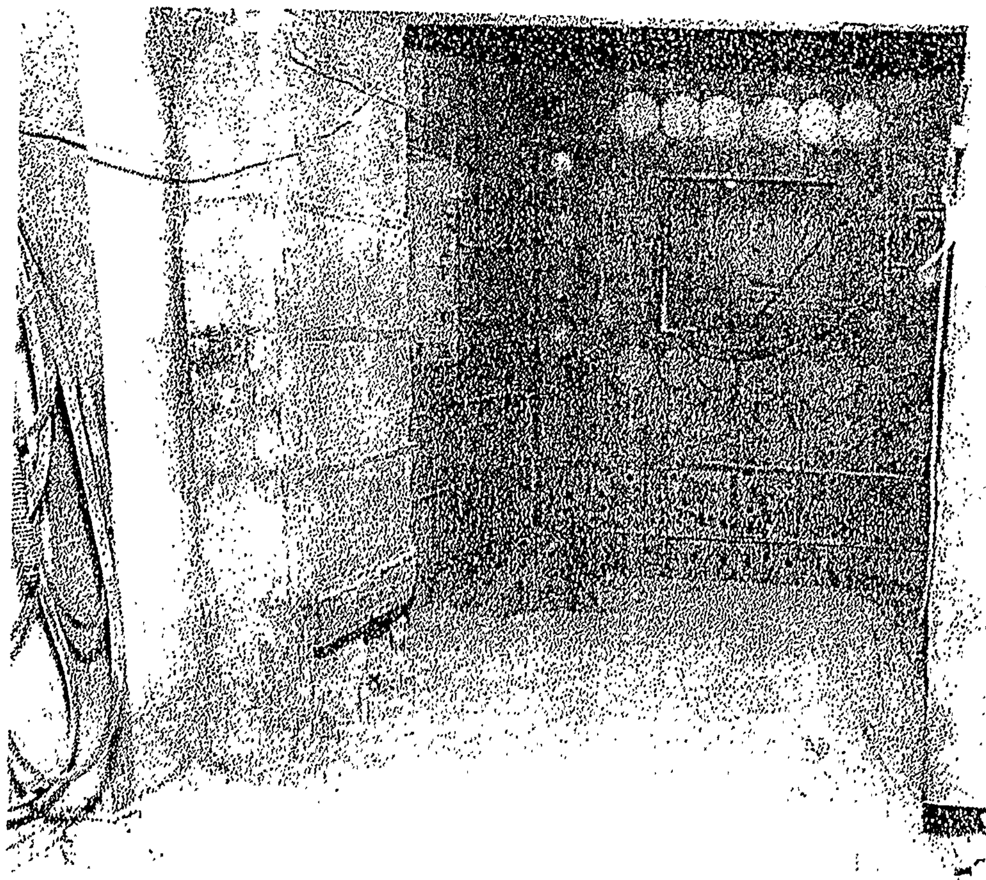

Figure 3-29

Sump Pumps in Basement

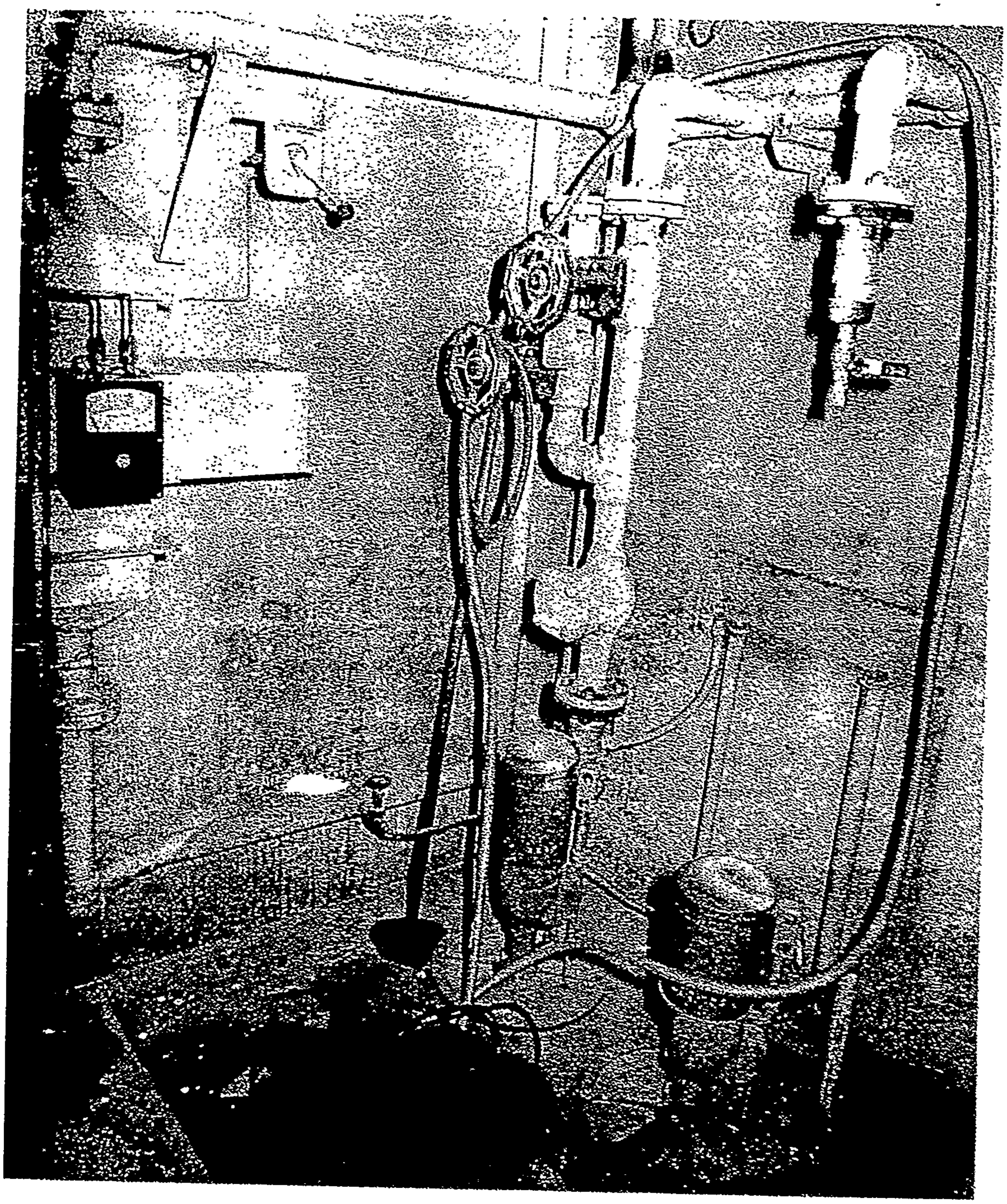

Figure 3-30

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SCHEDULE FOR D&D OF HOT LABORATORY

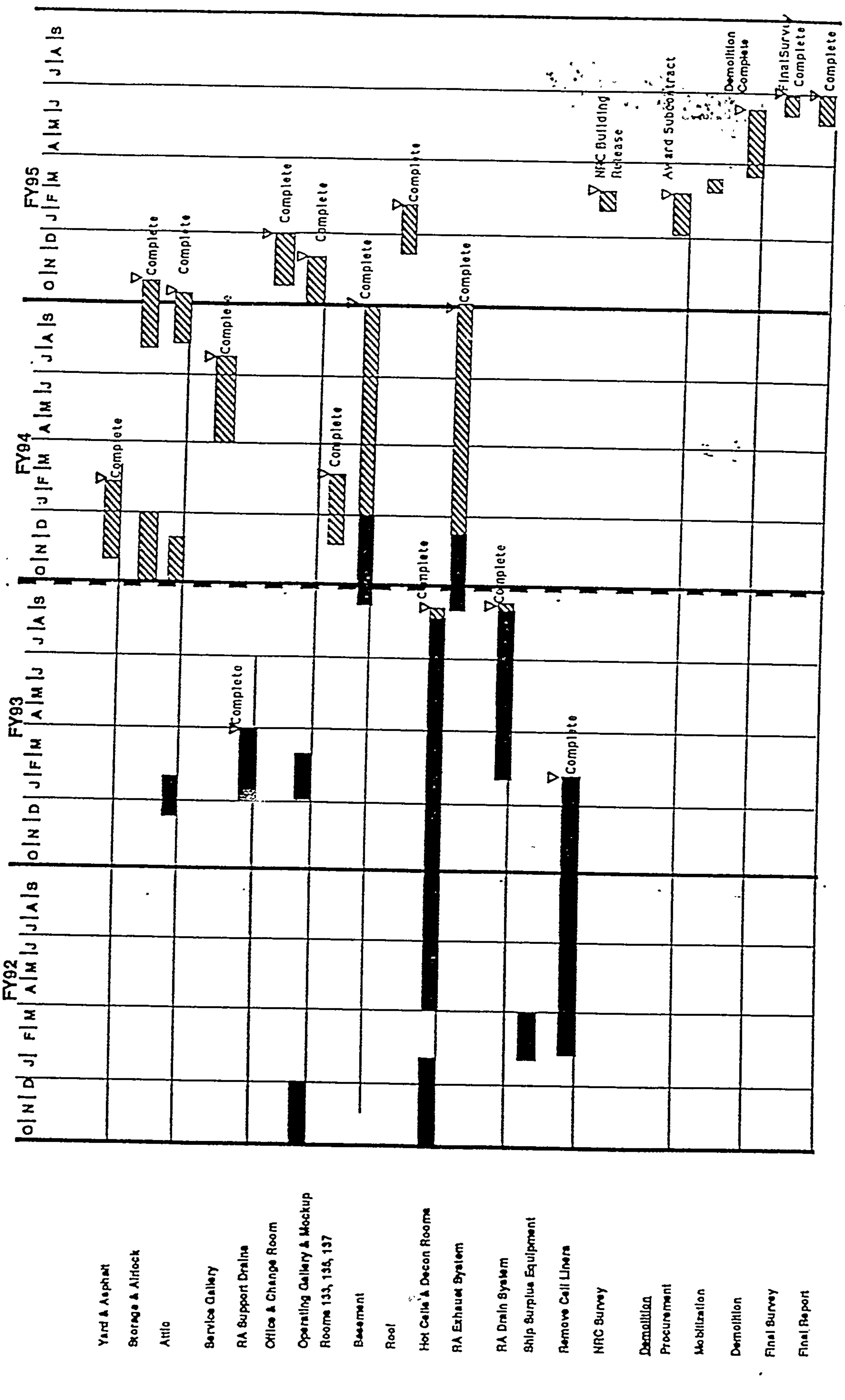

Figure 4-1