FINAL REPORT

FIELD TEST FT-34

ANNEX C

TEST SITE ENVIRONMENT (U)

SEPTEMBER 1968

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SYNOPSIS

For an arms control treaty the demonstration of the destruction of nuclear weapons probably would be conducted in a facility specially prepared or set aside for that purpose. Since no such facility exists in the U.S. wherein all operations associated with the destruction of weapons and the recovery of fissionable material could be performed, FT-34 was conducted in four AEC plants which, together, routinely perform such operations during the normal weapons retirement program.

This annex describes the four AEC manufacturing facilities used in FT-34. The geography and climate of the area, the basic mission of the facility, the portion of the facility utilized by FT-34, and the environment of the facility and surrounding community are discussed for the following facilities where FT-34 operations were performed:

1. Pantex Ordnance Plant, Amarillo, Texas.
2. Rocky Flats Plant, Golden, Colorado.
3. Paducah Plant, Paducah, Kentucky.
4. Y-12 Plant, Oak Ridge, Tennessee.

A number of photographs and illustrations are included in this annex to aid in the description of the facilities.

The environment of the test sites had little effect on the test results. A general effect of the restrictions (safety and security) imposed on the FT-34 inspectors tended to give them a feeling of inferiority.

It is recommended that inspection operations of any future tests of a similar nature (not actual treaty operations) be limited to Pantex and Oak Ridge so that test continuity could be maintained.

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I. INTRODUCTION

The concept for the demonstrated destruction of nuclear weapons envisions the use of a single facility within each nation agreeing to this method for reducing weapons stockpiles. All operations associated with destroying the weapons, recovering the fissionable material, and disposing of nonnuclear components would be carried out in the one facility. No single facility exists in the United States wherein all these operations could be tested. The field test was conducted, therefore, in four AEC plants which, together, routinely perform all operations associated with destroying weapons during the normal nuclear weapons retirement program. Components resulting from the disassembly of weapons inspected at the first site were shipped to other sites for further processing and inspections.

The test sites for FT-34 field operations were selected from the AEC weapon-production complex as most representative of the facilities and requirements that would be utilized in a single facility for the destruction of nuclear weapons. These sites were Pantex Ordnance Plant, Amarillo, Texas; Rocky Flats Plant, Golden, Colorado; Paducah Plant, Paducah, Kentucky; and the Y-12 Plant, Oak Ridge, Tennessee. This annex presents a description of the facilities and the site environment in which the FT-34 inspections were conducted, the environment in which the inspectors resided, and the possible effects of these environments on the test results. Weapons inspected and inspections of their resulting components are discussed in other annexes to this report.

At all of the AEC installations, special security and control procedures were established for FT-34 (CLOUD GAP-34). At times, these procedures (see appendix C1 for typical procedures) may have made the plant seem like a hostile environment to the inspectors. This added realism to the test, but there was no intent to harass inspectors.

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II. PANTEX ORDNANCE PLANT

A. GEOGRAPHY

The Pantex Ordnance Plant is an AEC-owned plant operated by the Mason and Hanger-Silas Mason Co., Inc., under contract to the AEC. The plant is located 22 miles northeast of Amarillo, Texas, and 8 miles southwest of Panhandle, Texas. The plant is located on a stretch of treeless high plain area. The road conditions at and near the Pantex Plant are comparable to those found in any similar semirural district near an urban area of approximately 175,000 people. Most of the roads are surfaced with blacktop.

B. CLIMATE

The climate of the area is considered to be mild. Amarillo, because of its altitude (3600 feet), is known to have the "coolest summer nights in Texas." During the summer months, temperatures often drop 30 degrees after sundown. The average temperature during the summer is 76°F.

The weather in Amarillo during FT-34 was typical summer weather: hot and humid. During LIMA operations there were many afternoon and evening showers, some of which were heavy.

C. FACILITY DESCRIPTION

The basic missions of the Pantex Plant are the fabrication of nuclear weapons from components provided by other AEC contractors and laboratories and the manufacture of high explosive weapon parts. Some weapon retirement is performed at Pantex, and the AEC Quality Evaluation System Tests (QEST) program of stockpile sampling is based at Pantex. The general layout of Zone 12 of the Pantex Plant showing the areas utilized during FT-34 is presented in figure C2-1.

The following major operations were performed at Pantex for FT-34:

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1. Walkthrough of the facilities by FT-34 inspectors.

2. Initial weapon monitoring.

3. Disassembly of weapons (not witnessed by inspectors).

4. Disposal (burning) of explosives and other burnable material.

5. Shipment of nuclear and nonnuclear residue to other AEC plants for further processing and disposal.

D. OPERATIONAL ENVIRONMENT

1. Administrative Area. The administrative area for FT-34 was on the second floor of Bldg. 12-42. Entrance for FT-34 was by outside metal fire-escape stairs. The administrative area, which included about 740 square feet, was supplied with all the necessary equipment, supplies, and services. A conference room, rest rooms, and a refreshment area were made available as required.

2. Inspectors' Office Space.

a. The inspectors were provided space in two trailers parked inside Zone 12, near the gate to Zone 12. These trailers were unfurnished, 10- by 55-foot, three-bedroom house trailers. The plumbing facilities were not connected, but outside chemical toilets were placed near the trailers. The trailers were cooled by evaporative coolers. Lights, water cooler, safe, desks, chairs, and telephones were also provided each trailer.

b. A two-man and a four-man team were assigned to each trailer.

3. Operational Areas.

a. General. FT-34 inspection operations were conducted at the burning ground and in Bldgs. 12-53, 12-44-6, and 12-R-44. The X-ray room in Bldg. 12-56 was used for demonstration of X-ray only. Building 12-53 and ramp 12-R-44 were modified (figure C2-2) to provide for a weapons' introduction area and storage areas (in ramp 12-R-44); these areas were separated from normal Pantex operations areas. The total area for inspection operations, exclusive of the burning grounds, was approximately 8,300 square feet.

b. Disassembly Areas. The areas used by Pantex personnel for disassembling weapons were Bldgs. 12-44-6 (cell #6) and 12-53. These buildings were the areas used for the walkthrough; these areas simulated the disassembly portion of a "single facility" for destruction of nuclear weapons. The combined disassembly areas used for FT-34 in these buildings was approximately 5,600 square feet. All tools required for weapons disassembly, as well as the scale for weighing weapons and burnable material, were located in this area. Buildings 12-44-6 and 12-53 were air conditioned and humidity controlled. Figure C2-3 shows a display of tools inside Bldg. 12-44-6.

c. Weapon Introduction Area. This area was the ramp 12-R-44 modified as shown in figure C2-4 to include doors and barriers. This ramp area, which was 190 feet long by 12 feet wide, was not well suited for the required weapon monitoring. It was impracticable to provide scales for weighing the weapon shapes in the ramp area. The doors and barriers made the ramp extremely hot and uncomfortable, because the windows could not be opened and the area was not air conditioned at the start of the exercise. This condition was corrected by 12 July by ducting conditioned air into the ramp and circulating it by fans. Figure C2-4 shows weapon shapes in the Weapon Introduction Area.

d. Burn Ground. The burn ground was located 4 miles from the other operation areas. Four burn pads were used for each burn: two for HE, one for detonators, and one for inert material. During burning operations, the number of personnel permitted on the burn ground was limited to 20. This required some control of movement of personnel but presented no major problem. The burn ground, which is devoid of shade, was

very hot during the disposal operations. Inspectors observed the burning by looking into two 12- by 24-inch mirrors and through a periscope. This allowed only limited observation of the burning, and Polaroid pictures could not be made satisfactorily. A layout of the burn area is shown in figure C2-5. Figure C2-6 shows one of the burning pads after burning of some of the FT-34 material.

4. Adverse Environmental Factors and Effect on Test Results.

a. The planned site preparation had not been completed prior to the arrival of the first teams of inspectors.

(1) The trailers used for inspectors' office space had not received even basic janitorial service, the evaporative coolers had not been connected, and the required furniture had not been provided. These conditions, which were remedied during the first week of inspection operations, did not have a detectable effect on the test results but probably had an effect on the morale of the inspectors.

(2) The weapon monitoring area had not been provided with even basic air ciruclation; this lack of air circulation caused a great deal of physical discomfort for the inspectors. The temperature reached a point where electronic weapon monitoring equipment (gamma spectrometer) would not function properly. Air conditioning and ventilation were provided as soon as possible, and the weapon monitoring proceeded satisfactorily with no detectable adverse effect on test results.

b. There were several minor sources of irritation for the inspectors during the operations at Pantex. For example, the nature of the work normally perfomed at the Pantex Plant and AEC security and safety regulations required that inspectors be escorted at all times within Area 12. None of these irritants had a detectable effect on test results.

III. ROCKY FLATS PLANT

A. GEOGRAPHY

The Rocky Flats Plant is an AEC-owned plant operated by the Dow Chemical Company under contract to the AEC. The plant is located about 10 miles south of Boulder, Colorado, and about 10 miles north of Golden, Colorado, on State Route 93. The plant itself is situated on a treeless mesa some 5 miles east of the front range of the Rocky Mountains. The towns of Golden and Boulder are both college towns with a primarily residential atmosphere. The city of Denver, about 20 miles east, offers the complete spectrum of services and activities of a city of 500,000 people. The road conditions in the vicinity of the Rocky Flats Plant are excellent; all roads and streets are surfaced.

B. CLIMATE

The climate of the area is considered mild. At an altitude of about 6,000 feet, the area has a bracing mountain climate. The air is clean, the relative humidity low, and the average day is bright with sunshine; occasional breezes take the edge off the daytime high temperatures. During the FT-34 operations, rainfall was limited to a few late afternoon showers, and there was only one full day of precipitation. The area is susceptible to severe and violent weather changes, as in any Rocky Mountain community.

The weather during FT-34 operations was typical Rocky Mountain weather, clear warm days, some afternoon showers, and cool nights.

C. FACILITY DESCRIPTION

The basic mission of the Rocky Flats Plant is the fabrication of plutonium pits for nuclear weapons. Weapons' grade plutonium direct from reactors and chemical separation as well as reclaimed plutonium from retired weapons, constitutes the feed material used at Rocky Flats. Smelting, casting, rolling, forming, and joining operations are performed at the

plant in the production of pits from feed material. Production tests for integrity of product and the assay of material for product control are also performed at this site. The general layout of the Rocky Flats Plant with the areas utilized by FT-34 indicated is shown in figure C2-7.

The following major operations were performed at Rocky Flats for FT-34:

1. Receipt of material from the Pantex Plant.

2. Walkthrough of the facilities by FT-34 inspectors.

3. Disassembly of pits and separation into alpha and delta plutonium, uranium, and other residue (not witnessed by inspectors). DOE (b)(3)

4. Melting and casting of plutonium parts into ingots (not witnessed by inspectors).

5. Sampling and assay of cast plutonium ingots.

6. Packaging and shipping nonplutonium fissile material to the Y-12 plant.

7. Disposal of other pit residue.

D. OPERATIONAL ENVIRONMENT

1. Administrative Area. The administrative area furnished to FT-34 site personnel was in the form of two 10- by 55-foot commercial office trailers. These trailers were well equipped with desks, telephones, files, and air conditioning. The trailers were located within the perimeter fence but were outside of Rocky Flats operational areas. Latrine facilities were available in an adjacent building, and no escort was required. The administration trailers were generally off-limits to the inspectors. The FT-34 trailer park is shown in figure C2-8.

2. Inspectors' Office Area. The FT-34 inspectors were provided office space in two 10- by 45-foot commercial office

trailers. A two-man team and a four-man team were assigned to each trailer. The trailers, which were located adjacent to the FT-34 administrative area, were well equipped with desks, chairs, tables, and air conditioning. Latrine facilities were available (without escort) in an adjacent building. The only inadequacy in equipment was the lack of electric calculators for use by the inspectors in assay calculations.

3. Operational Areas.

a. General. The operations at Rocky Flats were complicated by special security and health physics requirements. The Rocky Flats Plant has strict camera requirements, and special procedures had to be established for handling Polaroid cameras; in addition, AEC control was exercised over all exposed film. The radiation and toxicity hazards at Rocky Flats are extreme. Special clothing and equipment were required in all operational areas. A radiation check was made on each individual and his effects when he left a work area. All FT-34 personnel were required to be under escort by Dow Chemical personnel at all times within the operational areas. The inspectors were never permitted to put their hands into gloves or glove boxes (enclosed work benches). This resulted in very few operations being performed by inspectors. The areas used by FT-34 were used by Dow Chemical personnel for regular production during non-FT-34 time.

The size of all the areas in which inspection operations took place at Rocky Flats was approximately 7,500 square feet.

b. Receiving and Disassembly Area. This area was located in the northeast corner of Bldg. 77. The area used by FT-34 was separated from the operations in Bldg. 77 by canvas curtains. The Receiving and Unpacking area is similar to that in any small factory (see figure C2-9) and covered approximately 1,500 square feet. The appearance of the disassembly area, which covered approximately 2,400 square feet, may have been surprising to the FT-34 inspectors, because all operations in this area (even machine tool work), which were performed inside glove boxes, present a rather awesome

appearance to the unprepared visitor (see figure C2-10). Because of the contamination problems, hand tools (screw drivers, pliers, wrenches, etc.) not associated with FT-34 were left in the glove boxes.

c. Foundry Area. The foundry area of the Rocky Flats Plant that was utilized by FT-34 is located on the north side of Bldg. 76. The area was separated from the rest of the plant area of Bldg. 76 by canvas curtains in aisles, and kraft paper was attached to glove boxes to that visual access to unauthorized areas could not be obtained through the glove box windows. The space use for FT-34 operations was approximately 1,600 square feet. In the foundry area, as in the disassembly area, all operations on plutonium are performed in glove boxes. A general view of the foundry used by FT-34 is shown in figure C2-11. Melting plutonium and casting parts is performed in a vacuum furnace (figure C2-12) inside a large glove box. Weighing of cast ingots is performed on a balance with the sample pan inside a glove box and the weight pan outside (figure C2-13). Operational signs that would reveal information not pertinent to FT-34 were covered or removed (such signs as types of material, criticality limits, etc.).

The inspectors were again possibly overwhelmed by the appearance of the area, because it seemed radically different from areas usually associated with a "foundry."

d. Laboratory Area. The laboratory area utilized by FT-34 for the assay of plutonium is located in Bldg. 71. The FT-34 work area was in three general locations: wet chemistry area, mass spectroscopy area, and emission spectroscopy area. The total size of these work areas was approximately 2,000 square feet. Since the production quality control work of the Rocky Flats Plant is a continuous operation and the facilities were limited, the FT-34 assay operations were performed concurrently with the regular quality control. Neither FT-34 personnel nor work areas were separated from Rocky Flats personnel and work areas other than by escort. In the laboratory areas, as in the disassembly area and foundry, the majority of the work was performed in glove boxes.

Because of the contamination and corrosion problems, the interior of the glove boxes did not have a clean appearance. Figures C2-14 and C2-15 show the interior of typical glove boxes in the Assay Laboratory. The confidence of FT-34 inspectors in assay results from such apparently dirty conditions may have been lowered. The design of the glove boxes and methods of operation prevented close scrutiny of procedures by inspectors. Because of such restrictions many inspectors became rather disinterested in the assay procedures.

4. Adverse Environmental Factors and the Effect on Test Results.

a. The site preparation at Rocky Flats was not what would be expected in a "real treaty" inspection. Miscellaneous hand tools and small equipment not associated with FT-34 were not removed from glove boxes or work areas. This was an unavoidable operational problem which was so recognized by the inspectors; it had little if any effect on test results.

b. The general atmosphere of the Rocky Flats Plant, special clothing, shower requirements, radiation monitors in each operational area, all work in glove boxes, etc., no doubt had some adverse effect on the inspectors' mental attitudes and as such influenced the test results. The effect of the attitudes of inspectors on test results is assessed in annex E.

c. During nonoperational time, no adverse events were reported other than lack of personal transportation that might have affected the inspectors and their results.

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IV. PADUCAH PLANT

A. GEOGRAPHY

The Paducah Plant is an AEC-owned plant operated by the Union Carbide Company Nuclear Division under contract to the AEC. The plant is located 13.5 miles west of Paducah, Kentucky, just off Highway 60. Paducah is the metropolitan center of the Jackson Purchase area of Kentucky. It serves as the retail, wholesale, service, medical, and transportation center for much of southern Illinois, southeast Missouri, northwestern Tennessee, and western Kentucky. Activity in the surrounding area includes farming, industry, and recreation.

B. CLIMATE

The climate of the Paducah area is considered to be temperate. The area has a relatively high annual rainfall. High summer temperatures, coupled with high relative humidity, tend to make the summers rather uncomfortable.

The weather at Paducah during FT-34 operations was hot and humid with much rain.

C. FACILITY DESCRIPTION

The basic mission of the Paducah Plant is the production of enriched uranium by gaseous diffusion processes, reclamation of commercially valuable salvage material from weapon retirement programs, disposal of contaminated or classified salvage, and storage until final disposition of classified weapon components. The general layout of the plant and the areas utilized during FT-34 are shown in figure C2-16.

The following major operations were performed at the Paducah Plant for FT-34:

1. Walkthrough of the facilities by FT-34 inspectors.

2. Receipt of non-HE/nuclear material from Pantex.

3. Separation of material into salvageable categories.

4. Reclamation of aluminum and lead (smelting not witnessed by inspectors).

5. Disposal of classified and/or contaminated residue.

D. OPERATIONAL ENVIRONMENT

1. Administrative Area. A special administrative area was provided for the FT-34 Site Commander operations at Paducah. One end of Rm. 222, Bldg. C-100, was partitioned off for use of the Site Commander and the Test Controllers. The administrative functions for the Site Commander were performed by the Test Headquarters staff. The total administrative area use for FT-34 was approximately 2,600 square feet.

2. Inspectors' Office Space. The FT-34 inspectors were provided office space and facilities in Rm. 205, Bldg. C-100, of the Paducah Plant. Room 205 was subdivided into four separate areas, one for each team. The partitions were ceiling height. The total area of the inspectors' rooms was approximately 800 square feet.

3. Operational Areas. The FT-34 inspection area in Bldg. 746A was modified by constructing a black vinyl cloth wall inside the building and two barbed wire fences outside the building. This modification permitted FT-34 personnel inside the building in compliance with plant security requirements. The building included a foundry and an area for displaying components. Figures C2-17, C2-18, C2-19, and C2-20 show the FT-34 area in and around Bldg. 746. The total area of the foundry and the portion of the warehouse set aside for FT-34 operations was approximately 14,000 square feet. The secure area where some obsolete classified components were buried was adjacent to Bldg. 746.

Access to the inspection area was by an exterior perimeter road which circled the plant at a distance of about 4 miles until it reached the entrance of Bldg. 746; a gate was located in the perimeter fence 200 feet from the building.

4. Adverse Environmental Factors and Effect on Test Results. No specific adverse environmental factors were reported during the FT-34 inspection operations at Paducah. The event that the inspectors were most critical of was that of the disposal of classified material by burial in the ground. This was the actual burial of some classified components and a normal operation at Paducah. Inspectors believed this would not be a realistic manner in which to dispose of components of destroyed weapons for an international treaty.

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V. OAK RIDGE PLANT

A. GEOGRAPHY

The Y-12 Plant of the Oak Ridge complex is an AEC-owned plant operated by the Union Carbide Corporation Nuclear Division under contract to the AEC. The Y-12 Plant is located on Bear Creek Road approximately 3 miles from the city of Oak Ridge. Oak Ridge itself is a semiremote area located about 20 miles from Knoxville, Tennessee; it has a population of 30,000. The area, which is extremely hilly with small, flat valleys between tree-covered ridges, is very typical of the mountain area of eastern Tennessee. All of the roads in the immediate area are surfaced.

B. CLIMATE

The climate of the Oak Ridge area is considered to be temperate. The area has a relatively high annual rainfall. High summer temperatures and relatively high humidity tend to make the summers rather uncomfortable. Most buildings and residences are equipped with mechanical air conditioning.

The weather of Oak Ridge during FT-34 operations was typical for the area.

C. FACILITY DESCRIPTION

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The basic missions of the Y-12 Plant are the fabrication of nuclear and thermonuclear portions of weapons using enriched U-235, the production and fabrication of lithium compounds for weapons use, the reclamation and reworking of parts from retired weapons, and the assay of material for product control. The general layout of the Y-12 Plant and the areas utilized by FT-34 are shown in figure C2-21.

The following major operations were performed at the Y-12 Plant for FT-34:

1. Walkthrough of the facilities by FT-34 inspectors.

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2. Receipt of material from Pantex and Rocky Flats.

3. Disassembly of material received into components of enriched uranium, depleted uranium, lithium compounds, and residue parts (not witnessed by inspectors).

4. Decontamination of nonfissile material.

5. Melting and casting of uranium parts into ingots (not witnessed by inspectors).

6. Sampling and assay of cast ingots of enriched and depleted uranium.

7. Disposal of residue other than enriched uranium from weapon materials presented.

8. Test of evasion assay conducted on sample material from sources other than FT-34 weapon-derived material.

9. A contractor's assay conducted by Oak Ridge employees on sample materials from sources other than FT-34 weapon-derived material.

D. OPERATIONAL ENVIRONMENT

1. Administrative Area. An office area was provided for administration, support, and test control on the third floor of Bldg. 9204-4. The building is located close to the Bear Creek Portal; inspectors and site personnel were permitted unescorted access to the area. The area was equipped with appropriate office equipment, supplies, and services. The arrangement of the entire office area, which covered approximately 2,500 square feet, is shown in figure C2-22.

2. Inspectors' Office Area. The FT-34 inspectors were provided office space, equipment, and services on the third floor of Bldg. 9204-4 immediately across the hall from the test site headquarters. This space covered an area of approximately 1,600 square feet.

3. Operational Areas.

a. General. FT-34 inspection operations were conducted in the disassembly area, Bldg. 9998; foundry, Bldg. 9212; and assay laboratory, Bldg. 9995. The disassembly and foundry areas were modified by construction of screens and curtains so that FT-34 personnel did not have access to unneeded (and possibly confusing) classified information. The size of the areas used by FT-34 operations totaled approximately 13,000 square feet.

b. Disassembly Area. The layout of the disassembly area utilized by FT-34 is shown in figure C2-23. All tools and equipment used in the disassembly of FT-34 material were displayed for inspectors. Figures C2-24, C2-25, and C2-26 show typical tools, equipment, and work areas used for disassembly. The area set aside for FT-34 inspection operations was approximately 6,000 square feet.

c. Foundry and Sample Preparation Areas. The layout for the foundry area utilized by FT-34 during this exercise is shown in figure C2-27. All tools and equipment were displayed for the inspectors. This area was curtained so that inspectors could have access to the top and bottom of the furnace area (figures C2-28 and C2-29) and to the sample preparation area. FT-34 inspectors had access to approximately 4,500 square feet in the foundry and sample drilling area. The FT-34 main test inspectors were required to prepare and control their own samples.

d. Assay Laboratory. The layout of the laboratory and the areas utilized by FT-34 are shown in figure C2-30. The inspectors were permitted free access in the laboratory areas with which they were concerned. Normal plant operations continued during FT-34 operations. The total size of the portions of the laboratory used by FT-34 inspectors was approximately 2,500 square feet.

The general laboratory presented an extreme contrast to the Rocky Flats laboratory (figures C2-31 and C2-32). The Y-12 Plant does not have near the contamination

or toxicity problems that exist at Rocky Flats; therefore, the work areas had a much cleaner appearance.

4. Adverse Environmental Factors and Effect on Test Results. No particular adverse environmental effect was reported in the Oak Ridge operations of FT-34. As shown in annex E, inspectors generally found their work at Oak Ridge more gratifying than at other sites.

VI. EVALUATION OF ENVIRONMENT

A. GENERAL

Because of the lack of a single facility in which the demonstrated destruction of nuclear weapons could be tested inspectors were subjected to an environment and problems which would not have been present had the test been conducted at one location. Constant traveling by inspectors as they moved from one inspection site to the next, working with new people and new procedures at each site, and performing inspections "piecemeal" affected inspectors' attitudes and sense of accomplishment. There was no significant effect on test results, however, as discussed in annex E.

B. EFFECTS OF ENVIRONMENT

1. Operations. The concept of inspecting a demonstration of the destruction of nuclear weapons in a single facility envisions a definite sequence of operations - viz., inspectors would first inspect the facility with no weapons present; weapons to be destroyed would be presented for inspection in batches; weapons would be disassembled; then inspectors would assay the fissionable material obtained from the weapons and observe the disposition of the remaining weapons components. Finally, inspectors would again inspect the facility, and another batch of weapons would be presented for inspection.

This general sequence of operations was followed during FT-34 by observing pertinent operations at each site. Of necessity, however, there was some loss of continuity and much overlap in some operations. For test purposes inspectors monitored the processing of two batches of weapons. To reduce movement of personnel as much as possible all operations associated with destroying both batches of weapons at each site were conducted before inspectors moved to the next site. This, plus the movements of inspectors, caused some confusion to inspectors when trying to associate components seen at Rocky Flats, Paducah, or Oak Ridge with weapons originally inspected at Pantex. Perhaps more confusing were the walk-through inspections of the operational facilities at each site.

At a single facility, for two batches of weapons, inspectors would perform three inspections of the processing areas: one prior to the disassembly of the first batch, one following the processing of those weapons, and one following the processing of weapons of the second batch. For FT-34 12 such walkthrough inspections were required for each inspection team, three at each of the four sites. It was difficult for some inspectors to appreciate that these 12 walkthrough inspections were actually only three.

The FT-34 environment also caused the assay of fissionable material to be considerably different from that in a single facility. Not only were the Rocky Flats laboratory and the Oak Ridge laboratory quite different in layout, analysis procedures, and operational restrictions, but the assay of plutonium (at Rocky Flats) and the assay of uranium (at Oak Ridge) were separated in time by the disposition of nonnuclear components (at Paducah).

2. Administration and Support. Organizations and procedures for administration, support, and test control were standardized as much as possible at all sites. Each of these AEC plants, however, had different missions, and the four plants were operated by three different companies. Although basic AEC security and safety rules were followed at all plants, each had different procedures with which inspectors were required to conform. Identification badging, escort requirements, safety procedures, areas of access, administrative office areas, hours of operation, etc. were different at each plant. For example, movements of inspectors to, within, and from operational areas at Rocky Flats required constant escort. At Paducah inspectors were not permitted within the plant area and could travel unescorted directly to the warehouse where inspections were conducted.

In addition to being confronted with different administrative environments at each plant, repeated packing, traveling, and occupying different quarters while meeting a tight inspection schedule was a burden on inspectors. During their tours of duty of approximately 12 weeks, all inspectors moved four times and many moved five times in addition to

traveling from and returning to their home stations. This not only affected inspector morale, it also increased the cost of the test.

The cost of the test was increased further by the requirement to staff and support four sites instead of one for administering and controlling inspection operations. An organization recommended for administering and supporting an FT-34 type field test in a single facility would require approximately 20 personnel, as discussed in annex A, whereas the FT-34 test required three times as many.

3. Effects on Test. Annex E discusses uncontrolled variables such as inspector attitude. The attitude of inspectors was certainly affected by the changing operational environments of the test. There is no evidence, however, that the environment had any significant effect on the test results. Inconvenience to personnel and increased costs were the main effects of the differing environments on the test.

C. POSSIBLE ENVIRONMENTAL CHANGES

The cost of a field test such as FT-34, the number of personnel required to administer the test, and inconvenience to inspectors could be reduced significantly by reducing the number of test sites. This might be done by eliminating unnecessary operations or by combining operations at one or more sites.

1. Eliminating Sites. The primary objectives of FT-34 were to determine the amount of classified information revealed when demonstrating the destruction of nuclear weapons and to determine the credibility of the demonstration. To investigate these areas thoroughly all operations associated with the normal U.S. nuclear weapons retirement program were investigated where practicable; this led to inspections at four sites. The key areas of interest for inspecting a demonstration of the destruction of weapons are inspection of the weapons, assay of fissionable material, and monitoring the disposition of nonnuclear components.

a. Because of the strenuous safety considerations at Rocky Flats inspectors, irrespective of assigned access levels, were not allowed to perform the assay of plutonium. Conversely, inspectors assigned high access were permitted to perform all operations associated with the assay of uranium at Oak Ridge. It cannot be concluded, however, that operations tested at Rocky Flats should be eliminated from a field test such as FT-34.

Two important findings resulted from FT-34 operations at Rocky Flats. First, classified information was detected. Second, much effort was put into considering and planning evasion schemes. (These findings are discussed in annex D.) Some of these schemes were similar to those considered for uranium assay, but some were unique to plutonium assay. Significant information on access level, the most important variable of the field test, did not result from FT-34 operations at Rocky Flats. For example, classified information exposed did not vary with access. The information on classified information exposed and evasion schemes could have been obtained by a study group instead of by inspections as was the case for FT-34. The test could have been modified, therefore, by eliminating inspection operations at Rocky Flats and by forming a group of professional personnel to consider classified information and evasion.

b. At all sites other than Rocky Flats, sufficient information was gathered to assess the effects of access level. This was most evident at Pantex and at Oak Ridge where the principal inspection activities took place - that is, the initial inspection of complete weapons and the assay of uranium. These key operations should not be eliminated from a field test such as FT-34.

c. There may be some consideration, however, for eliminating inspection operations at Paducah. It could be argued that the manner in which nonnuclear components are normally disposed of at Paducah, and as inspected during FT-34, may not be the manner in which these components would be disposed of as required by a treaty. Yet, at Paducah different numbers of items of classified information were detected by inspectors at different access levels, and a major

portion of the weight of weapons destroyed was accounted for. These are significant considerations and should not be eliminated from a field test.

2. Combining Operations. An ideal inspection situation would be to combine all inspection operations at one site. This, however, would require extensive modifications of some existing AEC plant or construction of a new facility. These alternatives were discussed early in the planning of FT-34 but were quickly ruled out because of the great expense involved. A more practicable approach might be to combine similar operations - such as, the assay of plutonium and uranium or the disassembly of weapons and the disposition of nonnuclear components.

a. The laboratories at Rocky Flats and Oak Ridge, where plutonium and uranium are assayed respectively, are elaborate and expensive facilities. Safety precautions for handling and assaying plutonium are considerably greater than for uranium - e.g., all operations where plutonium is exposed must be conducted within enclosed work areas (glove boxes). Accordingly, the two laboratories are considerably different in design. Analysis of both fissionable materials in either laboratory would require extensive modification. This also applies to disassembly areas where plutonium and uranium assemblies from weapons are broken down and prepared for analysis. It would be impracticable to modify either laboratory for assaying both materials with resources on the order of those provided for FT-34.

b. The Paducah Plant does not have facilities for disassembling weapons, handling fissionable material components, handling high explosives, or burning high explosives. The cost of modifying the Paducah Plant to provide such capabilities would be great. It may be possible, however, to inspect the disposition of nonnuclear material at Pantex rather than at Paducah. Although the Pantex Plant has no facilities for smelting aluminum and lead components, all other operations included in the FT-34 test at Paducah could be performed at Pantex. The principal operations were weighing the nonnuclear components and displaying them for

inspection at different access levels. The burying of some classified components, at least temporarily, could be performed at Pantex, although this is not considered to be a realistic manner of disposing of components in a treaty situation. A better approach, which could be accomplished at Pantex, would be to package all nonnuclear and nonburnable material under inspector scrutiny and simulate its final disposition - perhaps by assuming it would be buried at sea.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. Geography. The fact that FT-34 was conducted at four widely separated facilities no doubt affected the test results by influencing the attitudes and morale of the inspectors. Although the separation of the facilities was necessitated by the processes involved in the destruction of nuclear weapons, the inspectors could not really associate the fissionable material at Oak Ridge and Rocky Flats with weapon shapes monitored at Pantex. Some association could be made between Paducah material and Pantex shapes, but it was difficult to associate this material with the specific batches of shapes inspected at Pantex.

The separation of facilities also caused a loss of a great deal of the continuity that would be present in a single facility. The inspectors did not seem to relate the walkthroughs as being performed at a "single facility."

The inspectors were "on the road" for a period of about 12 weeks. This constant packing, traveling, and unpacking as well as the absence from the "family circle" had an effect on morale.

2. Climate. In that FT-34 was conducted during the summer months in a temperate climate, there was no noticeable effect of climate on test results except early during the test at Pantex. At that location a hot and humid atmosphere in the weapon monitoring area caused physical discomfort to test personnel and improper functioning of the gamma spectrometer. This situation was alleviated by air conditioning.

3. Facility and Operational Environment. The environment associated with the facility and operation for FT-34 can be described by the term "exclusion": special badges were issued, work areas were partitioned off from other areas, site employees would not freely communicate with inspectors, special escorts were required in certain areas, and special travel routes were employed. These limitations and

restrictions, established by AEC Security on a "need to know" basis, and the health physics emphasis at each site tended to create a feeling of hostility in the inspectors. The limitations may seem to be extreme; however, they are the same that would be imposed on any visitor to the sites (regardless of type of clearance). The effect on the inspectors was generally to increase their suspicion of all operations. This effect was probably felt more at Rocky Flats where restrictions were the greatest and the actual inspection operations the most unfamiliar to the inspectors.

Other minor operational problems, such as would be expected on a first-time-type test, were quickly resolved; without a noticeable effect on test results.

B. RECOMMENDATIONS

1. If resources are available a single facility should be prepared for a field test such as FT-34. In any event the inspection operations could be limited to two sites: Pantex, or some other similar AEC facility, and the Y-12 Plant at Oak Ridge. Along with inspection operations a study should be made at the Rocky Flats plant on all pertinent matters concerning the recovery and assay of plutonium. This study should investigate evasion possibilities when assaying plutonium and determine what classified information might be compromised.

Pantex and Y-12 would provide all of the facilities necessary for a test of procedures for the actual treaty proposal. Weapon monitoring, disassembly, and disposal of nonnuclear material would be performed at a Pantex-like facility. Casting and assay of enriched uranium would be performed at Y-12.

By limiting the number of sites and simplifing the test procedures, a great deal more test continuity could be maintained. In addition, the number of personnel required to administer and control the test and the overall cost of the test could be reduced.

2. Most operations associated with processing nuclear weapons are conducted in a controlled environment, and it is assumed that such would be the case in any future test of the destruction of nuclear weapons. Special care should be taken, however, to provide the necessary atmospheric environment for proper functioning of all electronic equipment used in the test and for efficient operation of test personnel.

3. Security and personnel control procedures should be employed only as necessary and standardized where practicable. Test personnel should be made aware of the reasons for any restrictions on their operations. This was done during FT-34, but personnel reactions to various restrictions emphasized the necessity for close attention to this problem.

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FINAL REPORT

FIELD TEST FT-34

ANNEX C

APPENDIX C1

SAMPLE OF
RESTRICTIONS ON PERSONNEL (U)

SEPTEMBER 1968

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UNION CARBIDE CORPORATION
NUCLEAR DIVISION
P. O. BOX 1410, PADUCAH, KENTUCKY 42002

ORIENTATION FOR PERSONNEL OF CLOUD GAP-34
APPROVED FOR ACCESS AUTHORIZATION TO THE
PADUCAH PLANT

APRIL 10, 1967

For your information and guidance, the following information has been furnished our employees pertaining to your access authorization:

PLANT BULLETIN

TO: All Employees

SUBJECT: Badges for Cloud Gap Personnel

Personnel of Cloud Gap-34 working within the plant security area will be issued a metered-type badge similar to those issued Carbide employees except these badges will be provided with a green border. Admission and exit of all Cloud Gap personnel will be through the Guard Post in the C-100 Building.

Persons issued the above type badge will be authorized access in Buildings C-100, C-101, and C-102 only. Access to and in the furnace area (Building C-746A) will be permitted such individuals by a route outside the perimeter fence provided they are under the escort of authorized personnel designated for this purpose. Cloud Gap-34 personnel will not have access to any gaseous diffusion information but will be restricted to information needed for their mission.

Signed By: R. A. Winkel
Paducah Plant Superintendent

RAWinkel

Distribution: * A & B

* A - To all supervisors
B - Posted on all bulletin boards

CONFIDENTIAL

C1-3

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A supplemental badge system is required for admittance to the Paducah Plant area. Upon entering the security area, the Guard is required to obtain positive identification at the point of entry. The individual is required to present either a Paducah Plant picture badge, or other positive means of identification. Admittance to the area will be on a loan badge basis until photographic badges have been made. The Guard is required to determine from a cardex that entry to the area is authorized, then a positive identification is required at this time.

The Guard will then issue a loaned meter badge and a loaned slip-under badge, or if you have been issued a loaned meter badge, he will issue a loaned slip-under badge. The loaned meter badge may be retained as a take-home badge until a picture take-home badge is issued. The slip-under badge, either loan or picture, must be turned in at the Guard Post on exiting from the area.

The badges which you are issued by the Guard authorizes you access in Buildings C-100, C-101, and C-102, as necessary to perform your duties. Authorized access to Building C-746A area is restricted to escort by Carbide representatives approved by the AEC Area Manager.

If a badge is lost or left at home, the Guard will make a determination from Post instructions as to your eligibility to enter the area. He will then issue the appropriate badge in lieu of the lost or left at home badge. Badges lost should be reported to our security office.

The C-100 Building is the Administration Building. The C-101 Building is the Cafeteria reached by a corridor on the west side of the C-100 Building. The C-102 Building is the Medical Building reached via the corridor on the east side of the C-100 Building. The layout of the building is shown on an attachment.

All admittance and exits to this administrative security area by Cloud Gap-34 personnel will be made via the south Guard Post on the first floor of Building C-100. This Guard Post will be open 7 a.m. - 4:15 p.m. during the normal plant work week. You are required to wear both your slip-under and take-home badge in a visible position on your outer clothing at all times when in this area.

Admittance and exit to Building C-746A will be as follows:

1. The green border meter take-home badge which has been issued to you from the Guard Post, C-100 Building, must be retained by you.

2. The route to the Guard Post Control for the Building C-746A will be directed by Carbide representatives until such time as the Cloud Gap-34 group becomes familiar with the routing. After the route is learned, it is expected that the Cloud Gap-34 group will make the trip to and from this entrance point without escort.

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3. The Guard Control Point will be manned during the normal work hours (unless specifically established for other hours as provided below).

4. Cloud Gap-34 personnel will show their take-home meter badge (either with picture or loan-type for admittance). The guard will determine that proper escorting is provided and admit.

5. You are required to wear your meter badge at all times when in this area.

6. The badge will again be shown as exit is made via the Guard Post.

The normal working hours of the Plant are from 7:30 a.m. - 4 p.m., Monday through Friday. The following days are observed as holidays for the remainder of this calendar year:

Memorial Day, observed May 29
Independence Day, July 4
Labor Day, September 4
Thanksgiving Day, November 23
Christmas Day, December 25

During other than regular work hours, admittance or an extension of the established work hours by the Cloud Gap-34 group requires that prior arrangements be made as follows:

1. The supervisor in charge of the group will contact via telephone, the Plant Shift Superintendent (Telephone No. 211) requesting the deviation in work schedule. Such request should be made as far in advance as possible. At the time of such request a listing of personnel involved will be provided the shift superintendent.

2. The shift superintendent will make the necessary arrangements to provide guard services. The guard will permit authorized access and exits. He will be stationed in the immediate corridor area during these off regular hour activities.

In the Cafeteria (Building C-101), breakfast is served between the hours of 7 a.m. - 7:30 a.m.; lunch, between the hours of 11 a.m. - 12:30 p.m. during the normal work week.

Dispensary services are provided during the normal work week by Dr. R. H. Rucker and his staff, Telephone No. 266 (Building C-102). Ambulance service will be provided by calling Telephone No. 333 at any time.

Scheduling the use of the Chart Room in the C-100 Building should be through Mr. Winkel's office, Telephone No. 301.

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Scheduling the use of the Auditorium in the C-100 Building, should be through the Training Office, Telephone No. 369.

The Paducah Plant Safety program places the responsibility for the safety of activities and personnel involved on the supervisor in charge of each activity. A staff of safety specialists is provided for consultation and assistance. They can be reached at Telephone No. 286.

Slip-under badges have the emergency signals and the action to be taken on the reverse side. Please review these instructions. Emergency telephone numbers have been placed on the front of your telephone set.

Emergency activities are under the direction of the Plant Shift Superintendent who will issue additional instructions as required.

Electronic communication (including our private automatic telephone exchange) within the Plant other than Bell Telephone is restricted to AEC and Carbide employee use.

Our Guard force will check your office after hours to determine that all your classified material is secured in a locked repository.

Please furnish our Security group the name of your representative to be contacted on matters pertaining to security within our area.

All of you have an active security access authorization. Our access authorization, as yours, is limited to classified information which is necessary in the performance of our official duties.

FINAL REPORT - VOLUME II
FIELD TEST FT-34

DEMONSTRATED DESTRUCTION OF NUCLEAR WEAPONS (U)

SEPTEMBER 1968

The Field Operations of the Weapons Evaluation and Control Bureau assumes overall responsibility for the development of this document. The Sandia Corporation, under a Working Arrangement with the U.S. Atomic Energy Commission, contributed to its contents.

This document reports on part of a broad program of research on inspection and verification and does not necessarily express a U.S. position.

The Final Report on FT-34 has been prepared in three volumes. Volume I is a summary report of the test; volumes II and III are a compilation of six annexes containing more detailed treatments of the same material.

Prepared By

FIELD OPERATIONS
WEAPONS EVALUATION AND CONTROL BUREAU
UNITED STATES ARMS CONTROL AND DISARMAMENT AGENCY

RESTRICTED DATA

GROUP 1
Excluded from automatic

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FINAL REPORT

FIELD TEST FT-34

ANNEX C

APPENDIX C2

MAPS AND PICTURES OF INSPECTION AREAS (U)

SEPTEMBER 1968

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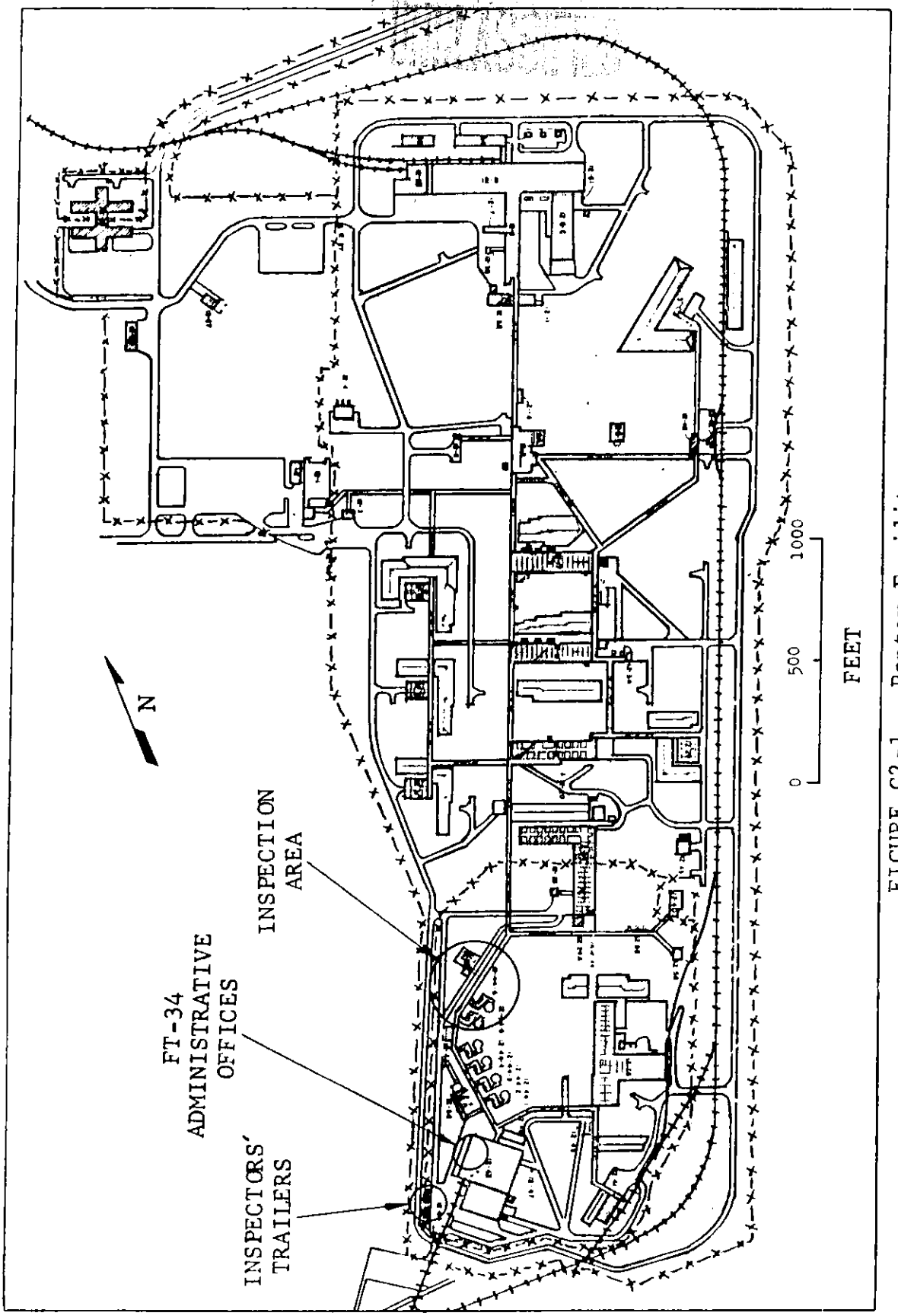

FIGURE C2-1. Pantex Facility

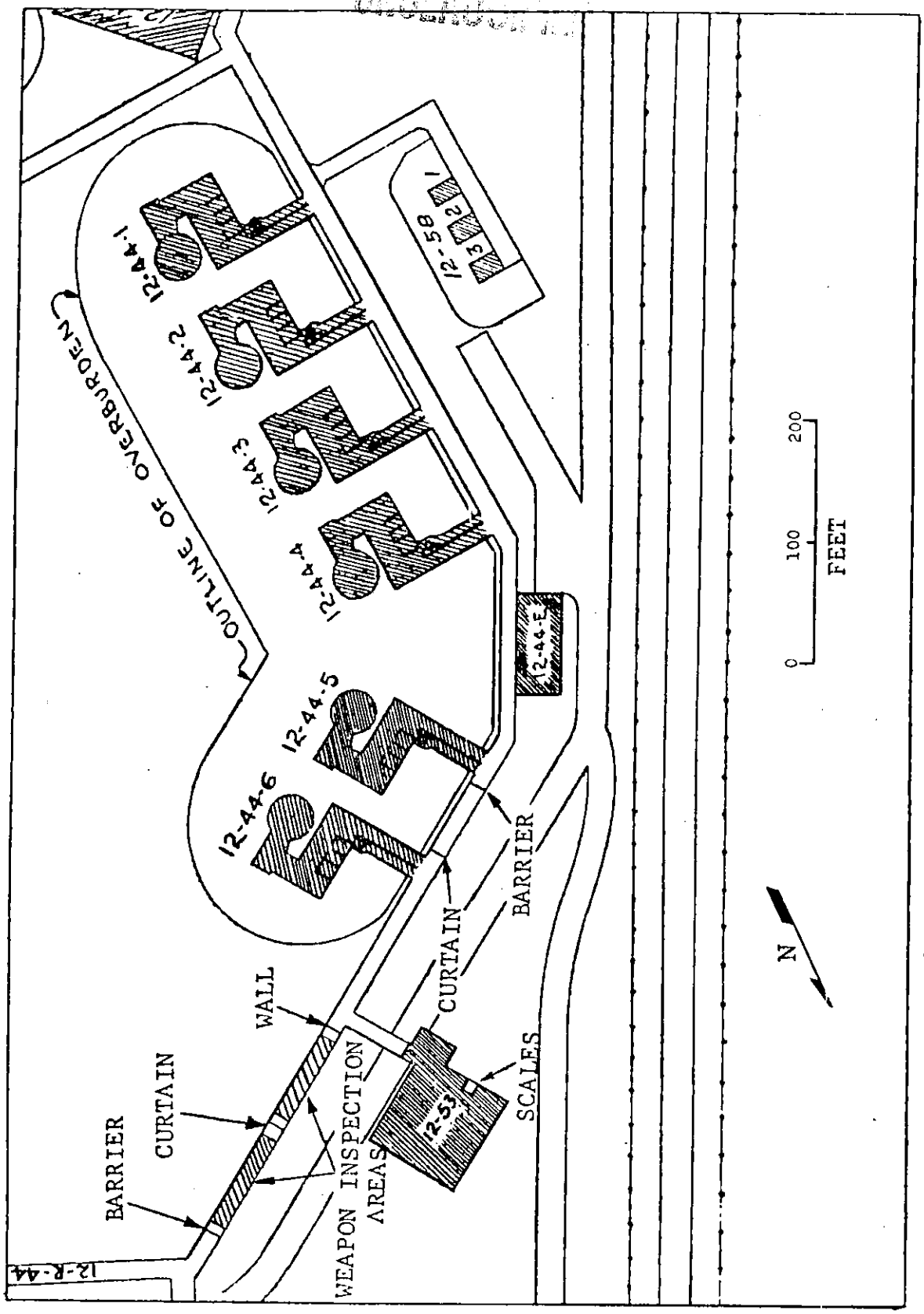

FIGURE C2-2. Inspection Area at Pantex

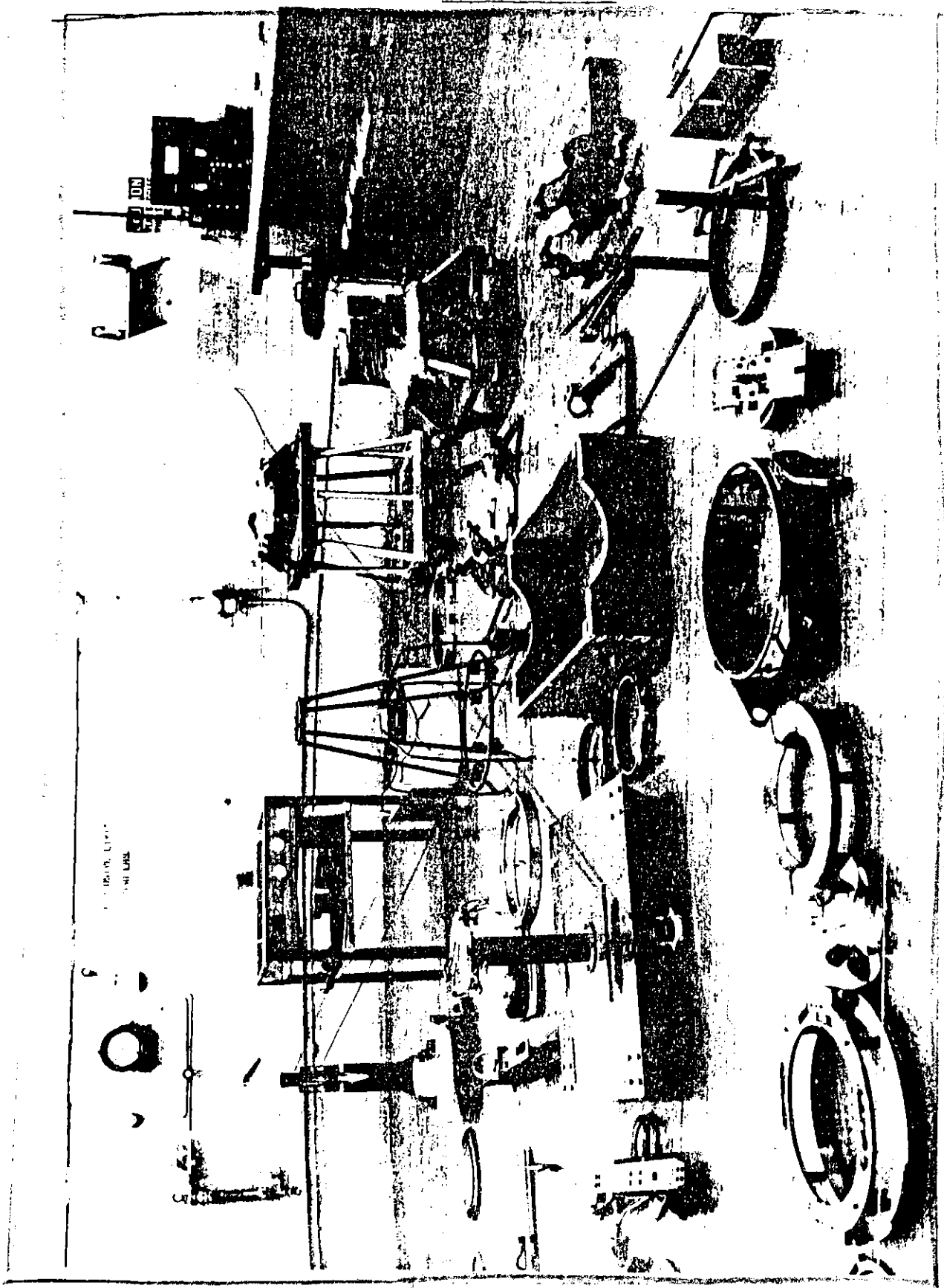

FIGURE C2-3. Typical Disassembly Tools Used at Pantex

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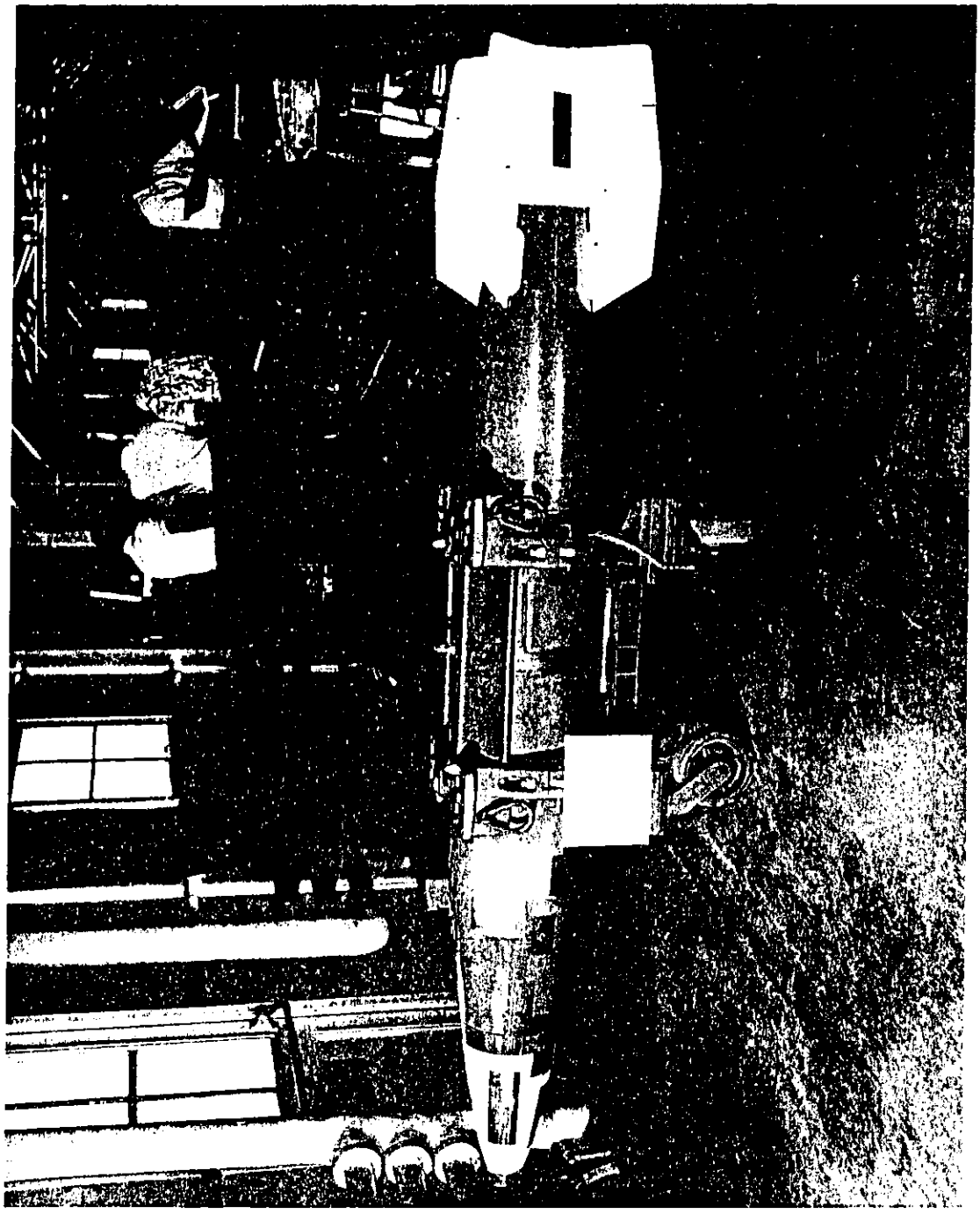

FIGURE C2-4. Weapon Introduction Area At Pantex

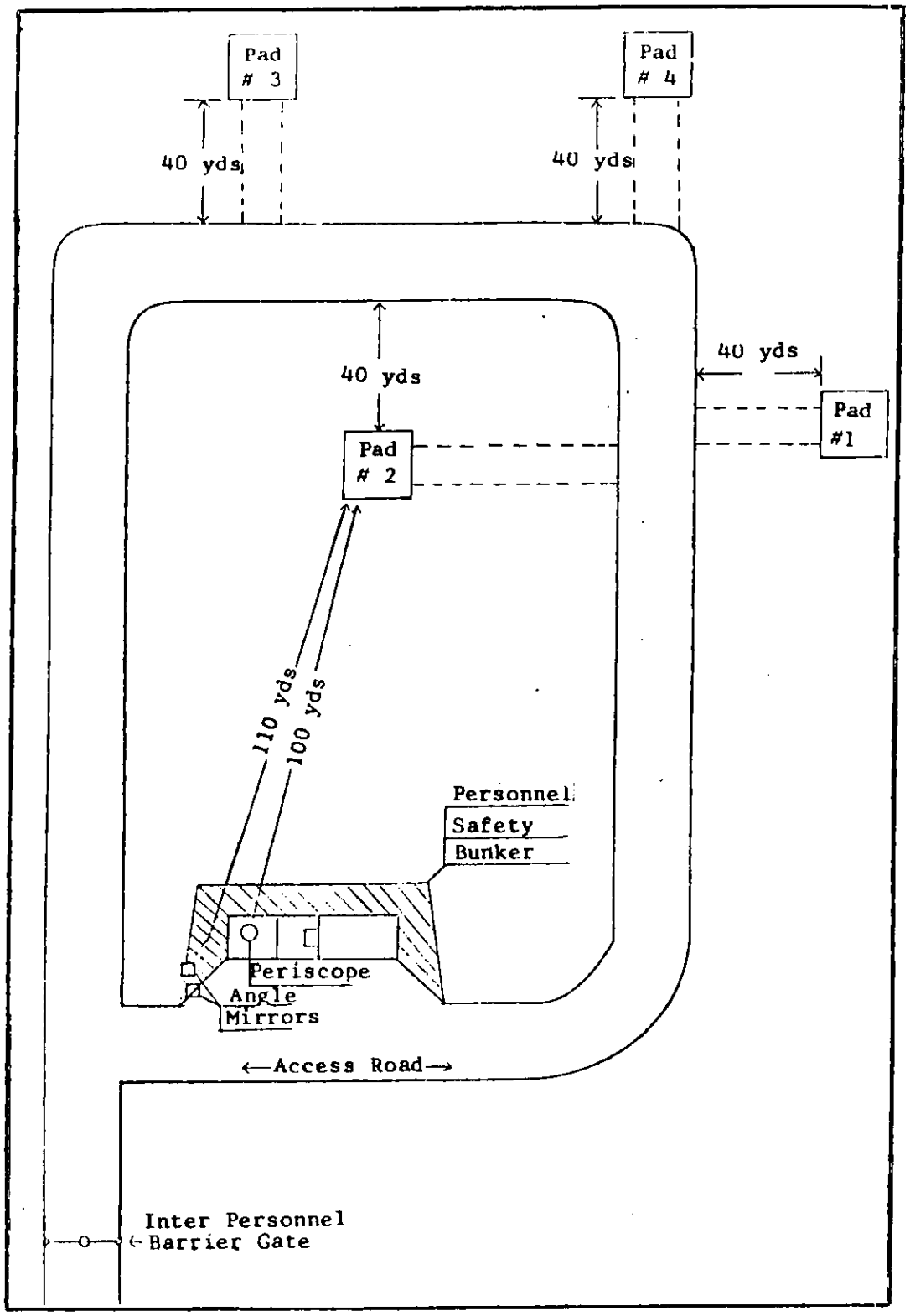

FIGURE C2-5. Pantex Burn Area

FIGURE C2-6. Burning Pad After Burning FT-34 Material

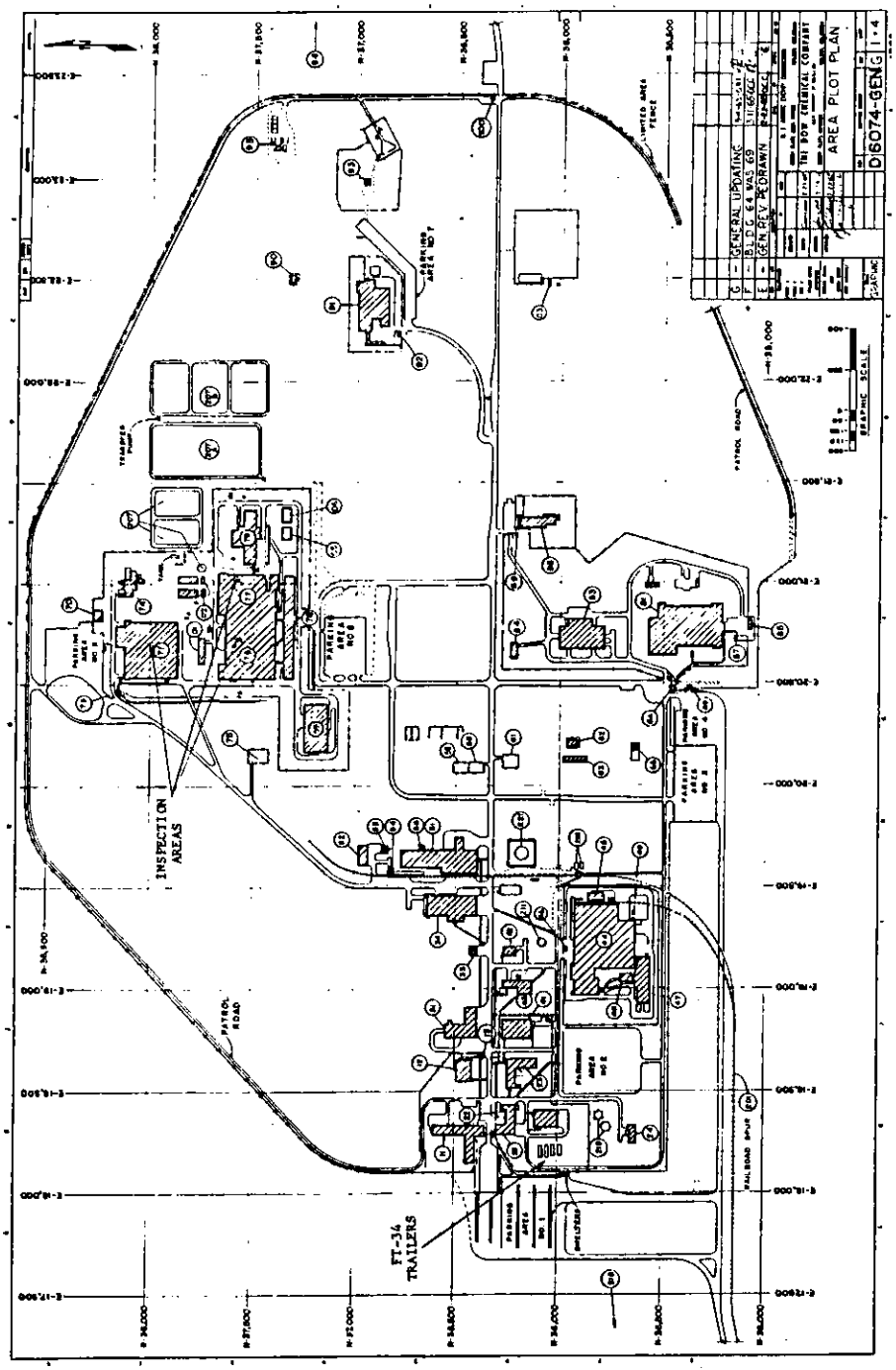

FIGURE C2-7. Rocky Flats Facility

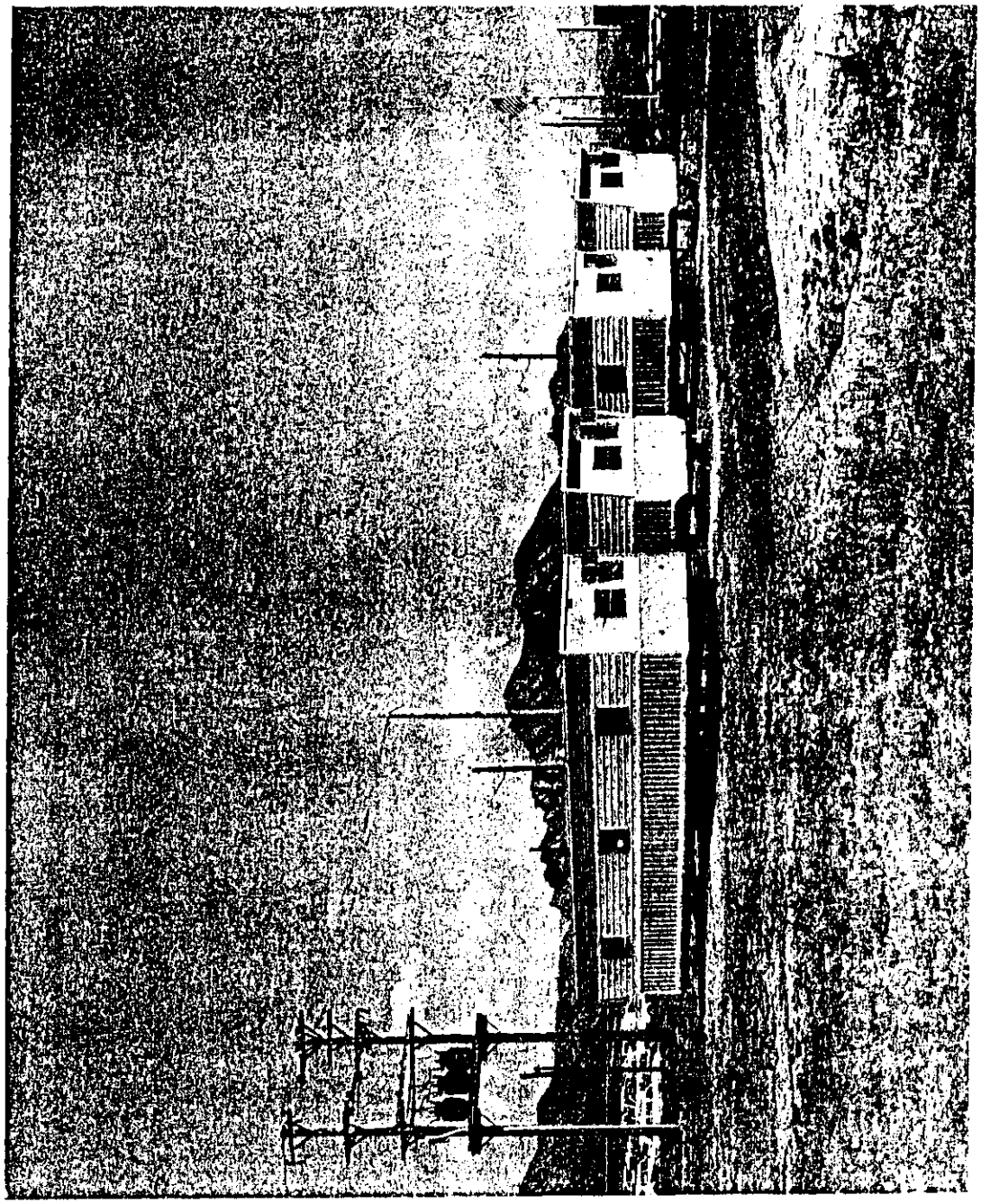

FIGURE C2-8. Administration and Inspectorate Trailer Park at Rocky Flats

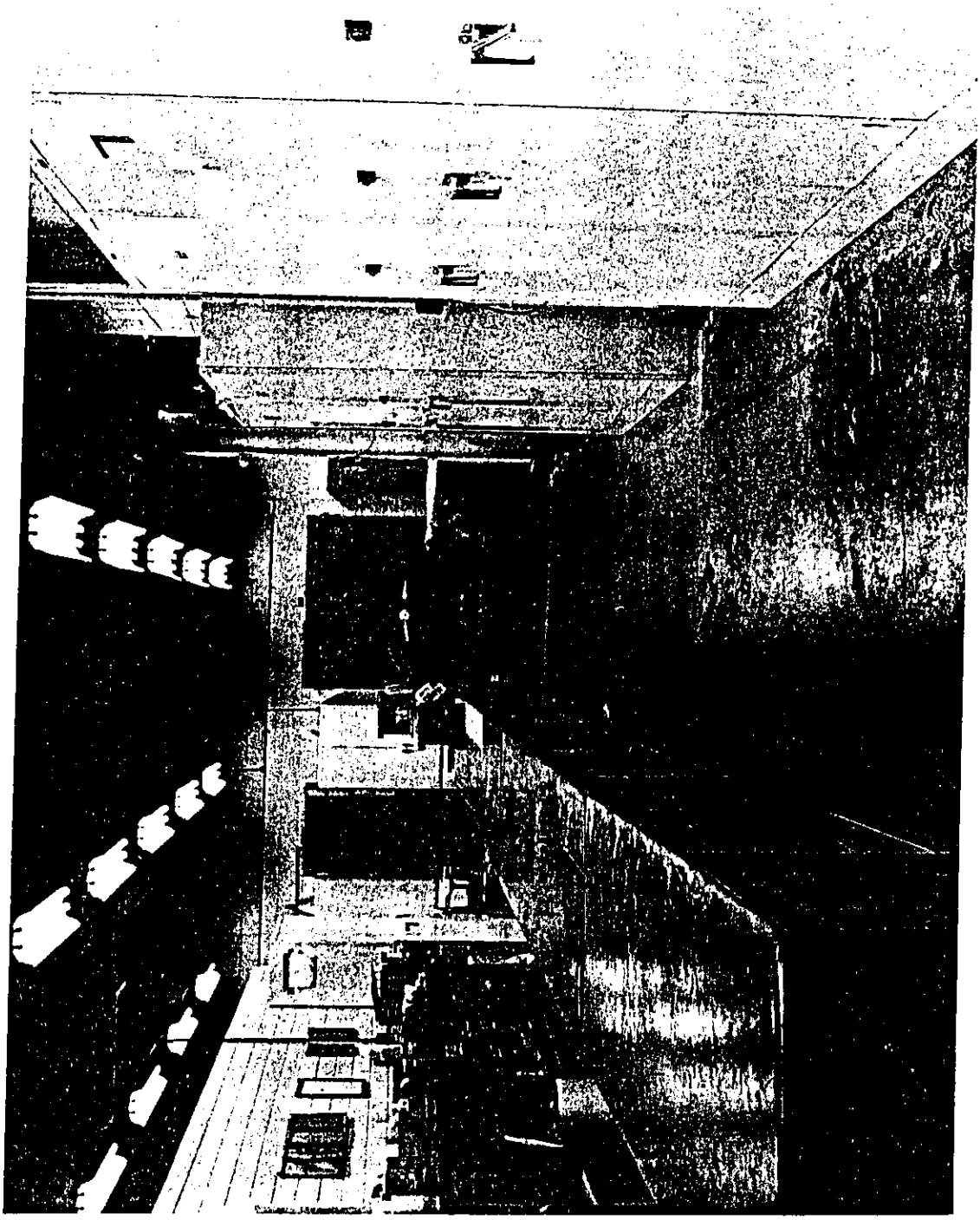

FIGURE C2-9. Receiving and Unpacking Area at Rocky Flats

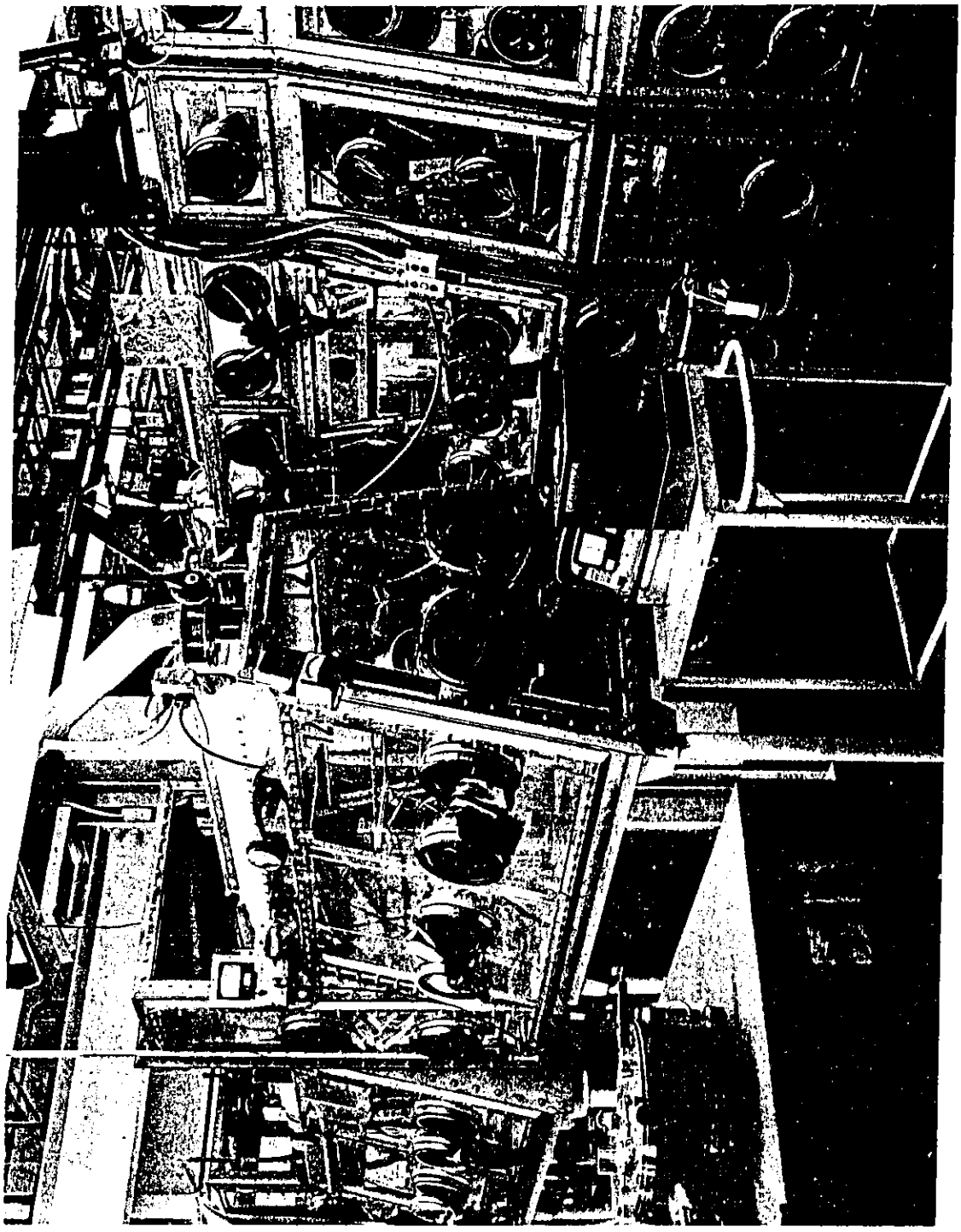

FIGURE C2-10. Disassembly Area at Rocky Flats

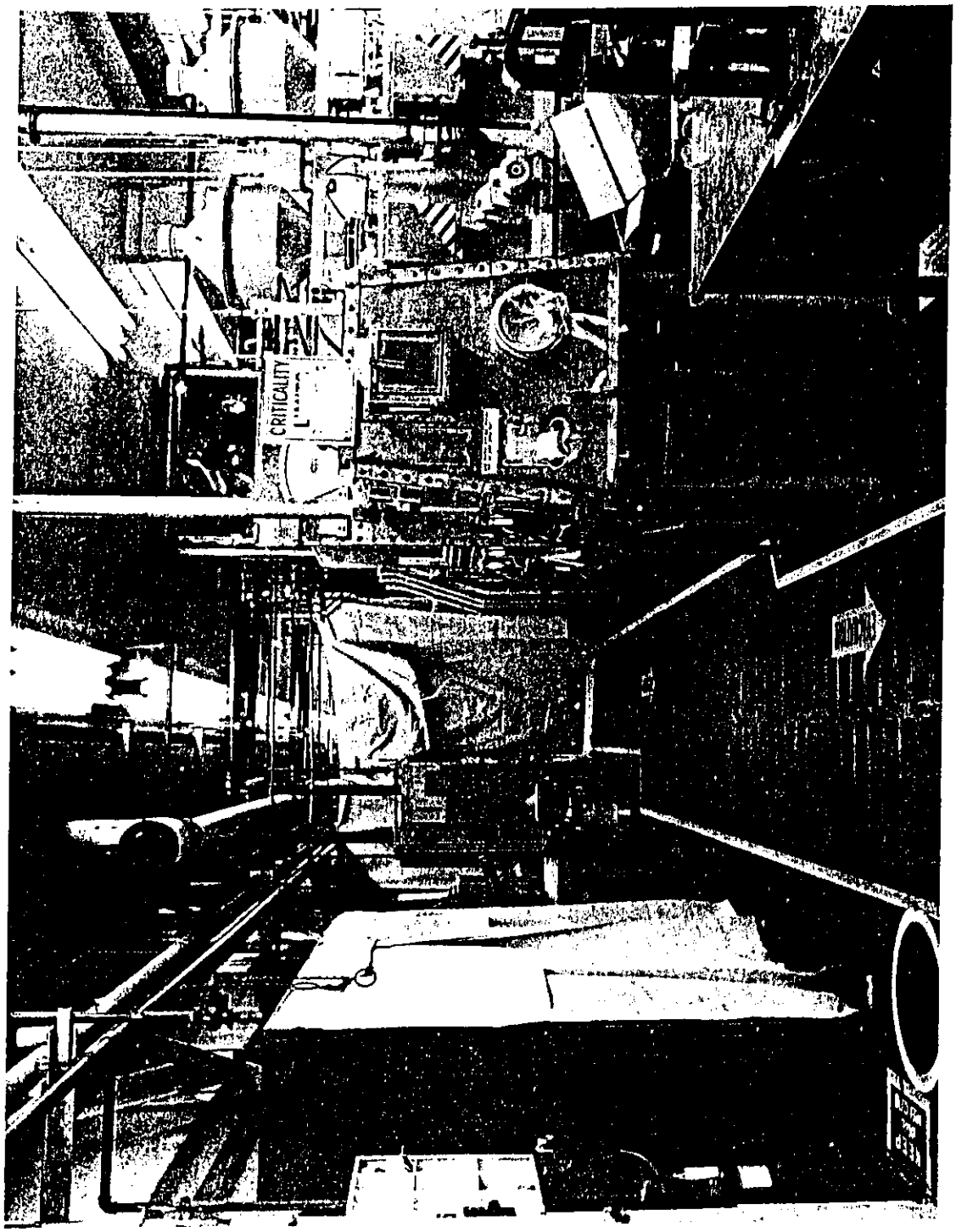

FIGURE C2-11. General View of Foundry Area at Rocky Flats

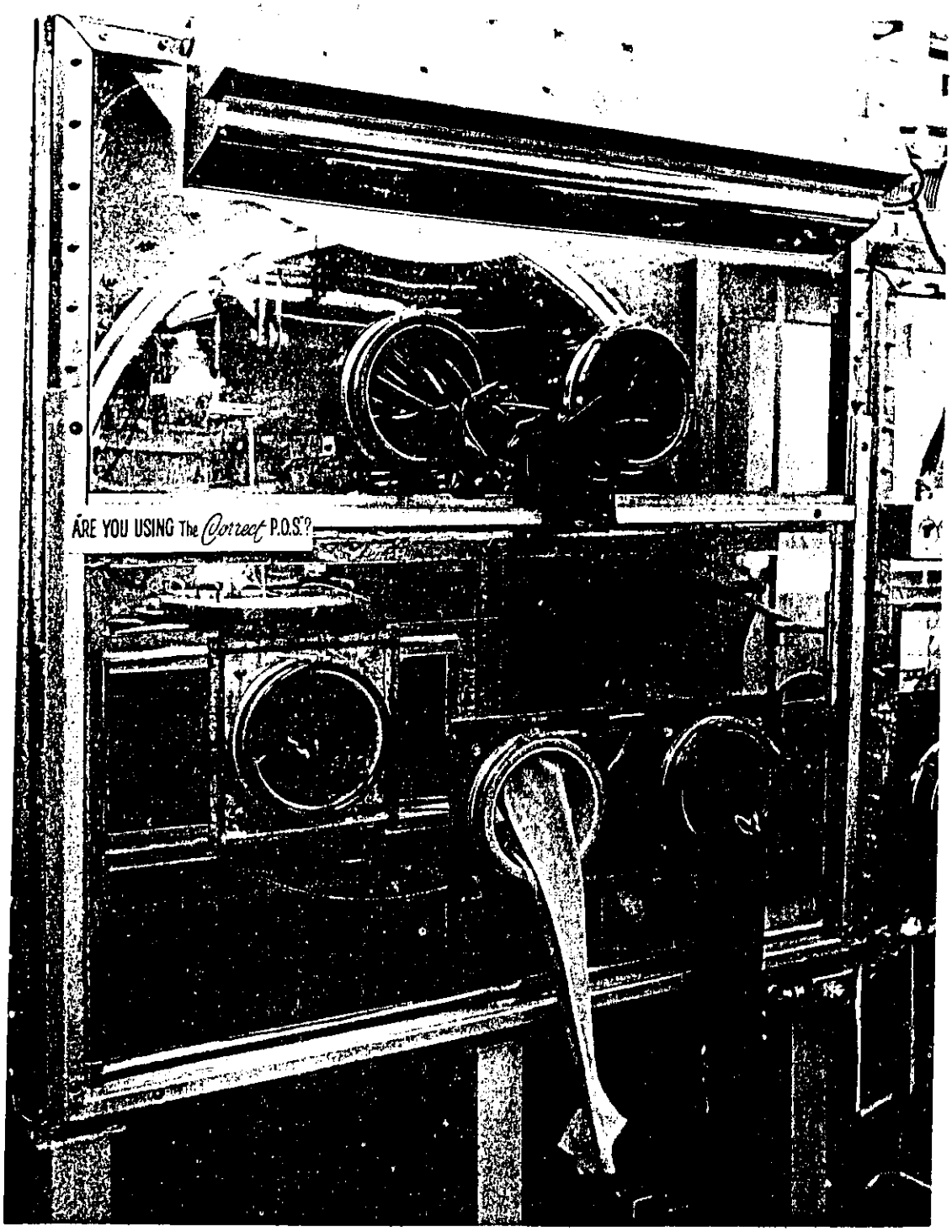

FIGURE C2-12. Vacuum Furnace for Casting Plutonium Ingots - Rocky Flats

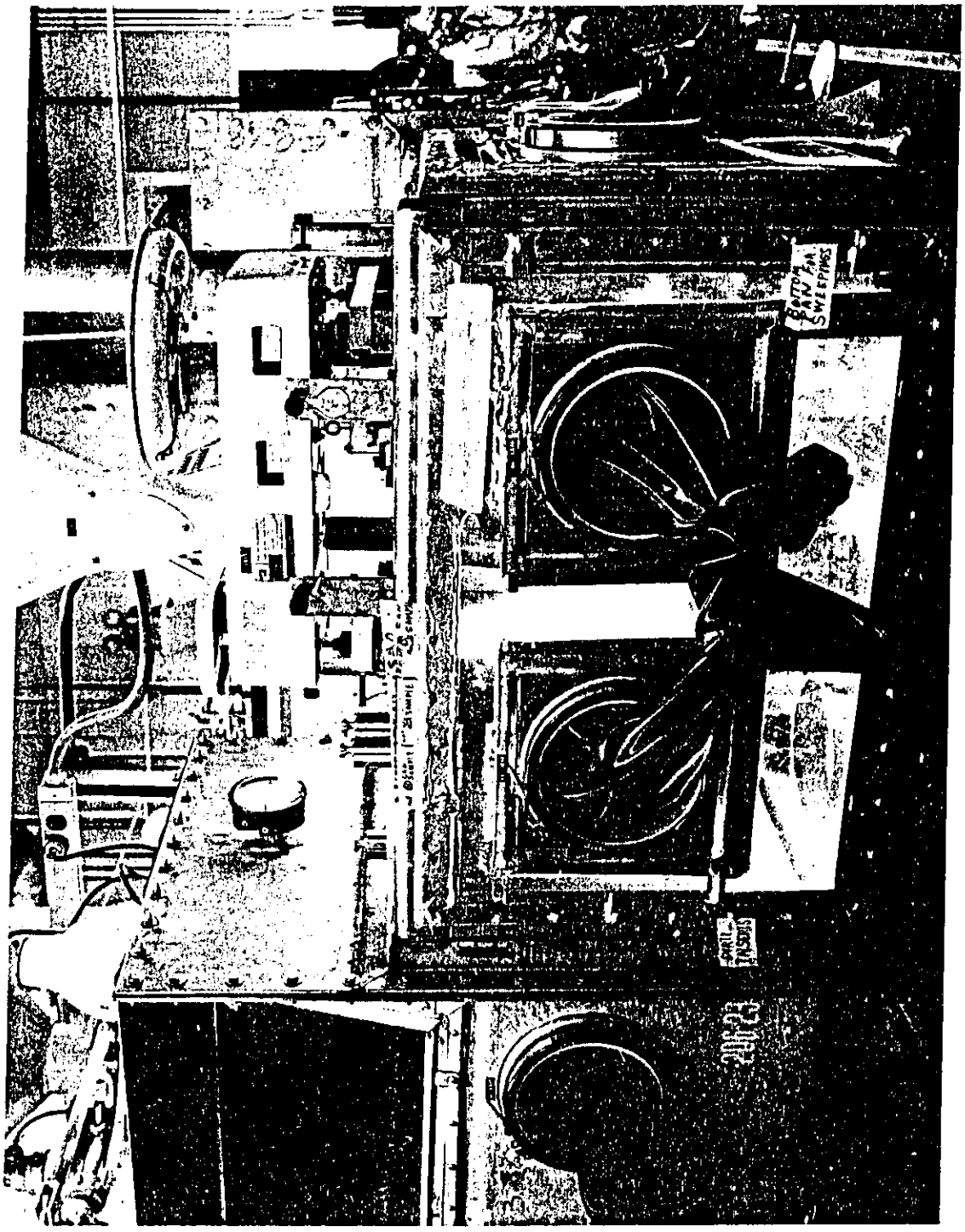

FIGURE C2-13. Balance for Weighing Plutonium Ingots

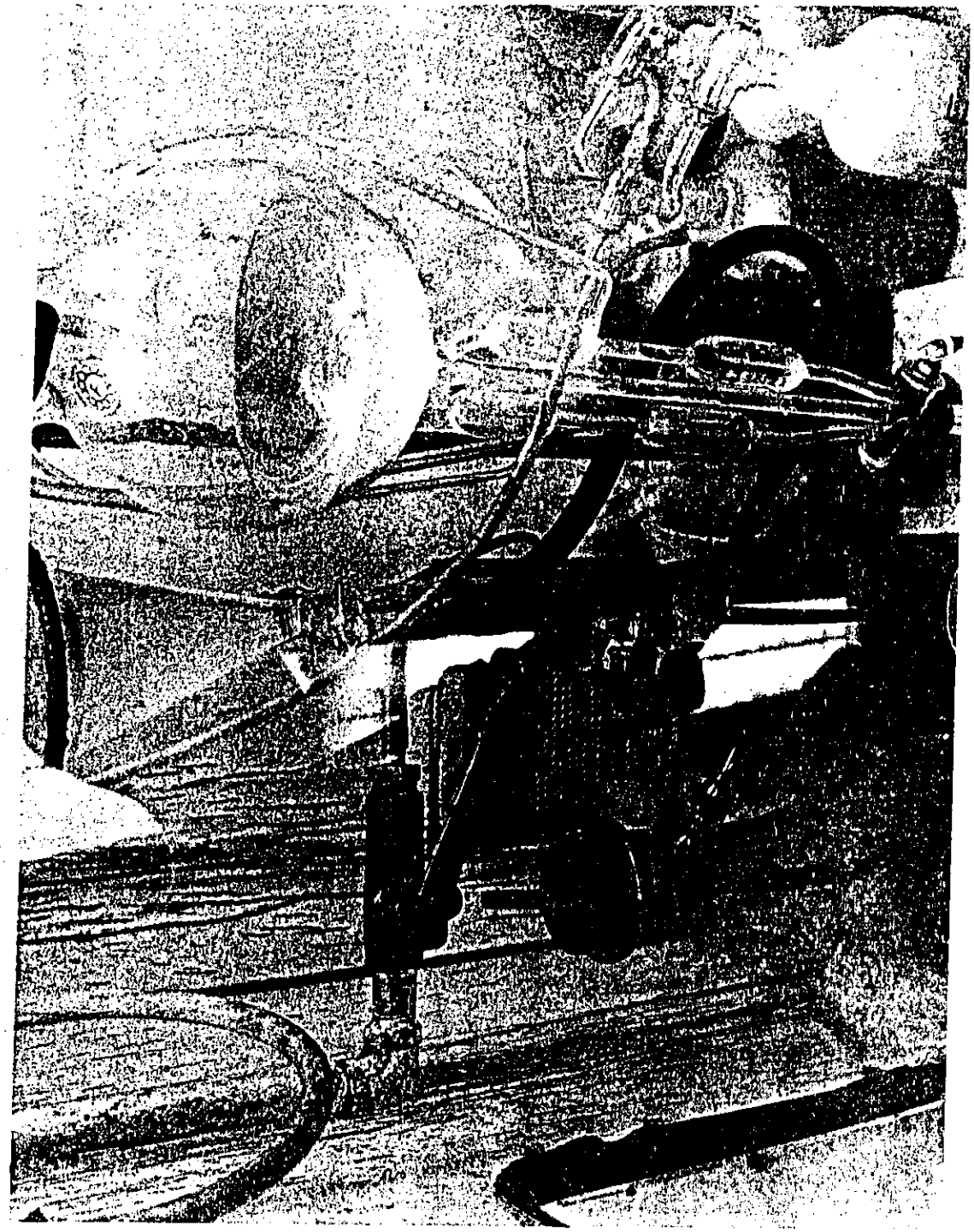

FIGURE C2-14. Interior of Glove Box in Assay Laboratory - Rocky Flats

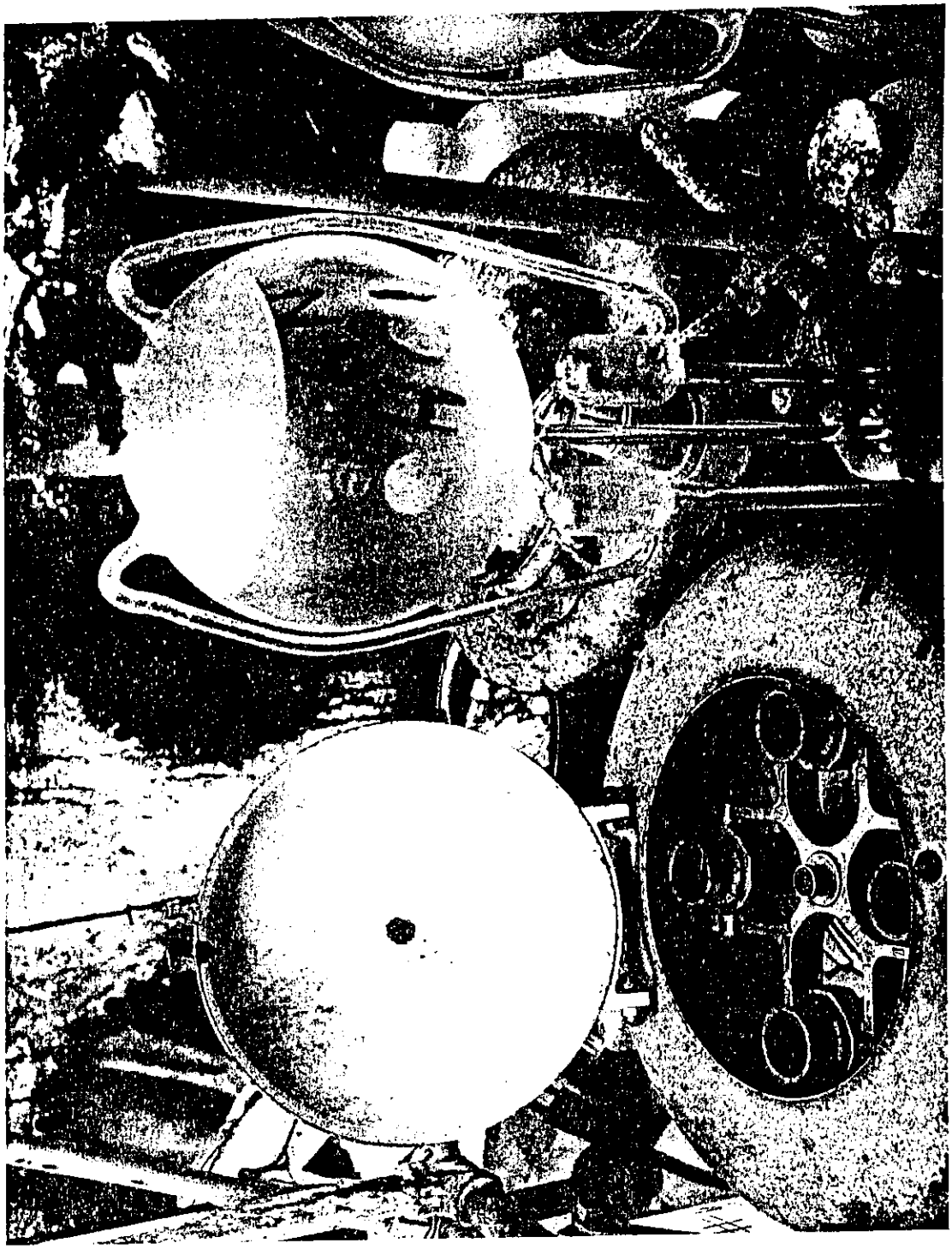

FIGURE C2-15. Interior of Glove Box in Assay Laboratory - Rocky Flats

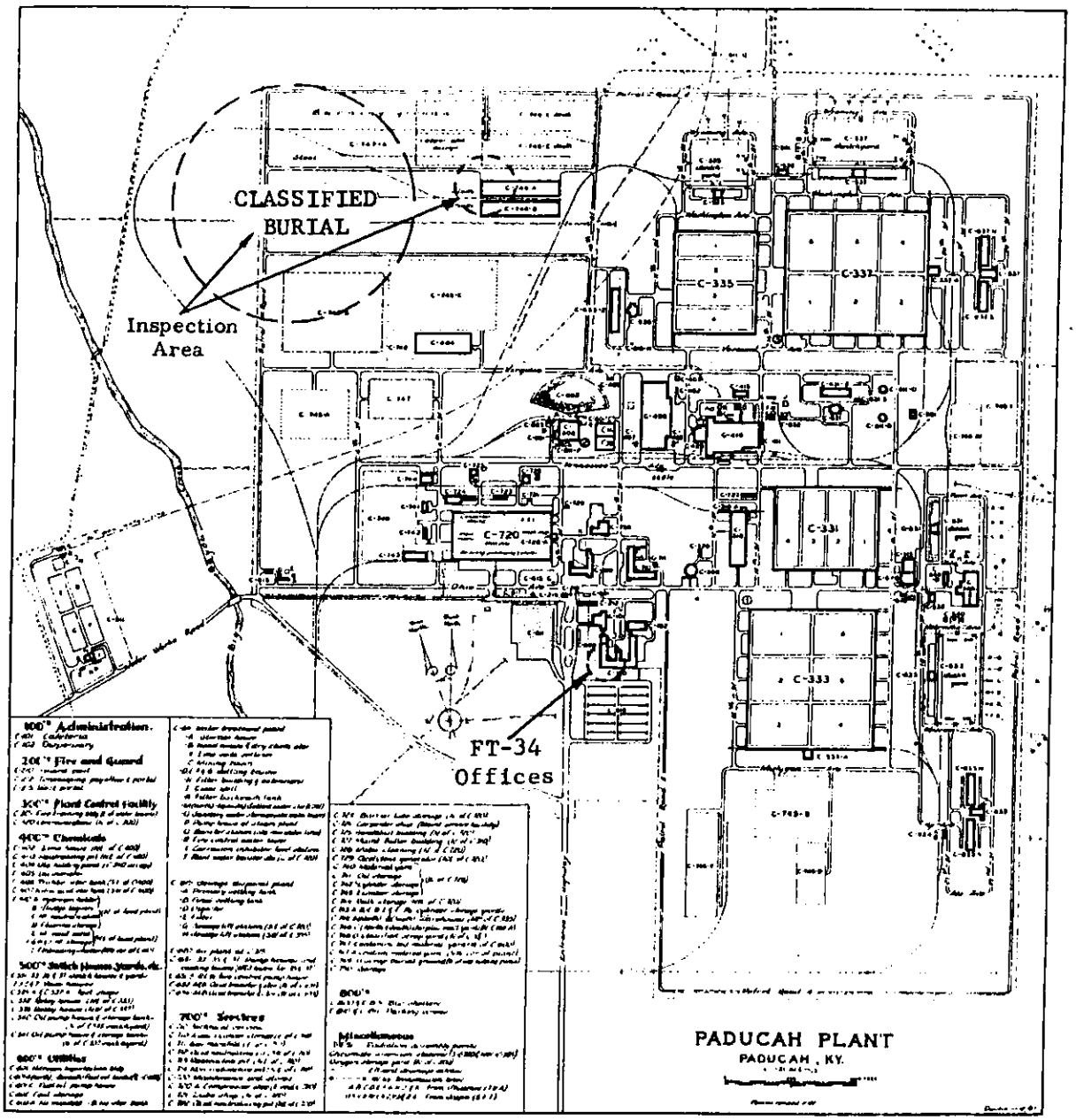

FIGURE C2-16. Paducah Facility

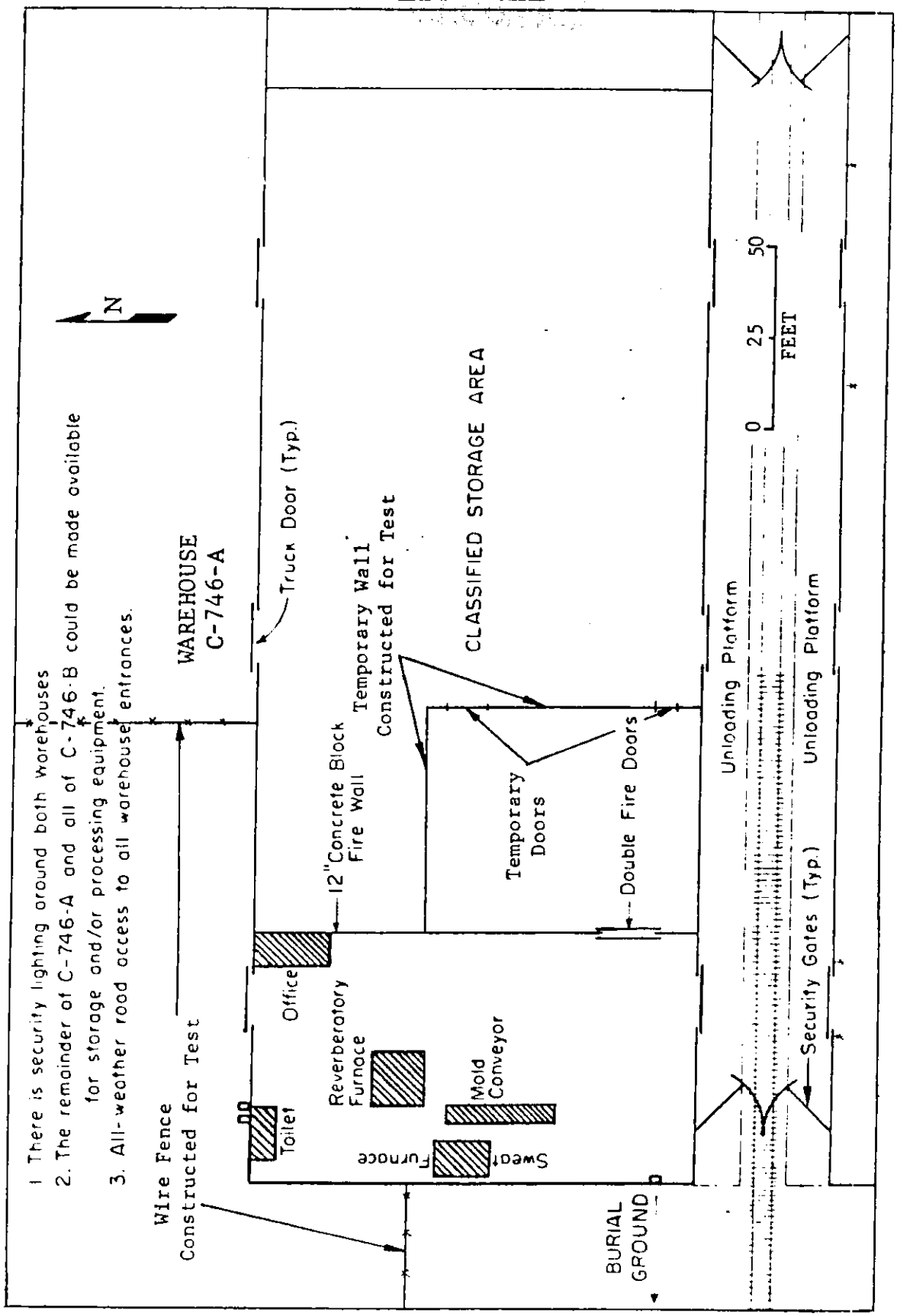

FIGURE C2-17. Inspection Area at Paducah (Modified)

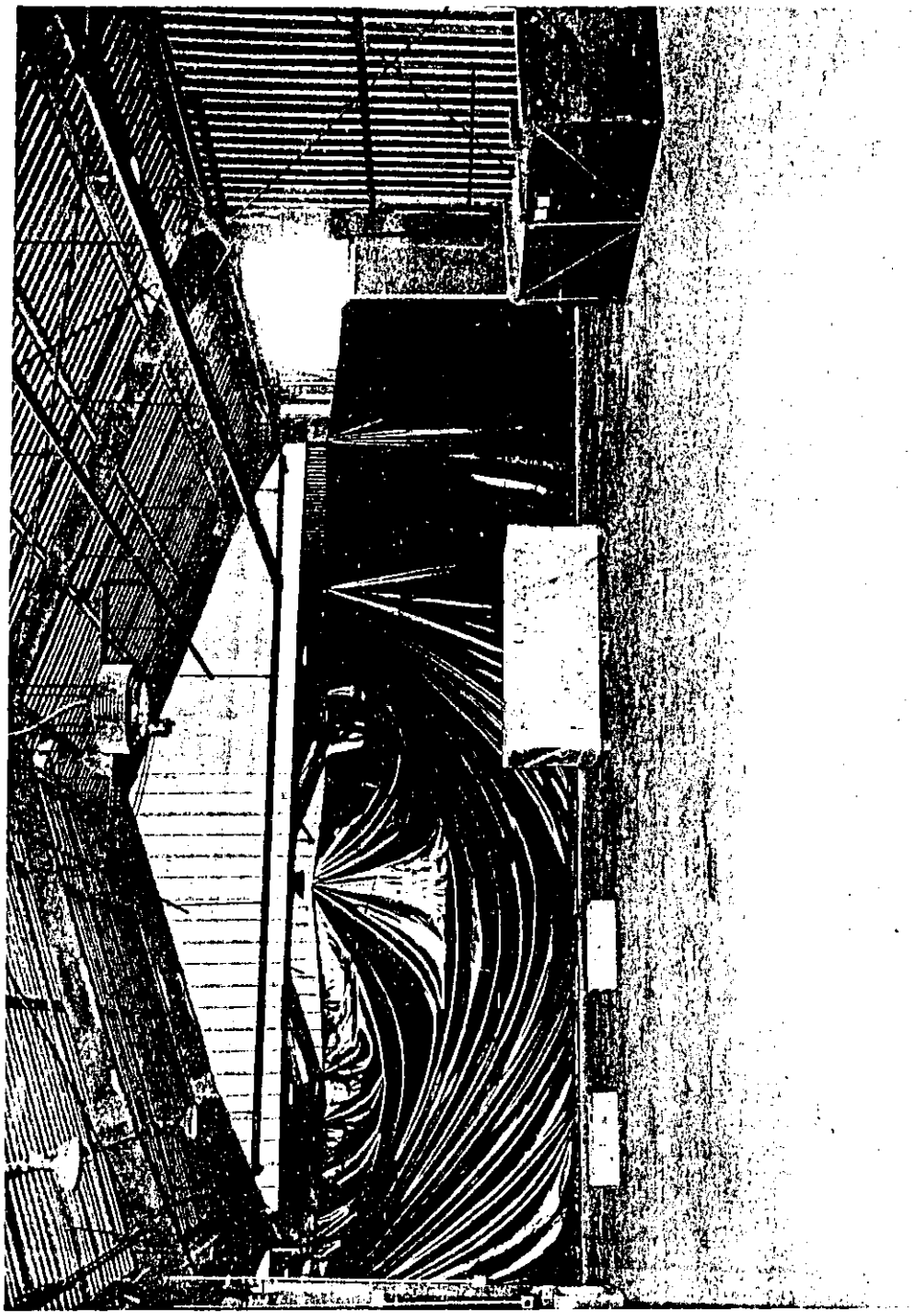

FIGURE C2-18. Interior of Bldg. 746 - Paducah Plant

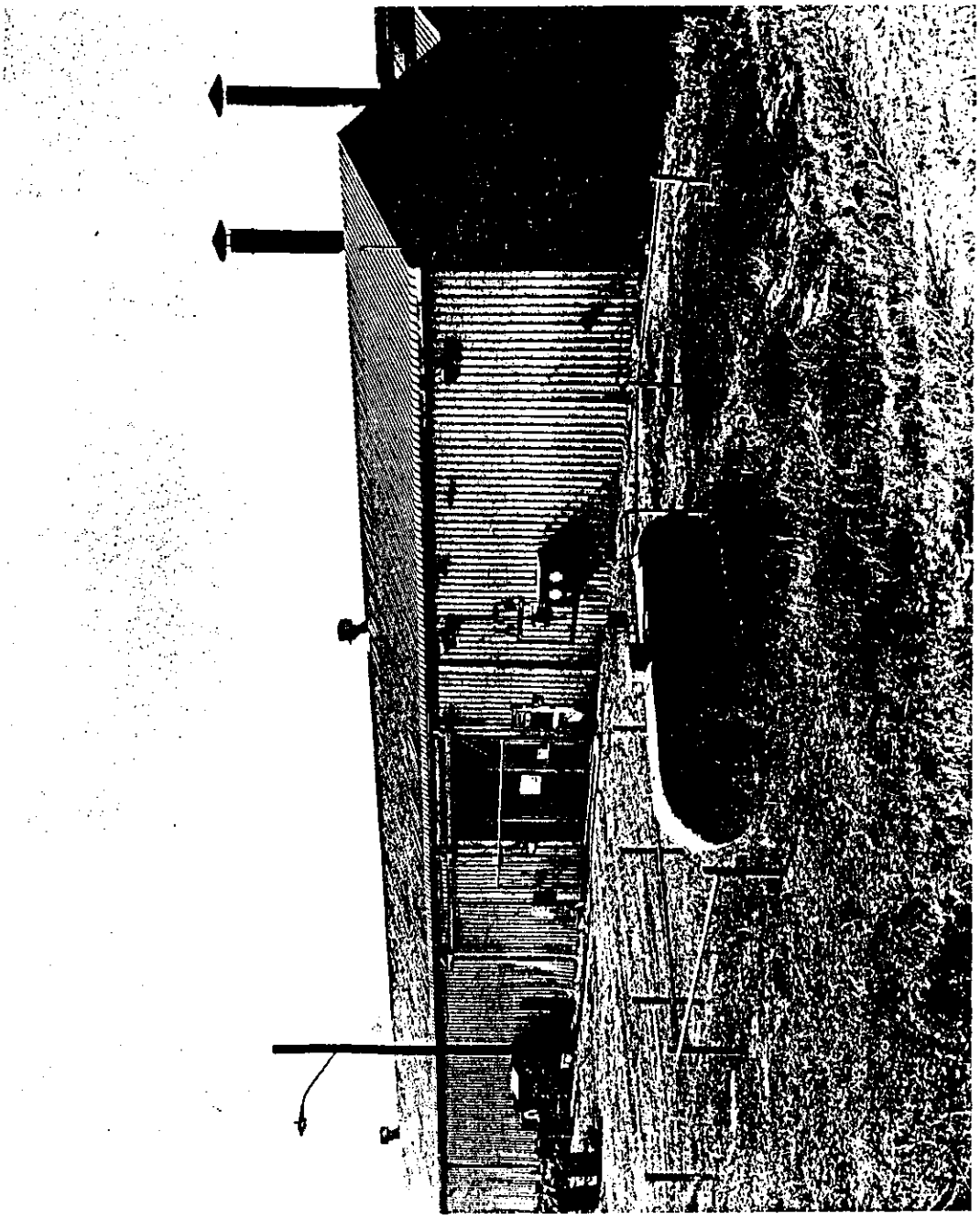

FIGURE C2-19. Exterior of Bldg. 746 - Paducah Plant

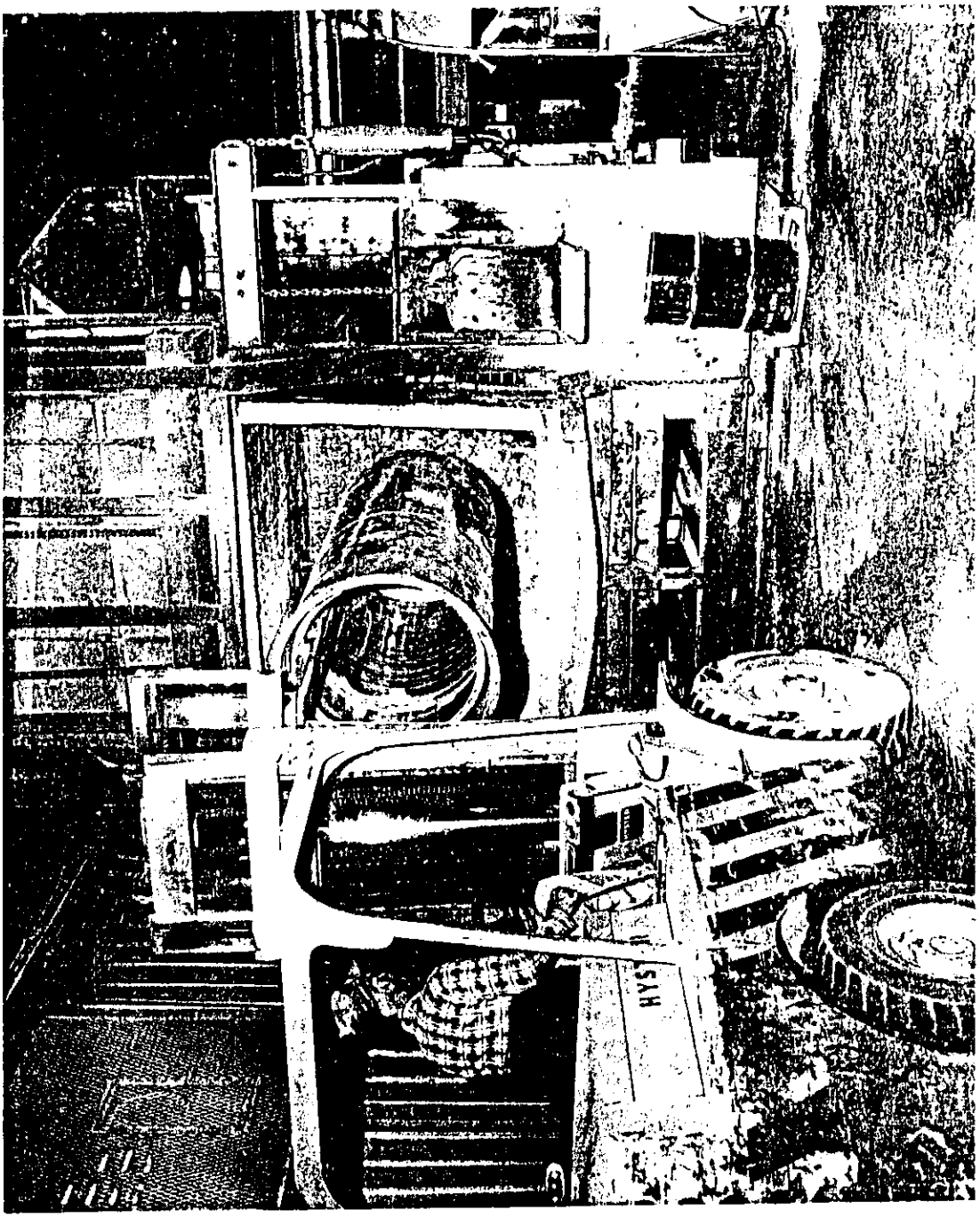

FIGURE C2-20. Charging an Aluminum Smelting Furnace, Bldg. 746, Paducah Plant

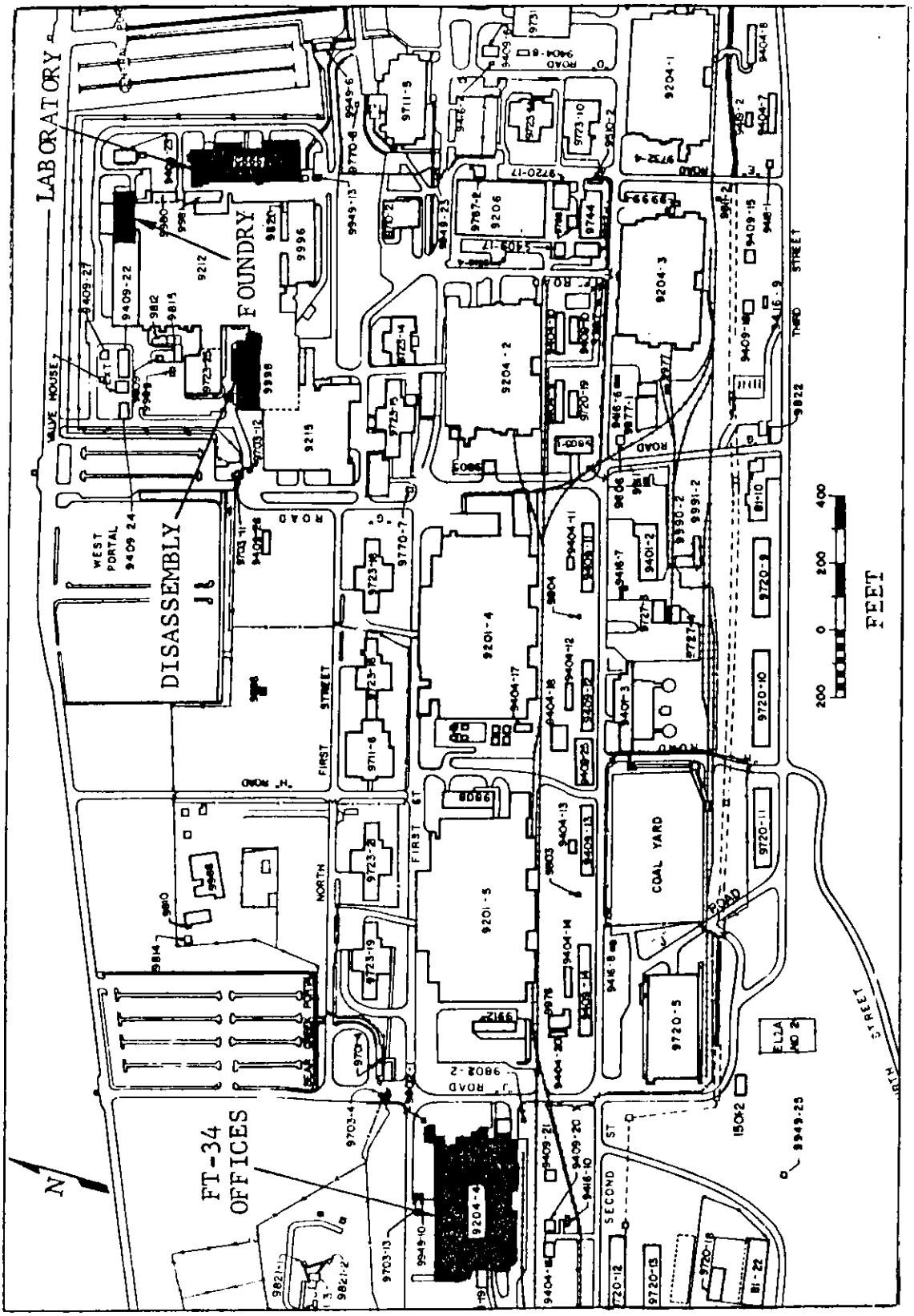

FIGURE C2-21. Inspection Area at Y-12, Oak Ridge

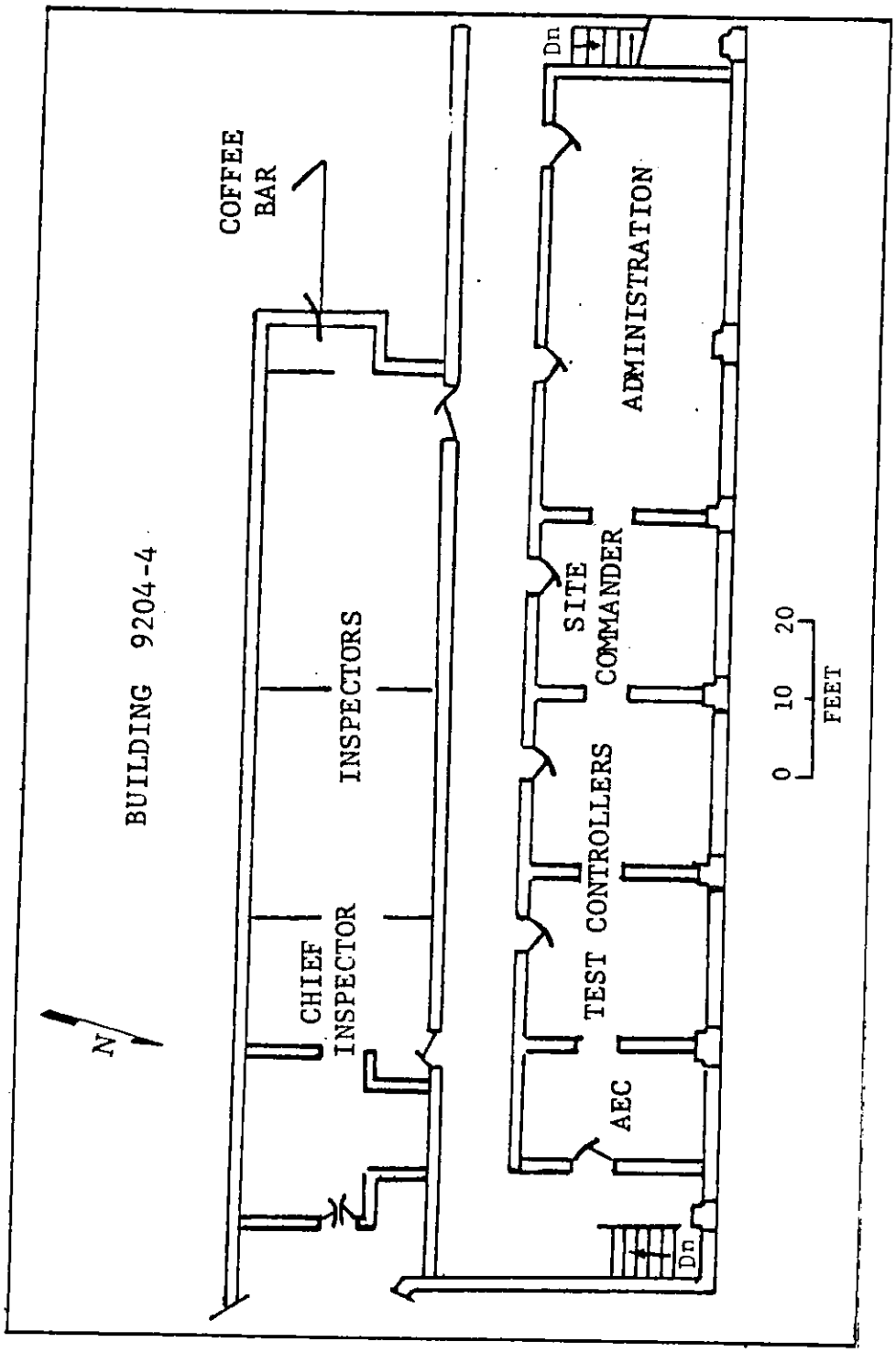

FIGURE C2-22. General Office Area, FT-34 - Y-12 Plant

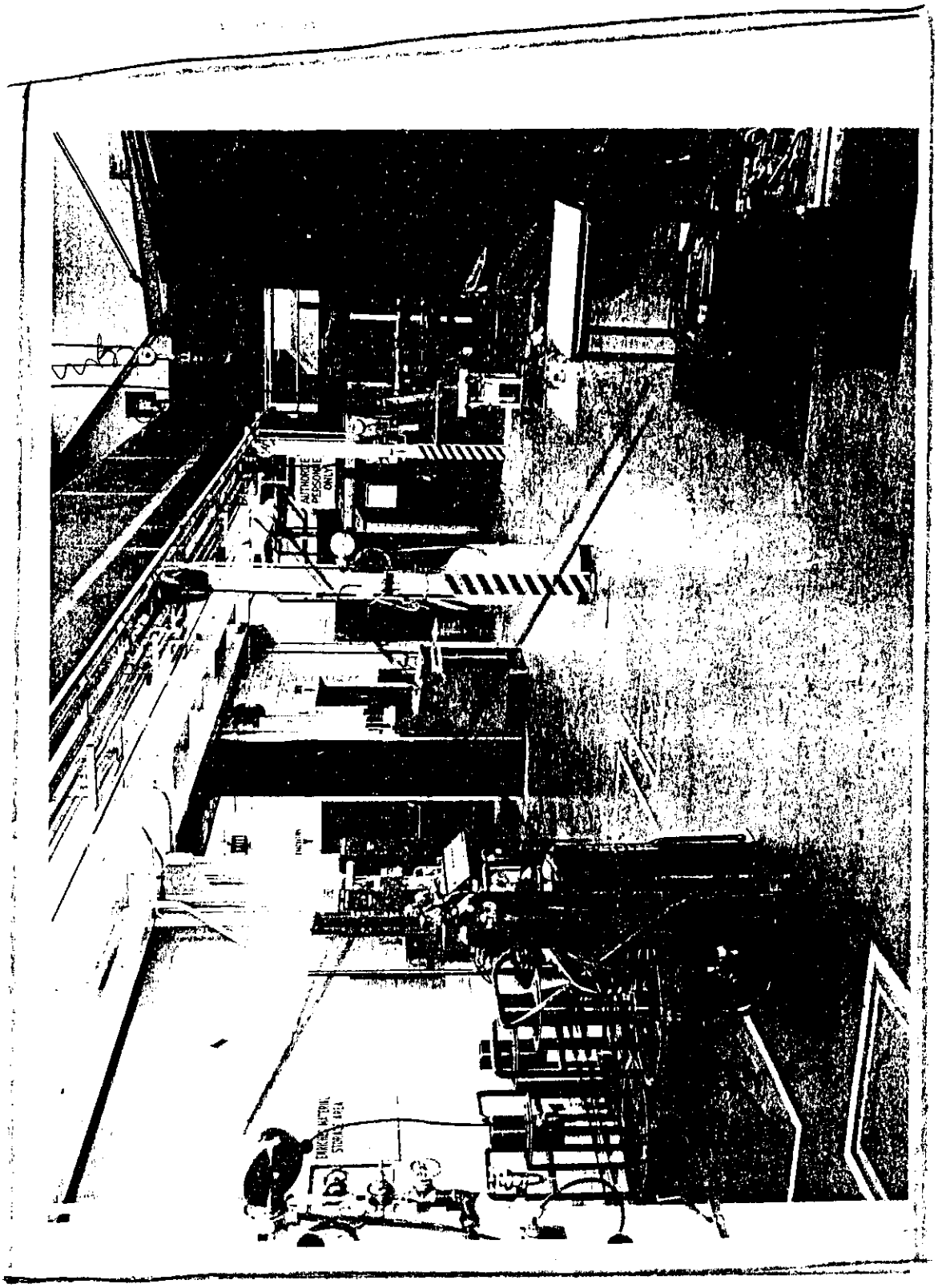

FIGURE C2-24. General View of Disassembly Area - Y-12, Oak Ridge

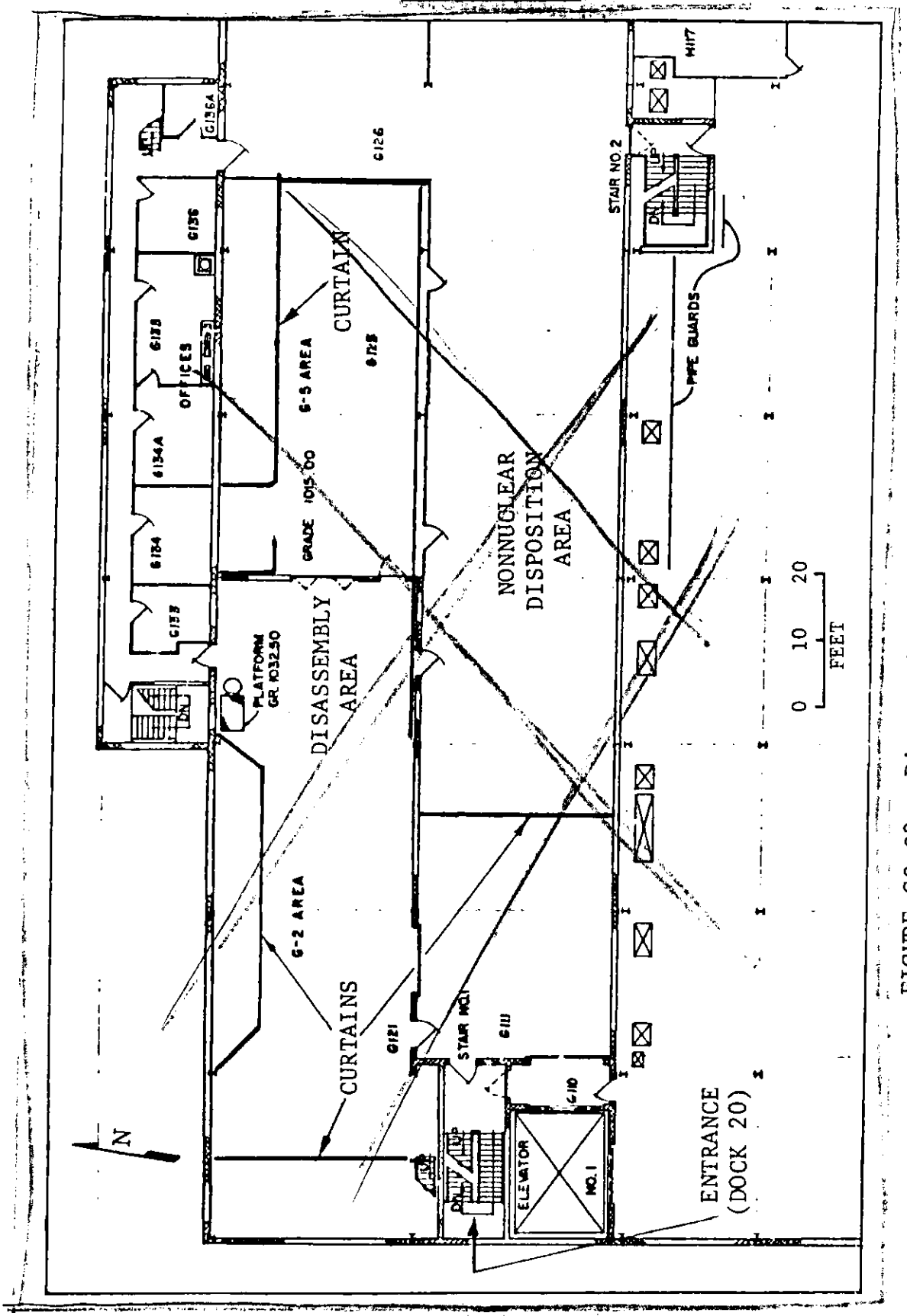

FIGURE C2-23. Disassembly Area at Oak Ridge

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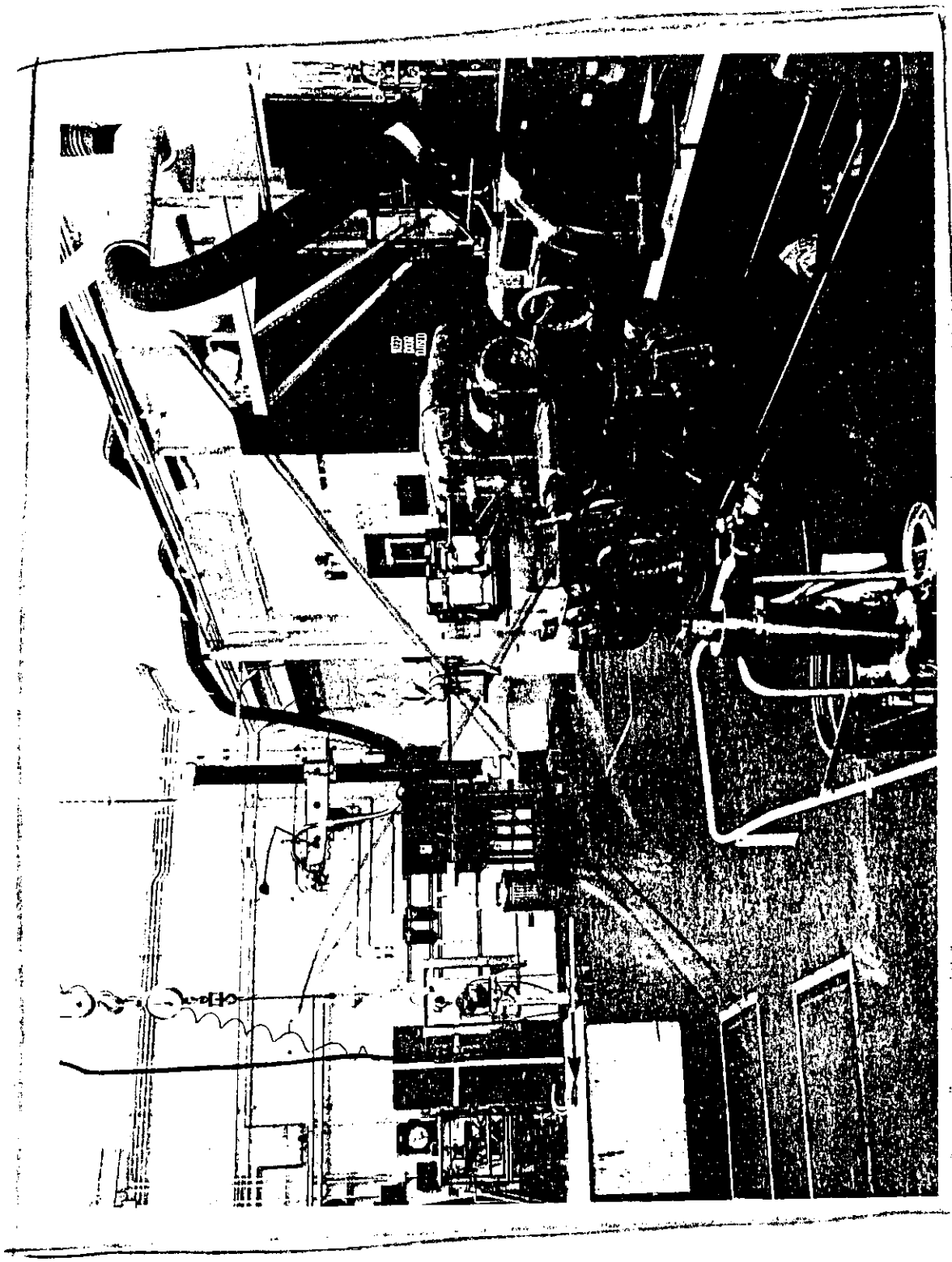

FIGURE C2-25. General View of Disassembly Area - Y-12, Oak Ridge

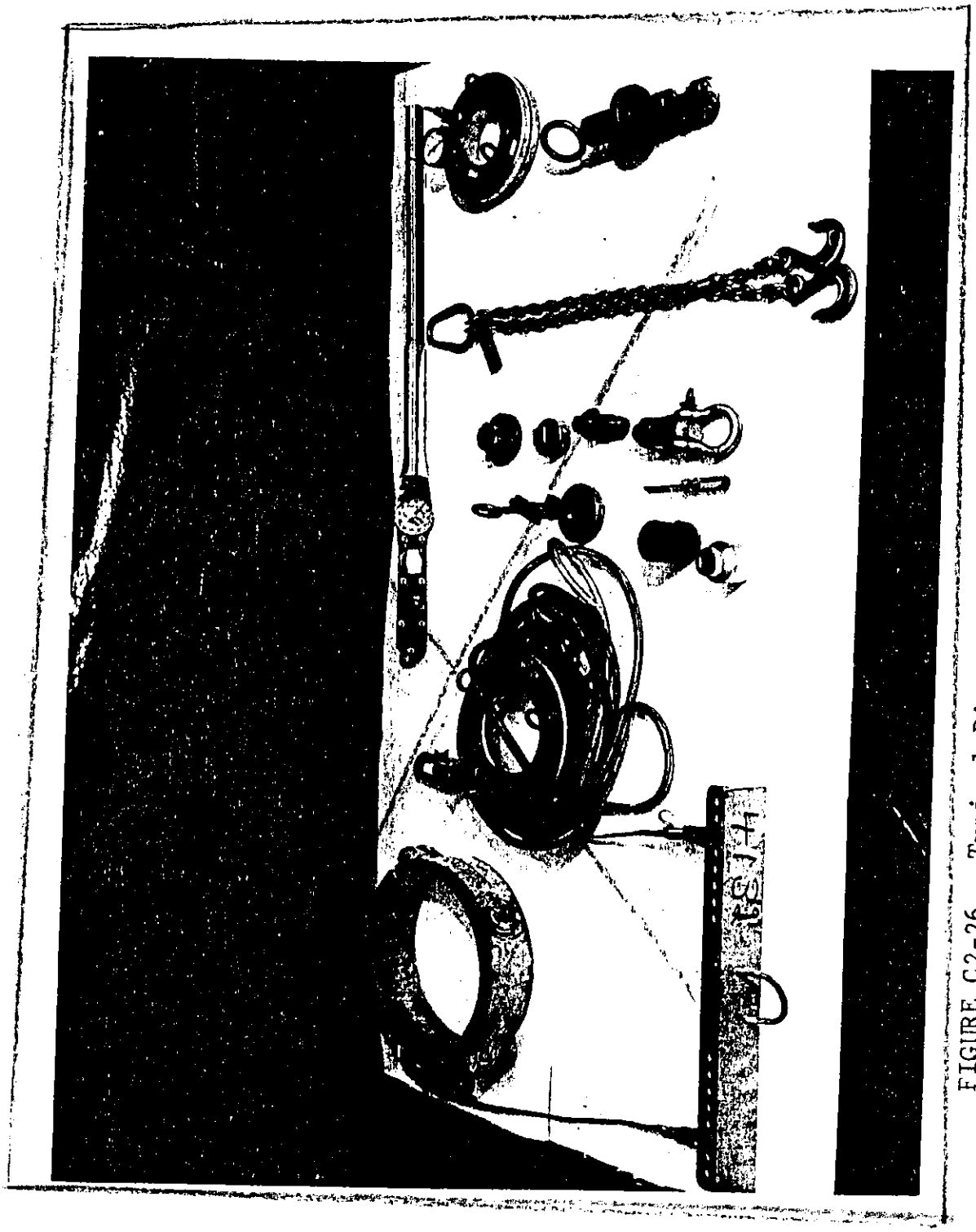

FIGURE C2-26. Typical Disassembly Tools - Y-12, Oak Ridge

DOE (b)(3)

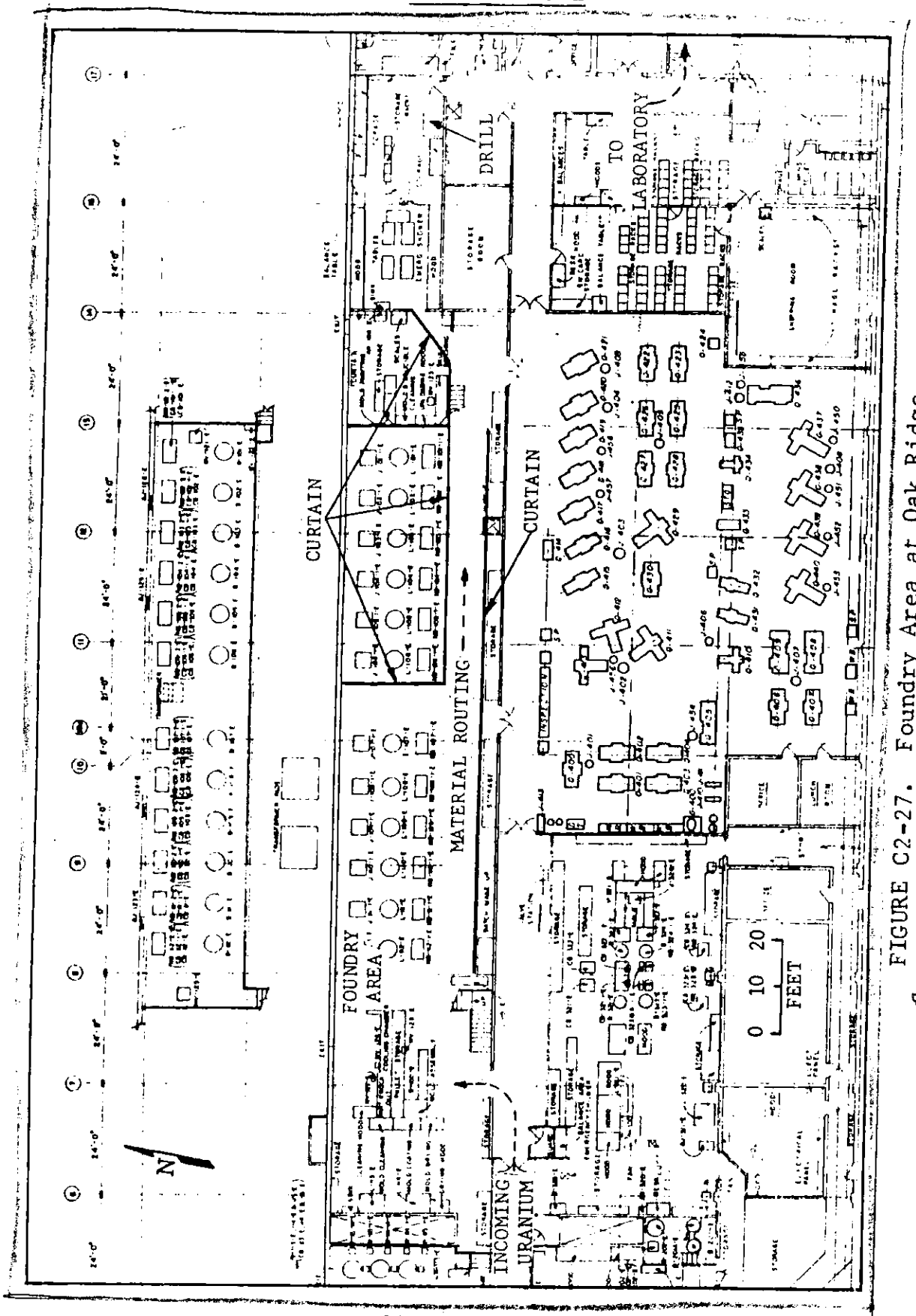

FIGURE C2-27. Foundry Area at Oak Ridge

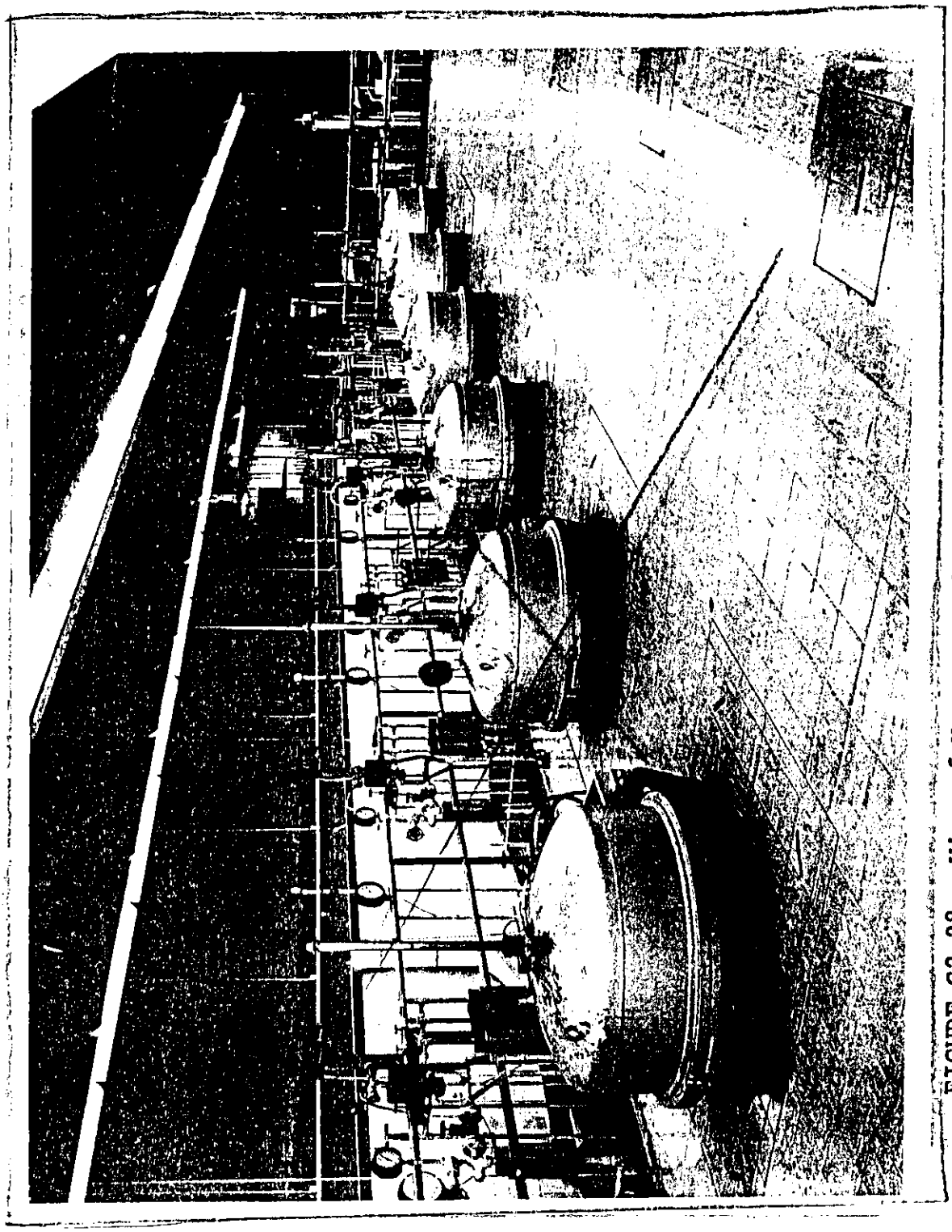

FIGURE C2-28. View of Upper Foundry Area, Y-12, Oak Ridge

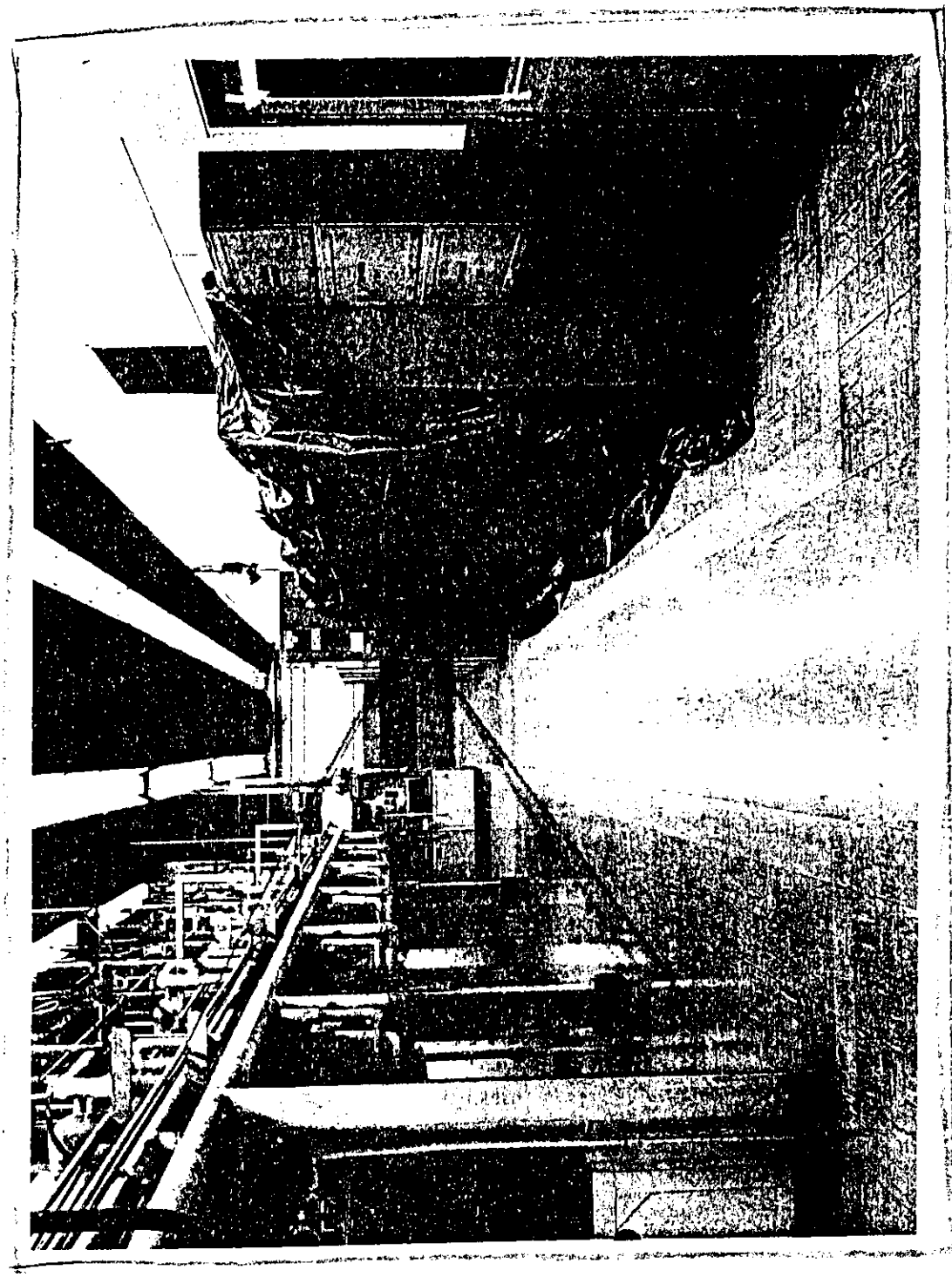

FIGURE C2-29. View of Lower Foundry Area, Y-12, Oak Ridge

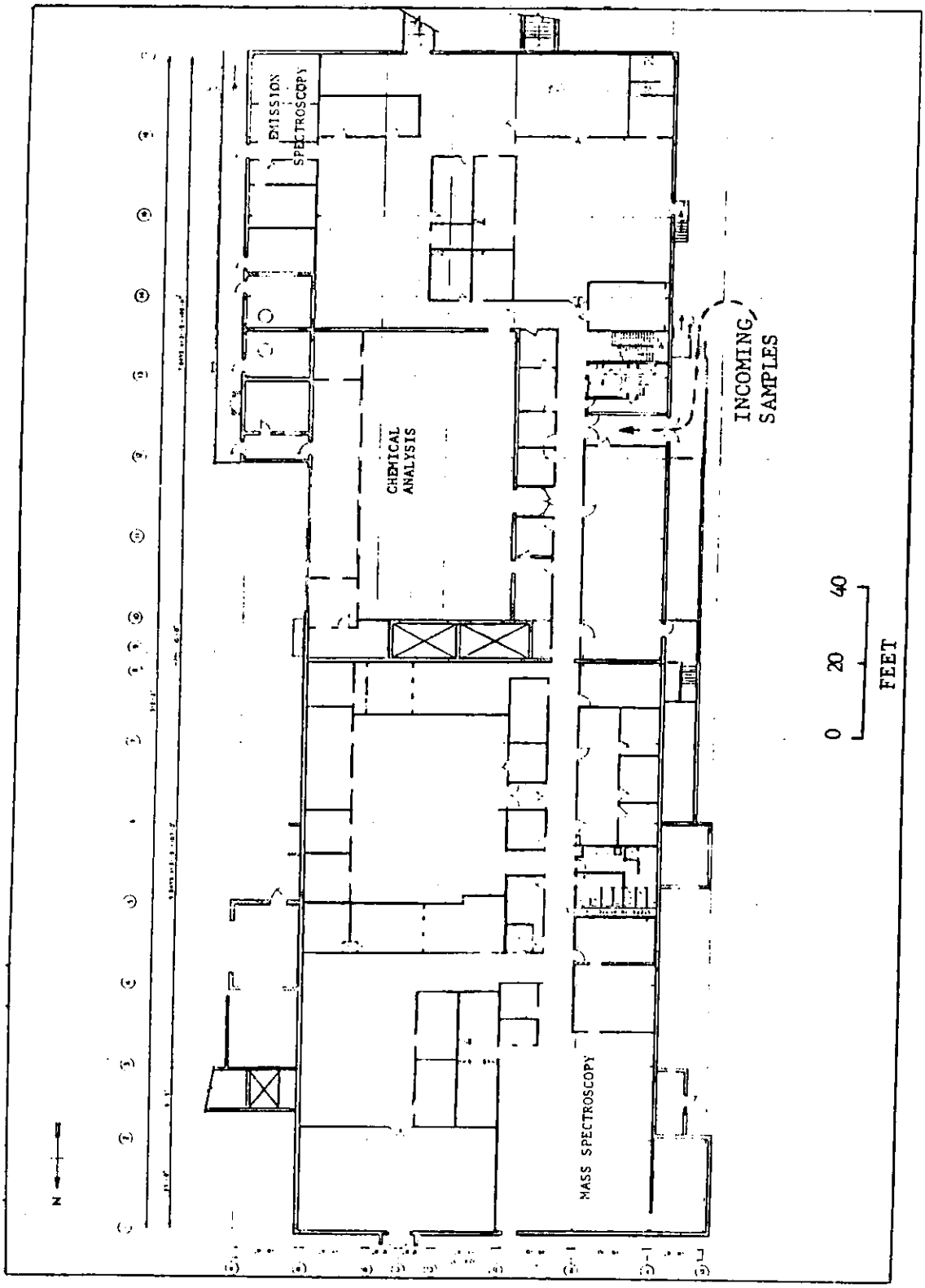

FIGURE C2-30. Laboratory Area at Oak Ridge

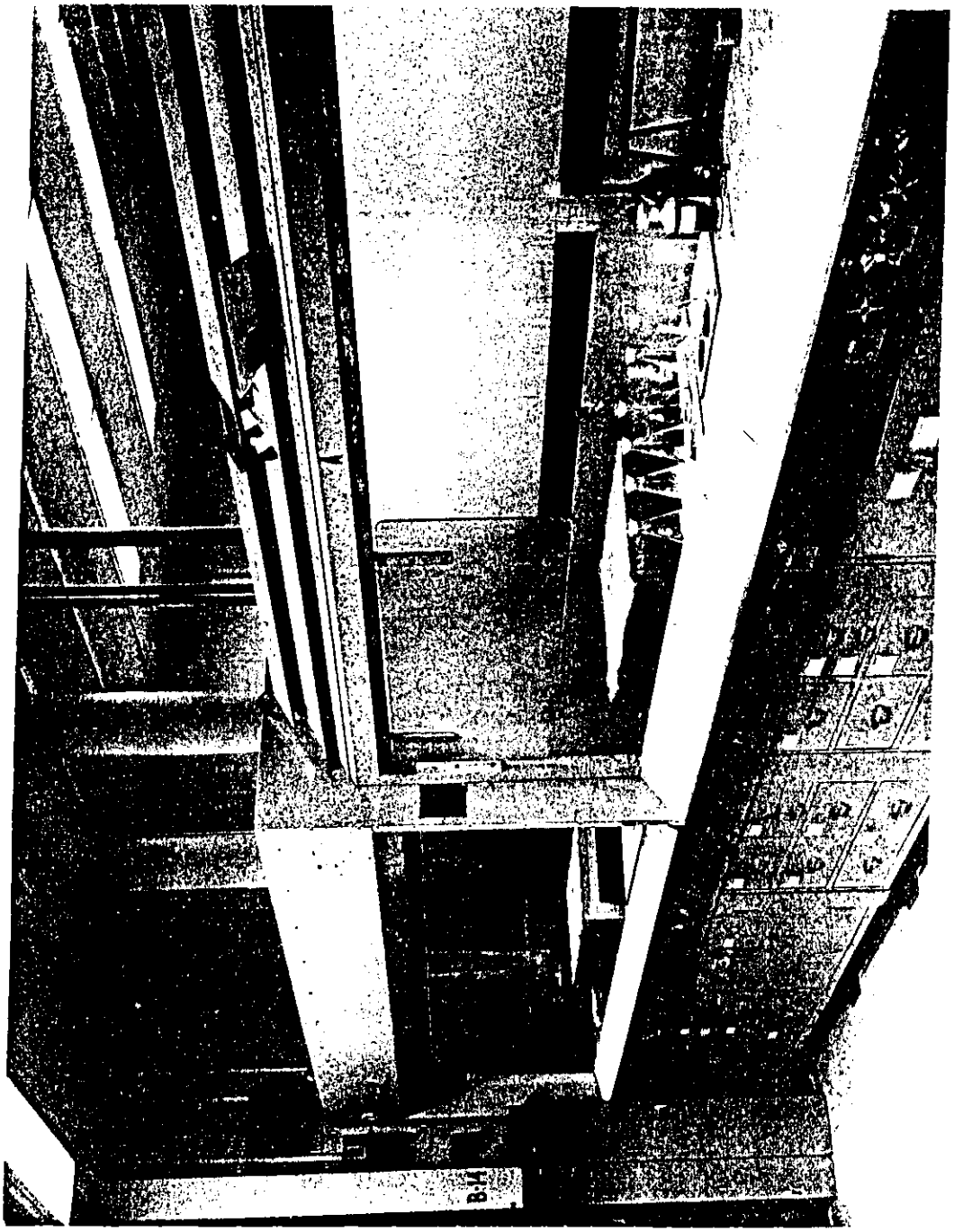

FIGURE C2-31. Typical Assay Laboratory Scene - Y-12, Oak Ridge

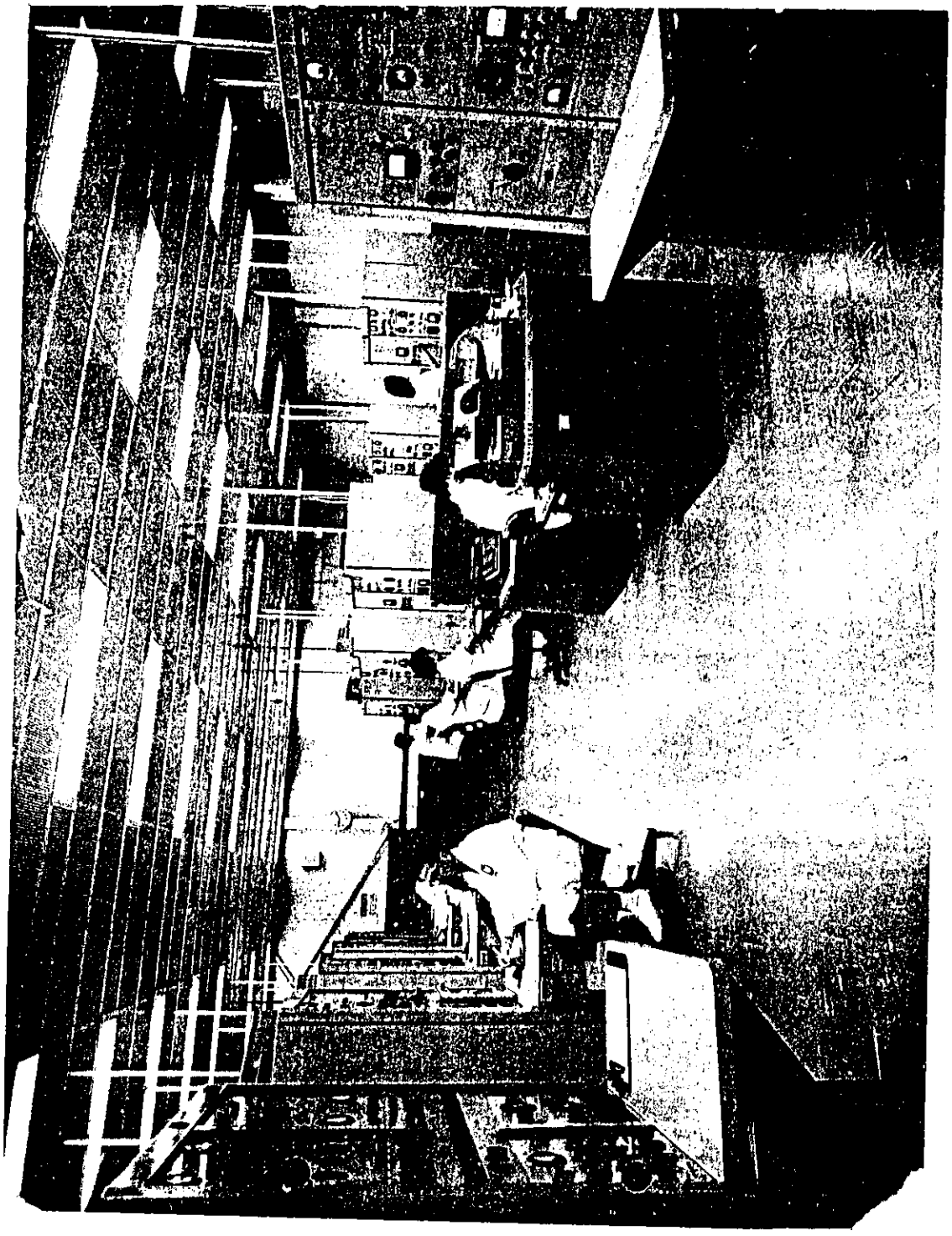

FIGURE C2-32. Mass Spectroscopy Laboratory - Y-12, Oak Ridge