WHC-EP-0535-1

UC-721

Annual Surveillance and Maintenance Report for the Retired Hanford Site Facilities Fiscal Year 1992

R. G. Egge

Date Published
November 1992

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Approved for Public Release

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References Available to Intended Audience	[X]	[]
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DOCUMENT TITLE: ANNUAL SURVEILLANCE AND MAINTENANCE REPORT FOR THE RETIRED HANFORD SITE FACILITIES FISCAL YEAR 1992

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ANNUAL SURVEILLANCE AND MAINTENANCE REPORT FOR THE RETIRED HANFORD SITE FACILITIES FISCAL YEAR 1992

R. G. Egge

ABSTRACT

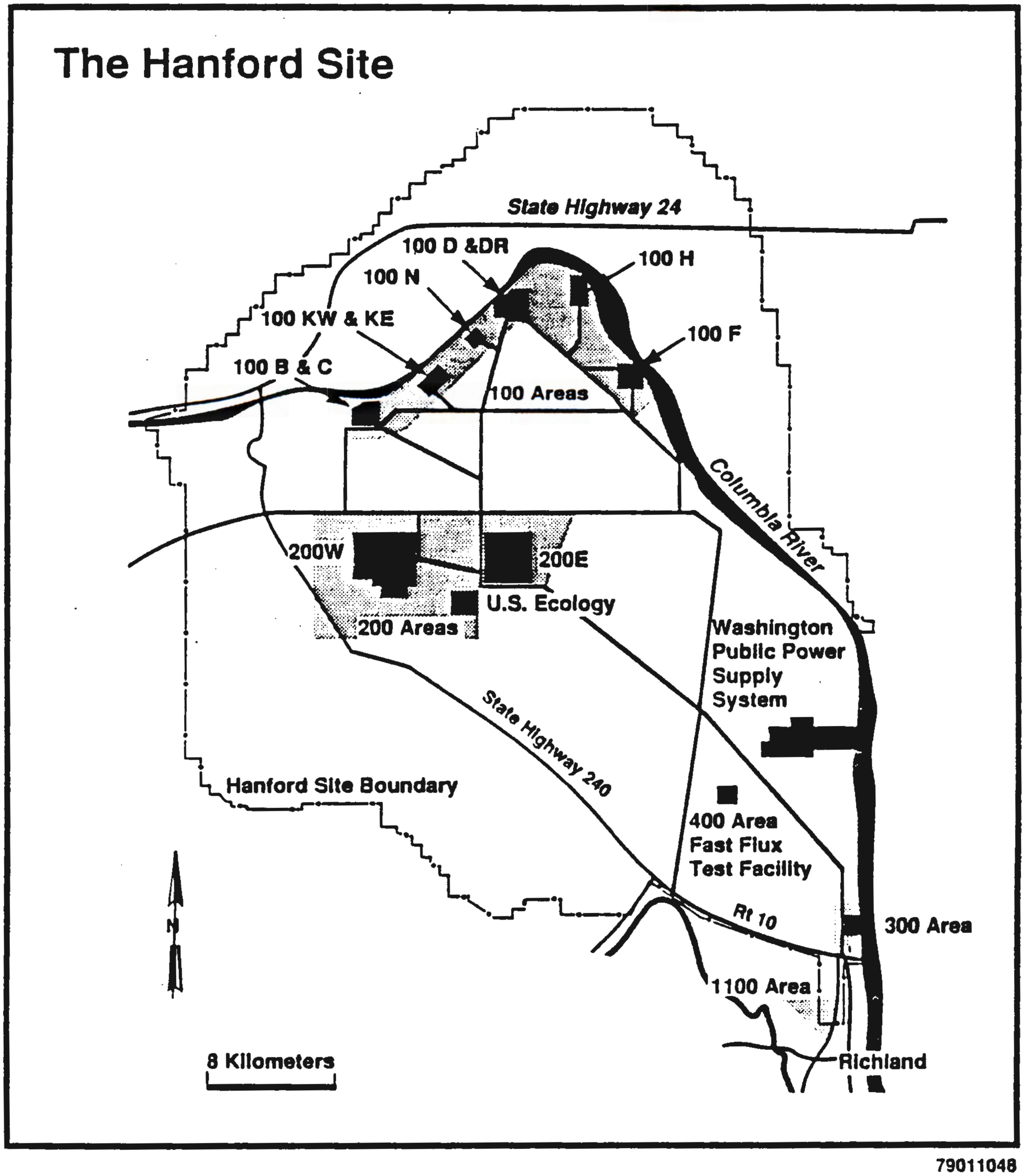
This report fulfills the U.S. Department of Energy, Richland Field Office, annual milestone requirement to provide a status of the surveillance and maintenance actions that were accomplished in fiscal year 1992 for the retired, surplus facilities at the Hanford Site. These actions comply with U.S. Department of Energy Order 5820.2A, Chapter V., and Order 5480.1B**, which require these facilities to be kept in a safe-storage configuration until final decommissioning can be accomplished.*

The surplus facilities covered in this report are located in the 100 and 200 Areas of the 1,450-Km² (560-mi²) Hanford Site (Figure A-1), a semiarid tract of land in southeastern Washington State. The facilities are located 24 to 48 kilometers (15 to 30 miles) from Richland, Washington (population 31,000). The 100 Area facilities are all located directly adjacent to the Columbia River.

**DOE*, *1988*, Radioactive Waste Managment, *DOE Order 5820.2A*, *U.S. Department of Energy*, *Washington*, *D.C.*

***DOE*, *1986*, Environment, Safety, and Health Program for Department of Energy Operations, *DOE Order 5480.1B*, *U.S. Department of Energy*, *Washington*, *D.C.*

Figure A-1. Hanford Site.



Information and data presented in the 1991 Annual Surveillance and Maintenance Report for the Retired Hanford Site Facilities *(WHC-EP-0535)** *shall be summarized in this year's report as well as all new significant developments regarding the present status of the facilities. Design life parameters and present age of buildings, surveillance interval and types, hazardous and radiological inventories, photographs and general descriptions of the buildings, routine and nonroutine maintenance accomplishments in fiscal year 1992, and outyear forecast estimates for nonroutine maintenance actions are contained in this report.*

**WHC, 1991*, Annual Surveillance and Maintenance Report for the Retired Hanford Site Facilities, *WHC-EP-0535*, *Westinghouse Hanford Company*, *Richland*, *Washington*.

EXECUTIVE SUMMARY

Implementation of the surveillance and maintenance activities in the contaminated inactive facilities, in accordance with applicable laws and regulations, is the responsibility of Inactive Facilities Surveillance and Maintenance. The fundamental goal is to ensure that risks to the environment and human health and safety, posed by the inventory of these contaminated inactive facilities and sites from past U.S. Department of Energy (DOE) operations, are maintained at prescribed safe levels in a timely and cost-effective manner until they can be fully decommissioned. In addition to periodic surveillance, sitewide procedures that specify physical and security controls and that minimize potential industrial hazards to the site worker and the general public are also implemented.

The current inventory of 109 inactive facilities (as of October 1, 1992) has stabilized during the past year, but it is anticipated to grow in the near future as additional programs are modified or phased out as part of the changing mission at the Hanford Site. Traditionally over the past decade, the inactive, surplus facilities covered in this report have been maintained in a safe condition by performing repairs only after damage has occurred. Funding for initial upgrades to place these facilities into a maintainable condition has not existed because of budget constraints and higher priority work. Because the decommissioning of these facilities is not directly driven by regulations and/or agreements (e.g., the *Hanford Federal Facility Agreement and Consent Order*)*, it is difficult to receive a high priority and the

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*Ecology, EPA, and DOE, 1990, *Hanford Federal Facility Agreement and Consent Order*, 2 vols,, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

budget necessary for major initial work projects. Of the $6,428,000 funding received for the surveillance and maintenance of inactive facilities during fiscal year 1992, approximately $250,000 (less than 5 percent) was spent on upgrades to existing systems to bring them up to an initial status to support the buildings' final decommissioning schedule. The remaining $5,750,000 was used to support routine surveillance and maintenance of these facilities and their respective confinement systems and structures and to ensure contamination control.

With equipment and structures approaching three times their original design life, the probability of contamination release to the environment has increased. To maintain the safe storage condition, water and other biological infiltrations must be prevented from getting into the facilities. Large amounts of water that currently enter contaminated areas could become contaminated. The contaminated water then spreads contamination to uncontaminated areas of the building and to the environment. Penetration into and entrapment of water in all structural elements of these buildings are the most prevalent and damaging causes of deterioration presently observed in all retired facilities. Delaying this initial upgrade work will become more costly as time passes because facility deterioration accelerates exponentially with each passing year. The sooner these facilities are stabilized and protected, the more cost effective the long-term maintenance and surveillance plan will become until the final decommissioning of the facilities covered in this report can be accomplished, which is not scheduled to be completed until 2016. It is therefore in the best interests of DOE to begin these upgrades as soon as possible or accelerate the decommissioning schedule.

The fatal accident that occurred at the 105-F Reactor Building on April 7, 1992, resulted from work being performed as an upgrade to the transfer bay roof to support the cleanout effort of the 105-F Fuel Storage Basin. The section of the roof that collapsed and resulted in the Kaiser Engineers Hanford ironworker falling to his death is an example of a cement roof panel that had deteriorated to the point of collapse under live loads that are 25 percent of the original design requirements. Continued weathering of these panels and similar panels through the other seven reactors place any roof access by site personnel within a potential fall hazard. Therefore, all access to the roofs in these buildings was immediately suspended and will remain suspended until personnel can be protected against this fall potential. This action guards against additional exposure to personnel from this type of fall hazard, but it has caused the roof structures to further deteriorate because the annual roof repair was not performed this past summer as scheduled. Once the roofing covers and structures received additional moisture, any partial repair to these structures was suspended because this caused the moisture to be entrapped within the roof, thus degrading the structure further. The long-term effects of this continued degradation will not be immediately apparent, but will continue to add to the cumulative effect of overall roof structure and covering deterioration. This deterioration is rapidly approaching the unrecoverable limit in many reactor roofs where annual repair is no longer adequate. Entire roof structures will need to be replaced to eliminate water infiltration and to provide confinement of the radiological inventories.

A special task team has been established and funded under the Environmental Restoration Operations group to evaluate the overall net effects of the current trends in the inactive, surplus facilities and to establish arisk-based analysis. The primary goal of this team is to review, inspect, independently analyze the current trends and operation of the major inactive surplus facilities, and document these in a risk-based analysis format. This analysis will be used to either suspend all activities in the high-risk facilities or to approach the DOE for funding requirements to upgrade the defective systems.

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DOE	U.S. Department of Energy
EIS	environmental impact statement
FY	fiscal year
IFS&M	Inactive Facilities Surveillance and Maintenance
HEPA	High-Efficiency Particulate Air (Filter)
KEH	Kaiser Engineers Hanford
PISCES	Plant Instrumentation Surveillance, Calibration, and Evaluation System
PM	preventative maintenance
PO	power operator
REDOX	Reduction Oxidation (Plant)
WHC	Westinghouse Hanford Company

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ANNUAL SURVEILLANCE AND MAINTENANCE REPORT FOR THE RETIRED HANFORD SITE FACILITIES FISCAL YEAR 1992

1.0 100 AREA FACILITIES

1.1 INTRODUCTION

Between the years 1943 and 1963 the U.S. Department of Energy (DOE) constructed nine water-cooled, graphite-moderated plutonium reactors along the Columbia River at the Hanford Site, near Richland, Washington. Eight of these reactors (B, C, D, DR, F, H, KE, and KW) are now retired from service and are presently under the Surplus Facilities Program. The proposed long-term action is to decommission the C, D, DR, F, and H Reactors; their associated nuclear fuel storage basins; and their support buildings during the years from 1999 through 2016. The B, KE, and KW Reactors and their associated facilities are not scheduled for final decommissioning because the 105-B Building has been recognized as a National Historic Monument and the KE and KW facilities are presently used for long-term storage of the 100 N nuclear fuels after the reactor was defueled. Because all these reactors contain irradiated reactor components and the buildings that housed the reactors are contaminated with low levels of radioactivity, continued surveillance and maintenance are necessary to maintain the existing confinement systems, thus reducing contamination spreads to the remaining uncontaminated portions of the building and the environment.

When these facilities were shut down, all of them had reached their design life. The parameters for the 100 Area reactor facilities were based on a 20-year life span, without full consideration of the time required to decommission these buildings and the lack of an initial minimal maintenance program. Basically, the buildings were allowed to severely deteriorate during the first 15 years after they initially were shut down, which is evident in all the built-up roof surfaces, construction joints, flashing, and trim. Today the building structure and equipment required to keep the reactor facilities in a safe storage configuration range in age from 39 to 49 years (Table 1-1). Using present estimates, the existing confinement systems are required to be maintained for at least an additional 7 years for the 105-H Reactor and up to 14 years for the 105-F Reactor before decommissioning can begin. The process of decommissioning, which is forecast to last up to 10 years, also may require the buildings' integrity and especially the roofs to remain intact to maintain a safe storage condition and to prevent water from getting into the facilities.

Water introduced into the reactor buildings is primarily from rain or snow runoff, which enters the building through cracks in the roofs or wall joints. Once the water enters the building, evaporation and condensation of this moisture is a large contributor to water-induced deterioration of the structural elements that maintain confinement. When the water is trapped in the roof system, the moisture corrodes roofing materials to a point of failure. The built-up roofing that is common to many of these structures acts

Table 1-1. Design Life Comparison.

Facility	Construction / Operation	Shutdown / Decom.[c]	Present age / Final age[c]	Extended design lives
105-B Reactor	1943-1944	1968	49	>3 lives
	1944-1968	unknown[a]	unknown[a]	
105-C Reactor	1951-1952	1969	41	2.5 lives
	1952-1969	2003-2013	52	
105-D Reactor	1943-1944	1967	49	3 lives
	1944-1967	2001-2011	58	
105-DR Reactor	1947-1950	1964	45	3 lives
	1950-1964	2003-2013	56	
105-F Reactor	1943-1945	1965	49	3 lives
	1949-1965	2006-2016	63	
105-H Reactor	1948-1949	1965	44	2.5 lives
	1949-1965	1999-2009	51	
105-KE Reactor	1953-1955	1971	39	>3 lives
	1955-1971	unknown[b]	unknown[b]	
105-KW Reactor	1952-1955	1971	40	>3 lives
	1955-1971	unknown[b]	unknown[b]	

[a]B Reactor has been designated as a national historical landmark; decommissioning timetables are undetermined.

[b]KE and KW Reactor Basins are presently being used for storage of N Reactor fuel; decommissioning timetables are undetermined.

[c]These years are the expected decommissioning times based on the proposed long-range plans.

as a sponge, trapping moisture for long periods of time. It is likely that some of the entrapped moisture was in existence within the roofing systems before the facility was shut down. Moist roofing material in contact with structural roof decks or panels allows for gradual damage to occur until the panel is in jeopardy of self-collapse or will not carry a fraction of its original design live load requirements.

A new flood coating of asphalt or urethane foam can be applied over an existing roofing system that contains moisture. Although this provides a quick, relatively inexpensive fix for the roof leaks, this type of procedure results in moisture being entrapped under the coating. This will accelerate the deterioration during dry, hot weather because the new cover provides a vapor barrier that traps the moisture and redirects its full destructive forces directly into and through the roof panels. The trapped moisture will literally boil the roof panels apart. In addition, during the winter months when freezing conditions directly follow rain and snowfall, the moisture that is trapped within the panels expands, causing severe mechanical damage to the structural integrity of the panels. Panels that bow inward or that show signs of discontinuity between the panel and rebar are examples of this deterioration and are present in all the reactor buildings. The continuous process of summer heating, followed by winter freezing (associated with bubbling and fracturing of flood coating roof protection), renders the material useless within a year. Therefore, the process selection for protecting the roof panel for periods greater than one year must incorporate either the elimination of moisture from the panels prior to coating or the complete replacement of the roofing with a membrane system. The membrane system offers the best long-term approach to protecting the internal areas within the building from moisture infiltration, but it requires the roof panels to be able to support a ballast load, which is placed over the membrane to hold it in place. Because the roof panels in the 185-B, 190-B, 105-C, 183-C, 105-F, and 105-H Buildings have been allowed to deteriorate to the present state, they will not support the added ballast loading; therefore, the membrane system cannot be used. The only alternative to ensuring the integrity of the roofing system in these facilities is the entire replacement of the present roof, thus eliminating water infiltration into the roof support structures and internal building areas. If funding permits, the buildings can be demolished, thus removing the need for confinement.

1.2 PHYSICAL DESCRIPTION AND PHOTOGRAPHS

The following sections briefly describe the most significant 100 Area surplus buildings and the general condition of the existing confinement systems. A tabulated form of the general overall building condition, surveillance requirements, and major maintenance accomplishments for the 100 Area surplus facilities in fiscal year (FY) 1992 are given in Table 1-2. Aerial photographs of the 100 B, C, D, DR, KE, KW, F, and H areas (Figures 1-1 through 1-8) follow. In addition, a photograph of each facility follows its description.

Table 1-2. 100 Area Facilities Surveillance and Maintenance.

Facility name	Physical condition				Hazardous constituents		Surveillance interval	Percentage S&M[d] budget	Major repairs and accomplishments fiscal year 1992 (see maintenance text)
Building number	I[a]	X[a]	R[a]	Q[a]	Radiological products	Chemical products			
Reactors								30%	
105-B	G	F	F	P[b]	Activation products	TBD[c], lead asbestos	Monthly		None.
105-C	P	P	P	P[b]	Activation products	TBD, lead asbestos	Monthly		None.
105-D	F	P	F	P[b]	Activation products	TBD, lead asbestos	Monthly		None.
105-DR	F	P	F	P[b]	Activation products	TBD, lead asbestos	Monthly		None.
105-F	P	P	P	NA	Activation products	TBD, lead asbestos	Monthly		Began transfer bay roof repair.
105-H	P	P	P	P[b]	Activation products	TBD, lead asbestos	Monthly		None.
105-KE	G	F	F	F[b]	Activation products	TBD, lead asbestos	Monthly		None.
105-KW	G	F	F	F[b]	Activation products	TBD, lead asbestos	Monthly		None.
Support buildings	F	P	P	NA	TBD	TBD	Quarterly, semiannual		None.

[a]I = Interior, X = exterior, R = roof, Q = operational equipment, E = excellent, G = good, F = fair, P = poor, NA = not applicable.
[b]Denotes condition of used electrical switchgear.
[c]TBD = To be determined during decommissioning.
[d]S&M = Surveillance and maintenance.

Figure 1-1. 100 B Area Aerial Photograph.

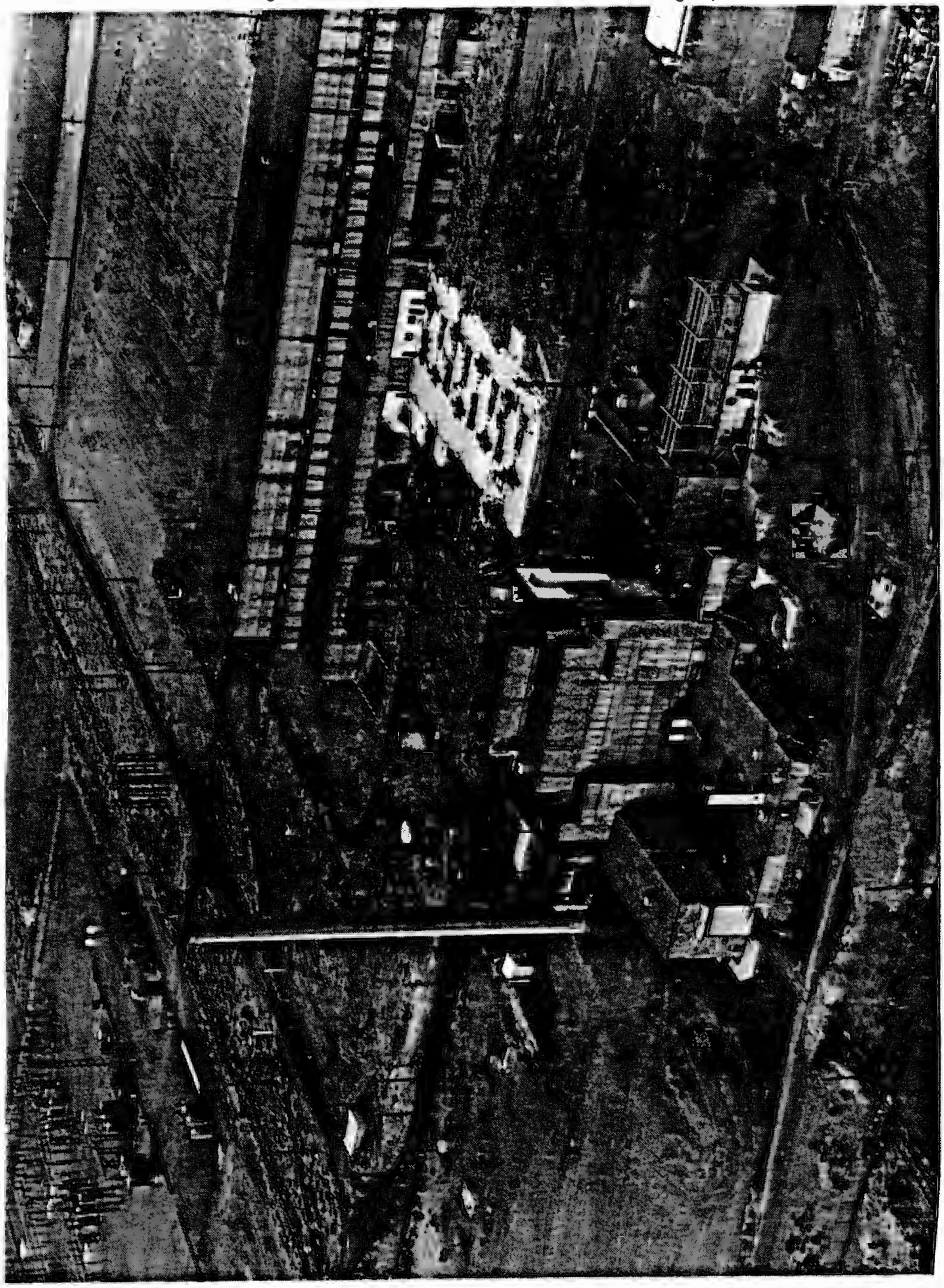


Figure 1-2. 100 C Area Aerial Photograph.

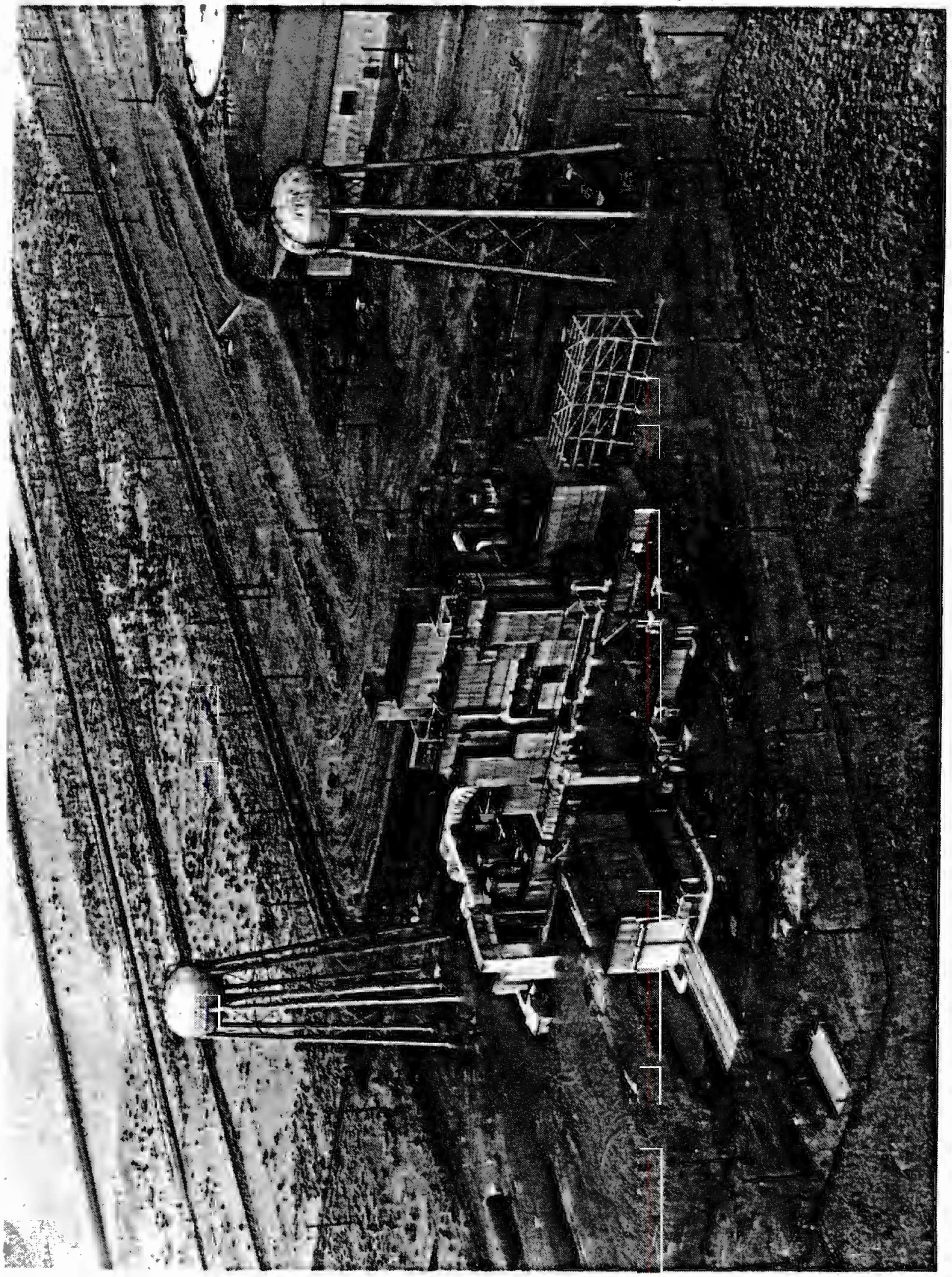


Figure 1-3. 100 D Area Aerial Photograph.

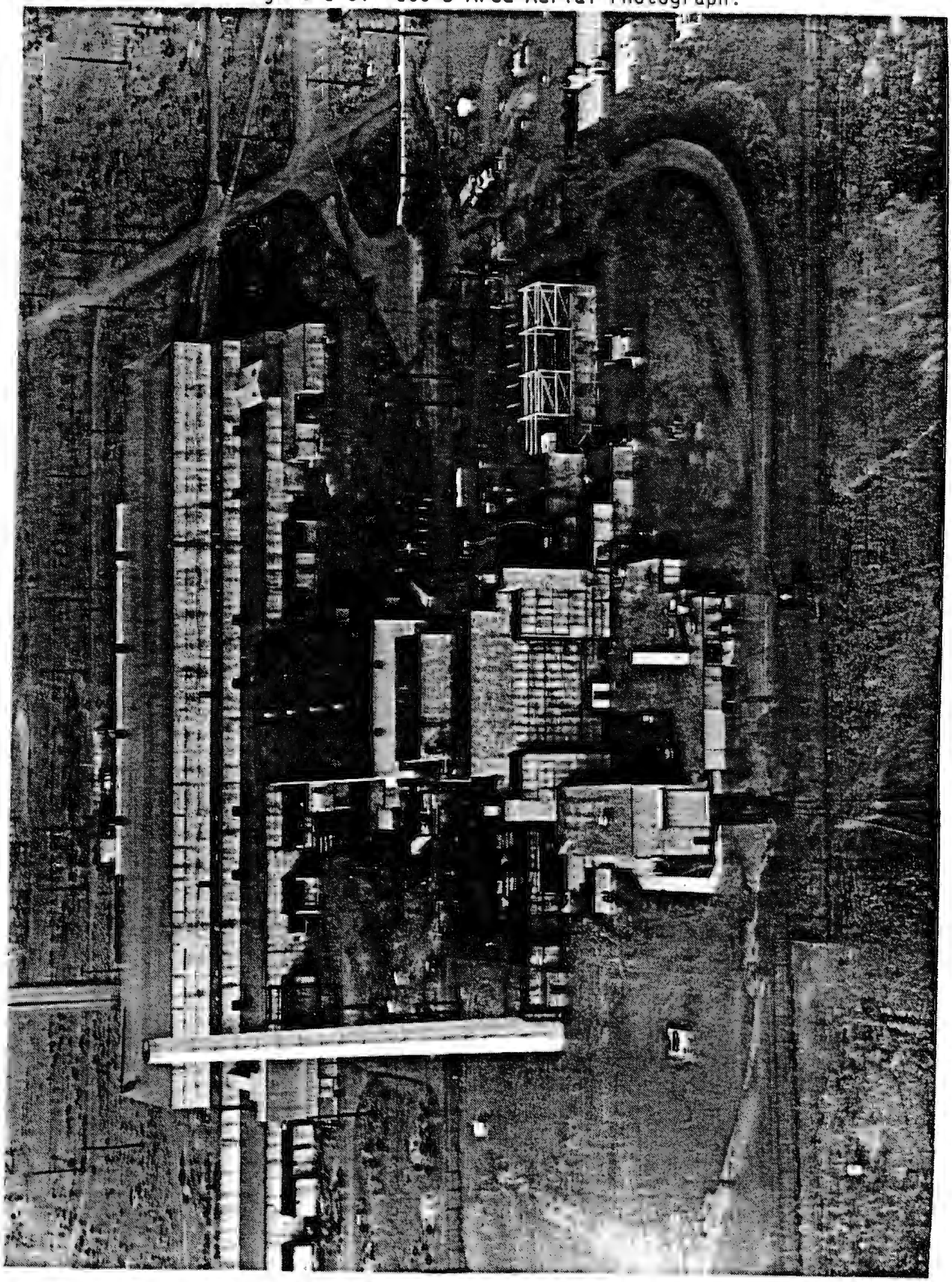


Figure 1-4. 100 DR Area Aerial Photograph.

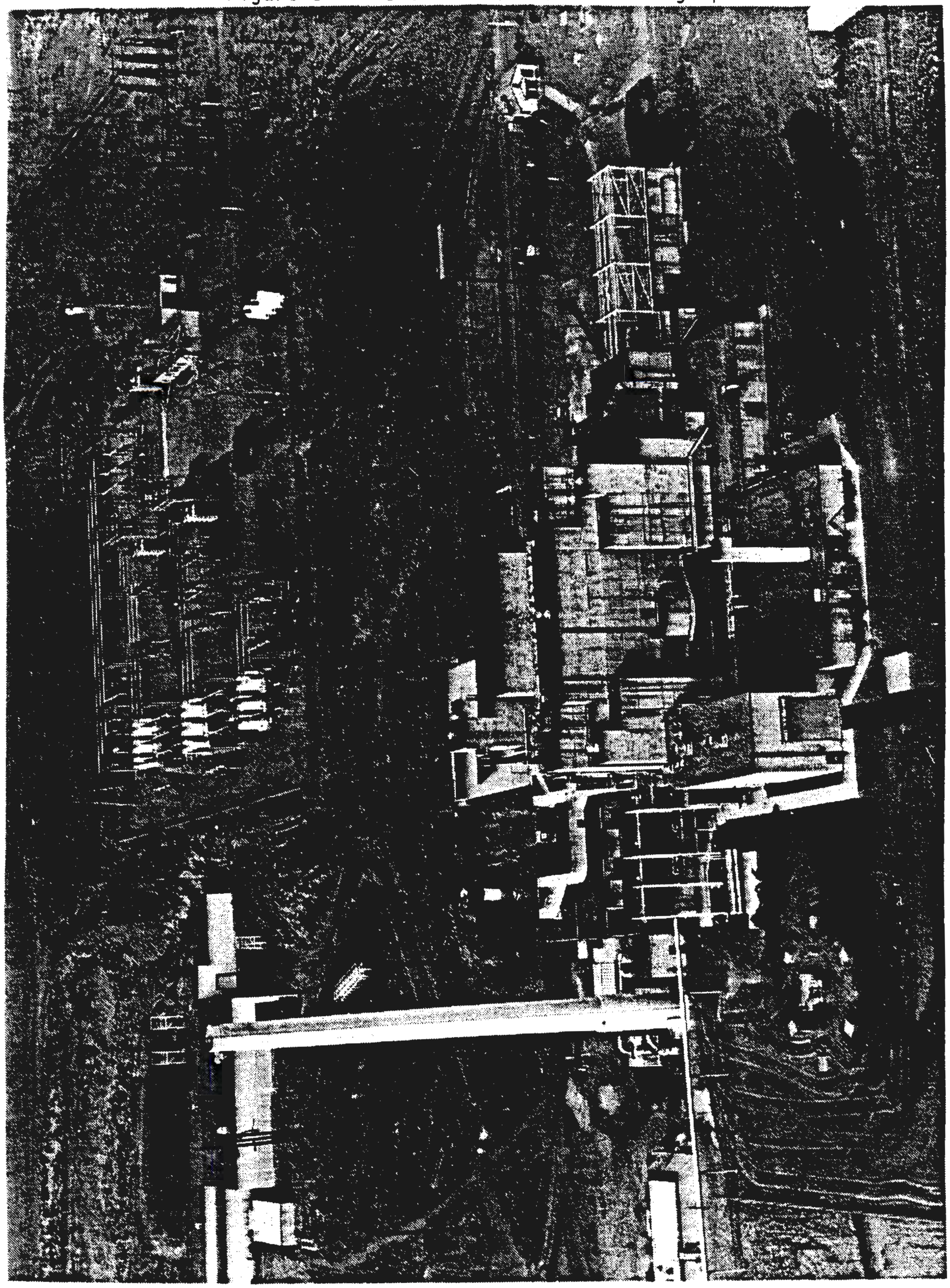


Figure 1-5. 100 KE Area Aerial Photograph.

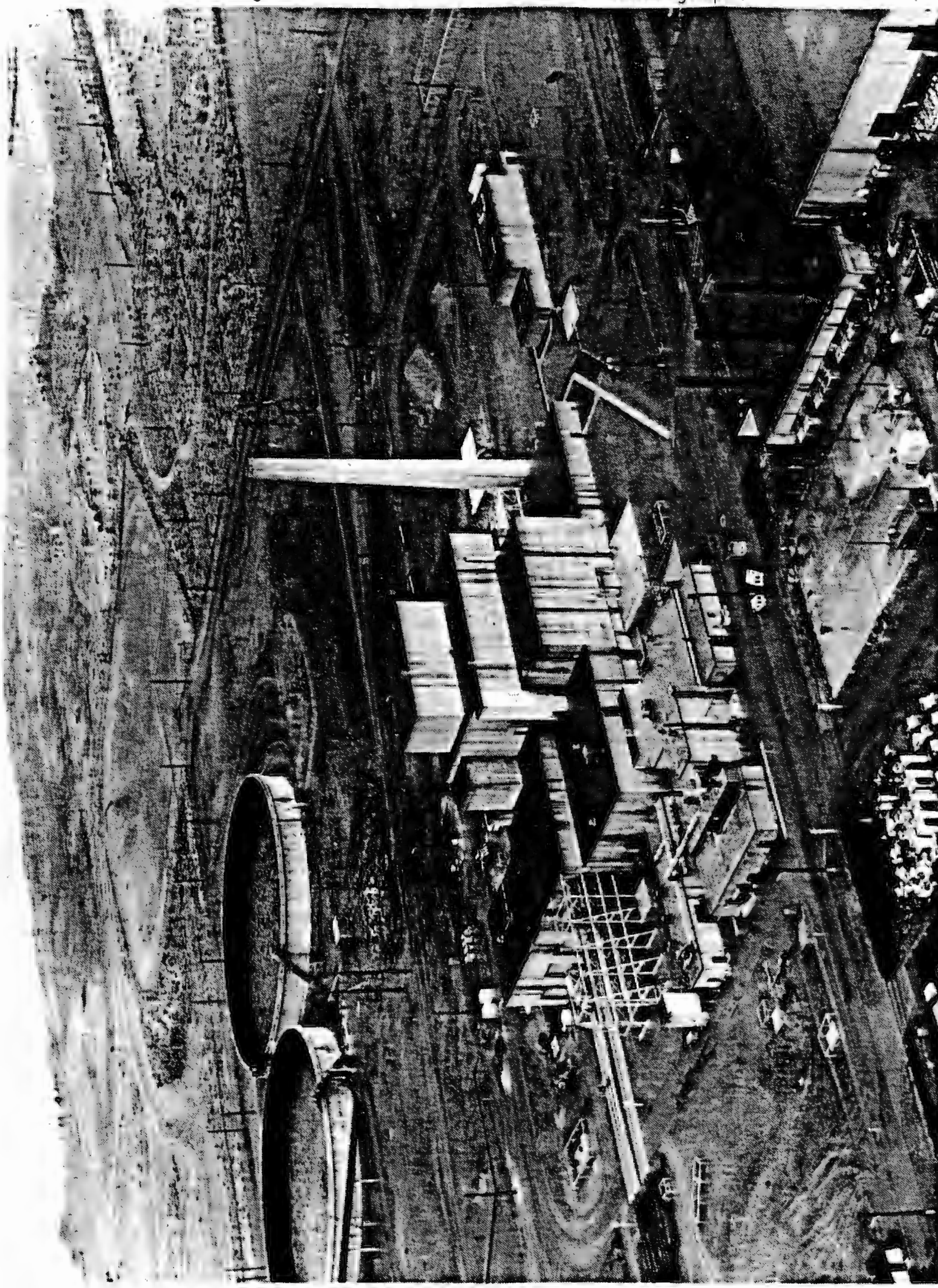


Figure 1-6. 100 KW Area Aerial Photograph.

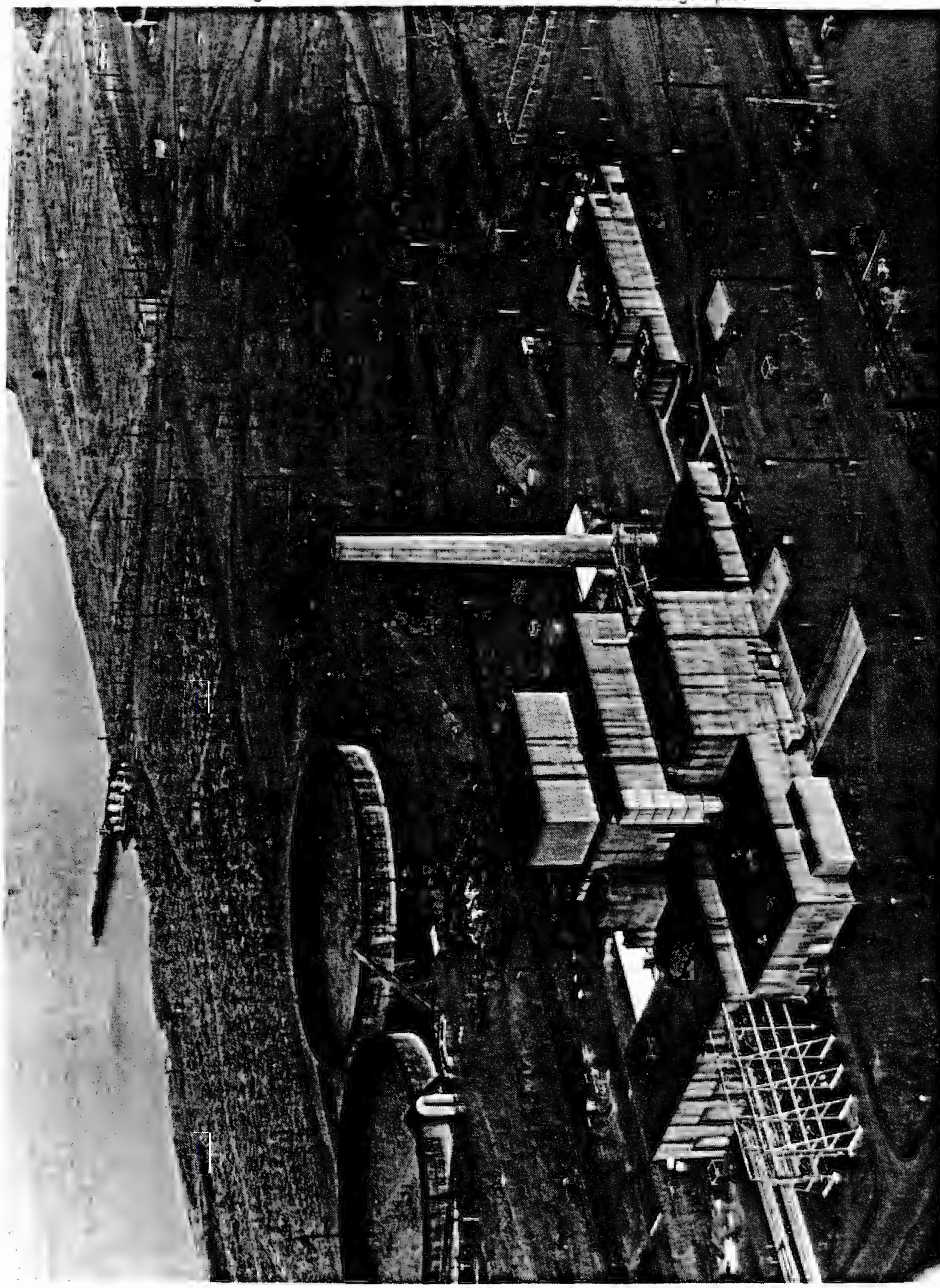


Figure 1-7. 100 F Area Aerial Photograph.

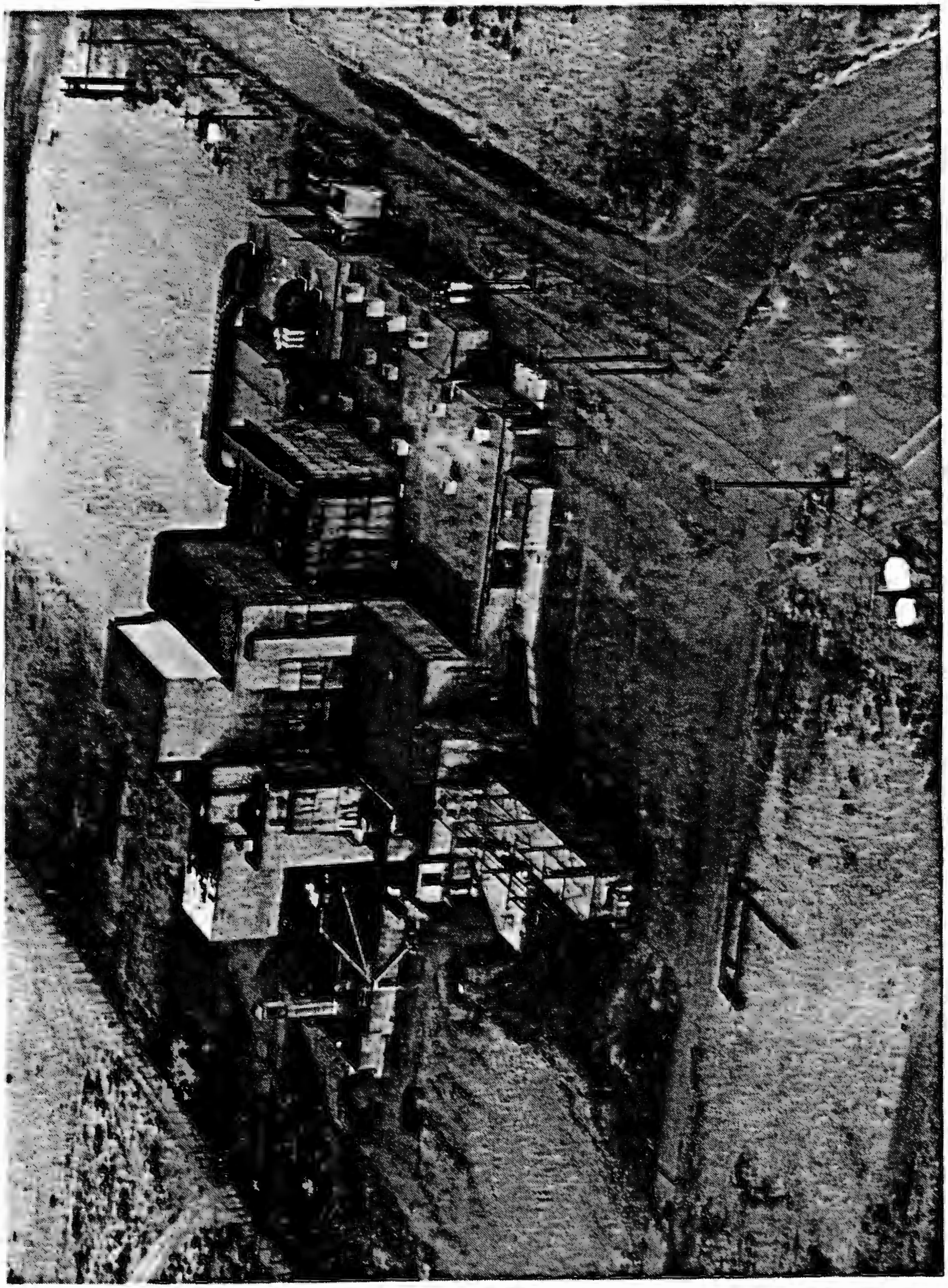
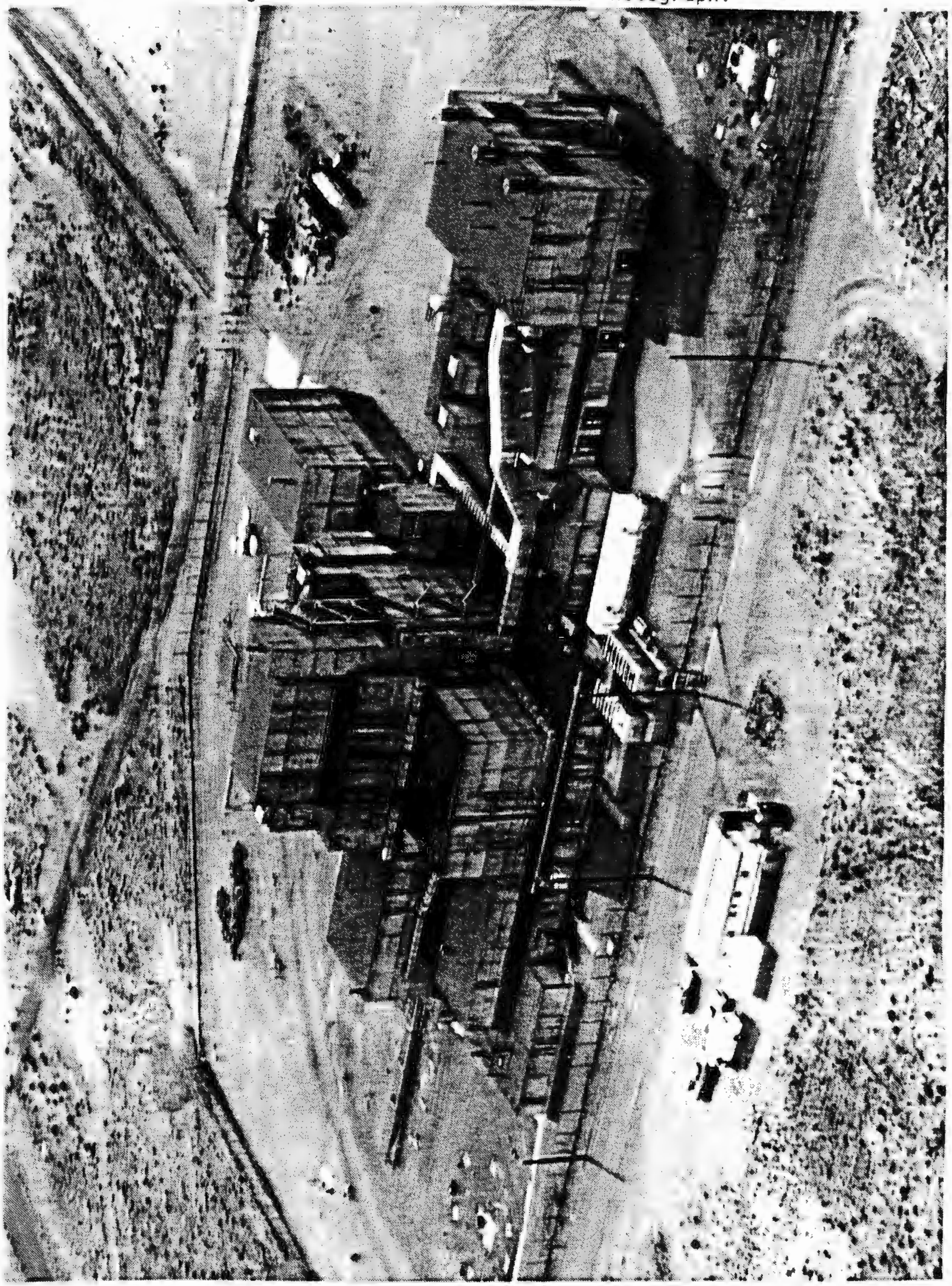


Figure 1-8. 100 H Area Aerial Photograph.



1.2.1 **103-B Riggers Loft** (Figure 1-9)

The original 103-B Building was used for pallet storage of fuel elements before use in the reactor. However, in 1985 the building was decontaminated and cleaned and is now used for storage of rigging equipment. This building is located directly north of the 105-B Building, inside the exclusion area fence. It is a one-story building (16.2 m by 8.2 m by 4.4 m [53 ft by 27 ft by 14.5 ft]) made of reinforced concrete foundation and floor, concrete block walls, and concrete roof with built-up tar and gravel surface.

The general condition of the building's interior is fair, the exterior is in fair to poor condition, and the roof is in poor condition.

1.2.2 **104-B-1 Tritium Vault** (Figure 1-10)

The 104-B-1 Building, located north of the 105-B Building inside the exclusion area fence, was placed in service in 1950 and was used for the storage of tritium recovered from irradiated lithium-aluminum target elements. This facility is constructed of concrete block, 3.1 m (10 ft) belowgrade and 3.1 m (10 ft) abovegrade.

The building's interior is in fair condition, the exterior is in fair to poor condition, and the roof is in poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 1998.

1.2.3 **104-B-2 Tritium Laboratory** (Figure 1-11)

The 104-B-2 Building, located in the northwest corner of the 105-B Reactor exclusion area fence, was used to store irradiated lithium-aluminum target elements before the separations processing at 108-B Building. This building is a one-story concrete structure (3.7 m by 7.3 m by 3.1 m [12 ft by 24 by 10 ft]), with special cells in the floor to store casks used in the pilot P-10 program.

The building's interior is in fair condition, the exterior is in fair to poor condition, and the roof is in poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 1998.

1.2.4 **105-B Reactor Building** (Figure 1-12)

The 105-B Reactor Building was constructed from August 1943 to September 1944 to house the nuclear reactor and directly associated equipment used in reactor operations. This reactor was the first of nine plutonium-producing reactors constructed and operated on the Hanford Site. A typical reactor facility is shown in Figure 1-13.

Figure 1-9. 103-B Riggers Loft.

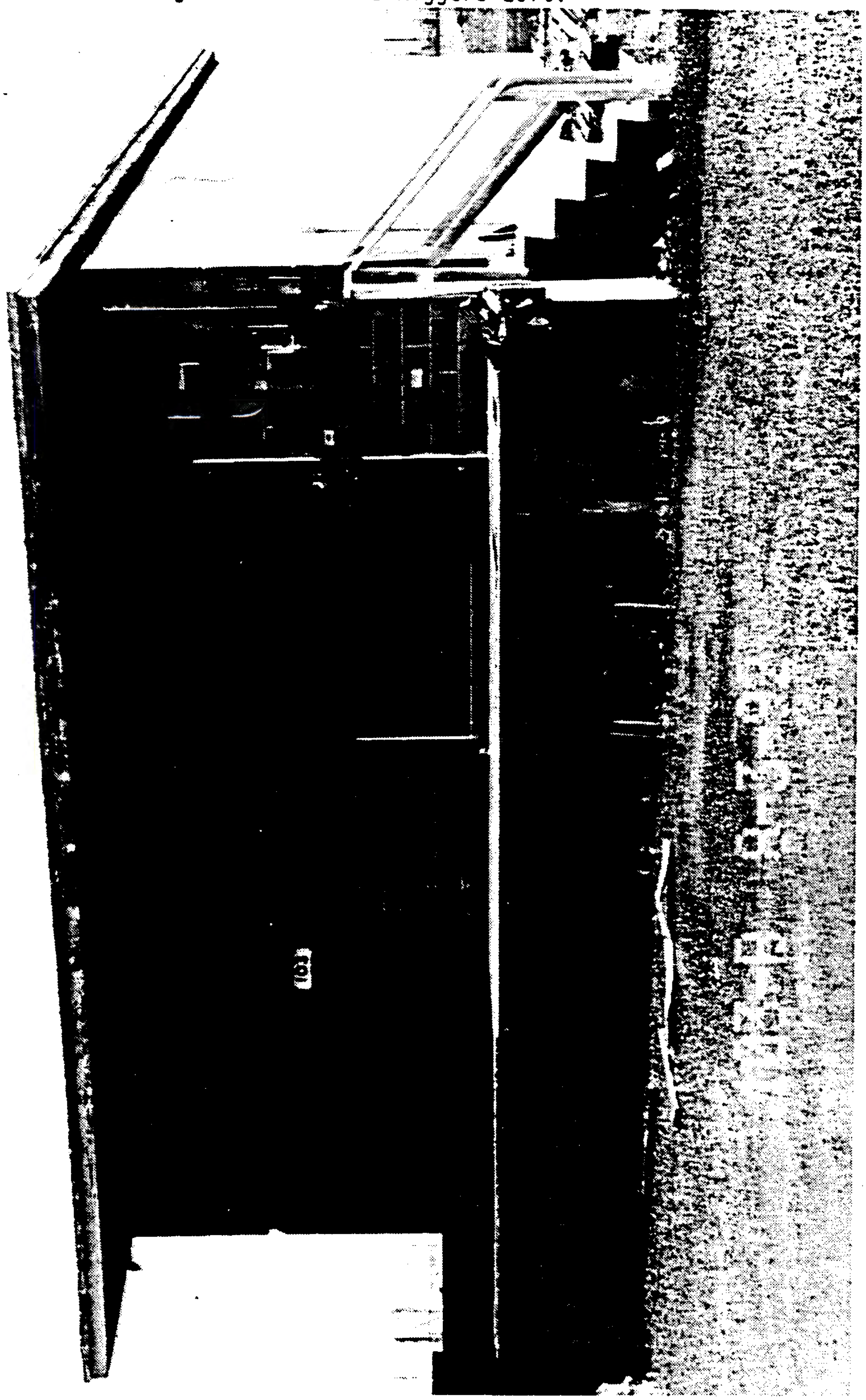


Figure 1-10. 104-B-1 Tritium Vault.

Figure 1-11. 104-B-2 Tritium Laboratory.

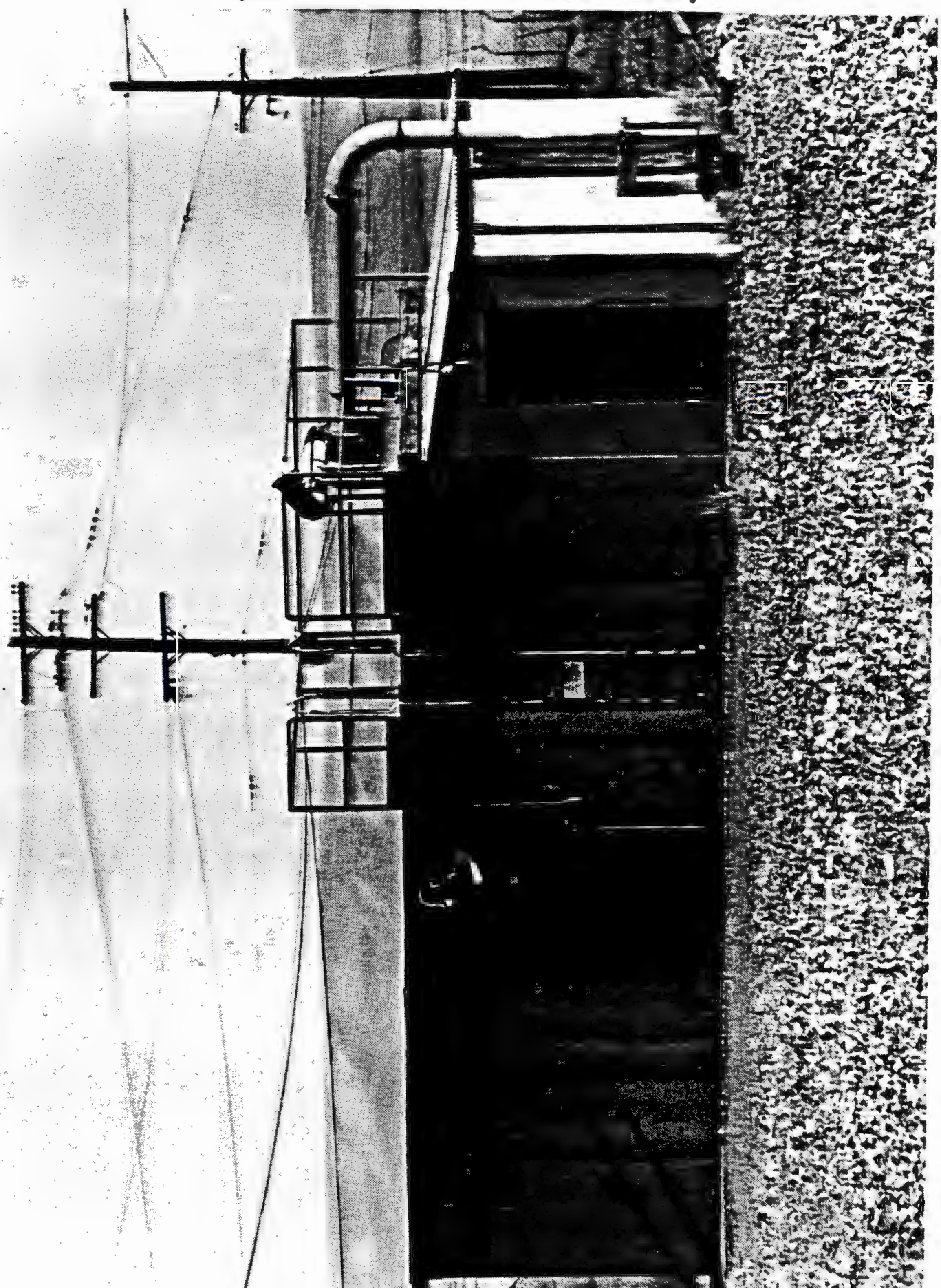


Figure 1-12. 105-B Reactor Building.

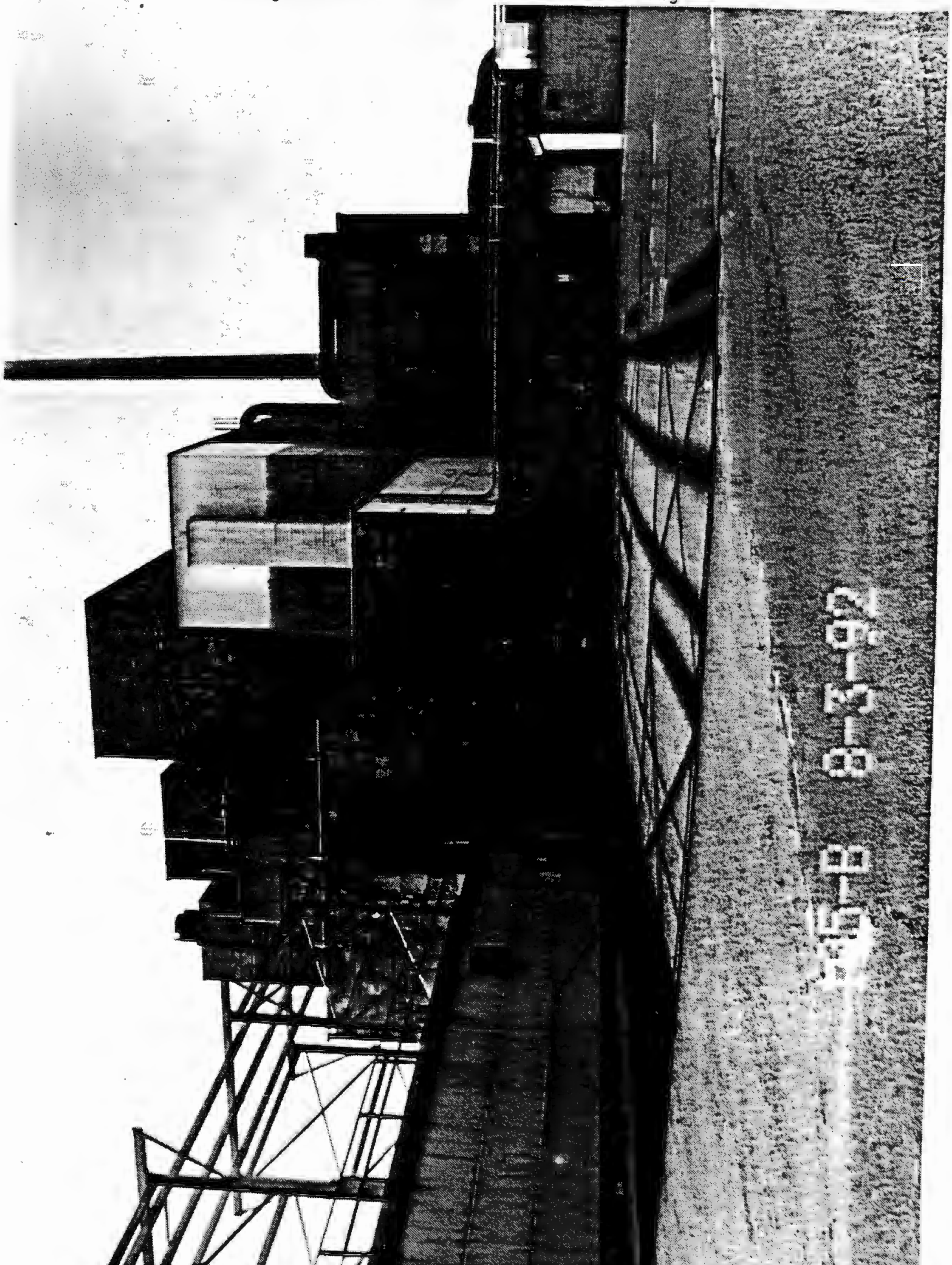
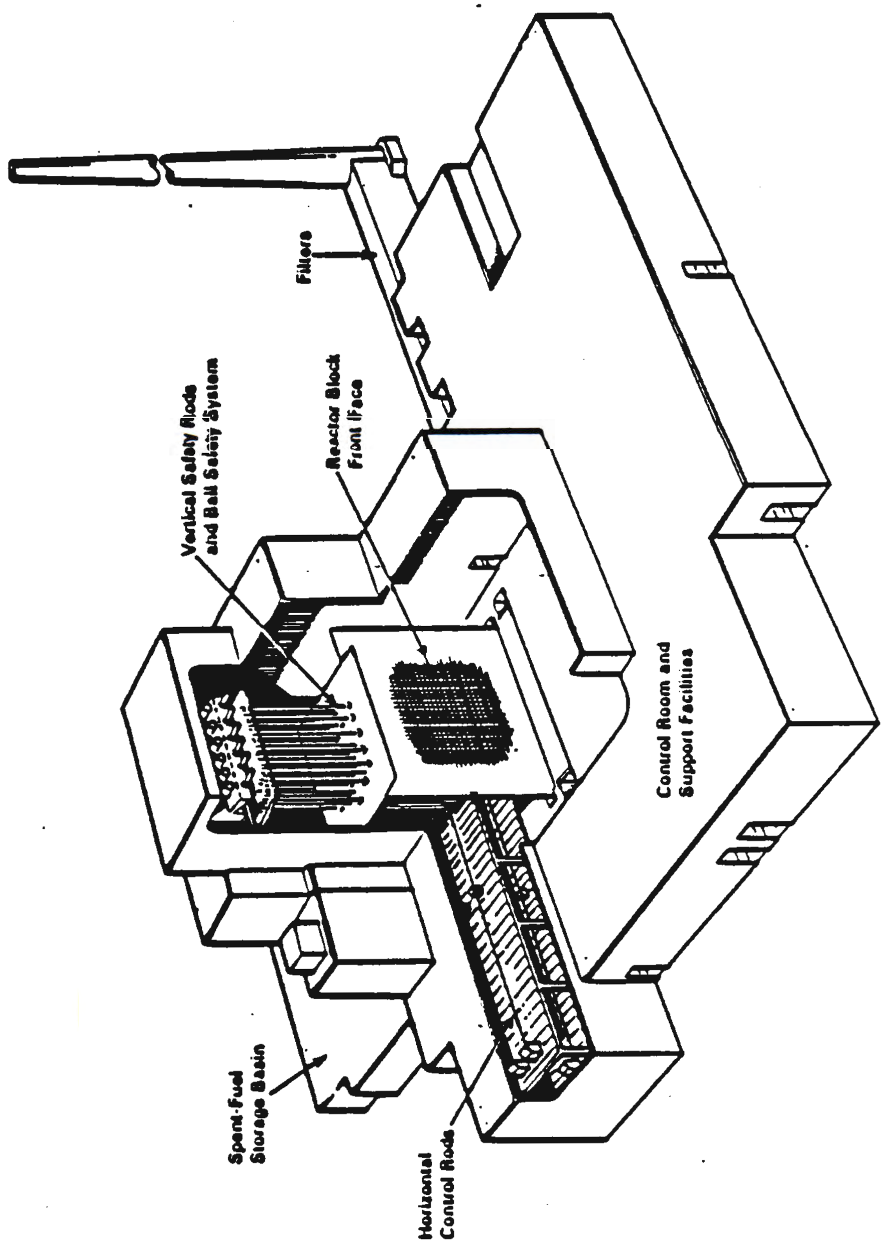


Figure 1-13. Typical Reactor Facility.



The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper location of this building is lighter in construction, using concrete block.

The reactor block is located near the center of the building (refer to Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and safety rod penetrations are on the top of the reactor. The control room is located directly under the horizontal control rod, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in a cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation. The block weighs approximately 9,145 metric tons (9,000 tons) and is 14.0 m by 14.0 m by 12.2 m (46 ft by 46 ft by 40 ft).

The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. It has since been drained and cleaned of debris, and fixative has been applied to radiologically contaminated surfaces.

The roof is primarily composed of membrane-covered, reinforced, precast concrete panels of the same type as the 105-D, 105-DR, and 105-F Reactors. These panels have endured the past 49 years with a minimum of maintenance and continue to be in good condition because of the initial and continued preventative maintenance the roofs have received since shutdown. Only a few cracked panels need to be replaced in this building.

The building's interior is in good condition and the exterior is in fair condition. The roof is in fair to good condition, but requires annual maintenance and repair to minimize water infiltration. The overall building contains an estimated 13,500 Ci of radionuclides (primarily activation products contained within the graphite core). This is based on the core analysis performed on the 105-D Reactor, which is the same basic size as the 105-B core. In addition, 89.4 metric tons (88 tons) of lead and an unknown quantity of asbestos are contained within the building structure.

The status of this facility is retired--radioactively contaminated. An environmental impact statement (EIS) has been prepared by DOE for decommissioning the eight shutdown Hanford Site reactors (DOE 1989). A final decision on the actions required by the EIS is pending.

In September 1976, the American Society of Mechanical Engineers established the B Reactor as a National Historic Mechanical Engineering landmark. This award honored those engineers who were directly responsible for the design and development of B Reactor. The inscription on the award is as follows: "This nuclear reactor was the first to demonstrate the practicality of producing large quantities of plutonium and was a major milestone in the U.S. Atomic Energy Program." In addition, the National Historic Foundation has recognized the B Reactor as a national monument, and it has been registered with the Washington State Historical Society.

1.2.5 116-B Exhaust Stack (Figure 1-14)

The 116-B Exhaust Stack was used to discharge ventilation air 61.0 m (200 ft) abovegrade from the 105-B Building. The stack extended 61.0 m (200 ft) abovegrade and 3.1 m (10 ft) belowgrade, with a 4.9-m- (16-ft-) diameter base. The stack is a monolithic, reinforced concrete structure, with a wall thickness of 0.5 m (1.5 ft) at the base and 0.3 m (1 ft) at the top. The stack is in good general condition and has no noted structural defects.

1.2.6 185-B Water Treatment Plant (Figure 1-15)

The 185-B Plant was originally intended as a deaerating plant, but was never used for that purpose. The building is a steel and concrete block structure (93.6 m by 14.6 m by 18.3 m [307 ft by 48 ft by 60 ft]) that adjoins the 190-B Building and shares a common wall. This facility served primarily as a maintenance and storage area.

The building's interior and exterior are in extremely poor condition. The roof, which is composed of reinforced, precast concrete panels with a built-up asphalt covering, is in poor condition and does not protect against water infiltration. Presently the building serves no purpose and is scheduled for decommissioning in FY 1999.

1.2.7 190-B Main Pump House (Figure 1-16)

The 190-B Facility housed water process and service pumps and ventilation equipment. The purpose was to supply treated water to the reactor and other equipment requiring cooling water. The building is a concrete and concrete block structure. The building's equipment has been removed and is prepared for demolition.

The building's interior and exterior are in extremely poor condition. The roof, which is composed of reinforced, precast concrete panels with a built-up asphalt covering, is in extremely poor condition and does not protect against water infiltration. Presently the building serves no purpose, and the internal equipment has been removed in preparation for decommissioning in FY 1999.

1.2.8 1608-B Gas Line Pressure/Vacuum Seal House (Figure 1-17)

The 1608-B Building contained the apparatus to provide a gas line pressure/vacuum for the 105-B Reactor gas system. This facility is 9.8 m (32 ft) belowgrade, 3.7 m (12 ft) long, and 3.7 m (12 ft) wide. It consists

Figure 1-14. 116-B Reactor Exhaust Stack.

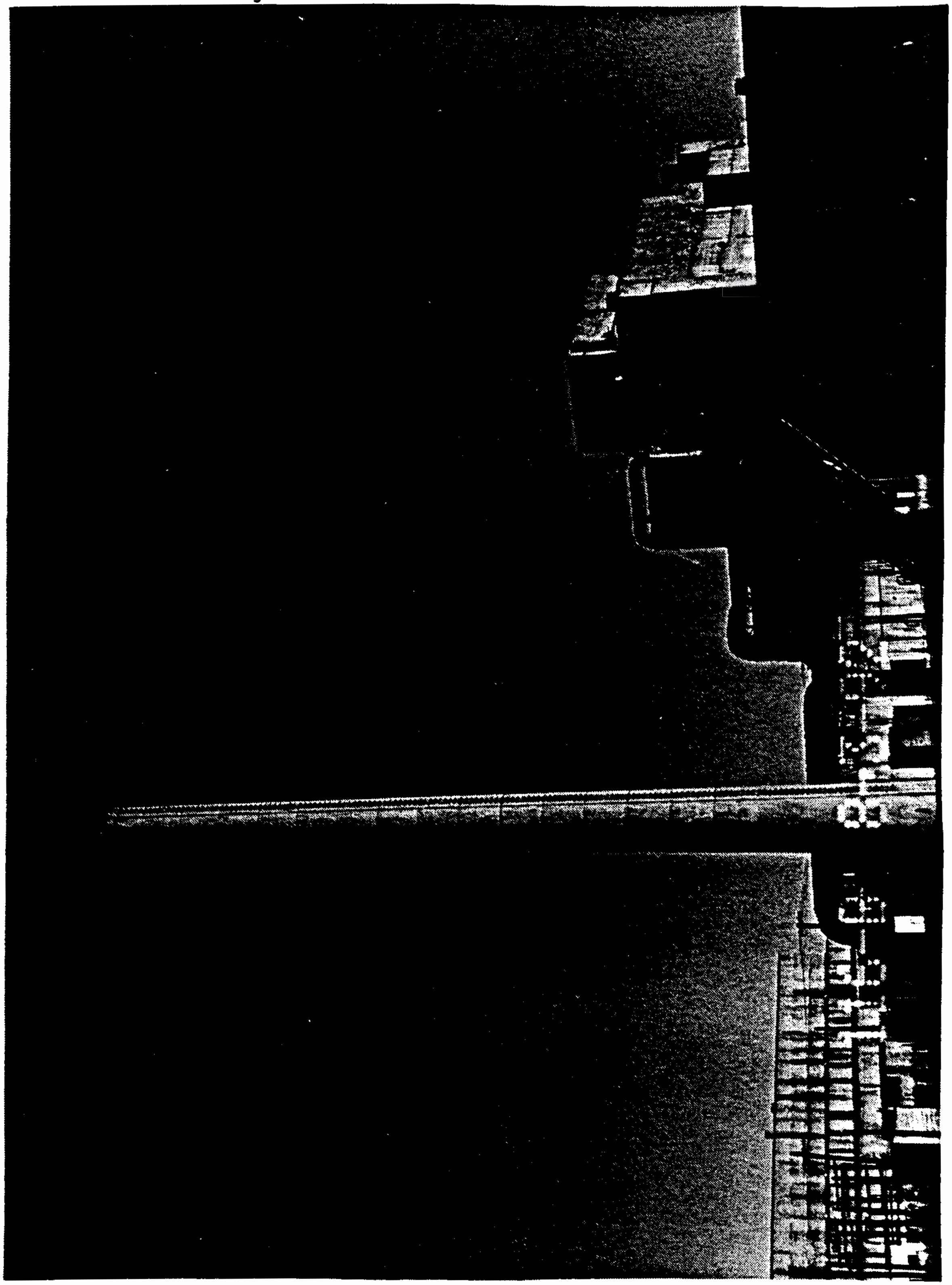


Figure 1-15. 185-B Water Treatment Plant.

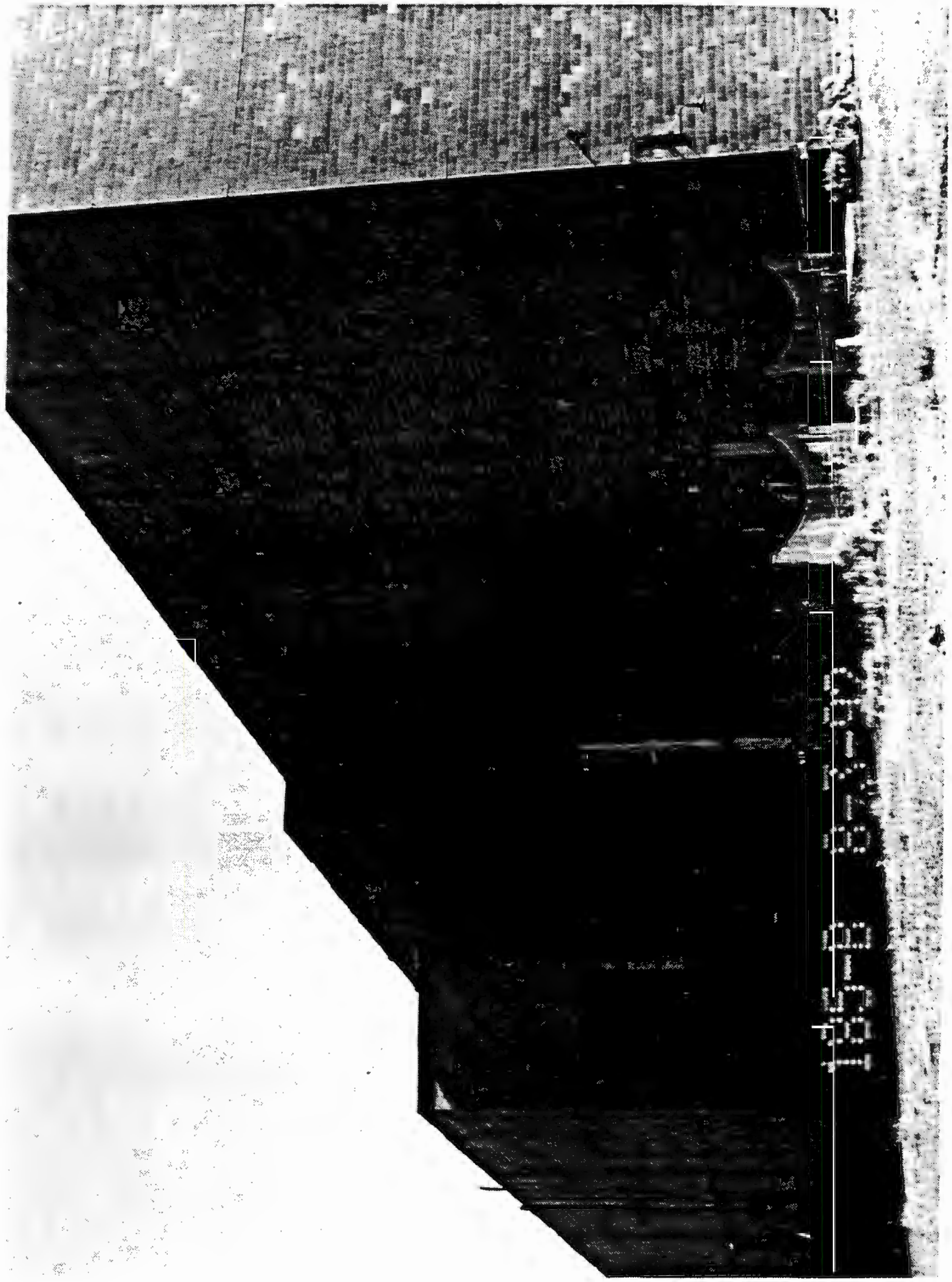


Figure 1-16. 190-B Main Pump House.

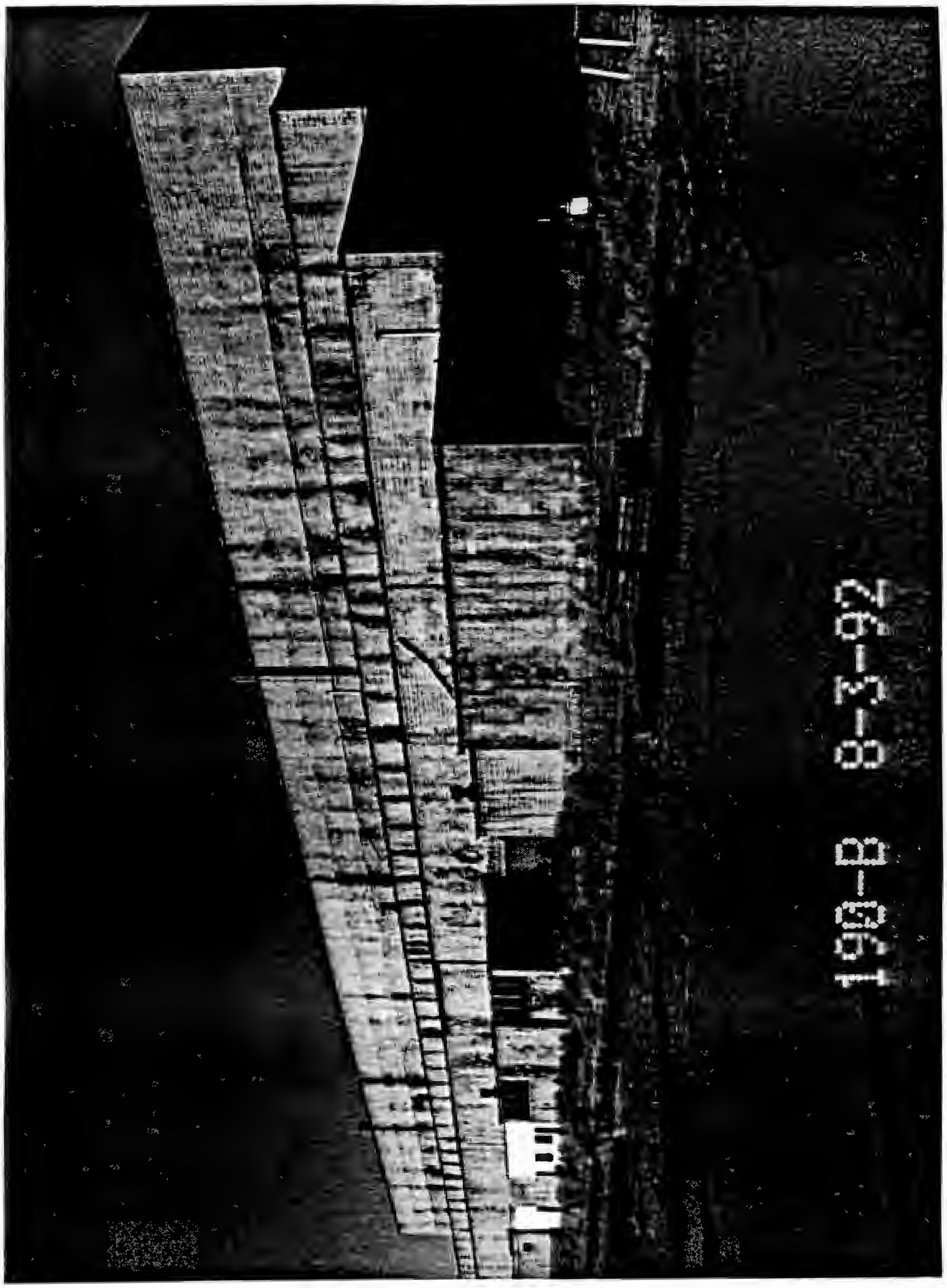
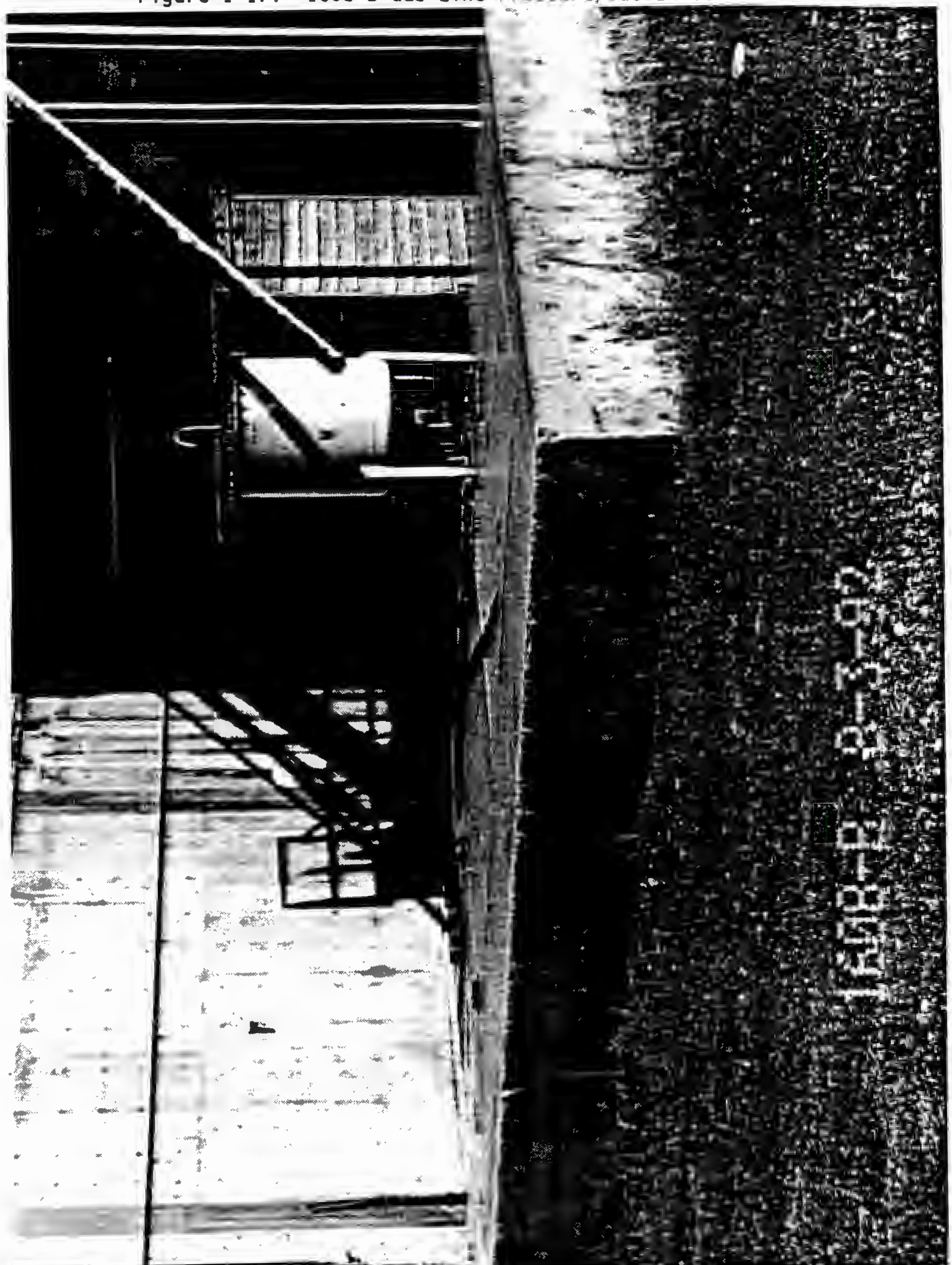


Figure 1-17. 1608-B Gas Line Pressure/Vacuum Seal House.



of two components: (1) a small, wooden framed structure to provide entry to the lower structure, and (2) the belowgrade concrete structure.

The building's interior is in fair condition and the exterior is in poor condition. The asphalt-shingled, wooden roof is in poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 1999.

1.2.9 1701-BA Exclusion Area Badge House (Figure 1-18)

The 1701-BA Badge House is located at the entrance to the 105-B exclusion area. It provided a shelter for a security check before entrance to the exclusion area. The facility is a concrete block structure, 6.1 m by 6.1 m (20 ft by 20 ft).

The building's interior is in fair condition, the exterior is in fair condition, and the wooden-framed roof is in poor condition. During the summer, a high-velocity wind blew the rolled asphalt covering from the roof. A Plant Forces Work Review awarded the work to Kaiser Engineers Hanford (KEH), who is in the process of rebuilding and covering the structure. Because the roof is not intact, the building is not being used at the present time for any function that supports Inactive Facilities Surveillance and Maintenance (IFS&M), and decommissioning is scheduled in FY 2009.

1.2.10 105-C Reactor Building (Figure 1-19)

The 105-C Reactor Building was constructed from 1951 to 1952 to house the nuclear reactor and directly associated equipment used in reactor operations. It is similar to the 105-B Reactor Building, except for a larger L-shaped building size (105.5 m by 45.7 m by 36.6 m [346 ft by 150 ft by 120 ft]; 45.7 m by 27.4 m by 6.1 m [150 ft by 90 ft by 20 ft]) and variations in layout.

The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper section of this building is lighter in construction, using steel-framed transite panels.

The reactor block is located near the center of the building (refer to Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and safety rod penetrations are on the top of the reactor. The control room is located directly under the horizontal control rod, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation.

Figure 1-18. 1701-BA Exclusion Area Badge House.

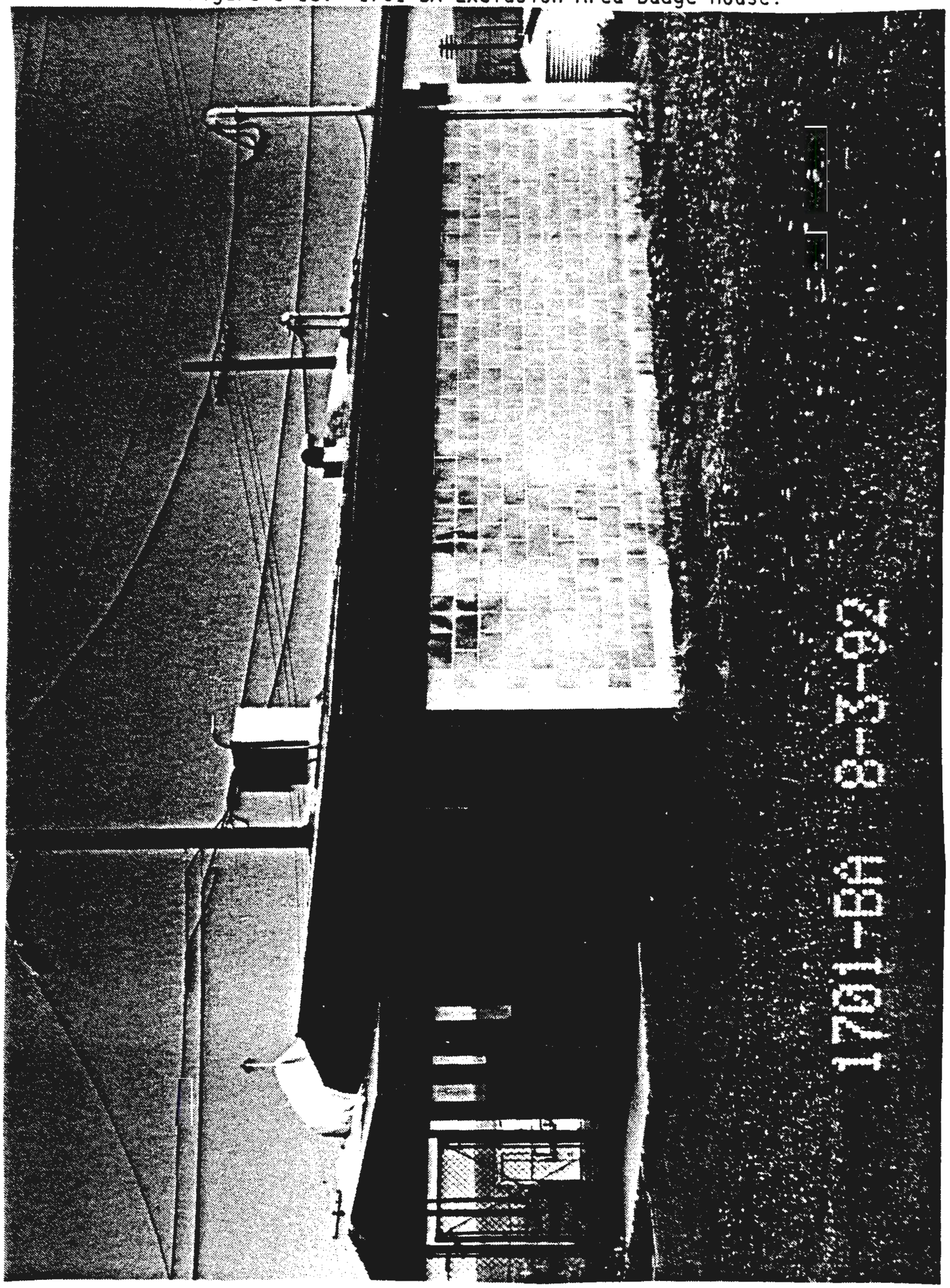
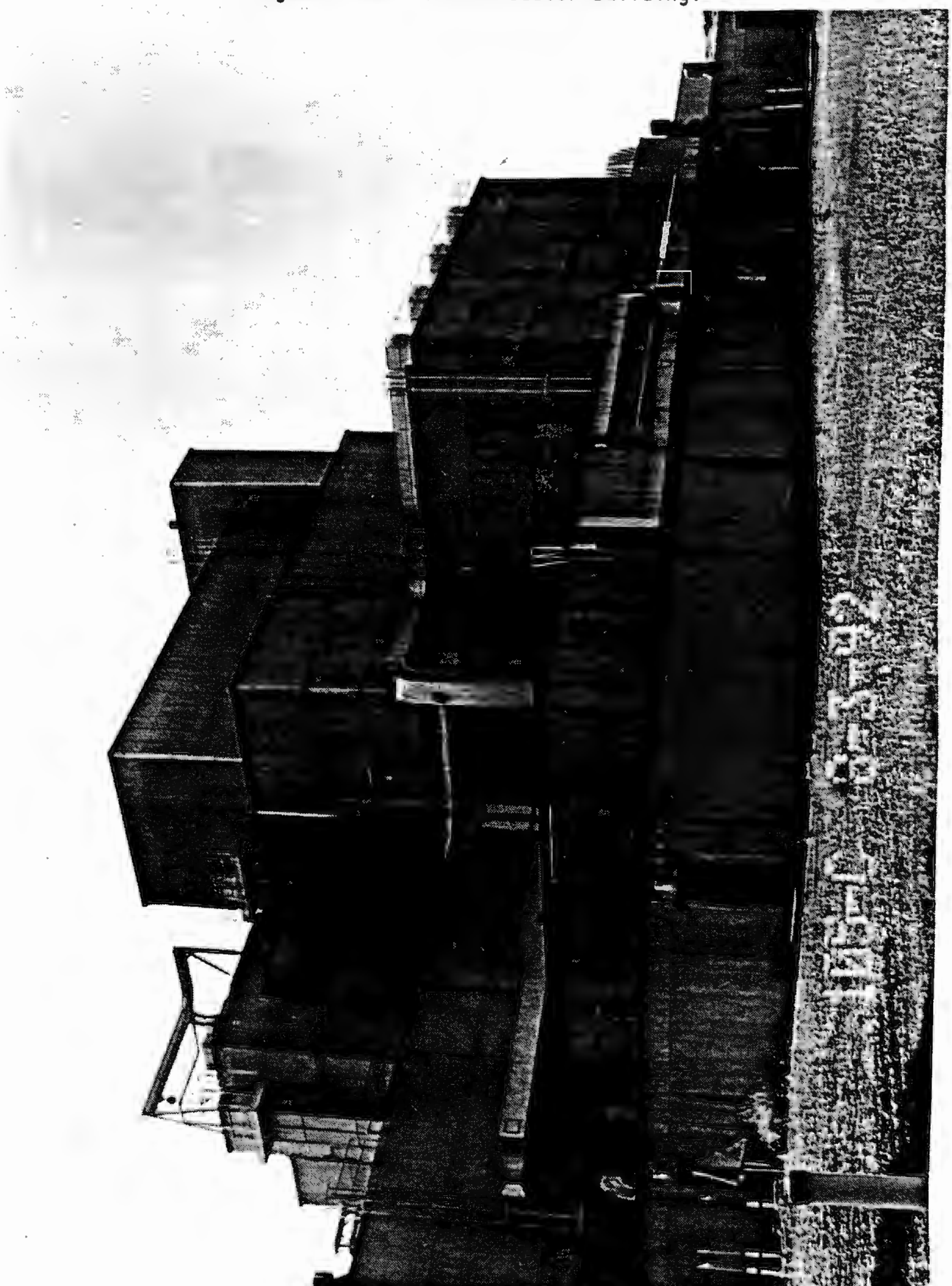


Figure 1-19. 105-C Reactor Building.



The block weighs approximately 9,145 metric tons (9,000 tons) and is 14.0 m by 14.0 m by 12.2 m (46 ft by 46 ft by 40 ft).

The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. It has since been drained and cleaned of debris, and fixative has been applied to radiologically contaminated surfaces.

The roof is primarily composed of asphalt-covered, reinforced, precast gypsum panels of the same type as the 105-H Reactor. These panels have endured the past 41 years with a minimum of maintenance, but have deteriorated past the point of corrective maintenance in numerous locations. Complete panel replacement is required in approximately 125 of these deteriorated roof panels. In addition, roof support structures have deteriorated because of water infiltration.

The building's interior and exterior are in poor condition, with numerous friable asbestos locations. The roof is in poor condition in several locations. Figure 1-20 shows the roof panels that have deteriorated over the equipment room, located on the top of the reactor core; the center of the panel collapsed because of water infiltration. The overall building contains an estimated 13,500 Ci of radionuclides (primarily activation products contained within the graphite core). This is based on the core analysis performed on the 105-D Reactor, which is the same basic size as the 105-C core. In addition, 106.7 metric tons (105 tons) of lead and an unknown quantity of asbestos are contained within the building structure. However, the core radionuclide loading may be slightly less than the 105-D core because the procurement specification for the graphite in the second group of reactors constructed at the Hanford Site, those being the 105-C, 105-DR and 105-H, did not allow the graphite to contain as many impurities as the original specification. The net result should be a lowering of the activation products.

The status of this facility is retired--radioactively contaminated. An EIS has been prepared by DOE for decommissioning the eight shutdown Hanford Site reactors (DOE 1989). A final decision on the actions required by the EIS is pending. The building is tentatively scheduled for decommissioning from FY 2003 through FY 2013.

1.2.11 183-C Filter Plant/Pumproom (Figure 1-21)

The 183-C Facility housed water treatment and filtering facilities and provided reservoir capacity for treated water. The treated water was used by 105-B and 105-C Reactors for core cooling. This building is a reinforced concrete and concrete block building 96.3 m by 87.8 m (316 ft by 288 ft).

The building's interior is in fair condition, the exterior is in poor condition, and the asphalt-covered metal roof is in very poor condition. Figure 1-22 shows a portion of the roof's exterior that was blown off by the wind. Figure 1-23 shows the internal roof trusses, which are deteriorating as

Figure 1-20. 105-C Roof Panel Deterioration.

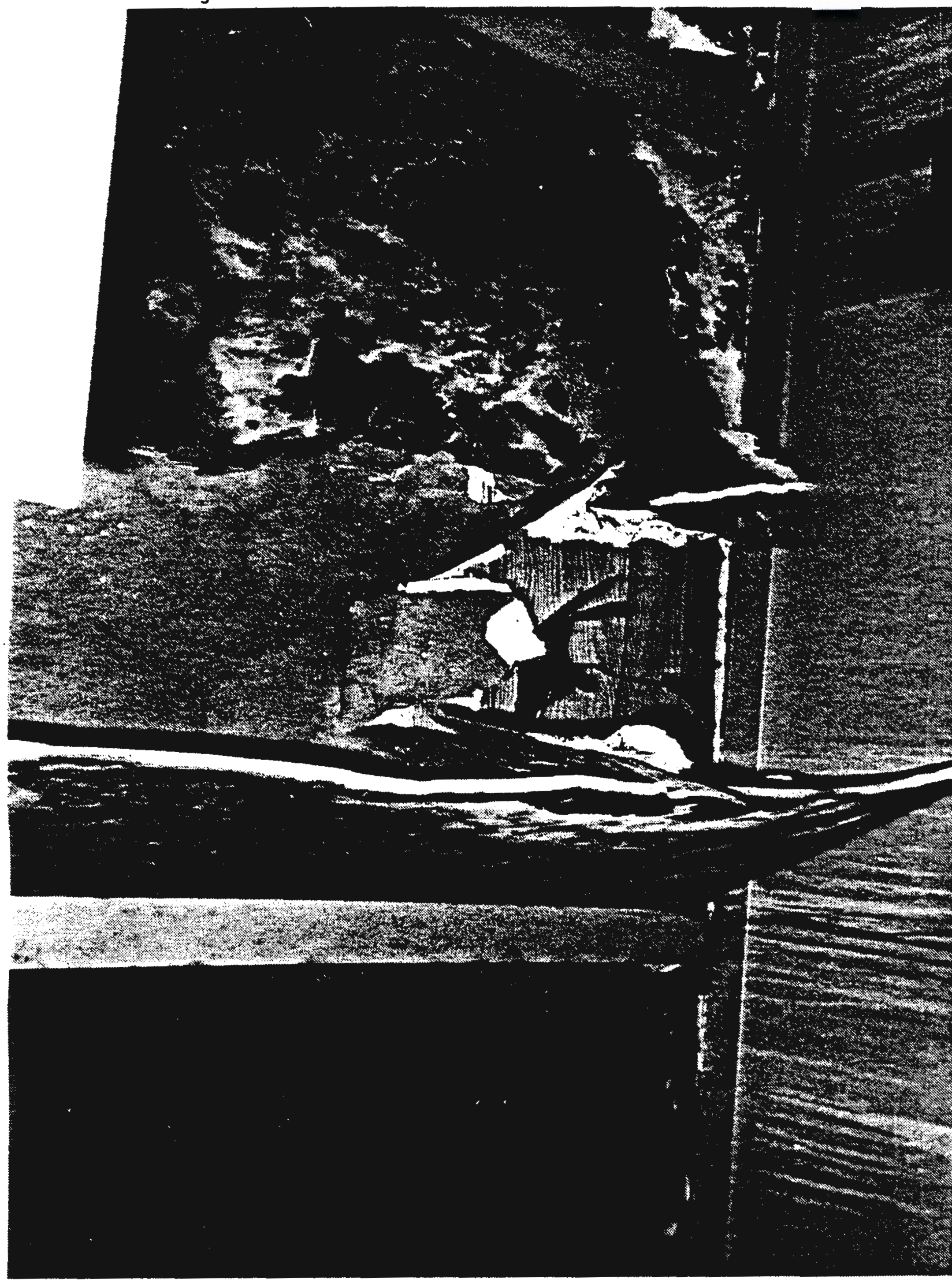


Figure 1-21. 183-C Filter Plant/Pumproom.

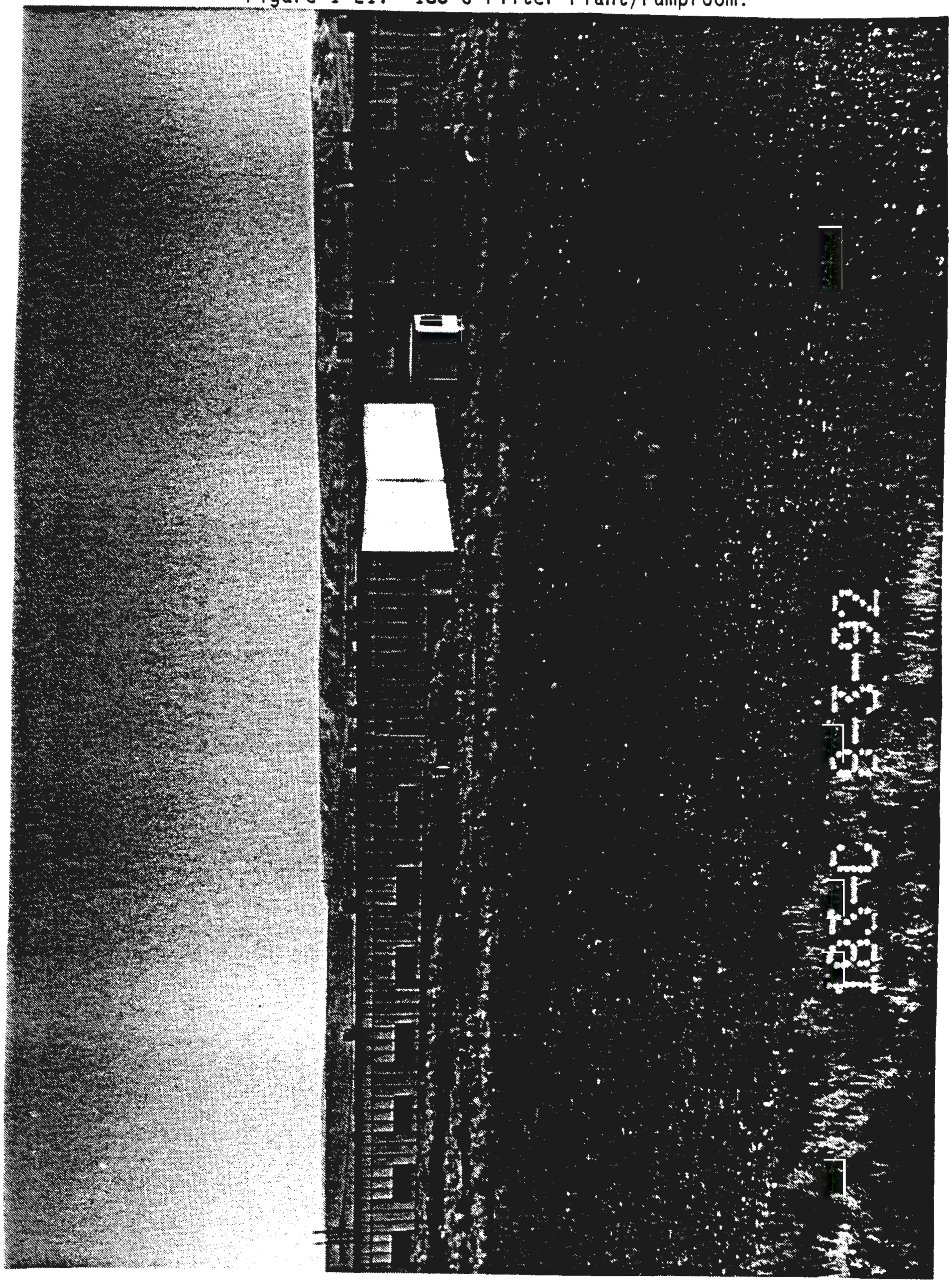
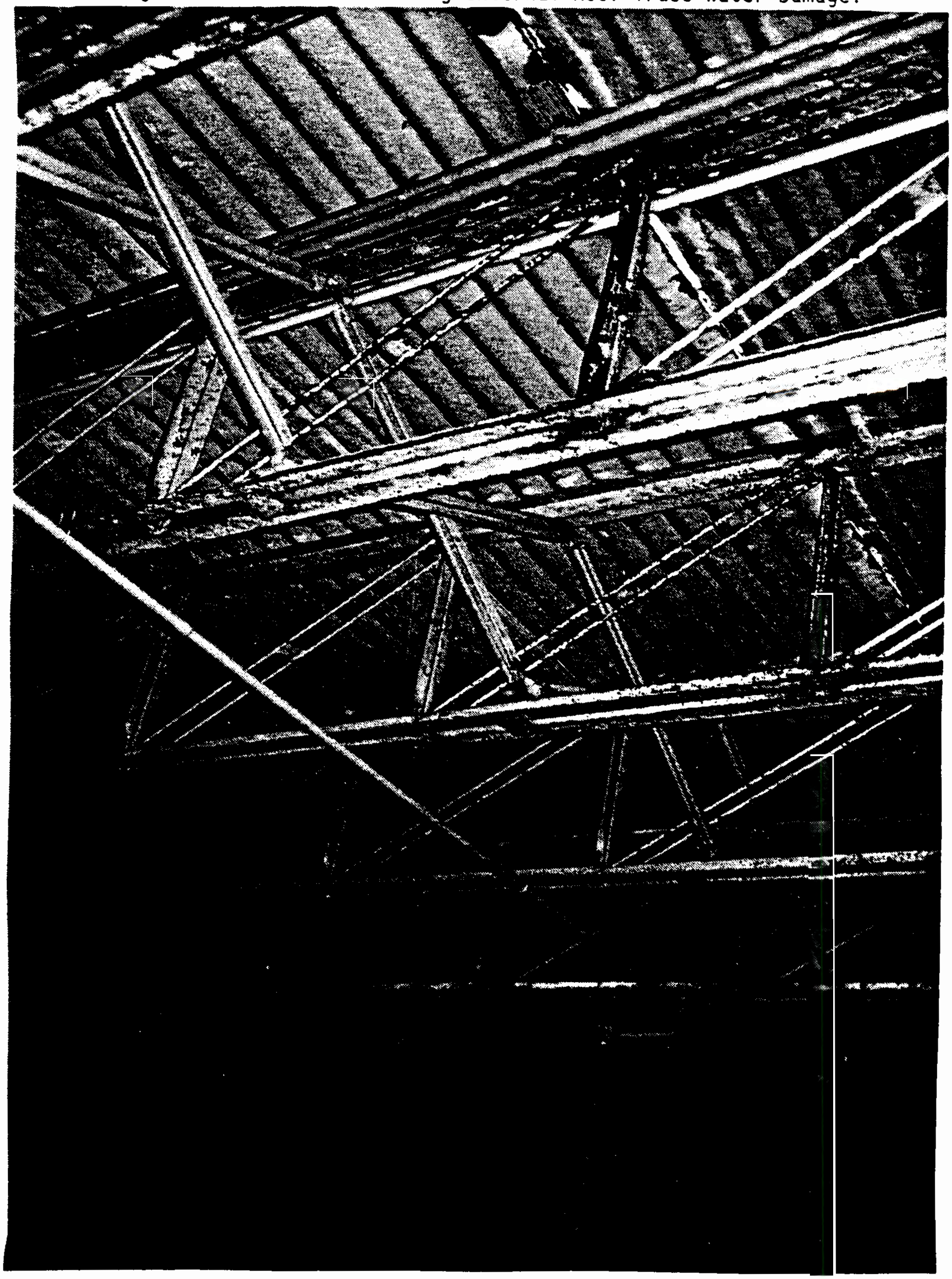


Figure 1-22. 183-C Building Roof Damage Caused by Wind.

Figure 1-23. 183-C Building Internal Roof Truss Water Damage.



a result of the infiltration of rain water. The water that infiltrated the building has collected in a belowgrade basin and will be pumped out in FY 1993. Presently the building serves no purpose and is scheduled for decommissioning in FY 2003.

1.2.12 190-C Main Pump House (Figure 1-24)

The 190-C Facility housed water process and service pumps and ventilation equipment. The purpose was to supply treated water to the reactor and other equipment requiring cooling water. The building, a steel-framed, transite-covered structure, has reinforced concrete floors and stations.

The building's interior is in poor condition, the exterior is in fair condition, and the asphalt-covered metal roof is in extremely poor condition. Presently the building is assigned to N Reactor under a Letter of Understanding for storage of radiologically contaminated filters. The internal equipment has been removed in preparation for decommissioning in FY 1999.

1.2.13 1702-C Badge House (Figure 1-25)

The 1702-C Badge House is located at the entrance to the 105-C exclusion area. It provided a shelter for a security check before entrance to the exclusion area. The facility is a wooden-framed structure, 19.5 m^2 (210 ft^2).

The building's interior is in good condition, the exterior is in fair condition, and the asphalt-covered, wooden-framed roof is in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2008.

1.2.14 1714-C Solvent Storage Building (Figure 1-26)

The 1714-C Building is located south of 105-C Reactor and was used for miscellaneous oil and solvent storage. This facility is a steel-framed, transite structure on a concrete foundation, approximately 14.5 m^2 (156 ft^2).

The building's interior, exterior, and roof are all in poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2008.

1.2.15 103-D Fresh Metal Storage Building (Figure 1-27)

The 103-D Building was originally used for pallet storage of fresh fuel elements before use in the reactor. The facility is now used for miscellaneous storage. This building is a reinforced concrete and concrete block structure, 16.2 m by 8.2 m by 4.4 m (53 ft by 27 ft by 14.5 ft).

Figure 1-24, 190-C Main Pump House.

Figure 1-25. 1702-C Badge House.

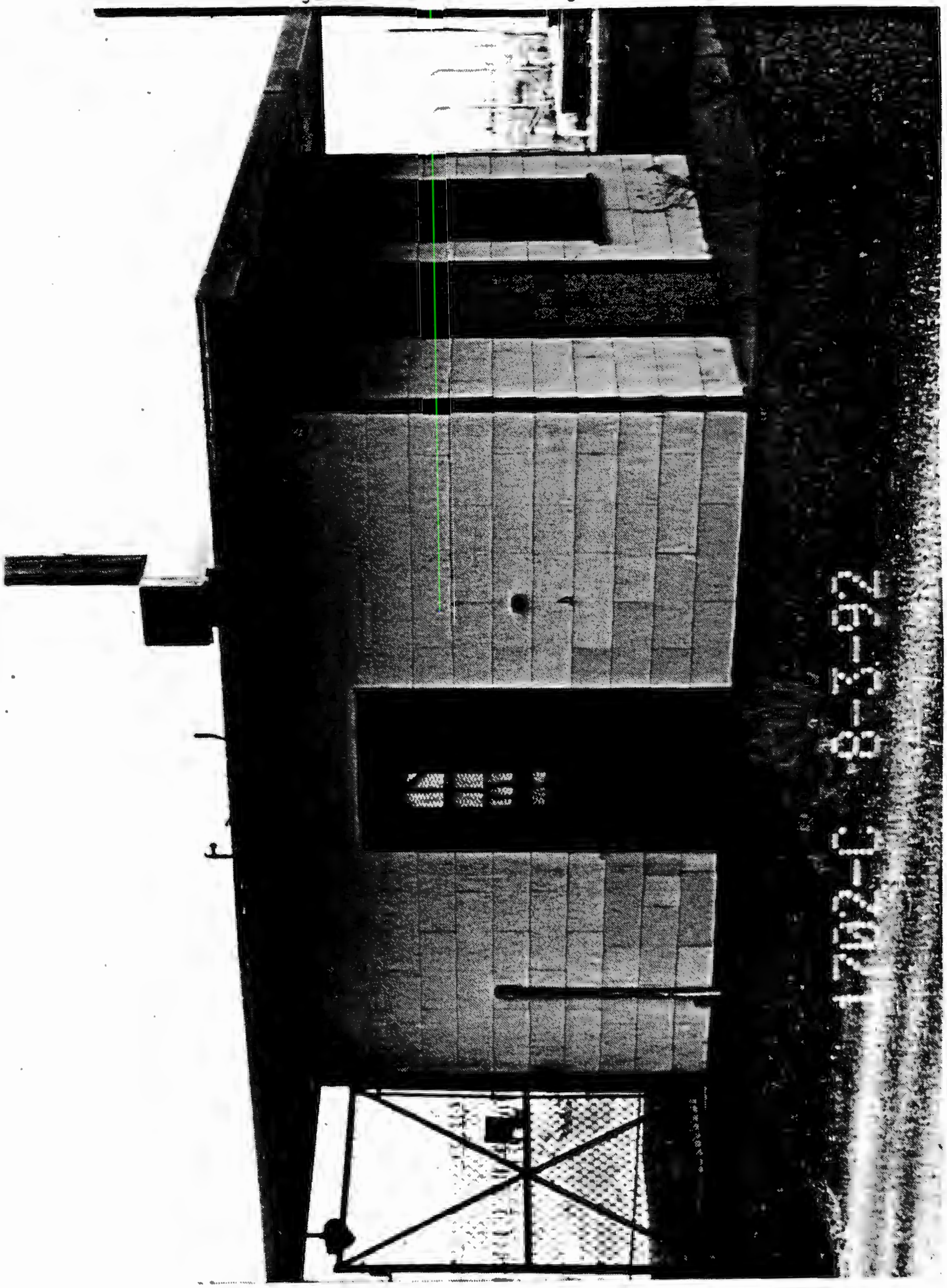
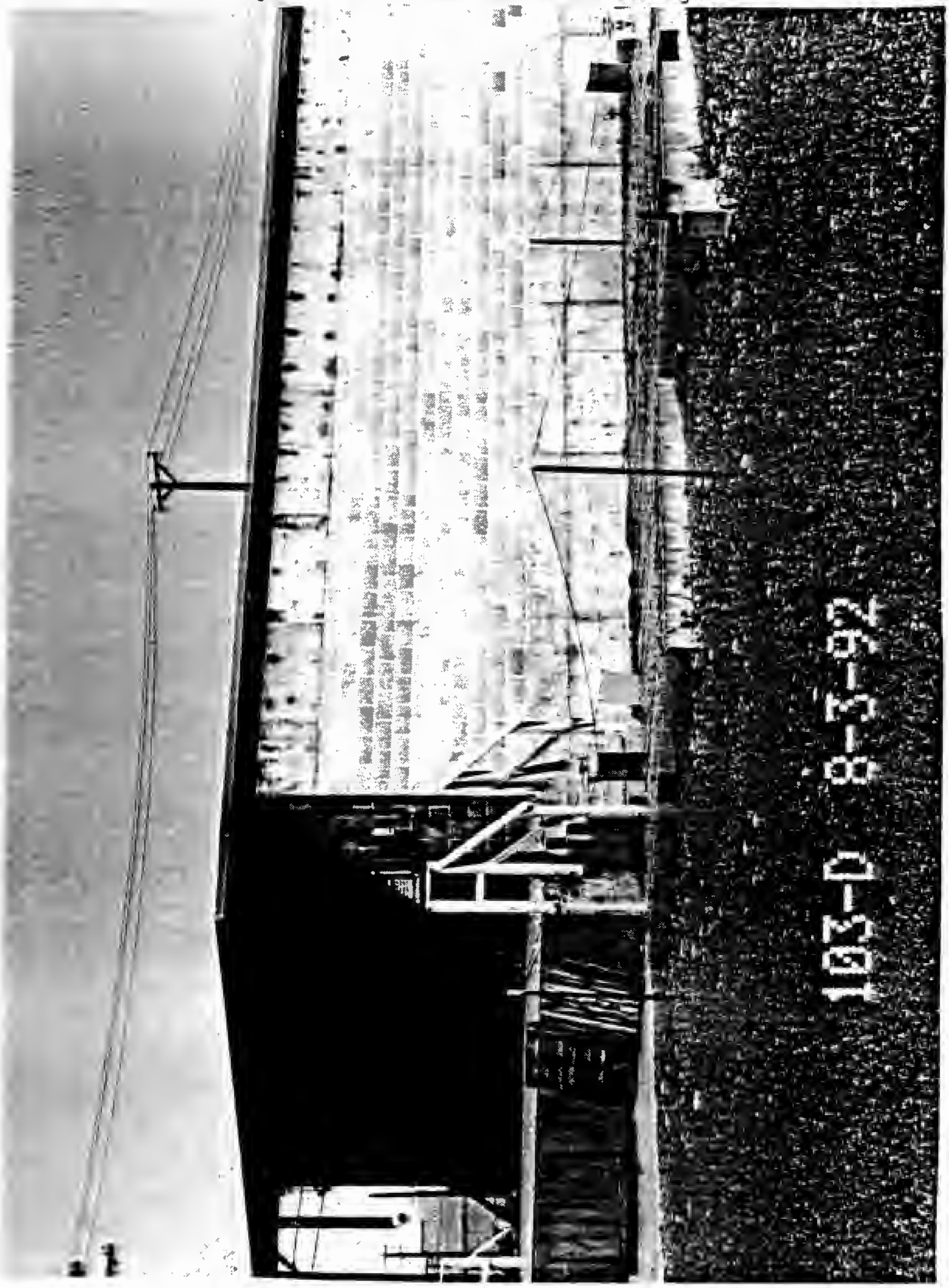


Figure 1-26. 1714-C Solvent Storage.

Figure 1-27. 103-D Fresh Metal Storage.



The building's interior and exterior are in fair condition. The asphalt-covered roof is in poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 1996.

1.2.16 105-D Reactor Building (Figure 1-28)

The 105-D Reactor Building was constructed from 1943 to 1944 to house the nuclear reactor and directly associated equipment used in reactor operations. It is similar to the 105-B Reactor Building, except for variations in layout.

The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper section of this building is lighter in construction, using concrete block.

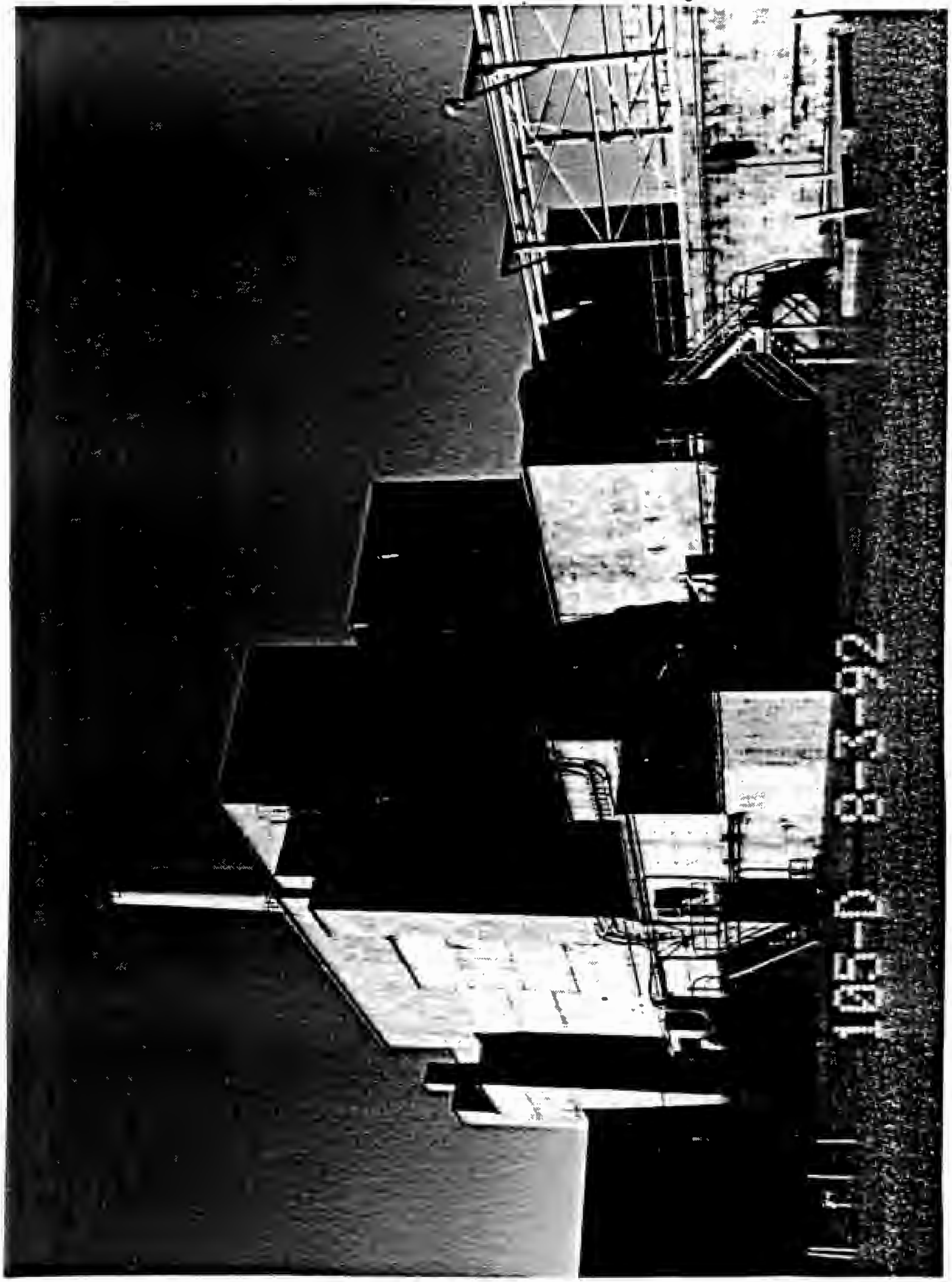
The reactor block is located near the center of the building (refer to Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and safety rod penetrations are on the top of the reactor. The control room is located directly under the horizontal control rod, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation. The block weighs approximately 9,145 metric tons (9,000 tons) and is 14.0 m by 14.0 m by 12.2 m (46 ft by 46 ft by 40 ft).

The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. It has since been drained and cleaned of debris, and fixative has been applied to radiologically contaminated surfaces.

The roof is primarily composed of asphalt-covered, reinforced, precast concrete panels of the same type as the 105-B and 105-F Reactors. These panels have endured the past 49 years with a minimum of maintenance, but they are beginning to show severe signs of deterioration in numerous locations. Complete panel replacement will be required in approximately 50 locations.

The building's interior is in poor condition, with numerous friable asbestos locations in radiologically contaminated areas; the exterior is in poor condition, with numerous friable asbestos problems; and the roof is in poor condition in several locations. The overall building contains an estimated 13,500 Ci of radionuclides (primarily activation products contained within the graphite core). In addition, 96.5 metric tons (95 tons) of lead and 2.83 m^3 (100 ft^3) of asbestos are contained within the facility.

Figure 1-28. 105-D Reactor Building.



The status of facility is retired--radioactively contaminated. An EIS has been prepared by DOE for decommissioning the eight shutdown Hanford Site reactors (DOE 1989). A final decision on the actions required by the EIS is pending. The building is tentatively scheduled for decommissioning from FY 2006 through FY 2016.

1.2.17 116-D Reactor Exhaust Stack (Figure 1-29)

The 116-D Exhaust Stack was used to discharge ventilation air 61.0 m (200 ft) abovegrade from the 105-D Building. The stack is 61.0 m (200 ft) abovegrade and 3.1 m (10 ft) belowgrade, with a 4.9-m- (16-ft-) diameter base. The stack is a monolithic, reinforced concrete structure, with a wall thickness of 0.5 m (1.5 ft) at the base and 0.3 m (1 ft) at the top. The stack is in good general condition and has no noted structural defects. The stack is scheduled for decommissioning in FY 1998.

1.2.18 105-DR Reactor Building (Figure 1-30)

The 105-DR Reactor Building was constructed from 1947 to 1950 to house the nuclear reactor and directly associated equipment used in reactor operations. It is similar to the 105-B Reactor building, except for variations in layout.

The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper section of this building is lighter in construction, using concrete block.

The reactor block is located near the center of the building (refer to Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and safety rod penetrations are on the top of the reactor. The control room is located directly under the horizontal control rod, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation. The block weighs approximately 9,145 metric tons (9,000 tons) and is 14.0 m by 14.0 m by 12.2 m (46 ft by 46 ft by 40 ft).

The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. It has since been drained and cleaned of debris, and fixative has been applied to radiologically contaminated surfaces.

Figure 1-29. 116-D Reactor Exhaust Stack.

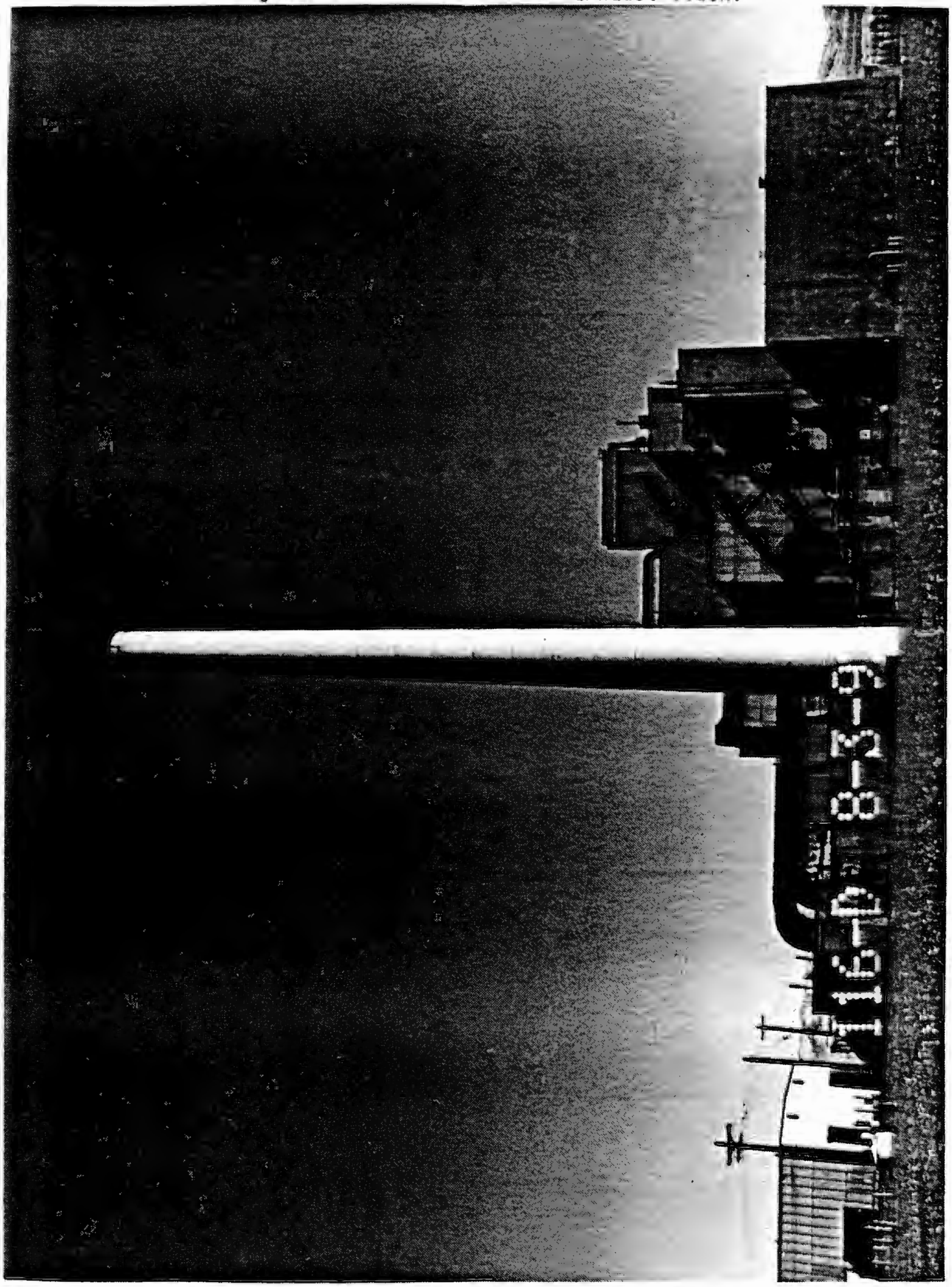
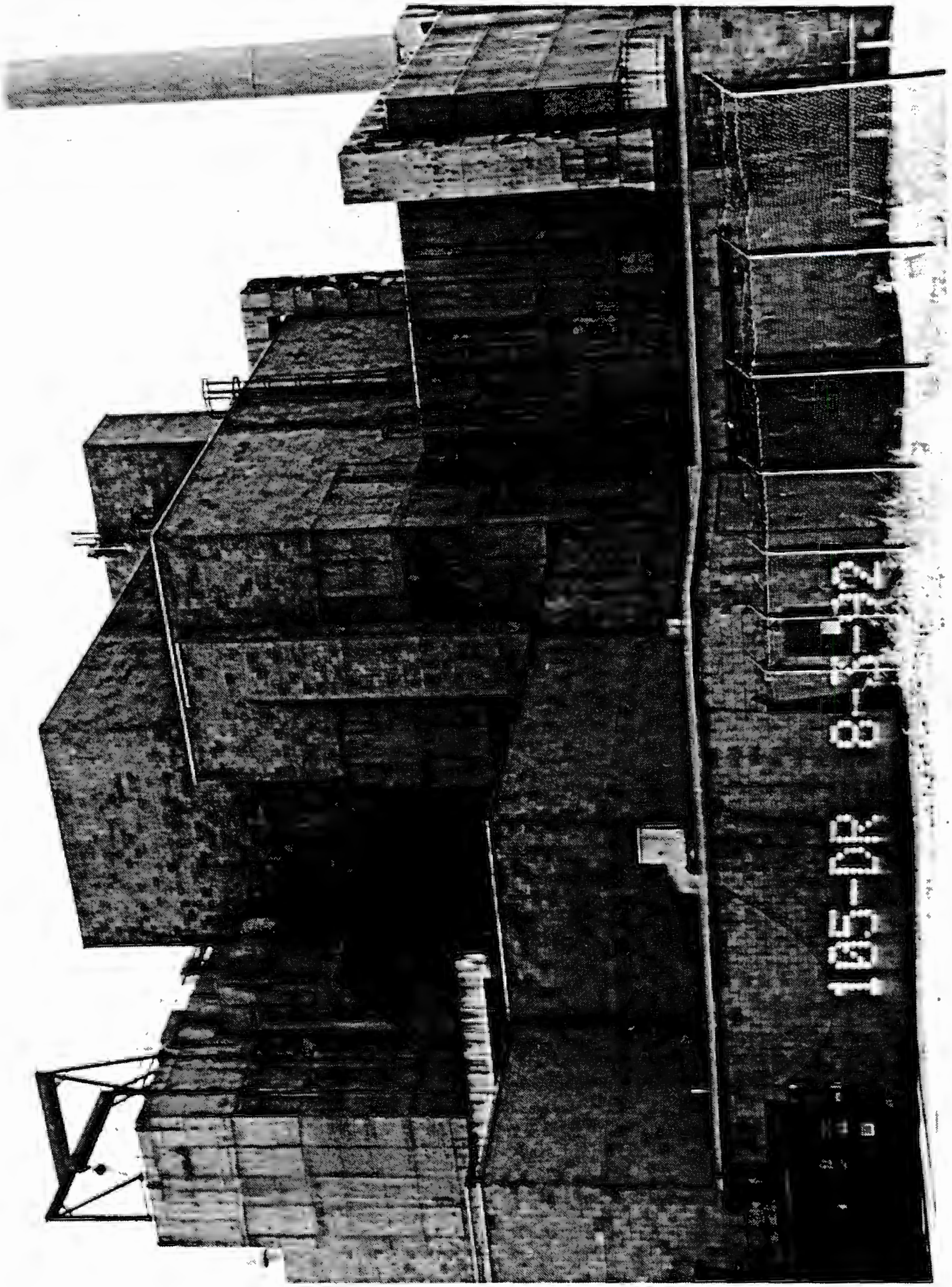


Figure 1-30. 105-DR Reactor Building.



The roof is primarily composed of asphalt-covered, reinforced, precast concrete panels of the same type as the 105-B, 105-D, and 105-F Reactors. These panels have endured the past 45 years with a minimum of maintenance, but they have deteriorated past the point of corrective maintenance in numerous locations. Complete panel replacement is required in approximately 45 of these roof panels.

The building's interior and exterior are in poor condition, with numerous friable asbestos locations, and the roof is in poor condition in several locations. The overall building contains an estimated 13,500 Ci of radionuclides (primarily activation products contained within the graphite core). This is based on the core analysis performed on the 105-D Reactor, which is the same basic size as the 105-DR core. In addition, 96.5 metric tons (95 tons) of lead and an unknown quantity of asbestos are contained within the facility. However, the core radionuclide loading may be slightly less than the 105-D core because the procurement specification for the graphite in the second group of reactors constructed at the Hanford Site, those being the 105-C, 105-DR and 105-H, did not allow the graphite to contain as many impurities as the original specification. The net result should be a lowering of the activation products.

The staus of this facility is retired--radioactively contaminated. An EIS has been prepared by DOE for the decommissioning the eight shutdown Hanford Site reactors. A final decision on the actions required by the EIS is pending. The building is tentatively scheduled for decommissioning from FY 2003 through FY 2013.

1.2.19 116-DR Reactor Exhaust Stack (Figure 1-31)

The 116-DR Exhaust Stack was used to discharge ventilation air 61.0 m (200 ft) abovegrade from the 105-DR Building. The stack is 61.0 m (200 ft) abovegrade and 3.1 m (10 ft) belowgrade, with a 4.9-m- (16-ft-) diameter base. The stack is a monolithic, reinforced concrete structure, with a wall thickness of 0.5 m (1.5 ft) at the base and 0.3 m (1 ft) at the top. The stack is in good general condition and has no noted structural defects. The stack is scheduled for decommissioning in FY 1997.

1.2.20 117-DR Exhaust Air Filter Building (Figure 1-32)

The 117-DR Building filtered ventilation air from the confinement zone of the 105-DR Reactor Building before its discharge to the atmosphere through the 116-DR Stack. The facility, a reinforced concrete structure, is 18.0 m (59 ft) long, 11.9 m (39 ft) wide, and 10.7 m (35 ft) high, with 2.4 m [8 ft] abovegrade.

The building's interior is in poor condition, the exterior is in fair condition, and the asphalt-covered roof is in fair condition. Presently the building serves no purpose and decommissioning is scheduled to begin in FY 1996.

Figure 1-31. 116-DR Reactor Exhaust Stack.

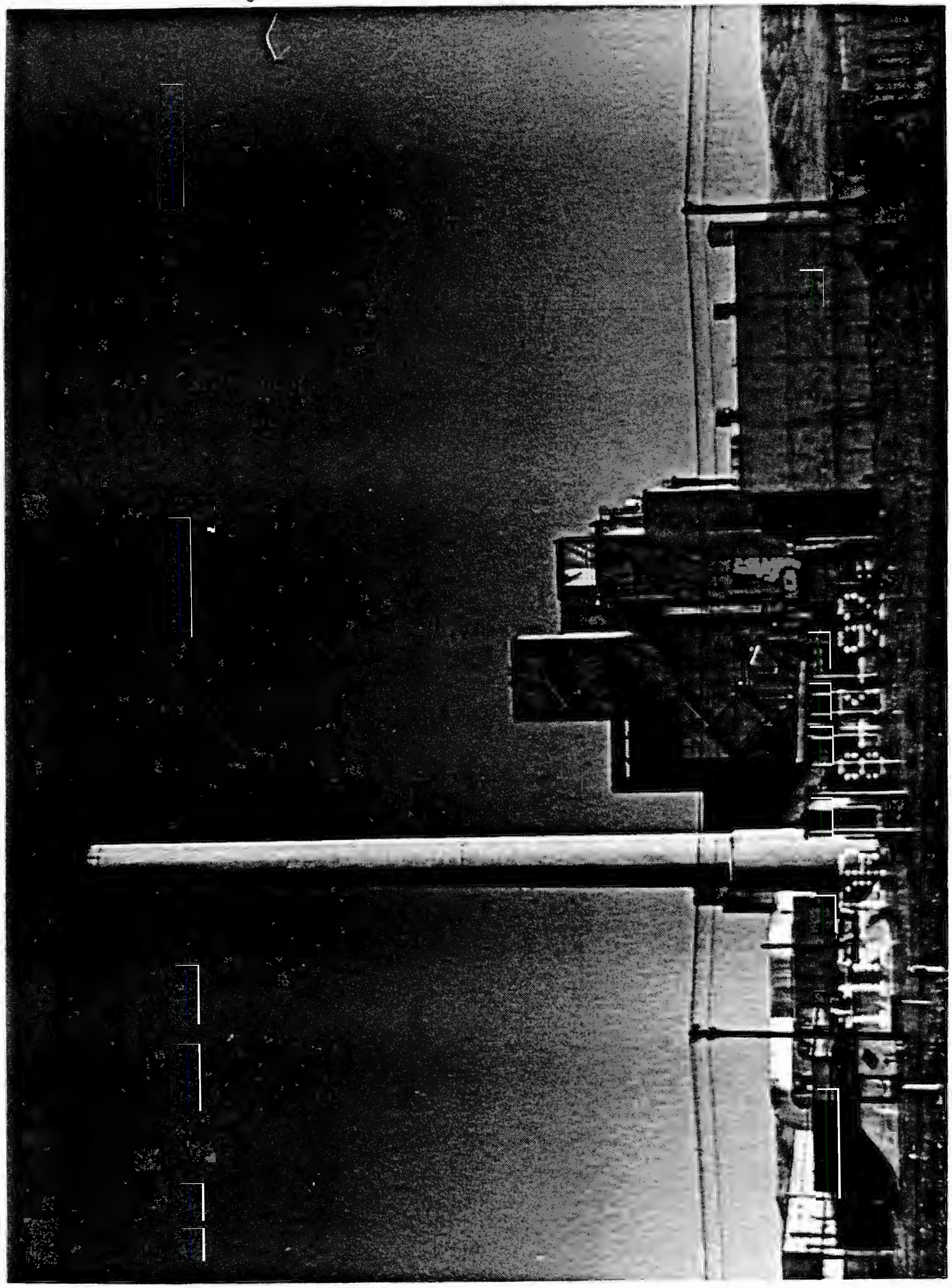


Figure 1-32. 117-DR Exhaust Air Filter Building.

1.2.21 119-DR Exhaust Air Sample Building (Figure 1-33)

The 119-DR Facility housed most of the instrumentation for the exhaust air system. A sample stream of the exhaust air was routed through a continuous air monitoring system in the building for monitoring radioactivity. The structure is a small prefabricated metal building, 4.6 m by 7.3 m (15 ft by 24 ft).

The building's interior is in fair condition, the exterior is in good condition, and the metal roof is in good condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 1996.

1.2.22 1702-DR Area Badge House (Figure 1-34)

The 1702-DR Badge House is located at the entrance to the 105-DR exclusion area. It provided shelter for a security check before entrance to the exclusion area. The facility is a one-story, wooden-framed structure, 6.1 m by 6.1 m by 3.7 m (20 ft by 20 ft by 12 ft).

The building's interior; exterior; and asphalt-covered, wooden-framed roof are in extremely poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2003.

1.2.23 105-F Reactor Building (Figure 1-35)

The 105-F Reactor Building was constructed from 1943 to 1945 to house the nuclear reactor and directly associated equipment used in reactor operations. It is similar to the 105-B Reactor Building, except for variations in layout.

The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper section of this building is lighter in construction, using concrete block.

The reactor block is located near the center of the building (refer to Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and safety rod penetrations are on the top of the reactor. The control room is located directly under the horizontal control rod, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation. The block weighs approximately 9,145 metric tons (9,000 tons) and is 14.0 m high by 14.0 m wide by 12.2 m deep (46 ft by 46 ft by 40 ft).

Figure 1-33. 119-DR Exhaust Air Sample Building.

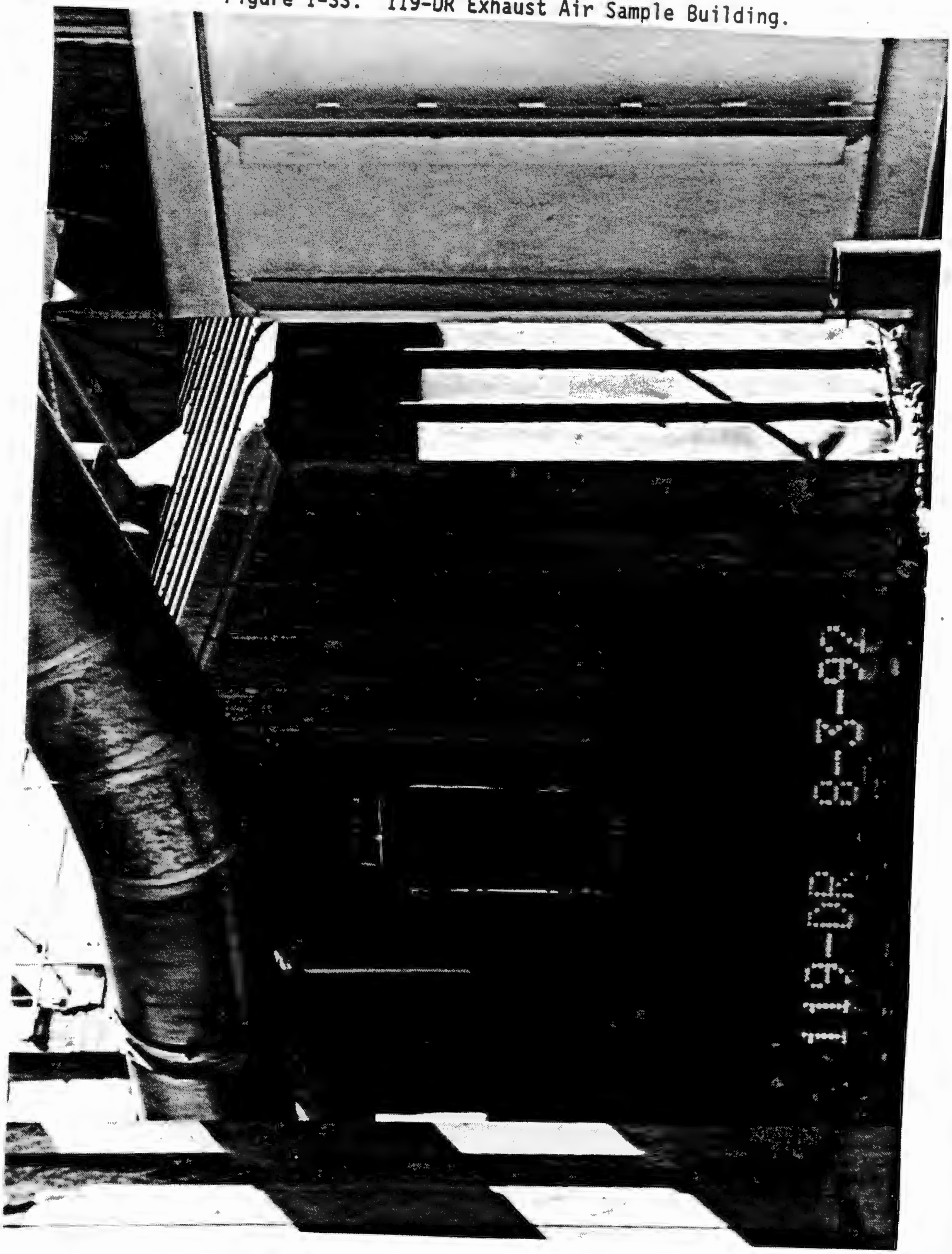
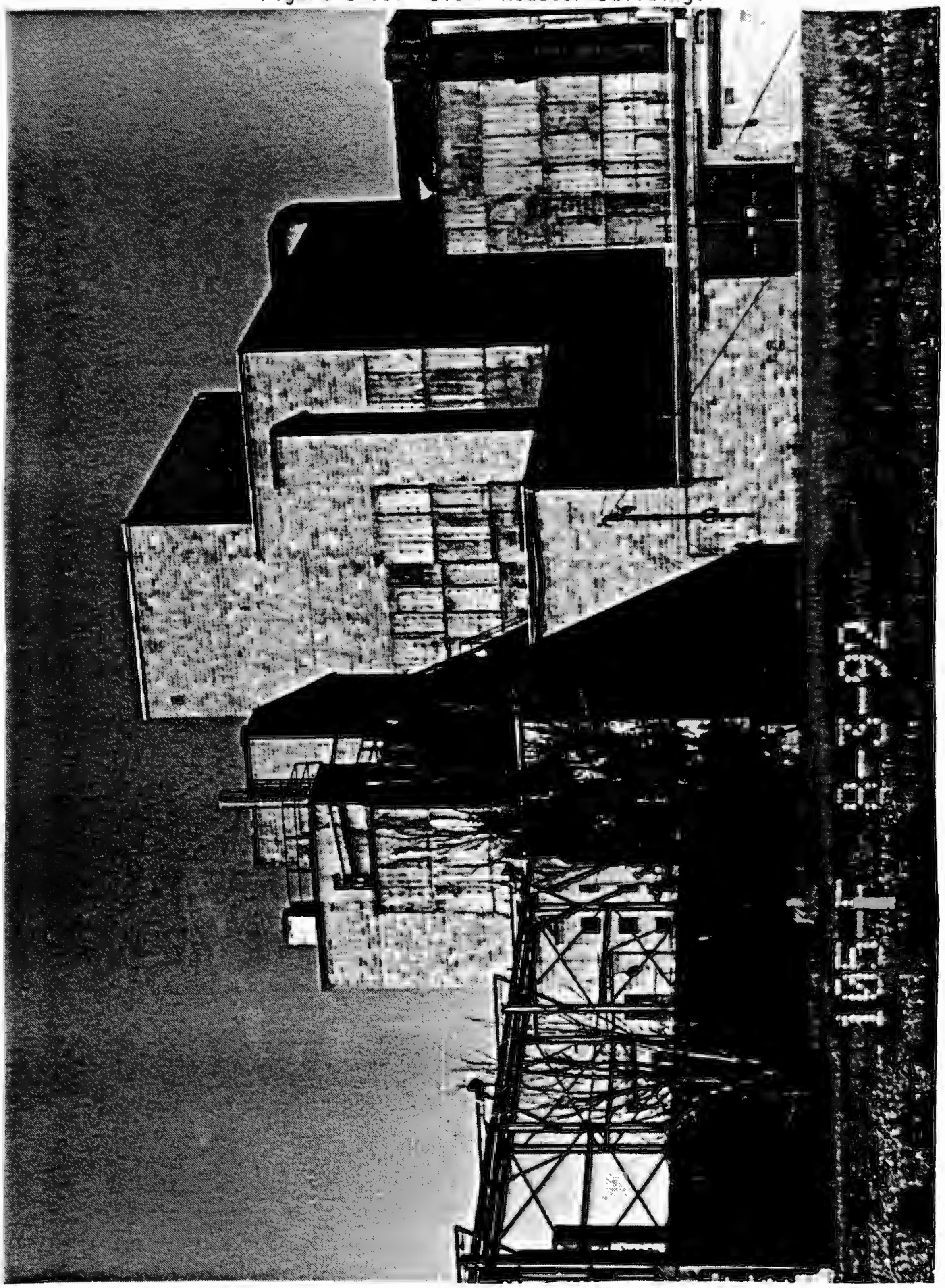


Figure 1-34. 1702-DR Area Badge House.

Figure 1-35. 105-F Reactor Building.



The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. It has since been partially drained and backfilled with soil and rock.

The roof is primarily composed of asphalt-covered, reinforced, precast concrete panels of the same type as the 105-B, 105-D, and 105-DR Reactors. These panels have endured the past 49 years with a minimum of maintenance, but they now show severe signs of deterioration in approximately 30 percent of the overall building. Complete panel replacement will be required in approximately 350 to 500 locations.

The building's interior and exterior are in poor condition. The asphalt-covered roof is generally in poor to very poor condition. Figure 1-36 shows the exterior. Figure 1-37 shows the interior section of the roof on the transfer bay of the 105-F Basin before the fatal accident. Figure 1-38 shows the roof after the fatal accident. A roof panel adjacent to the failed panel was removed and laboratory tested. It would only support approximately 25 percent (79.4 kg [175 lb]) of its initially designed live load capacity (272-318 kg [600-700 lb]) before it collapsed. In addition to the load carrying capacity, the overall degradation of the panels allows any liquids on the roof to have direct access to the smearable radiological contaminated area on the floor below. The water stains on the roof panels and floors in the fan room, work area, C elevator, D elevator, fuel storage basin, change room, and office areas indicate water continues to infiltrate many of the contaminated and noncontaminated sections of this building. The overall building contains an estimated 13,500 Ci of radionuclides (primarily activation products contained within the graphite core). This is based on the core analysis performed on the 105-D Reactor, which is the same basic size as the 105-F core. In addition, 96.5 metric tons (95 tons) of lead and an unknown quantity of asbestos are contained within the facility.

In addition to the panel deterioration shown in Figure 1-37, the interior supporting roof trusses have deteriorated because of their continuous exposure to moisture. If this trend continues, this will invariably lead to structural integrity problems of the main roof support members.

The normal annual program of roof repairs for all 100 Area facilities was not performed this past summer because of access restriction to all roofs. The net results of this missed window of opportunity will cause even faster deteriorating of the existing panels and supports due to continued water infiltration. The long-term effect will result in lower load-carrying capacities of the remaining panels and support members. Roof panels that have the potential for self-collapse with a minimal of external weight applications could be a serious threat in many areas of this building.

In addition, the electrical distribution network within the 105-F Reactor Building (Figures 1-39 and 1-40) has not been upgraded to eliminate personnel safety hazards or to correct code violations because of delays in work

Figure 1-36. 105-F Transfer Bay Area Roof, Exterior.

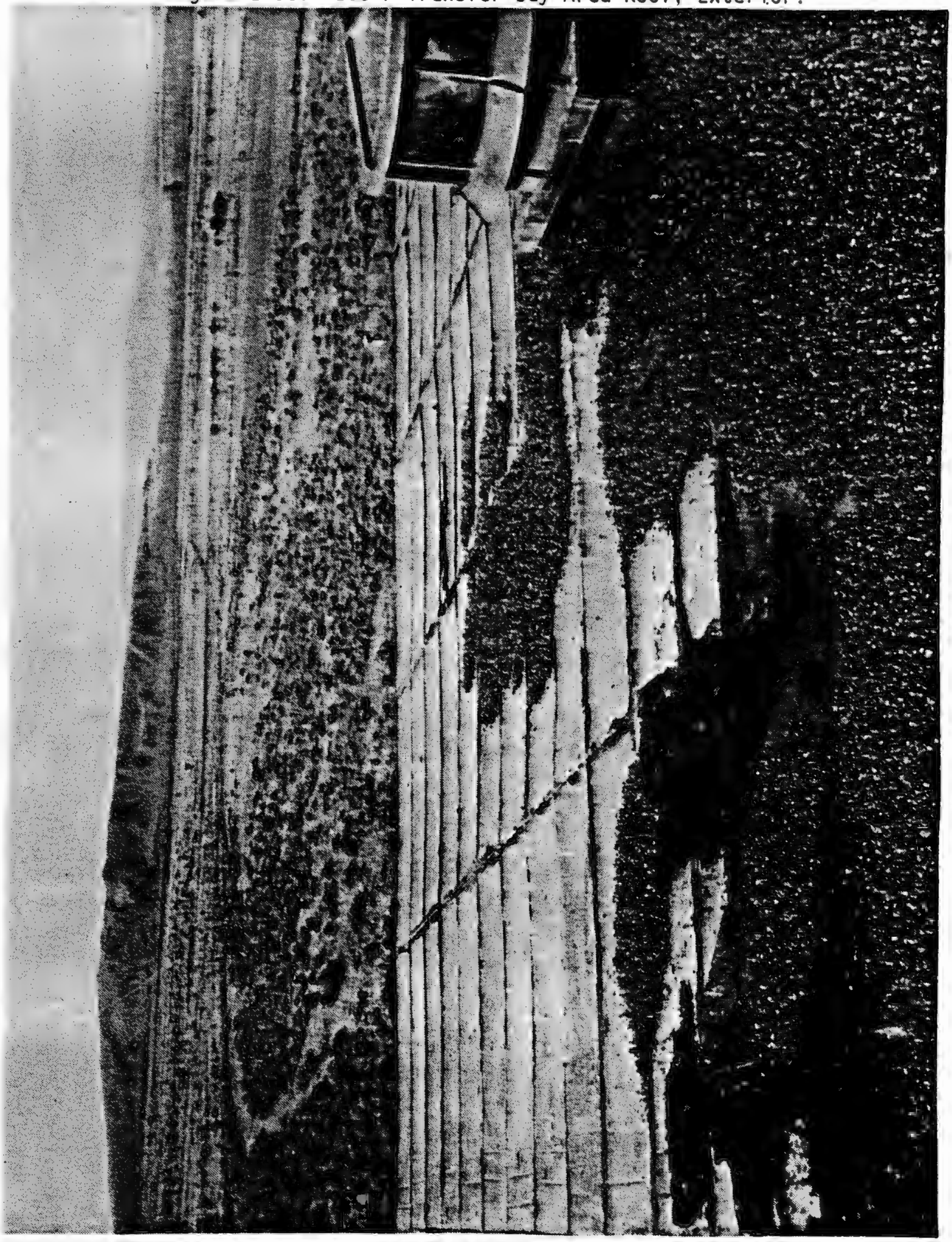


Figure 1-37. 105-F Transfer Bay Roof Panels, Interior.

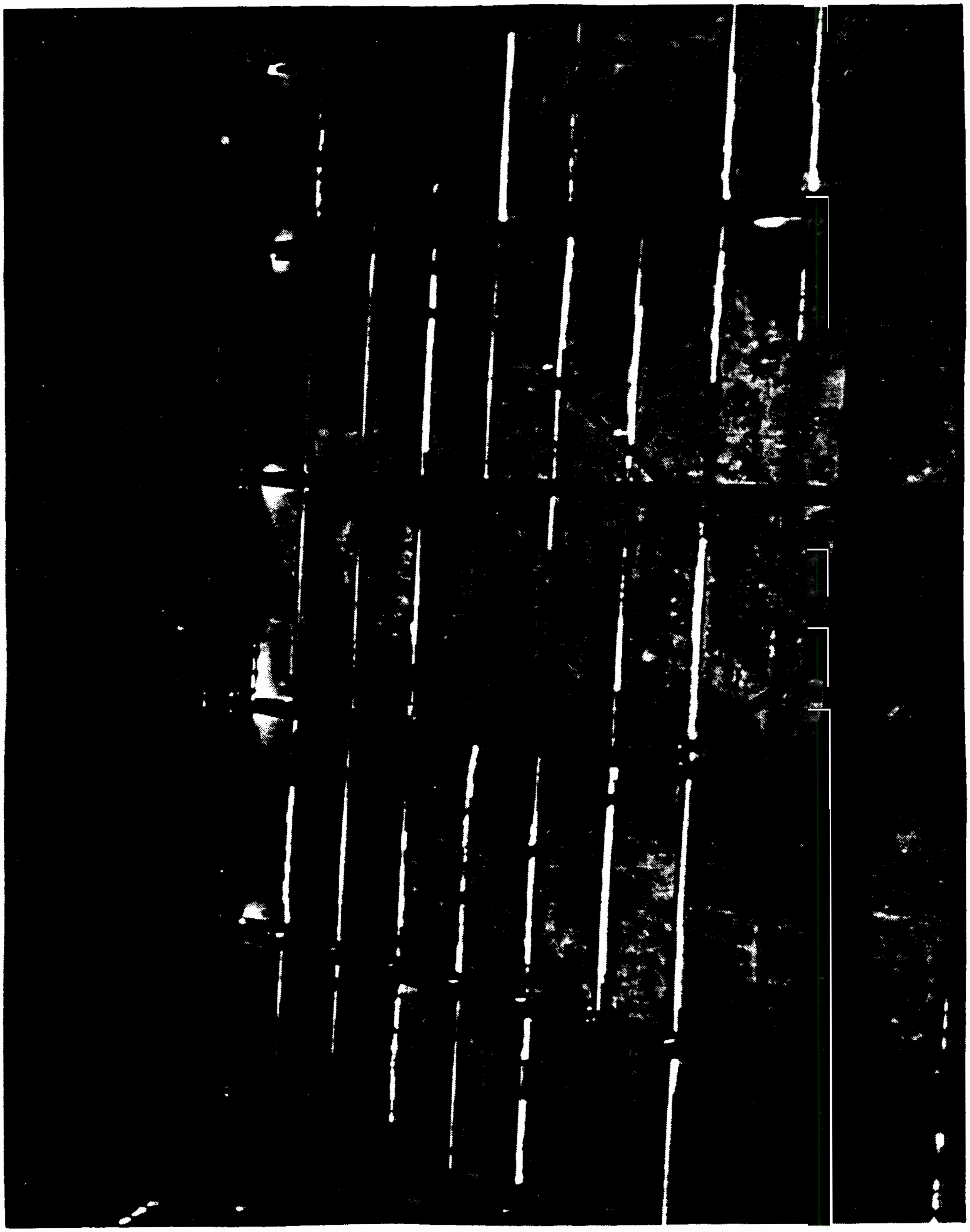


Figure 1-38. 105-F Transfer Bay Area Roof, After Accident.

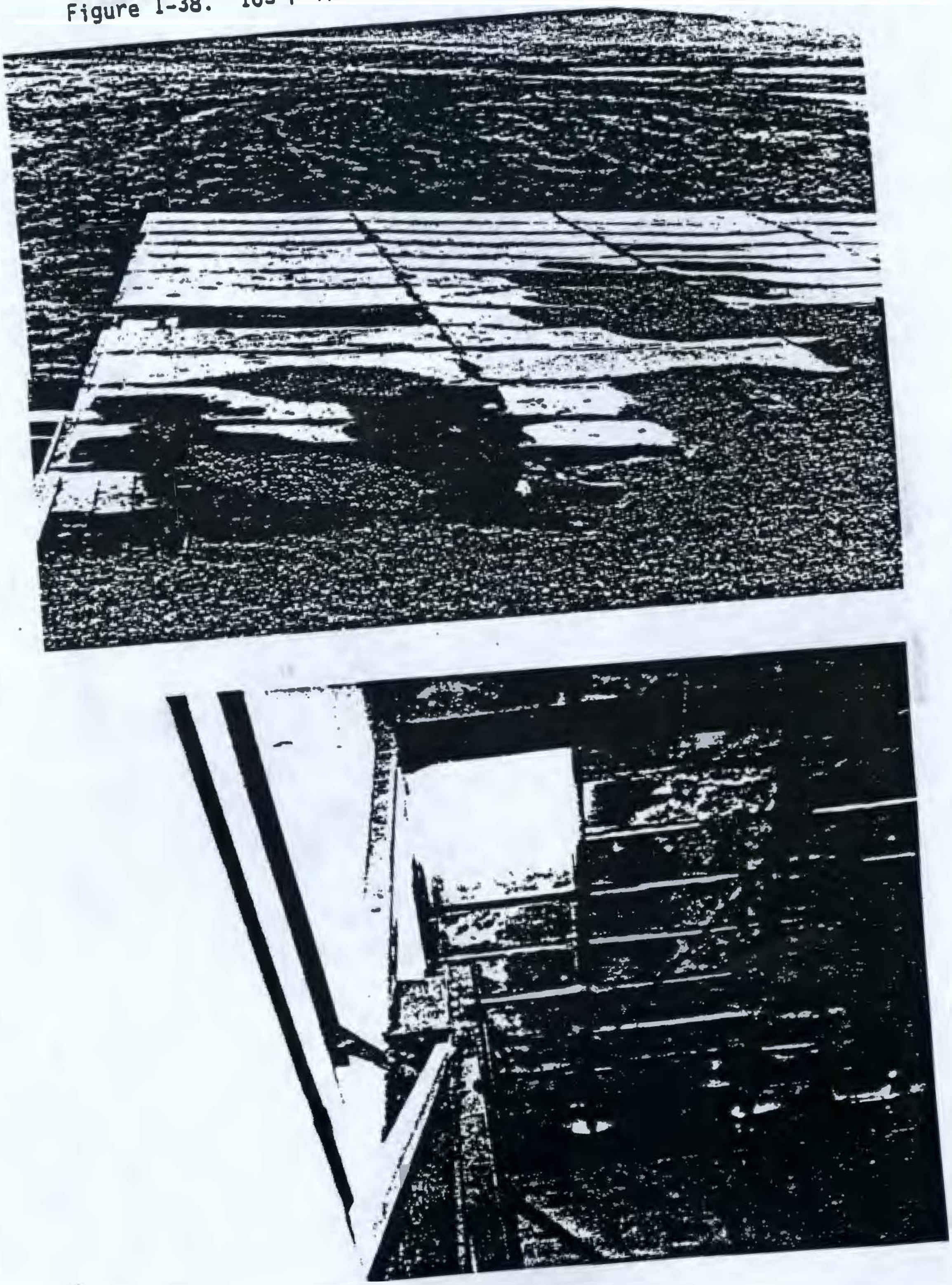


Figure 1-39. 105-F Reactor Building In-Service Lighting Panel.

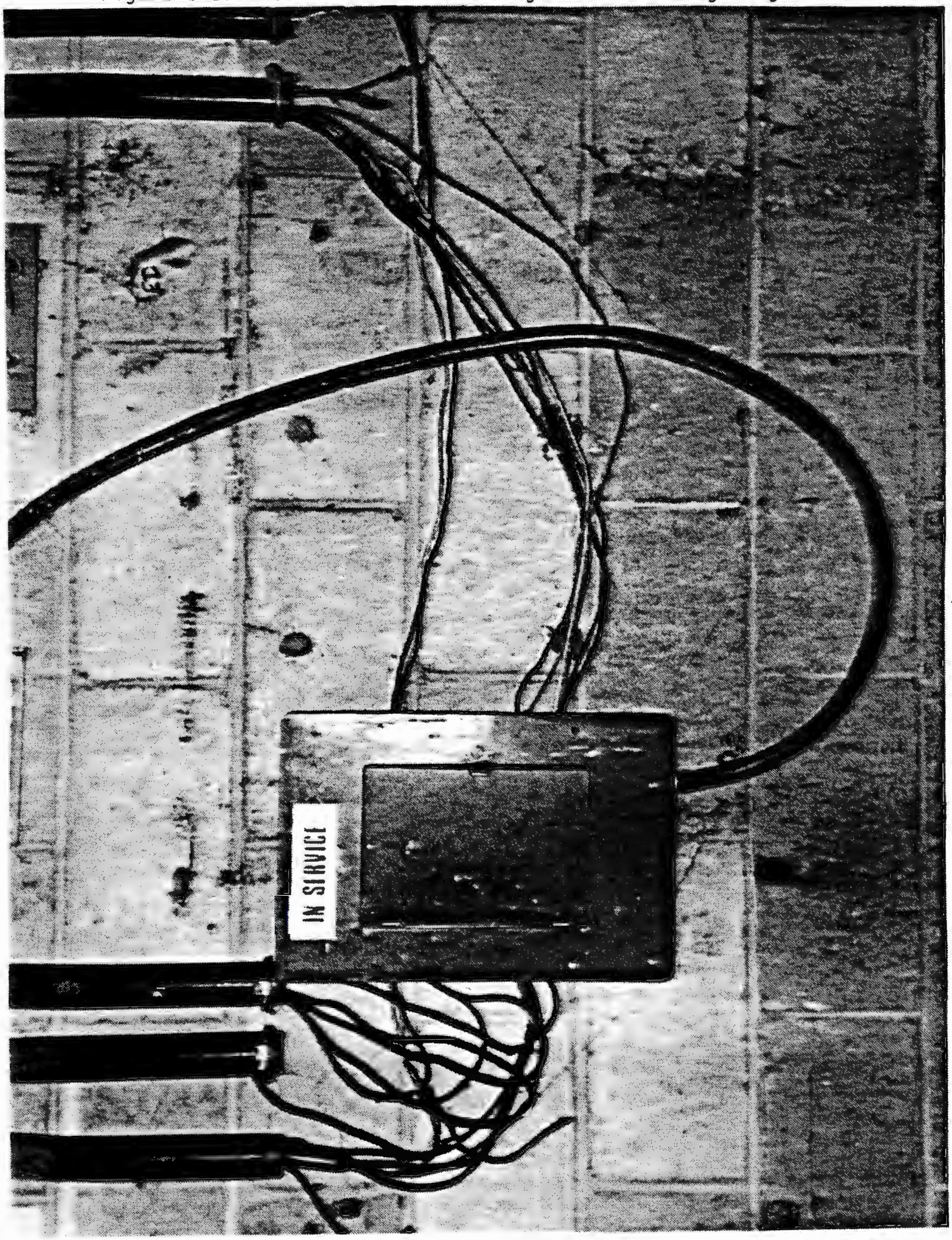
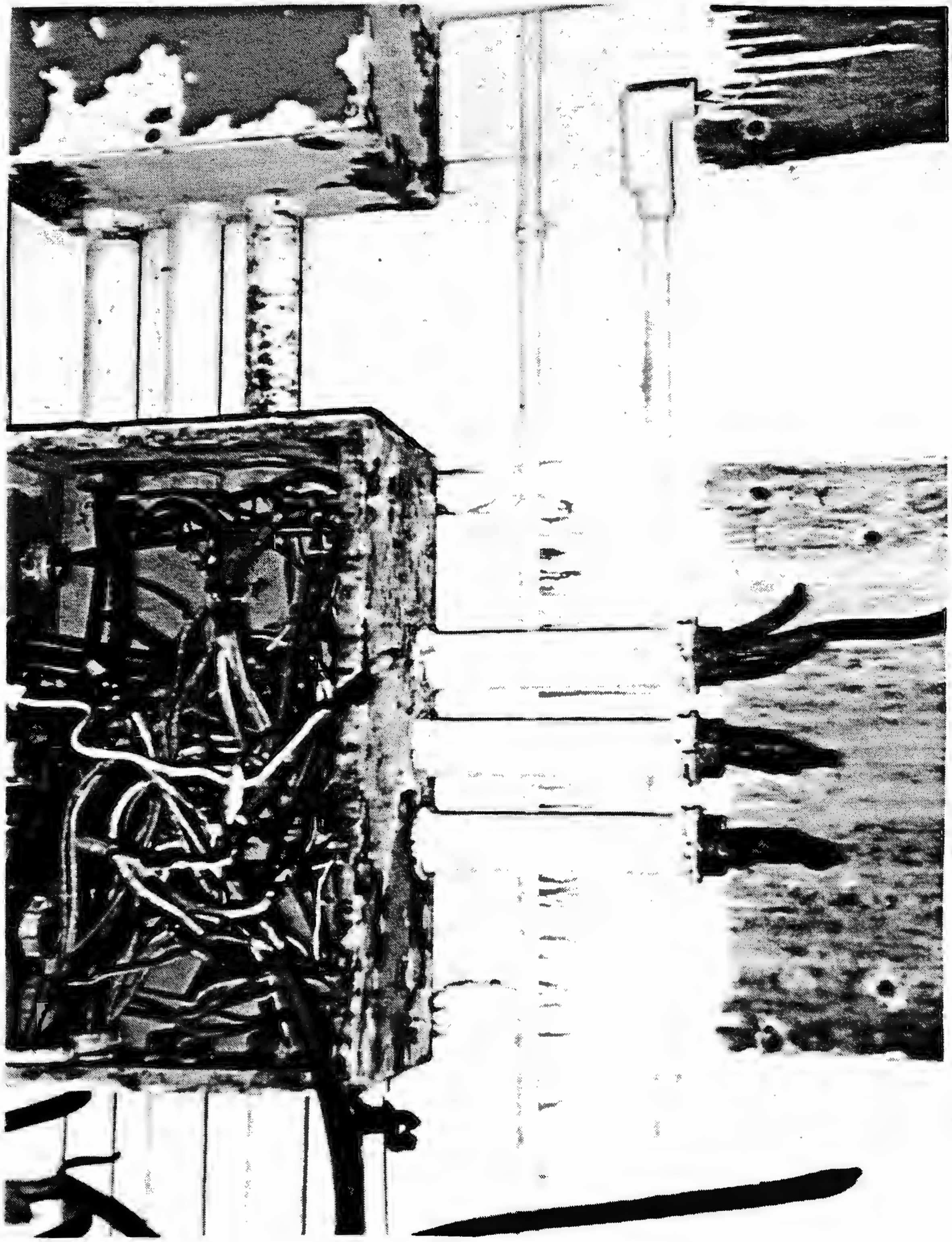


Figure 1-40. 105-F Reactor In-Service Lighting Gutter Box.



approvals. These delays have been caused by the restrictions placed on access to the building after the accident itself; the overall review of the interface between Westinghouse Hanford Company (WHC) and KEH, as specified under the original Letter of Instruction process; and the justification to spend money on these inactive building when the overall future is decommissioning and demolition. This project is now scheduled to begin in November 1992, with expected completion in March 1993.

The status of this facility is retired--radioactively contaminated. An EIS has been prepared by DOE for decommissioning the eight shutdown Hanford Site reactors (DOE 1989). A final decision on the actions required by the EIS is pending. The building is tentatively scheduled for decommissioning from FY 2006 through FY 2016.

1.2.24 **108-F Biology Laboratory Building** (Figure 1-41)

The 108-F Facility provided office and laboratory space for the Hanford Site Biology Laboratory. This building consists of the 108-F Laboratory Building (about 1,858 m^2 [20,000 ft^2], which was part of the original area construction, and an annex, which was added in 1961. The original building is a rectangular four-story, steel-framed, and concrete block structure with concrete foundation and floors. The newer annex, a rectangular three-story addition of concrete block construction (about 1,022 m^2 [11,000 ft^2]), adjoins the older building.

The building's interior is in poor condition, with severe friable asbestos problems and the exterior is in fair condition. The asphalt-covered roof is in fair condition, but it requires annual maintenance and repair to minimize water infiltration. Presently the building serves no purpose and decommissioning is scheduled to begin in FY 2001.

1.2.25 **1701-FA Gate House** (Figure 1-42)

The 1701-FA Facility served as an area badge house and security patrol station. The single-story, poured-concrete building is 6.1 m by 9.8 m (20 ft by 32 ft).

The building's interior and exterior are in fair condition. The asphalt-covered roof is in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2002.

1.2.26 **105-H Reactor Building** (Figure 1-43)

The 105-H Reactor Building was constructed from 1948 to 1949 to house the nuclear reactor and directly associated equipment used in reactor operations. It is similar to the 105-B Reactor Building, except for variations in layout.

Figure 1-41. 108-F Biology Laboratory Building.

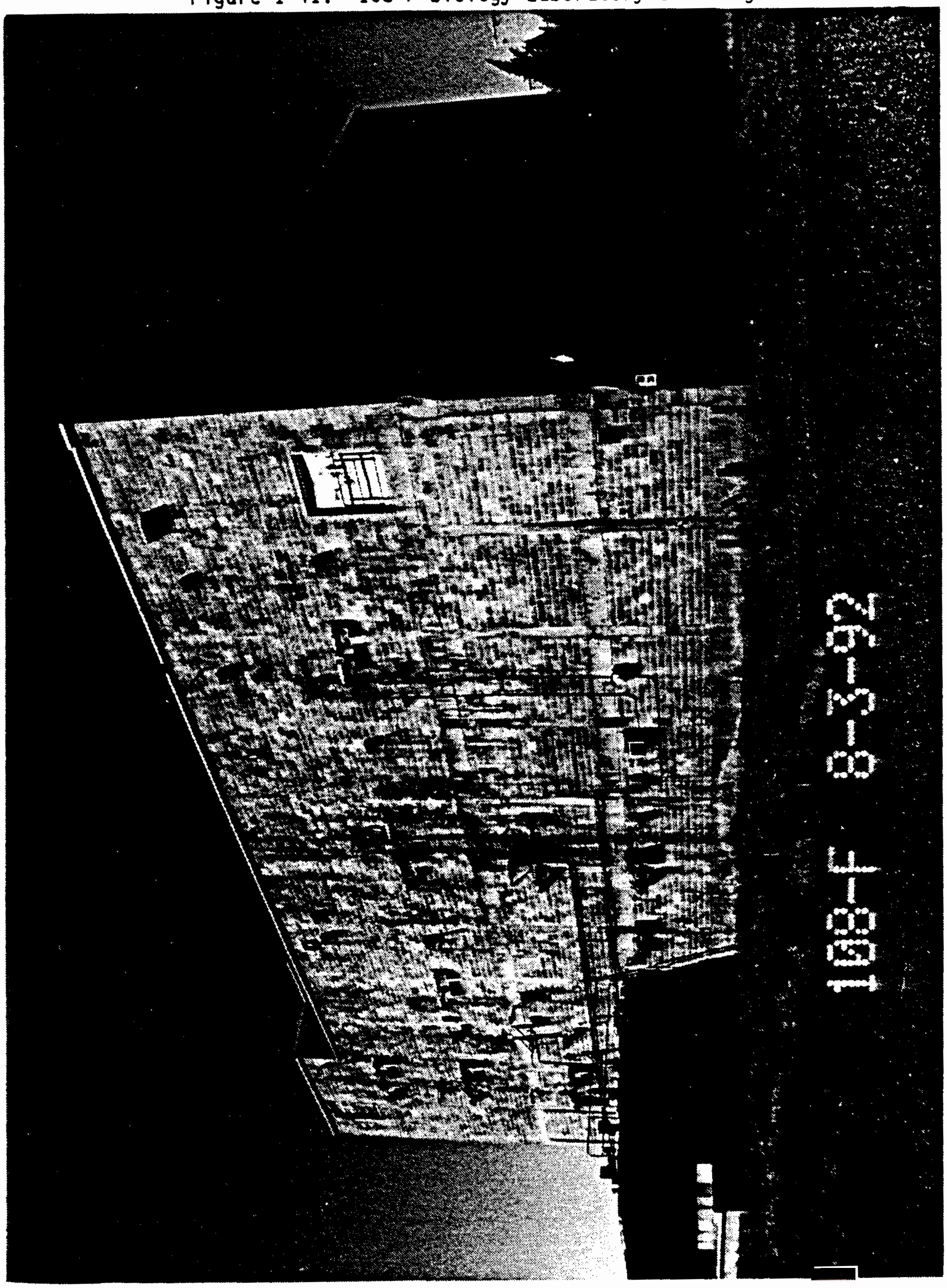


Figure 1-42. 1701-FA Gate House.

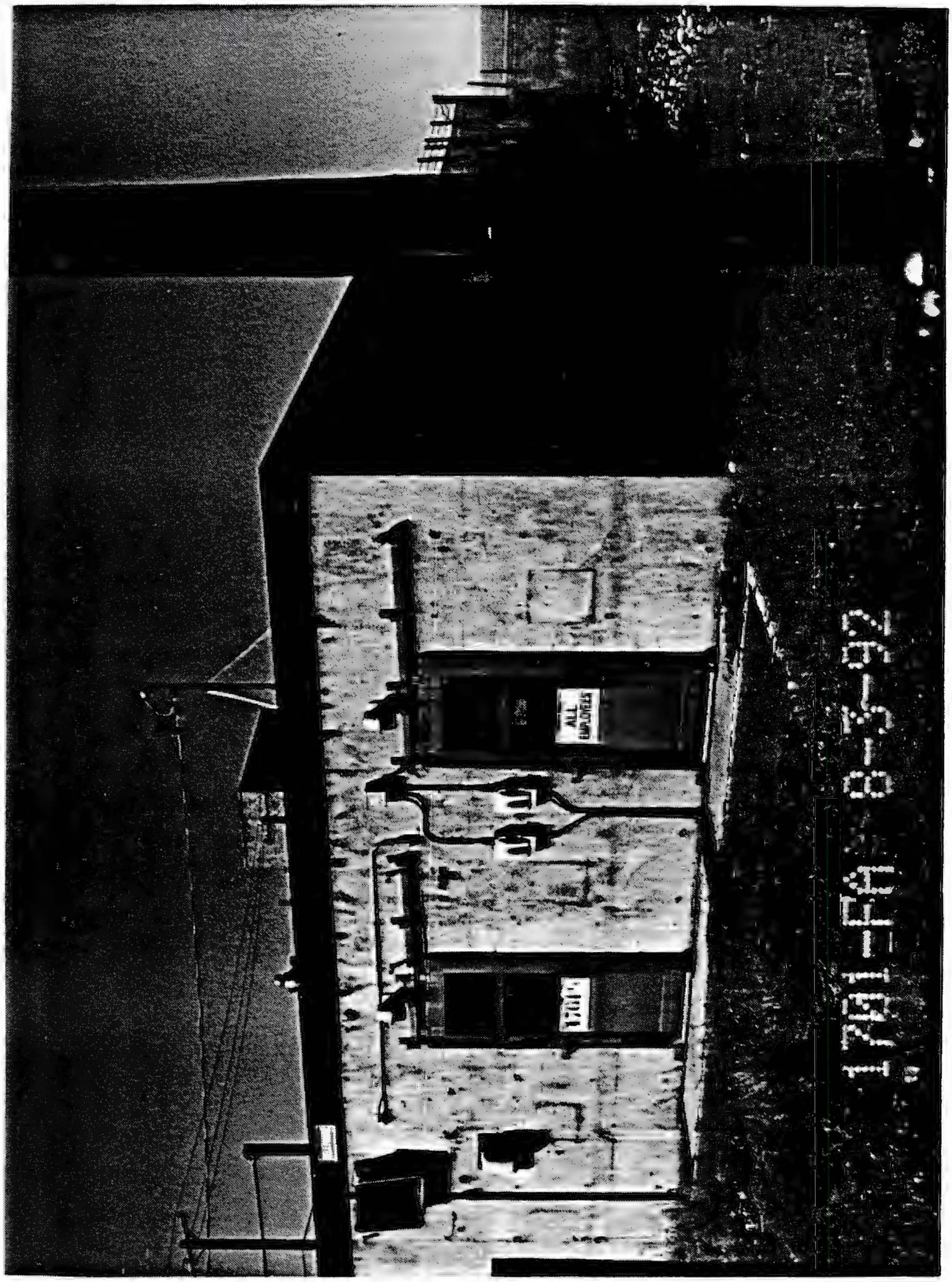
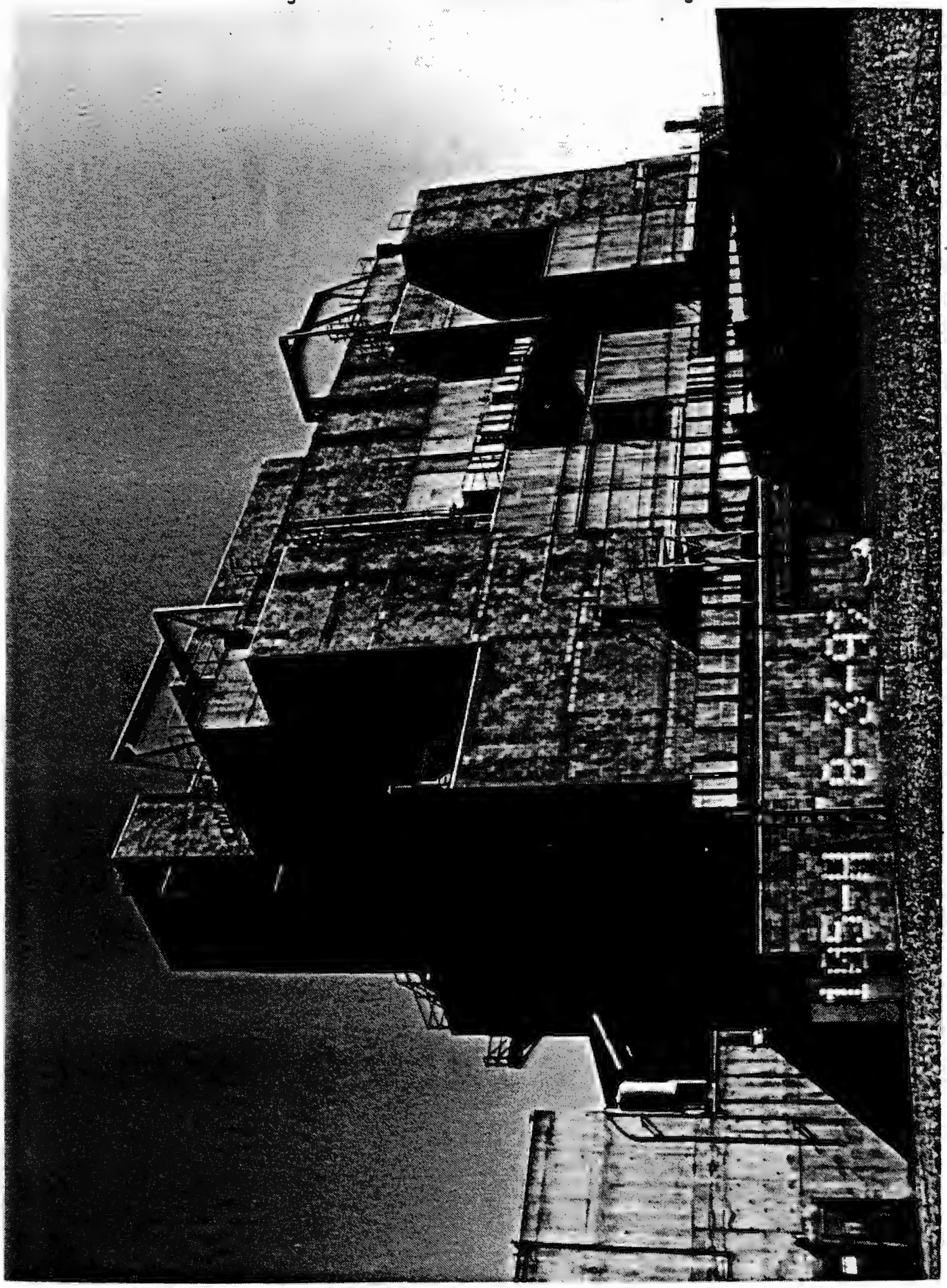


Figure 1-43. 105-H Reactor Building.



The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper section of this building is lighter in construction, using concrete block.

The reactor block is located near the center of the building (refer to Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and safety rod penetrations are on the top of the reactor. The control room is located directly under the horizontal control rod, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation. The block weighs approximately 9,145 metric tons (9,000 tons) and is 14.0 m high by 14.0 m wide by 12.2 m deep (40 ft by 46 ft by 40 ft).

The roof is primarily composed of asphalt-covered, reinforced, precast gypsum panels of the same type as the 105-C Building. These panels have endured the past 43 years with a minimum of maintenance, but they have deteriorated past the point of corrective maintenance in numerous locations. Complete panel replacement is required in approximately 125 of these roof panels. In addition, roof support structures have deteriorated because of water infiltration.

The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. It has since been partially drained and backfilled with soil and rock.

The building's interior and exterior are in poor condition, with numerous friable asbestos locations. The roof is in poor condition. The overall building contains an estimated 13,500 Ci of radionuclides (primarily activation products contained within the graphite core). This is based on the core analysis performed on the 105-D Reactor, which is the same basic size as the 105-H core. In addition, 113.8 metric tons (112 tons) of lead and an unknown quantity of asbestos are contained within the facility. However, the core radionuclide loading may be slightly less than the 105-D core because the procurement specification for the graphite in the second group of reactors constructed at the Hanford Site, those being the 105-C, 105-DR and 105-H, did not allow the graphite to contain as many impurities as the original specification. The net result should be a lowering of the activation products.

The status of this facility is retired--radioactively contaminated. An EIS has been prepared by DOE for decommissioning the eight shutdown Hanford Site reactors (DOE 1989). A final decision on the actions required by the EIS

1.2.27 **1713-H Warehouse** (Figure 1-44)

The 1713-H Building provides miscellaneous storage space. The facility is an "L"-shaped (14.5 m by 18.9 m; 22.0 m by 18.3 m [156 ft by 62 ft; 72 ft by 60 ft]), single-story, steel-framed structure with corrugated transite siding.

The building's interior and exterior are in fair condition. The asphalt-covered steel roof is in fair condition. Presently the building is used to store equipment in support of the 100 Area Surveillance and Maintenance Program and is scheduled for decommissioning in FY 2003.

1.2.28 **1720-HA Arsenal** (Figure 1-45)

The 1720-HA Building served as a storage space for ammunition used by Security Patrol and later for explosives used in demolition work. The facility is the old arsenal vault left when the patrol building was destroyed. The inside dimensions are about 1.8 m by 2.4 m (6 ft by 8 ft).

The building's interior and exterior are in fair condition. The asphalt-covered concrete roof is in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2002.

1.2.29 **167-K Crosstie Tunnel Building** (Figure 1-46)

The 167-K Building is used as the midway entry and ventilation shaft for the crosstie tunnel that connects the 190/165 Buildings in KE and KW Areas. The facility is a concrete and steel structure, 3.0 m by 4.6 m (10 ft by 15 ft).

The building's interior is in poor condition; the exterior is in fair condition; and the asphalt-covered concrete roof is in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2009.

1.2.30 **182-K Emergency Water Reservoir and Pump House** (Figure 1-47)

The 182-K Facility housed diesel engine-driven pumps and associated equipment for emergency reactor cooling. The building, a steel-framed structure, is approximately 242.47 m^2 (2,610 ft^2).

The building's interior and exterior are in fair condition. The asphalt-covered, steel roof is in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2002.

Figure 1-44. 1713-H Warehouse.

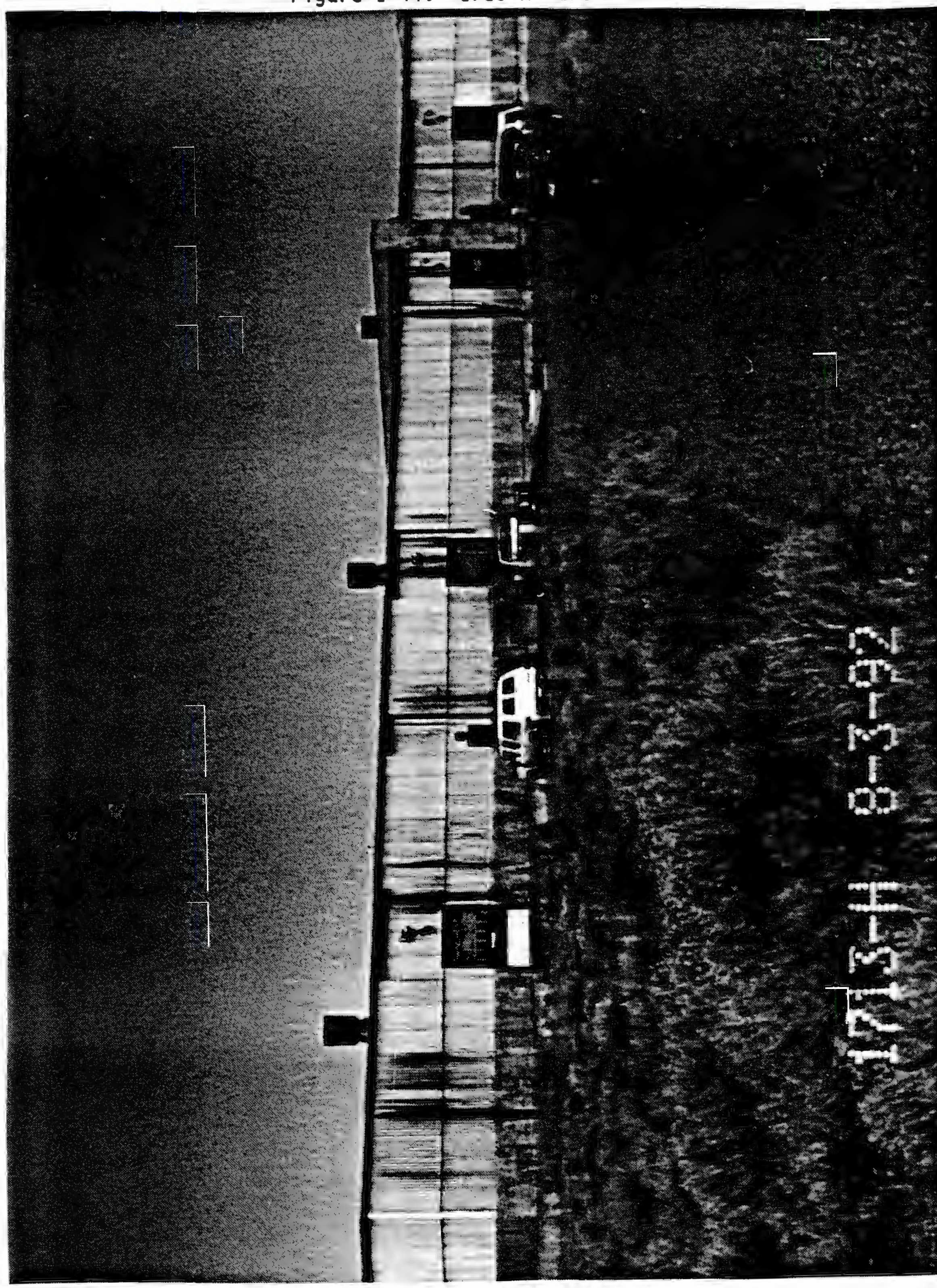


Figure 1-45. 1720-HA Arsenal.

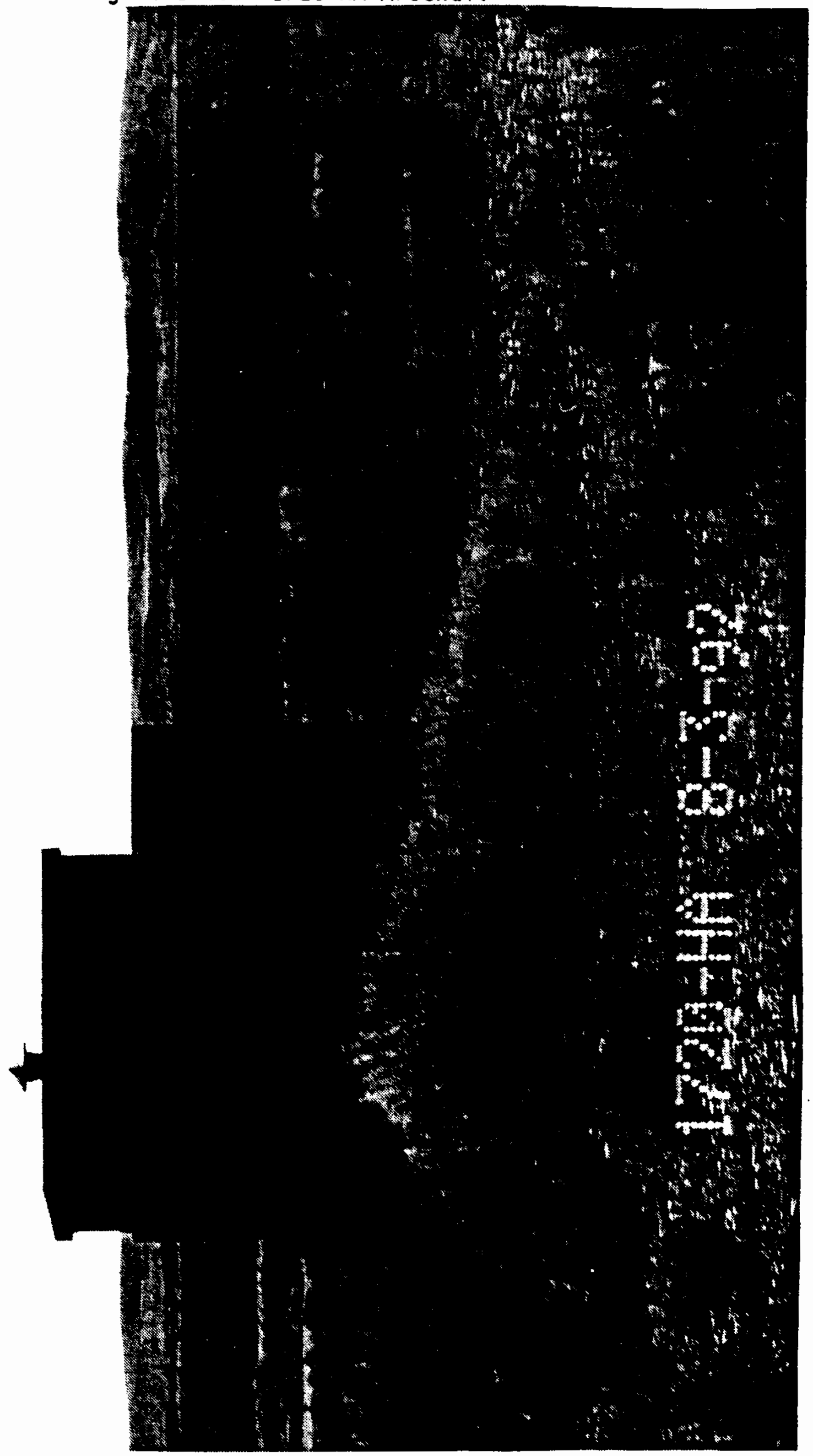


Figure 1-46. 167-K Crosstie Tunnel Building.

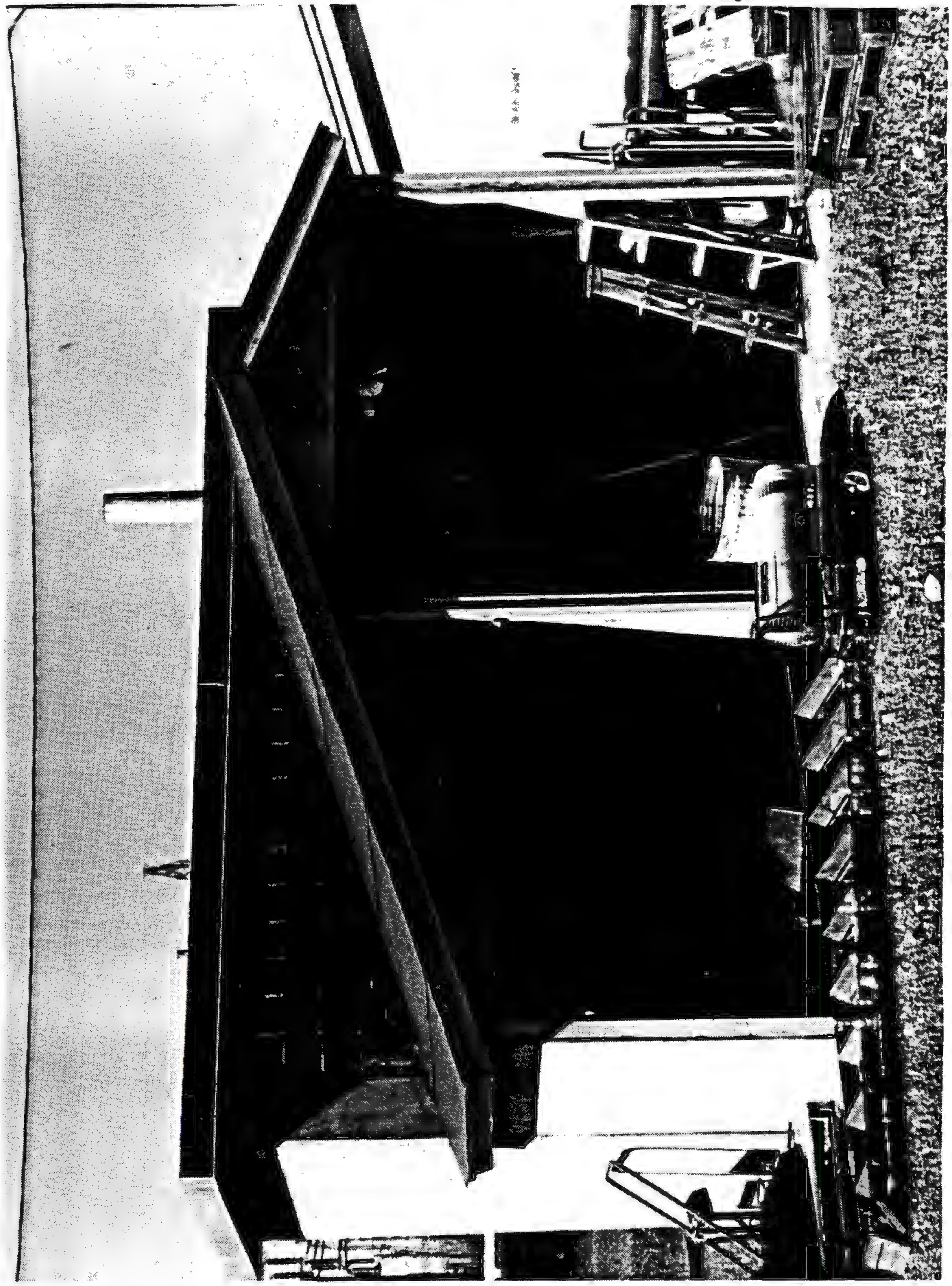


Figure 1-47. 182-K Emergency Water Reservoir and Pump House.

1.2.31 105-KE Reactor Building (Figure 1-48)

The 105-KE Reactor Building was constructed from 1953 to 1955 to house the nuclear reactor and directly associated equipment used in reactor operations. The reactor is a third-generation designed plutonium production system with a larger production capability (about twice) than the six older reactors.

The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper section of this building is lighter in construction, using concrete block.

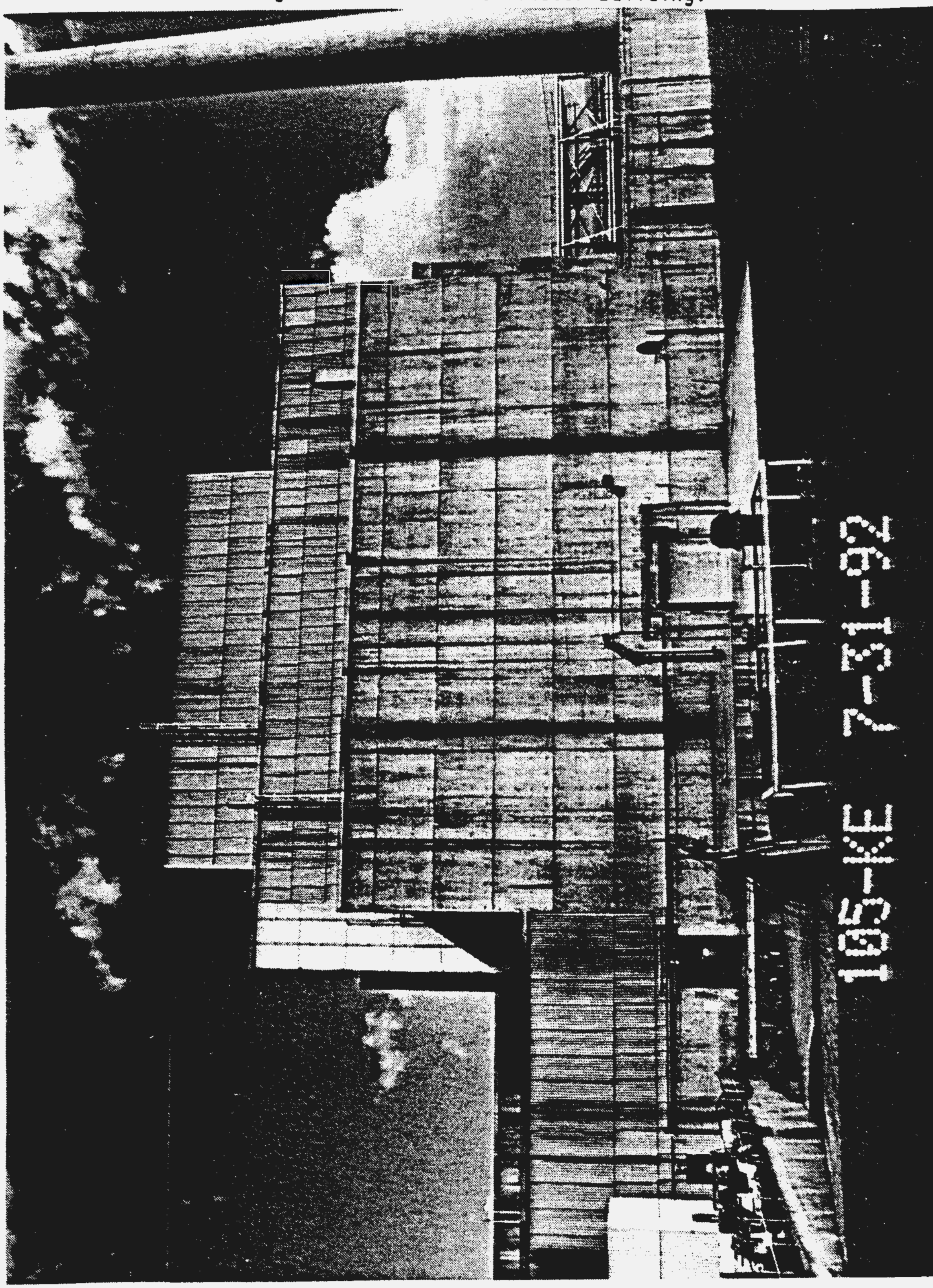
The reactor block is located near the center of the building (refer to Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and safety rod penetrations are on the top of the reactor. The control room is located directly under the intercontrol rod room, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation. The block weighs approximately 12,193 metric tons (12,000 tons) and is 14.0 m high by 14.0 m wide by 12.2 m deep (46 ft by 46 ft by 40 ft).

The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. The basin was originally cleaned of debris and deactivated as part of the initial reactor shutdown conditions. As part of the shutdown for the N Reactor, the 105-KE Basin was reactivated for storage of irradiated fuel removed from the 105-N Reactor core.

The building's interior is in good condition, except for the friable asbestos in the pipe tunnel area. The exterior is in fair condition, with numerous friable asbestos problems. The membrane covered, reinforced, precast concrete roof panels are in fair condition. The overall building contains an estimated 58,000 Ci of radionuclides (primarily activation products contained within the graphite core), 170 metric tons (167 tons) of lead, and 707.93 m^3 (25,000 ft^3) of asbestos.

This facility is considered retired (except for the basin area)--radioactively contaminated. An EIS has been prepared by DOE for decommissioning the eight shutdown Hanford Site reactors (DOE 1989). A final decision on the actions required by the EIS is pending.

Figure 1-48. 105-KE Reactor Building.



1.2.32 110-KE Gas Storage Facility (Figure 1-49)

The 110-KE Facility was the receiving and storage area at the 115 Building for the reactor graphite cooling media gas. It contained a number of helium and carbon dioxide tanks. The helium tanks and bunker have been removed.

Only the carbon monoxide tanks are left at this site and presently they serve no purpose and are scheduled for decommissioning in FY 2006.

1.2.33 115-KE Gas Recirculation Building (Figure 1-50)

The 115-KE Facility housed the gas circulating pumps and associated equipment for the reactor gas coolant system. The building, a single-story, reinforced concrete structure, is 34.6 m by 10.4 m (113.5 ft by 34 ft), with 6.1 m (20 ft) abovegrade and 6.1 m (20 ft) belowgrade.

The building's interior and exterior are in fair condition. The roof is in poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 1999.

1.2.34 116-KE Reactor Exhaust Stack (Figure 1-51)

The 116-KE Exhaust Stack was used to discharge ventilation air from the 105-KE Building. The stack was 61.0 m (200 ft) abovegrade and 3.1 m (10 ft) belowgrade, with a 4.9-m- (16-ft-) diameter base. The stack is a monolithic, reinforced concrete structure, with a wall thickness of 0.5 m (1.5 ft) at the base and 0.3 m (1 ft) at the top. The stack was decontaminated and the height reduced to 53.3 m (175 ft). The clean rubble was dropped inside the remaining portion of the stack. The stack is in good general condition and has no noted structural defects. The stack is scheduled for decommissioning in FY 1998.

1.2.35 117-KE Exhaust Air Filter Building (Figure 1-52)

The 117-KE Building filtered ventilation air from the confinement zone of the 105-KE Reactor Building before its discharge to the atmosphere through the 116-KE Stack. The facility, a reinforced concrete structure, is 18.0 m long by 11.9 m wide by 10.7 m high (59 ft by 39 ft by 35 ft) with 2.4 m (8 ft) abovegrade.

The building's interior, exterior, and roof are in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 1997.

Figure 1-49. 110-KE Gas Storage Facility.

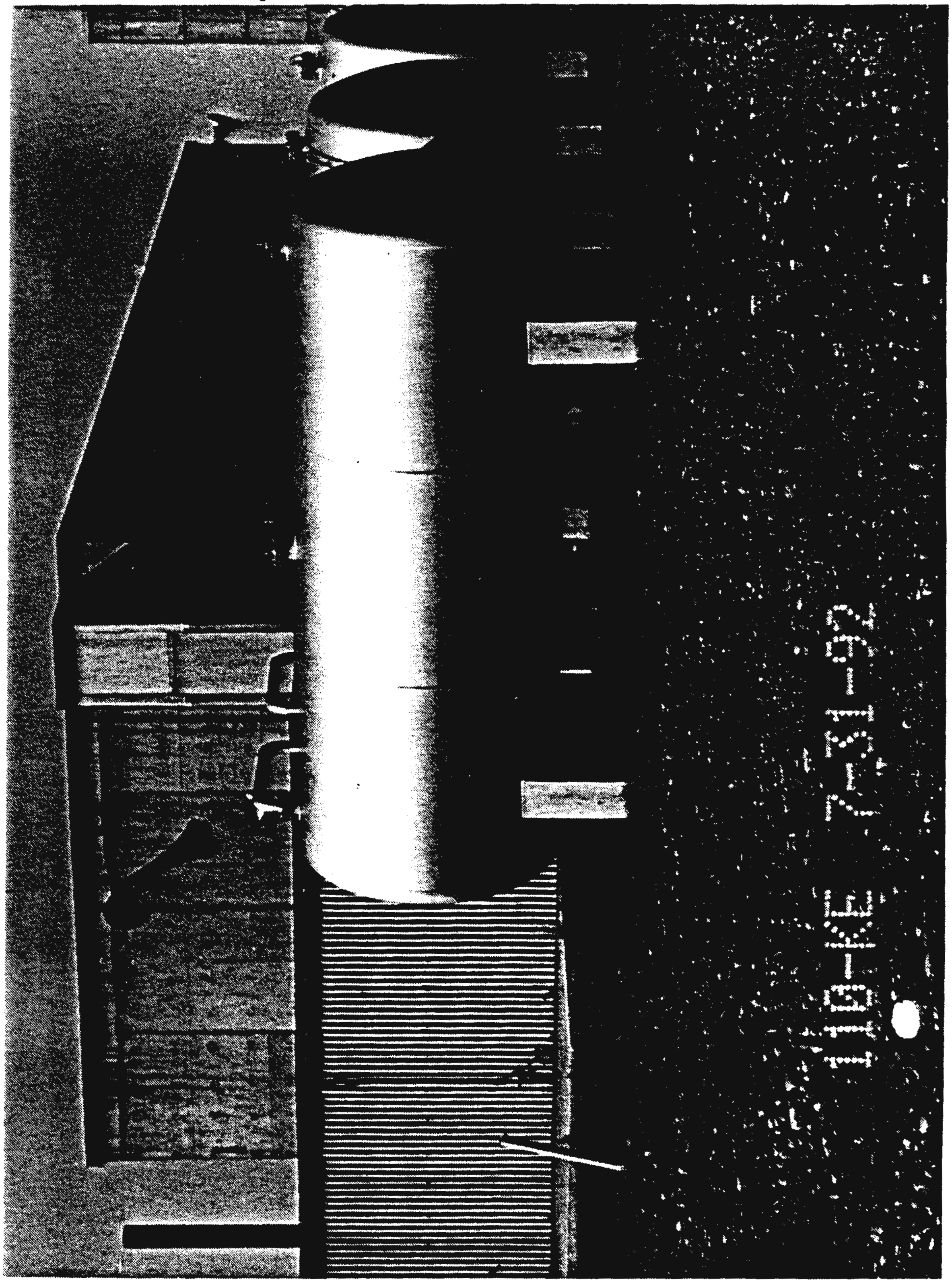


Figure 1-50. 115-KE Gas Recirculation Building.

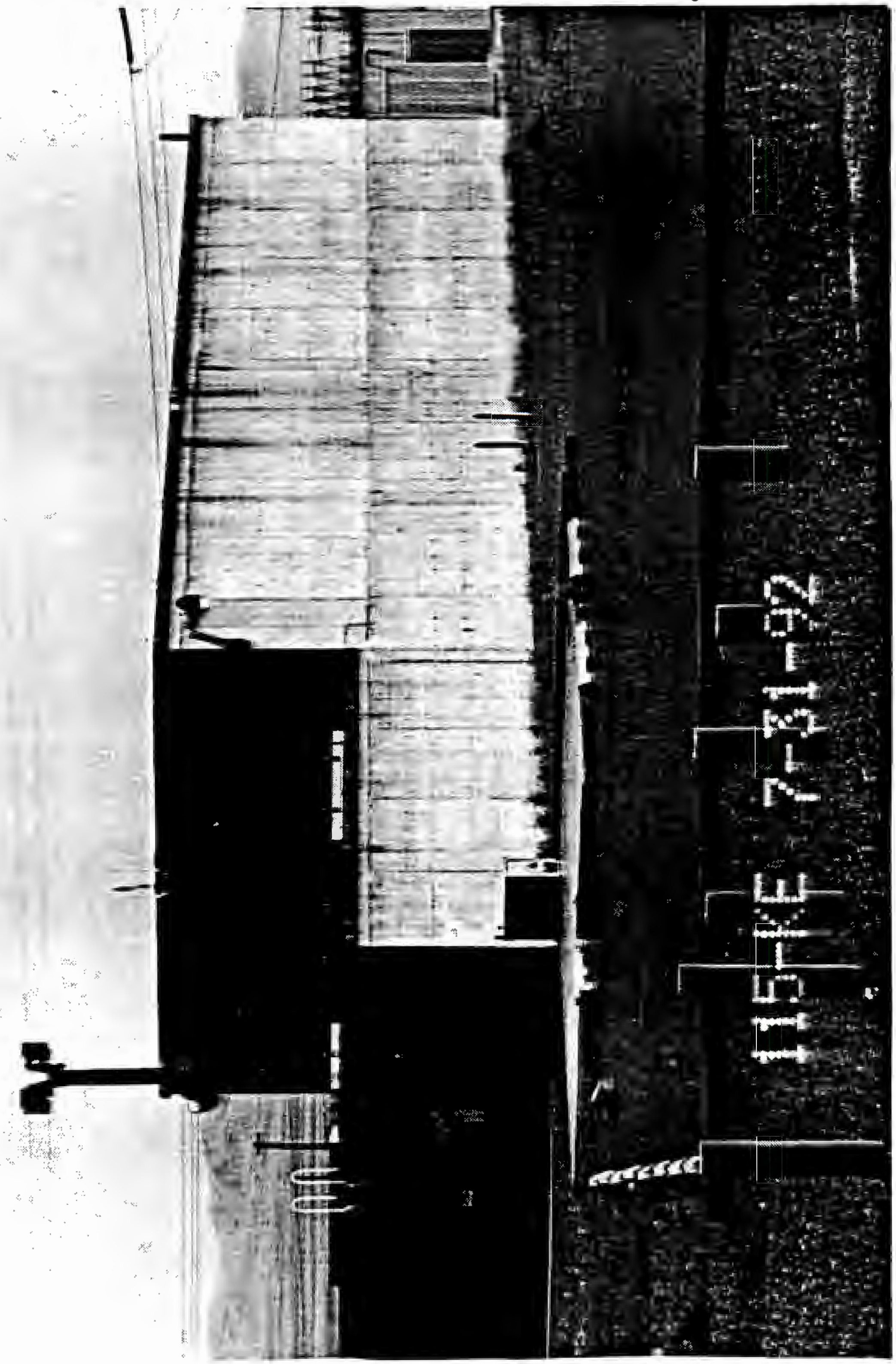


Figure 1-51. 116-KE Reactor Exhaust Stack.

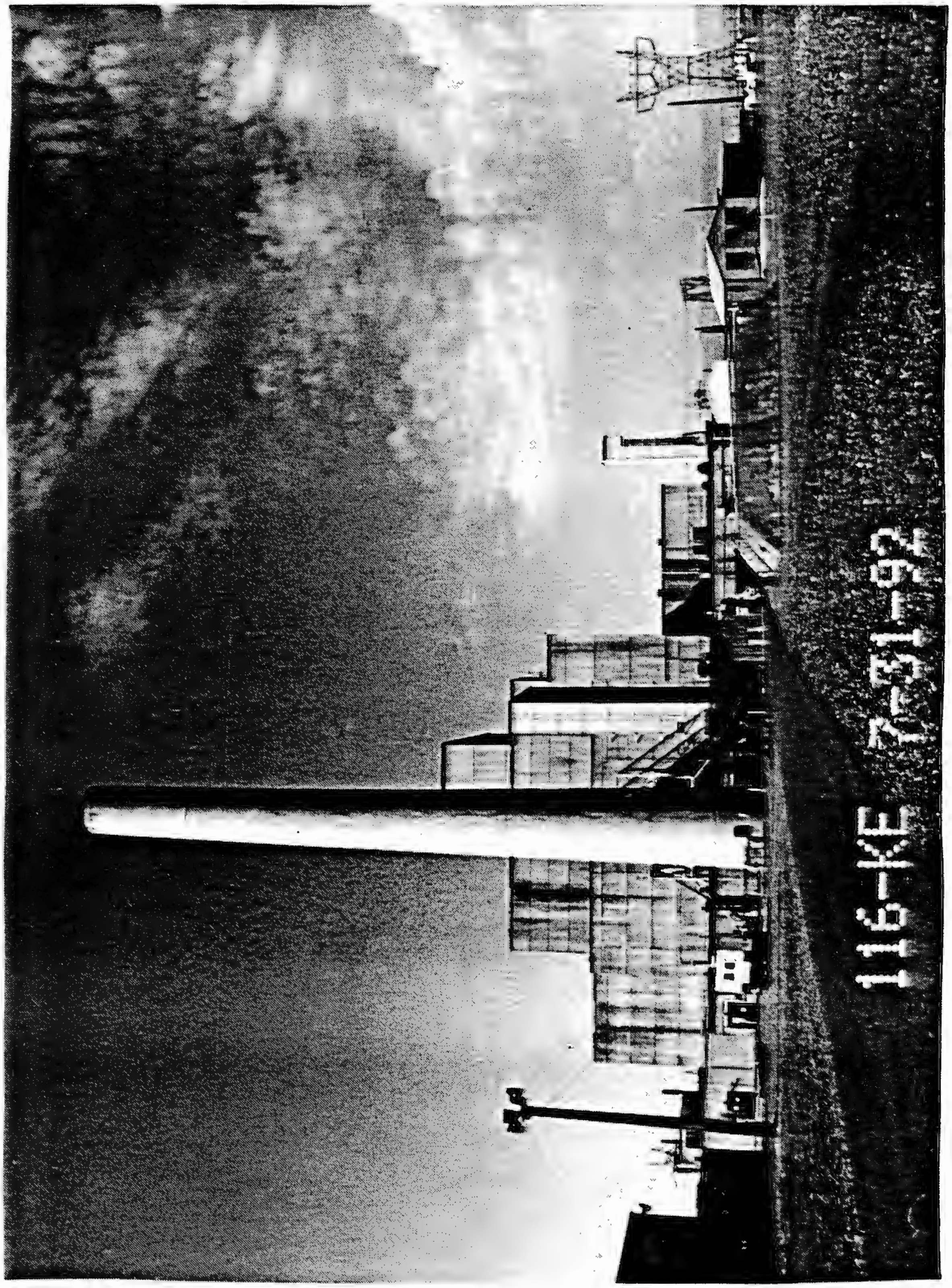
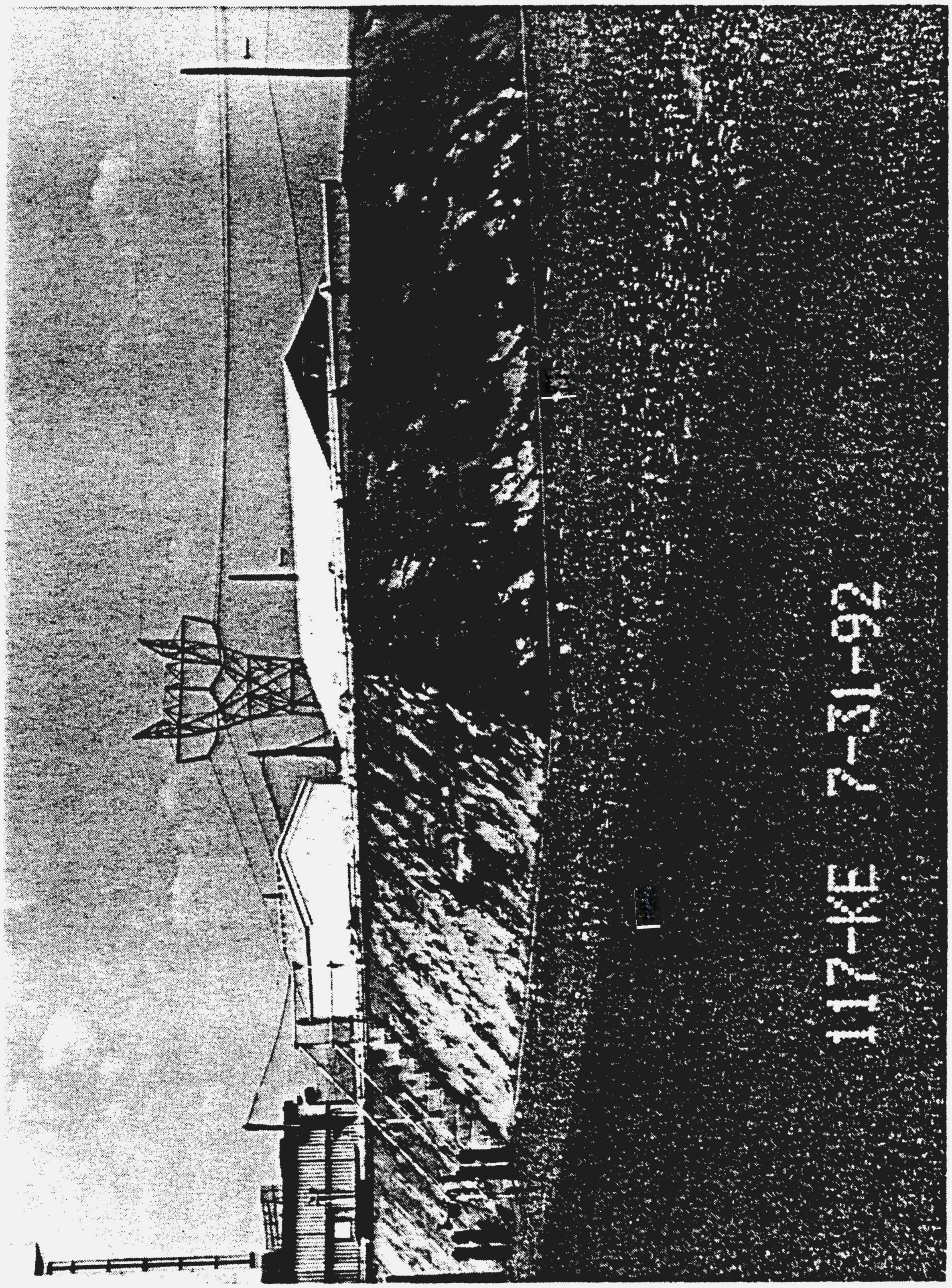


Figure 1-52. 117-KE Exhaust Air Filter Building.



1.2.36 166-AKE Oil Storage Facility (Figure 1-53)

The 166-AKE Facility was used for oil and grease storage. It is a 26.76-m^2 (288-ft^2) butler building.

The building's interior is in good condition, the exterior is in fair condition, and the roof is in good condition. Presently the building is being used by K Area personnel for solvent storage and is scheduled for decommissioning in FY 2009.

1.2.37 1702-KE Badge House (Figure 1-54)

The 1702-KE Badge House is located at the original entrance to the 105-KE exclusion area. It provided shelter for a security check before entrance to the exclusion area. The facility is a one-story wooden-framed structure, (6.1 m by 6.1 m by 3.7 m (20 ft by 20 ft by 12 ft).

The building's interior, exterior, and the asphalt-covered wood-framed roof are in extremely poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2009.

1.2.38 1713-KER Warehouse (Figure 1-55)

The 1713-KER Warehouse was used for storage of houserman partitions, electrical supplies, and miscellaneous equipment. The building is a 74.32-m^2 (800-ft^2) sheet metal butler building with a concrete floor and footing.

The building's interior is in fair condition, the exterior is in good condition, and the roof is in good condition. Presently the building is being used by K Area personnel for storage and is scheduled for decommissioning in FY 2009.

1.2.39 105-KW Reactor Building (Figure 1-56)

The 105-KW Reactor Building was constructed from 1952 to 1955 to house the nuclear reactor and directly associated equipment used in reactor operations. It is the same as the 105-KE, which is about twice the size of the original six production reactors.

The lower portion of the building is made of reinforced concrete. The massive reinforced concrete walls (0.9-m to 1.5-m [3-ft to 5-ft] thick) around the reactor block at the lower levels provide additional radiation shielding in conjunction with the biological core shield. The upper section of this building is lighter in construction, using concrete block.

Figure 1-53. 166-AKE Oil Storage Facility.

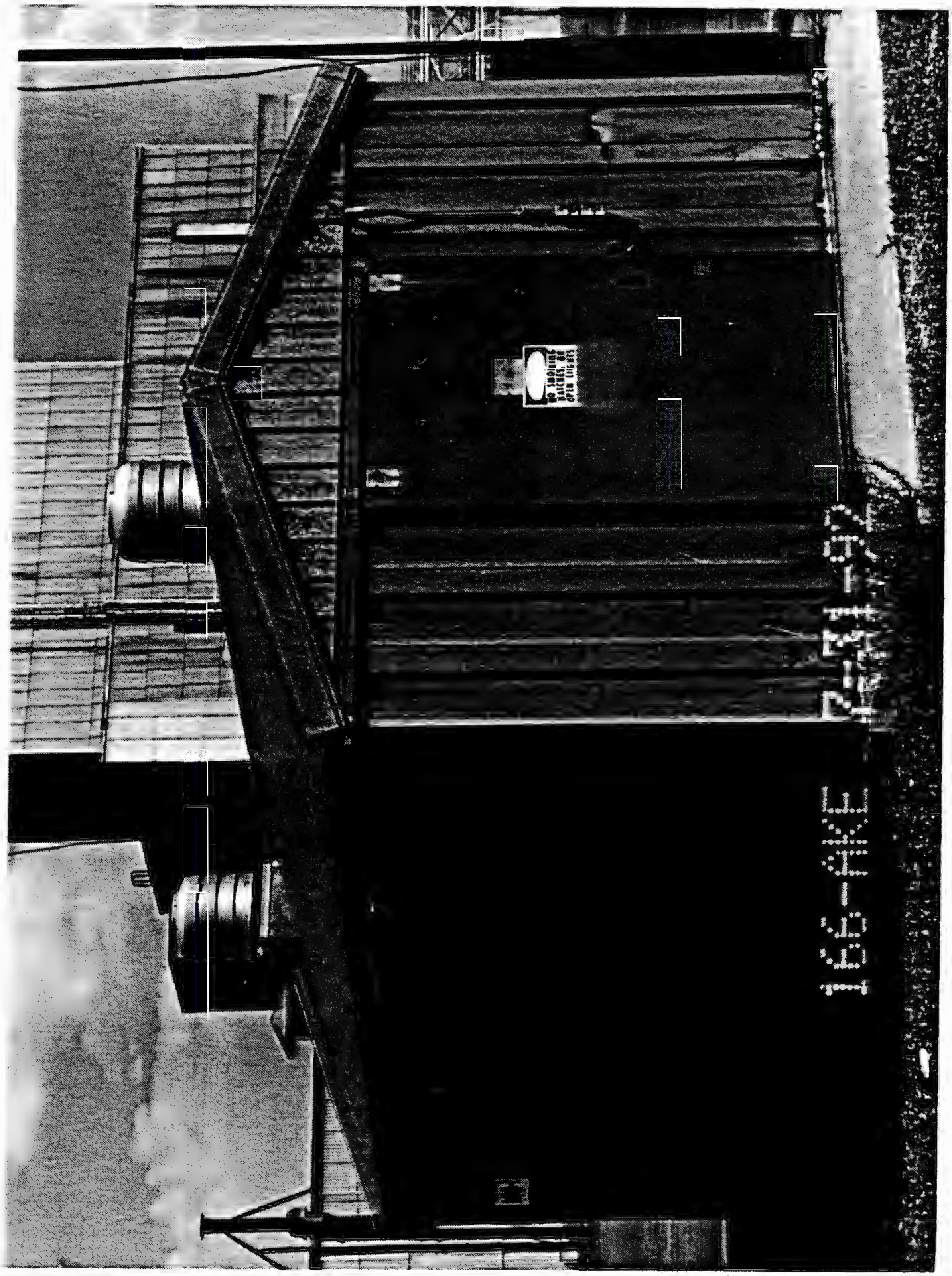


Figure 1-54. 1702-KE Badge House.

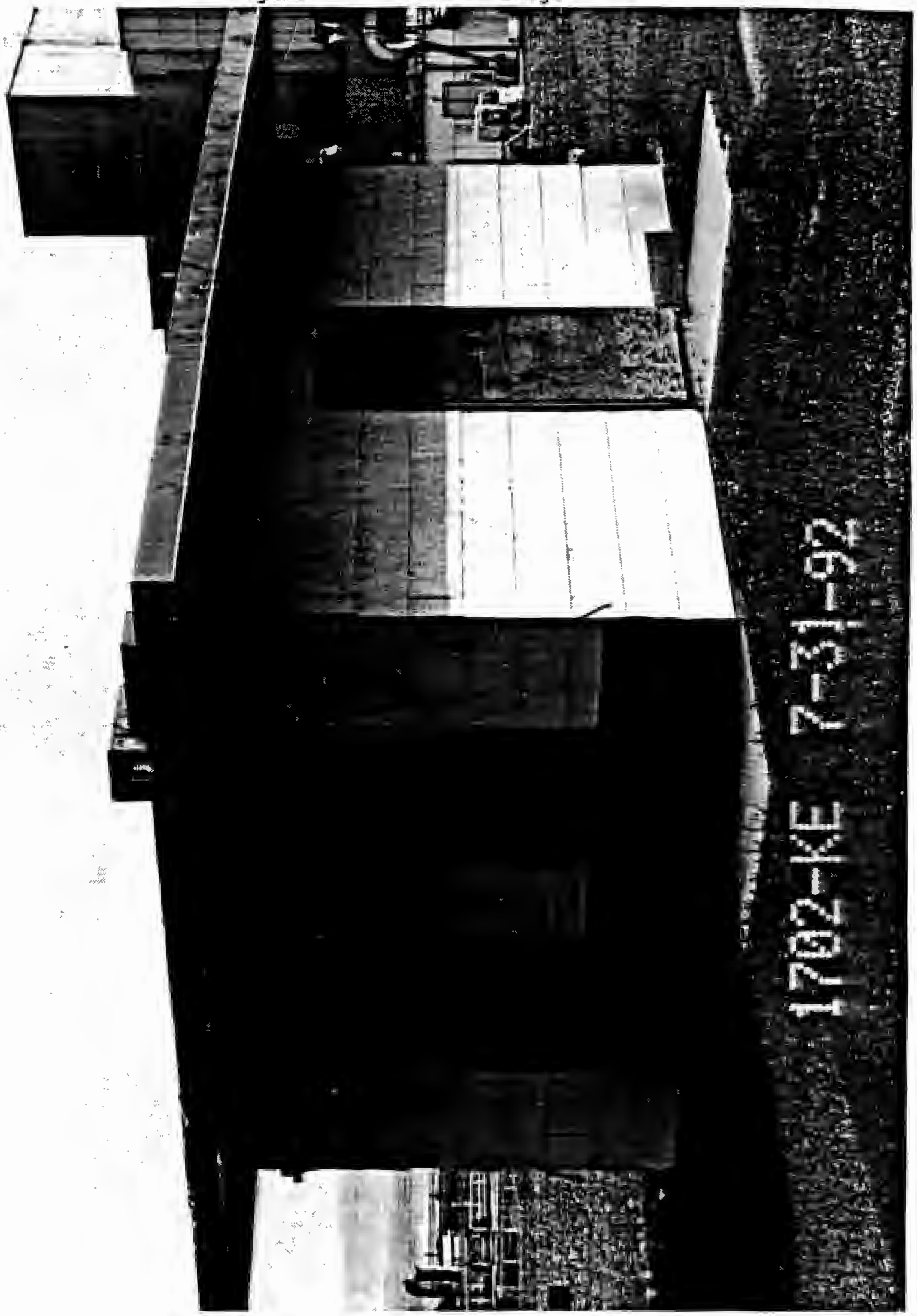


Figure 1-55. 1713-KER Warehouse.

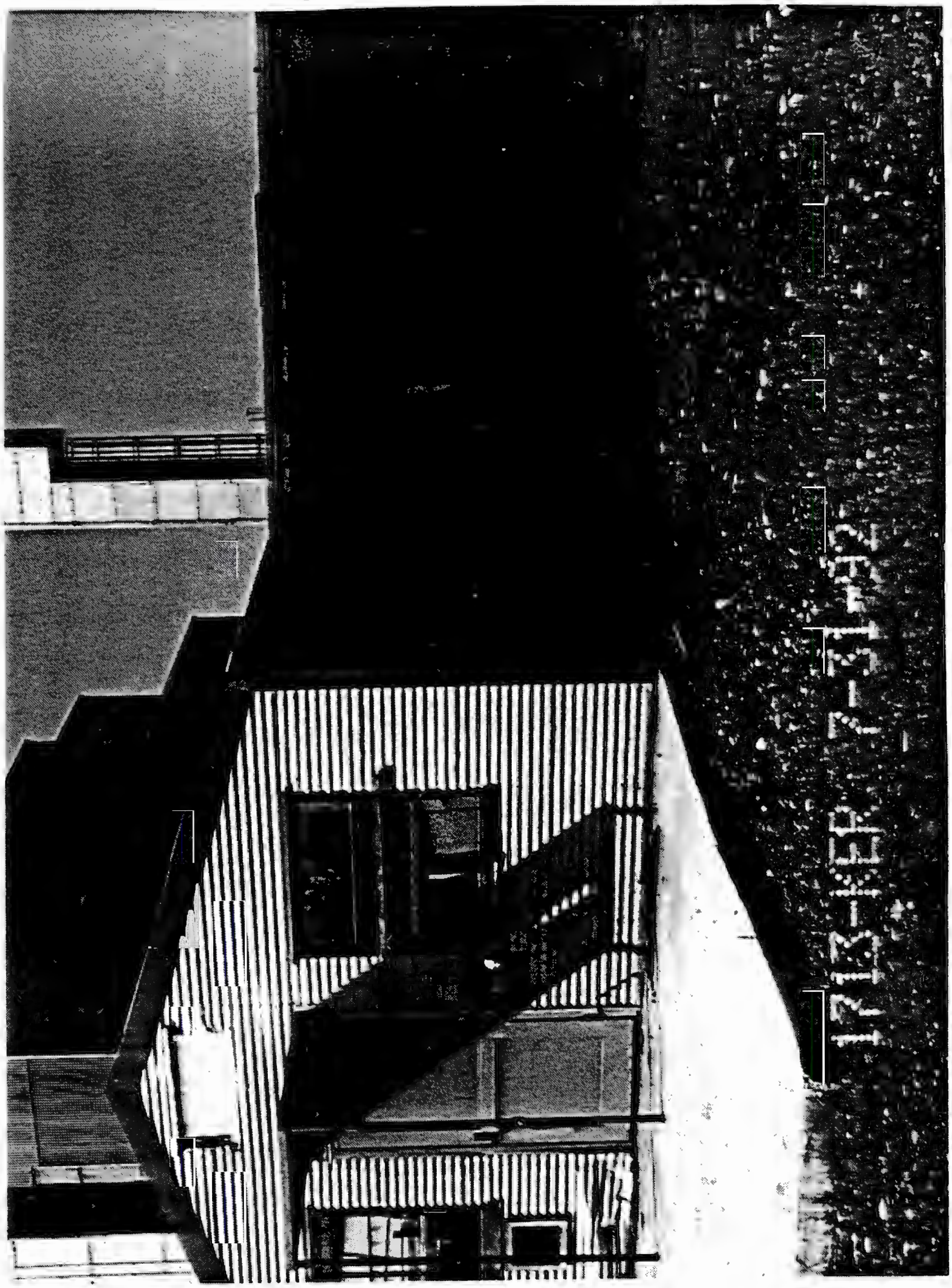
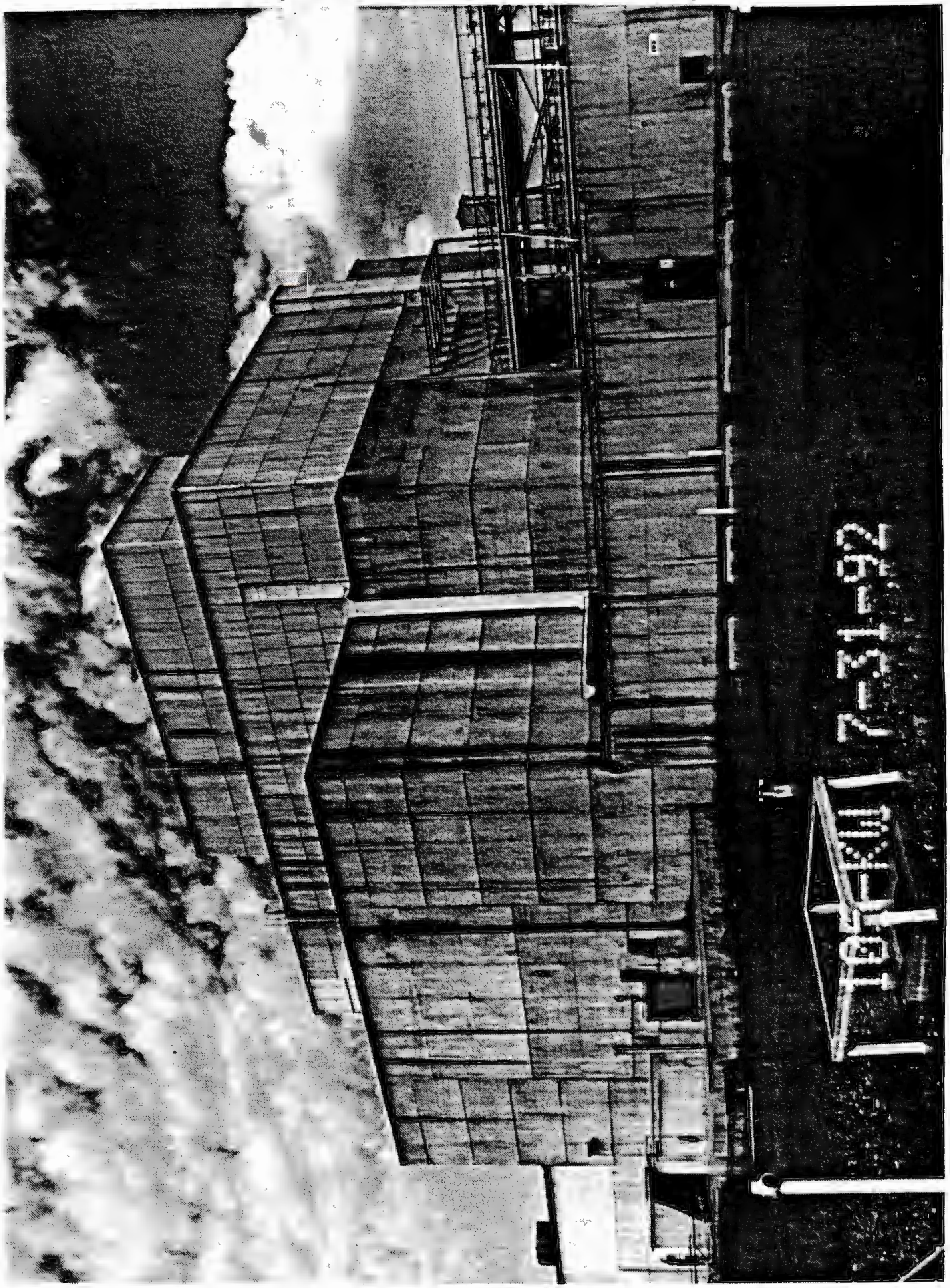


Figure 1-56. 105-KW Reactor Building.



The reactor block is located near the center of the building (see Figure 1-13). Horizontal control rod penetrations are on the left side of the reactor block (when facing the reactor front face), and the safety rod penetrations are on the top of the reactor. The control room is located directly under the intercontrol rod room, adjacent to the reactor core on the ground floor level. Fuel discharge and storage areas are located adjacent to the rear face of the reactor block, one level below the ground. Experimental test penetrations are located on the right side of the reactor. The reactor block consists of a graphite moderator stack encased in cast iron thermal shielding and a welded biological shield consisting of alternating layers of masonite and steel on the four sides and a nonwelded, stair-step labyrinth seal shield on top. The entire block rests on a massive concrete foundation. The block weighs approximately 12,193 metric tons (12,000 tons) and is 14.0 m high by 14.0 m wide by 12.2 m deep (46 ft by 46 ft by 40 ft).

The fuel storage basin served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. It consists of a fuel element pickup area, storage area, and transfer area. The basin is 6.7 m (22 ft) deep and contained 6.1 m (20 ft) of water during operation. The basin was originally cleaned of debris and deactivated as part of the initial reactor shutdown conditions. As part of the shutdown for the N Reactor, the 105-KW Basin was reactivated for the storage of irradiated fuel that was removed from the 105-N Reactor core.

The building's interior is in good condition; the exterior is in fair condition, with numerous friable asbestos problems; and the membrane-covered, reinforced, precast gypsum roof panels are in fair condition. The overall building contains an estimated 58,000 Ci of radionuclides (primarily activation products contained within the graphite core). In addition, 157.5 metric tons (155 tons) of lead and an unknown quanity of asbestos are contained within the facility.

The status of this facility is retired (except for the basin area)--radioactively contaminated. An EIS has been prepared by DOE for decommissioning the eight shutdown Hanford Site reactors (DOE 1989). A final decision on the actions required by the EIS is pending.

1.2.40 110-KW Gas Storage Facility (Figure 1-57)

The 110-KW Facility was the receiving and storage area at the 115 Building for the reactor graphite cooling media gas. An outdoor gas storage area consists of a number of 61-cm (24-in.) diameter by 24.4 m (80 ft) long, high-pressure helium tanks and four large diameter, low-pressure, carbon dioxide tanks.

The bunker building's interior, exterior, and roof are in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2006.

Figure 1-57. 110-KW Gas Storage Facility.

1.2.41 **115-KW Gas Recirculation Building** (Figure 1-58)

The 115-KW Facility housed the gas circulating pumps and associated equipment for the Reactor Gas Coolant System. The building is a single-story, reinforced concrete structure, 34.6 m by 10.4 m (113.5 ft by 34 ft), with 6.1 m (20 ft) abovegrade and 6.1 m (20 ft) belowgrade.

The building's interior, exterior, and roof are in fair condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2000.

1.2.42 **116-KW Reactor Exhaust Stack** (Figure 1-59)

The 116-KW Exhaust Stack was used to discharge ventilation air from the 105-KW Building. The exhaust stack was 61.0 m (200 ft) abovegrade and 3.1 m (10 ft) belowgrade, with a 4.9-m- (16-ft-) diameter base. The stack is a monolithic, reinforced concrete structure, with a wall thickness of 0.5 m (1.5 ft) at the base and 0.3 m (1 ft) at the top. The stack was decontaminated, and the height was reduced to 53.3 m (175 ft). The clean rubble was dropped inside the remaining portion of the stack. The stack is in good general condition and has no noted structural defects. The stack is scheduled for decommissioning in FY 1998.

1.2.43 **117-KW Exhaust Air Filter Building** (Figure 1-60)

The 117-KW Building filtered ventilation air from the confinement zone of the 105-KW Reactor Building before its discharge to the atmosphere through the 116-KW Stack. The facility, a reinforced concrete structure, is 18.0 m long by 11.9 m wide by 10.7 m high (59 ft by 39 ft by 35 ft), with 2.4 m (8 ft) abovegrade.

The building's interior, exterior, and roof are in fair condition. Presently the building serves no purpose and decommissioning is scheduled to begin in FY 1997.

1.2.44 **165-KW Power Control Building** (Figure 1-61)

The 165-KW Facility provided housing for the power house, control room, valve pit, and electrical switchgear for the water supply system. The building is a single-story, concrete structure (73.2 m by 33.5 m by 4.6 m [240 ft by 110 ft by 15 ft]), consisting of three parts: (1) the pump room and valve pit, (2) the electrical area, and (3) the oil-fired steam plant and control room.

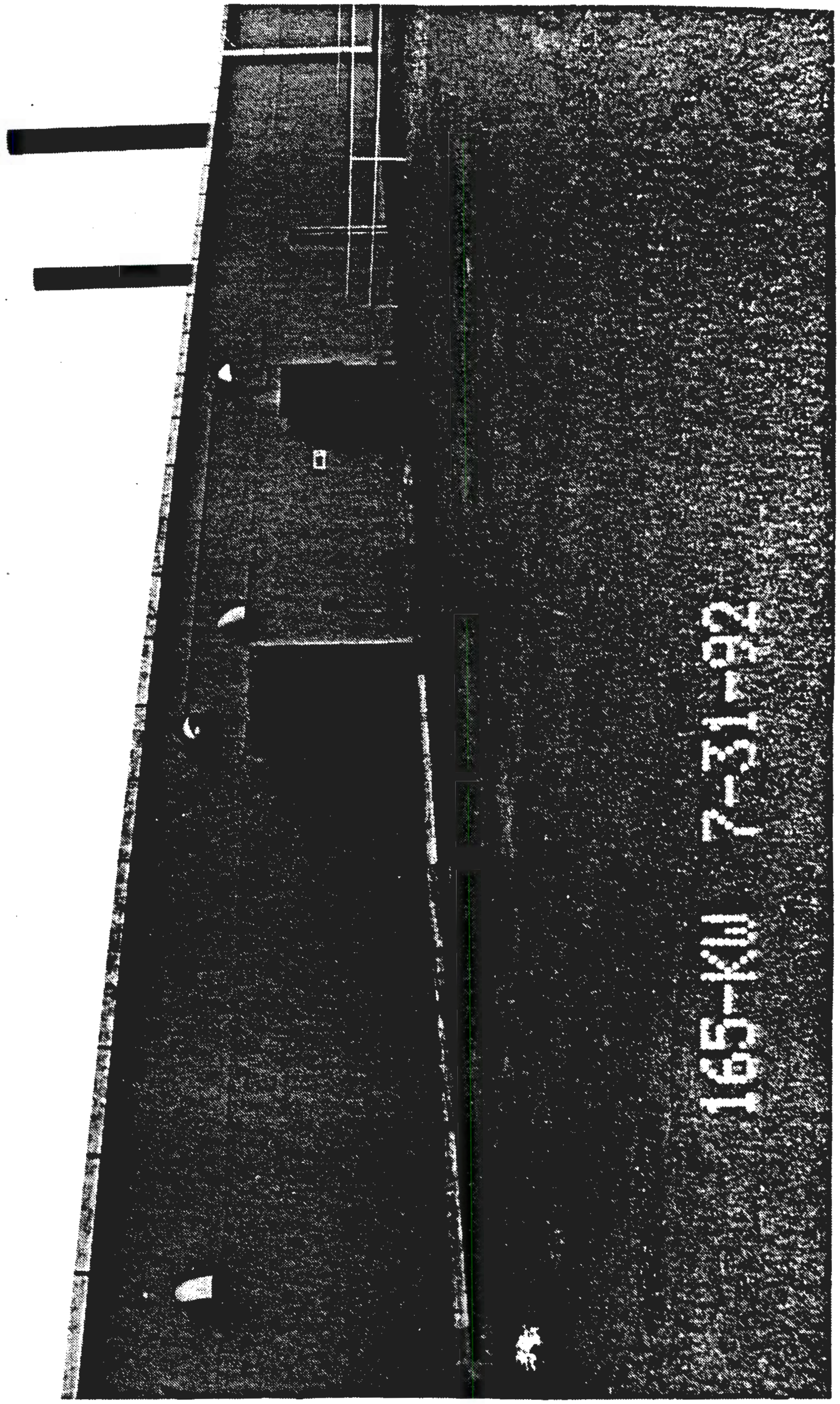
The building's interior, exterior, and roof are in fair condition. Presently the building supports the N Reactor fuel storage project and is scheduled for decommissioning in FY 2006.

Figure 1-58. 115-KW Gas Recirculation Building.

Figure 1-59. 116-KW Reactor Exhaust Stack.

Figure 1-60. 117-KW Exhaust Air Filter Building.

Figure 1-61. 165-KW Power Control Building.



1.2.45 1702-KW Badge House (Figure 1-62)

The 1702-KW Badge House is located at the original entrance to the 105-KW exclusion area. It provided shelter for a security check before entrance to the exclusion area. The facility is a one-story, wooden-framed structure, 6.1 m by 6.1 m by 3.7 m (20 ft by 20 ft by 12 ft).

The building's interior; exterior; and asphalt-covered, wooden-framed roof are in extremely poor condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2008.

1.2.46 1714-KW Warehouse (Figure 1-63)

The 1714-KW Facility was used for storage of nonfissile material. The building is a 74.32-m^2 (800-ft^2) sheet metal butler building with concrete floor and footing.

The building's interior, exterior, and steel roof are in good condition. Presently the building serves no purpose and is scheduled for decommissioning in FY 2008.

Figure 1-62. 1702-KW Badge House.

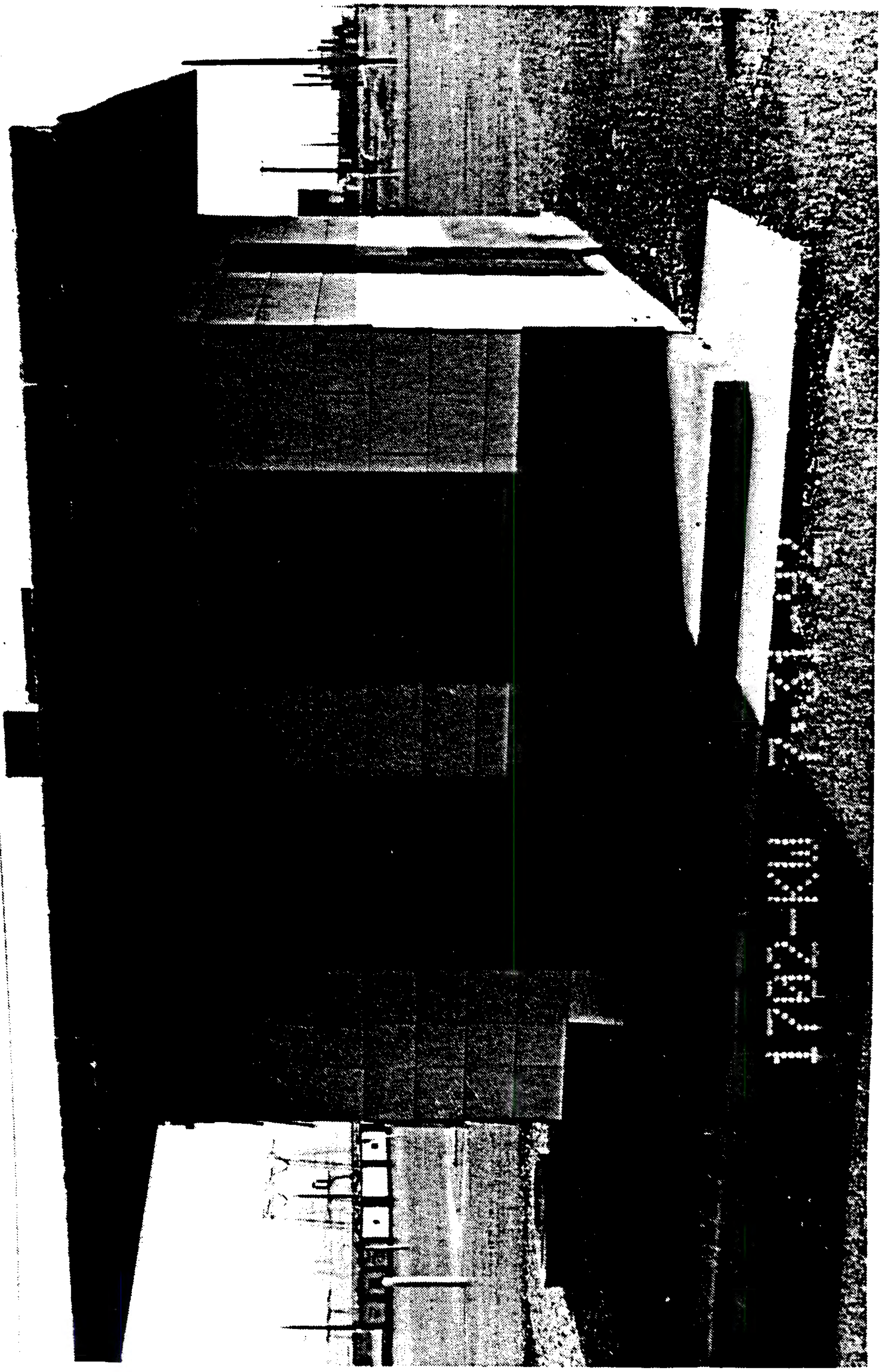
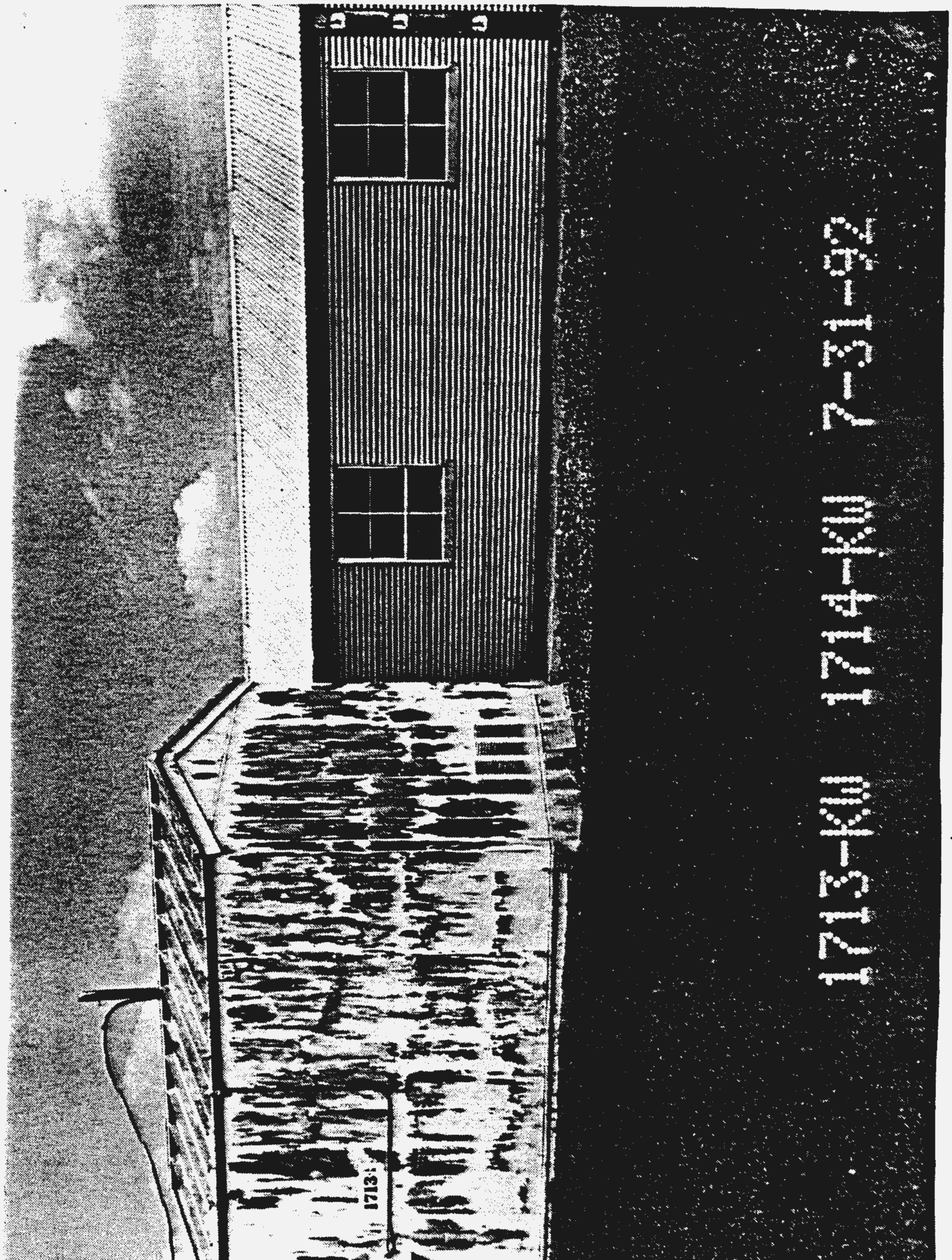


Figure 1-63. 1713-KW Warehouse.



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2.0 200 WEST AREA FACILITIES

2.1 INTRODUCTION

The S Plant, referred to as the Reduction Oxidation (REDOX) Facility, and the U Plant were plutonium extraction facilities that were declared surplus in the mid-1960's. They presently are within the Hanford Surplus Facilities Program under the Environmental Restoration Operations Management. The intent of the original design was for the buildings to be used, based on a 20-year life span, without full consideration of the time required to decommission them. Today, the building structure and equipment required to keep the U Plant Facility in a safe storage configuration are 48 years old, and the REDOX Facility is 40 years old (Table 2-1). Using present estimates, the existing confinement systems are required to be maintained for at least an additional 13 years before decommissioning can begin. Extended design lives of up to three times the original parameters require the building confinement structures and operational equipment to be carefully monitored under an ongoing surveillance and maintenance program. These programs are required in both of these retired chemical processing plants because the canyons are considered safety class 1 facilities.

Table 2-1. Design Life Comparison.

Facility	Construction / Operation	Shutdown / Start Decom	Present age / Final age (yr)	Extended design lives
U Plant	1944-1945	1964	47	3 lives
	1952-1958	2005	61	
S Plant	1950-1952	1967	40	3 lives
	1952-1966	2005	55	

2.2 BACKGROUND

2.2.1 U Plant Facility

The U Plant Facility is located in the 200 West Area of the Hanford Site (Figure 2-1). Figure 2-2 shows an aerial photograph of the 221-U Plant Facility exterior. The reinforced concrete canyon building (221-U) was originally constructed between 1944 and 1945 as an integral part of the U Plant fuel separation facility, but was never used for that purpose. From 1950 to 1952, the U Plant Facility was extensively modified for a uranium metal recovery program. Modification included all new cell process equipment in the canyon building.

Figure 2-1. 200 West Area.

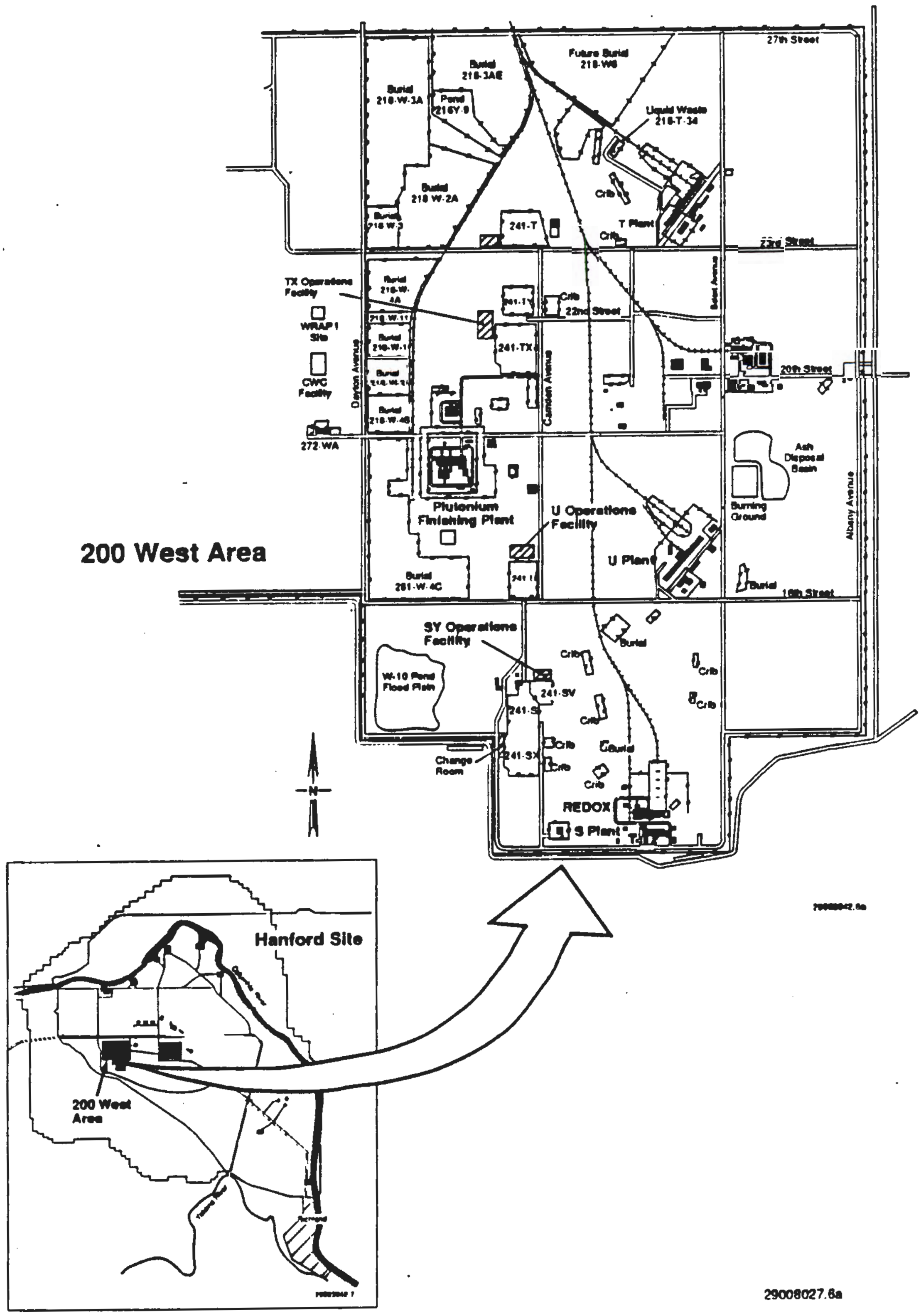
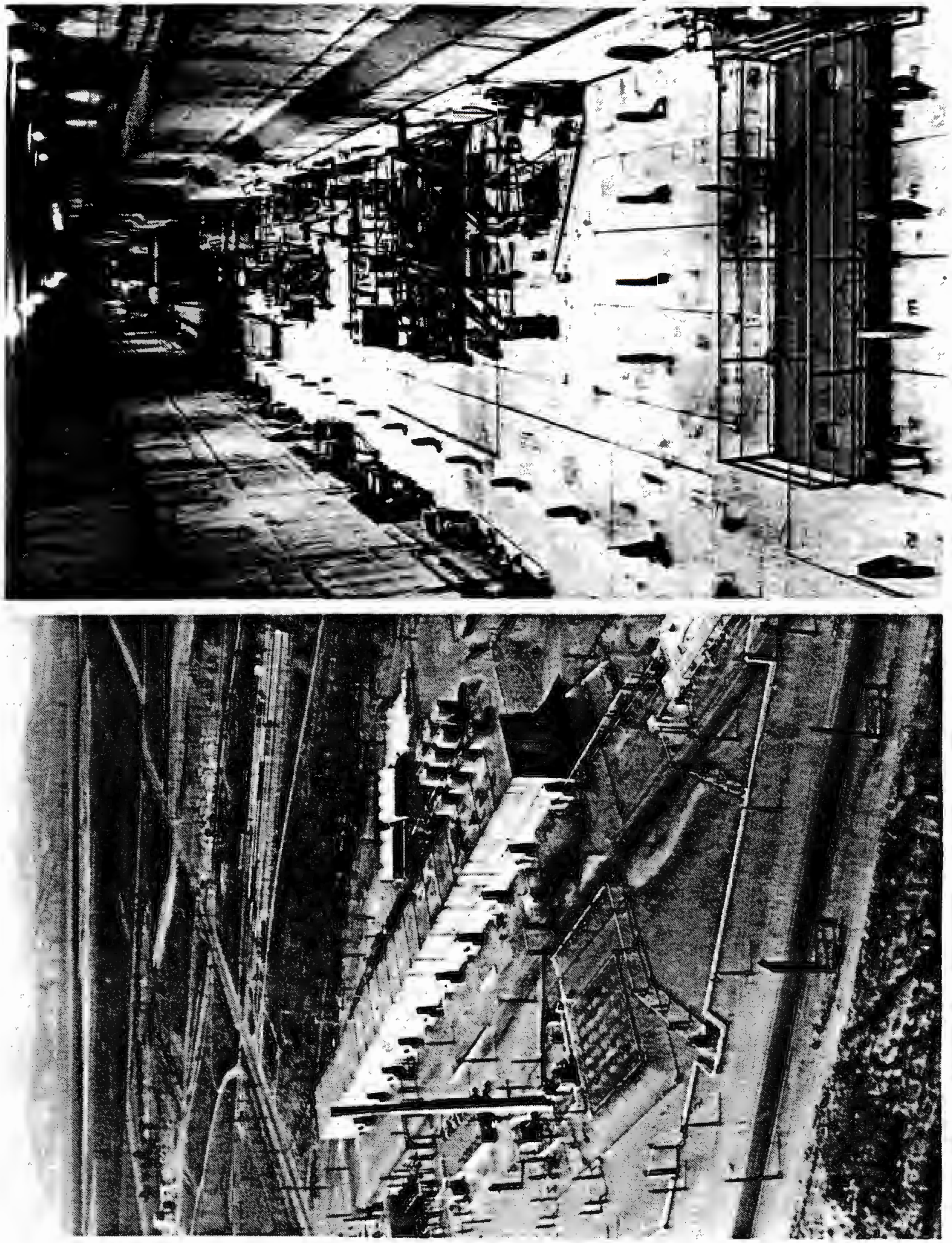


Figure 2-2. U Plant Facility.



From 1952 to 1958, the 221-U Canyon Building recovered uranium from high-level waste underground storage tanks containing liquid from the bismuth phosphate process fuel separation plant (B Plant). The process involved solvent extraction with tributyl phosphate for the separation and decontamination of the uranium.

2.2.2 Reduction Oxidation Facility

The REDOX Facility is located in the 200 West Area of the Hanford Site, directly south of the U Plant Facility (refer to Figure 2-1). Figure 2-3 shows an aerial photograph of the REDOX Facility. This facility, constructed from 1950 to 1952, became the first large-scale, continuous-flow, solvent extraction process plant built in the United States for the recovery of plutonium from irradiated uranium fuel. This process, which replaced the batch precipitation methods first used at the Hanford Site, was designed to separate uranium, plutonium, and neptunium as individual product streams from the fission products with which they are associated in the irradiated fuel. This separation was accomplished by controlling the relative distribution of the activated components between aluminum nitrated-salted aqueous solutions and an immiscible organic extractant, hexone (methyl isobutyl ketone).

2.3 PHYSICAL DESCRIPTION

2.3.1 221-U Canyon Building (Figure 2-4)

The main building associated with the U Plant facility is the 221-U Canyon Building. This building was built in 20 sections, with expansion joints between each section (refer to Figure 2-5). The sections, numbered 1 through 20, are each 12.2 m (40 ft) long and house the cell equipment used in the batch precipitation method. The building is divided lengthwise into the gallery side and the process canyon side. These two sections are separated by a wall that runs the full length of the building and is typically 1.5 to 2.7 m (5 to 9 ft) thick. Other typical thicknesses are: the floor, 1.8 m (6 ft); the roof, 0.9 to 1.2 m (3 to 4 ft); outside wall (process side), 1.5 to 2.7 m (5 to 9 ft); and the outside wall (gallery side), 0.9 m (3 ft).

The gallery side has four floors; all are 4.3 m (14 ft) wide. From the bottom to the top, these are the electrical gallery, pipe gallery, operating gallery, and crane cabway platform. The crane cabway is open to the top of the canyon with a concrete wall separating the cabway from the canyon for shielding purposes. The remaining galleries contain all the cold piping, electrical distribution equipment, process controls, and instrumentation for the canyon cells.

The building's interior and exterior are in good condition. The membrane-covered, poured concrete roof is in good condition, with minor areas that require annual repair to minimize water infiltration. Presently the canyon is used as a radioactive confinement area for the storage of used process equipment from several processing plants. The facility is scheduled for decommissioning to begin in FY 2004.

Figure 2-3. REDOX Facilities.

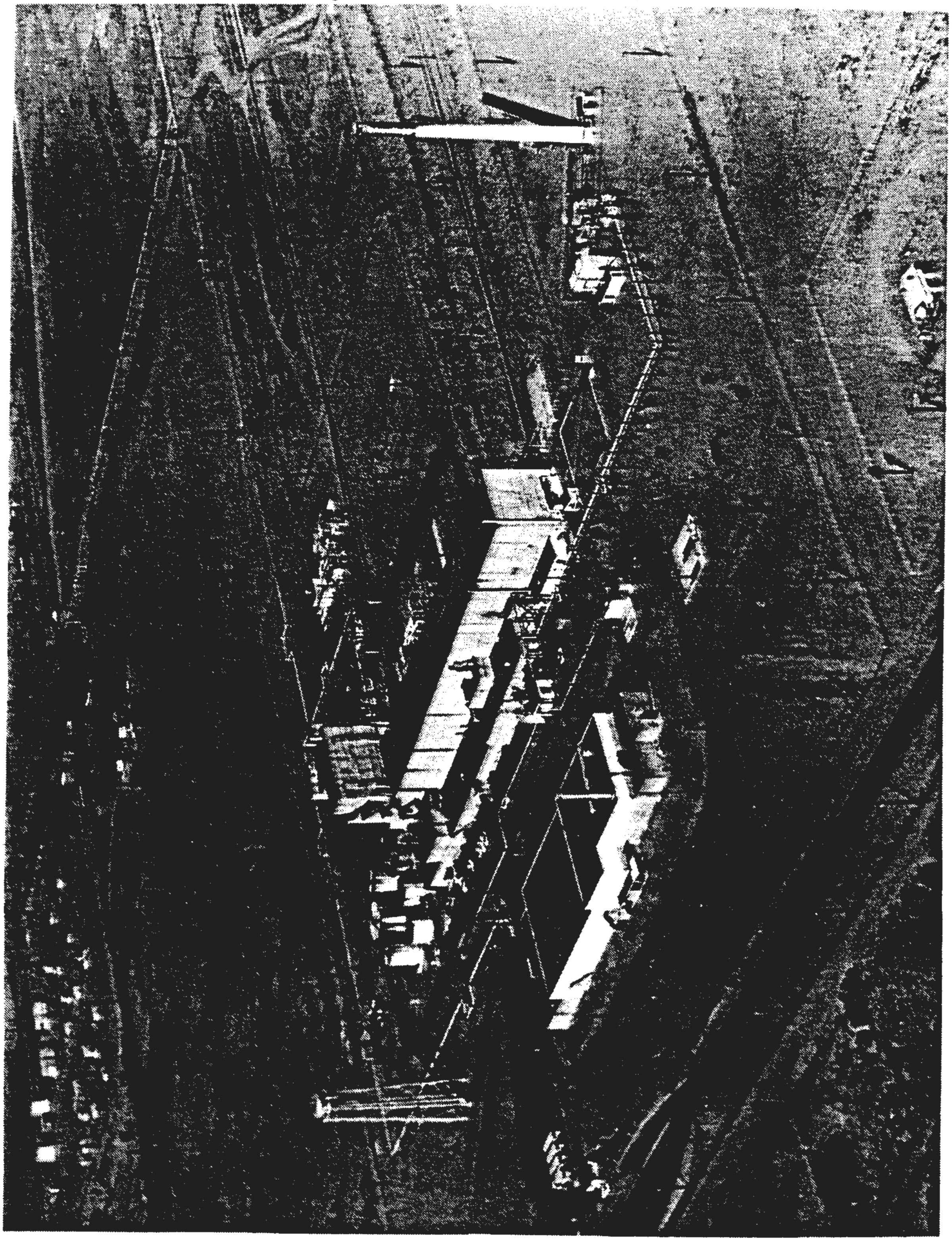


Figure 2-4. 221-U Canyon Building.

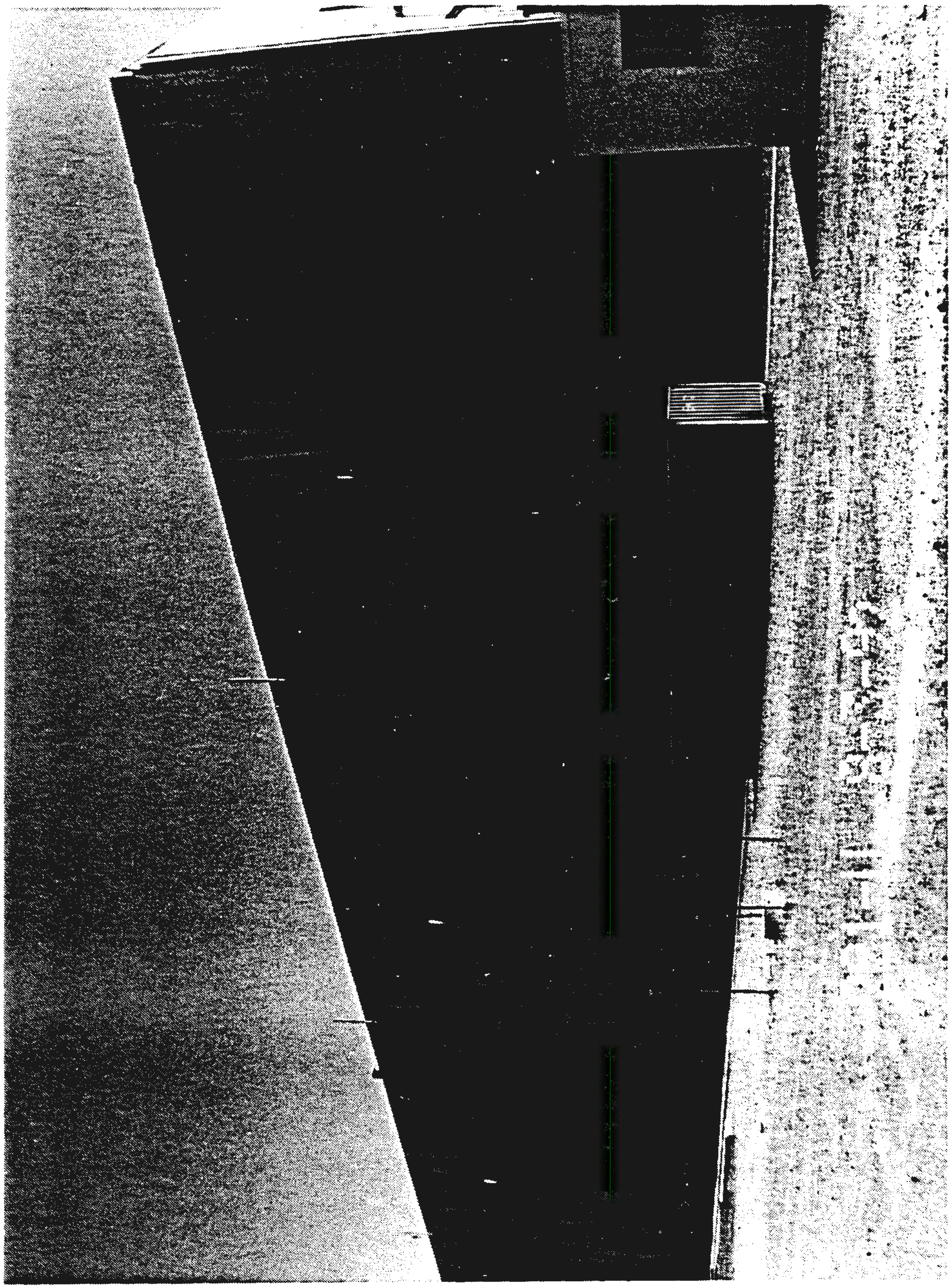
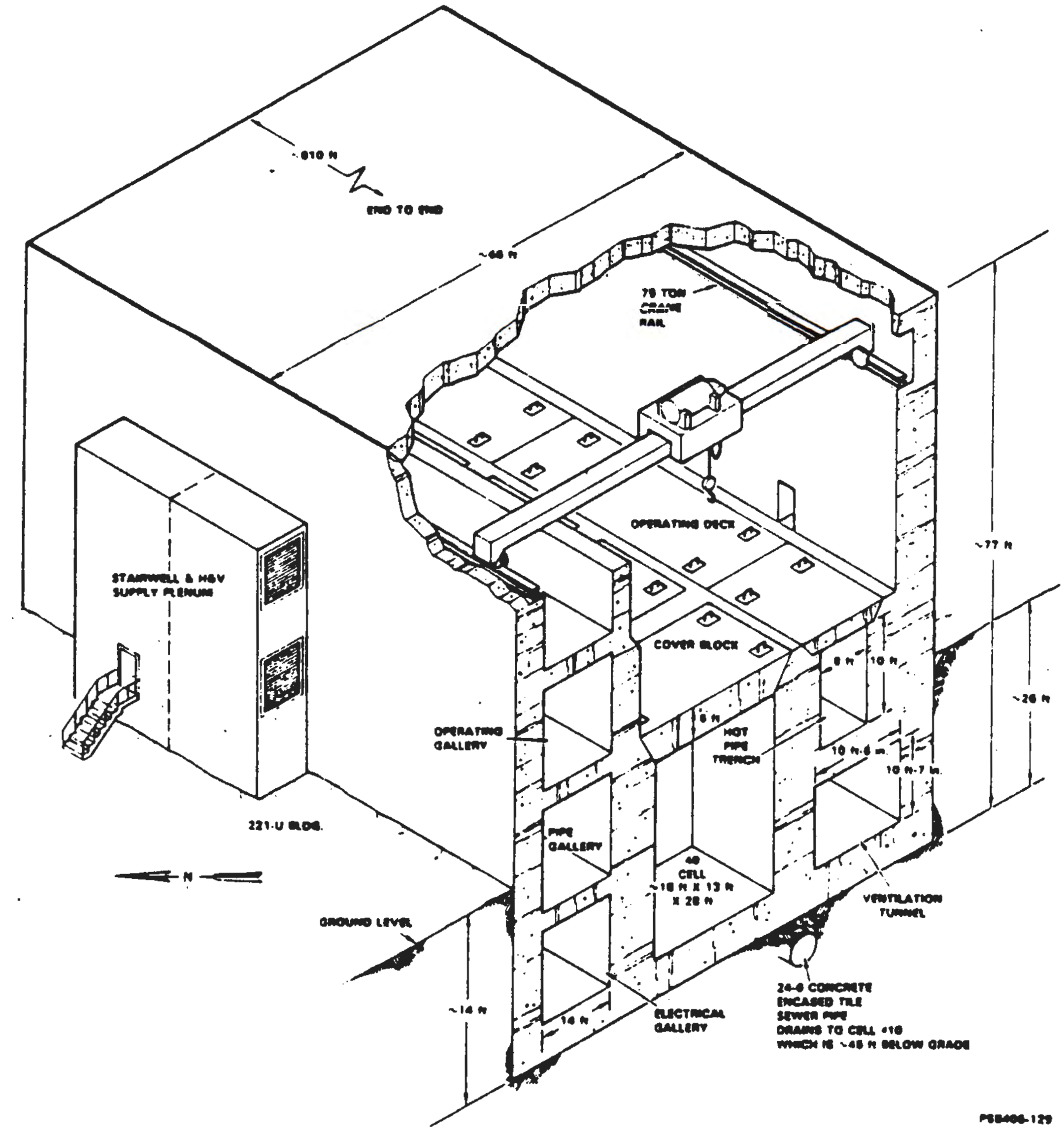


Figure 2-5. U Plant Canyon Cross Section.



2.3.2 **271-U Office Building** (Figure 2-6)

The 271-U Building is a four-floor office/storage complex associated with the U Plant facility. The building is directly attached to the north side of the 221-U Canyon Building and was used to house personnel, whose responsibility was to support the facility.

The building's interior and exterior are in good condition. The asphalt-covered, poured concrete roof is in good condition. Presently, the building is being upgraded to house operations and maintenance personnel who support all 200 Area retired facilities. This building will be part of the U Plant decommissioning activity.

2.3.3 **276-U Solvent Handling Facility** (Figure 2-7)

The 276-U Solvent Handling Facility was used for bulk storage of tributyl phosphate. This solvent was used for recovery of uranium from the underground storage waste tanks. The facility is located on the outside southwest wall of the 221-U Building. It is an aboveground concrete basin, 20.1 m by 16.5 m by 2.4 m (66 ft by 54 ft by 5 ft), with 1.5 m (5 ft) aboveground.

The general condition of the facility is good. This facility will be a part of the overall U Plant decommissioning.

2.3.4 **291-U Exhaust Fan Facility** (Figure 2-8)

The 291-U Exhaust Fan Facility contains the exhaust ventilation equipment for the 221-U Canyon Building, which maintains the radiologically contaminated areas under negative pressure with respect to the atmosphere and adjacent noncontaminated areas of the building. There are two stainless steel, direct-driven blowers of identical design, installed in parallel. Both are driven by a 60 hp electric motor. The ventilation load of the building is carried by an individual fan at a rate of 566 m^3/min (20,000 ft^3/min). The standby fan provides backup capabilities required during a malfunction or scheduled maintenance of the primary exhaust fan. The 291-U sand filter, which is 25.9 m by 25.9 m by 3 m (85 ft by 85 ft by 10 ft), is comprised of gradient layers of acid resistant rock and sand, which remove radioactive particles from the exhaust ventilation air before discharge to the atmosphere. The 291-U process stack, which is 61 m (200 ft) high, provides a discharge point for the exhaust air to ensure that the velocity and altitude are sufficient to eliminate any hazards to personnel.

The filter and building's interior is in fair condition and the exterior is in good condition. The filter roof was recently covered with urethane, thus eliminating the potential for water infiltration. Presently, the sand filter removes particulate from the canyon ventilated air before discharge up the stack.

Figure 2-6. 271-U Office Building.

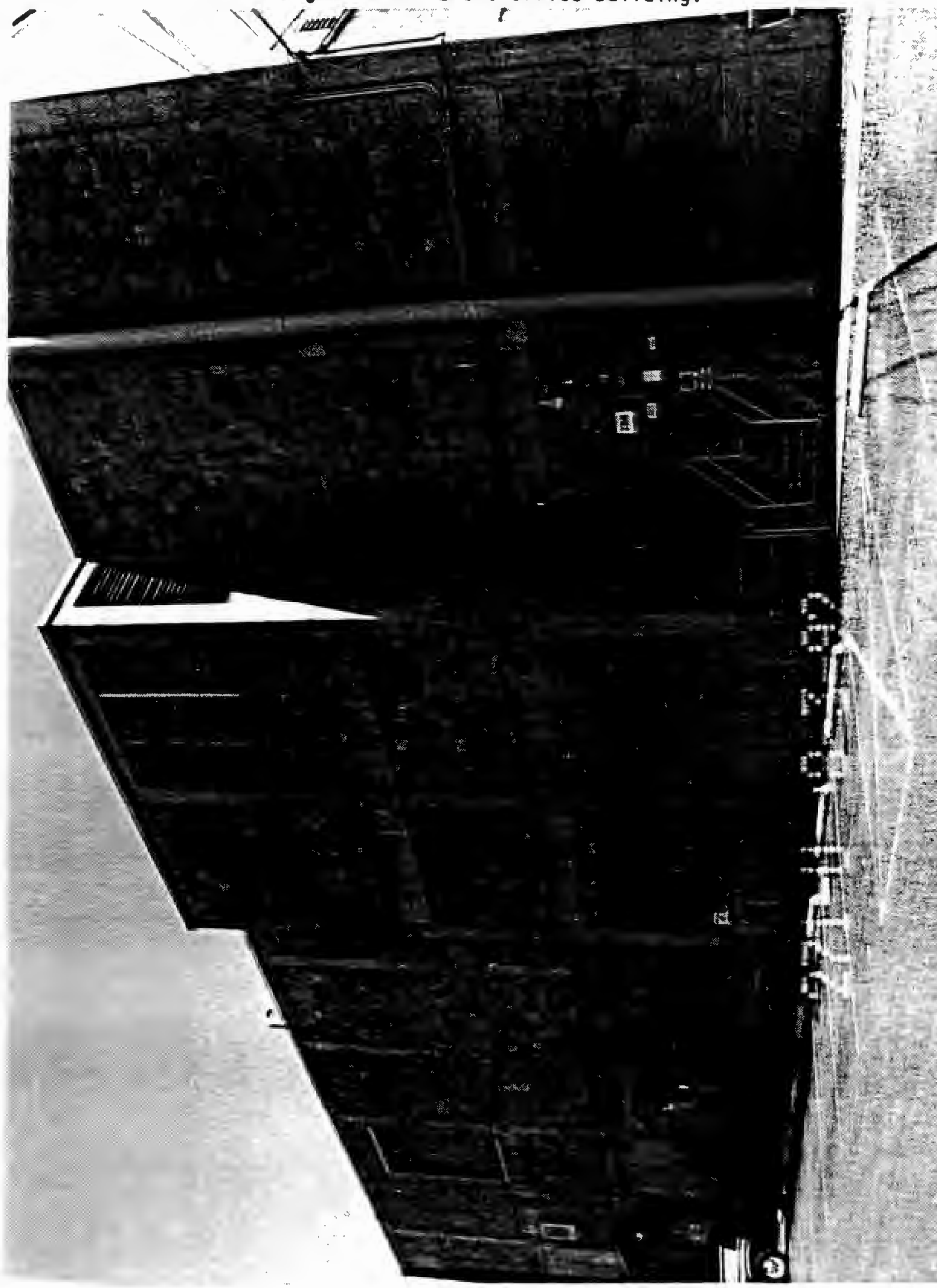


Figure 2-7. 276-U Solvent Handling Facility.

Figure 2-8. 291-U Exhaust Fan Facility.

2.3.5 **202-S Canyon Building** (Figure 2-9)

The 202-S Building is a reinforced concrete structure consisting of two main architectural features, the canyon and silo areas (see Figure 2-10). The building is 142.6 m (468 ft) long and 49.1 m (161 ft) wide. The canyon portion contains all the equipment for handling radioactive materials such as fuel dissolution, feed preparation, solvent distillation, and waste concentration and neutralization. The silo area, located at the west end of the canyon, houses the solvent extraction columns and aqueous makeup vessels.

Operating, pipe, and sample galleries are located on the north and south sides of the canyon area (refer to Figure 2-10). A storage gallery is located under the south sample gallery. The silo section consists of five chemical makeup levels, column maintenance level, column operating gallery, sample gallery, and column chemical feed tank level.

All service portions of the 202-S Building are shielded from the radioactive processing areas by concrete walls, nominally 1.8 m (6 ft) in thickness. The location of cell equipment behind massive concrete shielding required the operations to be done by remote control. Chemical, steam, and water additions to the process vessels were made from the service areas through pipes penetrating the concrete shielding (referred to as the "cold" side of the piping). Transfers of radioactive solutions between process vessels were made by steam jets, gravity flow, and electrically operated pumps via piping contained in the pipe tunnel, which is located in the canyon section. This piping was referred to as the "hot" side of the transfer lines. Agitation of solutions was accomplished by remote-operated recirculating steam jets or electrically driven agitators. This equipment and the monitoring and control assemblies comprise the majority of the deactivated equipment that are presently located within the canyon cells and building galleries.

The building's interior and exterior are in fair condition. The roof is in good condition, with minor areas that require annual repair to minimize water infiltration. Presently, the canyon is used as a radioactive confinement area for the original equipment used in the REDOX process. The REDOX Facility is scheduled for decommissioning to begin in FY 2004.

2.3.6 **233-S Plutonium Concentration Facility** (Figure 2-11)

The 233-S Plutonium Concentration Facility, located directly north of the 202-S Building, was built in 1954 and 1955 and was placed into operation in March 1955. During the initial process, a dilute plutonium nitrate solution was transferred from the 202-S Building to the 233-S Building. Within the 233-S Building, the plutonium solution was concentrated and loaded into product removal cans for transportation to other facilities for further processing. The facility is a reinforced concrete and corrugated metal structure consisting of eight rooms plus five airlocks. A 9.7-m (32-ft) high bay area is divided into two sections: a process zone and a viewing bay partitioned by vertical transparent plastic panels.

Figure 2-9. 202-S Canyon Building.

Figure 2-10. REDOX Canyon Cross Section.

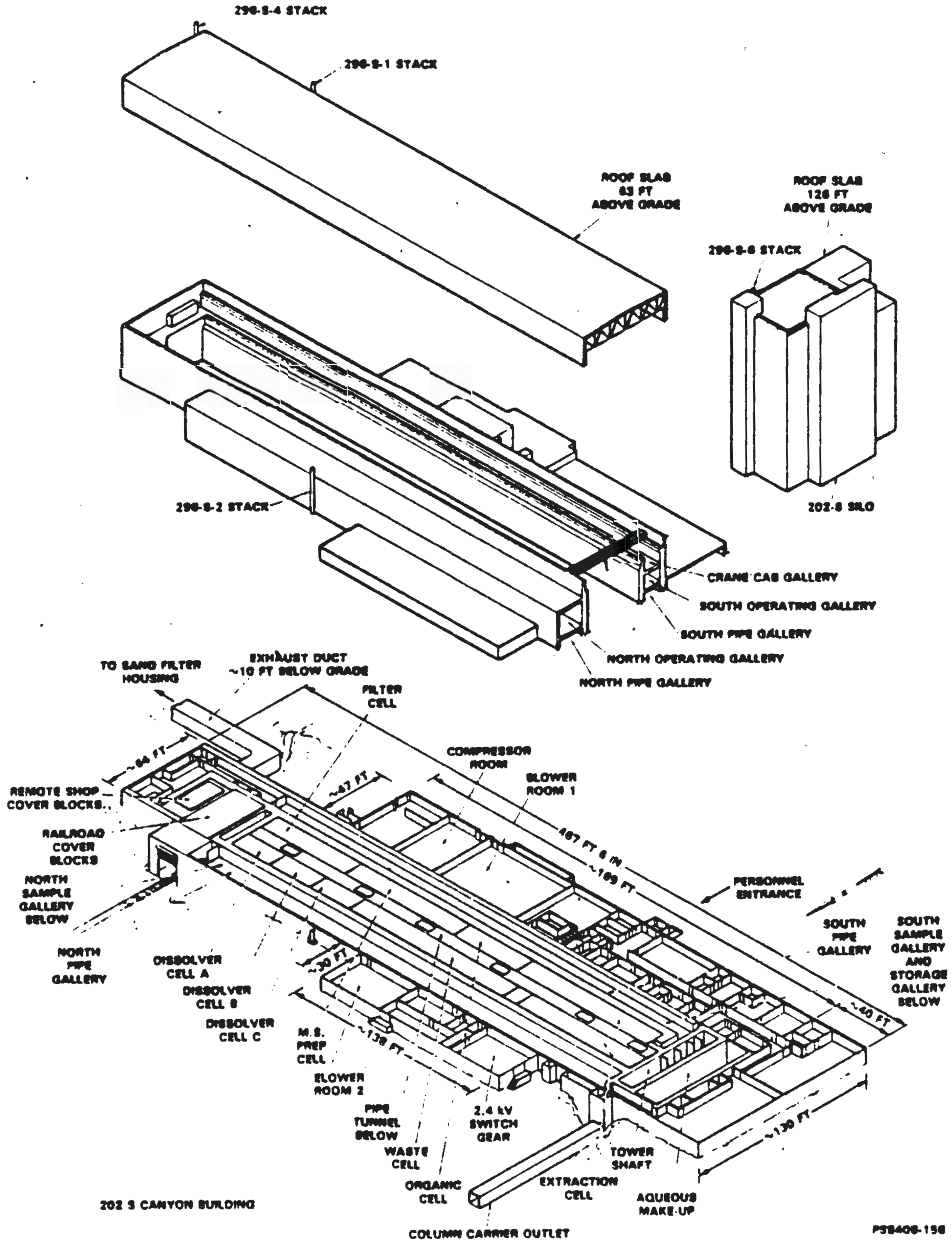
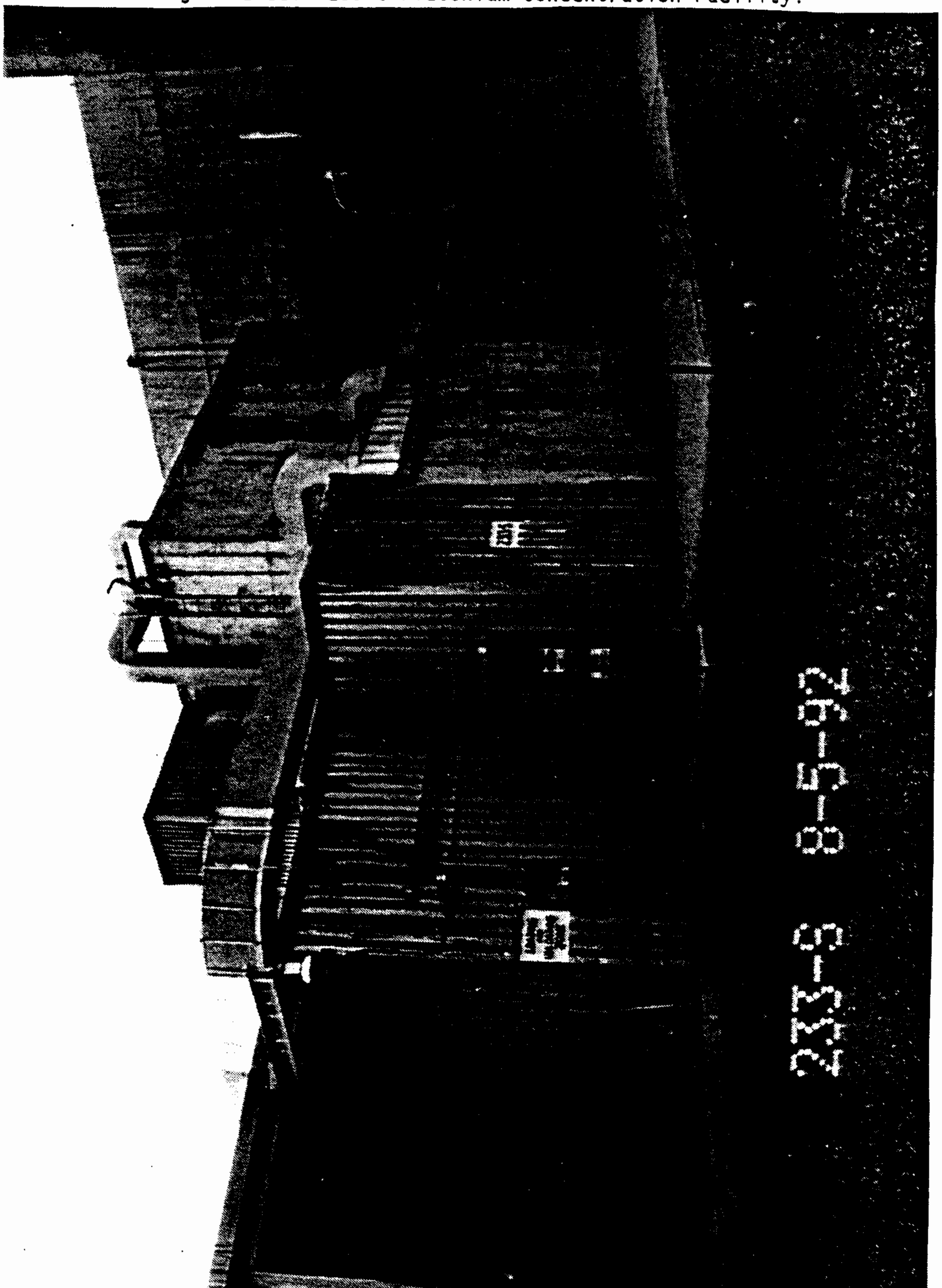


Figure 2-11. 233-S Plutonium Concentration Facility.



These panels offered very little shielding in the event of a criticality incident; therefore, all the process vessels were designed with a critically safe geometry. In 1962, the operations of the facility were expanded to include neptunium concentration and loadout process, along with an ion exchange purification process.

The building's interior and exterior are in poor condition. The urethane-covered, poured concrete roof is in poor condition because of water infiltration and radiological contamination problems. Presently, the building serves no purpose. Decommissioning was originally scheduled in FY 1992 but has been extended to FY 1996, pending demoliton design and funding.

2.3.7 276-S Solvent Handling Building (Figure 2-12)

The 276-S Solvent Handling Building was used for bulk storage of raw hexone and chemical treatment of new and recycled hexone. The facility is located west of the 202-S Canyon Building. It is an aboveground concrete building, 13.1 m (43 ft) wide by 17.7 m (58 ft) long.

The building's interior is in fair condition, the exterior is in poor condition, and the transite-paneled roof is in fair condition. Presently the building serves no purpose. Decommissioning, as part of the REDOX Facility, is scheduled to begin in FY 2004.

2.3.8 291-S Exhaust Fan Facility (Figure 2-13)

The exhaust ventilation equipment for the 202-S Canyon Building is contained in the 291-S Exhaust Fan Facility. There are three stainless steel, direct-driven blowers of identical design, installed in parallel. Two are powered by 60-hp electric motors, and the third is driven by a steam turbine. A single exhaust fan creates the 566 m^3/min (20,000 ft^3/min) flow rate up the process stack. The standby electric driven fan provides backup capabilities should a malfunction occur or during scheduled maintenance of the primary unit. The steam turbine driven exhaust fan is used to provide automatic backup capabilities and will automatically begin operation if electrical power fails, supply air falls, or differential pressure across the air tunnel to atmosphere decreases below established standards. The 291-S sand filter, 25.9 m by 25.9 m by 33 m (85 ft by 85 ft by 10 ft), is comprised of gradient layers of acid resistant rocks and sand, which removed radioactive particles from the exhaust ventilation air before discharge to the atmosphere. The 61-m (200-ft) high process stack provides a discharge point for the exhaust air, ensuring that the velocity and altitude are sufficient to eliminate any hazards to personnel.

Figure 2-12. 276-S Solvent Handling Building.

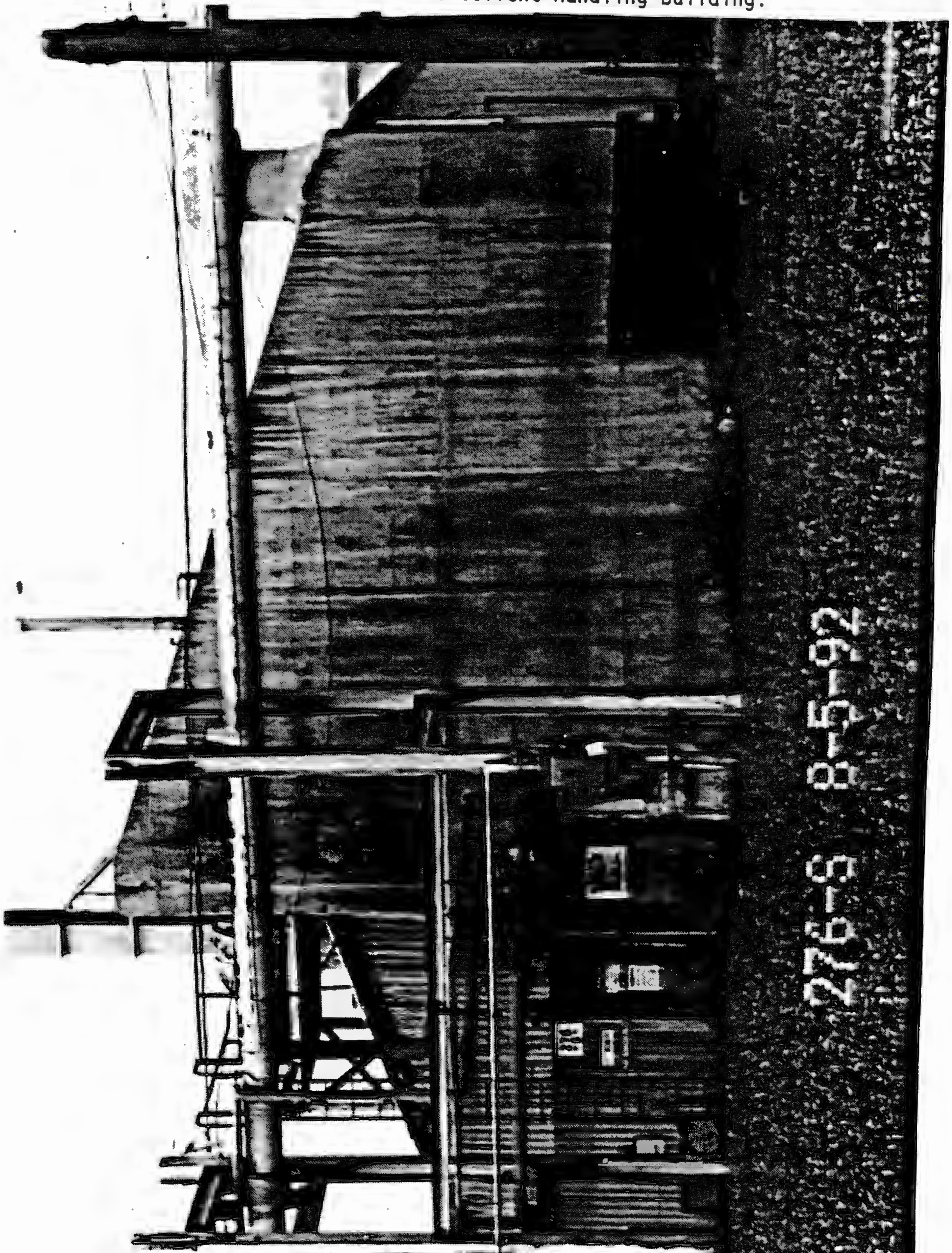


Figure 2-13. 291-S Exhaust Fan Facility.

The general condition of the filter is fair. The building's interior is in fair condition, the exterior is in good condition, and the asphalt-covered, poured concrete roof is in fair condition. The filter roof was recovered with urethane in 1991, thus eliminating the potential for water infiltration. Presently the sand filter removes particulate from the canyon ventilated air before discharge up the stack and will remain in operation until the entire REDOX Facility is demolished.

2.3.9 233-SA Exhaust Filter Building (Figure 2-14)

The 233-SA Exhaust Filter Building was built adjacent to the 233-S Building to handle ventilation for the 233-S Building. The building houses two banks of double high-efficiency particulate air (HEPA) filters. Each bank contains a separate exhaust fan, stack, and radiation monitoring instrumentation.

The 233-SA Building, a one-story, reinforced structure with outside dimensions of 7.3 m by 8.2 m by 2.6 m (24 ft by 27 ft by 8.5 ft), is in fair condition. The building's interior is in fair condition. The exterior and the roof are in poor condition. Presently the building is used to house the HEPA filters that remove particulate from the exhaust ventilation air prior to discharge to the environment. It will remain in operation until the 233-S Building is demolished.

2.3.10 292-S Jet Pit House (Figure 2-15)

The 292-S Jet Pit House, which was in service from 1952 to 1967, provided housing for the jets for the REDOX process vessel vent systems.

The 292-S Jet Pit House is a concrete building with outside dimensions of 4.8 m by 4.8 m by 3.2 m (15 ft 8 in. by 15 ft 8 in. by 10 ft 6 in.). The building's interior is in fair condition. The exterior and the roof are in poor condition.

The entire REDOX Facility, including this building, is scheduled for demolition to begin in FY 2004.

2.3.11 293-S Off-Gas Treatment and Recovery Building (Figure 2-16)

The 293-S Building, which was in service from 1958 through 1967, provided absorption of nitrogen oxides and volatile fission products from REDOX dissolver off-gas.

The 293-S Building, a reinforced concrete structure with a corrugated metal lean-to portion attached to the south wall, is in fair condition. The exterior and the roof are in poor condition.

The concrete portion, 8.8 m by 4.9 m (29 ft by 16 ft), extends from 3.7 m (12 ft) belowgrade to 9.1 m (30 ft) abovegrade. The main floor contains the absorption towers, with a pipe valve pit in the basement.

Figure 2-14. 233-SA Exhaust Filter Building.

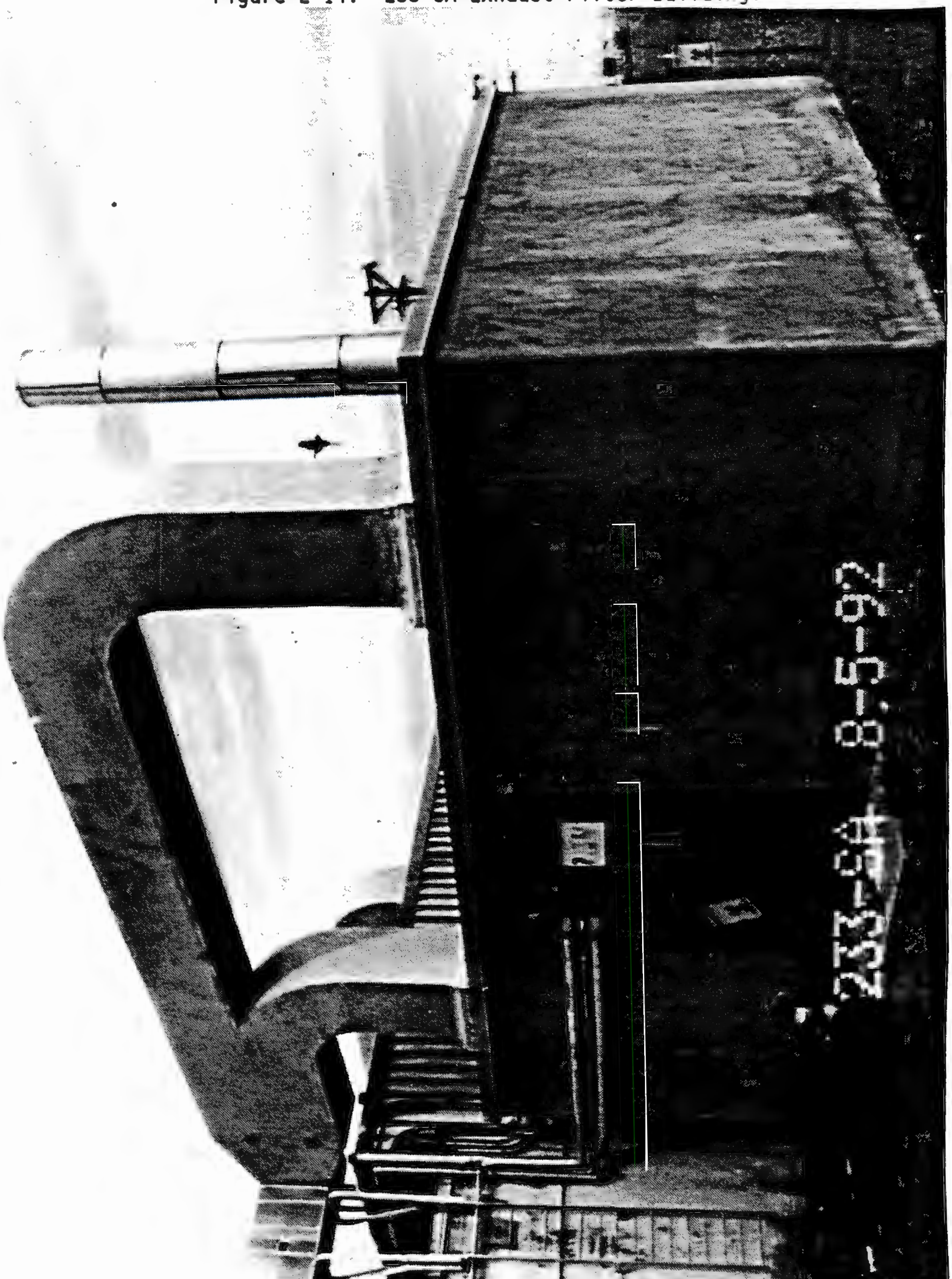


Figure 2-15. 292-S Jet Pit House.

Figure 2-16. 293-S Off-Gas Treatment and Recovery Building.

The lean-to structure, 2.6 m by 8.5 m (8 ft 6-3/4 in. by 27 ft 9.5 in.), houses the control room and change room facility, with a concrete basement that houses control piping.

Underground acid storage, 4.3 m by 4.0 m (14 ft by 13 ft), is provided adjacent to the west side of the main building. Also, ventilation supply equipment is present aboveground, adjacent to the south end of the lean-to structure.

The entire REDOX Facility, including this building, is scheduled for demolition to begin in FY 2004.

2.3.12 2711-S Stack Gas Monitoring Building (Figure 2-17)

The 2711-S Building was built to sample gas from the 291-S-1 stack and to monitor contamination.

The 2711-S Building is a wooden stack, gas monitoring, sample shelter with a sloping roof. Dimensions are 3.8 m by 4.3 m by 2.4 m (12 ft 6 in. by 14 ft by 8 ft). Total floor area is 16.26 m^2 (175 ft^2). The building's interior is in fair condition. The exterior and the roof are in poor condition.

Visual inspection of the building's exterior revealed that the walls are deteriorating and the roof is sagging. Substantial roof loads could lead to the collapse of the roof. Also, holes are present in windows and walls.

Equipment contained in the building includes a motor, a pump, and instrumentation for 291-S-1 stack gas sampling.

2.3.13 2718-S Sand Filter Sampler Building (Figure 2-18)

The 2718-S Sand Filter Sampler Building was built to monitor the performance of the 291-S sand filter. It is a wooden structure with a sloping roof. Outside dimensions are 3.8 m by 4.3 m by 2.4 m (12 ft 6 in. by 14 ft by 8 ft), with a total floor area of 16.26 m^2 (175 ft^2). The building's interior is in fair condition. The exterior and the roof are in poor condition.

Visual inspection of the building's exterior revealed minor wood deterioration. Equipment contained in the building includes office furniture and a magnahelic with associated vacuum pump, piping, and electrical wiring.

2.3.14 2904-SA Cooling Water Sampler Building (Figure 2-19)

The 2904-SA Building was built in 1956 to provide sampling of process waste flowing from the REDOX Facility through 2904-S-170 weir to the liquid waste disposal site. The 2904-SA Building extends 1.0 m (3 ft 2 in.) over the south end of the 2904-S-170 weir. Samples are taken of REDOX Facility process effluents while being routed through the weir.

Figure 2-17. 2711-S Stack Gas Monitoring Building.

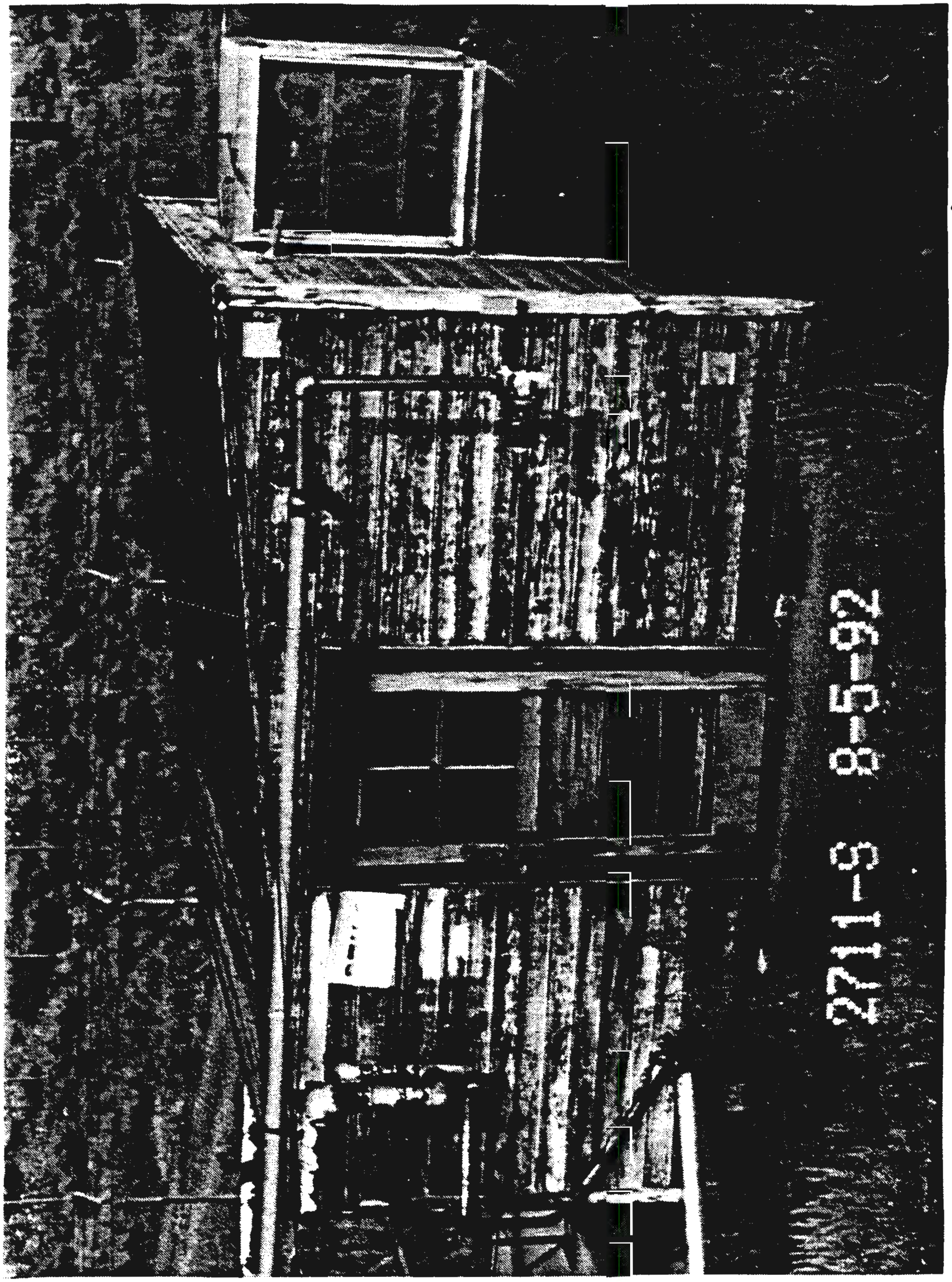


Figure 2-18. 2718-S Sand Filter Sampler Building.

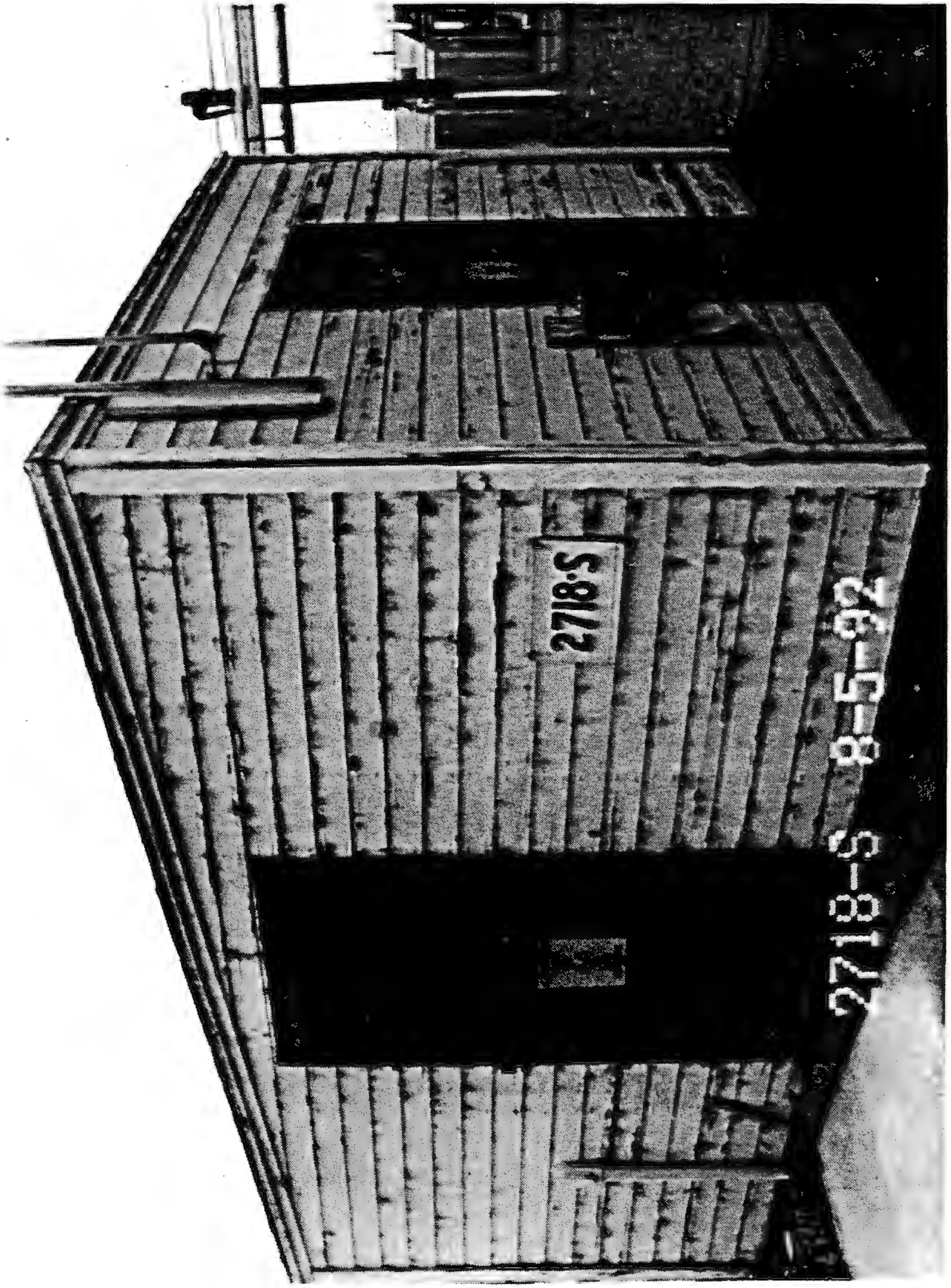
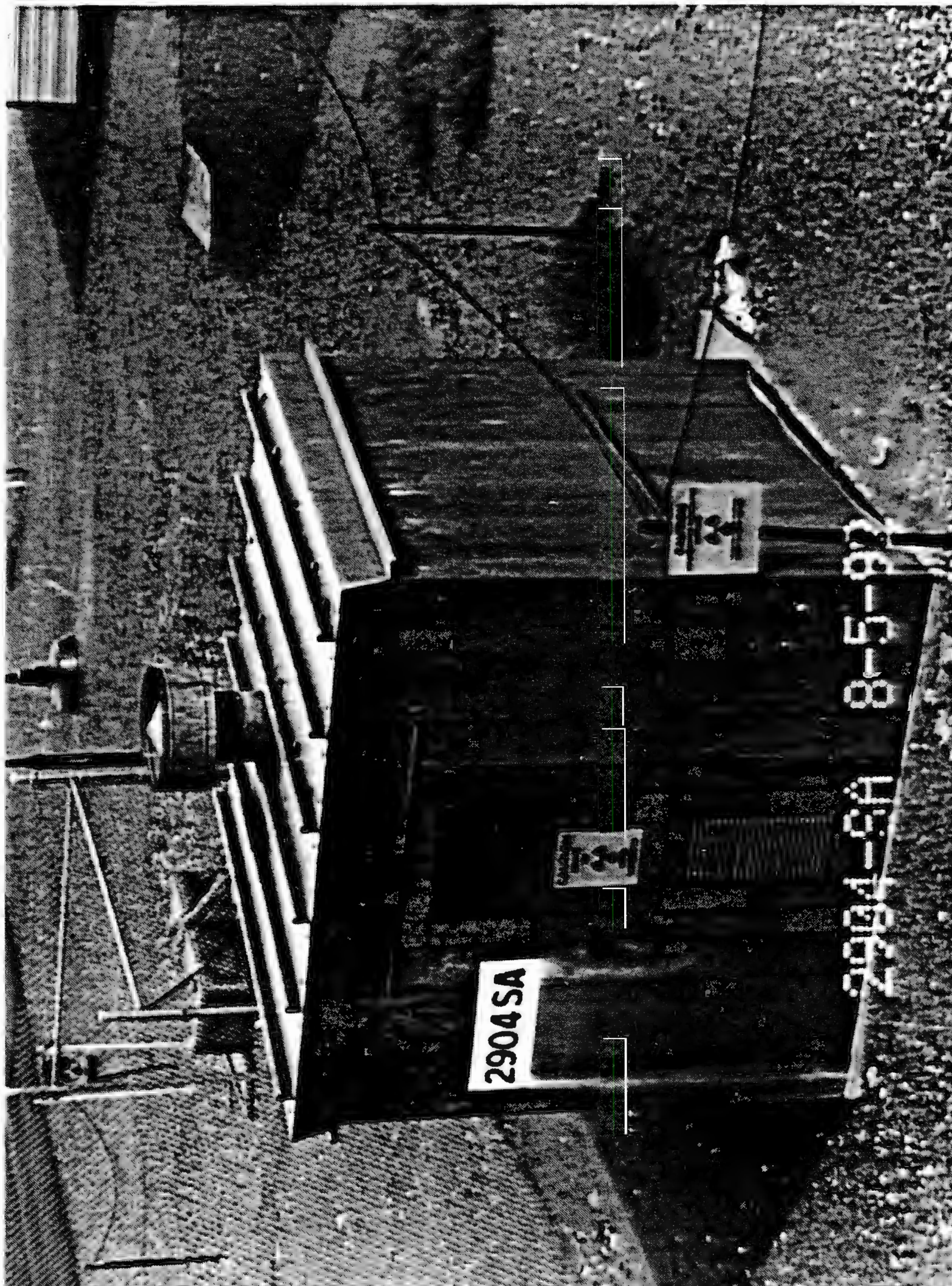


Figure 2-19. 2904-SA Cooling Water Sampler Building.



The 2904-SA Building is a prefabricated metal building resting on a concrete foundation, with outside dimensions of 2.4 m by 2.4 m by 2.1 m (8 ft by 8 ft by 7 ft). The building's interior is in fair condition. The exterior and the roof are in poor condition.

Sample equipment inside the building consists of a pump and a 0.6-m (2-ft) diameter, 0.9 m (3 ft) high stainless steel tank belowgrade, with a sample riser protruding up through the building floor and associated piping.

2.3.15 212-N, 212-P, and 212-R Storage Buildings (Figures 2-20, 2-21, 2-22)

Buildings 212-N, 212-P, and 212-R are identical storage structures. Each building is composed of two main sections and a heat room. These sections each have a concrete slab, roof, and walls constructed of concrete and concrete block. There are no windows.

The high roof, or transfer section, has an opening 4.6 m by 5.5 m (15 ft by 18 ft) high for the railroad into the building. The rail into the building penetrates 16.5 m (54 ft). The original 81.3-metric ton (80-ton) crane and associate motors, brakes, etc., have been removed from the 212-N and 212-P Buildings, but the crane rails are in place and centered over the railroad unloading area. The interior height at the unloading area is 10.7 m (35 ft) from the top of the railroad rails to the ceiling. Height from the top of the rails to the top of the crane rail is 8.2 m (27 ft). At the rear of the railroad cut are two transfer pots approximately 9.1 m (30 ft) deep. There are walkways on each side of this unloading area resembling inside docks. The main walkway is 3.7 m by 22.6 m (12 ft by 74 ft). The height from the walkways to the ceiling is 8.5 m (28 ft).

The low-roof section of the building is 3.7 m (12 ft) abovegrade and extends 5.5 m (18 ft) belowgrade. It has a 5.0-cm (2-in.) wood plank floor, level with the walkways in the high-roof section. This floor is 6.1 m (20 ft) above the floor of the storage basin and 2.4 m (8 ft) from the ceiling. This plank floor is supported by concrete piers 6.1 m (20 ft) high.

Adjacent to the low-roof section and centered in relation to it is a space 4.3 m by 7.9 m (14 ft by 26 ft) with a 2.4-m (8-ft) ceiling. This space once housed the fan, heaters, and controls to prevent freezeup of the water in the basin. Most of the equipment has been removed.

Exterior dimensions of the high-roof section are 8.2 m by 22.6 m by 9.1 m (27 ft by 74 ft by 30 ft). The low-roof section is 15.0 m by 22.0 m by 3.7 m (49 ft by 72 ft by 12 ft). The heater room is 4.3 m by 7.9 m by 3.7 m (14 ft by 26 ft by 12 ft). The total area is 554.61 m^2 (5,970 ft^2).

Visual inspection of each building's exterior revealed that these three buildings are in fair condition. The exteriors and the roofs are in good condition with the exception of the 212-R Building, which suffered wind damage to its membrane-covered roof during this past summer.

Figure 2-20. 212-N Storage Building.

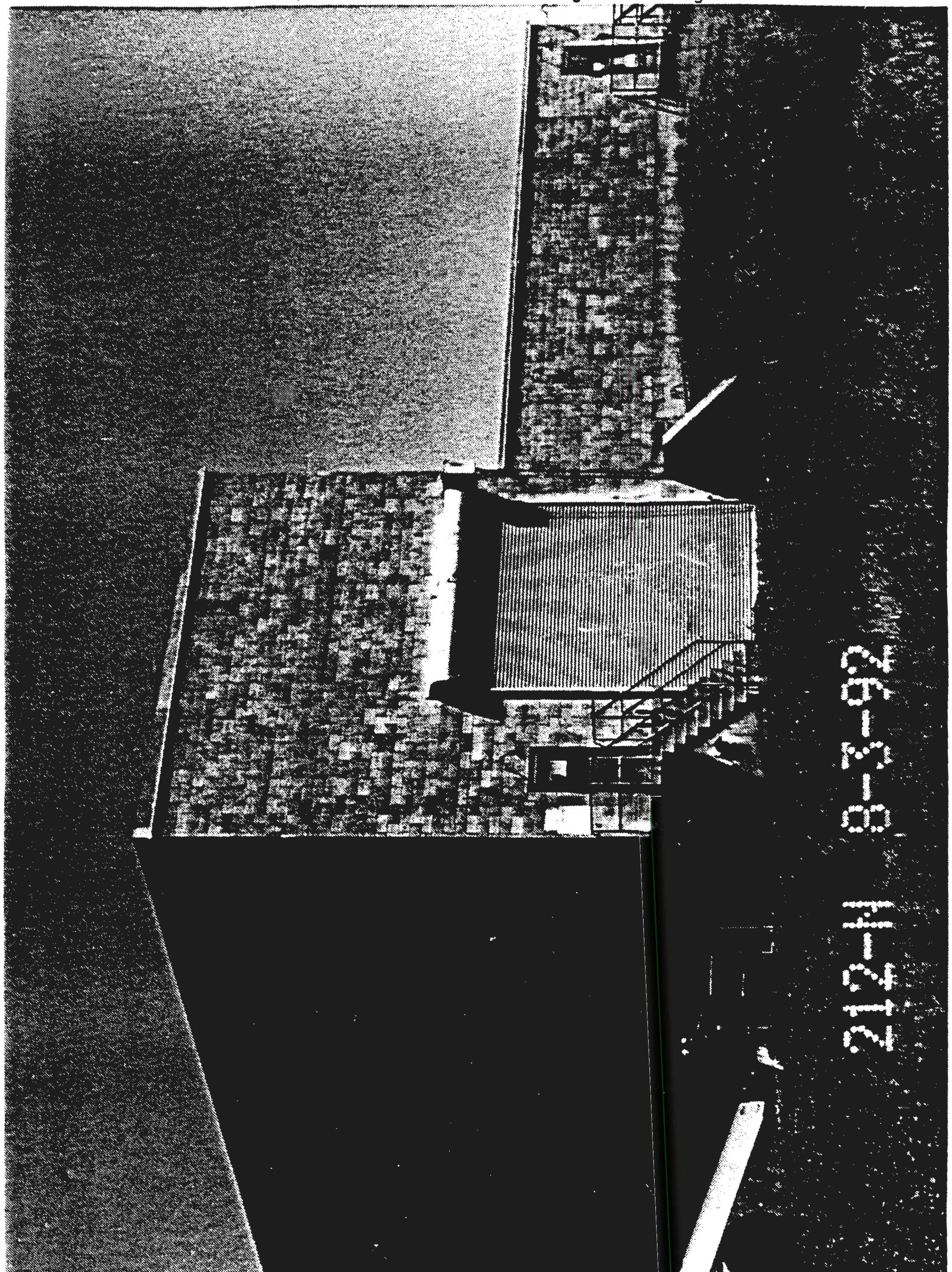


Figure 2-21. 212-P Storage Building.

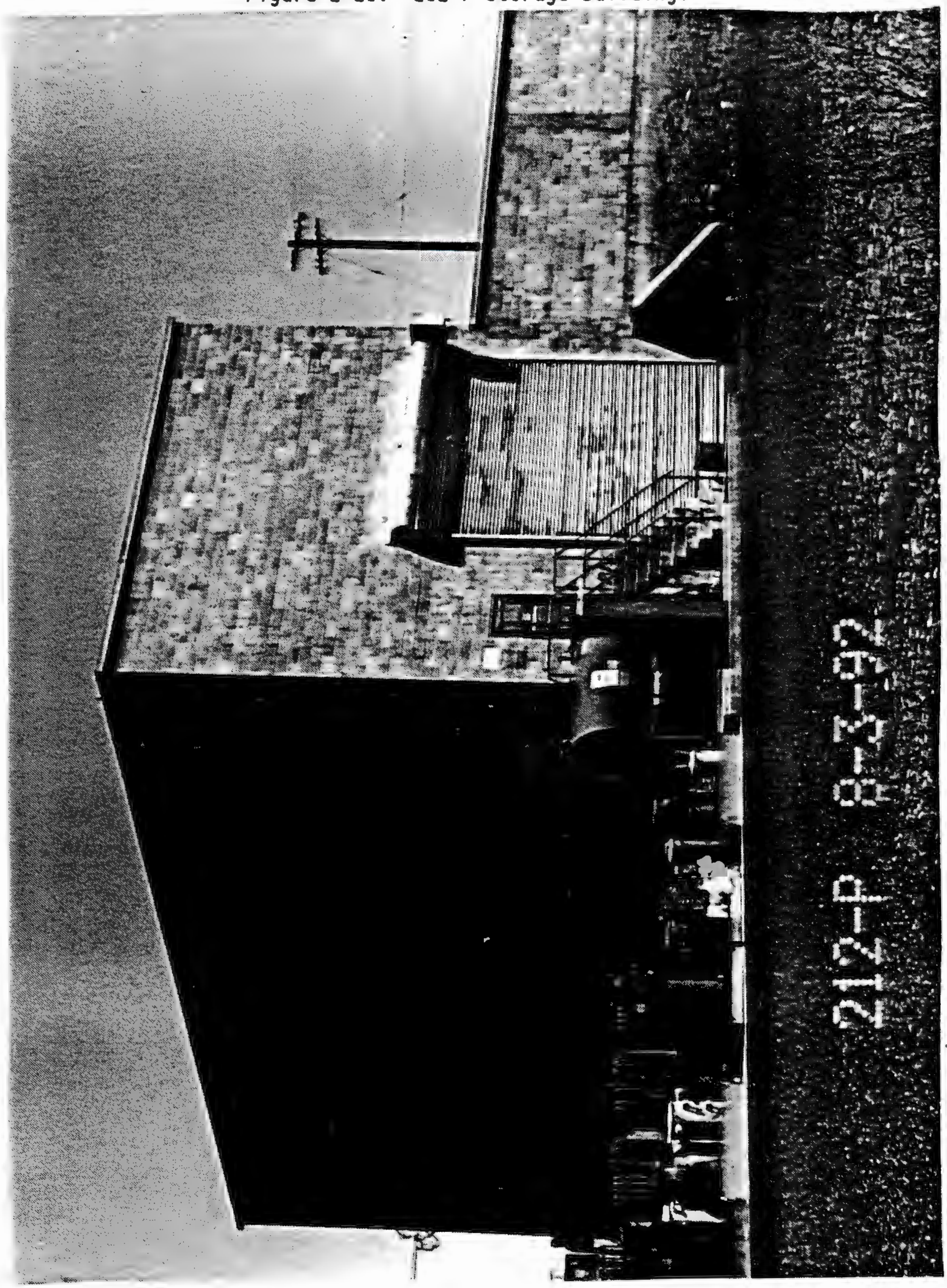
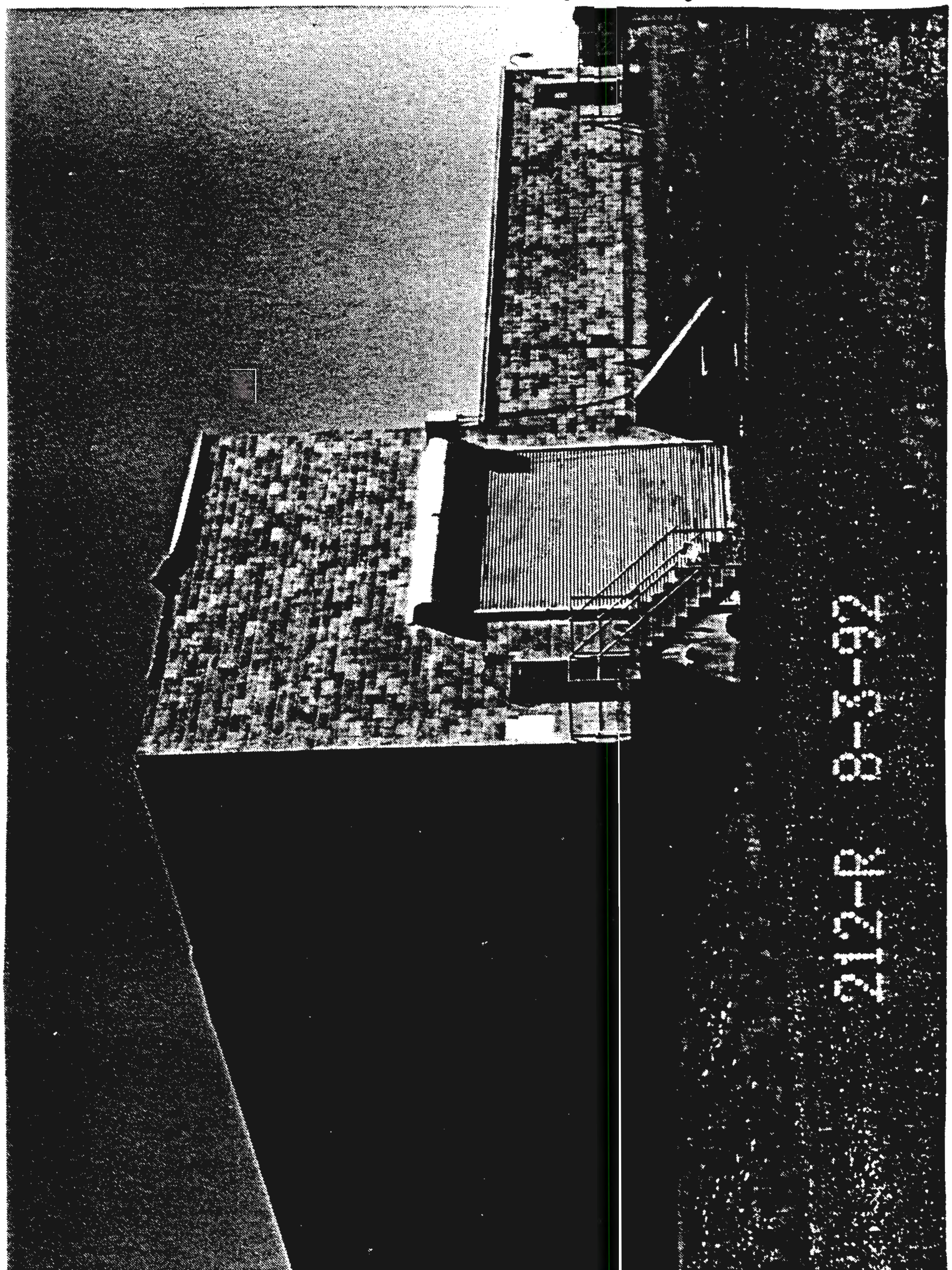


Figure 2-22. 212-R Storage Building.



3.0 SURVEILLANCE

3.1 100 AREA FACILITIES

Eight water-cooled, graphite-moderated plutonium production reactors (B, C, D, DR, F, H, KE, and KW) are now retired from service and are presently under the Surplus Facilities Program. The proposed long-term action is to decommission the C, D, DR, F, and H Reactors; their associated nuclear fuel storage basins; and their support buildings during the years from 1999 through 2016. The B, KE, and KW Reactors and their associated facilities are not scheduled for final decommissioning because the 105-B Building has been recognized as a National Historic Monument and the KE and KW Facilities are presently being used for long-term storage of the 100-N nuclear fuels after the reactor was defueled. Because all these reactors contain irradiated reactor components and the buildings that housed the reactors are contaminated with low levels of radioactivity and hazardous materials, continued surveillance and maintenance are necessary to maintain the existing confinement systems, thus reducing contamination spreads to the remaining uncontaminated portions of the building and the environment.

When these facilities were shut down, all of them had reached their design life. The parameters for the 100 Area reactor facilities were based on a 20-year life span, without full consideration of the time required to decommission these buildings and the initial lack of a minimal maintenance program. Basically, the buildings were allowed to severely deteriorate during the first 15 years after they initially were shut down, which is evident in all the built-up roof surfaces, construction joints, flashing, and trim. Today the building structure and equipment required to keep the reactor facilities in a safe storage configuration range in age from 39 to 49 years (Table 1-1). Using present estimates, the existing confinement systems are required to be maintained for at least an additional 7 years for the 105-H Reactor and up to 14 years for the 105-F Reactor before decommissioning can begin. The process of decommissioning, which is forecast to last up to 10 years, also may require the buildings' integrity and especially the roofs to remain intact to maintain a safe storage condition and prevent water from getting into the facilities.

Since the 100 Area facilities have been covered under the Environmental Restoration Operations, the structural and operational confinement systems have been maintained under an ongoing surveillance program. Plant procedures specify the surveillance frequencies and the requirements of this surveillance to further enhance the operational effectiveness of these confinement systems. The critical components in this program are the building structures themselves, which must be kept intact to provide radiological confinement and protection from natural elements that could create radiological migration.

The surveillance requirements that IFS&M personnel perform, and the frequency, are specified in procedures that address the 100 Area reactors and the respective auxiliary buildings. The surveillance involves the walkdown of the buildings' perimeters, as well as the noncontaminated internal areas, on a monthly basis and the radiologically contaminated areas on a quarterly basis. Surveillance personnel visually inspect for damage or deterioration of the buildings' internal support structures, openings or holes in the buildings' exterior walls, indication of water leaks or water infiltration, animal or insect intrusion, floor or ceiling damage, accumulation of excess combustible materials, and safety hazards that affect surveillance and maintenance personnel.

The surveillance intervals for the reactor buildings are listed in Table 1-2. The plant operating procedure requires that any off-standard condition that involves the confinement system must be immediately reported to the manager of IFS&M to provide prompt evaluation of the situation and to initiate appropriate corrective actions. In addition, any deficiencies that are noted on the surveillance data sheet independently are tracked under the Job Control System.

3.2 200 AREA FACILITIES

Since deactivation of the U Plant and S Plant (REDOX) Facilities in 1967, all identified critical systems have been maintained under an ongoing surveillance program. The critical systems included in these programs are the building structures and ventilation systems, which maintain radiological confinement, and instrumentation, which monitors tanks and sumps in the canyon cells.

The surveillance requirements that IFS&M personnel perform, and the frequency, are addressed in procedures that relate to the U Plant and REDOX Facilities. The surveillance involves the walkdown of the buildings' perimeters, as well as the noncontaminated internal and external areas, on a daily basis and the contaminated internal and external areas on a weekly basis. Surveillance personnel visually inspect for damage or deterioration in the buildings' internal support structures, openings or holes in the buildings' exterior walls, indication of water leaks or water infiltration, animal or insect intrusion, floor or ceiling damage, accumulation of excess combustible or hazardous materials, instrument readings that monitor the performance of the ventilation system or status of liquid levels in the canyon tanks and cells, and safety hazards that affect surveillance and maintenance personnel.

The surveillance interval for the 200 Area Process plants are listed in Tables 3-1 and 3-2. Considering the potential for contamination migration within the 202-S, 233-S, and 221-U Buildings, efficient surveillance of the operational systems is vital to protect the environment and occupied areas of these buildings. Any off-standard condition noted during the performance of the surveillance procedure must be reported to the manager of the facility to provide prompt evaluation of the condition and initiate appropriate corrective actions.

3.3 OPERATIONAL HEALTH PHYSICS SURVEILLANCE

Health Physics performs radiological surveys of the retired facilities at the Hanford Site on a periodic basis, established by a specific routine that monitors the radiological migration potential of the source and provides

Table 3-1. U Plant Facility Surveillance and Maintenance.

Facility name	Physical condition				Hazardous constituents		Surveil-lance interval	Per-centage S&M[d] budget	Major repairs and accomplishments fiscal year 1992 (see maintenance text)
Building number	I[a]	X[a]	R[a]	Q[a]	Radiological products	Chemical products			
U Plant								30%	
221-U	G	G	G	P[b]	10,015 Ci beta	TBD[c], asbestos	Daily		Cleaned and applied fixative to asbestos.
211-U	NA	P	NA	NA	Fission products	TBD, asbestos	Weekly		None.
271-U	NA	P	NA	F	TBD	Asbestos	Daily		Continued upgrades for occupancy.
276-U	NA	P	NA	NA	Fission products	TBD, tributyl phosphate, asbestos	Weekly		Completed asbestos covered piping removal from basin. Disposed of abandoned drums.
291-U	P	P	P	F	Fission products	TBD, Asbestos	Daily		None.
Support structures	F	P	P	NA	TBD	TBD	Monthly		None.

[a]I = interior, X = exterior, R = roof, Q = operational equipment, E = excellent, G = good, F = fair, P = poor, NA = not applicable.
[b]Denotes condition of used electrical switchgear.
[c]TBD = to be determined during decommissioning.
[d]S&M = surveillance and maintenance.

Table 3-2. REDOX Facility Surveillance and Maintenance.

Facility name	Physical condition				Hazardous constituents		Surveillance interval	Percentage S&M[d] budget	Major repairs and accomplishments fiscal year 1992 (see maintenance text)
Building number	I[a]	X[a]	R[a]	Q[a]	Radiological products	Chemical products			
REDOX								40%	
202-S	F	F	G	F[b]	1,500 Ci Pu, 9,000 Ci beta	TBD[c], asbestos	Daily		Installed electric overhead heaters.
211-S	NA	P	NA	NA	Fission products	TBD, asbestos	Weekly		None.
233-S	P	P	P	F[b]	Transuranic products	TBD, asbestos	Daily		Repaired ventilation ducts.
276-S	F	P	F	NA	Fission products	TBD, asbestos	Weekly		None.
291-S	F	P	F	F[b]	Fission products	TBD, asbestos	Daily		Designed and procured diesel generator to replace steam turbine.
292-S and 293-S	P	F	F	NA	Fission products	TBD, asbestos	Weekly		None.
2711-S	P	P	P	NA	Activation products	TBD, asbestos	Monthly		None.
2718-S	P	P	P	NA	Activation products	TBD, asbestos	Monthly		None.
Support structures	F	P	P	NA	TBD	TBD	Monthly		None.

[a]I = interior, X = exterior, R - roof, Q = operational equipment, E = excellent, G = good, F = fair, P = poor, NA = not applicable.
[b]Denotes condition of used electrical switchgear.
[c]TBD = to be determined during decommissioning.
[d]S&M = surveillance and maintenance.

surveillance based on these factors. The documentation that controls the depth and frequency of these surveys is controlled by the Operational Health Physics group and is funded by IFS&M.

3.4 OFF-SHIFT SURVEILLANCE OF THE REDUCTION OXIDATION FACILITY AND U PLANT FACILITIES

The IFS&M funds the Power Operator (PO) group from Z Plant to perform all off-shift surveillance, including swing and graveyard shifts on a weekday and on a weekend/holiday basis. In addition, the PO performs day, swing, and graveyard shifts on a weekend/holiday basis. Plant procedures specify the required surveillance and response actions for the REDOX Facility. The surveillance involves the walkdown of the buildings' operational equipment (i.e., air supply ventilation equipment, air exhaust ventilation equipment, sand or high-efficiency particulate air filters, and standby equipment operational readiness) on prescribed intervals. The surveillance requires the documentation of instrumentation readings and the inspection of used plant equipment for damage or deterioration that affects its operational status. The procedure requires the surveillance data sheet to be reviewed by the PO off-shift supervisor and immediate notification be provided to IFS&M management when a prescribed threshold is exceeded. Any off-standard condition that affects the ventilation equipment requires the IFS&M facility manager to provide prompt evaluation of the condition and to initiate appropriate corrective actions.

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4.0 PREVENTATIVE MAINTENANCE

Several preventative maintenance systems are used at the 100 Area reactors and the REDOX and U Plant Facilities to ensure the calibration of active instrumentation and the reliable operation of confinement systems. These systems are the Plant Instrumentation Surveillance, Calibration, and Evaluation System (PISCES) and the Preventative Maintenance (PM) System. Table 4-1 summarizes the overall quantity and effective use of these systems on the retired facilities in FY 1992.

The PISCES system is a computerized program using a database to document and forecast plant-installed instrument and equipment calibrations and verifications. The PISCES system is used for calibration of all portal monitoring stations and continuous air monitors that are used for personnel safety and air effluent discharge point monitoring. In addition, the differential pressure gauges that measure liquid levels in tanks and sumps and all operational instrumentation that provide a visual, audio, or control function output also are included in the PISCES recall system. The calibration process itself is the responsibility of the facility manager, who provides the funding for all personnel and equipment. This ensures the calibration is accomplished within a 30-day interval. When the 30-day interval is exceeded, an overdue report is issued by PISCES and immediate corrective actions are required.

The PM system, which presently is a nondatabase recall system, is used in the 100 Area reactors and the REDOX and U Plant Facilities to document and forecast preventative maintenance actions required to maintain the operational status of the exhaust systems, inspection of the buildings' confinement structures, and general inspection/lubrication of all rotational equipment used to support the facility in its inactive status. The performance of this maintenance action is the responsibility of the facility manager. This responsibility includes providing the funding for all personnel and equipment to ensure the systems receive the required maintenance on a regularly scheduled interval that meets the standards established by the individual equipment procedures. The benefit of this type of maintenance greatly extends the operational life expectancy of the equipment and drastically reduces the system replacement costs.

Table 4-1. Preventive Maintenance System Utilization in Fiscal Year 1992.

Plant Surveillance, Calibration, and Evaluation System (PISCES)			
Area/facilities	Active instrumentation	Overdue instruments	Out-of-calibration occurrences
100 Area reactors	0	0	0
200 Area REDOX and U Plant	114	0	0
Preventive Maintenance (PM) System			
Area/facilities	Number of active PMs	Number of overdue PMs	Number of third party audit findings
100 Area reactors	4	0	0
200 Area REDOX and U Plant	44	6	0

REDOX = Reduction Oxidation (Facility).

5.0 NONROUTINE MAINTENANCE

Nonroutine maintenance items are identified during the surveillance activities and require special consideration in the overall maintenance for the retired facilities. This type of maintenance is required when failures occur to operational equipment, building structures require repair to maintain the integrity of the confinement system, or specific findings are reported by the surveillance or audit personnel. A review by calendar month (FY 1992) of the 420 work packages that Remedial Maintenance Operations completed on this maintenance activity is presented Table 5-1.

Table 5-1. Maintenance Accomplishments. (Fiscal Year 1992).

Completed work orders													
Area/ facilities	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	YTD Total
100 Area Reactors	2	5	4	2	2	3	3	6	4	9	2	4	46
200 Area REDOX and U Plant	23	39	25	26	28	29	42	30	25	30	43	34	374
Total	25	44	29	28	30	32	45	36	29	39	45	38	420

REDOX = Reduction Oxidation (Plant).

The optimum design life, initial and preventative maintenance actions, and overall quality of workmanship that is used to repair these defective systems are the basis for overall life expectancy. Without proper care and maintenance, the nonroutine maintenance items will continue to degrade operational effectiveness to the point where only replacement of entire systems will eliminate the potential failure mode.

A brief description of significant accomplishments by Inactive Facilities Surveillance and Maintenance in the 100 Area inactive facilities in FY 1992 are listed below.

- Completed sampling and disposal requirements for the water that migrated into the 183-C Basin from rain and snow.
- Completed sampling of the 3X balls that are stored at the 105-KE and KW Facilities.
- Supported removal of a roof panel from the 105-F Transfer Bay for the Accident Investigation Team.
- Completed asbestos-covered pipe removal at the 190-B Building and around the perimeter of the B Area.
- Identified and collected hazardous materials from all 100 Area facilities.
- Removed and began restoration of the main control panel from the 105-D Reactor for the Smithsonian Museum Physics Exhibition.

A brief description of the significant accomplishments by Inactive Facilities Surveillance and Maintenance in the 200 Area inactive facilities in FY 1992 are listed below.

- Completed installation of 19 overhead electrical heaters in the 202-S Building, thus eliminating the need for steam heat.
- Blanked all steam distribution lines to the REDOX Facility.
- Isolated all unused sanitary water lines in the REDOX Facility.
- Removed all stored radiologically contaminated samples from the 202-S Sample Gallery and returned them to the 222-S Laboratory.
- Completed installation of the air-cooled air compressor in the REDOX Facility. Blanked unused compressed air distribution lines.
- Completed the compressed air and sense lines from the 202-S Building to the 291-S Facility.
- Completed asbestos-covered pipe removal and disposal in the 276-U Facility.
- Completed exterior, asbestos-covered, exhausted ducts repair on the roof of the 233-S Building.
- Completed asbestos removal in the 271-U Office Building in preparation for occupancy.
- Completed upgrade and functional checkout of the fire system in the 271-U Office Building.
- Repaired and closed out 19 electrical deficiencies in the U Plant and REDOX Facility, identified by the Site Electrical Task Group.
- Began installation of four hand and foot counters in the U Plant and REDOX Facility.
- Replaced electric motor bearings in the #2 exhaust fan at the 291-S Facility.
- Completed repair of roof flashing on the 212-N Building and redistributed the rock ballast load.
- Installed 60 new lead acid batteries in the 202-S Building's standby power source.
- Completed installation of a new sanitary water line in the 221-U Building, thus isolating the supply to the 271-U Office Building.
- Deactivated and consolidated the electrical distribution system in the 202-S Building.

- Began the investigation into the cause of the roof supporting structure failure and installed temporary roof supports for the south office section of the 202-S Building.

- Completed implementation of a standalone statistical analysis of surveillance data from the REDOX Facility.

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6.0 SUMMARY

To assist planning for future funding requirements in FY 1994 through FY 1996, a rough order of magnitude cost for nonroutine maintenance is presented in Table 6-1. These particular items have been identified by the Site Electrical Task Group evaluation of energized electrical equipment in the inactive facilities, the Essential Equipment Evaluation Report on the REDOX and U Plant Facilities, and the requirements for facilities to assess their hazardous materials inventory in the canyon areas of the retired chemical processing plants.

Table 6-1. Rough Order of Magnitude Costs for Outyear Nonroutine Maintenance.

Fiscal Year	1994	1995	1996
Minimum base case	($7,820)	($9,000)	($10,350)
Reduction Oxidation Plant/202-S Building			
Electrical assessment findings/observations required corrective actions	$30	$15	$10
Essential equipment/systems upgrade	175	50	50
Hazardous material evaluation	50	TBD*	TBD
Radiological materials evaluation	25	TBD	TBD
Asbestos removal	300	500	100
Structural upgrades	200	100	100
U Plant/221-U Building			
Electrical assessment findings/observations required corrective actions	100	40	15
Essential equipment/systems upgrade	200	50	50
Hazardous material evaluation	60	150	300
Radiological materials evaluation	40	100	200
Asbestos removal	200	200	100
Structural upgrades	50	50	50
100 Area Reactors			
Electrical assessment findings/observations required corrective actions	150	300	500
Structural deficiency corrective actions	500	1,000	1,000
Friable asbestos removal	200	300	500
Hazardous material evaluation	20	25	30
Radiological materials evaluation	30	40	100

*TBD = to be determined (no data available at this time).

Note: All estimates are in thousands of dollars and are for preliminary planning only. Detailed cost estimates, schedules, and work scope have not been developed for this work.

7.0 REFERENCES

DOE, 1989, *Draft Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, DOE/EIS-0119D, U.S. Department of Energy, Washington, D.C.

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