BWXT Y-12

Protecting America's Future

Y/TS-1893

NATIONAL HISTORIC PRESERVATION ACT HISTORIC PRESERVATION PLAN

Prepared By
Thomason and Associates Preservation Planners
Nashville, Tennessee

Y-12 NATIONAL SECURITY COMPLEX

Environmental Compliance Organization
Environment, Safety and Health Division
Oak Ridge Y-12 National Security Complex

September 2003

Prepared by the
Y-12 National Security Complex
Oak Ridge, Tennessee 37831
managed by
BWXT Y-12, L.L.C.
for the
U.S. Department of Energy
Under Contract DE-AC05-00OR22800

MANAGED BY
BWXT Y-12, L.L.C.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

UCN-13672 (11-03)

September 2003 Y/TS-1893

NATIONAL HISTORIC PRESERVATION ACT HISTORIC PRESERVATION PLAN

Prepared By
Thomason and Associates Preservation Planners
Nashville, Tennessee

Environmental Compliance Organization
Environment, Safety and Health Division
Oak Ridge Y-12 National Security Complex

September 2003

Prepared by the
Y-12 National Security Complex
Oak Ridge, Tennessee 37831
managed by
BWXT Y-12, L.L.C.
for the
U.S. Department of Energy
Under Contract DE-AC05-00OR22800

ACKNOWLEDGEMENTS

Thanks are due to a number of individuals who provided information and assisted in the completion of this Historic Preservation Plan. Particular thanks go to Jennifer Dixon, Y-12 National Historic Preservation Act Coordinator, under whose direction the project was completed. We would also like to thank Mick Wiest, Y-12 Environmental Engineer, and Robert Johnson, Y-12 NEPA Program Manager, for their assistance in coordinating the project, and Tommy Maxwell for his photography skills.

Assistance in the preparation of this plan was provided by a Task Team consisting of BWXT Y-12 Office of Environmental Management (Bechtel Jacobs), Office of Science and Energy (UT-Battelle/ORNL), NNSA and DOE personnel whose input into the development of this plan was essential. In addition to those already mentioned, members of this team were the following:

Scott Aaron
Glenn Anderson
Mark Belvin
Jim Eaton
Mitch Evans
James Hall
Gary Hartman
Bob Hawthorne
Clarence Hill
Carlo Melbihess
Susan Morris
John Powell
Robert Presley
Larry Rackstraw
Sherree Shaw
Ray Smith
Nancy Slater
Sheila Thornton
Cynthia Woodward

LIST OF ACRONYMS FREQUENTLY USED IN REPORT

AEC	Atomic Energy Commission
AHPA	Archaeological and Historic Preservation Act
AIRFA	American Indian Religious Freedom Act
AMSE	American Museum of Science and Energy
ANP	Aircraft Nuclear Propulsion Division
APE	Area of Potential Effect
ARPA	Archaeological Resource Protection Act
BJC	Bechtel Jacobs Corporation
CAIS	Condition Assessment Information System
CAS	Condition Assessment Survey
CC&C	Carbide & Carbon Chemicals Company
CEW	Clinton Engineering Works
CLG	Certified Local Government
Council	Advisory Council on Historic Preservation
CRMP	Cultural Resource Management Plan
D&D	Decontamination & Decommission
DOE	Department of Energy
EM	DOE Office of Environmental Management
EPA	Environmental Protection Agency
ETTP	East Tennessee Technology Park
FIMS	Facility Information Management System
FLPMA	Federal Land Policy & Management Act
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HEUMF	Highly Enriched Uranium Materials Facility
HPP	Historic Preservation Plan
IR	Infrastructure Reduction
MED	Manhattan Engineering District
MMES	Martin Marietta Energy Systems, Inc.
MOA	Memorandum of Agreement
NAGPRA	Native American Graves and Repatriation Act
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NHPA	National Historic Preservation Act
NNSA	National Nuclear Security Administration
NPS	National Park Service
NRHP	National Register of Historic Places
NSC	National Security Complex
NWC	Nuclear Weapons Complex
ORAU	Oak Ridge Associated Universities
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Act
PA	Programmatic Agreement
PBCUA	Public Facilities Corporate Use Act
PIDAS	Perimeter Intrusion Detection and Assessment System

RPV	Replacement Plant Value
SC	DOE Office of Science and Energy
SHPO	State Historic Preservation Officer
S&M	Surveillance & Maintenance
SMC	Special Materials Capabilities
TYCSP	Ten-Year Comprehensive Site Plan
TVA	Tennessee Valley Authority
UT-B	UT-Battelle, LLC

TABLE OF CONTENTS

List of Figures vi

List of Tables ix

1.0 Management Summary 1

2.0 Purpose and Introduction 4

3.0 Y-12 Plant Historical Overview 12

4.0 Y-12 Plant Historical Properties 35

5.0 Y-12 Plant Archaeological Properties 55

6.0 Y-12 and Historical Property Stewardship 56

7.0 Y-12 Planning and Vision 64

8.0 Y-12 Building Management 145

9.0 Archaeological Site Management 151

10.0 Training 154

11.0 Y-12 Historic Property Management and Procedural Review 155

12.0 Y-12 Historic Properties and Recommendations 164

13.0 Bibliography 168

APPENDICES

Appendix A: Resumes of Principal Investigators

LIST OF FIGURES

Figure 1: Regional Location of Y-12 Oak Ridge Reservation....6

Figure 2: Location of the Y-12 National Security Complex within the Oak Ridge Reservation....6

Figure 3: Oak Ridge USGS Quadrangle....7

Figure 4: Site Plan of the Y-12 National Security Complex....8

Figure 5: Y-12 Plant Construction, September, 1943....20

Figure 6: Y-12 Plant Construction, 1943....21

Figure 7: Y-12 Workers at Shift Change, 1940s....22

Figure 8: Y-12 Plant Cubicle Operators, 1944....23

Figure 9: Y-12 Plant Oval Racetrack, 1944....24

Figure 10: Y-12 Plant Rectangular Racetrack, 1944....26

Figure 11: East End of the Y-12 Complex showing National Register Boundaries....36

Figure 12: Mid-Section of the Y-12 Complex showing National Register Boundaries....37

Figure 13: West End of the Y-12 Complex showing National Register Boundaries....38

Figure 14: National Register-eligible Building 9803....42

Figure 15: National Register-eligible Building 9201-1....44

Figure 16: National Historic Landmark-eligible Building 9731....44

Figure 17: National Historic Landmark-eligible Building 9204-3....45

Figure 18: National Register-eligible Building 9722-22....47

Figure 19: Interior view of Building 9201-2....48

Figure 20: Interior of Building 9201-2 showing high bay area....48

Figure 21: Interior office space of Building 9201-2....49

Figure 22: Interior of Building 9201-3....49

Figure 23: High bay interior area of Building 9201-3....50

Figure 24: Interior view of Building 9201-3 50
Figure 25: Interior view of Building 9204-1 51
Figure 26: Interior office space of Building 9204-1 51
Figure 27: Interior of Building 9204-3, Second Floor 52
Figure 28: Interior of Building 9204-3, Second Floor Control Room 52
Figure 29: Interior of Building 9204-3, showing original calutrons 53
Figure 30: Interior of Building 9204-3, original office space 53
Figure 31: Building 9201-4 – Uranium Enrichment Facility 74
Figure 32: Building 9201-5 – Uranium Enrichment Facility 77
Figure 33: Building 9206 – Uranium Processing Facility 79
Figure 34: Building 9207 – Biology Reasearch 83
Figure 35: Building 9210 – Research Facility 86
Figure 36: Building 9213 – Research and Training Facility 88
Figure 37: Building 9404-4 – Pumphouse 90
Figure 38: Building 9404-6 – Pumphouse 92
Figure 39: Building 9404-12 – Pumphouse 94
Figure 40: Building 9404-13 – Pumphouse 96
Figure 41: Building 9404-16 – Pumphouse 98
Figure 42: Building 9416-4 – Utilities Water Treatment Facility 100
Figure 43: Building 9419-2 – Utility Building 102
Figure 44: Building 9510-2 – Process Waste Disposal Facility 104
Figure 45: Building 9616-3 – Chemical Unloading Station 106
Figure 46: Building 9704-1 – Offices 108
Figure 47: Building 9720-12 – Warehouse 110
Figure 48: Building 9720-13 – Warehouse 112

Figure 49: Building 9720-17 – Uranium Chemistry Lab 114
Figure 50: Building 9723-24 – Changehouse 116
Figure 51: Building 9729 – Storage Facility 118
Figure 52: Building 9738 – General Shops 120
Figure 53: Building 9752 – Utilities Facility 122
Figure 54: Building 9767-2 – Utilities Facility 124
Figure 55: Building 9768 – Utilities Facility 126
Figure 56: Building 9770-2 – Radiation Source 128
Figure 57: Building 9802-2 – Utility Facility 130
Figure 58: Building 9977 – Utility Facility 132
Figure 59: Building 9987 – Storage Facility 134
Figure 60: East End of Y-12 Complex Denoting Current Demolition Plan 135
Figure 61: Mid-Section of Y-12 Complex Denoting Current Demolition Plan 136
Figure 62: West End of Y-12 Complex Denoting Current Demolition Plan 137
Figure 63: Mid-Section of Y-12 Complex Denoting Proposed New Construction 141
Figure 64: West End of Y-12 Complex Denoting Proposed New Construction 142
Figure 65: Construction Chronology of the Y-12 Plant 147

LIST OF TABLES

Table 1: Group 1, Historic Properties Projected to Have Future Mission.....66

Table 2: Group 2, Historic Properties Excess to Y-12 NSC Missions.....67

Table 3: Group 3, Historic Properties with Mission Needs Uncertain.....68

Table 4: Group 4, Buildings Re-evaluated as Non-contributing Properties to the Historic District 69

Table 5: Contributing Buildings to the Y-12 Historic District Determined to be Excess Facilities (Group 2).....71

1.0 MANAGEMENT SUMMARY

The National Nuclear Security Administration (NNSA), a quasi-independent agency within the Department of Energy (DOE), is the landlord program office having responsibility for the Y-12 National Security Complex (Y-12). The Y-12 NSC is one of the three major DOE research and production installations located on the Oak Ridge Reservation (ORR) in Anderson and Roane Counties, Tennessee. The DOE Office of Science and Energy (SC) is the landlord for the Oak Ridge National Laboratory (ORNL), DOE Office of Nuclear Energy (NE) and DOE Office of Environmental Management (EM) is the landlord for East Tennessee Technology Park (ETTP). The National Historic Preservation Act (NHPA) of 1966 requires every Federal agency to examine its undertakings and how those actions could affect historic properties. It also requires every Federal agency to assume responsibility for preserving historic properties under it's jurisdiction. Since the end of the Cold War, Y-12 has experienced significant challenges with respect to its facilities and infrastructure. Y-12 is also unique in that four DOE programmatic entities (NNSA, SC, NE, and EM) have co-located ongoing missions at the Y-12 site.

As part of meeting the requirements of the NHPA, an intensive architectural and historic survey of the Y-12 Plant was completed in 1995 (final version, 1999). The results of this survey were presented in the report "Architectural/Historical Evaluation of the Y-12 Plant, Oak Ridge Reservation, Anderson County, Tennessee." The report details buildings and sites with the potential for listing on the National Register of Historic Places. The Tennessee Historical Commission State Historic Preservation Officer (SHPO) reviewed the report and concurred with its findings. This report documented that ninety-six (96) buildings at the Y-12 Plant were found to be National Register-eligible. The report recommended boundaries for the proposed Y-12 Plant National Register Historic District. It also recommended National Historic Landmark status be sought for Buildings 9731 and 9204-3 for their roles in uranium enrichment and in the production of stable isotopes.

To better fulfill the requirements of the NHPA, DOE has committed to the development of a historic preservation plan for Y-12 National Security Complex. This plan is intended to provide an effective approach to preserve the historically significant features of the Y-12 Complex, while facilitating the continued use of the site for ongoing mission needs. The Y-12 Historic Preservation Plan (HPP) defines the preservation strategy for the Y-12 National Security Complex and will direct efficient compliance with the NHPA and federal archaeological protection legislation at Y-12 as DOE continues mission activities. The HPP is directed at all historic properties at the Y-12 installation. Each ORR entity (NNSA, DOE Oak Ridge Operations, DOE Office of Science and Energy, DOE Office of Nuclear Energy, and DOE Environmental Management) as well as the respective operating and integrating contractors, BWXT Y-12, UT-Battelle, LLC, and Bechtel Jacobs Company has participated in the development of the plan and will be committed to the Y-12 historic preservation program as described in this plan. The HPP seeks to find an effective way to meet the obligations at Y-12 for historic and archeological protection while at the same time facilitating the effective completion of ongoing site mission activities, including removal of obsolete or contaminated facilities, adaptive reuse of existing facilities whenever feasible, and construction of new facilities in order to meet site mission needs. The HPP consists of management recommendations which will be implemented via an associated Programmatic Agreement, information about the history of Y-12, an inventory of National Register-eligible properties at Y-12, and procedures for their effective management.

Within the HPP is an analysis of all foreseeable DOE undertakings (projects or programs) that are likely to have an effect on Y-12 historic properties over the next several years. Standard operating procedures for the timely review of these effects and coordination with the Tennessee SHPO are provided. Additionally, responsibilities and a timetable for review by DOE, the Tennessee SHPO, and the Advisory Council on Historic Preservation (Council) will be defined in a Programmatic Agreement that will be developed based on the HPP.

The Y-12 historic preservation strategy, as described in this plan, is to ensure that historic preservation is an integral part of the comprehensive planning process. As a part of this preservation strategy and based on the dynamics of Y-12s planning efforts over the next five years, Y-12's existing historic properties have been categorized into the following four groups: (1) Future Mission Need, (2) Excess to Mission Need, (3) Future Mission Need Uncertain, and (4) Historic Status Re-evaluated. Implementation of theY-12 historic preservation strategy will be accomplished through the combined application of historic preservation interpretive initiatives, and the physical preservation of historic properties. Physical preservation will be evaluated in the context of, but not necessarily limited to, continuing mission need, functional use, and economic considerations. This strategy recognizes that historic preservation must go beyond the preservation of physical structures - principally due to the fact that much of Y-12's historic significance goes beyond its physical structures (i.e. part of Manhattan Project, the significance of Y-12's products in World War II and the Cold War, etc.). The historic preservation strategy addresses the need to preserve more global historic features of Y-12. A key component of properly protecting Y-12's historic features will involve performing a set of interpretive initiatives designed to comprehensively document Y-12's historical significance. These interpretive initiatives, which will be described in detail in the forthcoming Y-12 Interpretive Plan, will specifically address each of the following important elements:

- Interpretive effort to preserve the "feel", "size" and "look" of the Y-12 historic district. This effort will address the magnitude and speed by which Y-12 was constructed as part of the Manhattan Project, including efforts to convert Y-12 to support other mission needs (e.g. thermonuclear weapon program) in later years.

- Interpretive effort to capture Y-12's historic missions, products, and people. The focus of this effort will not be on physical facilities, but on Y-12's historic missions, products, and people.

- Interpretive effort to preserve the significant features of each of the Y-12 historic properties (buildings) that are to be demolished, using a graded approach consistent with the degree of historic significance:

    - Facilities of Minor Historic Significance

    - Facilities of Moderate Historic Significance

    - Facilities of Major Historic Significance

For future mitigation purposes and to preserve Y-12's unique history for the public, Y-12's interpretive plan will also highlight each of the Y-12 facilities that are of major historic significance. This detailed interpretive plan will be developed by the end of 2004.

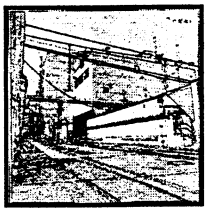
The Y-12 National Security Complex possesses an important heritage in the history of the development of atomic weaponry and nuclear energy at what was known as the "Y-12 Plant." Protection and management

of this heritage requires careful planning and coordination. Recommendations from the Y-12 Complex Historic Preservation Plan will be incorporated within future master planning documents for the installation.

In order to enrich our future and comprehensively capture the historically significant features of Y-12's people, products, and missions, Y-12 will develop an interpretive plan by the end of 2004, establish an oral history program by interviewing key past and current workers by the end of 2005, and conduct an inventory of historic machinery and equipment by the end of 2006.

Finally, in order to maintain the effectiveness of the Y-12 HPP, the HPP will be reviewed in consultation with the State Historic Preservation Officer and Advisory Council every five years to determine if updates are needed. The five year review will provide the noted parties the opportunity to reflect on the effectiveness of preservation initiatives, evaluate continuously evolving site mission needs and modernization efforts, and evaluate the effectiveness of the intended integration that the plan has established.

The Y-12 HPP establishes the strategy and framework for effectively preserving the historically significant features of Y-12 for future generations, while at the same time allowing continued missions of the Site to be accomplished in an effective manner. A cornerstone of the HPP strategy is the commitment to effectively interpret Y-12's historic people, products, and missions. The HPP will expand the public's understanding and awareness of Y-12's past contributions and continued significance in the defense and security of this Nation.



2.0. PURPOSE and INTRODUCTION

2.1. Historic Preservation Plan Approach

The Historic Preservation Plan (HPP) recognizes that the Y-12 National Security Complex is a vital and long-term component of DOE and NNSA. In addition to NNSA missions, the Office of Science and Energy, the Office of Nuclear Energy, and the Office of Environmental Management have properties located at Y-12 that must be taken into consideration. The HPP also recognizes that the challenge for cultural resource management is incorporating the requirements of NNSA, SC, NE, and EM missions while preserving and protecting its historic resources. The HPP seeks to find an effective way to meet the obligations at Y-12 for historic and archeological protection while at the same time facilitating effective completion of ongoing site mission activities, including removal of obsolete or contaminated facilities, adaptive reuse of existing facilities whenever feasible, and construction of new facilities in order to meet site mission needs. The Y-12 Historic Preservation Plan (HPP) defines the preservation strategy for the Y-12 National Security Complex and will direct efficient compliance with the NHPA and federal archaeological protection legislation at Y-12 as DOE and NNSA continues mission activities of the site.

2.2 Historic Preservation Plan Objectives

The HPP is designed to provide the following information:

- An overview of the historic properties at Y-12;
- The legal obligations of DOE ORO and NNSA to protect and manage historic and archeological properties;
- Procedures for the identification, evaluation and protection of cultural resources and assurances that such procedures are completed in a timely manner;
- Identification of all foreseeable DOE ORO and NNSA undertakings over the next seven years at Y-12 and their effect on historic resources;
- Determination of the level of effect(s) of Y-12 activities upon historic and archaeological properties;
- Consideration of alternative actions that would avoid any adverse effects to cultural resources;
- Consideration of alternative measures to mitigate adverse effects to cultural resources such as recordation and interpretation, and;
- Outline the responsibilities of the NNSA, SC, NE, and EM concerning management of historic and archaeological properties.

2.3. The Y-12 National Security Complex

The Y-12 National Security Complex is one of three DOE federal facilities that comprise the 34,424 acre Oak Ridge Reservation (ORR) in Anderson and Roane Counties in East Tennessee. The ORR also includes the Oak Ridge National Lab (ORNL) and East Tennessee Technology Park (ETTP). The three installations are within the corporate limits of the city of Oak Ridge, Tennessee. The ORR is bordered on the north and east by the city and on the south and west by the Clinch River/Melton Hill Lake impoundment. The region's largest city, Knoxville, Tennessee, lies approximately fifteen miles east of the ORR.

Y-12 is situated on approximately 800 acres in Bear Creek Valley in Anderson County, Tennessee, and includes over 650 buildings and other structures. The Complex was established in the early 1940s as part of the Manhattan Project, the U.S. government's top secret effort to build the world's first atomic bomb. The installation's dominant function during this period was the enrichment of uranium, a major component of atomic weapons. The site was chosen primarily for the area's hilly terrain. The interlocking ridge and valley system would confine the devastating results of an explosion, should one accidentally occur. The site was also located near required rail transportation, and extensive water and power sources.

Following World War II, Y-12 became a vital part of the growing Nuclear Weapons Complex (NWC), a collection of various production and laboratory facilities across the United States. Y-12's mission evolved into producing key components of nuclear weapons and test devices needed for the greatly expanding nuclear weapons stockpile for our nations' defense, and in storage of the nation's highly enriched uranium stockpile. Also during the Cold War era, various ORNL's research division occupied many buildings at Y-12. One of these, Building 9204-3, is used in the production of stable metallic isotopes vital to medicine, scientific, and industrial research.

A number of Y-12's buildings and structures were constructed prior to 1950 during the plant's primary role in the historic Manhattan Project. Most of the facilities have had several changes in mission over the years. Several new buildings were constructed during the 1970s and 1980s with the beginning of new nuclear weapons programs. Beginning in the late 1980s, an increased focus on the environment, safeguards and security, and health and safety, resulted in the construction of numerous service and support facilities.

The total floor area of Y-12 is approximately 7.7 million square feet. NNSA is the landlord program office for approximately three fourths of the existing Y-12 floor space. Other DOE program offices (EM, NE, and SC) have responsibility for the remaining one third.

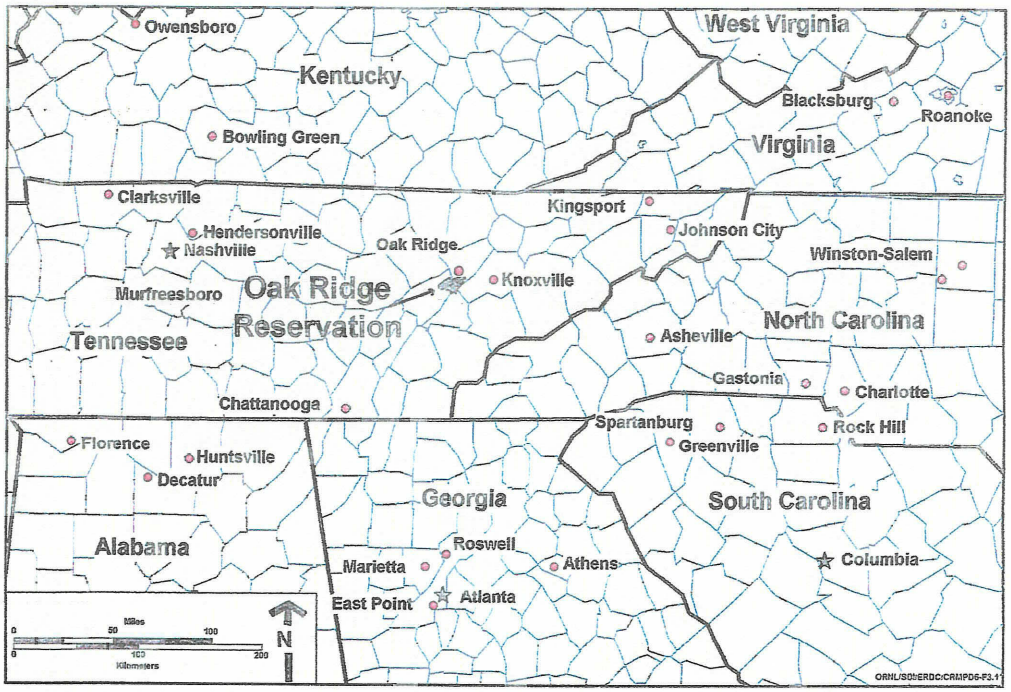


Figure 1: Regional Location of Y-12 Oak Ridge Reservation.(not to scale-*map courtesy of Cultural Resource Management Plan: DOE Oak Ridge Reservation Anderson and Roane Counties, TN July, 2001*).

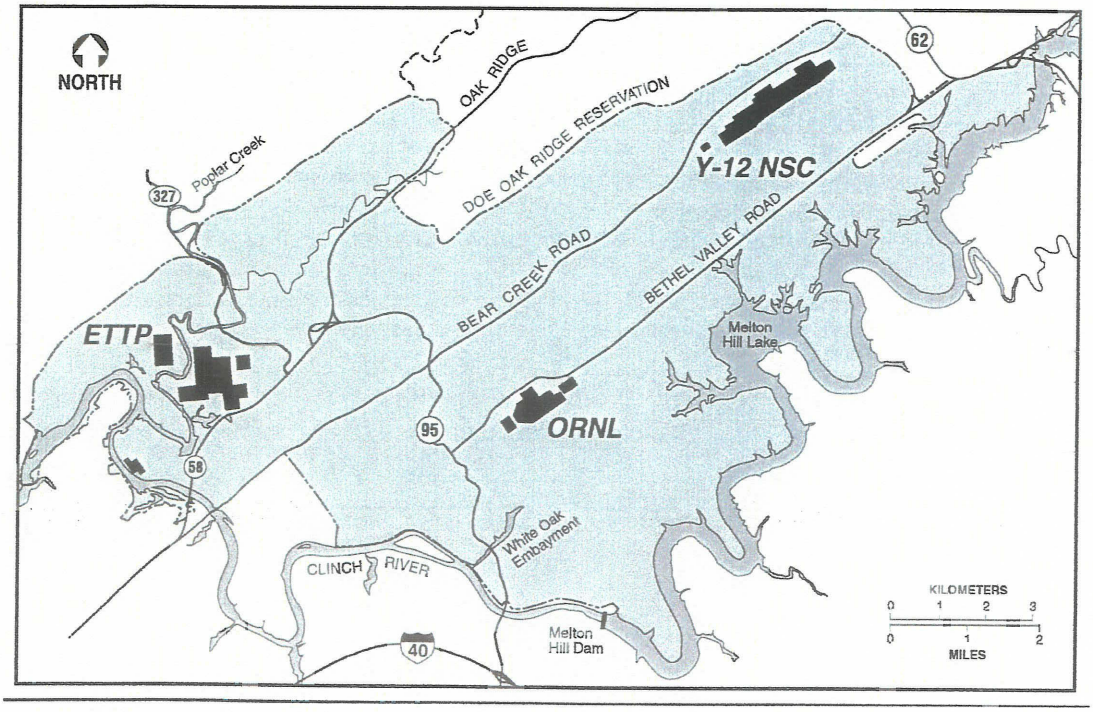


Figure 2: Location of the Y-12 National Security Complex within the Oak Ridge Reservation (map courtesy of Y-12 National Security Complex: *Ten Year Comprehensive Site Plan FY2003-FY2013*).

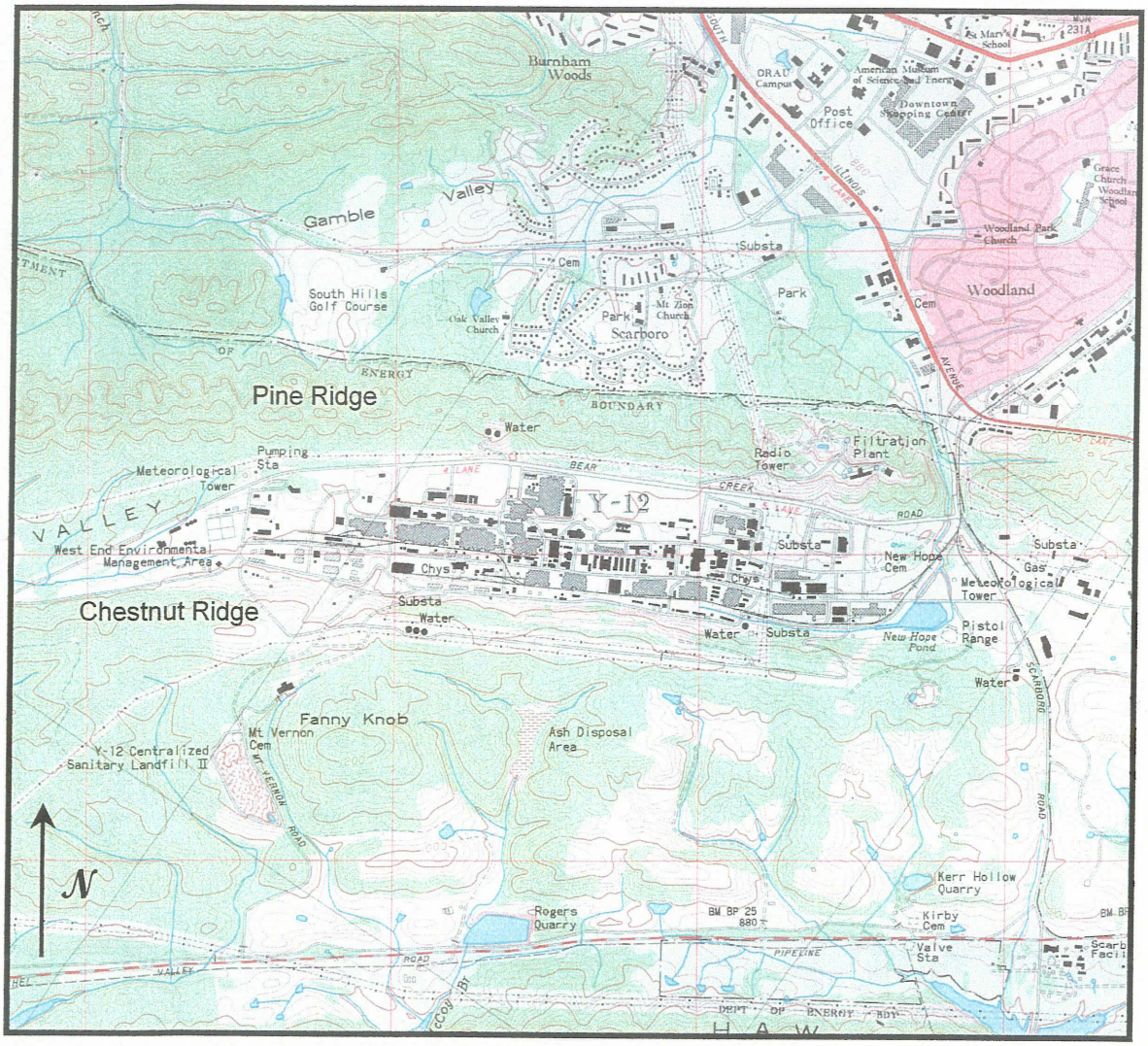


Figure 3: Oak Ridge USGS Quadrangle showing location of Y-12 between two ridge systems.

Y-12 National Security Complex

Figure 4: Y-12 National Security Complex Site Plan

NNSA National Nuclear Security Administration

BWXT Y-12

2.4. *Mission Statements*

Y-12 is also unique in that three DOE and NNSA Programs (Y-12, ORNL, and ETTP) have facility responsibilities on the Y-12 Site. As a Federal installation, all historic properties at Y-12 must be maintained and protected regardless of which ORR entity has operational ownership of the property.

Y-12 Mission: The Y-12 National Security Complex performs missions that are vital to U.S. Department of Energy (DOE) and the National Nuclear Security Administration (NNSA). These missions are:

- Effectively re-manufacture, surveil, and assess all uranium, lithium and secondary components in the nuclear stockpile while protecting people and the environment; and
- Safely store, process and disposition uranium, lithium and secondary components associated with the nuclear stockpile; and
- Perform complementary work that reduces DOE ORO's burden in maintaining Y-12 capability while contributing to regional economic development.

ORNL Mission: The Oak Ridge National Laboratory (ORNL) is a multi-program science, technology, and energy laboratory with distinctive capabilities in materials science and engineering, neutron science and technology, energy production and end-use technologies, mammalian genetics, environmental science, and scientific computing. In support of the mission of the U.S. Department of Energy (DOE), ORNL conducts basic and applied research and development (R&D) to create scientific knowledge and technological solutions that:

*strengthen the nation's leadership in key areas of science;
*increase the availability of clean, abundant energy;
*restore and protect the environment; and
*contribute to national security

ORNL is managed by UT-Battelle LLC for DOE. The ORNL main campus is located approximately 5 miles southwest of the Y-12 Site. Currently ORNL occupies about one million square feet of floor space located on the Y-12 site.

ETTP Mission: The Office of the Assistant Secretary for Environmental Management (EM) provides program policy development and guidance for the assessment and cleanup of inactive waste sites and facilities and waste management operations; develops and implements an aggressive applied waste research and development program to provide innovative environmental technologies to yield permanent disposal solutions at reduced costs; and oversees the transition of contaminated facilities from various Departmental programs to environmental restoration once they are determined to be surplus to their original mission. Currently, ETTP manages the treatment, storage, and disposal of waste generated by Y-12 through the use of various facilities located on the Y-12 site. ETTP also manages the environmental restoration of land areas and buildings under their jurisdiction located on the Y-12 site.

2.5. *The National Register of Historic Places*

The National Register of Historic Places is the nation's official list of properties significant in architecture, history, and culture. Eligible properties may be significant on a local, state, or national level. The National

Register is administered by the National Park Service and Keeper of the Register who makes the final decision about whether a property should be listed. Properties that are eligible for the National Register receive the same consideration as those that are listed.

In order to be listed on the National Register, a property must possess historic significance and integrity. A property is eligible for listing on the National Register if it meets one or more of the following criteria:

> Criterion A: association with historic events or activities;
> Criterion B: association with important persons;
> Criterion C: distinctive design or physical characteristics; or
> Criterion D: properties that have yielded, or may be likely to yield, information about prehistory or history.

In addition, the property must retain integrity, or sense of time and place. Integrity is composed of seven qualities, which are: location, design, setting, materials, workmanship, feeling, and association.

No properties within the Y-12 Plant are presently listed on the National Register. As a result of the 1995 Architectural and Historic Evaluation and subsequent SHPO review, an historic district was determined eligible for listing on the National Register.

Generally, properties that are less than fifty years old are excluded from listing on the National Register. However, National Register Criteria Consideration G allows the listing of a property that is less than fifty years old if it has exceptional importance. The proposed Y-12 Historic District has a period of significance to 1958. Although this date exceeds the fifty-year benchmark, it reflects the ending of the initial development of Y-12, the closure of the Manhattan Era uranium enrichment program, and the end of certain national trends in scientific research. The contributing buildings within the historic district meet the requirements of National Register Criteria Consideration G for exceptional significance for properties less than fifty years of age.

2.6. National Historic Landmarks

National Register properties that hold exceptional national significance are designated as National Historic Landmarks by the Secretary of the Interior. These properties represent the nation's most important historic and cultural resources. National Historic Landmark (NHL) designation is given to buildings, sites, structures, and objects that possess exceptional value or quality in illustrating the history and culture of the United States. The major difference between NHLs and other National Register properties is their level of significance. NHL properties must outstandingly represent or be associated with events that have made a significant contribution to broad national patterns or themes in American history, architecture, archaeology, engineering, or culture. The National Park Service commemorates NHL properties with a plaque that acknowledges their status as National Historic Landmarks.

The 1995 architectural and historical survey recommended that National Historic Landmark status be sought for Buildings 9731 and 9204-3 (Beta-3). These two buildings are within the boundaries of the proposed Y-12 Historic District. Building 9204-3 (Beta-3) was one of the original uranium production facilities at Y-12 and Building 9731 housed the "Pilot Plant" for the prototype calutron. Due to their roles in the nationally significant Manhattan Project and the pioneering efforts in the production of enriched uranium and stabilized isotopes, these two buildings are eligible for National Historic Landmark designation.

2.7. *The Department of Energy and Historic Preservation*

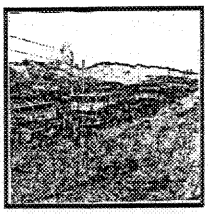
Within the past decade the DOE ORO has worked with the Advisory Council on Historic Preservation, an independent Federal agency established under the National Historic Preservation Act, to identify actions to assist in the preservation of historic properties under its stewardship. The DOE ORO worked closely with the Council to identify areas of concern and how best to integrate the responsibilities of the Agency under the NHPA. The contributions of the DOE ORO to this process were included in the Council's report "*Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities* published in 1991. This report outlined the challenges facing Federal agencies such as the DOE in preserving and protecting its historic resources while at the same time meeting its missions and goals.

As a result of this report and other efforts, Federal agencies such as the DOE that operates highly scientific activities, increased their communication and dialogue with state historic preservation offices and the general preservation community.

Continued focus on these efforts led to the Council's 2001 study, "*Caring for the Past, Managing for the Future: Federal Stewardship and America's Historic Legacy.*" This study was completed with the assistance of various Federal agencies on how the Federal Government could do a better job of preserving the historic resources it controls. The study recommended executive and legislative action to remedy many of the problems identified in the government's historic building management. One of the partners in this study was the DOE and several of the Council's policy and program recommendations for the DOE are relevant to the Y-12 Historic Preservation Plan.

2.8. *Summary*

The mission of the Y-12 National Security Complex involves the manufacture and assessment of nuclear weapons secondaries, cases, and other weapons components, the safeguard of special nuclear materials, and the preventions of the proliferation of weapons of mass destruction. The responsibilities of this mission are set within a historic environment. The need to fully assess the historic significance of this environment and conduct preservation efforts in accordance with the NHPA is recognized by the DOE. Protection and management of this heritage requires careful planning and coordination. The goals and objectives of the HPP is to preserve and maintain its historic resources while providing guidelines and procedures so that the missions and goals of NNSA, SC, NE, and EM can be achieved without undue delay.



3.0. Y-12 PLANT HISTORICAL OVERVIEW

3.1. Previous Studies at Y-12

Information on the history and cultural resources of the Y-12 Plant is located in various publications and reports. Repositories containing this documentation includes the Tennessee State Library and Archives, the Oak Ridge Public Library, the Y-12 Environmental Compliance Document Center, and the office of the National Historic Preservation Act Coordinator.

Oak Ridge National Laboratory (ORNL) Division histories were prepared as part of ORNL's fiftieth anniversary (1943-1993), and Leland Johnson and Daniel Schaffer prepared a general history of ORNL in 1992. A three-volume history of the Atomic Energy Commission (AEC) (Hewlett and Anderson 1962; Hewlett and Duncan 1969; and Hewlett and Holl 1989) provides a general national context for the period 1939 through January 1961. The AEC volumes specifically address trends affecting nuclear research and the development of ORNL. In addition, the AEC and DOE have published several brief documents on various historical topics. However, the three-volume AEC series is the basic reference work for the period, and beyond this series, there has been little scholarly work done that provides a contextual overview of nuclear research or nuclear development facilities.

In 1995 (final version-1999) Thomason and Associates completed an architectural and historical evaluation of the Y-12 facility. This report provides a comprehensive overview of the history and architectural resources of the Y-12 Plant. For this project a total of 248 properties were individually surveyed that encompassed the range of facilities located on the grounds of the Y-12 Plant.

A minimum of ten major archaeological reconnaissance-level surveys have been conducted on the ORR including a study by Fielder et al. (1977) that evaluated pre-World War II farmsteads. The Y-12 complex contains no known archaeological sites A study of the Y-12 complex completed in the early 1990s reveals that due to previous ground disturbance the potential for preserved archaeological sites are minimal.

In 1991 the City of Oak Ridge (Townsite) engaged the preservation consulting firm of Thomason and Associates to prepare a National Register nomination for all eligible properties within the Townsite. Thomason and Associates prepared a Multiple Property Nomination that contains a Cover Nomination for the area encompassed by the original 59,000-acre ORR (which would include the original Townsite and the three production facilities X-10 Site, Y-12 Plant, and K-25 Site). The Cover Nomination justifies three Historic Context Periods: I) Valley Before World War II, ca. 1840-1942; II) World War II Era, 1942-1945; and III) Post War II Era, 1945-1959. However, post-World War II material in the Cover Nomination primarily deals with the Townsite rather than the Manhattan Project industrial complexes.

In 2002, Thomason and Associates performed a historic items inventory of artifacts located in Beta-3.

3.2. *Historic Context – The Emergence of Atomic Energy*

The Y-12 Plant in Anderson County, Tennessee was established in the early 1940s as part of the World War II Manhattan Project, the United States government's secret effort to build the world's first atomic bomb. The main function of the Y-12 Plant was uranium enrichment and production of nuclear weapons components. The plant was one of three installations established as part of the U.S. Army Corps of Engineers Oak Ridge Reservation (ORR), which also included the K-25 site and the Oak Ridge National Laboratory. The neighboring city of Oak Ridge was designed and built to house the people involved with the project.

In the first week of January 1939, German scientists Fritz Strassman and Otto Hahn of Berlin's Kaiser Wilhelm Institute announced that the nucleus of the uranium atom could be caused to split or fission by bombardment with neutrons. The binding energy of the nucleus so released was tremendous, ten million times larger than the energy released by chemical reactions.[1] This discovery was confirmed by laboratories around the world, including four in the U.S., and physicists worldwide became excited about the possibilities uranium fission held.[2] Foremost among these possibilities was the development of atomic weaponry, and the race to build the first atomic bomb began.

By spring of 1939, scientists researching at Columbia University made advances toward creating a chain reaction. As scientists grasped possibilities, they began to seek a practical demonstration, an experiment far too costly for any team then researching the topic. The concept of forcing billions of atoms to fission in the blinking of an eye was beyond comprehension. Leo Szilard and other leading scientists worked feverishly to stir interest from the United States government. Although they were successful in generating interest they received no funding.

Szilard sought advice, and solace, from Eugene P. Wigner, a physicist then teaching at Princeton. Finding themselves in complete agreement, Wigner and Szilard decided President Franklin D. Roosevelt should be contacted without further delay. Through mutual friends, they involved Alexander Sachs, a financier who grasped the issue at hand and could speak with confidence to the President. The men enlisted the help of Albert Einstein, who prepared a letter to the president regarding the implications of this scientific development.

Before this document could be composed, war broke out in Europe. Sachs finally met with Roosevelt on October 11, 1939. Sachs, who thoroughly understood theoretical science, read Einstein's letter to Roosevelt. Sachs and Roosevelt knew one another well, and Roosevelt was impressed not only with his friend's dedication but also with Einstein's endorsement. Roosevelt readily understood the letter's urgent tone and ordered Major General Edwin M. "Pa" Watson to look into the matter.[3] In October, 1940, Roosevelt organized a committee charged with managing theoretical scientific experimentation, which approved $6,000 for uranium fission research.

---

[1]Jonathan Logan, "The Critical Mass," *American Scientist* (May-June 1996), 264.

[2]Henry D. Smyth, *Atomic Energy for Military Purposes: The Official Report on the Development of the Atomic Bomb Under the Auspices of the United States Government, 1940-1945.* (Princeton, NJ: Princeton University Press, 1945), 25.

[3]C. Allardice and E.R. Trapnell, *The Atomic Energy Commission* (New York and Washington: Praeger Publishers, 1974), 6-7.

The Japanese attack on Pearl Harbor in December, 1941 brought the United States into World War II, and the urgency to develop atomic power intensified. On December 2, 1942, scientists working at the University of Chicago under the direction of Arthur Compton attempted a controlled nuclear reaction by specifically arranging tons of uranium and graphite. The experiment, which was conducted on a squash court located beneath the university's football stadium, proved successful.[4] From this experiment scientists learned precepts fundamental to understanding fission research:

Two fissionable materials, plutonium-239 and uranium-235 could create an explosion;

* In the early developmental stages, the core mechanism could be assembled and prepared for aircraft delivery;

* Plutonium could be created in a chain reaction and separated through chemical means.

As scientific investigation moved forward, the Army Corps of Engineers began seeking sites for uranium separation and plutonium production in earnest. A remote inland site with abundant water and electrical power was required. Army guidelines for location munitions facilities were specific stipulating they be located beyond reach of enemy aircraft, between the Rockies and Appalachians, and not within 200 miles from U.S. Canadian and Mexican borders.

In an attempt to aid construction and security requirements, the Army initially planned that all manufacturing facilities would be constructed in a single installation. The need for acquiring thousands of acres became readily apparent. Site requirements involved constructing a town for the thousands of workers needed for the project's construction and plant production phases. And requirements for the installation were specific. The site must be isolated and located in a moderate climate permitting year-round construction. A steady supply of workers was vital as was access to both motor and railroad transportation systems. The terrain must be composed of an interlocking ridge and valley system confining the devastating results of an explosion should one accidentally occur. In the best of all possible worlds, the Corps sought a remote location comprised for four isolated areas within a single, larger boundary.[5]

In April, 1942, representative officials traveled to East Tennessee and identified a possible site between the rural communities of Clinton and Kingston. The area met transportation, water, and electrical criteria as this region of Tennessee bordered the Clinch River, was served by two railroads, and was within easy reach of the Tennessee Valley Authority's (TVA) electrical power. Compton perused the site, approved all he saw, and visited TVA chairman David Lilienthal.

Lilienthal was frankly dismayed. "We didn't want them to take over such vast areas of land of such fertility, and tried to get them to consider western Kentucky."[6] Compton steadfastly refused to consider Lilienthal's recommendations and suggested land could be acquired through the courts. Lilienthal's desire to press his cause was discouraged and the military ultimately had its way.

---

[4]Ibid., 11.

[5]V.C. Jones, *Manhattan: The Army and the Atomic Bomb*, (Washington, DC: Center of Military History, United States Army, 1985), 46.

[6]D. Lilienthal, The Journals of David E. Lilienthal, (1964), 1.

3.3 *The Manhattan Project*

In a race to build the world's first atomic bomb during World War II, the United States government established the Y-12 facility in the hills of East Tennessee in 1942-1943. The plant's original mission was the production of enriched uranium by electromagnetic separation. The plant and its mission were top secret and worked in concert with two other DOE facilities, K-25 and X-10, the three of which comprised the Oak Ridge Reservation (ORR). The nation's top physicists worked at the ORR facilities. The nearby town of Oak Ridge was built to house employees of the facilities, which numbered in the thousands. The uranium produced at Y-12 was used to develop the atomic bomb "Little Boy," which the U.S. dropped on the city of Hiroshima, Japan on August 6, 1945. The bombing led to Japan's surrender and the subsequent end to World War II.

Following World War II, the Atomic Energy Commission was formed and management of the ORR, including the Y-12 Plant, was contracted to private companies. Union Carbide took charge of Y-12 plant operations in 1947. Initially much of the plant was closed and employment dropped drastically.

In the ensuing Cold War years, Y-12 ceased its uranium enrichment operations and was converted to the precision machining of weapons components. Y-12 became a key producer of key components of nuclear weapons and test devices for the greatly expanding nuclear weapons stockpile. It also served as a storage facility for the nation's enriched uranium stockpile. Also during the Cold War era, ORNL's research divisions occupied many buildings at the Y-12 site and focused on the production of stable metallic isotopes vital to medicine, scientific, and industrial research and other areas or research including Biology, Fusion Energy, and Engineering Technology.

Management of Y-12 was transferred to Martin Marietta Energy Systems, Inc. (later known as Lockheed-Martin) in 1984, and technology transfer became the complex's primary mission. With the end of the Cold War in 1989, the nation's nuclear weapons stockpile was decreased substantially. On-going missions at Y-12 included storage of the nation's enriched uranium stockpile, disassembly of some weapons/components to study aging and other effects, and the production of a small number of nuclear weapons parts and assemblies needed to replace units taken from the stockpile. BWXT Y-12, LLC, a subsidiary of the Bechtel National, Inc. and BWX Technologies, Inc., assumed management of the Y-12 National Security Complex in November 2000.

Security demands placed the atomic research program within military perimeters, and construction requirements positioned the program within the bounds of the U.S. Army Corps of Engineers (Corps). The Army initially appointed Colonel James C. Marshall as construction and administrative head of the project, but in September, Colonel Leslie R. Groves replaced Marshall, who was reassigned as District Engineer. The Corps was responsible for site selection, plant design, construction and management of project facilities. Commanded by the army, an oversight committee comprised of scientists, named S-1, would govern research and experimental work. Within forty-eight hours of his appointment, Groves moved to acquire land in East Tennessee and obtained AAA priority ranking.[7]

The original code name assigned the effort was Laboratory for the Development of Substitute Materials, or DSM. Groves, however, did not care for the name and "demurred on the grounds of security, feeling the

---

[7]Jones, 603; F.G. Gosling, *The Manhattan Project: Science in the Second War* (Washington, DC: U.S. Department of Energy, 1990), 12-14; G.O. Robinson, *The Oak Ridge Story* (Kingsport, TN: Southern Publishers, 1950), 42.

name was bound to arouse curiosity."[8] Ordinarily, Corps districts were named for their host city. Groves and Marshall followed this course, naming the effort "Manhattan" for the city in which Marshall originally had established headquarters.

The Manhattan Engineer District (MED) was formed on August 16, 1942. In very real terms, the Manhattan Engineering District was a nationally based district whose offices were scattered throughout the United States. The installation eventually formed by the Corps in East Tennessee was but one component of a multi-faceted "team." Research moved at a feverish pace at universities, laboratories, and plants across the country. Universities as diverse as Columbia, the University of California at Berkeley, and the University of Chicago were key players. More than twenty firms were involved in research design and in resolving production problems for the Tennessee based plants.

As the Corps continued its search for plant site(s), scientists throughout the nation raced to establish their institution as the project's research base and to complete the American effort ahead of Germany. Competition accelerated as scientists and engineers sought to prove their methodology the most beneficial.[9] Two routes to producing the bomb were undertaken, the uranium route and plutonium route. Neither approach had ever been tried before, both were full of tremendous uncertainties, but each offered some possibility of success. It was felt certain the Germans were working on one or both approaches and might have had a head start.

It was discovered early on that the fission in uranium was occurring primarily in uranium atoms of the light isotope, the form of the uranium atom in nature that has an atomic weight of 235 rather than 238. Unfortunately, only 7 atoms out of 1000 in nature are the U-235 form (0.7115%) and they behave identically in chemical reactions so separation can only be effected by physical means taking advantage of the very small differences in mass or in the average behavior of molecules. Scientific studies revealed various possible approaches for separating the uranium isotopes: gas centrifuge, gaseous diffusion, thermal diffusion, photochemical, and electromagnetic. Scientists and engineers debated which process would be ultimately successful and did not hesitate to request changes to process methodology or plant construction. The choice was narrowed in late 1942 to two methods, the electromagnetic process and the gaseous diffusion process. No one had ever separated uranium isotopes in any but micro-lab-scale quantities.

Ultimately, the Manhattan Project's core sites came to consist of three separate installations: the Clinton Engineer Works (CEW or ORR, Oak Ridge, Tennessee), code named "Site X"; the Hanford Site (Hanford, Washington), code named "Site W"; and the Los Alamos Laboratory (Los Alamos, New Mexico), code named "Site Y." The three sites developed simultaneously. The CEW focused on uranium enrichment and the Hanford Site produced plutonium. "Site Y," the Los Alamos Laboratory, was responsible for the design and assembling of nuclear weapons. This isolated site was the most secret of the three installations. Many of the nation's premier scientists came to live and work at Los Alamos, where the uranium based implosion device "Little Boy" and the plutonium based "Fat Man," the world's first atomic weapons, were developed.

---

[8]L.R. Groves, *Now It Can Be Told* (New York: Harper and Brothers, 1962), 13.

[9]Gosling, 14.

3.4. The Oak Ridge Reservation (Clinton Engineer Works)

The proposed Oak Ridge Reservation site was located thirty-five miles west of Knoxville, Tennessee in an area bordered by the Clinch River and a craggy mountain range known as Black Oak Ridge. The region was roughly rectangular and almost divided in half by the Roane-Anderson County line. Three distinct valleys, fixed on a northeast course were located here. Each valley was bisected by a road running through the valley floor and connected to its neighbors by narrow roads running across the mountains.[10] The reservation was first known through the code name "Kingston Demolition Range" after Kingston, Tennessee, the town located south of the reservation. The reservation was later renamed "Clinton Engineering Works" after Clinton, Tennessee, the town located to the reservation's north. (The site is now known as the Oak Ridge Reservation or ORR.)

From the early settlement period of the late eighteenth century through the Depression era, the residents of East Tennessee tended to be "subsistence farmers" who survived by producing crops and livestock for their own consumption. Most farmers resided within narrow valleys along the more fertile bottom lands of streams and rivers. The adjoining mountainous terrain prevented the large scale farming of cash crops such as tobacco or cotton.

Although the project would not be officially authorized by FDR until December 28, 1942, on October 7th of that year, the U.S. Army filed a declaration of taking in Federal Court in Knoxville. Through the War Powers Act the U.S. Corps of Engineers was granted 59,000 acres of land. Originally authorized to obtain 56,200 acres in Roane and Anderson Counties, the Corps was permitted ten additional parcels bringing total acreage to 58,900.[11] The region contained four primary communities, Elza, Robertsville, Wheat, and Scarboro, each consisting of homes, schools, farms, and churches. The valleys were inhabited by those whose families had owned and farmed the same land for generations, and by families who had been previously evicted from their homes due to the development of the Great Smoky Mountains National Park in 1934 and the construction of Norris Dam in 1939.[12]

Smaller communities existed within the primary communities, often named after a nearby church or school. At the east end of what is today the Y-12 Complex stood the New Hope Baptist Church and cemetery. Although the New Hope Cemetery remains, the church did not exist after 1942. During site preparation for Y-12, some cemeteries were transferred off the ORR and added to existing cemeteries in nearby communities. Of the thirty cemeteries on the ORR, all are maintained, and several are within the Y-12 area.

Roughly 1,000 families (approximately 3,000 people) were affected by the establishment of the Oak Ridge Reservation.[13] The majority believed they were substantially underpaid for their farms and addressed grievances in federal court.[14] Although local opposition was sometimes intense, residents found

---

[10]Robinson, 62.

[11]Jones, 320.

[12]J.A. Young, "An Historical View of Oak Ridge: The Pre-Oak Ridge Communities and Katy's Kitchen," (Oak Ridge Public Library, Oak Ridge Room, n.d.), 6.

[13]J. Overholt, ed. "These Are Our Voices, The Story of Oak Ridge 1942-1970." (Oak Ridge, TN: Children's Museum of Oak Ridge, 1987), 102.

[14]Jones, 324.

little outside support. A real estate office, opened to purchase land through condemnation, secured clear title.

Crops were ripening in the fields, and hay was freshly stored when federal agents covered the region. Pounding on doors they noted the War Powers Act, notifying farming families that the government was acquiring property. Landowners were told they had thirty days to vacate, and that the price of land - an average of $56 an acre - was non-negotiable. Finding no one at home, notices were nailed directly on the dwellings. In some instances, farming families were given two weeks notice. There were cases of families who were packing household goods while crews began tearing at the roof of their homes. The Army's eviction and relocation practices did not include relocation costs and required that property owners not be paid until the family vacated the premises. There were instances of compensation arriving six months after property condemnation.[15] Residents began leaving by the end of November. Numbered among them were those who hoped their loss would contribute to winning the War.

Land was quickly accrued. The Army lost no time in clearing the site, and demolished many farm related buildings. When possible, existing buildings were utilized with approximately 180 pre-Manhattan era dwellings incorporated in the Corp's overall scheme. Laboratory and processing spaces were desperately needed. A functioning model of the Chicago pile (X-10) was erected to provide design criterion for Hanford's production plant. Additionally, the MED erected the following at Oak Ridge:

* An electromagnetic plant, costing $300 million to construct and $177 million to operate (Y-12). This plant would generate the first weapons grade uranium provided to the laboratory at Los Alamos.

* A thermal diffusion plant, costing $10 million in construction expense and $5 million to operate (S-50). This facility provided feed material for another plant and made successful tandem operations possible.

* A gaseous diffusion plant, costing $460 million to construct (K-25). The plant proved the most successful of the three plants despite scientific advice to the contrary.[16]

Security was tight at Oak Ridge, and with the exception of a handful of select officials, employees worked on a "need to know" basis. Information was compartmentalized within each department. Employees knew only what was necessary to complete their assigned portion of the work. While many workers held slight notions about the type work they were doing, the vast majority learned of their role from radio broadcasts following the bombing of Hiroshima.[17]

The 92 square mile reservation was fenced with barbed wire salvaged from existing homesteads.[18] Security also included mounted guards who patrolled the boundary's perimeter. Seven gates allowed monitored entry to the reservation. The gates effectively separated the outside world from the world of the reservation. Once within reservation boundaries, checking stations provided additional security marking established limits between the town and each individual plant.

---

[15]Young, 4.

[16]Allardice and Trapnell, 17.

[17]Overholt, 91-92, 149.

[18]C.W. Johnson and C.O. Jackson, *City Behind a Fence: Oak Ridge, Tennessee, 1942-1946* (Knoxville: The University of Tennessee Press, 1981), 10.

Beginning in early 1942, the Boston based architectural firm of Skidmore, Owings, and Merril prepared detailed plans for the town of Oak Ridge. The community would occupy the northern edge of hilly Black Oak Ridge. Originally intended to house approximately 13,000 workers, Oak Ridge's population peaked at 75,000.[19] In time the Townsite came to contain a post office, supermarkets, drugstores, shops, churches, nurseries, movie theaters, cafeterias, laundries, a guest house/hotel, schools, a hospital, recreational facilities, trailers, hutments, barracks, dormitories, and houses. [For more information on the buildings at the Townsite, the National Register nomination prepared in 1991 by Thomason and Associates may be consulted].

Materials and equipment were procured through purchase orders, contracts, subcontracts, and formal modifications. Material provision involved thousands of manufacturers and vendors. These came to include DuPont, General Electric, Allis-Chalmers, and Westinghouse, as well as a number of construction subcontractors.

Contracts for design and construction were awarded, but restricted to select companies. Upon the awarding of a contract, contractors were required to isolate that portion of their plant dedicated to Manhattan Project business. No less than one hundred and nineteen (119) field inspector-expediters, twenty-six (26) schedulers, nine (9) "priority men" and eighty-five (85) field stenographers/clerks were employed to inspect and move material. In addition, eleven branch offices were opened in principal manufacturing regions across the country. Originally located in Boston, the expediting office was eventually closed and moved to Oak Ridge.[20]

3.5. The Y-12 Plant

Y-12 is the World War II code name given to the large plant constructed at Clinton Engineering Works in 1942-1943 to exploit the electromagnetic method developed at the University of California. It was the first of the three wartime plants built at Clinton Engineering Works. Also the first of many Manhattan Project facilities built all over the U.S., Y-12 was then considered one of the most important by virtue of being considered the fastest and surest of the gambles in the race for an atomic bomb.

The electromagnetic process was pioneered by Alfred O. Nier of the University of Minnesota, but by 1940, the scientist most closely associated with the process was E.O. Lawrence and his Berkeley staff. The process preferred by Lawrence used a mass spectrometer or spectrograph to send a stream of charged particles through a magnetic field separating U-235 from U-238 by forcing the particle stream through a field of powerful magnets. As Lawrence explained, the lighter U-235 particles formed a curve of shorter radius than the curve formed by the U-238 particles, and by "catching" the "beam" in a "basket" within the calutron's magnets, the isotopes would separate creating the more pure U-235.[21]

Although the most promising, the electromagnetic process was one of many methods the Corps pursued in its atomic research. In the fall of 1942, S-1 ordered a five-tank pilot plant and a two-hundred tank section of a full-scale plant be built at the ORR. The facility was code-named Y-12; neither the letter "Y" nor the number "12" having any significance. The letter and numeral were chosen for the sake of confusion.[22]

---

[19]Overholt, 105.

[20]*Engineering News-Record*, 13 December 1945: 125-127.

[21]Gosling, 6; Jones, 10.

[22]Robinson, 92.

The plant was located in the Bear Creek Valley, along Black Oak Ridge, northeast of X-10 and south of Oak Ridge. The Corps also established a gaseous diffusion plant (K-25) and a liquid thermal diffusion facility (S-50) at CEW.

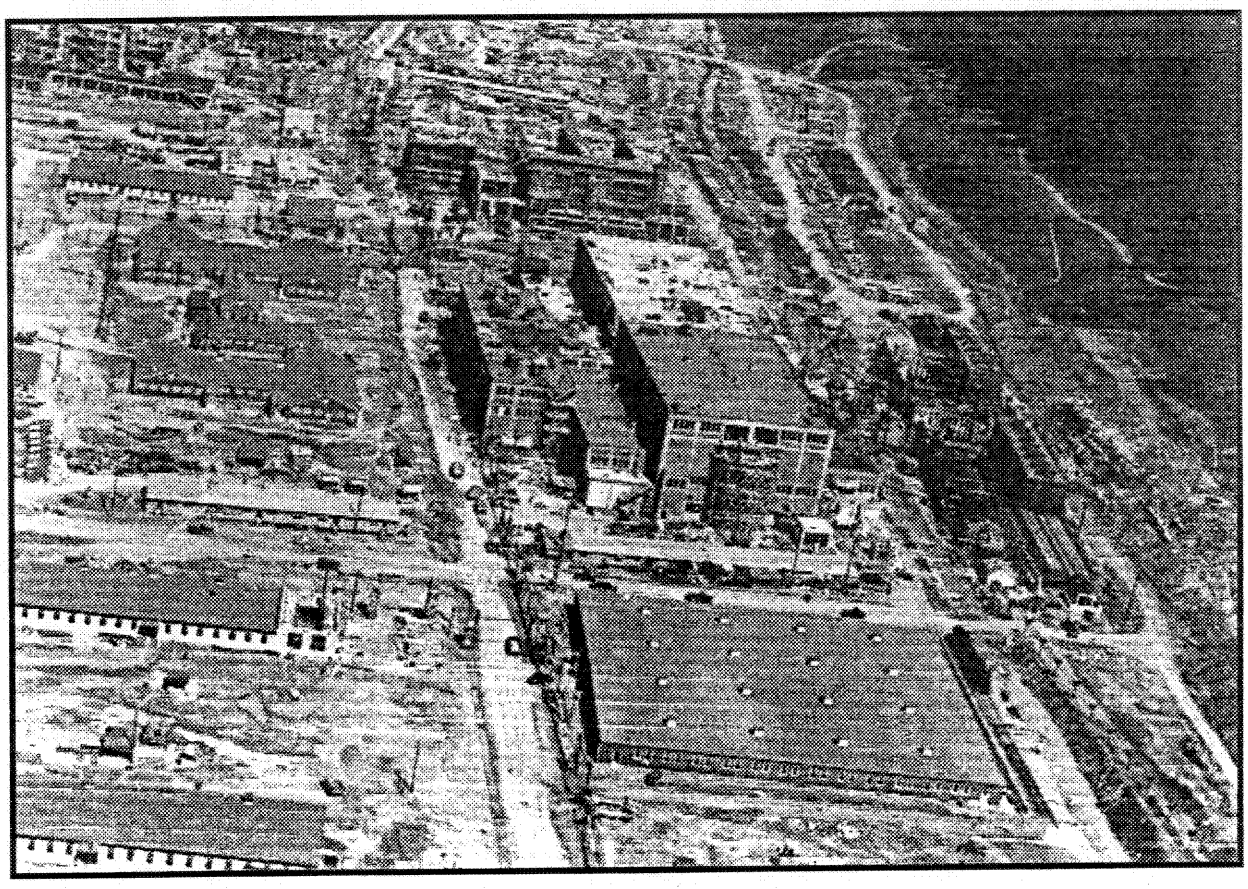


Figure 5: Y-12 Plant Construction, September, 1943.

The Boston based engineering-construction firm of Stone and Webster was selected to design, construct, and manage "central facilities" for the reservation's town, plants, and utility systems. The Tennessee Eastman Corporation served as construction consultant, pursued special research needs, provided training, and operated the plant.[23] The original construction contract estimated building costs would exceed $300 million. Preliminary planning began in the summer of 1942. Assuming the three production facilities would cultivate a town of approximately 13,000, Stone and Webster planned for 3,000 houses, 1,000 trailers, dormitories, cafeteria, a guest house, central laboratory, and an administration building.[24]

Labor was difficult to recruit given the number of highly skilled craftsmen necessary to complete construction. Stone and Webster recruited key personnel from Boston, opened an employment office in Knoxville, and contacted federal/state employment services and a variety of national craft unions. Recruiters were stationed in the south's larger labor centers and directed a steady stream of craftsmen

[23]Ibid, 148; Robinson, 84-85.

[24]R.G. Hewlett and O.E. Anderson, *The New World, 1939/1946: Volume I, A History of the United States Atomic Energy Commission* (University Park, PA: Pennsylvania State University Press, 1969), 170-173.

toward Oak Ridge in the early days of 1943. Special equipment was manufactured, shops equipped with every tool imaginable, and crews of task specific workmen were trained to move from complex to complex.[25] Construction workers, totaling 110,000 men, were employed between November 1942 and August 1945. In April 1944, construction employment reached its peak.

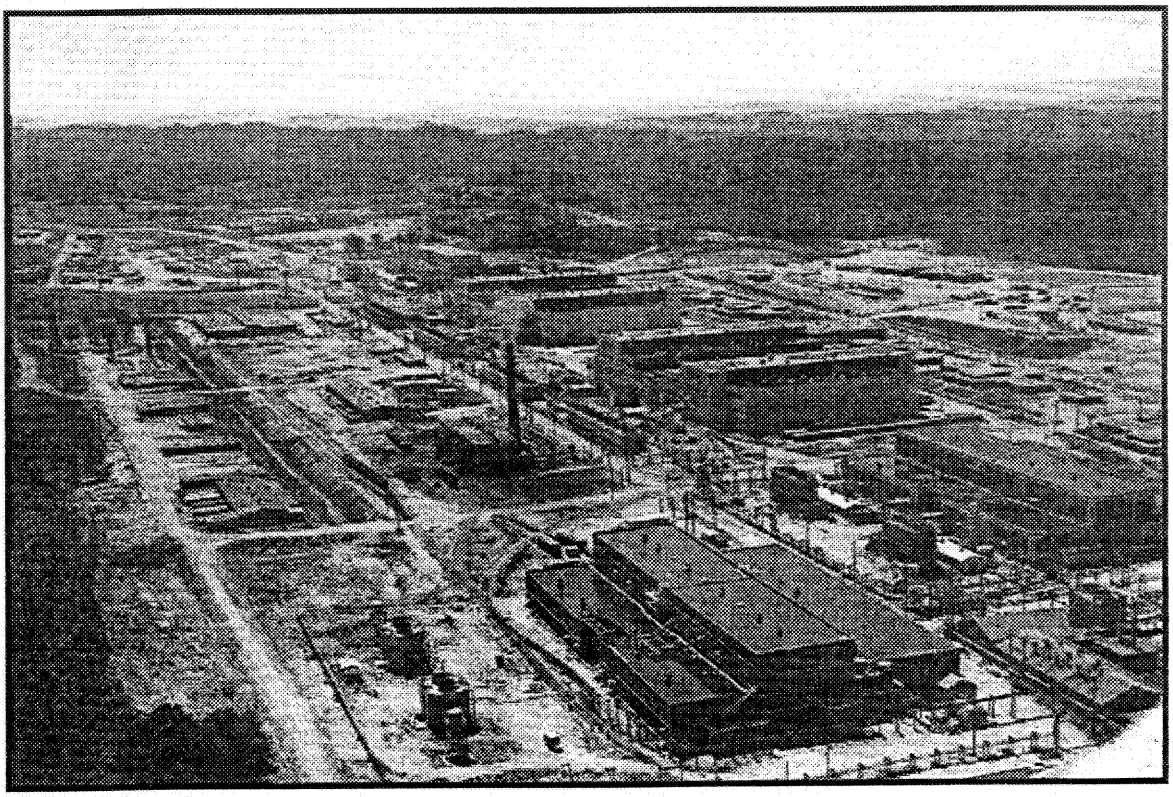


Figure 6: Y-12 Plant Construction, 1943 (*photo courtesy of AMSE*).

The procurement of materials and equipment for Y-12 was a huge undertaking in and of itself. In one four week period, sixty-three rail cars carrying concrete block were unloaded at the plant. In an eleven week period, 1,585 cars of lumber arrived. Almost thirty-eight million board feet of lumber, five million bricks, and 13,000 windows were delivered. Inspector-expediters were forced to rush raw materials to equipment fabricators. As construction peaked in early 1944, Stone and Webster had more than one hundred men following thousands of orders and purchase orders placed by their own company.[26]

Enormous amounts of copper were needed for the calutron's magnet coils and electrical conductors. With the war placing copper in desperately short supply, project personnel were confronted with not only identifying a material capable of conducting electricity but then acquiring several thousand tons. E.O. Lawrence understood the ability of silver to conduct electricity and suggested silver as a substitute.[27] Arrangements were made with the U.S. Treasury, which agreed to make an initial 47,000 tons of silver available and an additional 39,000 tons could be released with Congressional approval.

---

[25]Ibid.

[26]Hewlett and Anderson, 153.

[27]Groves, 47.

At plants in New Jersey, silver bars were cast into cylindrical billets and extruded and rolled into strips. The strips, 5/8 inch thick, three inches wide, and about forty feet long, were wound on the magnet coils by Allis-Chalmers in Milwaukee. The huge bus bars of solid silver, roughly a square foot in cross section and running around the top of the racetrack, were later fabricated at Oak Ridge.[28]

Figure 7: Workers at shift change *(photo courtesy of AMSE).*

To fulfill Y-12's employment needs, Tennessee Eastman organized an extraordinary recruiting and training program. Not knowing the number of workers needed, Eastman's Frederick R. Conklin estimated 4,459 workers would be necessary. In July 1945 the number grew to 7,500 and in August to 13,500.

"Vestibule" training began in June 1943. Wooden cubicles were constructed with dials and knobs. As cubicle operations were changing constantly, the prototypes designed one day were completely obsolete twenty-four hours later. Trainees, most of whom were women, were sworn to complete secrecy. The initial training period ran six to eight weeks with on-the-job training requiring several months more. Scientists were amazed by the women's performance. These women displayed a remarkable ability to master a methodology which until then had been undertaken only by academics.[29] Women generally filled all of Y-12's processing operations - either chemical, physical, or clerical. As a general rule men were assigned to technical, engineering, and maintenance positions.[30]

---

[28]Hewlett and Anderson, 153.

[29]S. Groueff, *Manhattan Project* (Boston: Little, Brown, and Company, 1967), 238-239.

[30]"For Your Information, A Biography of Dr. John M. Googin," Vol. 6,. No. 1 (April 1994), 44.

Figure 8: Y-12 Plant Cubicle Operators, 1944 *(photo courtesy of AMSE).*

At the Y-12 Plant, Stone and Webster were specifically charged with the design and construction of 175 separate buildings - nine of which would enrich uranium. These nine "processing buildings" were designed to house calutrons and to separate U-235 from U-238. As Lawrence explained, the lighter U-235 particles formed a curve of shorter radius than the curve formed by the U-238 particles, and by "catching" the "beam" in a "basket" within the calutron's magnets, the isotopes would separate creating the more pure U-235.[31]

In order to separate these elements, the ionized particles must travel in a very high vacuum or they would be "deflected by collisions with molecules of air." To create the almost perfect vacuum, pumps of much higher speed and lower pressure than those currently in use, were designed. Conditions within the magnetic field must be perfectly maintained, for if conditions varied even slightly, the particle stream would weaken causing the entire refining process to fail.[32]

Research on magnet, placement, size, and beam resolution led to a "racetrack" configuration. This system came to include two magnet tracks with forty-eight gaps per building. Ten buildings (9 production facilities and 1 pilot plant with 2 Alpha and 2 Beta units) were necessary to provide the 2,000 sources and collectors needed to separate the one hundred grams of U-235 Y-12 processed daily.[33] By war's end, Y-12

---

[31]Gosling, 6; Jones, 10.

[32]*Engineering News-Record*, 13 December 1945: 125.

[33]Gosling, 21.

would possess 864 alpha units and 288 beta units.[34] The constant introduction of new technology caused Y-12 itself to become as much an experiment as was the plant's enrichment of uranium.[35]

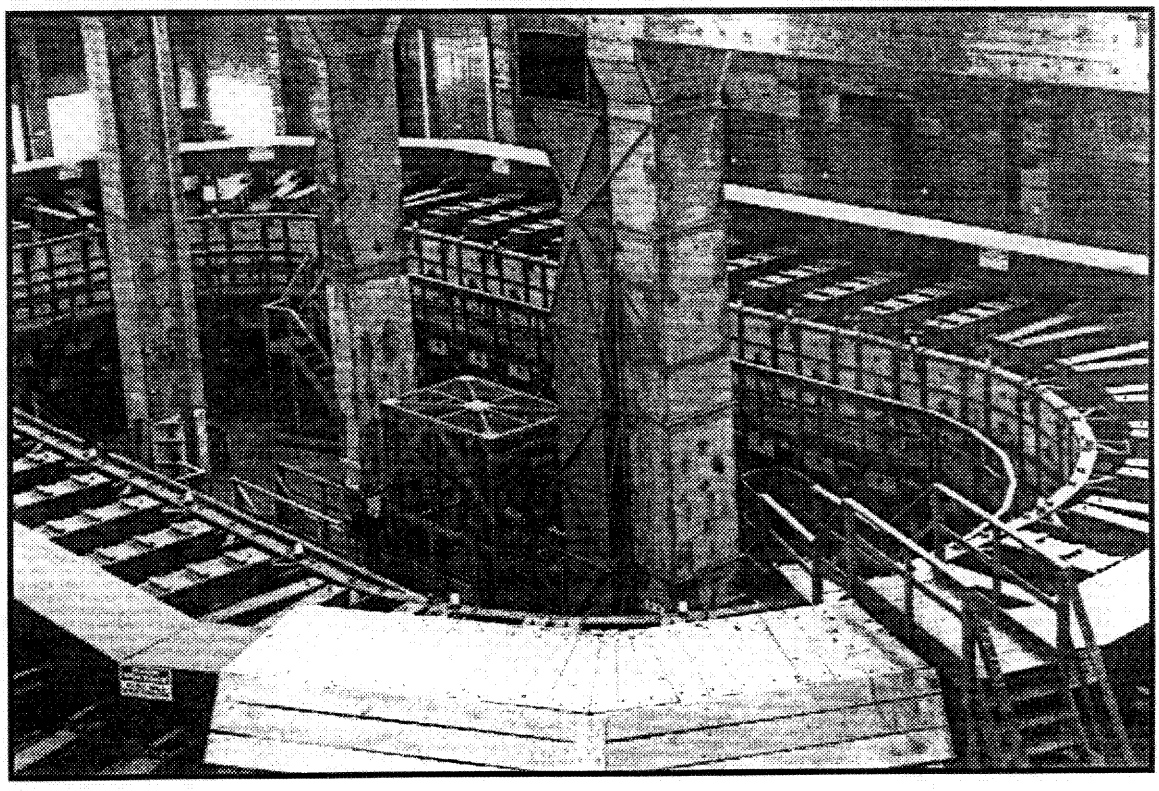


Figure 9: Y-12 Plant, Oval Racetrack, 1944 *(photo courtesy of AMSE).*

On February 8, 1943, with only the building's foundation drawing approved, Stone and Webster broke ground on Y-12's first plant, known as the Alpha Plant. The Alpha Plant involved five oval shaped racetracks, each of which contained ninety-six separators, or calutrons, housed in three long buildings. The racetracks were massive, steel, elliptical structures measuring 122 feet long, 77 feet wide, and 15 feet high. Since two tracks were placed end-to-end on the second floor of each building, the reinforced concrete and masonry structures were nearly 450 feet long. Two-story bays on each side of the racetrack housed complex electrical equipment with the entire ground floor occupied by massive vacuum pumps and cooling equipment. Given the sensitive nature of the project's calutrons, or separators, the buildings housing these facilities were designed with zero tolerance for building movement or "settlement."[36] As separate chemistry buildings were needed nearby, the complex eventually included over 170 buildings on approximately 500 acres.[37]

---

[34]Leon O. Love, "The Early History of the Electromagentic Separation of Large Quantities of Stable and Radioactive Isotopes," (Unpublished Manuscript, 1992), 1.

[35]Jones, 10.

[36]*Engineering News-Record*, 13 December 1945: 130.

[37]Hewlett and Anderson, 149-150; Robinson, 85.

Several technological advances were made in building the actual facility. Many changes however, could not be integrated as delays in one component prompted chain-reaction delays elsewhere. The Beta facilities were modest but necessary to process the small amount of enriched material generated during the Alpha process.[38] The Beta facilities were designed to house two tracks of thirty-six tanks.[39]

By August 1943, Y-12's first Alpha unit was completed with "racetrack" operation scheduled to begin by mid September. Construction had been plagued with problems and failed attempts abounded. Leaks occurred in the vacuum tanks and magnet coils, welds in the magnets failed, and the stress brought by the magnets pulled tanks out of alignment. These obstacles were overcome and Alpha I's start date continued on schedule.[40] Initially the track ran well, but within days, short circuits caused a shut down lasting six weeks. By December these issues had been successfully resolved and Y-12's first Alpha unit was ready to begin the electromagnetic process.

From the first, the track's performance became increasingly unreliable and the system was completely shut down. Rust within the magnet coils appeared to be the track's most significant problem. The coils were removed and shipped to Allis-Chalmers where they were cleaned and special filters added.[41] As a secondary precaution, a pickling plant was constructed at Oak Ridge. Groves ordered that every pipe be removed and processed through the plant eliminating every particle of dust. With additional oil filters installed, the system was reassembled. While the system was ultimately repaired, difficulties continued on a daily basis. Electrical failures, cracked insulators, and corroded chemical tanks were all too common. At one point exasperated scientists discovered a calutron's magnetic seal had been voided by a dead mouse.[42]

While research and construction of the electromagetic process progressed, in July 1943 scientists at Los Alamos reported they would need 300% more enriched uranium than originally anticipated. Even if Y-12's racetracks performed as hoped, it was conceivable the electromagnetic process might fail to enrich sufficient U-235 to produce a bomb ahead of Germany. Certain the electromagnetic process would prove successful, Groves began expanding the size of the electromagnetic plant - in effect double the plant size. The expansion area, designated Alpha II, was comprised of two buildings which each contained two tracks of ninety-six tanks. Magnets here were rectangular with all tanks fronting the same side of the magnet. Alpha I's cold tank sources were replaced with hot sources. Groves pondered constructing yet another Beta building and its vital chemical facilities.[43]

---

[38]Hewlett and Anderson, 151.

[39]Ibid., 157.

[40] Groueff, 239.

[41]Hewlett and Anderson, 162-163.

[42]Groueff, 242.

[43]Hewlett and Anderson, 161.

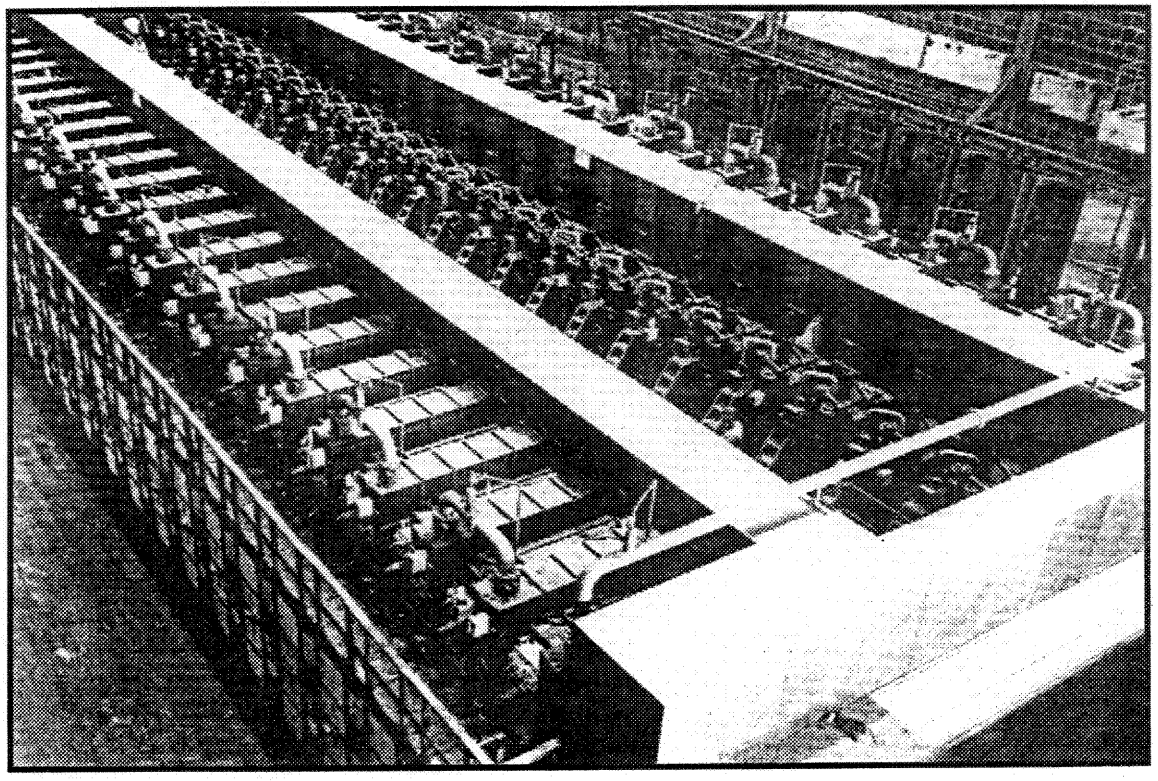


Figure 10: Y-12 Plant, Rectangular Racetrack, 1944 *(photo courtesy of AMSE).*

Each unit within the electromagnetic process was designed to function independently of other units. In case trouble erupted, machinery was designed to be removed or repaired without interfering with the enrichment process. Beta track development boosted Y-12's window of opportunity by enriching pre-processed uranium several more degrees.

This tandem operation brought some degree of reassurance, but it also harbored potential problems. This complex system functioned through a myriad of smaller units designed to enrich several grams of uranium per cycle. Once the process was complete, the system was dismantled, cleaned and then reassembled. Beta units could run three days before cleaning. Alpha units ran for a somewhat longer period. Operating the system required a battery of attendants and an astronomical amount of electricity. Chemists, increasingly frustrated, discovered only 10% of the product captured neatly in the calutron's receiving baskets. The remaining 90% was found embedded in the walls of the calutron.

This frustration was especially critical in the Beta units. As feed material had been enriched to a small degree, any loss of product became a calamity. Chemists, asked to recover the scattered enriched product, were confronted with a knotty problem, one more serious than retrieving uranium from the receiving baskets. While the stainless steel tank liners were washed every third day with nitric acid, many impurities remained. Under these circumstances, successful recovery never looked more dim. A variety of possibilities were proposed, and teams of chemists began working twenty-four hours a day. Y-12's chemical needs came to involve between five to ten thousand people, workers completely separate from cubicle operators.

Dr. Clarence Larson, a Berkeley chemist, headed one of these teams and based his theory on properties unique to uranium: its precipitation by hydrogen peroxide - everyday peroxide sold over-the-counter in

drugstores. As other elements were not condensed by hydrogen peroxide, this methodology offered some degree of hope in recovering uranium. But Larson's attempt failed. Peroxide, Larson learned, decomposed in the face of iron. Before Larson could be pleased with his experiment, the peroxide condensed throughout the lab, causing yet one more frustration. Chemists were thrown into despair. The Beta operation was pointless if 90% of the enriched uranium was permanently embedded in the calutron's walls.

Despite the failed attempt, the peroxide's decomposition seemed somewhat familiar to Larson. He recalled a similar deterioration in plant proteins from his years as a biochemist. He remembered that by keeping materials cold, decomposition had not occurred. Materials were varied; but Larson tried again, this time in a double walled vessel where a cooling system had been installed. This time decomposition was prevented resulting in the successful separation of the enriched uranium from its impurities.[44]

Lawrence and his team continued exploring means of improving the electromagnetic process. They discovered that hot (high positive voltage) electrical sources could replace the single cold (grounded) source, a method providing not only increased efficient power usage, but one which decreased insulator failure, and made multiple rather than single beams possible.[45] In the meantime, receiver design evolved rapidly enough to be included into planning for the Alpha plant. In March, 1943, with the Beta process officially authorized, work increased at the Radiation Laboratory.

By December 1944, belief in the electromagnetic process had returned to Y-12. The alpha cycle was working successfully and two additional Alpha facilities had been erected. The Beta cycle was well established with "top grade product" produced. In the Beta Buildings, Larson's cold peroxide precipitation process was working with Building 9206 functioning as the heart of the system. Soon material generated at Y-12 exceeded 90% enrichment. The electromagnetic gamble paid off, and by late summer, five Alpha buildings and three Beta units were fully operational.[46]

Tentative success hallmarked the initial combination of K-25's product with that produced by the Alpha process at Y-12. The attempt proved sound, and the assay produced eventually surpassed assay generated through the alpha stage of the electromagnetic process. Beginning in April, 1945, K-25 produced only 1.7% enriched uranium. The percentage began improving in June and by July reached 10.7%. The levels only increased and by August grew to 23% enrichment. By August, K-25 was producing 21.5Kg's per day at a unit cost of $41 per gram. This growth effectively proved that K-25 could enrich six times more product (2.15 Kg per day versus 0.348 Kg per day), at a unit cost twenty times less ($40 per gram versus $800 per gram) and at a greater concentration than Y-12 alpha process (23% versus 13.6%). Enrichment levels increased and by December, 1945 enrichment at K-25 reached 29%.[47] The Beta process was still needed to get to 90%.

Following President Roosevelt's death on April 12, 1945, Harry S. Truman assumed the presidency and thus ultimate control of the Manhattan Project. Truman had little prior knowledge of the Manhattan Project. In the eighty-two days Truman served as Vice President, he had met Roosevelt privately on two

---

[44]Groueff, 244 - 245.

[45]Hewlett and Anderson, 155.

[46]Groueff, 245.

[47]History, Electromagnetic Process 1944 -1947, n.d..

occasions. Nothing of importance had been mentioned either time. Beyond the memorandum FDR had signed at Hyde Park, the Manhattan Project had no policy statement. A portion of the document read that once the weapon was prepared, "It might perhaps, after mature consideration, be used against the Japanese, who should be warned that this bombardment will be repeated until they surrender."[48]

In the moments after Truman's inauguration, Henry Stimson, Roosevelt's Secretary of War, broached the topic of the Manhattan Project. Stimson explained "a matter of the utmost urgency" must be explained and that it involved "a new explosive of unbelievable power."[49] Twelve days into his presidency, Truman learned fully of the Manhattan Project. Stimson had prepared a memorandum: "Within four months we shall in all probability have completed the most terrible weapon ever known in human history, one bomb of which could destroy a whole city."[50]

The Manhattan Project, having proved itself successful, had assumed "a life of its own." The project had effectively weathered the death of FDR and was functioning well as the Truman administration assumed control. Scientists now believed there were two possibilities for producing an atomic weapon. The first option lay with the plutonium generated at Hanford. The second option lay in using fissionable material from Oak Ridge in a gun-based device.

Meanwhile, Los Alamos scientists were not certain the "Fat Man" device, the implosion weapon designed with Hanford's plutonium would work. A test of the device was conducted on July 16, 1945, and proved successful.[51] There was less uncertainly surrounding Oak Ridge's uranium bomb, and "Little Boy" was not tested. The Manhattan Project had achieved its goals and produced not one but two atomic weapons.[52]

As bomb development neared its end, decision makers realized these atomic weapons could be ready by August, 1945. And scientists began to debate whether the weapons should ever be used. Moral and ethical questions were raised, and a petition drive began urging the weapons not be employed.[53]

S-1 met on Wednesday, May 9, 1945 to discuss the deployment of the U.S. Atomic weapons. Chaired by Secretary of War Henry Stimson, the Interim Committee on the Manhattan Project included eight other members: Karl T. Compton, president of MIT; Ralph A. Bard, Under Secretary of the Navy; James Bryan Conant, president of Harvard; Vannevar Bush, president of the Carnegie Institute; William L. Clayton, Assistant Secretary of State for Economic Affairs, and George L. Harrison, president of the New York Life Insurance Company.[54] Further meetings scheduled for the 14th and 18th of May followed the initial May 9th session. A meeting, spanning two days began on May 31st. Following long and often heated arguments, committee members and their advisors hammered out three conclusions:

---

[48]D. McCullough, *Truman* (New York: Simon and Schuster, 1992), 379.

[49]Ibid., 348.

[50]Ibid., 377.

[51]Gosling, 40.

[52]Hewlett & Anderson, 301 - 302.

[53]Johnson & Jackson, 159.

[54]McCoullough, 390.

1) The bomb should be used against Japan as soon as possible.

2) It should be used against war plants surrounded by worker's homes or other buildings susceptible to damage, in order "to make a profound psychological impression on as many inhabitants as possible."

3) It should be used without warning.[55]

These recommendations were reported to the President by Stimson who stressed S-1's role was entirely advisory. Truman later wrote:

> The conclusions of the Committee were similar to my own, although I reached mine independently. I felt that to extract a genuine surrender from the Emperor and his military advisers, there must be administered a tremendous shock which could carry convincing proof of our power to destroy the Empire. Such an effective shock would save many times the number of lives, both American and Japanese, that it would cost.[56]

Motivated by a desire to end the war in the fastest way possible, the Truman administration began to ponder a Japanese invasion. Given Japan's refusal to surrender, the United States forged ahead with plans to drop the bomb.

The Enola Gay departed the Marianas on August 6, 1945. On board was the "Little Boy" bomb, the uranium-gun weapon produced in the Oak Ridge plants. The bomb was dropped on the city of Hiroshima immediately killing almost 100,000 people and fatally injuring 100,000 others. Hiroshima's destruction was felt for five square miles.[57] Truman's statement followed immediately:

> Sixteen hours ago an American airplane dropped one bomb on Hiroshima . . . It is an atomic bomb. It is a harnessing of the basic power of the universe . . . We are now prepared to obliterate more rapidly and completely every productive enterprise the Japanese have above ground in any city. We shall destroy their docks, their factories, and their communications. Let there be no mistake; we shall completely destroy Japan's power to make war . . . If they do not now accept our terms they may expect a rain from the air, the like of which has never been seen on this earth . . .[58]

Within hours of the bombing President Truman released a second statement warning Japan bombing would continue if unconditional surrender did not result. On August 9, 1945, the American's second atomic weapon, the "Fat Man" device made with Hanford's plutonium, was dropped on Nagasaki.[59] While casualties were similar to Hiroshima, physical damage was limited due to the hills surrounding the city. Japan surrendered to American forces on Tuesday, August 14, 1945.

---

[55]Ibid., 391.

[56]Ibid., 394.

[57]Gosling, 51.

[58]Ibid., 455.

[59]Ibid., 53.

3.6. The Cold War Era

Within weeks of Japan's surrender, Congress decided to make the Oak Ridge plants permanent facilities with a focus on peacetime applications. In August, 1946, the Atomic Energy Act became law transferring management of America's nuclear research program from military to civilian direction. The act established the Atomic Energy Commission (AEC), which assumed leadership of the Oak Ridge facilities from the MED on January 1, 1947.

Union Carbide took charge of plant operations on May 4, 1947. The K-25 and K-27 cascades were working so well that Y-12 was rendered unnecessary.[60] So, with the exception of a single Beta unit, Y-12 was closed. Employment at Y-12 dropped from 8,600 to 1,500 reducing operational expense by $2 million a month.[61] In the ensuing years, uranium enrichment continued at K-25 while Y-12 was converted to the precision machining of weapons components.

Drastic staff reductions were the norm for the entire reservation. In 1945, 82,000 people were employed on the reservation. In the three months following the bombing of Hiroshima, 51,000 workers remained on the reservation. By June 1946, reservation employment had dwindled to 34,000.

Y-12 was assigned a new mission of becoming a vital part of the growing Nuclear Weapons Complex (NWC), one of what came to be twelve production facilities spread over the U.S., each with a unique role under the leadership of the AEC's Albuquerque Operations Office. Y-12's mission evolved into producing some of the key components of nuclear weapons and test devices needed for the greatly expanding nuclear weapons stockpile for the nation's defense and in storage of the nation's highly enriched uranium stockpile. Y-12 succeeded in carrying out that challenging mission, responding to tight production schedules and to fast changing and often beyond the state-of-the-art technologies demanded by new weapons designs over a period of almost half a century.

In the years leading to World War II, the United States had not pursued science as a national interest. But to achieve an Allied victory, the federal government had funded scientific research. Federal funding, in the years following the war, was continued. Indeed, science was seen as the doorway to power and success. Research centered on a wide range of topics. Among them numbered spy planes, atomic weapons, advanced computers, improved radar systems, and long range missiles. The National Science Board, the National Science Foundation, and the Science Advisory Committee were organized. The U.S. Army and U.S. Navy continued their individual research efforts. In 1947 Clinton Laboratories became Clinton National Laboratory. The name was changed in 1948 when the lab became the Oak Ridge National Laboratory (ORNL).

In February 1950, ORNL and Y-12's research divisions merged, placing Y-12's calutrons within easy reach of ORNL staff (Johnson and Schaffer 1992: 59 - 60, 78). As Y-12's physicists had constructed the calutrons during the war, they eagerly anticipated using them during peacetime. Between the late 1940s and early 1950s, physicists constructed three cyclotrons (later synchrotrons) to examine properties of compound nuclei and heavy particle reactions.

In the late 1940s, Robert Livingston and his team built the 22-inch cyclotron in building 9204-3 (Beta-3) to test the use of electromagnets in calutrons and examine the ways high-current calutron ion-source

---

[60]Hewlett and Anderson, 628 - 630.

[61]Ibid., 646.

techniques could be applied to cyclotron functioning. In November 1950, the 86-inch cyclotron installed in Building 9201-2 (Alpha-2) became operational and was used in the Aircraft Nuclear Propulsion Project to perform radiation damage studies. The cyclotron housed in Alpha-2 was used primarily for producing isotopes related to nuclear medicine. In 1951, engineering divisions from ORNL, the Reactor Experimental Engineering Division and the Aircraft Nuclear Propulsion Division (ANP), occupied buildings at Y-12. The ANP occupied Buildings 9704-1 and 9201-3 while staff of the Reactor Experimental Engineering Division acquired Building 9204-1.[62]

Y-12 housed ORNL scientists who came to fill the Biology, Chemical Technology, Engineering Technology, and Fusion Energy Divisions. Y-12 support of ORNL research involved parts fabrication for the High Flux Isotope Reactor, the Molten Salt Reactor Experiment, the Oak Ridge Isochronous Cyclotron, and the DCX fusion experiment.[63] ORNL personnel staffed in Y-12 buildings pursued initiatives whose interests diverged from plant and experimental grafting studies to cancer research.[64]

Alexander Hollaender, leader of the Biology Division, explored the impact of radiation on living cells. His study was inclusive of proteins and nucleic acids found within the cell. Hollaender's division became the world's largest biological laboratory.[65] The Biology Division occupied former Chemistry buildings, currently vacant, at Y-12. ORNL staff occupied buildings 9207 and 9210. The research undertaken there forever altered scientific practice.

Much of the research undertaken by the Biology Division centered on radiation experiments directed by William and Liane Russell. The Russell's work focused on mice and was designed to explore the effects of radiation of mammals. By 1949, the program had grown to include 10,000 mice. In 1950, Liane Russell exposed gestating mice to varying amounts of radiation. Her work revealed information critical to understanding stages of embryonic development. Her work proved exposure to radiation during gestation could alter embryonic cell formation and structure. This discovery led doctors to caution women of exposure to radiation during pregnancy.

Waldo Cohn began the Laboratory's radioisotope program. He applied ion-exchange chromatography to separate fission products and practiced the same technology to identify and separate the basic components of nucleic acid. Cohn worked with Elliott Volkin and the two discovered that ribonucleic acid (RNA) possessed the same basic structure as deoxyribonucleic acid (DNA), a discovery that fundamentally changed the study of virology, molecular biology, and genetics.[66] A Biophysical Separations Laboratory was began, and used centrifuge technology adapted from K-25 to explore the complexities of leukemia.

Other areas explored by the Biology Division included the freezing and transplanting of embryos, prompting innovations in animal husbandry. Cancer research was yet another area of focus. In 1965 the Biology Division gained the support of the National Cancer Institute for establishing a Carcinogenesis Research Laboratory. In 1968 a smoking related study was begun.

---

[62]*Engineering Technology History* 1992: 15.

[63]Oak Ridge National Laboratory, "Review," Vol. 25, Nos. 3 and 4, 1992: 2.

[64]*Business Week*, "AEC Unlocks Some Files For Business" 2 October 1965: 54.

[65]Oak Ridge National Laboratory, "Review," Vol. 25, Nos. 3 and 4, 1992: 39, 41

[66]*ORNL Review*: 90 - 91.

Y-12 also played an important role in Project Sherwood, which researched whether or not the detonation of a thermonuclear weapon would touch off a chain reaction destroying the earth and its' atmosphere. The AEC directed ORNL to construct a cyclotron to determine if this theory were indeed fact. Housing the new unit in Beta-3 (Building 9204-3), ORNL erected and tested the unit within 18 months of the original request. Testing began in 1952 and was led by Dan Scott and Harry Reynolds. The team soon discovered a hydrogen bomb would not initiate a chain reaction immolating the earth. Their focus then turned the unit's capability to basic research. The cyclotron became the world's first source of energetic heavy ions, creating "the interactions of complex nuclei in a new field of scientific investigation," an endeavor which allowed ORNL to pursue heavy ion nuclear science.[67]

In late 1945 the Y-12 Plant was selected to house the Stable Isotope Separations Program. As Y-12 and its 1100 separators (calutrons), could not compete with K-25's gaseous diffusion process, Y-12 was scheduled for closure.[68] During the war years, Y-12 scientists learned the EM process was unsurpassed when isotopic purity or flexibility. Y-12's "pilot plant" (Building 9731) housed four calutrons and the first stable isotope production was generated in the two beta units found in the building. It was during this period that Tennessee Eastman and Manhattan Engineering District officials gathered to discuss using Building 9731 to produce enriched materials for applied and basic research. Correspondence was exchanged between E.P. Wigner of Clinton Laboratories and A.V. Peterson of the MED.

To better understand the significance of the stable isotopes separation program, one must realize that before its formation, only the isotope deuterium had been separated in appreciable amounts. To that date most physical isotopic characteristics were unknown, though definitely subjects of conjecture. Because isotopes could not be physically examined scientists could not know an isotope's mass, physical property or occurrence. The stable isotope program examined these properties providing the foundation for future nuclear research.[69]

Organization of the stable isotope separation program began in 1946. By 1957, the effort had grown to include optical and mass spectrometry. It was in 1957 the Stable Isotope Section assumed responsibility for all separations. The section's workload included facility management and exploring the process in the alpha-active isotopes of plutonium.

Understanding the properties of corrosion was always of prime concern to Y-12 physicists and engineers. To better understand the phenomenon, technology (ultrasonic detectors and highly sensitive X-ray equipment) were designed. Following this development the methodology was used by NASA to identify imperfections in heat shields, in "proving out" rocket-nozzle inserts, and in testing components critical to the Polaris submarine.[70]

Y-12 was deeply involved in the federal government's "Plowshare" effort designing, developing and operating tooling equipment required for the weapons effort. Y-12's interest in the manufacture of

---

[67]Ibid., 79 - 80; W.E. Thompson, "History of the Oak Ridge National Laboratory 1943-1963," (Oak Ridge: Oak Ridge National Laboratory, 1963), 145 - 146; Overholt, 362.

[68]Love, 1.

[69]Ibid., 133.

[70]Ibid., 58.

fissionable material for nuclear power plants developed with the industry. The production of stable isotopes for business and medical needs was also continued.[71]

Union Carbide ended its tenure as facilities operator in 1982. Martin Marietta was awarded the operating contract in 1983 and assumed control the next year. Energy Systems, Inc., a subsidiary organization, was established to administer the reservation and associated facilities.[72] Throughout the years of the Cold War, Y-12 was involved in every nuclear weapons program conducted by the United States, and many non-nuclear projects as well.

3.7. Post-Cold War Missions

With the end of the Cold War, Y-12's focus on weapons production decreased sharply. In 1991, President Bush announced that the U.S. would stop all underground testing of nuclear weapons, would stop the design of any new nuclear weapons, and would cut the nation's nuclear weapons stockpile from over 30,000 to around 3,000. The year 1992 saw a new era begin at Y-12, characterized by major cut-backs in production work, cutting back on the number of buildings in operation to reduce operating costs, and an emphasis on transferring Y-12's unique manufacturing technology to American industry where classification permitted. Other on-going missions included storage of the nation's stockpile of weapons-grade highly enriched uranium for the DOE ORO, disassembly of some weapons/components each year to study aging and other effects, production of the small number of nuclear weapons parts and assemblies needed to replace units taken from the stockpile; decontamination and decommissioning of unused buildings, and environmental and waste management.

As part of the effort to make U.S. companies more competitive, Y-12 and ORNL have been involved in technology transfer since 1984, when Martin Marietta Energy Systems Inc. (MMES Inc.) began managing both facilities for DOE. Technology transfer was identified in Martin's contract as a primary mission. As a result, both organizations offer a wide range of technology transfer options. Y-12's three year relationship with the Coors Ceramics Company runs the gamut of these options. This relationship became one of the reasons Coors decided to build a new ceramics manufacturing facility in Oak Ridge.[73] Among the agreements Coors has entered into with Y-12, calls for plant personnel to perform nondestructive evaluations of ceramic tubes used in lasers. These evaluations take two forms: measuring the material properties of the tubes and searching for cracks and defects that can cause them to fail.[74]

On January 12, 1995, Energy Secretary Hazel O'Leary visited Oak Ridge to honor Project Sapphire team members. Under Project Sapphire, a team of thirty-one people from Energy Systems and others from ORAU, DOE and EG&G spent six weeks in Kazakhstan, formerly a part of the Soviet Union, to examine, repackage and retrieve 600 kilograms of "weapons-capable" enriched uranium. Some one hundred people were involved in the project. These support personnel performed a wide range of activities in helping team members prepare for the mission. Involvement included equipment preparation and conducting readiness, quality assurance, and environmental assessments.

---

[71]Ibid., 54.

[72]Johnson and Schaffer, 207.

[73]Ibid., 68.

[74]Ibid.

The project was hailed as an important step in nuclear non-proliferation as it withdrew a significant amount of weapons-grade material from potential terrorists. The material was brought to Y-12 in November, 1994 and stored until it could be blended into low-enriched uranium by private industry and sold as commercial reactor fuel.[75]

On January 3, 1995, the Y-12 calutrons operated by ORNL staff were placed back in service after three years in standby. Since World War II, the electromagnetic separation units have provided high quality stable (non-radioactive) isotopes vital to medicine, scientific, and industrial research. Y-12's calutrons also produced "enriched precursors" to radioisotopes and included: thallium-203, the precursor to thallium-201 (used for heart scans), zinc-68, the precursor to gallium-67 (used for tumor imaging); and strontium-88 (source of Sr-89, Metastron, proves effective as a treatment for cancer-induced bone pain).[76] This facility competes on the world market with a similar facility in Russia and operations are cyclical depending on market conditions.

Today, Y-12 continues to be a center for specialized development and high-precision manufacturing for government and non-government needs. Y-12 is now in the preliminary design stage for the Highly Enriched Uranium Materials Facility, the next major step in improving the storage of the nation's inventory of highly enriched uranium. Prototype development for a new beryllium manufacturing facility is also presently underway.

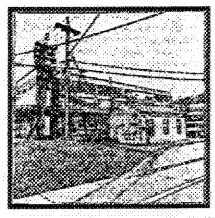
3.8. Summary

The construction and operation of the Y-12 Plant was a key element in the success of the Manhattan Project during World War II. The Alpha and Beta Racetracks supplied the enriched uranium necessary for the atomic weaponry which helped end the war. Following World War II, the plant continued to be a center of nuclear weapons and materials research and design. Significant contributions in these years include the production of lithium- and genetic research on the effects of radiation. Much of the existing physical plant and appearance of Y-12 reflects the legacy of its World War II and Cold War eras.

---

[75]*Energy Systems News*, "O'Leary Gives Personal Praise To Project Sapphire Team," Vol 12, No. 2 (January 26, 1995): 1.

[76]*Energy Systems News*, "Calutrons Resume Isotope Production", Vol. 12, No. 3, (February 9, 1995): 1.



4.0 Y-12 HISTORIC PROPERTIES

4.1. The 1995 Architectural/Historic Evaluation of the Y-12 Plant

In 1995, an intensive Architectural and Historic Evaluation was completed for the properties at the Y-12 National Security Complex (final version-1999). This survey was conducted in accordance with Section 106 of the National Historic Preservation Act of 1966 (as amended). The survey evaluated all buildings, structures and sites for eligibility for the National Register of Historic Places. A total of 248 properties that encompassed the range of facilities located on the grounds of the Y-12 Plant were individually surveyed for this project. The plant's additional 325 facilities were identified and categorized by design and use.

The results of the 1995 survey were presented in the report "Architectural/Historical Evaluation of the Y-12 Plant, Oak Ridge Reservation, Anderson County, Tennessee." The report identified a large historic district within the plant. The proposed "Y-12 Historic District" originally contained ninety-six (96) buildings and structures that would be considered contributing to the character of the district. Three buildings were listed as contributing to the district in error: Buildings 1405, 1501-1, and 9712. These three buildings are located well outside the boundaries of the historic district and do not possess sufficient architectural or historical integrity to be contributing but noncontiguous elements. Also, the Pine Ridge Guard Tower was originally a contributing but discontiguous element to the district. The property on which the guard tower is situated was transferred to the City of Oak Ridge. The railroad tracks that extend along the southern boundary of the historic district have been added as a contributing structure to the district. Since the completion of the 1995 survey, seventeen contributing buildings to the Y-12 Historic District have been approved for demolition. Memorandums of Agreement between the SHPO, Council and Y-12 officials were prepared for these properties. As a stipulation of the MOAs, these buildings were documented through maps, photographs, and structural and architectural drawings. The Y-12 Historic District currently contains seventy-seven contributing properties and structures.

The district is eligible for listing in the National Register of Historic Places under Criterion A for its historical associations with the Manhattan Project, development as a nuclear weapons component plant within the overall post-World War II government sponsored scientific movement, and early nuclear development activities. The district is also eligible under Criterion C for the engineering merits of many of the properties and for its contributions to science.

The 1995 report concluded that the proposed district also meets National Register Criteria Consideration G for exceptional significance for properties less than fifty years of age, with the period of significance extending to 1958. The 1958 date reflects the initial development of the Y-12 Plant, the closure of the Manhattan Era uranium enrichment program, and the end of certain national trends in scientific research.

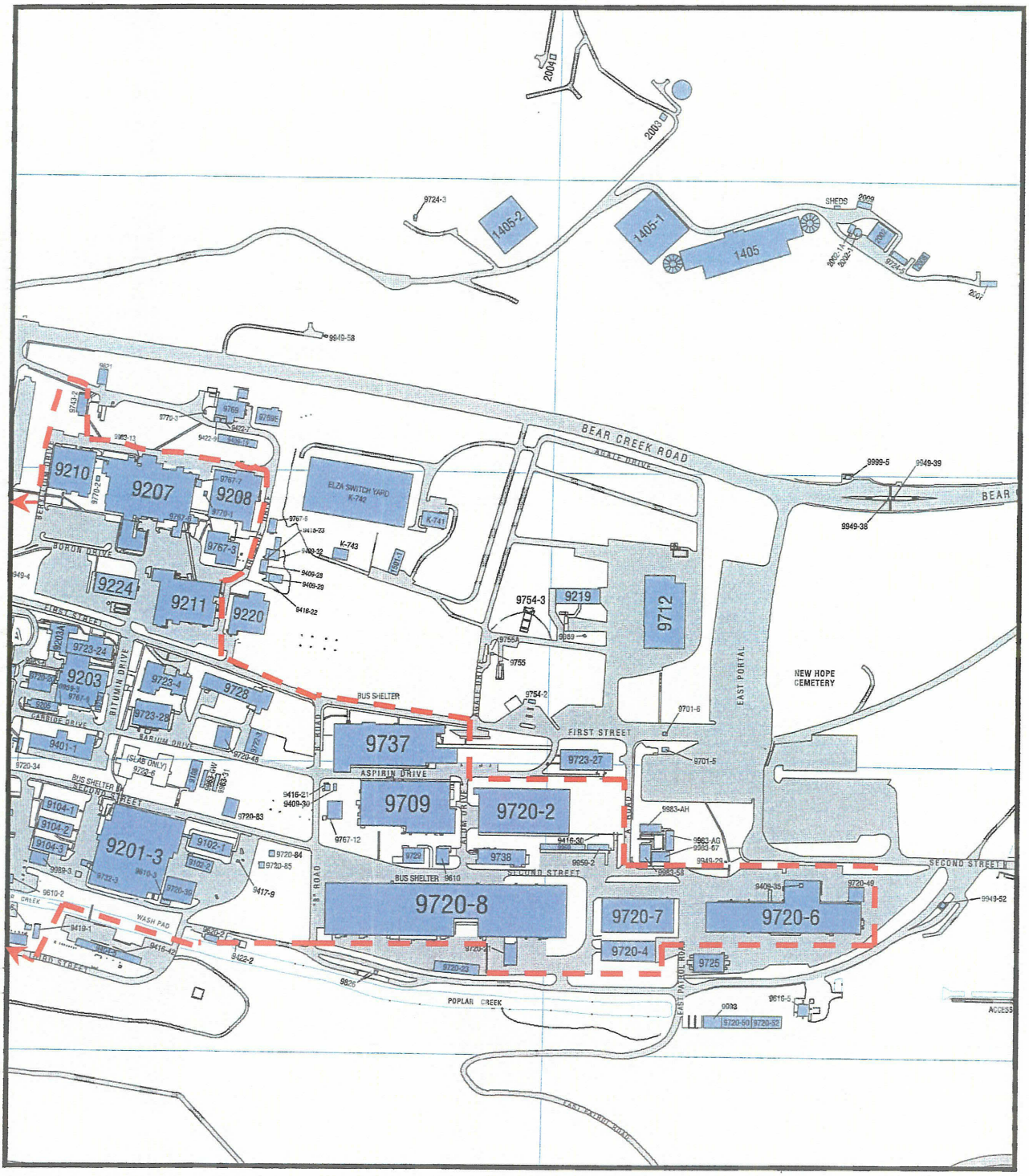


Figure 11: East End of the Y-12 Complex with the proposed Y-12 National Register Historic District outlined in red.

Figure 12: Mid Section of the Y-12 Complex with the proposed Y-12 National Register Historic District outlined in red.

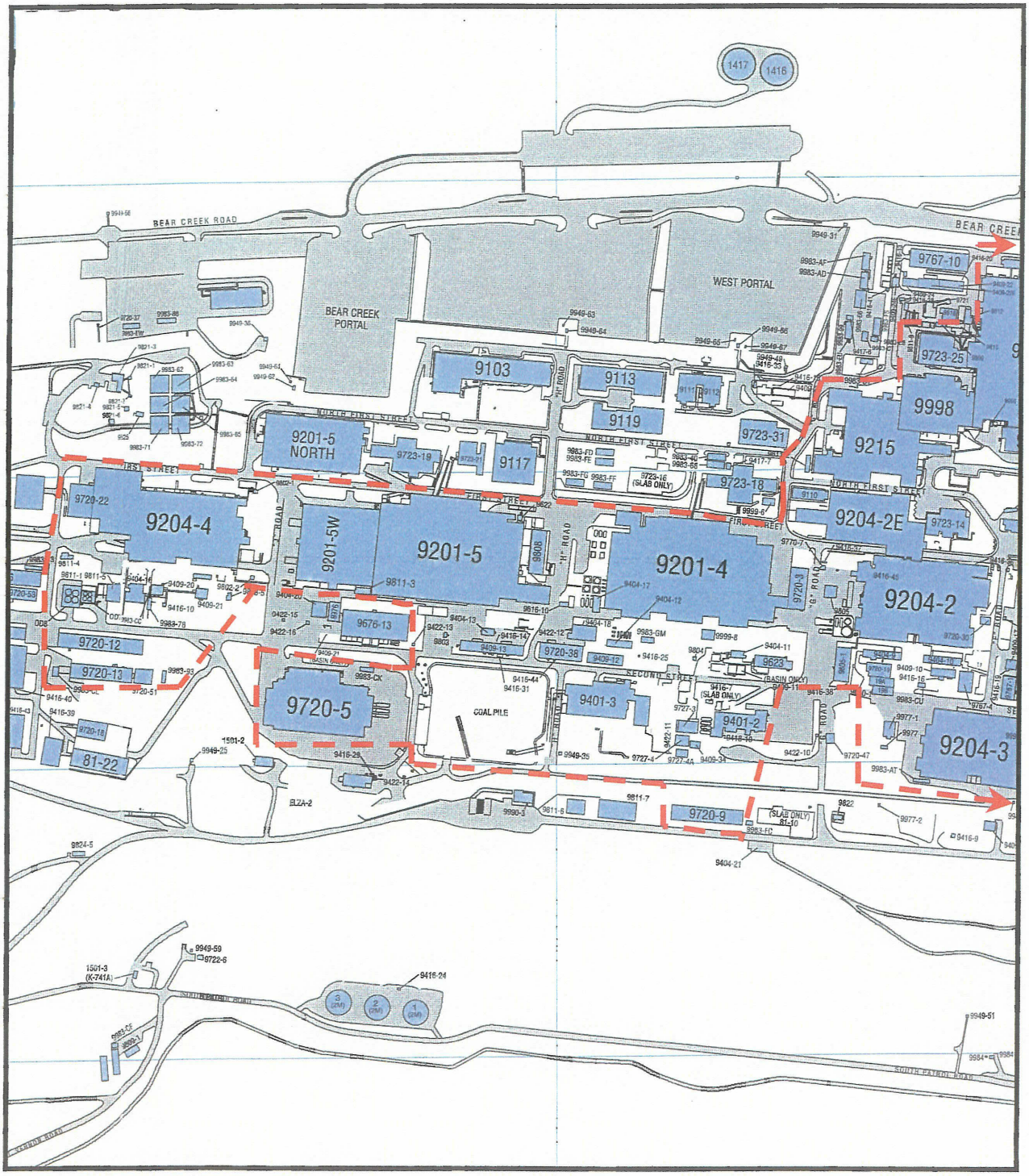


Figure 13: West End of the Y-12 Complex with the proposed Y-12 National Register Historic District outlined in red.

4.2. Cold War Significance

With the end of World War II in 1945, America entered into what became known as the "Cold War" with the USSR, China, and their allies. The Cold War era lasted until 1989 when the Berlin Wall was dismantled and the USSR dissolved into separate nations. The architectural and historical survey of the Y-12 Complex in 1995 evaluated properties for their significance in both World War II and the Cold War. Information on the Manhattan Project and related World War II history was readily available, however, research on the role of Y-12 during the Cold War was limited. Since the completion of the survey in 1995, data on the Cold War significance of Y-12 has been enhanced. In 2001, William J. Wilcox Jr. published An Overview of the History of Y-12, 1942-1992. This document provides additional information on the role of Y-12 during the Cold War.

The Cold War significance of the Y-12 Complex and DOE's other operations at the Oak Ridge Reservation continues to be studied. However, some operations at the Y-12 Complex are clearly notable and this historical significance must also be evaluated and assessed in future planning for the facility. The most important contributions to the Cold War based on the available information are summarized as follows:

Research and Development in the Components, Materials, and Subassemblies of Nuclear Weapons

Within sixteen months of the end of World War II, all of the Alpha and Beta units at Y-12 were shut down because of the success of the gaseous diffusion plant at K-25. The K-25 plant proved to be the most efficient operation for the supply of enriched uranium and the electromagnetic processes at Y-12 were no longer needed. One Beta building, 9204-3 (Beta-3), was left operational on an experimental basis to improve the efficiency of the calutrons. In May of 1947, the Tennessee Eastman Company, which operated Y-12 during World War II, was relieved of its responsibilities and a new contractor, the Carbide & Carbon Chemicals Company (C&CC) assumed plant operations. C&CC was a division of the Union Carbide and Carbon Corporation.

Under the operations of C&CC, the Y-12 Complex began their new mission - research and development to provide components and subassemblies of nuclear weapons for the National Defense stockpile. As the Cold War progressed, the need for more precision tooling and designing of nuclear weapons increased dramatically. Nationwide, Y-12 was in the forefront of these efforts and produced state-of-the-art machine tools over the next several decades. These included advances in template-controlled tools in the 1950s, tape controlled tools in the 1960s, and computer-controlled machines in the 1970s. In addition to this important work, Y-12 was also a center of research in material components for nuclear weapons. In 1952, Building 9995 was constructed as a laboratory in the analytical chemistry field for the Nuclear Weapons Complex. Y-12 was also responsible for the research and development in the production and utilization of various materials for weapons parts. These materials included high purity enriched and depleted uranium, uranium alloys, beryllium, lithium hydride and deuteride, and tungsten. Engineers and research scientists at Y-12 patented hundreds of new designs and machines which were utilized in the production of America's nuclear arsenal during the Cold War. Many of these patents have benefited the public in ways unrelated to the weapons programs.

Buildings significant under this context:

Building 9206:	Production (highly enriched uranium)
Building 9212:	Production (highly enriched uranium)
Building 9215:	Production (machine tooling and fabrication)
Building 9733-1:	Research and Development

Building 9733-2:	Research and Development
Building 9733-3:	Research and Development
Building 9995:	Research and Development (Note: This building was included as non-contributing to the district in 1995. This building should be reassessed for its Cold War significance)
Building 9998:	Production (highly enriched uranium)

Development of Zirconium Purification Procedures

In 1949, Y-12 was given the assignment of producing pure zirconium from the mineral zircon. The removal of the naturally occurring impurity hafnium was necessary in order to produce pure zirconium, and Y-12 scientists were able to achieve this goal by early 1950. At Y-12, this research was carried out by the Chemical Development Department in Buildings 9733-1 and 9733-2. The plant to produce the zirconium was built within the existing Building 9211. Zirconium was essential to contain and clad the reactor fuel in a nuclear submarine. This allowed the Navy to begin building nuclear submarines in June of 1952. The first such submarine, the *Nautilus*, was launched in January of 1954, and during the 1960s the Navy's nuclear submarines emerged as one of America's most potent offensive weapons during the Cold War.

Buildings significant under this context:

Building 9211:	Production
Building 9733-1:	Research and Development
Building 9733-2:	Research and Development

Development of the ELEX and COLEX Processes

On January 31, 1950, President Harry Truman gave final approval for the development of a hydrogen bomb. One of the experimental components of this proposed new weapon was the light isotope of lithium, lithium-6 (Li-6). Separating this isotope from the more plentiful and naturally occurring Li-7 required the development of the ELEX and COLEX processes at Y-12. The ELectrical EXchange or ELEX process was developed in the laboratory by ORNL scientists. In the ELEX process, the rate of exchange of the lithium-6 and -7 isotopes were manipulated within a strong electrical field to produce highly enriched Li-6. The ELEX production pilot plant was begun in 1951 and housed in Building 9201-2 (Alpha-2) until 1952. The production facility was then moved to Building 9204-4 (Beta 4) and operated for four years. The ELEX process plant in Beta-4 produced some of the first Li-6 which was used in the nation's early hydrogen bomb efforts. ELEX was phased out due to the greater production success of COLEX.

As the technology of the hydrogen bomb was refined, Li-6 emerged as one of the primary components in the bombs developed by both the United States and USSR. Lithium isotope separation became a national defense priority and in 1953 at the urging of the Atomic Energy Commission, Y-12 dramatically expanded its production facilities. In addition to ELEX, another lithium separation process, the COLEX process, was also established at Y-12. This process was a chemical exchange in which vertical columns of upward pumped lithium hydroxide solutions reacted against a down-flowing lithium amalgam (an alloy of mercury and lithium metal). The column and exchange method resulted in its name - the Column and EXchange process.

One of these new production facilities was located in Building 9201-5 (Alpha 5) which contained six cascades of COLEX columns. Building 9201-4 (Alpha-4) was placed into production with four cascades of the COLEX process. Both of these plants produced immense quantities of Li-6 and helped to fulfill the

nation's needs for this isotope. The first use of a Li-6 thermonuclear device was the Castle Bravo test in the Marshall Islands on March 1, 1954. Over the next several years, hundreds of hydrogen bombs were added to America's nuclear arsenal. Production of Li-6 in Alpha-5 ceased in 1959 and in Alpha-4 in 1962. The total project cost of the Li-6 project at Y-12 was $233 million.

Buildings significant under this context:

Building 9201-2:	Production
Building 9201-4:	Production
Building 9201-5:	Production
Building 9733-2:	Research and Development

Isotope Separation and Research

In 1946, the Atomic Energy Commission initiated the Stable Isotopes Program to utilize Y-12 calutrons for the separation of isotopes for research in medicine, agriculture, industry, and biology. Over the next forty years Y-12 was the center of this isotope separation research and development. The first operations of the Beta calutrons took place in Building 9731 but by 1950 it was decided to preserve the 72 calutrons at Building 9204-3 (Beta-3) and devote them to the isotope separation process. This research and development led to many advances, especially in the field of medical isotopes. Highly enriched actinide isotope (Th, U, Pu, Am, and Cm) were also produced primarily for research and development applications.

Buildings significant under this context:

Building 9204-3:	Research and Development/Production
Building 9731:	Research and Development/Production

Biological Research

The Biology Division of Y-12 was created after World War II and conducted extensive biological research on genetics and radiation. Under the direction of William and Liane Russell, this research included studies on the effects of radiation on mammals. This research focused on the various effects of radiation and medical use of radiation therapy and cancer. Other important research involved nucleic acids and embryonic formation. The Biology Division was housed in Buildings 9207, 9208, and 9210.

Buildings significant under this context:

Building 9207: Research and Development
Building 9208: Research and Development
Building 9210: Research and Development

4.3. Summary of Y-12's Historic Buildings by Type

The seventy-seven contributing buildings and structures in the Y-12 Historic District represent a number of building types. The following summary of building types found in the Y-12 Historic District reflect the buildings' historic uses. These Building Types are: Pumphouses, Changehouses, Production/Processing Facilities, Research/Lab Facilities, Offices, Storage Facilities, and Utilities/Maintenance Facilities.

- **Pumphouses:** Pumphouses are intrinsic to the Y-12 Complex. Appearing as early as 1944, pumphouses reflect a variety of forms and materials. Often rectangular, though sometimes square in plan, these facilities were covered in transite, tile, or masonry. Roof types also vary and are seen in flat or gabled forms. Facilities were often altered through the years, acquiring new shape and wall coverings. As support buildings to the major production facilities at Y-12, pumphouses aided in the plant's overall operation and production of enriched uranium. It is important to preserve representative examples of these ancillary buildings to convey the district's World War II era composition and operations.

  Seven contributing buildings to the Y-12 historic district are pumphouses. Five are of masonry construction, one is frame with metal panels, and one has a steel frame and a transite exterior. Five pumphouses (9404-4, 9404-6, 9404-12, 9404-13, and 9404-16) have been proposed for demolition.

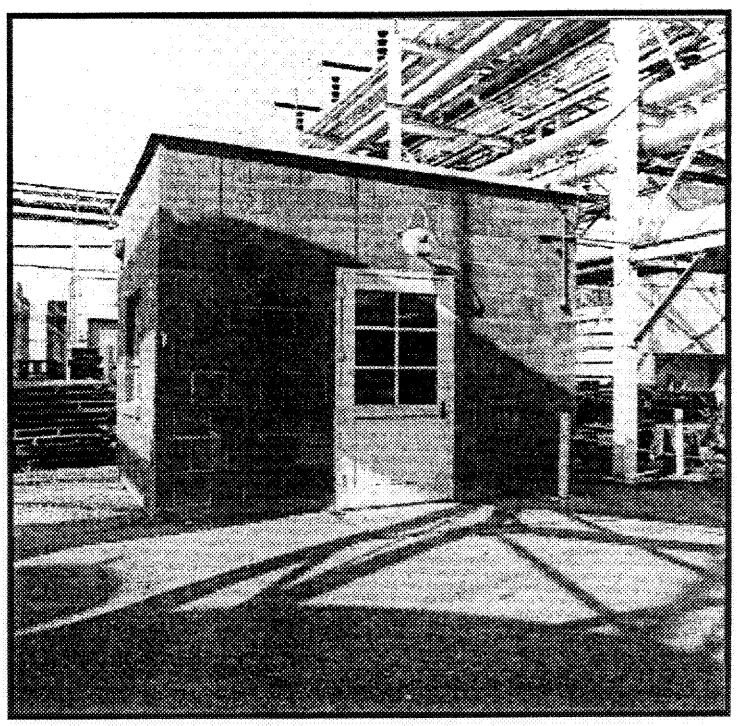


Figure 14: National Register-eligible Building 9803. Small buildings such as pumphouses housed the necessary machinery and equipment to power the alpha and beta buildings.

- **Changehouses:** Change houses are a traditional component of the Y-12 landscape as the buildings in which employees changed into Y-12 issued clothing. In these buildings, workers made the transition from ordinary civilian to an employee of an important and secret mission. Changehouses were located throughout the plant. They are typically rectangular in plan and feature gable or flat roofs. Wallcovering varies and includes asbestos siding, weatherboard, and metal paneling.

  There are two remaining changehouses that are contributing buildings to the Y-12 Historic District - Buildings 9723-24 and 9723-25. Constructed in 1945, these are both frame structures with asbestos shingle exteriors. Building 9723-24 has been identified as excess and is proposed for demolition. The architectural integrity of these two changehouses has been somewhat compromised through later additions and window alterations. Both are attached to larger adjacent buildings.

- **Production/Processing Facilities:** Y-12's production and processing facilities are the heart and soul of the complex. During World War II they housed the processes of uranium enrichment, which was the reason for the plant's initial creation. In the years of the Cold War many accommodated the plant's COLEX process, which separated the element Lithium-6, an important component in the manufacture of hydrogen bombs. Y-12's historic production and processing facilities are the primary facilities at the Y-12 Complex. All other buildings serve to support the operations that take place in these structures.

  Y-12's production and processing facilities are typically large two- to four-story buildings that occupy hundreds of thousands of square feet, which their historic processes required. They are generally of reinforced concrete and brick construction and have a large amount of attached piping on the exterior. They are typically surrounded by several small ancillary buildings such as pumphouses and other utility structures that supported their operations. Most of the buildings have undergone alterations over the years in order to support changing missions and operations.

  There are fifteen production/processing facilities that are contributing buildings to the Y-12 Historic District. These buildings are major components of the district and provide the fundamental essence of the plant's historic setting. These are some of the largest buildings in the Y-12 complex and they occupy core positions within the Y-12 Historic District. The most prominent among Y-12's production facilities are the five Alpha and four Beta buildings, which contained the uranium enrichment processes central to the Manhattan Project. Beta-3 (Building 9204-3) is eligible for National Historic Landmark status due to its pioneering involvement with the production of enriched uranium and stable metallic isotopes. Another National Historic Landmark building is Building 9731, which housed the prototype calutron for the plant and is Y-12's oldest building. Three of Y-12's processing facilities have been determined excess to future mission needs and are proposed for demolition. These are: Building 9201-4 (Alpha-4), Building 9201-5 (Alpha-5), and Building 9206.

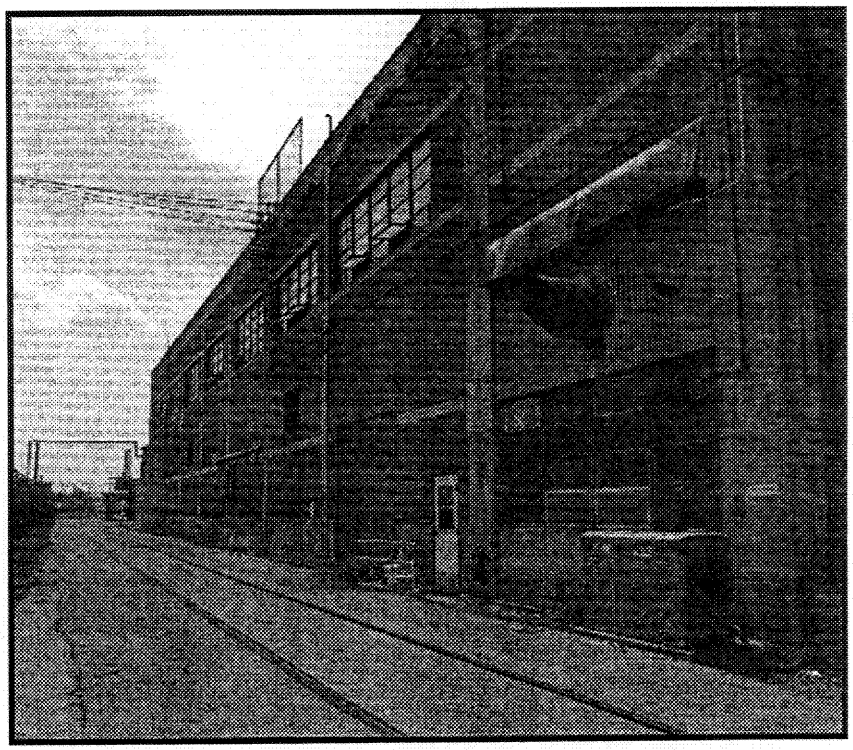


Figure 15: National Register-eligible Building 9201-1 (Alpha-1). This building is representative of the alpha buildings constructed to house the calutrons during World War II.

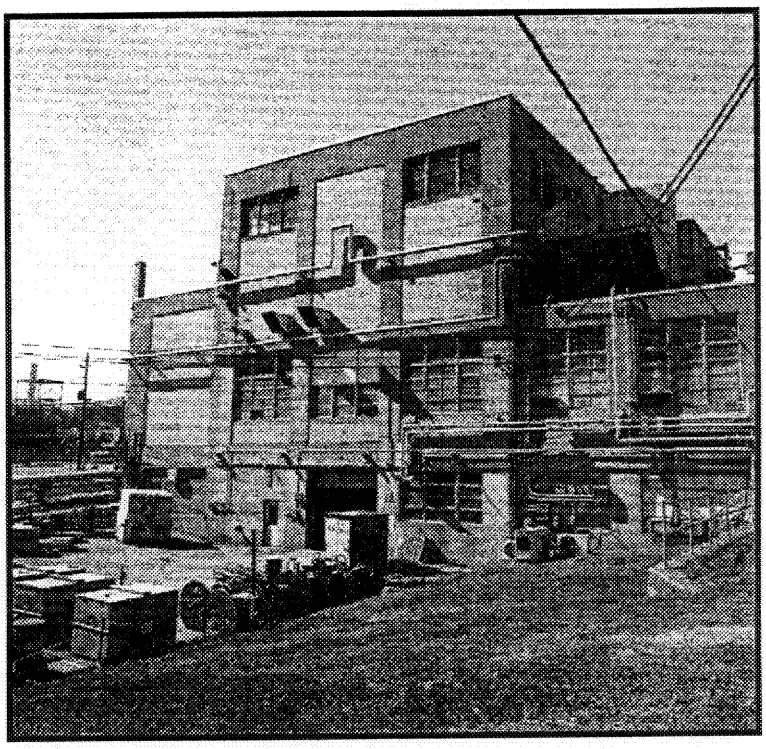


Figure 16: Y-12's Building 9731 is eligible for National Historic Landmark designation. This building housed the original prototype calutrons and is known as the Y-12 Pilot Plant.

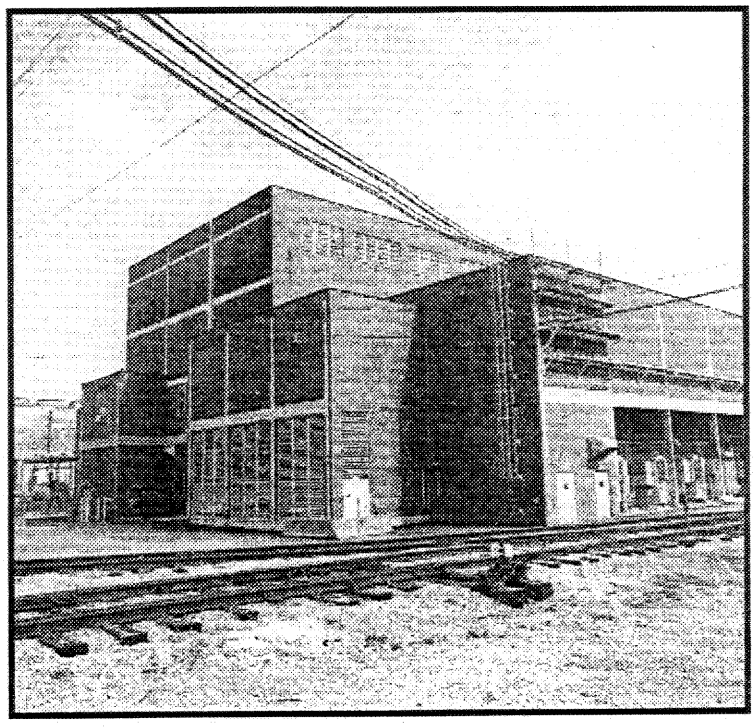


Figure 17: Y-12's Beta-3 (Building 9204-3) is eligible for National Historic Landmark designation. It continues to house original calutrons installed during World War II.

- **Research/Lab Facilities:** The sixteen contributing research or laboratory facilities in the district vary in shape and form, and construction materials. They range from one- to five-stories in height and are of reinforced concrete and masonry or frame construction. Built mainly during the 1940s these buildings initially supported Y-12's Manhattan Project mission, but their greater historical significance is derived from the research and development of the Cold War era and Y-12's new mission of providing nuclear weapons components for the National Defense stockpile. Many of these facilities have housed operations connected with ORNL for many years and are associated with the scientific achievements of that installation, including the biological research on genetics and radiation conducted by William and Liane Russell. These include Buildings 9207, 9210, and 9211, which are located in the northeast portion of the historic district. Building 9207, which contains 247,500 sq. ft. in its six stories, is the most dominate building in the complex of Biology buildings.

  Also included in this category are the row of buildings known as "Engineering Row" located in the center of the historic district: Buildings 9733-1, 9733-2, 9733-3, 9734/9739, and 9736. The first three are frame buildings of similar design with asbestos shingle or glazed terra cotta siding. Buildings 9734/9739 and 9736 sit at the west end of the row and are of masonry construction. Research involving the development of zirconium purification procedures and the ELEX and COLEX processes took place in these structures as did research and development in the components, materials, and subassemblies of nuclear weapons. The buildings currently provide office space. Of a similar design and located adjacent to one another, these buildings convey a strong sense of time and place within the historic district. Of the fifteen contributing research facilities in the Y-12 Historic District, six have been identified as excess to future mission needs and are slated for demolition. These six buildings are: 9207, 9210, 9213, 9616-3, 9720-17, and 9770-2.

- **Offices:** Four contributing buildings in the Y-12 Historic District are primarily office space. These four buildings are: 9704-1, 97-4-2, 9706-2, and 9764. Currently, Building 9704-1 is proposed for demolition. These are one-story frame and masonry buildings that are located on the north end of the district near "Engineering Row." Originally constructed in the 1940s, these buildings have been modified through added exterior siding, the construction of additions, and replacement doors and windows. Throughout their history, these buildings have housed the offices of various divisions within Y-12.

- **Storage Facilities:** Storage facilities on the Y-12 complex reflect a variety of construction methods and materials and range in size from 400 to over 140,000 square feet. Many are of pre-fabricated metal and others are of frame or steel and have metal wall panels. A few are of masonry construction. These buildings are used to warehouse a variety of items including building materials, chemicals, and records.

  The Y-12 Historic District contains eight contributing buildings that are storage facilities. Four of these eight buildings are proposed for demolition – Buildings 9720-12, 9720-13, 9729, and 9987 – These four buildings are largely located on the periphery of the historic district, have minimal architectural integrity and have not played a defining role in Y-12's history.

- **Utilities/Maintenance Facilities:** The Y-12 Historic District contains twenty contributing buildings that are utilities/maintenance facilities other than pumphouses. These include tank facilities, power and generator buildings, valvehouses, machine shops, nitrogen stations, disposal pits, and the Y-12 steam plant. These buildings represent a wide variety of forms and are constructed of a range of materials including steel and masonry. They range in size from 80 square feet to over 137,000 square feet. These buildings served as ancillary support facilities to the operations of Y-12's production facilities. Currently nine of the twenty utilities/maintenance facilities have been determined excess to future mission needs and are proposed for demolition. These nine buildings are: 9416-4, 9419-2, 9510-2, 9738, 9752, 9767-2, 9768, 9802-2, and 9977.

  The majority of these buildings have not played a crucial role in the historic operations of Y-12, and their size and location are such that their contributions to the historic district are minimal. Four utilities/maintenance buildings in the district are representative examples of their building type, have a greater association with individually significant buildings, and/or occupy a notable space within the historic district. These four buildings are: 9401-3, 9738, 9996, and 9998.

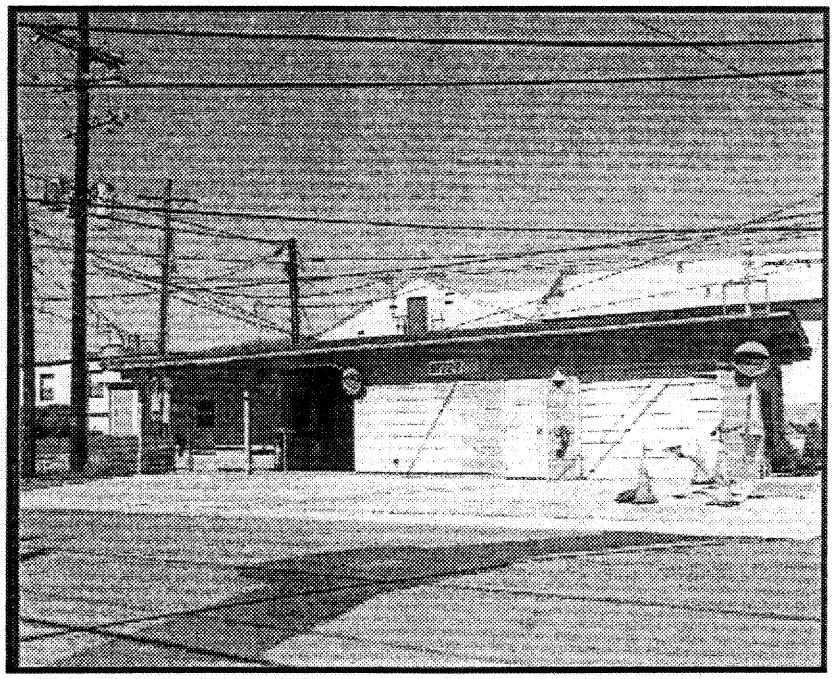


Figure 18: National Register-eligible Building 9722-2 serves as an emergency power facility. Numerous small support facilities such as this supported the goals and missions of Y-12 during World War II.

- **Miscellaneous Buildings and Structures:** Three contributing properties to the Y-12 Historic District do not fit into any of the above categories. These properties are: Buildings 9710-2, 9711-1, and the railroad tracks. Building 9710-2 is a guard post that also houses a fire depot. The building's architectural integrity has been compromised through a large two-story addition and other modifications. Building 9711-1 was originally constructed as a cafeteria and now serves as an office building. This H-plan building has minor historical significance, but retains a fair degree of architectural integrity. The Railroad Tracks on the property of the Y-12 complex extend across the southern border of the Y-12 Historic District. The tracks played a critical role in the initial development of Y-12 and the early years of the Cold War as a method of transporting materials and goods to the site. The transport of goods to the site was vital to the success of its operations, and the railroad tracks reflect this importance. The visual contribution of the railroad tracks to the historic district is moderate as the tracks are situated along the southern border of the district.

4.4. Historic Interiors

In addition to the buildings themselves, the interiors of some of Y-12's historic buildings also possess historical significance. The high bay layout and configuration of the large Alpha and Beta buildings were essential to the uranium enrichment processes that took place within them. Machinery and equipment associated with these processes also holds important historic value. Buildings 9204-3 (Beta-3) and 9731 have been identified as two particular buildings in which the machinery connected with Y-12's World War II era operations remains intact. In 2002, UT-Battelle, LLC had an inventory completed of the World War II era machinery and artifacts in Beta-3. This type of inventory is important in the future interpretation of Y-12's historic properties, and Y-12 will conduct and prepare an inventory report and assessment of its historic machinery and equipment no later than 2006.

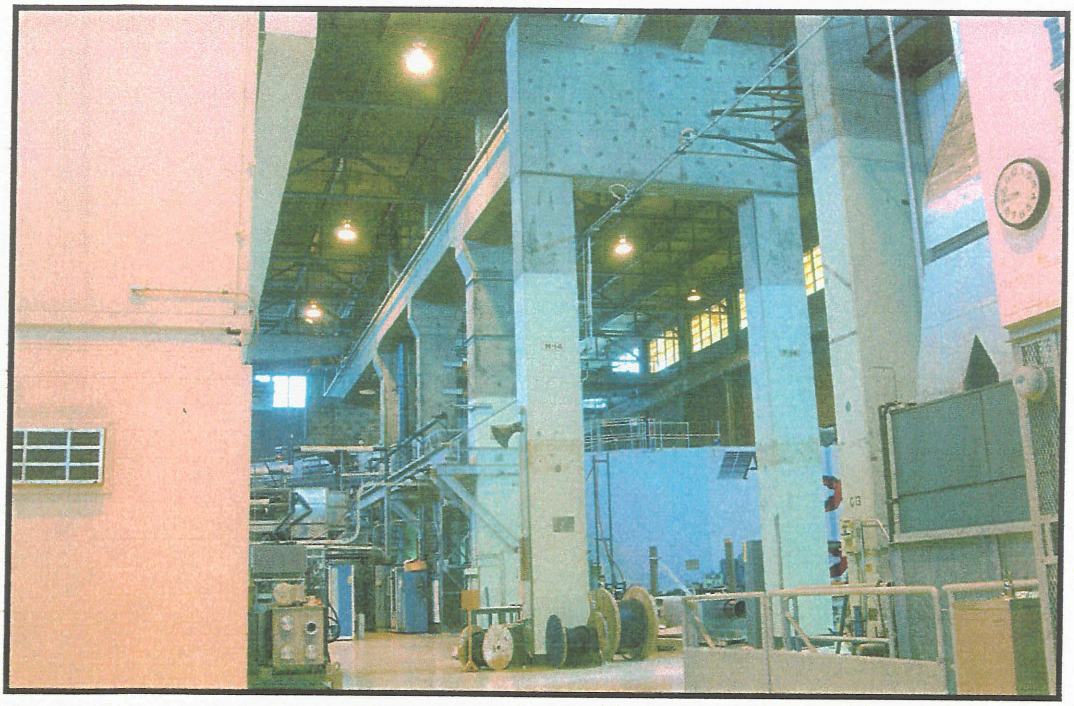


Figure 19: Interior view of Building 9201-2 (Alpha-2) showing high bay area.

Figure 20: Interior view of Building 9201-2 (Alpha-2), showing high bay area.

Figure 21: Interior office space of Building 9201-2 (Alpha-2).

Figure 22: Interior of Building 9201-3 (Alpha-3).

Figure 23: High bay interior area of Building 9201-3 (Alpha-3).

Figure 24: Interior of Building 9201-3 (Alpha-3).

Figure 25: Interior view of Building 9204-1 (Beta-1).

Figure 26: Original office space area of Building 9204-1 (Beta-1).

Figure 27: Interior view of Building 9204-3 (Beta-3) showing the second floor, which houses the original calutrons.

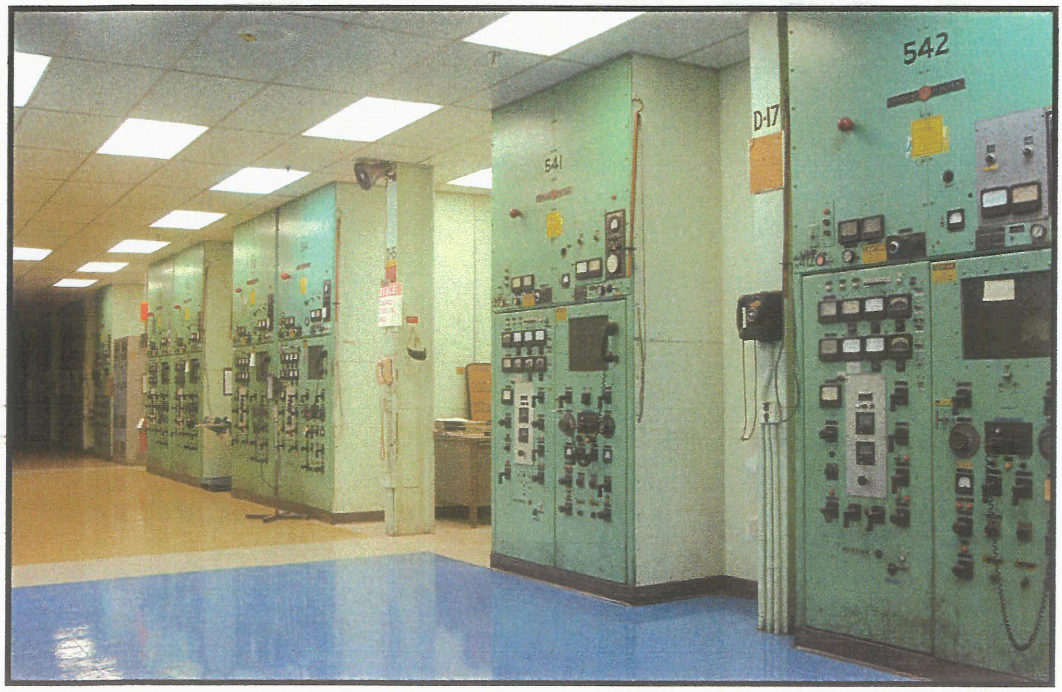


Figure 28: Interior view of Building 9204-3 (Beta-3) second floor control room.

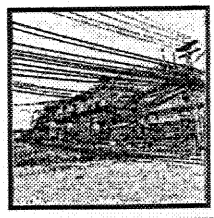
Figure 29: Interior of Building 9204-3 (Beta-3) showing original calutrons.

Figure 30: Interior view of Building 9204-3 (Beta-3) showing original office space.

4.6. Summary

No properties within the Y-12 Plant are presently listed on the National Register of Historic Places, the nation's official list of properties significant in architecture, history, and culture. The 1995 Architectural/Historical Evaluation of the Y-12 Plant identified a large historic district within the Y-12 Plant that is eligible for the National Register. Since the completion of the 1995 survey, the SHPO has approved the demolition of seventeen contributing buildings to the Y-12 Historic District, and Memorandums of Agreement were prepared for these properties. The proposed "Y-12 Historic District" presently contains seventy-seven properties and structures that would be considered contributing to the district. The 1995 report also recommends National Historic Landmark status for Buildings 9731 and 9204-3. The SHPO concurred with these recommendations.

The 1995 architectural and historical survey of Y-12 utilized existing historical research and analysis in assessing the World War II and Cold War significance of the facility. Since the completion of this survey, new information now provides a more comprehensive perspective of the role of Y-12's operations during these years. An inventory of the installation's World War II and Cold War era machinery and equipment will be completed by 2006. This information will be utilized in future interpretive efforts to capture the more global features of Y-12, and will be described in more detail in the Y-12 Complex Interpretive Plan (See Section 7.3).



5.0. Y-12 ARCHAEOLOGICAL PROPERTIES

5.1. Previous Archaeological Investigations at the Y-12 National Security Complex

A minimum of ten major archaeological reconnaissance-level surveys have been conducted on the Oak Ridge Reservation (ORR). Through these studies forty-four archaeological sites have been identified and recorded on the ORR. Of these sites, thirteen have been determined to be eligible for listing in the National Register of Historic Places. None of these properties is within the boundaries of the Y-12 Complex. In 1992, DuVall & Associates, Inc. conducted a field review of the Y-12 Complex and found no preserved prehistoric or historic archaeological sites.

5.2. Potential for Archaeological Properties at the Y-12 National Security Complex

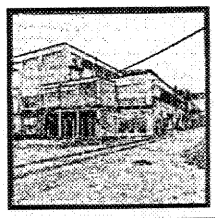
The 1992 DuVall & Associates archaeological evaluation of the Y-12 Complex concludes that the potential for archaeological properties at the Complex is extremely limited. Initial and subsequent construction of the Y-12 Complex have caused severe disturbance of the valley floor. Bulldozing, and construction of facilities and infrastructure including transmission lines and waste disposal areas have been substantial on the property since the early 1940s. As a result of the amount of previous disturbance within the valley, the potential for archaeological properties at the Y-12 Complex is extremely low.

5.3. National Register Assessment

There are no identified National Register-eligible archaeological properties within the Y-12 Complex. The potential for archaeological sites meeting the criteria for inclusion in the National Register of Historic Places is minimal.

5.4. Summary

Several archaeological surveys have been conducted at the ORR. However, no prehistoric or historic archaeological sites have been identified at the Y-12 Complex. Due to the amount of previous ground disturbance at the Y-12 Complex, the potential for preserved archaeological sites is considered minimal.



6.0 Y-12 and Historic Property Stewardship

6.1. Federal Agencies and the National Historic Preservation Act

The basis of Federal historic and archaeological resources protection law is the National Historic Preservation Act of 1966 (NHPA) as amended. NHPA was passed in response to the destruction that occurred during the 1950s and 1960s due to Federal projects such as highways, dams and urban renewal. Congress created the NHPA to help prevent further destruction of historic properties by Federal agencies without prior review. Amendments in 1976, 1980, and 1998 furthered the goals of the act, providing stronger protection of historic properties. The main provisions of the act include the following:

- Authorization of the Secretary of the Interior (Secretary) to expand and maintain a National Register of Historic Places (NRHP);
- Establishment of procedures for nomination of historic and archaeological properties to the NRHP;
- Direction for the Secretary to approve State preservation programs directed by a State Historic Preservation Officer (SHPO) and an historic preservation review board;
- Establishment of the Advisory Council on Historic Preservation (Council) as an independent Federal agency to advise the President, Congress, and other Federal agencies on historic preservation;
- Establishment of the Section 106 Review Process to ensure that historic and archaeological resources are properly considered and reviewed by Federal agencies;
- Incorporation and further definition of Executive Order 11593 in Section 110; 11593 is the directive to complete inventory and assessment of historic and archaeological resources on federally-owned or controlled lands.

With the 1966 Act came several specific preservation activities including the establishment of the National Register of Historic Places, State Historic Preservation Officers (SHPOs), Certified Local Governments (CLGs), Grants-in-aid, the Advisory Council on Historic Preservation (Council) and regulations, standards and guidelines. Four sections of the 1966 Act deal directly with Federal agencies. The most powerful of these areas is Section 106, which requires Federal agencies to take into account the effects of their activities and programs on historic properties.

6.2. Section 106 of the National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) is a process designed to ensure that historic properties are considered during Federal project planning and execution. The review process is administered by the Advisory Council on Historic Preservation (Council), which is an independent Federal agency. Section 106 acts as the cornerstone of the 1966 Act which was created out of public

concern that the Nation's historic resources were not receiving adequate attention. Section 106 was created to protect historic properties from Federal activities.

Section 106 requires that every Federal agency examine its undertakings and how those actions could affect historic properties. Undertakings requiring review in the Section 106 process are those that present a type of activity that has the potential to affect historic properties. These include a broad range of activities, including construction, rehabilitation and repair projects, neglect, demolition, licenses, permits, loans, loan guarantees, grants and Federal property transfers. A historic property is any property listed in or eligible for the National Register of Historic Places. Even properties not yet discovered may be eligible for listing on the National Register. Therefore, it is important that all properties be examined before proceeding with a Federal activity.

Section 106 cannot prevent a Federal agency from proceeding with desired projects, but it does require analysis of the project and allows for identification of historic properties. In many cases, alternatives are suggested which satisfy all interested parties. It is the responsibility of the DOE, as a Federal agency, to comply with this important tool of preservation law.

One of the most important participants in the Section 106 process is the **State Historic Preservation Officer (SHPO)**. SHPOs are appointed by state governors to carry out NHPA responsibilities. The SHPO performs a wide variety of functions under the NHPA, State law, and other authorities. These functions include the nomination of properties to the National Register of Historic Places, the conduct of statewide historic preservation planning and a statewide inventory of historic properties; provision of technical assistance to Federal and State agencies, local governments and others; and the certification of local governments to participate in the national program. During the Section 106 process, identification of historic properties is the basic step in determining effects of an undertaking on those properties. Since the SHPO is directly responsible for conducting statewide surveys of historic properties, it is essential that officials of facilities on the Y-12 Complex coordinate identification efforts with the Tennessee SHPO.

If historic properties exist within the area of a potential project, the appropriate officials should consult with the Tennessee SHPO in applying the criteria of effect set forth in Section 106. It is the SHPO's responsibility to assist DOE ORO and its contractors in carrying out their historic preservation responsibilities, thus the SHPO helps in the determination of effects of an undertaking on historic properties. The Tennessee SHPO should be aware of ways to avoid or to reduce adverse effects on historic properties, offering this advice to the appropriate officials. As a representative of state interests, the Tennessee SHPO is often asked to provide views to the Advisory Council on Historic Preservation.

It may happen that a historic property is discovered only after the project begins. In this case, it is the SHPO's responsibility to provide a special review process within an expedited period of time. It is also DOE's and its contractor's responsibility to provide information on the National Register eligibility of any affected properties. If the discovered resource is principally of archaeological value, officials may decide to comply with the Archaeological and Historic Preservation Act of 1974 rather than Council regulations. The SHPO must be given an opportunity in any event to comment on the project before it continues.

The **Advisory Council on Historic Preservation** (Council) is an independent Federal agency, established under the NHPA that carries out the following duties:

- Advises the President and Congress on historic preservation matters, including annual reports, special reports and policy recommendations on preservation topics, technical assistance and testimony on legislative proposals;

- Carries out Section 106 review; and

- Reviews Federal agency historic preservation programs and policies.

Members of the Council consist of four persons from the general public (one of whom serves as the chair), four historic preservation experts, the Secretary of the Interior, the Secretary of Agriculture, the Architect of the Capitol, four Federal agency heads, one governor, one mayor, the President of the National Conference of SHPOs and the Chairman of the National Trust for Historic Preservation.

The Council is greatly concerned with the participation of all interested persons in the Section 106 process. Such interested parties include, but are not limited to Certified Local Governments; applicants for Federal assistance, permits and licenses; Indian tribes; cultural leaders; landowners and private groups and organizations.

In 1989, the Council issued its own guidelines about public participation in Public Participation in Section 106 Review: A Guide for Agency Officials. This publication informs agencies about how to include public participation in the review process. The Council also advises the public about how to participate in the review process. Part of the Council's mission is to assure that there is direct communication between the agency and the public, offering assistance to both parties during the Section 106 process. The Council seeks public views during the agency's steps in historic property identification, evaluation of effects and development of alternatives. It is in the agency's best interest to stimulate public participation as the Council views such opinions vital to the Section 106 process. Public notice should adequately inform individuals of preservation issues, elicit views on such issues and when possible, involve public opinion in decision making.

Council participation in Section 106 is vital. The Council regulates criteria for the assessment of effects. If the Council determines that Section 106 responsibilities are not being properly carried out by an agency or SHPO, it may choose to participate in the consultation process. In this case, the Council participates in a manner parallel to the SHPO and must be allowed to comment directly. The Council is responsible for reviewing MOAs and has the right to accept or reject such agreements. Although the agency has the right to reject Council comments, it should consider such comments seriously. If the Council fails to issue its comments within the specified period of time, the agency has the right to proceed with its project.

6.2.1. Assessing Effects to Historic and Archaeological Properties

The missions and responsibilities of theY-12 Complex can affect historic and archaeological resources in a variety of ways. These effects can range from the total demolition of a property, removal of a site, or simple maintenance of a building. In order to determine the "effects" a project may have on historic properties, the appropriate officials must consider not only direct effects, but also those that may come indirectly as a result of the project.

Assessing the effects of a project can result in three possible findings:

1. **NO EFFECT** - where historic properties are not altered or affected;

2. **NO ADVERSE EFFECT** - where there may be an effect but it will not harm characteristics that qualify properties for inclusion on the National Register.

3. **ADVERSE EFFECT** - where the effect will possibly damage the integrity of a historic property.

Any Federal undertaking must make a determination of "effect" or "no effect." During this stage of the Section 106 process, it must be determined whether there is any effect, and if so if the effect is adverse. Any time a project directly or indirectly alters a historic property or activities associated with that property, there is an effect. Any undertaking that has the possibility to alter a property's significance is considered to be an effect. When determining whether a project has an effect on properties it is important to remember that the effect does not have to be negative to qualify as an effect. Long range as well as immediate changes from the project also need to be considered.

If the appropriate officials determine that there is no effect from an undertaking, it must notify the SHPO and any other interested parties of this decision. The SHPO has a fifteen day period to object to the decision. If the SHPO disagrees, an effect is determined and the agency must reassess the project in consultation with the SHPO.

Once an effect is determined, then it must be decided whether the effect is adverse. Any undertaking is adverse if it degrades a property or results in loss of characteristics that make the property eligible for listing on the National Register of Historic Places. Detrimental changes from vandalism or from natural forces may also result in an adverse effect.

Any effect is adverse if it results in at least one of the following:

- Destruction or alteration of the historic property or its surrounding landscape;
- Isolation from or alteration of the historic property's environment;
- Intruding elements such as visible, audible or atmospheric changes;
- Neglect of the historic property or its surroundings; and
- Transfer, lease or sale of the historic property or its significant surroundings.

Undertakings with the potential to have an adverse effect include:

- Demolition of historic buildings or structures;
- Additions to historic buildings or structures;
- Alterations to historic properties such as exterior material replacement, window or door replacement, and removal of historic fabric; and
- New building construction within or adjacent to the National Register Historic District.

If the appropriate officials determine that the effect is not adverse, it must obtain the SHPO's agreement and notify the Council with written documentation so that the decision is available for public inspection. Documentation must be submitted with the decision and the Council is given thirty days in which to comment.

Once all parties agree upon a course of action, the appropriate contractor may proceed with the proposed project. If no agreement is reached, DOE ORO and contractor management must consider Council comments and make a decision at that point. Once the Council's comments have been reviewed, the appropriate officials notify the Council of its final decision and proceed with that decision.

If the Council believes that an agency or an applicant for the agency's assistance has foreclosed on Council comments, the Council will notify the agency of the foreclosure and allow for an agency response. Foreclosure usually occurs if the review process is ignored, if the project has already harmed a historic property beyond repair, or if the project is beyond a stage that allows alternative measures. ***If foreclosure is confirmed, the agency breaks the law and opens itself to litigation. Early planning and consultation with the SHPO will avoid this situation.***

6.2.2. *Prepare and Implement Programmatic Agreements/Memorandums of Agreements*

Programmatic Agreements (PA) and Memorandums of Agreements (MOA) are legal documents that provide evidence that DOE ORO and its contractors have completed its responsibilities as specified under Section 106. A PA defines historic properties and the roles and responsibilities of an agency in meeting its legal obligations for cultural resource protection. In addition to the stipulations outlined in a PA, DOE ORO might also find it necessary to prepare a MOA for specific projects or undertakings. Council acceptance of a PA and/or MOA serves as its comment, which completes the process. The PA/MOA provides the appropriate DOE ORO Program official and contractor with legal support to fight challenges to its project. However, if these entities fail to carry out its responsibilities as outlined in the PA/MOA, it has to request Council comment before continuing with its undertaking.

A publication detailing the various steps in preparing agreement documents is available from the Council and reference to this document is recommended. This publication, "*Preparing Agreement Documents: How to Write Determinations of No Adverse Effect, Memoranda of Agreement, and Programmatic Agreements under 36 CFR Part 800,*" provides extensive information on the preparation of such documents.

A PA has been prepared for Y-12 that describes overall types of installation actions and activities that require SHPO and Council review. The PA was developed to clarify effects requiring review and to make the review process more efficient. For some activities that do not require review or will have no adverse effects, the PA will provide all of the guidance necessary for activity completion. However, if the undertaking results in adverse effects then a separate Memorandum of Agreement will be required for that specific undertaking.

6.2.3. *Emergency Conditions*

Emergency conditions include natural disasters and threats to national security. Such conditions may threaten public health or safety and are declared by a Federal agency head, the President, the state's governor or a local government official. In case of an emergency situation, Y-12 should notify the SHPO and Council of proposed actions.

6.3. *Section 110 of the National Historic Preservation Act*

A Federal agency's responsibilities to stewardship of a historic property are outlined in Section 110 of the National Historic Preservation Act (NHPA). A Federal agency must, under the 1966 law, assume responsibility for preserving historic properties that it owns. Major responsibilities are as follows:

- Designate a qualified preservation officer who will be responsible for coordinating the agency's preservation activities.
- Inventory and evaluate all historic properties owned by the agency and nominate them to the National Register of Historic Places.
- Do not allow National Register eligible properties to deteriorate or to be sold, demolished, altered or transferred until all possible alternative actions have been considered.
- Assume responsibility for preservation of historic properties.
- Use historic properties to their maximum extent.

- Undertake preservation activities including protection, management, rehabilitation, restoration, stabilization, maintenance, and reconstruction.

- If a historic property must be altered, damaged or destroyed, record the property in accordance with established guidelines and deposit the record with the Library of Congress with copies to DOE ORO echelons. All expenditures involving a preservation activity are authorized and may include compensation to SHPOs.

It is the responsibility of DOE, as a Federal agency, to comply with Section 110.

6.4. Related Federal Laws

The National Historic Preservation Act and Section 106 interrelate with a number of Federal laws. These laws include:

- National Environmental Policy Act (NEPA) of 1969;
- Archaeological and Historic Preservation Act (AHPA) of 1974;
- Archaeological Resource Protection Act (ARPA) of 1979;
- American Indian Religious Freedom Act (AIRFA) of 1979;
- Native American Graves and Repatriation Act (NAGPRA) of 1989;
- Agency-specific legislation, including Department of Transportation Act of 1966 (Section 4(f)), Federal Land Policy and Management Act (FLPMA) of 1977, National Forest Management Act (NFMA) of 1976, and Public Facilities Cooperate Use Act (PBCUA) of 1976.

Compliance with any of the above laws does not substitute for compliance with Section 106 unless the Council agrees that it does and there is a Programmatic Agreement or approval of counterpart regulations.

6.4.1. National Environmental Policy Act (NEPA) of 1969

Under the NEPA, Federal agencies are responsible for the environmental impact of their activities. Historic properties are considered to be part of this environment. The NEPA and Section 106 of the NHPA require many of the same actions but should not be confused with one another. They cannot be substituted for each other, activities involving each can be coordinated. For example, completion of steps one and two of Section 106 can be done as NEPA documents are prepared as they address many of the same questions. During the consultation process (Step 3) of Section 106, an environmental impact statement (EIS) or environmental assessment (EA) may be used as a basis for consultation. The Memorandum of Agreement (MOA), if required, would be prepared during Step 4 of the 106 process and may be included as part of a final NEPA report. If the MOA is not included, its terms should at least be outlined in the final NEPA report.

6.4.2. *Archaeological and Historic Preservation Act (AHPA) of 1974*

When a Federal project involves archaeological sites, the AHPA demands certain actions that may or may not be covered by Section 106. Notification to the Department of the Interior that your agency is involved in an undertaking covered by the AHPA, does not cover Section 106 compliance. Again, procedures for compliance with Section 106 and the AHPA are similar, and you may complete some steps for both at the same time. However, satisfying requirements for one is not sufficient. These are separate laws and must be treated as such.

6.4.3. *Archaeological Resource Protection Act (ARPA) of 1979*

When a project involves Federal or Indian lands, the ARPA may demand additional action. Again, acquiring an ARPA permit does not constitute compliance with Section 106.

6.4.4. *American Indians Religious Freedom Act (AIRFA) of 1979*

Any site of religious importance to American Indians is subject to consultation with tribal religious leaders. Although the process is separate, it may be coordinated with Section 106.

6.4.5. *Native American Graves and Repatriation Act (NAGPRA) of 1989*

This law addresses when museums and federal agencies must return human remains and related grave goods to Native Americans. The law sets forth a process for returning human remains and associated funerary objects to Native American tribes.

6.5. *Identification of Historic and Archaeological Properties at the Y-12 National Security Complex*

The responsibilities of the DOE ORO regarding cultural resources at the Y-12 Complex are varied and require specific actions. These actions follow the provisions of Section 106 as well as the ORR CRMP. DOE ORO officials must review available information concerning historic and archaeological properties within a project or program area for potential effect. The 1995 survey of the Y-12 Plant identified and inventoried 248 individual buildings and structures and identified the plant's remaining 325 facilities through type. These include buildings constructed from the initial establishment of the plant in 1942 through 1990. This survey effort resulted in the completion of the report entitled the "Architectural/Historic Evaluation of the Y-12 Plant, Oak Ridge Reservation, Anderson County, Tennessee." This report provides extensive information regarding the historic properties of the Y-12 Plant and should be referenced in future planning efforts or project development at the Y-12 Plant. Results of this report and previous archaeological studies are detailed in Sections 4.0 and 5.0 of the HPP.

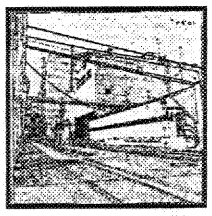
6.6. *Future Cultural Resource Investigations*

The fifty-year benchmark for assessing historic properties will continue to require the Y-12 complex to update its survey efforts in the future. The 1995 architectural and historical survey of the Y-12 complex focused on the installation's historic Manhattan Project era. Y-12 also possesses a compelling history associated with the Cold War. A future study is needed that will assess the installation's role and significance during this era (1945-1989). Any future surveys will follow established Federal standards for cultural resource identification and include historical and architectural documentation of Y-12's significance in a given historical context.

Additional archaeological investigations may be justified when there are ground disturbance activities planned for areas with medium to high archaeological potential. These types of projects could include new building construction, extensive grading or landscaping, or the construction or rerouting of roadways. Archaeological investigations should be included within the scopes of work for these types of activities and the investigations coordinated with the Tennessee SHPO.

6.7. Summary

The basis of Federal historic and archaeological resources protection law is the National Historic Preservation Act of 1966 (NHPA). Section 106 of the NHPA requires that every Federal agency examine its undertakings and how those actions could affect historic properties. Undertakings requiring review in the Section 106 process include a broad range of activities, and when activities occur, there must be assessment of effects to cultural resources. Federal agencies also have specific responsibilities regarding the preservation of its historic properties under Section 110 of the NHPA. These responsibilities include inventory and evaluation of historic properties. The State Historic Preservation Officer (SHPO) is responsible for assisting Y-12 in carrying out its historic preservation responsibilities.



7.0 Y-12 NSC MISSION AND COMPREHENSIVE PLANNING - HOW IT AFFECTS HISTORIC PROPERTIES

7.1. Y-12 NSC Mission and Comprehensive Planning

Since the end of the Cold War, Y-12 has experienced significant challenges with respect to its facilities and infrastructure. The historic district overlays the vast majority of this facility and infrastructure base. Y-12 is also unique in that four DOE programmatic entities have ongoing missions located here, including the National Nuclear Security Administration, the Office of Science and Energy, the Office of Nuclear Energy, and the Office of Environmental Management. NNSA is the site landlord and will have a long-term national security presence. Some of the key challenges facing the NNSA landlord with respect to historic preservation are:

- While its workload is increasing, Y-12 has a footprint that is oversized, and costly to maintain for the projected workload and missions.

- While the vast majority of its buildings are active, many have been reused over the 60-year history of the site. Some of this reuse has resulted in workflow inefficiencies prompting the need for consolidation of its functions and operations. This consolidation, or footprint reduction, is of paramount importance to improving the efficiency and effectiveness of NNSA missions.

- While maintenance and capital expenditures have increased recently, the upgrade and retention of some Y-12 facilities may not be viable. As consolidation or relocation plans progress, economic considerations must be considered along with preservation strategies.

- The Office of Science and Energy (SC) and the Office of Nuclear Energy (NE) are vacating the Y-12 site and returning their operations to the Oak Ridge National Laboratory. However, the Office of Nuclear Energy is maintaining the calutrons in an operable stand-by condition. When vacated, approximately 1 million square feet of floor space, some with historical significance will become excess to the SC mission. NNSA, SC, and NE are integrating their planning efforts to determine if any reuse options are justifiable.

- The Office of Environmental Management is conducting Decontamination and Decommissioning (D&D) activities on the Y-12 site. The largest facility D&D activity is Building 9201-4, a mercury contaminated facility in the heart of Y-12's manufacturing area. While included in the historic district, this contaminated facility is excess to any current or projected mission need.

- Much of what is historically significant about Y-12 is not represented by today's view of Y-12 physical structures. The role that Y-12 has played in the National defense and security of the Nation from World War II through the Cold War transcends the physical facilities of Y-12 as they appear today.

There are various planning documents that have been created to direct needed changes on the Y-12 site, principal among these is the *Y-12 Strategic Plan*. Formulated in April 2001, the *Strategic Plan* is updated annually and establishes the direction for Y-12 in terms of its long-range vision, objectives, and goals, NNSA participates in Y-12's strategic planning process to ensure compatibility with NNSA Strategic Plan.

With respect to facilities and infrastructure, the projects designed to achieve the goals of the *Y-12 Strategic Plan* are outlined in Y-12's *Ten-Year Comprehensive Site Plan* (TYCSP). The objective of the TYCSP is to express the results of a comprehensive planning process that evaluates mission requirements and facility and infrastructure needs. The results take the form of capital projects and other investments (i.e. maintenance and repair) required to ensure the safe and secure performance of the assigned missions. Projects proposed within the plan are required to be evaluated for NEPA and NHPA requirements prior to implementation. Comprehensive planning is a dynamic process and occurs continuously. The TYCSP is updated and approved by NNSA annually. As Y-12 continues to address the challenges described above, additional facility and infrastructure alternatives will be developed and analyzed. These alternatives will no doubt involve historical facilities and the historical district.

7.2. Historic Preservation Strategy

The Y-12 Historic Preservation Strategy is to ensure that preservation is an integral part of the annual comprehensive planning process. Implementation of the Y-12 historic preservation strategy will be accomplished through the combined application of historic preservation interpretive initiatives, and the physical preservation of historic properties. Physical preservation will be evaluated in the context of, but not necessarily limited to, continuing mission need, functional use, and economic considerations. This strategy recognizes that historic significance must go beyond the preservation of physical structures – principally due to the long-range need for less space to perform the site's missions and due to the fact that most of Y-12's historic properties are historically significant due to the historic missions that took place within them over the years and the role that Y-12 as a whole has played in the defense and security of the Nation over time. The Y-12 historic preservation strategy also addresses the need to preserve more global historic features, such as Y-12's part in the Manhattan Project, the "feel" of Y-12 during the war effort, and the historic significance of Y-12's products (which are of particular importance to the Cold War era), historic documents, artifacts, and people.

Interpretive historic preservation initiatives developed as part of the Y-12 historic preservation strategy are discussed in section 7.3. However, the Y-12 historic preservation strategy also recognizes the physical preservation of historic structures. Physical preservation must be based on sound comprehensive planning and NNSA mission directives. As a part of this preservation strategy and based on the dynamics of planning efforts, 76 of the existing 77 historic properties and structures at Y-12 have been categorized into the following four groups:

(1) Future Mission Need
(2) Excess
(3) Future Mission Need Uncertain
(4) Historic Status Re-evaluated

The groupings reflect the current dynamics of Y-12's Plan for the future. There is some uncertainty as to whether capital budgets will be sufficient to execute the TYCSP. Hence, the category of "future mission need uncertain." The HPP provides an assessment of contributing properties in the Y-12 National Register Historic District. This assessment categorizes each property's contribution to the historical and architectural character of the district as either minor, moderate, or major effect. These determinations were

based on each building's historical significance, architectural significance and integrity, and the building's location in the district and its contribution to the district's historic streetscape.

- Group 1 Buildings: These 31 Y-12 historic properties have an identified future mission need for the foreseeable future. The physical preservation of historically significant features of these properties will be ensured through an active facility maintenance program (See Section 8.0); and alterations to these properties will be reviewed for potential adverse affect to historic properties as described in Section 11.0.

TABLE 1: Group 1 – Historic Properties Projected to Have Future Mission.

	Building Number	Building Type	Contribution to District's Visual Appearance	Contribution to District's Historic Integrity
1	9201-1 (Alpha 1)	Process	Major	Major
2	9201-3 (Alpha 3)	Process	Major	Major
3	9204-2 (Beta 2)	Process	Major	Major
4	*9204-3 (Beta 3)	Process	Major	Major
5	9202	Development	Major	Major
6	9203	Lab Development	Major	Major
7	9212	Production	Major	Major
8	9215	Production	Major	Major
9	9404-9	Pumphouse	Minor	Minor
10	9404-10	Pumphouse	Minor	Minor
11	9404-17	Pumphouse	Minor	Minor
12	9404-18	Pumphouse	Minor	Minor
13	9510-2	Disposal Facility	Minor	Minor
14	9710-2	Fire Department	Moderate	Moderate
15	9720-5	Warehouse/Storage	Major	Major
16	9720-6	Warehouse/Storage	Minor	Minor
17	9720-7	Warehouse/Storage	Minor	Minor
18	9720-8	Warehouse/Storage	Moderate	Moderate
19	9720-9	Warehouse/Storage	Minor	Minor
20	9722-2	Emergency Power Facility	Minor	Minor
21	9723-25	Changehouse/Offices	Moderate	Moderate
22	9727-3	Nitrogen Plant	Minor	Minor
23	9732-2	Storage	Minor	Minor
24	9732-3	Storage	Minor	Minor
25	9737	Engineering	Moderate	Moderate
26	9739	Engineering	Major	Major
27	9803	Valvehouse	Minor	Minor
28	9805-1	Chemistry Facility	Moderate	Moderate
29	9977-1	Nitrogen Station	Minor	Minor
30	9996	Maintenance	Moderate	Moderate
31	9998	Machine Shop	Moderate	Moderate

*Office of Nuclear Energy (ORNL)

- Group 2 Buildings: These 29 Y-12 historic properties have been determined to be excess to future mission needs. Historically significant features of these facilities will be preserved through interpretive initiatives, and the facilities will be demolished (in some cases after completing required decontamination & decommissioning work or placed in "safe storage" standby condition). Interpretive initiatives that will be performed prior to demolition to capture and preserve the historically significant features of these facilities are described in Section 7.3.

TABLE 2: Group 2 – Historic Properties Excess to Y-12 NSC Missions.

	Building Number	Building Type	Contribution to District's Visual Appearance	Contribution to District's Historical Integrity
1	*9201-4 (Alpha 4)	Process	Major	Major
2	9201-5 (Alpha 5)	Process	Major	Major
3	9206	Processing/Production	Major	Major
4	**9207	Biology	Major	Major
5	**9210	Research	Major	Major
6	*9213	Development/Training	Minor	Moderate
7	9404-4	Pumphouse	Minor	Minor
8	9404-6	Pumphouse	Moderate	Moderate
9	9404-12	Pumphouse	Moderate	Moderate
10	9404-13	Pumphouse	Moderate	Moderate
11	9404-16	Pumphouse	Moderate	Moderate
12	9416-4	Utilities	Minor	Minor
13	9419-2	Utilities	Minor	Minor
14	9510-2	Waste Disposal	Minor	Minor
15	9616-3	Chemical Facility	Minor	Minor
16	9704-1	Offices	Moderate	Moderate
17	9720-12	Warehouse/Storage	Minor	Minor
18	9720-13	Warehouse/Storage	Minor	Minor
19	9720-17	Warehouse/Storage	Moderate	Moderate
20	9723-24	Changehouse/Offices	Moderate	Moderate
21	9729	Storage	Moderate	Moderate
22	9738	Shops	Moderate	Moderate
23	9752	Utilities	Minor	Minor
24	9767-2	Utilities	Moderate	Moderate
25	9768	Utilities	Minor	Minor
26	*9770-2	Radiation Source Facility	Minor	Minor
27	9802-2	Utilities	Minor	Minor
28	9977	Nitrogen Station	Minor	Minor
29	9987	Storage	Minor	Minor

*Office of Environmental Management (EM)
**Office of Science and Energy (ORNL)

- Group 3 Buildings: These 16 Y-12 historic properties future mission needs are uncertain at this time, albeit most are at least partially active today. Physical preservation of historically significant features of these historic properties will be ensured through an active surveillance and maintenance program (See Section 8.0). The objective of the surveillance & maintenance program is to prevent the inadvertent loss of historically significant features through neglect. Restoration and/or upgrade to these structures will be deferred until future mission needs have been determined. At such time as future mission needs have been determined, the facility will be reclassified as a Group 1 or Group 2 building, in accordance with the process described in section 7.2. Alterations to Group 3 properties will be reviewed for potential adverse affect using the same process as established for Group 1 buildings (as described in section 11.0).

TABLE 3: Group 3 – Historic Properties with Mission Needs Uncertain.

	Building Number	Building Type	Contribution to District's Visual Appearance	Contribution to District's Historical Integrity
1	*9201-2 (Alpha 2)	Process	Major	Major
2	*9204-1 (Beta 1)	Process	Major	Major
3	9204-4 (Beta 4)	Process	Major	Major
4	9401-1	Engine Test Cells	Moderate	Moderate
5	9401-3	Steam Plant	Moderate	Moderate
6	9704-2	Offices	Moderate	Moderate
7	9706-2	Medical	Moderate	Moderate
8	9711-1	Offices	Moderate	Minor
9	9731	Development	Major	Major
10	9733-1	Offices	Major	Major
11	9733-2	Offices	Major	Major
12	9733-3	Offices	Major	Major
13	9734	Offices	Major	Major
14	9736	Offices	Major	Major
15	9764	Offices	Moderate	Moderate
16	9804	Valvehouse	Minor	Minor

*Office of Science and Energy (ORNL)

- Group 4 Buildings: These 3 Y-12 historic properties have been identified as needing to be re-classified as non-contributing properties to the proposed Y-12 Plant National Register Historic District. They were listed erroneously in the "Architectural/Historic Evaluation of the Oak Ridge Y-12 Plant, Oak Ridge Reservation, Anderson County, Tennessee" as contributing properties to the district. These buildings are discontiguous properties to the Y-12 Plant Historic District. They were re-evaluated by the Preservation Planners and it was recommended that they be considered non-contributing properties.

TABLE 4: Group 4 – Buildings re-evaluated as non-contributing properties to the historic district.

	Building Number	Building Type	Contribution to District's Visual Appearance	Contribution to District's Historical Integrity
1	1405	Filter Plant	N/A	N/A
2	1501-1	Elza Switchyard Equipment Room	N/A	N/A
3	9712	Garage	N/A	N/A

7.3. Y-12 Interpretive Approach

As discussed earlier, Y-12's historic preservation strategy is to ensure the preservation of features associated with Y-12 that are of historical significance through the integration of historic preservation initiatives with ongoing mission objectives. Preservation of historically significant features will be accomplished through the combined application of historic preservation interpretative initiatives, and the physical preservation of historic properties. This strategy recognizes that effective preservation of features of historic significance to Y-12 goes beyond simply preserving physical structures. Effective preservation of Y-12's historic features should also address more global features, such as the massive construction of Y-12 over a short 18-month period as part of the Manhattan Project, the "feel" of Y-12's historic district, and historic significance of Y-12's products (particularly important to Cold War era), artifacts, and people.

Attempts have been made to record portions of the history and significance of the Y-12 Complex in numerous ways. Various books and publications detailing the history of the facility during World War II have been published. In addition, the American Museum of Science and Energy at Oak Ridge contains several exhibits pertaining to the operations of Y-12, and offers limited bus tours of the facility. However, at present, the existing documentation, exhibits, tours, and other methods of interpretation are not comprehensive enough to adequately convey the historical importance of Y-12 during World War II and the Cold War. In order to address this need, Y-12 will develop an Interpretive Plan by the end of 2004.

A key component of properly protecting Y-12's historic features will involve performing a set of interpretive initiatives designed to comprehensively document Y-12's historical significance. These interpretive initiatives, which will be described in detail in the Y-12 Interpretive Plan, will specifically address each of the following important elements:

- Interpretive effort to preserve the "feel," "size" and "look" of the Y-12 historic district. This effort will address the magnitude and speed by which Y-12 was constructed as part of the Manhattan Project, including efforts to convert Y-12 to support other mission needs (e.g. thermonuclear weapon program) in later years. This effort will also address the look of the Y-12 historic district over the years as missions changed and the site underwent significant changes.

- Interpretive effort to capture Y-12's historic missions, products, and people. The focus of this effort will not be on physical facilities, but on Y-12's historic missions, products, and people.

- Interpretive effort to preserve each of the Y-12 historic properties (buildings) that are to be demolished, using a graded approach consistent with the degree of historic significance.

- Facilities of Minor Historic Significance: Facilities of low relative historic significance will have record files developed containing facility photos, facility construction drawings (if available), and a brief written physical description of the facility's historic missions.

- Facilities of Moderate Historic Significance: Facilities of moderate relative historic significance will have a more detailed interpretive record developed. The interpretive record will include a collection of available facility photos to document the life cycle of the facility (construction through demolition, if available), a collection of facility maps and drawings (if available), and a more detailed account of historic missions and activities.

- Facilities of Major Historic Significance: Facilities of high relative historic significance will have an extensive interpretive effort prepared, suitable for preservation using video and/or CD-ROM technology. The more detailed interpretive effort will include an attempt to develop a photo-record history of the facility, a collection of facility maps and drawings (if available), a detailed account of historic missions and activities (including interviews with former workers if available).

- Consistent with the above-noted graded approach, the level of interpretation to be performed on each of the 29 historic properties that are excess to mission need and, therefore, scheduled for demolition (Group 2 properties) is described in Section 7.4.

Y-12's historical significance may be documented through a variety of interpretive measures. Potential interpretive efforts, which will be described in detail in the Y-12 Interpretive Plan, might include, but are not limited to, the following:

- **An oral history program of current and former Y-12 plant employees.**
- **Development or enhancement of an interpretive center readily available to the public.**
- **Provide a vantage point and wayside exhibits for tour buses and the general public.**
- **Prepare exhibits and markers at building locations for the general public and Y-12 employees.**

7.4. Proposed Demolition and Assessment of Impact

There are currently twenty-nine buildings classified as Group 2 and proposed for demolition. These historic properties have been determined to be excess to future mission needs. They include pumphouses and utility buildings, offices, warehouses, labs, storage, and production facilities. Table 7 identifies these buildings and their year of construction.

TABLE 5:
Contributing Buildings in the Y-12 Historic District Determined to be Excess Facilities (Group 2)

	Building Number	Building Type	Year Built
1	*9201-4 (Alpha 4)	Process	1944
2	9201-5 (Alpha 5)	Process	1945
3	9206	Processing/Production	1945
4	**9207	Biology	1945
5	**9210	Research	1945
6	*9213	Development/Training	1947
7	9404-4	Pumphouse	1943
8	9404-6	Pumphouse	1943
9	9404-12	Pumphouse	1944
10	9404-13	Pumphouse	1944
11	9404-16	Pumphouse	1954
12	9416-4	Utilities	1943
13	9419-2	Utilities	1944
14	9510-2	Disposal Facility	1944
15	9616-3	Chemical Facility	1946
16	9704-1	Offices	1943
17	9720-12	Warehouse/Storage	1954
18	9720-13	Warehouse/Storage	1954
19	9720-17	Warehouse/Storage	1956
20	9723-24	Changehouse/Offices	1945
21	9729	Storage	1943
22	9738	Shops	1944
23	9752	Utilities	1944
24	9767-2	Utilities	1945
25	9768	Utilities	1945
26	**9770-2	Radiation Source Facility	1945
27	9802-2	Utilities	1954
28	9977	Nitrogen Station	1955
29	9987	Storage	1945

*Office of Environmental Management (EM)
**Office of Science and Energy (SC)

Demolition of any contributing building in the National Register-eligible historic district qualifies as an adverse effect on the district. In order to preserve the historic significance of these facilities, specific interpretive efforts will be completed on each facility prior to demolition using a graded approach consistent with the degree of historic significance.

On the following pages are individual assessments of the twenty-nine historic properties listed in Group 2 currently proposed for demolition at Y-12. These assessments include a brief architectural description and history of each building, a summation of its historical significance, and the recommended interpretive effort to protect the historical significance of the building prior to demolition.

BUILDING 9201-4

ARCHITECTURAL DESCRIPTION:

Constructed of reinforced concrete, structural steel, and transite with masonry walls, this four-story building is one of the largest structures on the Y-12 Plant and is one of the original Alpha Processing buildings. The predominantly rectangular shaped building has varying roof heights (from one to four stories) and features a basement, penthouse, flat roof, and is covered with metal wall panels. The building's south facade features an overhead, metal, track door, metal louvered vents on the upper facade, and a row of hooded metal vents attached directly to the building's face. Hollow core, metal pedestrian doors are located on the south facade. The building's west facade features a variety of mechanical and piping systems located behind fencing. A metal ventilation system is directly attached to the face of the east facade. Paired bands of twenty-pane aluminum awning style windows are located in the upper stories of the north facade. Paired metal vents are also found across the north elevation's face. The lower northeast corner of the north facade contains a wall of wooden louvers. An overhead, metal track door adjoins the louvered wall.

HISTORY:

Completed in October 1944 by Stone & Webster Engineering Corporation, this facility originally functioned as an Alpha Processing building and began operating as an uranium isotope separation property in 1945. The process utilized electromagnetic separation to enrich uranium used in creating the atomic bomb. In 1947, the process was shutdown, although the building was placed in stand-by mode until 1953. At that time, the installation of the lithium (Li) isotope separation process by the column exchange method (Colex) was installed, and began production in June of 1955. The Colex process used substantial quantities of mercury as a solvent to affect the separation of high purity Lithium-6 (Li-6) from natural Lithium -- Li-6 was used in fusion bombs. The isotope Li-6 will combine (or fuse) in a thermonuclear explosion to produce additional energy. The Colex production was shutdown in December of 1962 and placed on stand-by mode until 1983, the end of the Cold War era, when it was determined that additional quantities of Li-6 were not needed.

The building is currently in the DOE-EM Decontamination and Decommissioning program. Small portions of the building are used for general plant maintenance, electrical, and utilities use. The building contains 501,422 square feet and is one of the largest buildings on the Y-12 Plant, with several small ancillary buildings attached to the east and west facades. A railroad track runs along the south facade and First Street runs along the north facade.

SIGNIFICANCE:

Building 9201-4 (Alpha-4) functioned as a uranium enrichment facility and furthered the plant's mission of producing enriched uranium for the atomic bomb. Between 1953 and 1962, the building was used to produce Lithium with the Colex process. From 1962 until 1983 the building was placed on stand-by.

As an Alpha processing facility associated with the Manhattan Project, and later serving as the site for lithium isotope separation during the Cold War years, Building 9201-4 aided in the development of wholly new technology and substantially advanced the field of nuclear science. In terms of facility planning, project engineers originally designed all Alpha and Beta buildings with "zero tolerance" for building movement or settling as the successful operation of the Y-12 Plant's calutrons depended on absolute structural stability.

Building 9201-4 is eligible for inclusion in the National Register under Criteria A and C and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development. It is felt to be eligible under Criterion C for engineering merits and for contributions to science and technology.

PROPOSED DEMOLITION: 2007

ASSESSMENT OF IMPACT:

Building 9201-4 (Alpha 4) is one of the main processing buildings in the Y-12 Historic District. The building played a critical role in the complex's uranium enrichment operations during the Manhattan Project and in lithium isotope separation during the Cold War years. It is one of the largest buildings in the Y-12 Complex, and it occupies a core position within the historic district. Building 9201-4 is important in conveying the district's history and its sense of time and place. Removal of this building would have a major effect on the district's visual appearance and its historic integrity.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9201-4 (Alpha-4) would require substantial recordation and interpretation, which would be described in the Y-12 Complex Interpretive Plan. Building 9201-4 has a major historic significance and would have an extensive detailed interpretive effort prior to demolition. This effort would include, but not be limited to, the use of video and/or CD-ROM technology as well as an attempt to develop a photo-record history of the facility, a collection of facility maps and drawings (if available), and a detailed account of the building's historic missions and activities.

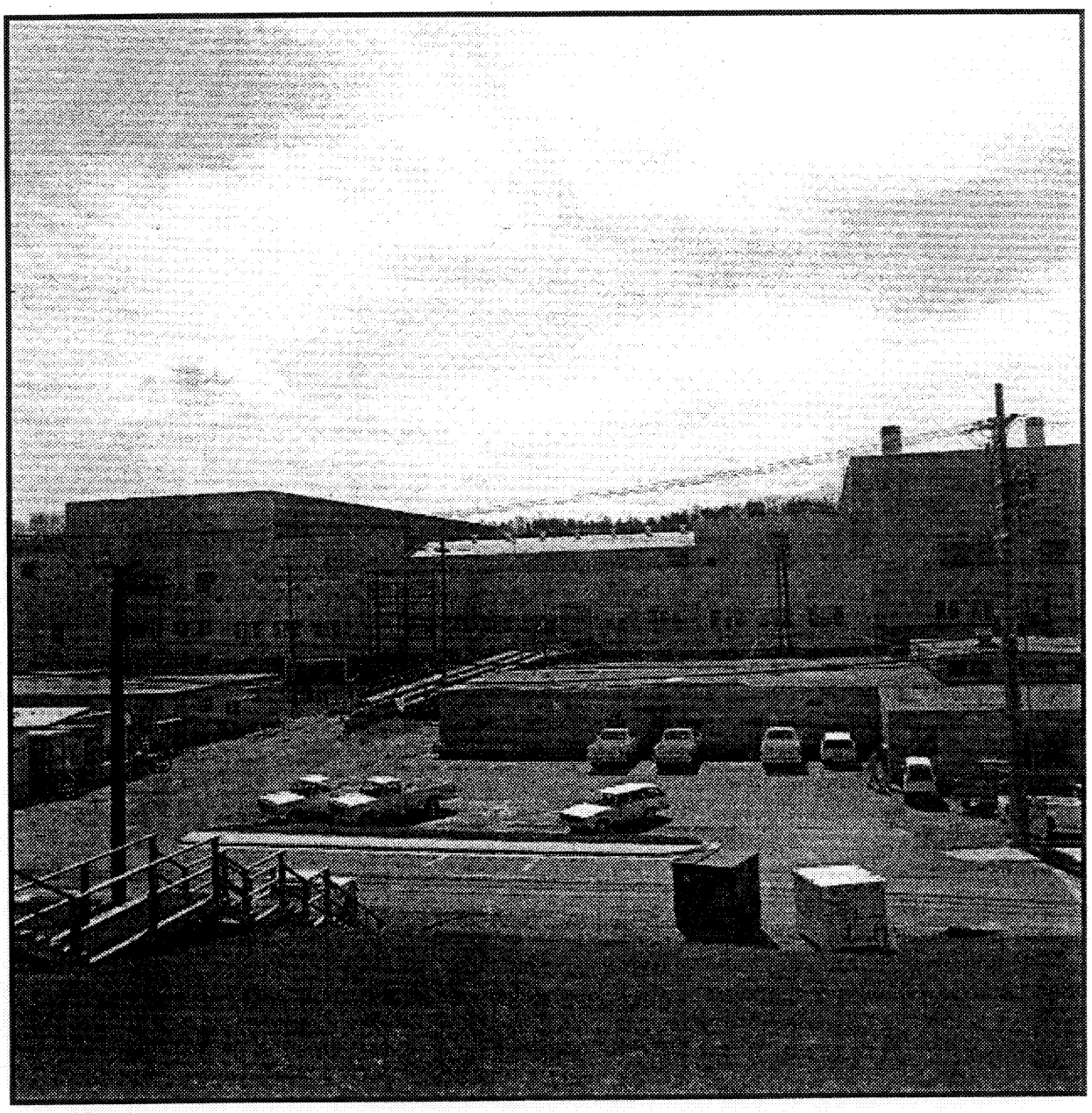


Figure 31: Building 9201-4 (Alpha 4) – Uranium Enrichment Facility

BUILDING 9201-5

ARCHITECTURAL DESCRIPTION:

Constructed of reinforced concrete and structural steel skeleton with masonry and transite wall panels, this large building is four stories in height with a flat roof. The mostly rectangular shaped building's south facade features hooded vents attached directly to the building's face and numerous electrical and piping systems. A circular metal stack, located within steel framing stands on the roof of the south facade. A one story, rectangular plan, shed roof, steel sided and roofed addition has been constructed near the building's southwest corner.

A single story, rectangular plan, concrete block, flat roof addition was constructed on the west facade of the facility and completed in December of 1967. This addition houses a Machine Shop and is known as Building 9201-5W. A single story, flat roof, rectangular plan addition is located on the roof of this addition. A second single story, rectangular plan, flat roof, concrete block addition has been constructed on the south facade of this addition. A metal, overhead track door is located on the addition's west facade. The overhead track door's cast concrete loading dock is reached by a loading ramp constructed below grade.

Building 9808 is attached to the main building's east facade. A cast concrete bridge connects a second level entrance and loading dock on the north central facade of the main building; connecting with the street level between Buildings 9723-19 and 9723-21 and crosses above First Street.

HISTORY:

Completed in May of 1944, this building housed the Alpha-5 Production facility. Located on the Y-12 Plant, the 530,000 square foot building is the next to largest of the original Alpha Production facilities and was constructed by Stone & Webster Engineering Corporation and the Catalytic Construction Company. The building was enlarged with a one-story addition on the west facade in December of 1967 (Building 9201-5W). The facility underwent a major renovation in 1970 which altered the interior with new walls, ceilings, floors, mezzanine, work platform, office space, and changehouse. Other building modifications have resulted in extensive exterior alterations and additions.

SIGNIFICANCE:

Building 9201-5 (Alpha-5) functioned as a uranium enrichment facility during World War II and furthered the plant's mission of producing enriched uranium for the atomic bomb. As an Alpha processing facility associated with the Manhattan Project, Building 9201-5 aided in the development of wholly new technology and substantially advanced the field of nuclear science. In terms of facility planning, project engineers originally designed all Alpha and Beta buildings with "zero tolerance" for building movement or settling as the successful operation of the Y-12 Plant's calutrons depended on absolute structural stability. After World War II, the building was used in the plant's COLEX process of the 1950s which separated the element Lithium-6 (Li-6). This was an important component in the manufacture of hydrogen bombs and the COLEX process is of notable significance in Cold War history.

Building 9201-5 is eligible for inclusion in the National Register under Criteria A and C and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, and its association with the Cold War COLEX process. It is also eligible under Criterion C for its engineering design.

PROPOSED DEMOLITION: 2009

ASSESSMENT OF IMPACT:

Building 9201-5 (Alpha 5) is one of the key buildings of the Y-12 Historic District. The building played a critical role in the complex's uranium enrichment operations during the Manhattan Project and in the plant's nuclear enrichment programs of the Cold War. The building is one of the largest in the Y-12 Complex, and it occupies a core position within the district. Building 9201-5 is vital to conveying the district's history and its sense of time and place. Removal of this building would have a major effect on the district's visual appearance and its historic integrity.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9201-5 (Alpha-5) would require substantial recordation and interpretation, which would be described in the Y-12 Complex Interpretive Plan. Building 9201-5 has a major historic significance and would have an extensive detailed interpretive effort prior to demolition. This effort would include, but not be limited to, the use of video and/or CD-ROM technology as well as an attempt to develop a photo-record history of the facility, a collection of facility maps and drawings (if available), and a detailed account of the building's historic missions and activities, which may include interviews with former workers associated with this building.

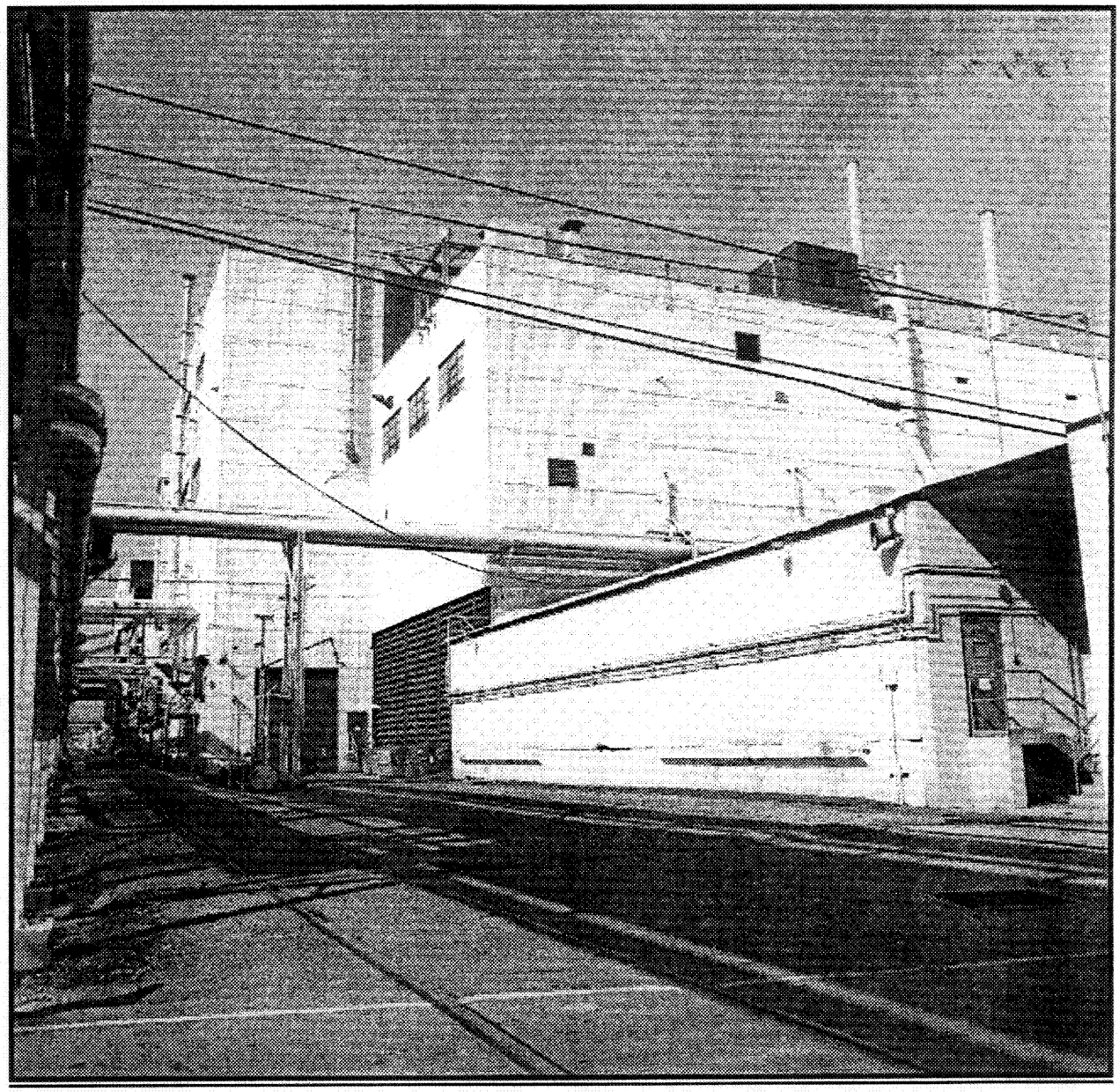


Figure 32: Building 9201-5 (Alpha-5) – Uranium Enrichment Facility

BUILDING 9206

ARCHITECTURAL DESCRIPTION:

Constructed of a structural steel skeleton with hollow core tile walls, this two-story building features a flat roof. The rectangular building has one-story additions located on most facades. Two large, circular steel stacks are supported by structural steel framing and are located along the west facade. Recessed, cast concrete steps, framed with metal handrailing, lead to paired, hollow core metal pedestrian doors on the south facade. A variety of piping and mechanical systems are attached to the building's face on the east facade. A loading dock, of cast concrete construction, is covered with a flat metal roof supported by square metal posts and wraps the building's southern and western elevations. The building's mezzanine, constructed of masonry and featuring a flat roof, is located in the southwest corner and bears a variety of mechanical equipment on its roof.

A documentary photograph (March, 1944) reveals that the building was originally a simple facility with a central two-story section and a flanking one-story wing attached to the south facade. Some of the original windows were filled with glass block and others featured metal paned windows, but almost all have been filled in with masonry.

HISTORY:

Completed in May of 1944, this building houses a former Uranium Processing/Production facility. The 67,294 square foot building was constructed by Stone & Webster Engineering Corporation. Originally, the facility was in charge of "handling (the) balance of Beta cycle" during the war period. In 1991, additions of platforms, exhaust ductwork, and a baghouse were constructed for almost $1.3 million.

SIGNIFICANCE:

Building 9206 handled the "balance of the Beta cycle" during World War II and furthered the plant's World War II mission of enriching uranium for the atomic bomb. The building retains architectural and historical significance to meet National Register Criteria. Building 9206 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2007

ASSESSMENT OF IMPACT:

Although a significant building within the historic district, Building 9206 has been identified as possessing severe contamination problems and its adaptive reuse may not be feasible. This building is located in the center of the historic district and its demolition would have a major visual effect and result in a diminishment of the district's integrity.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9206 would require substantial interpretation and recordation, which would be described in the Y-12 Complex Interpretive Plan. Building 9206 has a major historical significance and would have an extensive detailed interpretive effort prior to demolition. This interpretive effort would

include, but not be limited to, the use of video and/or CD-ROM technology as well as an attempt to develop a photo-record history of the facility, a collection of facility maps and drawings (if available), and a detailed account of the building's historic missions and activities, which may include interviews with former workers associated with the building.

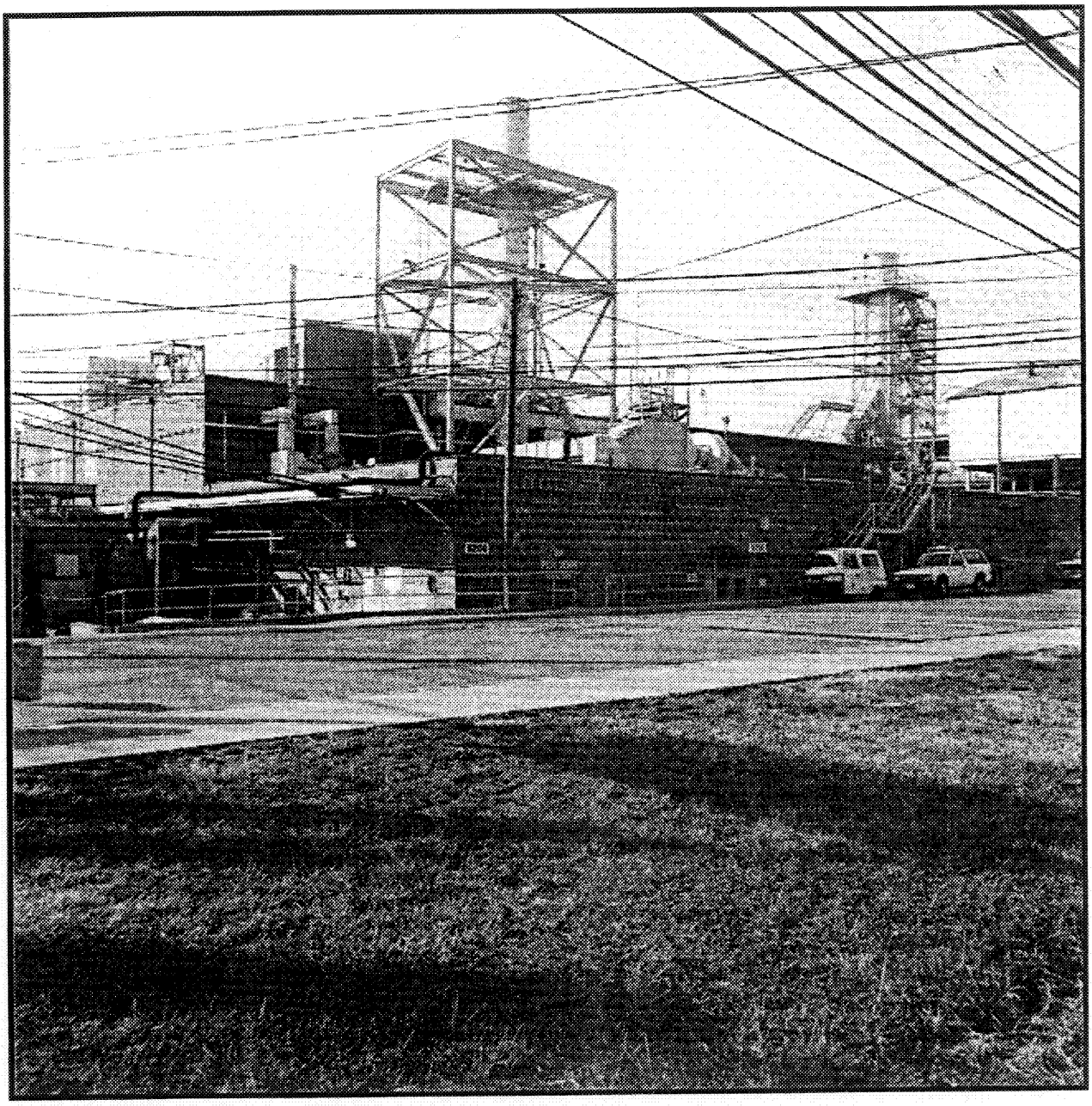


Figure 33: Building 9206 - Uranium Processing/Production facility

BUILDING 9207

ARCHITECTURAL DESCRIPTION:

Constructed of a structural steel skeleton with masonry walls, this six story building is the center of a facility that features numerous additions and enlargements. The flat roof, irregular plan building is connected to the north facade of Building 9211 via an elevated and enclosed skyway that connects to the southeast corner of the building. This skywalk is constructed of a cast concrete structure with masonry walls and circular cast concrete columns and was added to the building ca. 1985.

The main block features 6-light, fixed, aluminum and glass windows scattered across all wall surfaces. Pedestrian doors are comprised of single and paired, hollow core metal doors with single light safety glass. A steel, exterior flight of stairs opens onto the parking lot. A flat roof, concrete block corridor connects the building to the west facade of Building 9208 (AN 159). Pedestrian doors on the main block are covered with flat roof metal canopies.

The building also exhibits a large, one-story addition (ca. 1960) on the south facade with features a flat roof and brick walls. Windows are covered with aluminum mesh screens and are comprised of 3 vertical fixed sash above a single vertical light awning window. The primary entrance is comprised of paired aluminum and glass doors with single light transom above. A cast concrete ramp and cast concrete steps lead to the entrance.

Steel stairs placed in steel framing span the main block's height and are located on the southwest corner. A loading dock placed beneath a multi-story metal paneled, flat roof addition stands on the north facade. The metal structure is supported by steel I-beams placed on poured concrete piers. Trailers (Buildings 9983-13 and 9983-15) are located on the north facade as is a modest, cast concrete loading dock. The main block features multiple, large mechanical systems located on the roof. A five-story, masonry wing was constructed onto the southeast corner and features windows on the east and west facades.

Documentary photographs (1944-46) reveal that the building originally exhibited very distinctive circular pipes protruding from the roof. These metal ventilation pipes/smokestacks were painted pitch "wartime" black and gave the building an ominous presence on the Y-12 Plant (no other building besides 9208 and 9210 featured these type of roof-mounted, black pipes). A few of the bases of the pipes have been retained and are now painted white. Other details revealed in the historic photographs are: window awnings on the east facade, wood cooling towers (9409-19, AN 161) which have been replaced with metal clad towers.

An extensive renovation in 1968-69 resulted in a new conference room, kitchen, offices, Physical Biology labs, a tower annex, Environmental room, and a Radiation Laboratory (costing over $600,000). Other major renovations occurred in 1975, 1978, and 1980 - when a 20,000 square foot laboratory was renovated for over $1.5 million, and 1984.

HISTORY:

Completed in February of 1945, this building houses a Biology Research facility for ORNL. The 247,500 square foot building was constructed by Stone & Webster Engineering Corporation and originally housed chemical facilities. The building was one of the most expensive constructed at Y-12, costing $4,549,132.00.

The Biology Division greatly expanded as a result of the changing emphasis in the late 1950s and eventually became ORNL's largest division and the largest biology laboratory in the world (Johnson and

Schaffer 1992:39, 41). The division was housed at the Y-12 Plant within Buildings 9207, 9210, and 9208. Much of the Biology Division, including the radiation experiments conducted on mice by William and Liane Russell, were conducted in these buildings. Research on mice was designed to advance understanding of radiation effects on mammals. According to William Russell, mice were used for genetic studies because they had fewer diseases, could be fed and maintained economically, reproduced rapidly, and have the same essential organs as humans.

Liane Russell's 1950 survey of the gestation period of mice to examine their sensitivity to radiation yielded valuable information about critical periods during embryo development. She showed that radiation-induced changes of cells were more likely to occur during gestation. Largely because of her discovery of the greater sensitivity of embryos, women have been cautioned about X-ray examinations during pregnancy.

By 1949, 10,000 mice were housed in ORNL's renovated facilities at the Y-12 Plant. Laboratory biologists learned that nucleoproteins, present in living cell nuclei and essential to normal cell functioning, are sensitive to ionizing radiation. Paper chromatography and ion-exchange methods used to separate compounds, Laboratory researchers reasoned, could help scientists and medical researchers measure and gauge this sensitivity.

After applying ion-exchange chromatography to separation of fission products and starting the Laboratory's radioisotopes program, Waldo Cohn used the same technique to separate and identify the constituents of nucleic acids. From this work came the discovery with Elliott Volkin that ribonucleic acid (RNA) had the same general structure as deoxyribonucleic acid (DNA), a concept that had a fundamental impact on molecular biology, virology, and genetics (ORNL Review: 90 - 91). The Biology Division opened a Biophysical Separations Laboratory that conducted research into leukemia using centrifuge technology adapted from the centrifuge designs at the Oak Ridge Gaseous Diffusion Plant (the K-25 Site). The Biology Division also conducted research in freezing and transplanting embryos which resulted in changes in animal husbandry. The Biology Division did extensive research in cancer and in 1965 received support from the National Cancer Institute for a Carcinogenesis Research Laboratory and in 1968 began smoking related research. An out-growth of this work was the 1967 UT-ORNL Graduate School of Biomedical Science. However, after its peak in the 1960s, the changing focus of the ORNL pulled research away from this division. By the 1980s, the number of researchers in this division had shrank by half (Johnson and Schaffer 1992:210).

SIGNIFICANCE:

Building 9207 was designed as a portion of a larger complex (Buildings 9207, 9208, 9210, 9211, and 9769) and was incorporated into the uranium enrichment process by integrating "the old high pressure chlorination and sublimation step for the precipitation of the uranium tetrachloride feed" during the chemical refining phase. Following the war years, this complex was occupied by ORNL staff. Building 9207 is eligible for inclusion in the National Register under Criteria A and C and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development. It is felt to be eligible under Criterion C for engineering merits and for contribution to science and technology.

PROPOSED DEMOLITION: 2005
ASSESSMENT OF IMPACT:

Building 9207 is a key component of the complex of Buildings that comprise the Biology Division located in the northeastern portion of the Y-12 Historic District. One of the buildings within the Biology complex, Building 9211, has already been approved for demolition, and another, Building 9210 is also proposed for demolition. Building 9207 is the central and largest building in this area. Removal of this building would have a major effect on the visual appearance of this section of the historic district and its historic integrity. The scientific research conducted within Building 9207 lead to many advances and development in biology, medicine, genetics, and other fields.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9207 would require substantial recordation and interpretation, which would be described in the Y-12 Complex Interpretive Plan. Building 9207 has a major historic significance and would have an extensive detailed interpretive effort prior to demolition. This effort would include, but not be limited to, the use of video and/or CD-ROM technology as well as an attempt to develop a photo-record history of the facility, a collection of facility maps and drawings (if available), and a detailed account of the building's historic missions and activities, which may include interviews with former workers associated with the building.

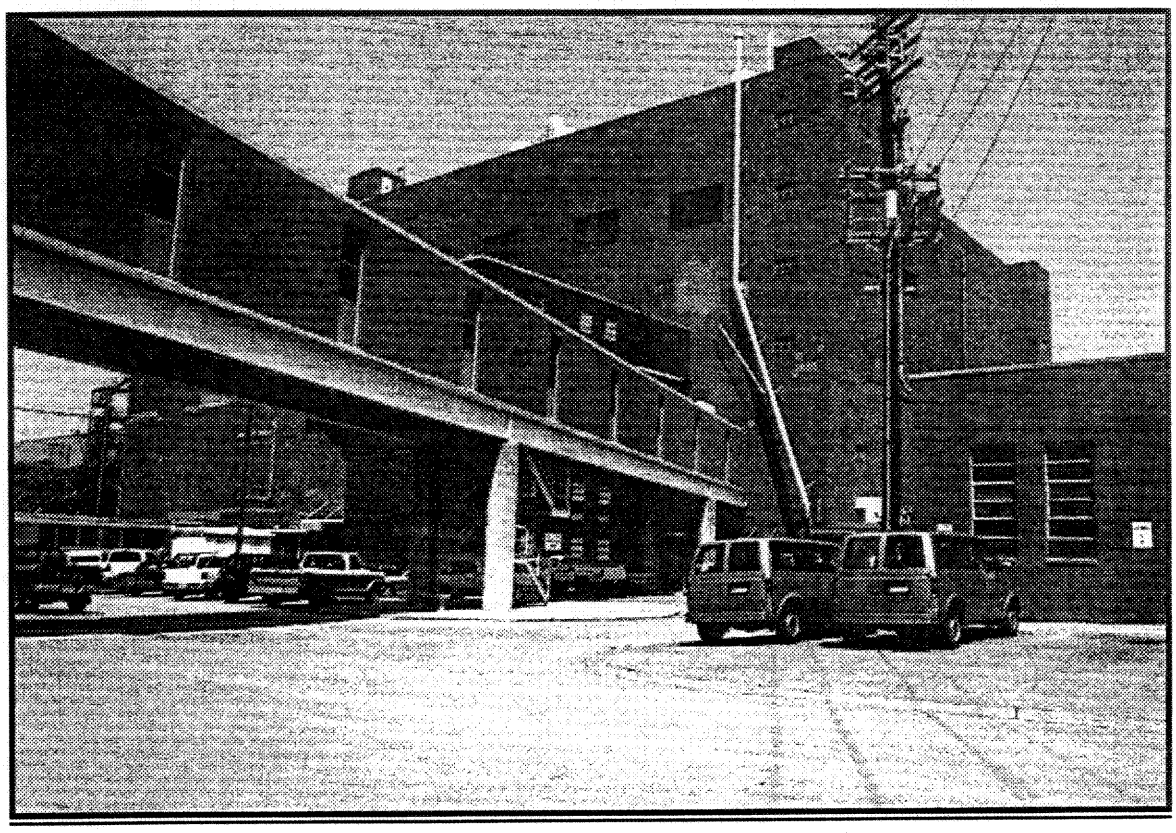


Figure 34: Building 9207 – Biology Research

BUILDING 9210

ARCHITECTURAL DESCRIPTION:

Constructed of a structural steel skeleton with masonry walls, this three-story, square building is connected to the northeast corner of Building 9207 (AN 158) with an original enclosed platform corridor. The flat roof facility features terra cotta coping and a cast concrete foundation. Pedestrian doors are comprised of single or paired hollow core metal doors with single light safety glass. Loading docks, located on the west and north facades, are constructed of cast concrete and covered with flat roof metal canopies. Windows are scattered across wall surfaces and are comprised of 6-light, fixed wood (upper facade) and 8-light fixed aluminum (first floor) sash.

Documentary photographs (1944-46) show the building's construction phases and original appearance; the building had many circular, metal pipes protruding from the roof. The tall ventilation pipes/stacks were painted "wartime" black and gave the facility an ominous presence on the Y-12 Plant (no other buildings besides 9207 and 9208 featured these roof-mounted, black pipes). The pipes have been removed and the building was renovated in 1980-81 with 2,100 square feet of added floor space and a Skeletal Preparatory Lab.

HISTORY:

Completed in February of 1945, this building houses a Biology Research facility for ORNL, which conducts Mammalian Genetics research in the building. The 65,700 square foot building was constructed by Stone & Webster Engineering Corporation and originally housed a Vacuum Process Building (cost $1,052,509.00).

The Biology Division greatly expanded as a result of the changing emphasis in the 1960s and eventually became the ORNL's largest division and the largest biology laboratory in the world (Johnson and Schaffer 1992:39, 41). The division was housed at the Y-12 Plant within Buildings 9207, 9210, and 9208. Much of the Biology Division, including the radiation experiments conducted on mice by William and Liane Russell, was conducted in these buildings. Research on mice was designed to advance understanding of radiation effects on mammals. According to William Russell, mice were used for genetic studies because they had fewer diseases, could be fed and maintained economically, reproduced rapidly, and have the same essential organs as humans.

Liane Russell's 1950 survey of the gestation period of mice to examine their sensitivity to radiation yielded valuable information about critical periods during embryo development. She showed that radiation-induced changes of cells were more likely to occur during gestation. Largely because of her discovery of the greater sensitivity of embryos, women have been cautioned about X-ray examinations during pregnancy. By 1949, 10,000 mice were housed in ORNL's renovated facilities at the Y-12 Plant. Laboratory biologists learned that nucleoproteins, present in living cell nuclei and essential to normal cell functioning, are sensitive to ionizing radiation. Paper chromatography and ion-exchange methods used to separate compounds, Laboratory researchers reasoned, could help scientists and medical researchers measure and gauge this sensitivity.

After applying ion-exchange chromatography to separation of fission products and starting the Laboratory's radioisotopes program, Waldo Cohn used the same technique to separate and identify the constituents of nucleic acids. From this work came the discovery with Elliott Volkin that ribonucleic acid (RNA) had the same general structure as deoxyribonucleic acid (DNA), a concept that had a fundamental impact on molecular biology, virology, and genetics (ORNL Review: 90 - 91).

The Biology Division opened a Biophysical Separations Laboratory that conducted research into leukemia using centrifuge technology adapted from the centrifuge designs at the Oak Ridge Gaseous Diffusion Plant (the K-25 Site). The Biology Division also conducted research in freezing and transplanting embryos which resulted in changes in animal husbandry. The Biology Division did extensive research in cancer and in 1965 received support from the National Cancer Institute for a Carcinogenesis Research Laboratory and in 1968 began smoking related research. An out-growth of this work was the 1967 UT-ORNL Graduate School of Biomedical Science. However, after its peak in the 1960s, the changing focus of the ORNL pulled research away from this division. By the 1980s, the number of researchers in this division had shrunk by half (Johnson and Schaffer 1992:210).

SIGNIFICANCE:

Building 9210 was designed as a portion of a larger complex (Buildings 9207, 9208, 9210, 9211, and 9769) and was incorporated into the uranium enrichment process by integrating "the old high pressure chlorination and sublimation step for the precipitation of the uranium tetrachloride feed" during the chemical refining phase. Following the war years, this complex was occupied by ORNL staff. The building retains historical significance to meet National Register Criteria.

Building 9210 is eligible for inclusion in the National Register under Criteria A and C and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development. It is felt to be eligible under Criterion C for engineering merits and for contribution to science and technology.

PROPOSED DEMOLITION: 2005

ASSESSMENT OF IMPACT:

Building 9210 is a key component of the complex of Buildings that comprise the Biology Division located in the northeastern portion of the Y-12 Historic District. One of the buildings within the Biology complex, Building 9211, has already been approved for demolition, and another, Building 9207 is also proposed for demolition. Building 9210 played a key role in the scientific research of ORNL's Biology Division, which led to numerous advances in science and medicine. Removal of this building would have a major effect on the visual appearance of this section of the historic district and its historic integrity.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9210 would require substantial recordation and interpretation, which would be described in the Y-12 Complex Interpretive Plan. Building 9210 has a major historic significance and would have an extensive detailed interpretive effort prior to demolition.. This effort would include, but not be limited to, the use of video and/or CD-ROM technology as well as an attempt to develop a photo-record history of the facility, a collection of facility maps and drawings (if available), and a detailed account of the building's historic missions and activities, which may include interviews with former workers associated with the facility.

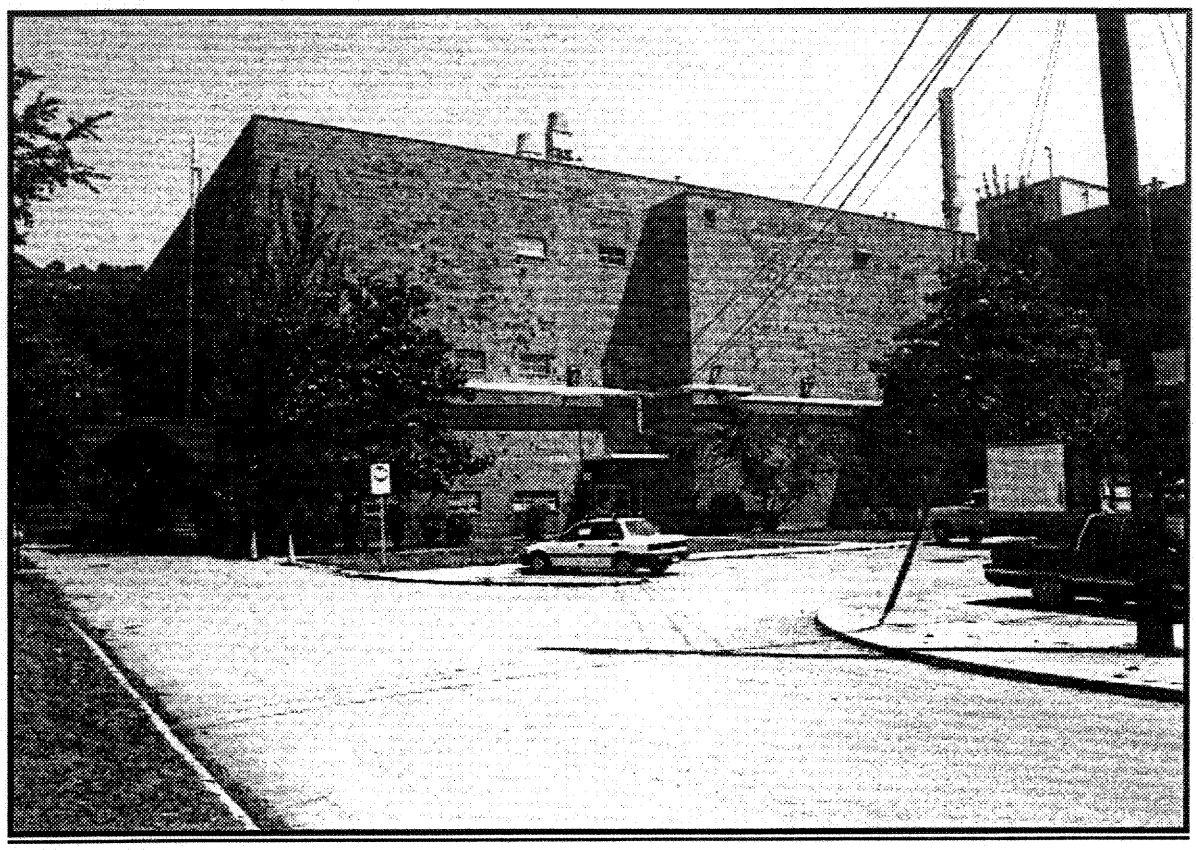


Figure 35: Building 9210 – Research Facility

BUILDING 9213

ARCHITECTURAL DESCRIPTION:

Constructed of concrete block, this two-story, flat roof, irregularly shaped building features 10-light/6-light awning and stationary style windows. Pedestrian doors consist of single and paired hollow core metal doors with two lights. Paired, vehicular entrances, comprised of solid, hollow core metal, are found on the primary facade. A square plan, flat roof addition adjoins the building on the rear facade. The facility has a poured concrete foundation and the roof is covered with tar and gravel.

HISTORY:

Completed in December 1947, this building housed Development and Training facilities for personnel and High Flux Isotope Reactor testing, however, the structure is presently unoccupied. The 23,500 square foot building was constructed by Giffel & Vallet and Burns & McDonald. Building 9213 was the site of radiation experimentation and housed several radiation sources. Construction design included walls measuring four feet in thickness to enhance shielding from possible radiation leaks. The building's southwest wall measure 58' long by 16' high by 3 1/2' thick for shielding purposes. The building is somewhat isolated from the plant's other facilities, and was located here in the event of criticality.

SIGNIFICANCE:

Building 9213 is eligible for inclusion in the National Register under Criteria A and C. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development. It is felt to be eligible under Criterion C for engineering merits and for contributions to science and technology. Building 9213 aided in the development of wholly new technology and substantially advanced the field of nuclear science.

PROPOSED DEMOLITION: 2010

ASSESSMENT OF IMPACT:

Building 9213 is not located within the boundaries of the Y-12 Historic District; however, it is eligible for the National Register as a contributing but noncontiguous element of the district. Because of its original function, the building is in an isolated location away from the main plant area. Its removal, therefore, would have a minor visual effect on the historic district. However, demolition of Building 9213 would have a moderate effect on the district's historic integrity.

RECOMMENDED INTERPRETIVE EFFORT:

Building 9213 played an important and unique role in the installation's history of scientific nuclear development. It is of moderate historic significance and prior to its demolition will be documented through a detailed interpretive record and report. The interpretive report will include a collection of available facility photos that will document the life cycle of the facility, any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

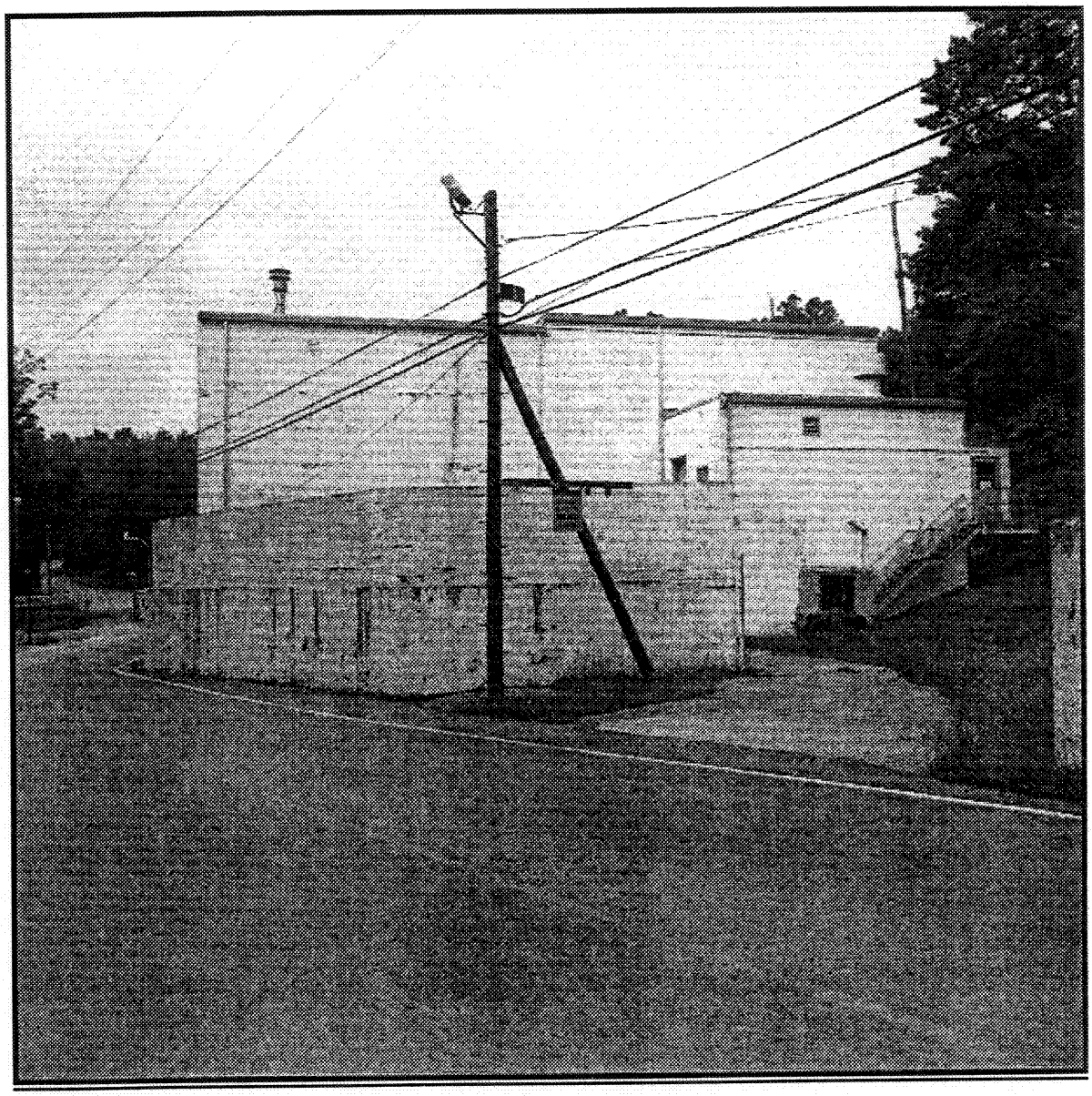


Figure 36: Building 9213 – Research & Training Facility

BUILDING 9404-4

ARCHITECTURAL DESCRIPTION:

Constructed of masonry, this one story gabled roof building features 4-light stationary sash, poured concrete lintels, louvered vents on the end walls, and a rectangular plan, flat roof addition. Circular vents are located on the building's ridgeline.

HISTORY:

Completed in September of 1943, this 5,500 square foot building houses a pumphouse and was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

Building 9404-4 originally functioned as a pumphouse for Building 9201-2 and, as an ancillary facility, furthered Y-12's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9404-4 retains architectural and historical significance to meet National Register Criteria. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2010

ASSESSMENT OF IMPACT:

Building 9404-4 has minimal architectural integrity and is located at the southeastern edge of the historic district. Its removal would have a minor effect on the district's integrity and appearance.

RECOMMENDED INTERPRETIVE EFFORT:

Building 9404-4 is of low historic significance. Prior to its demolition a record file will be developed that contains photos of the facility, any available construction drawings, and a brief written physical description of the facility and its historic missions.

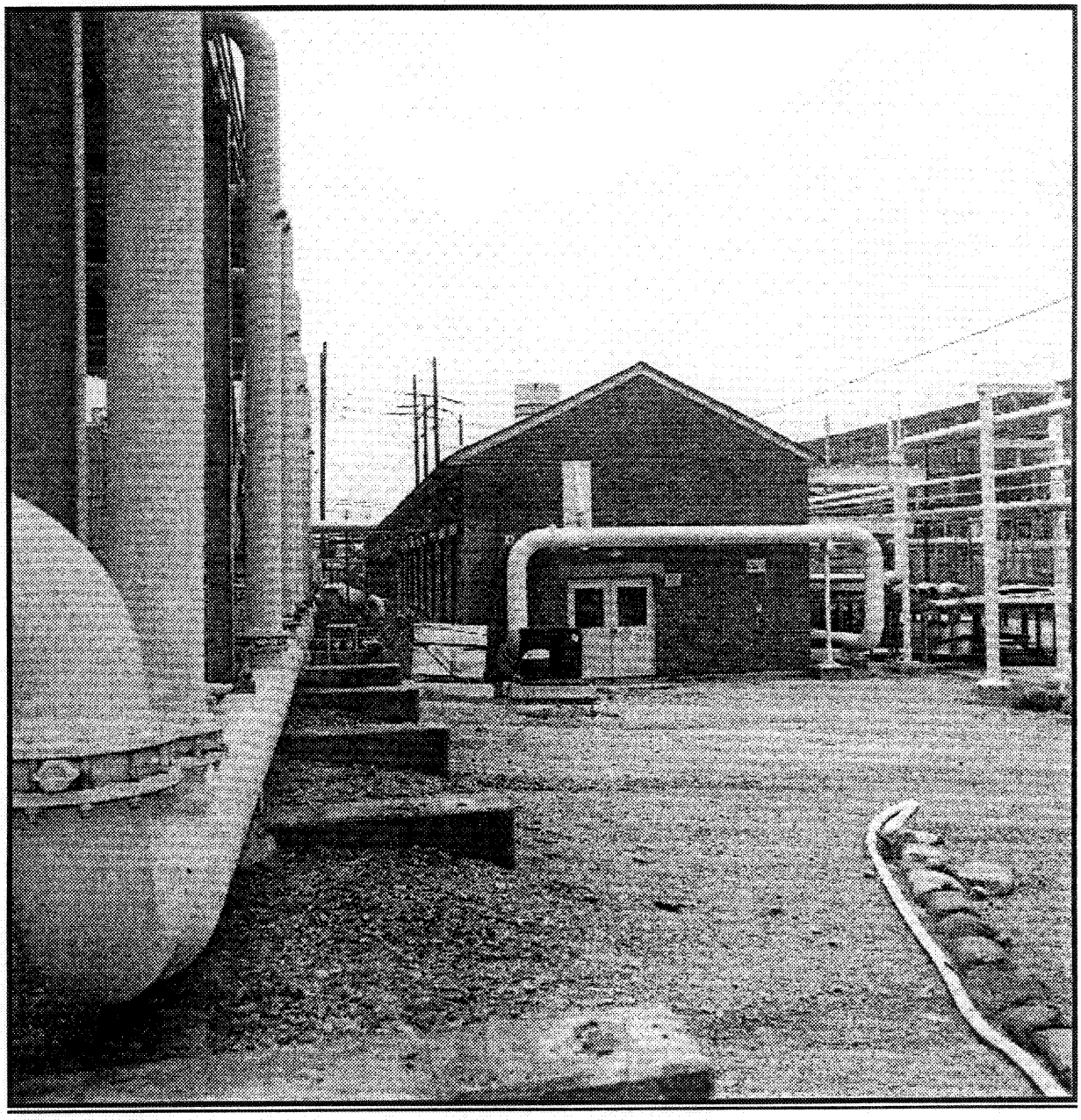


Figure 37: Building 9404-4 – Pumphouse

BUILDING 9404-6

ARCHITECTURAL DESCRIPTION:

This one-story building has an exterior of glazed brick and an asphalt shingle gable roof. Windows have been enclosed and have concrete lintels and sills. The west facade retains two-over-two fixed (upper) and awning (lower) wood sash. An original, 2-light single panel wood door is found on the north facade. The original wood sash windows are located on the east. The pedestrian door retains a cast concrete lintel, as well. Mechanical equipment adjoins the building on north and east facades. A documentary photograph (1946) shows that the building retains its original form and window fenestration.

HISTORY:

Completed in June of 1943, this building houses a pumphouse facility for Building 9731. The 800 square foot facility was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

Building 9404-6 functions as a pumphouse for Building 9731. As an ancillary property, Building 9404-6 furthered the plant's World War II mission of enriching uranium for the atomic bomb, and during the Cold War years, furthered the plant's mission of exploring government sponsored nuclear research.

The building retains historical significance to meet National Register Criteria. Building 9404-6 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2003

ASSESSMENT OF IMPACT:

Building 9404-6 is a small utility building that is a support structure for Building 9731, which is eligible for National Historic Landmark status. Building 9404-6 is located in the center of the historic district, and is a support structure to one of only two National Historic Landmark buildings at Y-12. Because its standardized plan has lost architectural integrity due to deterioration over the years, it has a moderate visual effect to the historic district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9404-6 would require a detailed interpretive record prior to demolition. Building 9404-6 has a moderate historic significance and the interpretive effort would include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

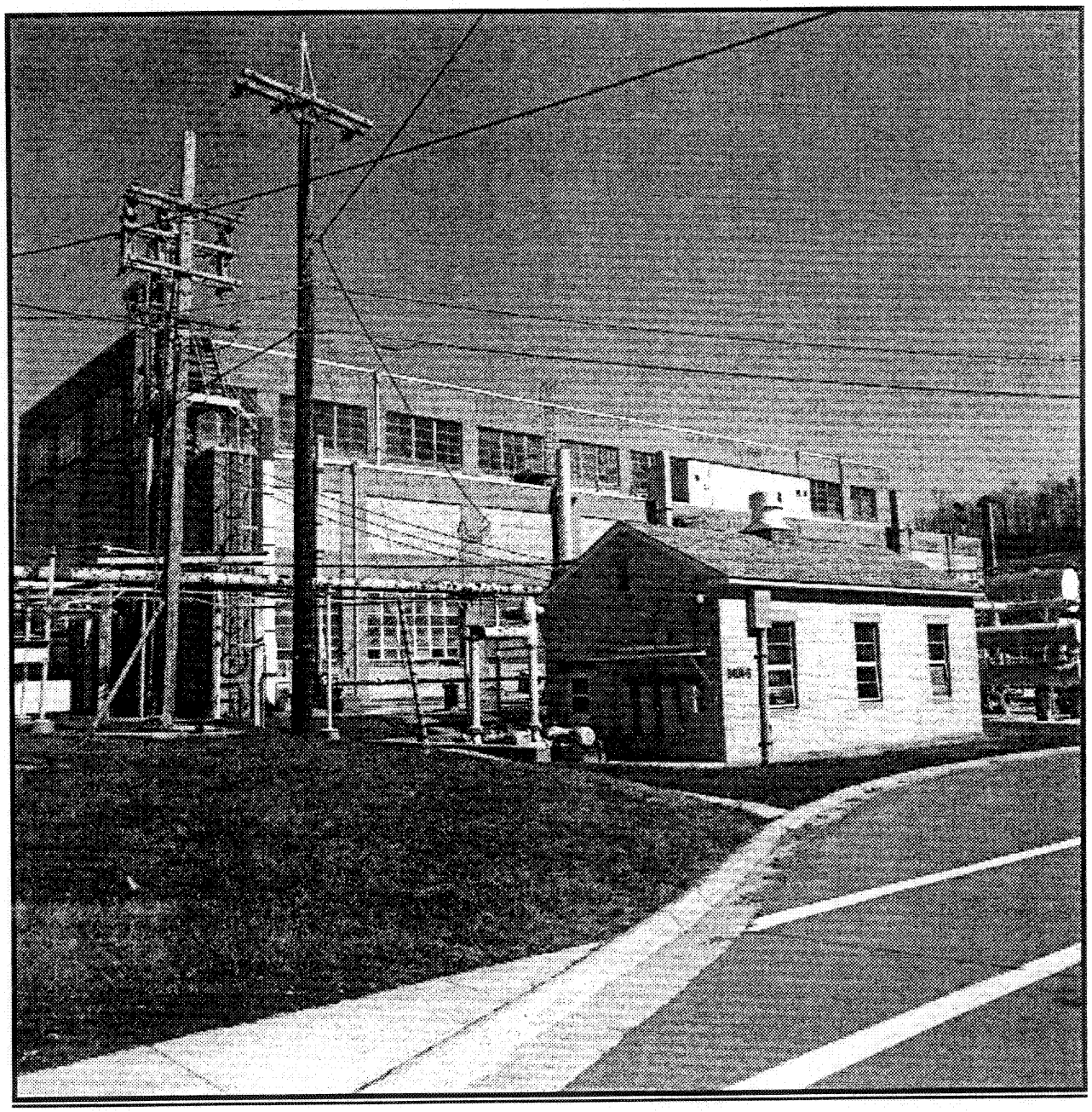


Figure 38: Building 9404-6 - Pumphouse with NHL Building 9731 in the background.

BUILDING 9404-12

ARCHITECTURAL DESCRIPTION:

Constructed of masonry bearing walls with wood roof framing, this one story, rectangular building features a gabled roof, frame eaves, cast concrete foundation, and asphalt shingles. The building's north and south facades bear original one-over-one fixed, frame sash. An original wood door with single panel is located on the east facade. A variety of mechanical equipment stands on the building's east and west facades.

HISTORY:

Completed in March of 1944, this building currently houses Pumphouse A-4. Located on the Y-12 Plant, this building is 1,900 square feet and was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

Building 9404-12 functioned as a pumphouse for Building 9201-4 and, as an ancillary facility, furthered Y-12's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

The building retains architectural and historical significance to meet National Register Criteria. Building 9404-12 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2003

ASSESSMENT OF IMPACT:

This building is a pumphouse located adjacent to Building 9201-4 (Alpha-4) and retains much of its original architectural character. It is one of only five original World War II era masonry pumphouses that remain at the Y-12 complex. Building 9404-12 is a good example of this building type and its removal would have a moderate visual effect on the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9404-12 would require a detailed interpretive record prior to demolition. Building 9404-12 has a moderate historic significance and the interpretive effort would include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

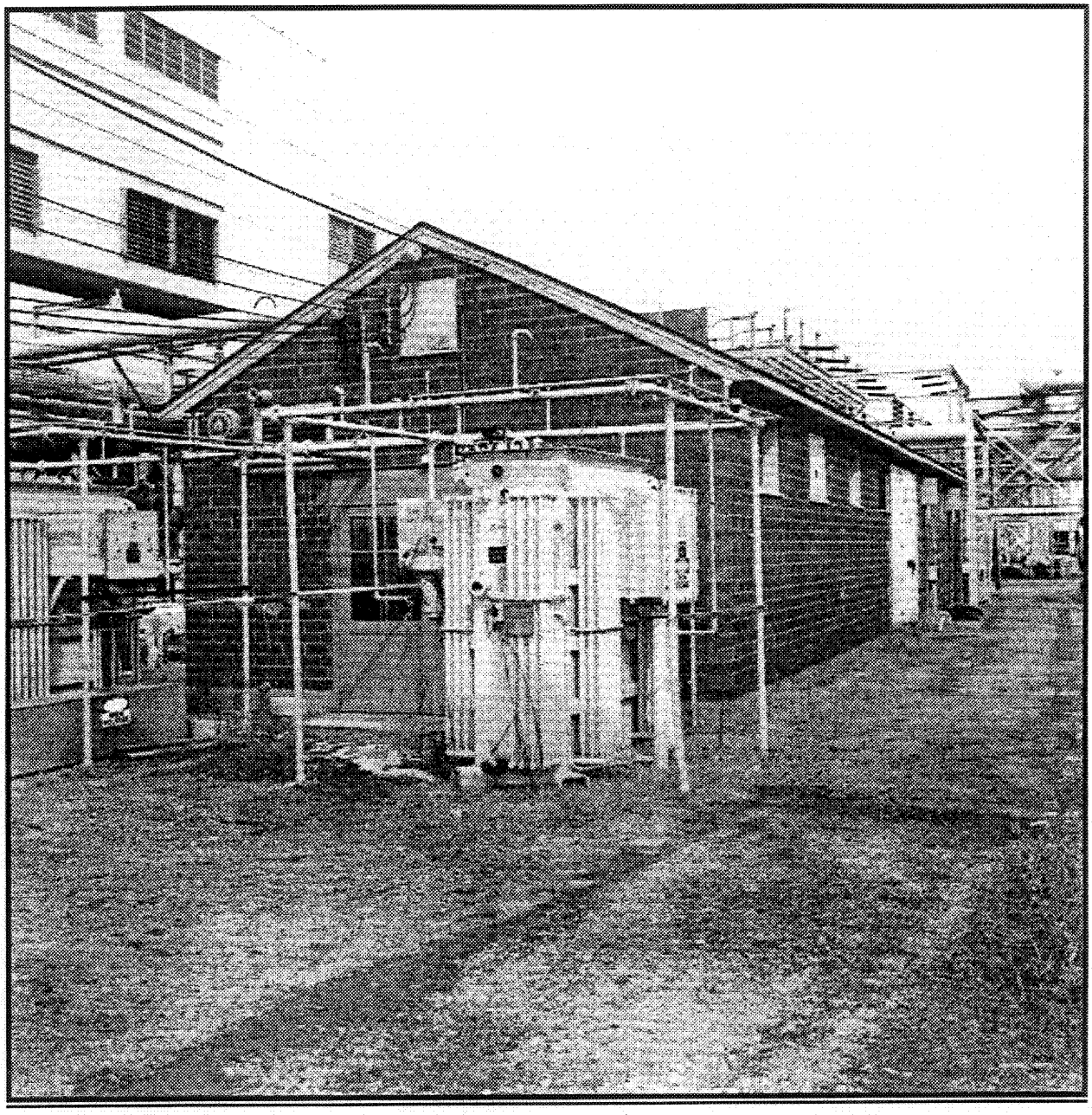


Figure 39: Building 9404-12 - Pumphouse

BUILDING 9404-13

ARCHITECTURAL DESCRIPTION:

Constructed of masonry bearing walls with a wood frame gabled roof, this one-story building features an original, centrally located, wood paired pedestrian entrance with 6-lights and single panels. The rectangular building also retains a 12-light wood transom above the entrance. Former window space, located in the gable end, has been enclosed. The building's east facade features 2-light, frame hinged sash windows. Mechanical systems have been attached directly to the building's face on the east and south facades. The entire building is supported by a cast concrete foundation.

HISTORY:

Completed in April of 1944, this building houses Pumphouse A-5. Located on the Y-12 Plant, the 1,000 square foot building was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

Building 9404-13 functioned as a pumphouse and, as an ancillary facility, furthered Y-12's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9404-13 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: To be determined

ASSESSMENT OF IMPACT:

This building is a pumphouse located adjacent to Building 9201-5 (Alpha-5) and retains much of its original architectural character. It is one of only five original World War II era masonry pumphouses that remain at the Y-12 complex. Building 9404-13 is a good example of this building type and its removal would have a moderate visual effect on the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9404-13 would require a detailed interpretive record prior to demolition. Building 9404-13 has a moderate historic significance and the interpretive effort would include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

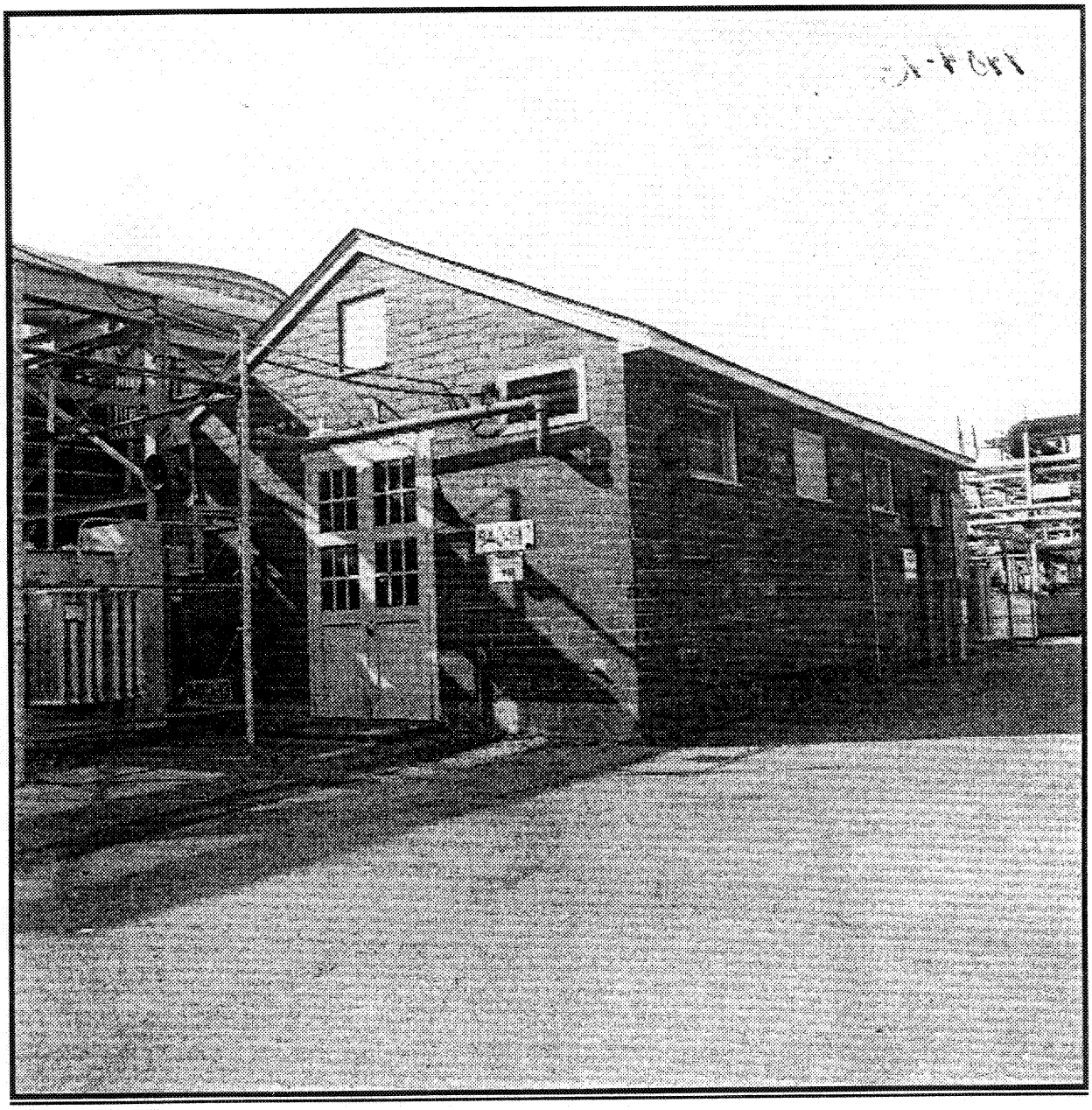


Figure 40: Building 9404-13 - Pumphouse

BUILDING 9404-16

ARCHITECTURAL DESCRIPTION:

Constructed of masonry bearing walls and a precast concrete roof, this one-story, rectangular plan building was designed with hollow core tile and flat roof. This small building is used as a utilities facility and features a double entry on the east facade and fenestration on the north and south facades of hinged six-pane window sash with fixed, three-pane sash above and below. The west facade exhibits a small, projecting bay of hollow core tile construction with two, small fixed glass windows.

HISTORY:

Completed in February of 1954, this 1,480 square foot building houses a Utilities facility and was constructed by Union Carbide Corporation Nuclear Division.

SIGNIFICANCE:

Building 9404-16 functioned as a utilities building for Building 9204-4 and, as an ancillary facility, furthered Y-12's post-World War II mission of nuclear research and development. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9404-16 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: To be determined

ASSESSMENT OF IMPACT:

This building is a utility facility located adjacent to Building 9204-4 (Beta-4) and retains much of its original architectural character. It is one of only a few original World War II era hollow core tile utility buildings that remain at the Y-12 complex. Building 9404-16 is a good example of this building type and its removal would have a moderate visual effect on the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9404-16 would require a detailed interpretive record prior to demolition. Building 9404-16 has a moderate historic significance and the interpretive effort would include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

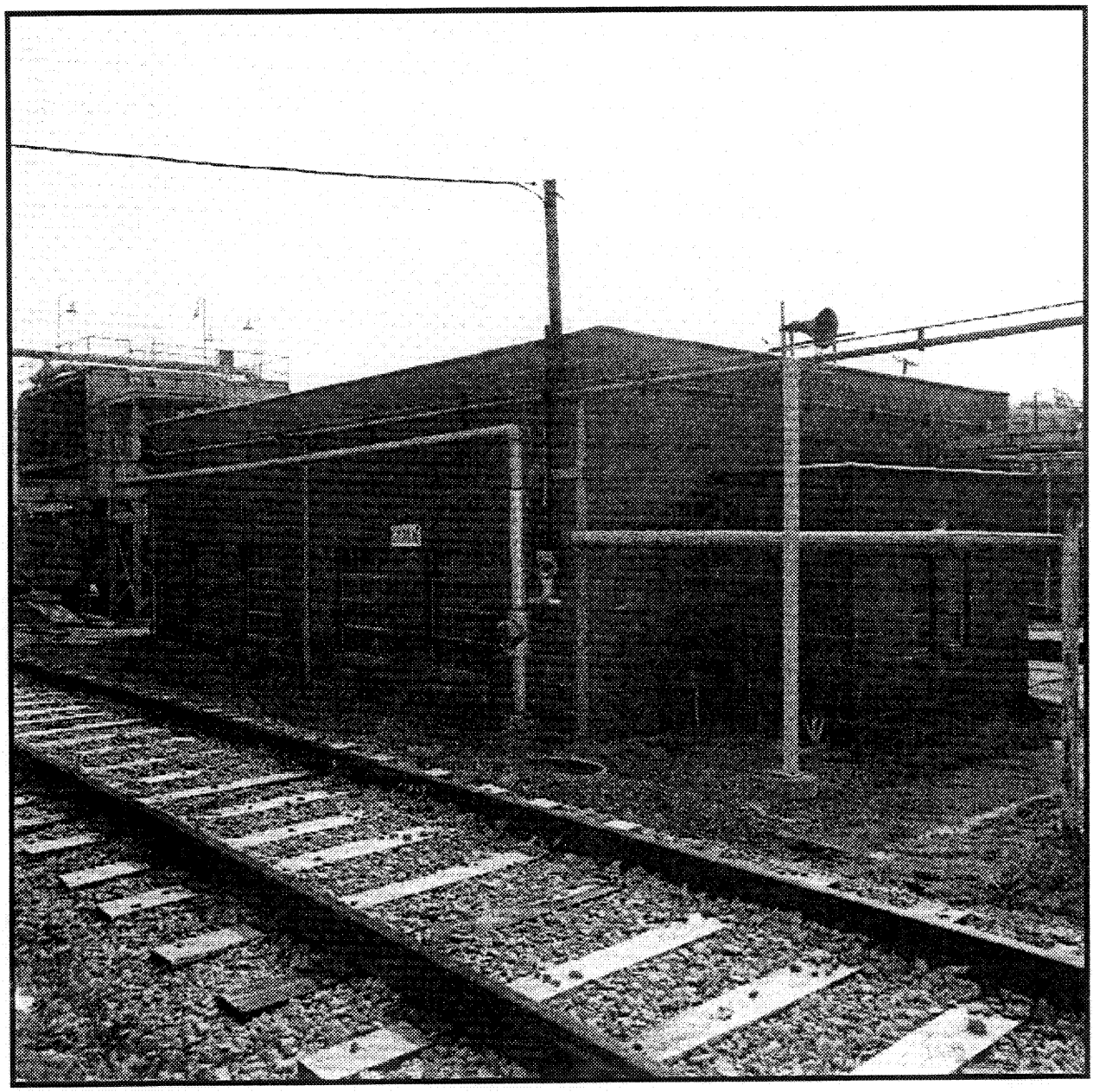


Figure 41: Building 9404-16 - Pumphouse

BUILDING 9416-4

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame with a wood frame gable roof, this small, one-story building is supported by a cast concrete foundation and has an asbestos shingle siding exterior. The building retains original six-over-six, double hung wood sash windows and original two-panel doors. An exterior fire connection, or water spigot, is located beside the entrance on the west facade.

HISTORY:

Completed in September of 1943, this building houses a Utilities Water Treatment facility. The 230 square foot building was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

As an ancillary property, Building 9416-4 furthered the plant's World War II mission of enriching uranium for the atomic bomb and for meeting identified plant missions during the Cold War. The building retains sufficient historical and architectural significance to meet National Register Criteria. Building 9416-4 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2003

ASSESSMENT OF IMPACT:

Building 9416-4 played a minor role in Y-12's history during the Manhattan Project and the Cold War. This small utility building is adjacent to several large condensers, and its removal would have a minor visual effect on the Y-12 Historic District.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9416-4 would require a minimal interpretive effort prior to demolition. Building 9416-4 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

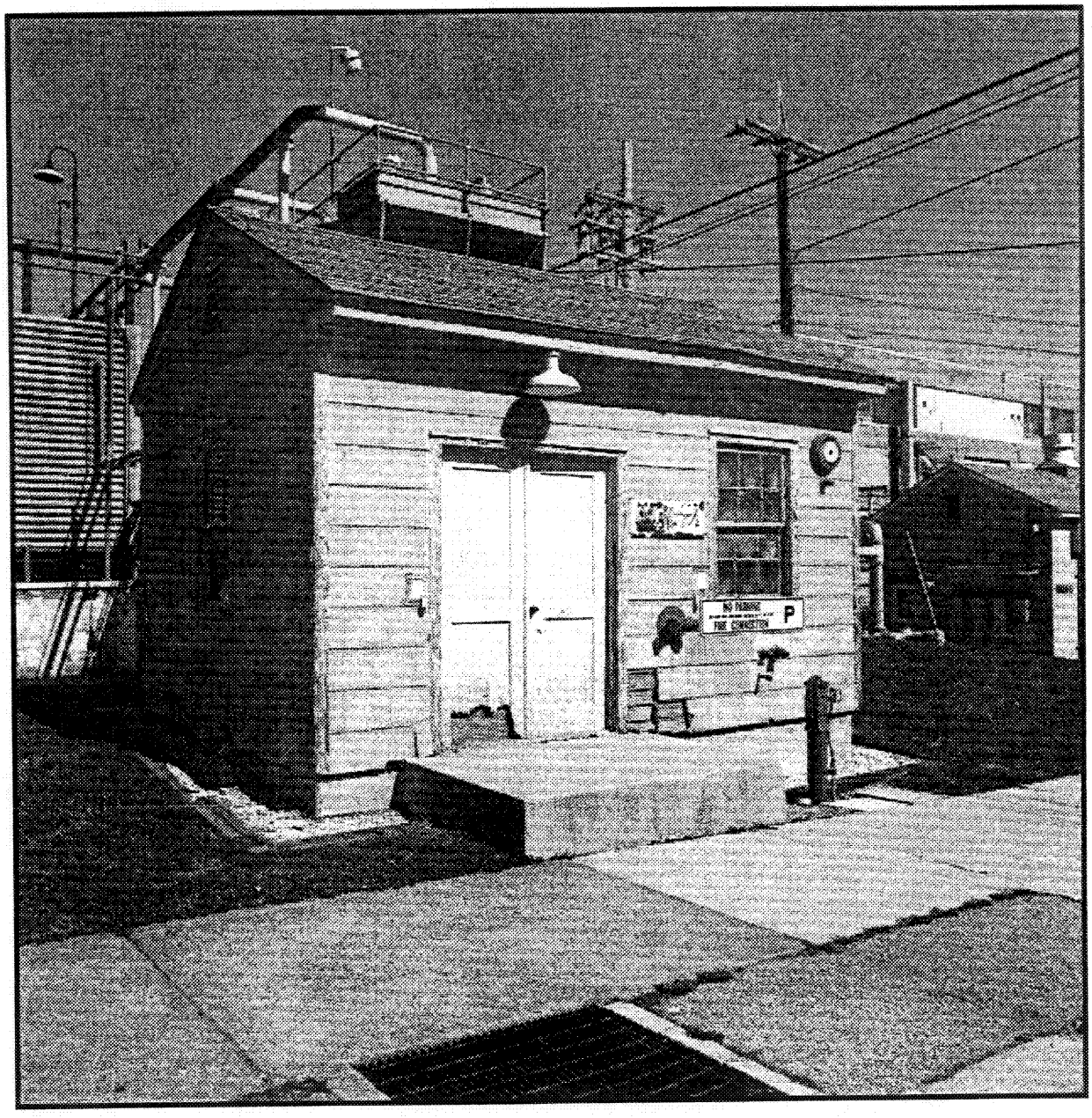


Figure 42: Building 9416-4 - Utilities Water Treatment Facility

BUILDING 9419-2

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame and covered in transite, this one story, rectangular plan building features entrances on the gable ends and 4-light stationary/awning style windows. The facility has a metal roof and a poured concrete foundation.

HISTORY:

Completed in January of 1944, this small utility facility was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

This building is composed of a standardized plan and retains architectural significance. As an ancillary facility, Building 9419-2 possesses architectural significance to meet National Register Criteria. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9419-2 is eligible for inclusion in the National Register under Criteria A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2003

ASSESSMENT OF IMPACT:

This is a small utility building that is located on the southern edge of the Y-12 Historic District. The building played a minor role in the history of the installation and its removal from the district would have a minor effect on the district's appearance and historic integrity.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9419-2 would require a minimal interpretive effort prior to demolition. Building 9419-2 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

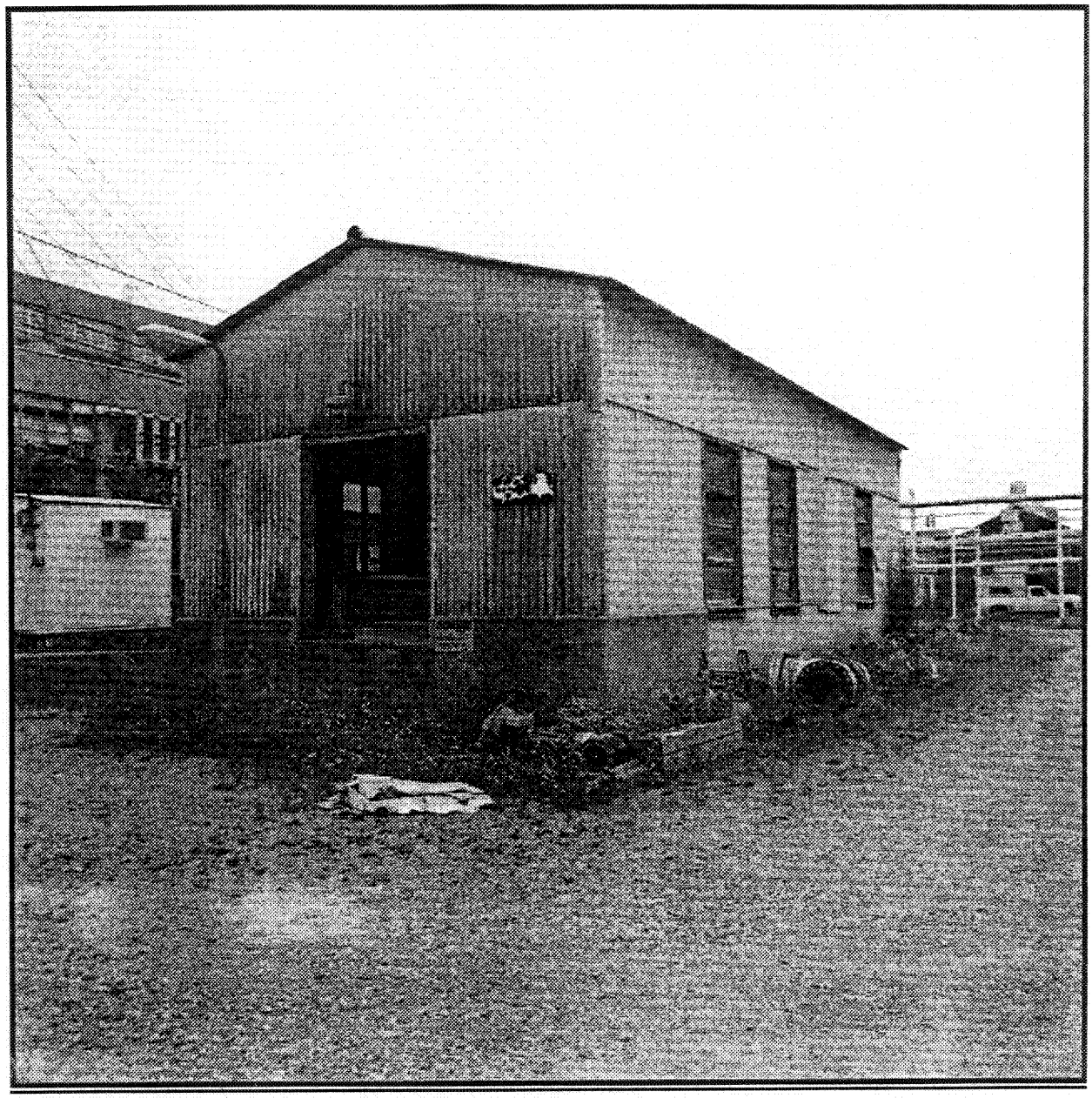


Figure 43: Building 9419-2 – Utility Building

BUILDING 9510-2

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame, this small, one story building features a gable roof and asbestos siding. A cast concrete loading dock framed with a metal handrail is located on the east facade. The loading dock is served by original, paired, two paneled wood doors. An original, wood, four vertical light (with fixed upper and lower lights) awning type window is located on the building's east facade. The central panes have been infilled with a metal hood. There is no fenestration on the building's north or south facades. A variety of mechanical equipment and piping systems adjoins the building on the west. The building is supported by a cast concrete foundation and a small metal, circular flue is found on the north roof ridge.

HISTORY:

Completed in August of 1944, this building houses a "Process Waste Disposal" facility ("Disposal Pit"). The 900 square foot building was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

Building 9510-2 functioned as a disposal pit and, as an ancillary facility, furthered Y-12's World War II mission of enriching uranium for the atomic bomb. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9510-2 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2004

ASSESSMENT OF IMPACT:

Building 9510-2 played a minor role in Y-12's history during the Manhattan Project and the Cold War. This small utility building is located south of Building 9206 and is adjacent to a storage facility. Its removal would have a minor visual effect on the Y-12 Historic District.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9510-2 would require a minimal interpretive effort prior to demolition. Building 9510-2 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

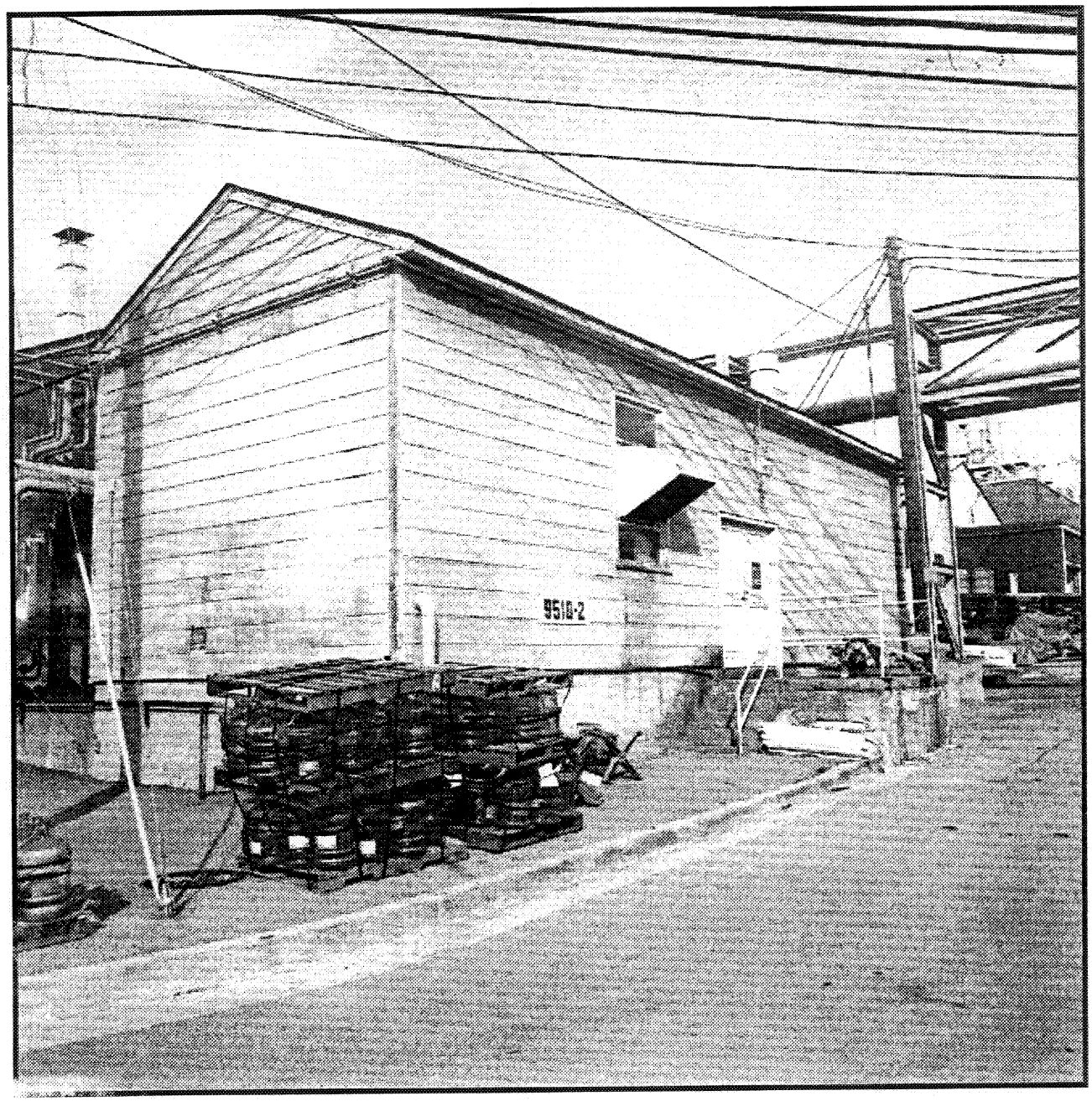


Figure 44: Building 9510-2 - Process Waste Disposal Facility

BUILDING 9616-3

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame, this one-story, rectangular building features a gable roof and asbestos siding. Windows are original six-over-six wood sash design, and the building has replacement doors. Elevated piping and steel structural members, connecting the building with Building 9202, are attached to the northeast corner.

HISTORY:

Completed in November of 1946, this 1,400 square foot building houses a Chemical Unloading Station and constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

Building 9616-3 functions as a Chemical Unloading Station and as an ancillary facility, furthered the plant's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9616-3 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the World War II government sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2003

ASSESSMENT OF IMPACT:

Building 9616-3 is a small building that played a limited role in Y-12's history. The building does not serve as a critical building to the historic district and its removal would have a minor visual effect to the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9616-3 would require a minimal interpretive effort prior to demolition. Building 9616-3 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

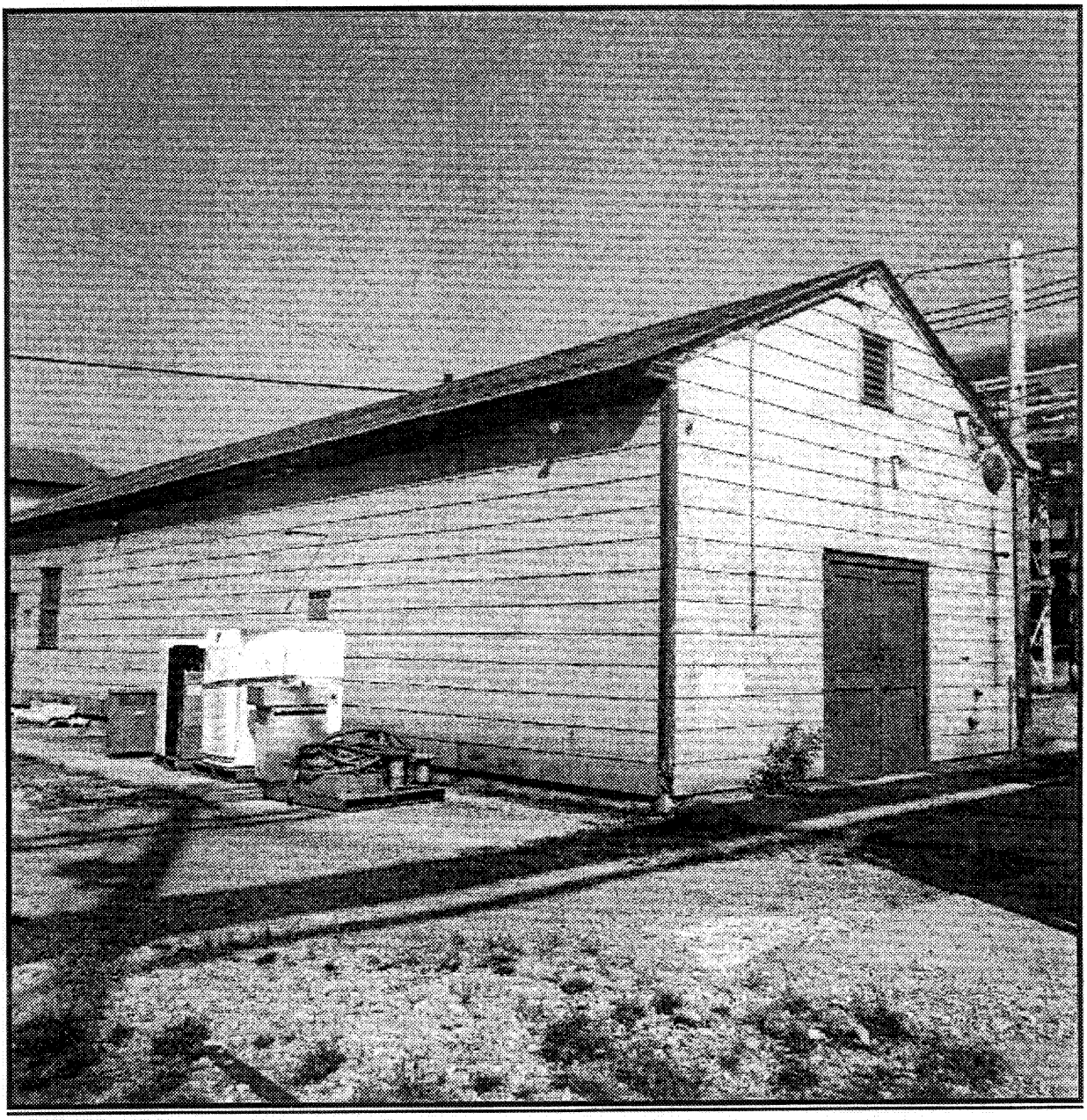


Figure 45: Building 9616-3 - Chemical Unloading Station

BUILDING 9704-1

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame, this one story, rectangular building features a gable roof with asphalt shingles and is supported by a cast concrete foundation. All facades of the facility contain six-over-six double-sash windows and are covered with synthetic siding. The gable ends on the main section of the building feature rectangular, frame louvered vents. The building's south facade features a one-story, frame, shed roof addition with an asphalt shingle roof. The building's west facade retains a central, pedestrian entrance covered with a gabled canopy and is supported by posts. A frame addition has been constructed on the east facade that continues the gable roof and features a pedestrian entrance. Except for two hollow core metal pedestrian doors located on the addition's east facade, the addition has no fenestration. The building's north facade features a central pedestrian entrance comprised of paired glass and aluminum which is covered by a frame, gabled canopy covered with asphalt shingles.

HISTORY:

Completed in June of 1943, this building houses offices, utilities, and a computer room. The 8,700 square foot building was constructed by Stone & Webster Engineering Corporation. Presently the building houses office space used by the Waste Transportation and Landfill Operations (WTLO) and Waste Storage and Shipping Operations (WSSO), as well as housing Waste Management personnel.

SIGNIFICANCE:

Building 9704-1 is composed of a standardized plan and retains architectural and historical significance. The building is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, with World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2009

ASSESSMENT OF IMPACT:

Building 9704-1 has moderate architectural integrity and is not a major focal point of the historic district. As an office building it has provided necessary support space to Y-12's historic missions and operations, but is was not a key component of those operations. The removal of Building 9704-1 would have a moderate effect on the historic district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition Building 9704-1 would require a detailed interpretive record prior to demolition. Building 9704-1 has a moderate historic significance and the interpretive effort will include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

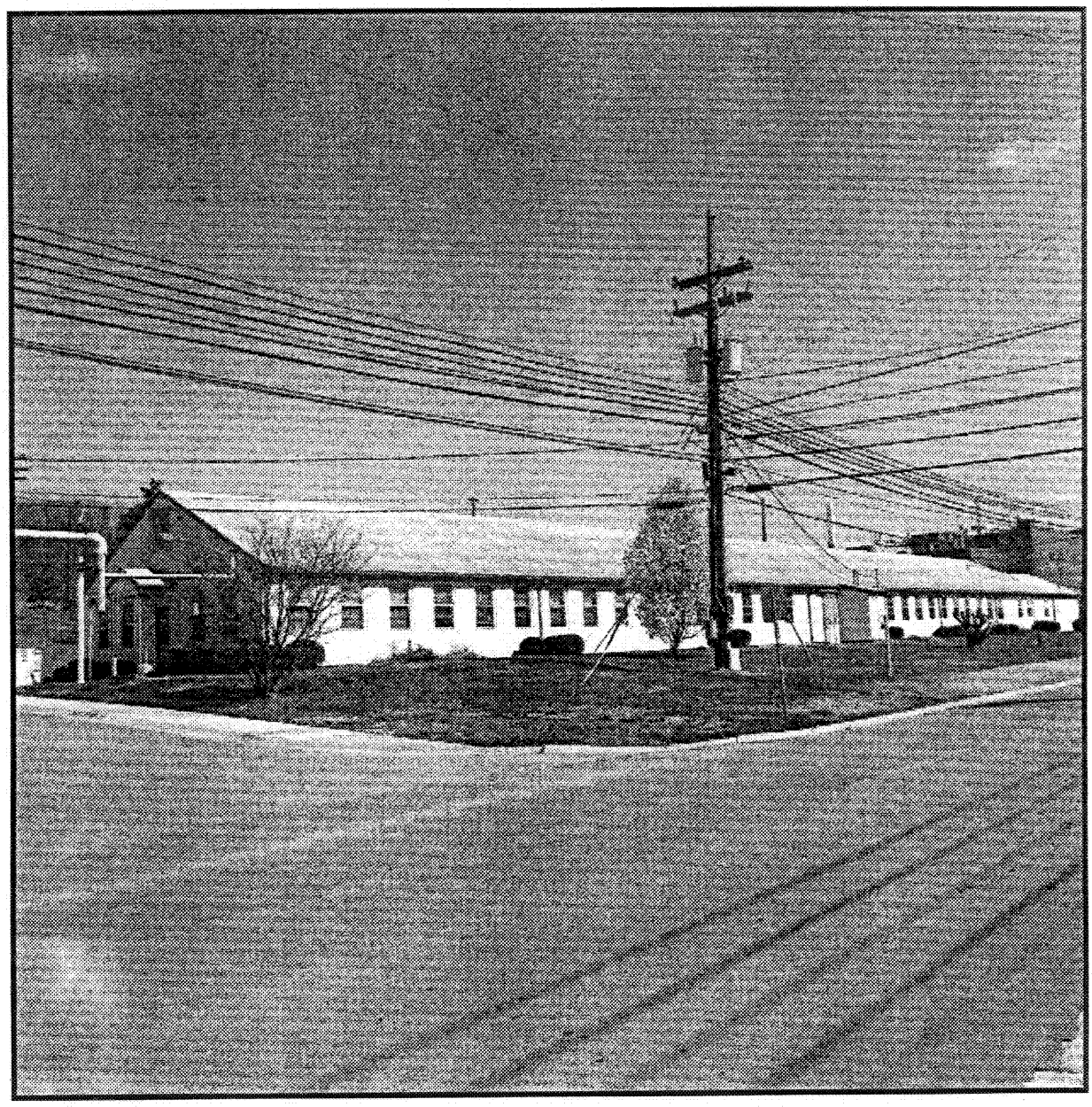


Figure 46: Building 9704-1 - Offices

BUILDING 9720-12

ARCHITECTURAL DESCRIPTION:

Constructed of steel frame and covered in metal panels, this one story, gable roofed building features a rectangular plan, multiple sliding track doors, and circular vents along the ridgeline. A poured concrete loading dock and a system of pipes attached directly to the building's face are located on the structure's east facade. Poured concrete foundation and metal roof.

HISTORY:

Completed in June of 1954, this 15,000 square foot building houses a Plant Maintenance Warehouse and a Machine Tooling facility.

SIGNIFICANCE:

This building is composed of a standardized plan and retains architectural significance. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9720-12 is eligible for inclusion in the National Register under Criteria A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2004

ASSESSMENT OF IMPACT:

Building 9720-12 played a limited role in Y-12's history as a storage facility and its contribution to the streetscape of the historic district is minor. The building is located near the district's boundary in the southwestern corner. Building 9720-12 does not serve as a critical building to the historic district and its removal would have a minor visual effect to the Y-12 Historic District.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9720-12 would require a minimal interpretive effort prior to demolition. Building 9720-12 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

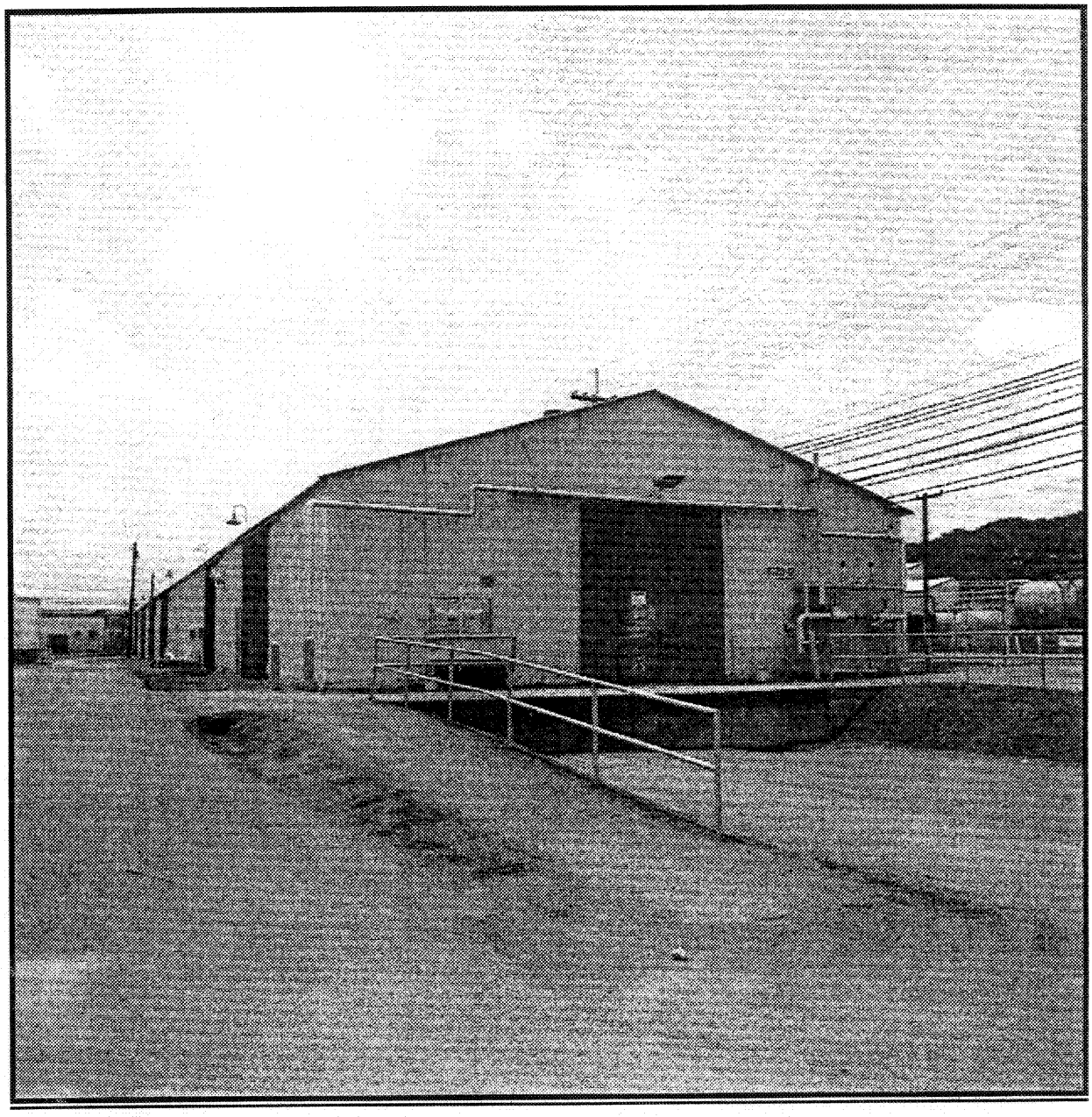


Figure 47: Building 9720-12 - Plant Maintenance Warehouse and a Machine Tooling facility.

BUILDING 9720-13

ARCHITECTURAL DESCRIPTION:

Constructed of steel frame and covered in metal panels, this one story, rectangular plan building features a gable roof, circular vents on the ridgeline and stationary 9-light windows. Overhead track doors are located on the south and west facades. A single story, steel frame, modified gable roof, open air shed is attached to the building's east facade. An original, 6-light wood door with recessed panel is located on the north facade. The facility has a poured concrete foundation and metal roof.

HISTORY:

Completed in August of 1954, this 2,400 square foot building houses a Plant Maintenance Warehouse.

SIGNIFICANCE:

The building is composed of a standardized plan and retains architectural significance. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9720-13 is eligible for inclusion in the National Register under Criteria A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2005

ASSESSMENT OF IMPACT:

Building 9720-13 played a limited role in Y-12's history as a storage facility and its contribution to the streetscape of the historic district is minor. The building is located near the district's boundary in the southwestern corner. Building 9720-13 does not serve as a critical building to the historic district and its removal would have a minor visual effect to the Y-12 Historic District.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9720-13 would require a minimal interpretive effort prior to demolition. Building 9720-12 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

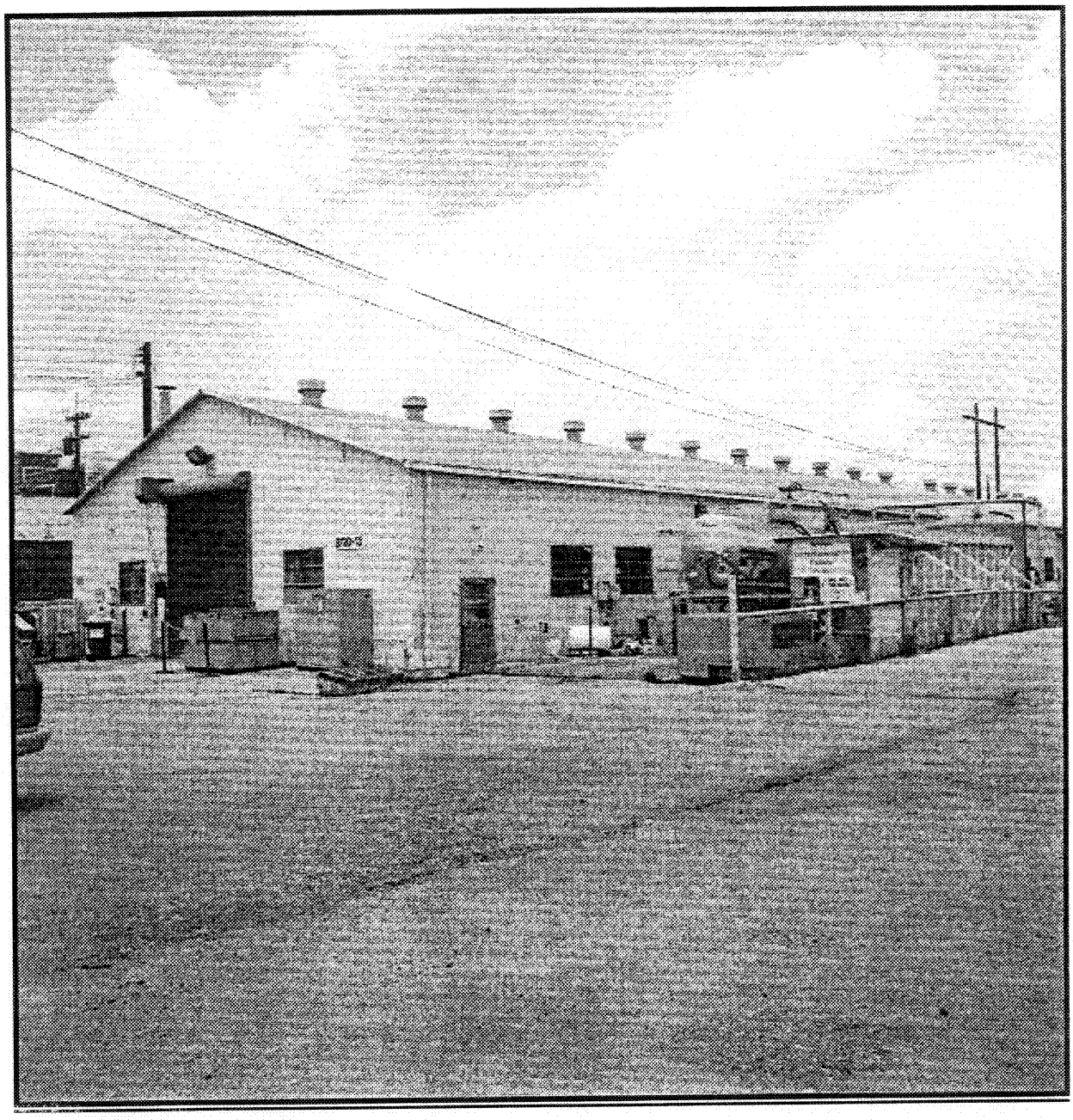


Figure 48: Building 9720-13 - Plant Maintenance Warehouse

BUILDING 9720-17

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame, this one story, rectangular building features a metal gable roof and is covered with metal wall panels. The building's north and east facades feature a raised, cast concrete loading dock reached by a flight of metal stairs. Another loading dock, located in the central bay of the east facade, was added to the building ca. 1980. This loading dock has a flat roof enclosure constructed of concrete block and features a metal overhead track door. A single, hollow core metal door with single lights is found on the east facade. A six-light aluminum awning window with a three-light fixed sash flank the enclosed loading dock on the east facade. The only fenestration located on the south facade is found in grouped, framed louvers. A large mechanical system placed in steel framing adjoins the building on the south facade. The entire facility is supported by a cast concrete foundation.

HISTORY:

Completed in November of 1956, this building houses a Uranium Chemistry Lab. Located on the Y-12 Plant, this 4,100 square foot facility was constructed by the Catalytic Construction Co.

SIGNIFICANCE:

Building 9720-17 was constructed as a Uranium Chemistry Lab during the Cold War years aiding in the development of wholly new technology and substantially advancing the field of nuclear science. The building retains architectural and historical significance to meet National Register Criteria. Building 9720-17 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2007

ASSESSMENT OF IMPACT:

Constructed in the mid-1950s, Building 9720-17 was built directly adjacent to Building 9206 as a support facility to that building's historic operations in the uranium production process. Building 9720-17 is associated with Y-12's Cold War history and its construction reflects the importance of uranium production during this era. Its removal would have a moderate effect on the integrity of the Y-12 Plant Historic District.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9720-17 would require a detailed interpretive record prior to demolition. Building 9720-17 has a moderate historic significance and the interpretive effort will include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

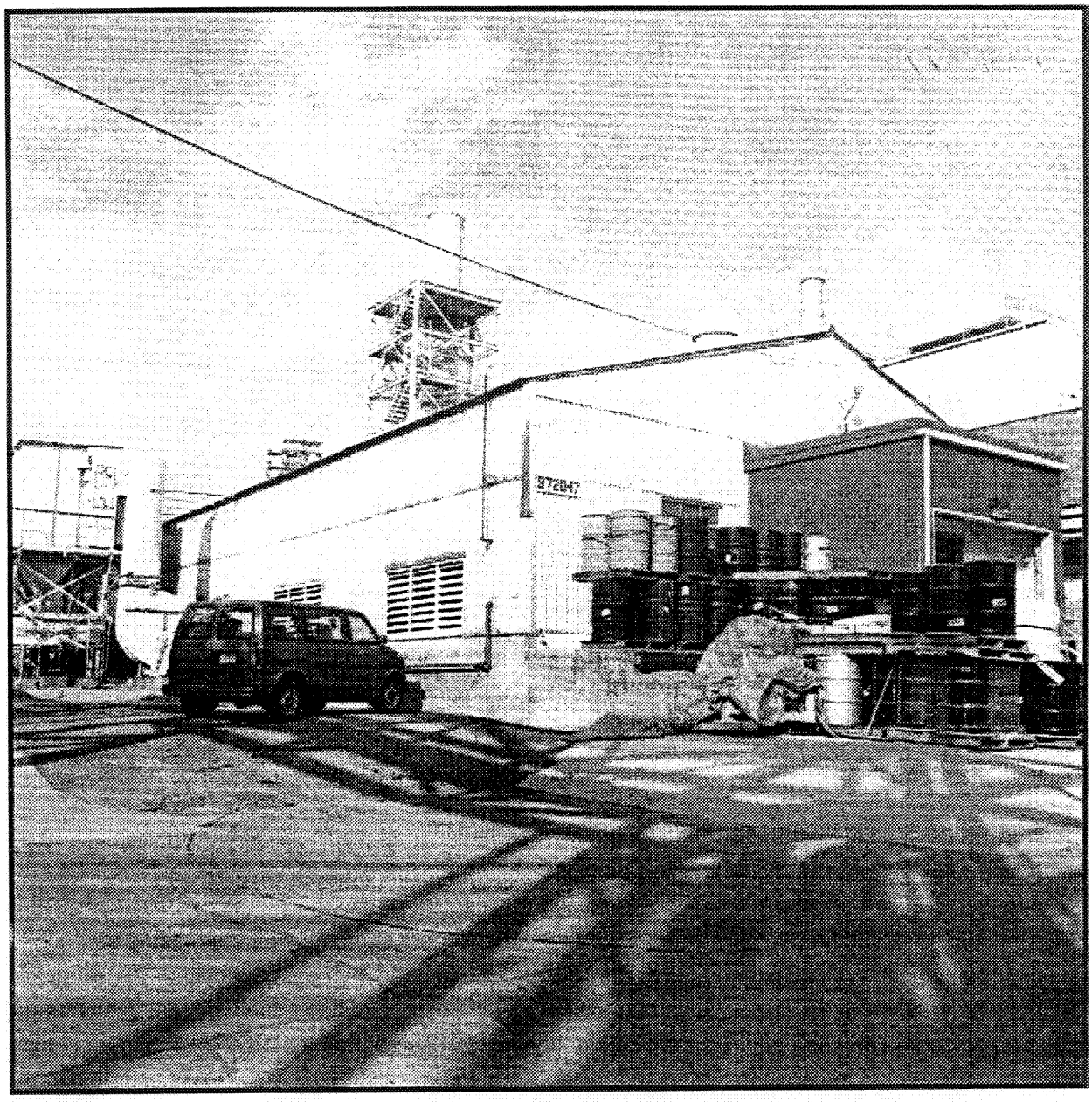


Figure 49: Building 9720-17 – Uranium Chemistry Lab

BUILDING 9723-24

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame, this one-story, rectangular plan building is actually an enlargement of Building 9203 and attached to the north facade of the larger building. The shed roof building features asbestos siding, a flat roof wing along the south facade, and is supported by a cast concrete foundation. The building has replacement steel doors, one-over-one added aluminum windows, and replacement steel posts on the north façade porch. A centrally located shed-roof wing is found on the north facade.

HISTORY:

Completed in July of 1945, this 12,122 square foot building houses a changehouse, laboratory development, and offices.

SIGNIFICANCE:

As an ancillary property, Building 9723-24 furthered Y-12's World War II mission of enriching uranium for the atomic bomb. The building retains historical and architectural significance to meet National Register Criteria. Building 9723-24 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2003

ASSESSMENT OF IMPACT:

Located in the eastern end of the Y-12 Historic District, Building 9723-24 serves as an extension of Building 9203. It is one of three remaining changehouses at the Y-12 Complex that date to the World War II era. One of these three has already been approved for demolition. Changehouses help to convey the story of Y-12's historic operations and are important elements to the historic district. It is in these buildings that workers at the plant made the transition from their lives as ordinary civilians to employees engaged in a secret mission. They donned protective clothing necessary to perform their important work, even though most were not fully aware of what that work was.

None of the remaining World War II era changehouses at the Y-12 Complex retain a high degree of architectural integrity. All, including Building 9723-24, have been modified and are attached to larger buildings. Due to its alterations, removal of Building 9723-24 would have a moderate visual effect on the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9723-24 would require a detailed interpretive record prior to demolition. Building 9723-24 has a moderate historic significance and the interpretive effort will include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

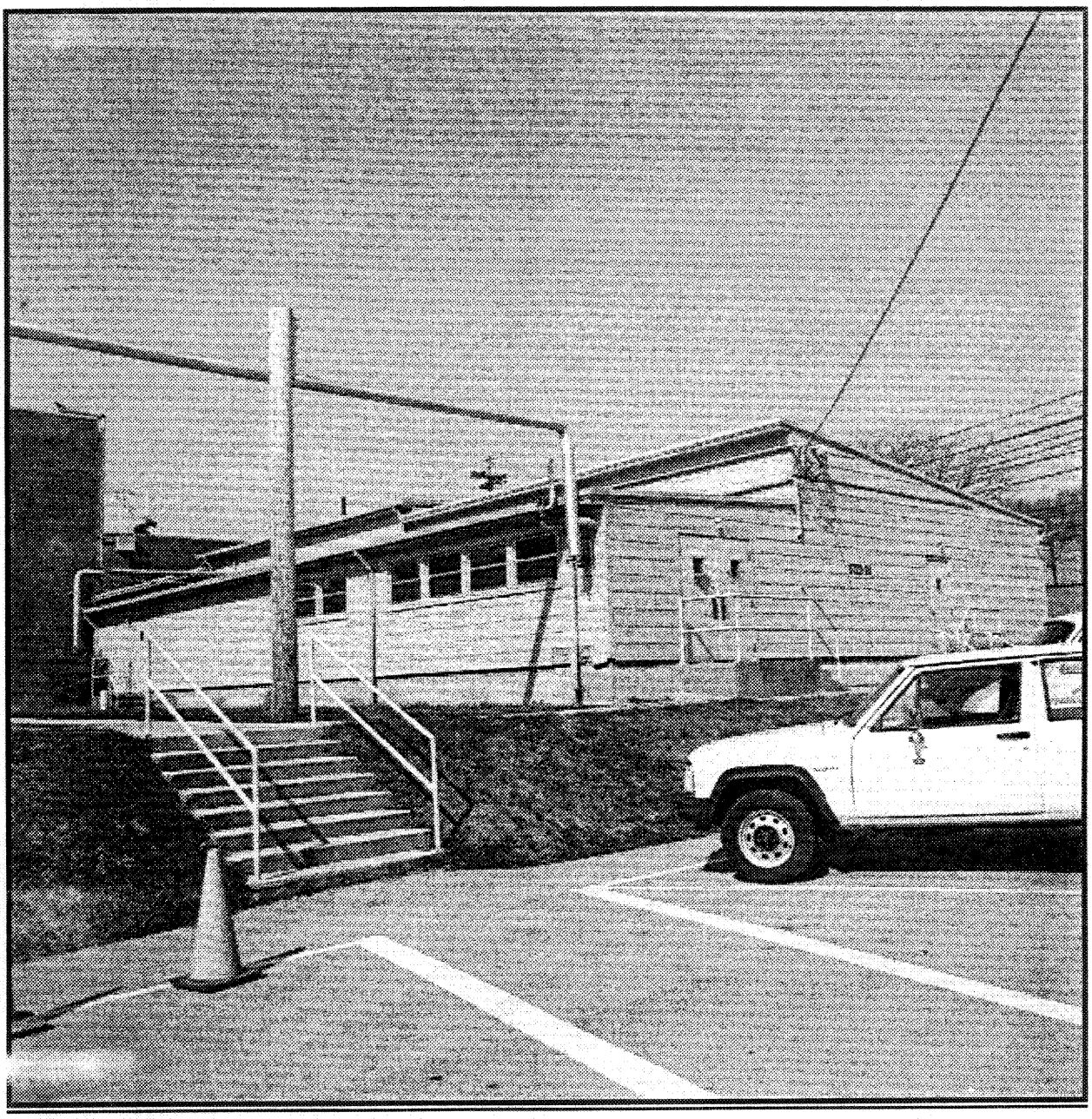


Figure 50: Building 9723-24 - Changehouse, laboratory development, and offices.

BUILDING 9729

ARCHITECTURAL DESCRIPTION:

This is a one-story, rectangular, hollow core tile building with a gable asphalt shingle roof. The building is on a raised poured concrete foundation and has added rollup and pedestrian doors. The side facades have original louvered vents of wood. A loading dock and metal ramp are found on the north facade. Wooden louvered vented spaces are located on the building's south and east facades.

HISTORY:

Completed in November of 1943, this 3,500 square foot building houses carbon dioxide stores and a storage facility for miscellaneous and large items. The building is sometimes referred to as the "ice house" because of its unique design, similar to early ice storage buildings that sit on pillars.

SIGNIFICANCE:

The building is a standardized plan but retains architectural significance. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9729 is eligible for inclusion in the National Register under Criteria A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2003

ASSESSMENT OF IMPACT:

Building 9729 is a small support building located in the far eastern end of the Y-12 Historic District. The building is one of a row of three buildings of similar shape and size, two of which are marked for demolition (Buildings 9610 and 9729). Removal of Building 9729 would have a moderate visual effect on the historic district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9729 would require a detailed interpretive record prior to demolition. Building 9729 has a moderate historic significance and the interpretive effort will include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

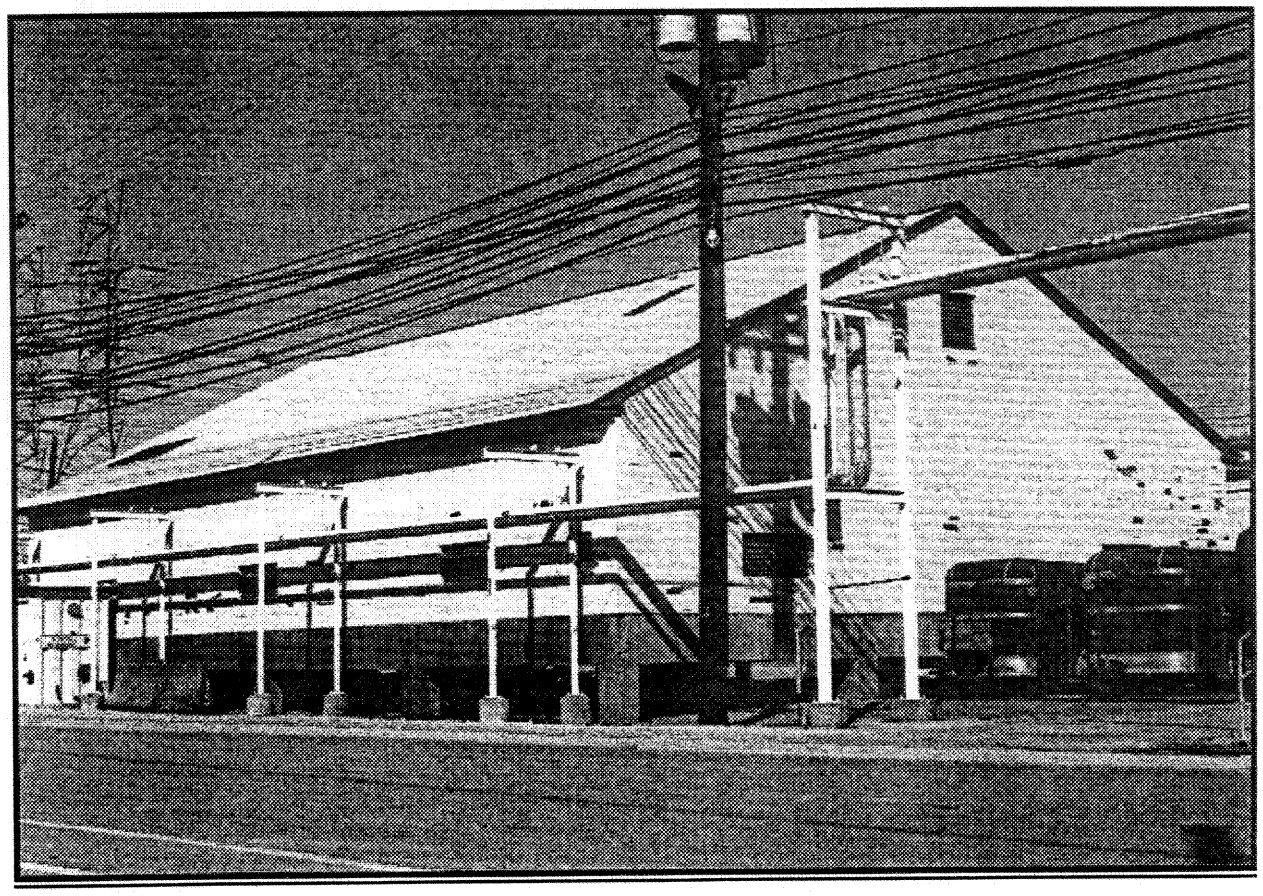


Figure 51: Building 9729 - Storage Facility

BUILDING 9738

ARCHITECTURAL DESCRIPTION:

Constructed of masonry bearing walls with a wood frame flat roof, this one story building features a central, monitor-type roof. The rectangular facility is supported by a cast concrete foundation. Two overhead, metal track doors are located on the west facade. Fenestration is comprised of six-over-six wood awning style windows on the west facade, with 3-light fixed, wood sash located beneath each window. Some former window spaces are infilled with hollow core tile. All existing and infilled windows are marked with cast concrete sills and lintels. A single, metal, overhead track door is located on the east facade. A hollow core, tile, shed roof addition is constructed on the east facade and adjoins the overhead door. The shed addition is open on the north. The shed's roof is covered with metal panels. Pedestrian entrances are comprised of paired 4-light or 2-light, single panel wood doors.

HISTORY:

Completed in July of 1944, this building was originally occupied by a foundry. Presently the building houses General Shops. The 8,750 square foot facility was constructed by Stone & Webster Engineering Corporation.

SIGNIFICANCE:

Designed by Stone and Webster, Building 9738 retains architectural integrity and furthered the plant's World War II mission of nuclear research and development. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9738 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project and the post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2006

ASSESSMENT OF IMPACT:

Building 9738 is a support building located in the southeastern section of the historic district and was important, but not vital to, Y-12's historic operations. It is a representative example of its building type and its removal would have a moderate effect on the visual appearance of the district and on the district's historic integrity.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9738 would require a detailed interpretive record prior to demolition. Building 9738 has a moderate historic significance and the interpretive effort will include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

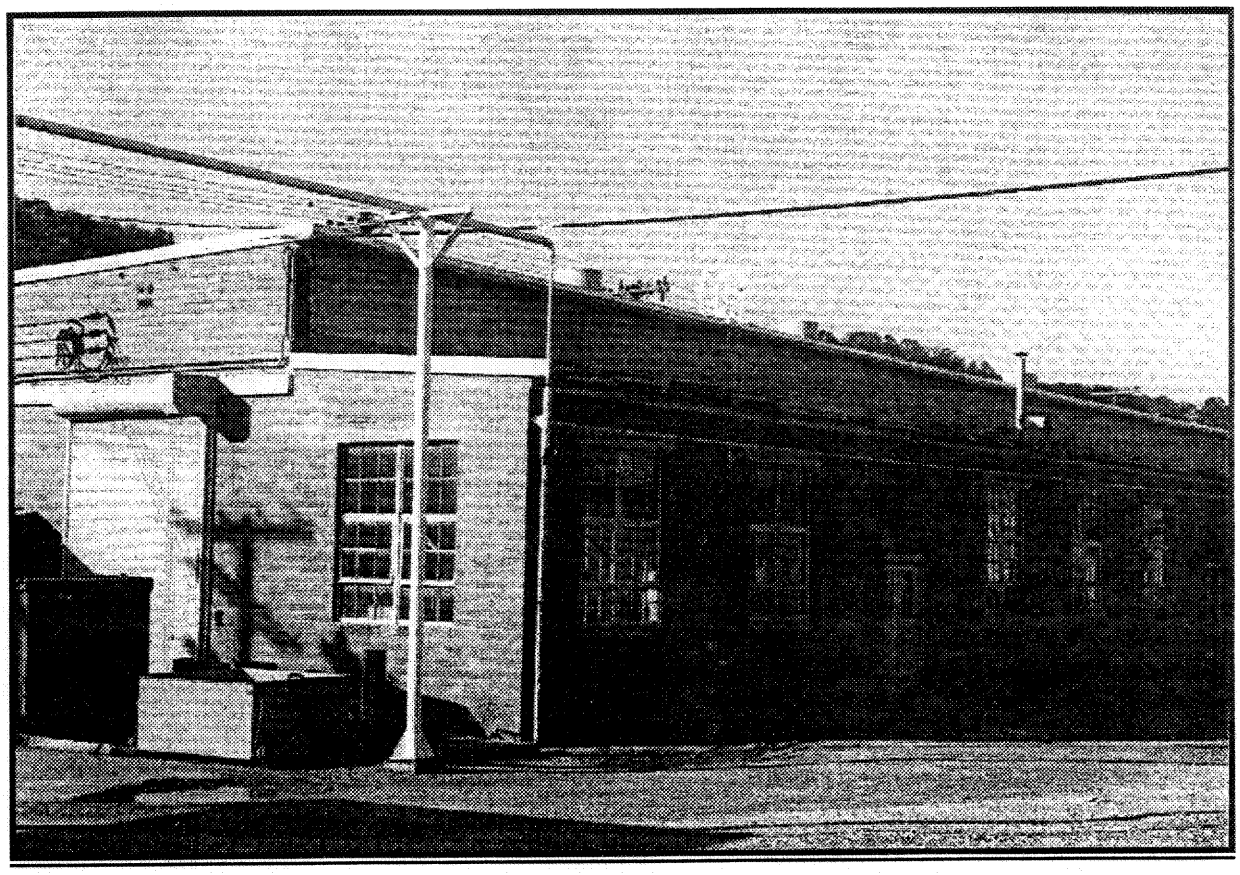


Figure 52: Building 9738 – General Shops

BUILDING 9752

ARCHITECTURAL DESCRIPTION:

This one-story building has an exterior of hollow core tile, a frame gable roof, enclosed windows and replacement steel doors. It is attached to the south facade of Building 9203 and has an added wood canopy on the south facade. Building 9752 has an irregular plan and features a centrally-located interior firewall of concrete block construction which projects from the roofline and is supported by a cast concrete foundation. One window on the east facade is of two-over-two horizontal metal sash design.

HISTORY:

Completed in July of 1944, this 1,200 square foot building houses a Utilities facility.

SIGNIFICANCE:

As an ancillary property, Building 9752 furthered the plant's World War II mission of enriching uranium for the atomic bomb and helped to meet identified goals during the Cold War. The building retains historical and architectural significance to meet National Register Criteria. Building 9752 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: To be determined.

ASSESSMENT OF IMPACT:

Building 9752 is an ancillary building that plays a small role in the history of the Y-12 Complex. Its removal would have a minor visual impact on the historic district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9752 would require a minimal interpretive effort prior to demolition. Building 9752 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

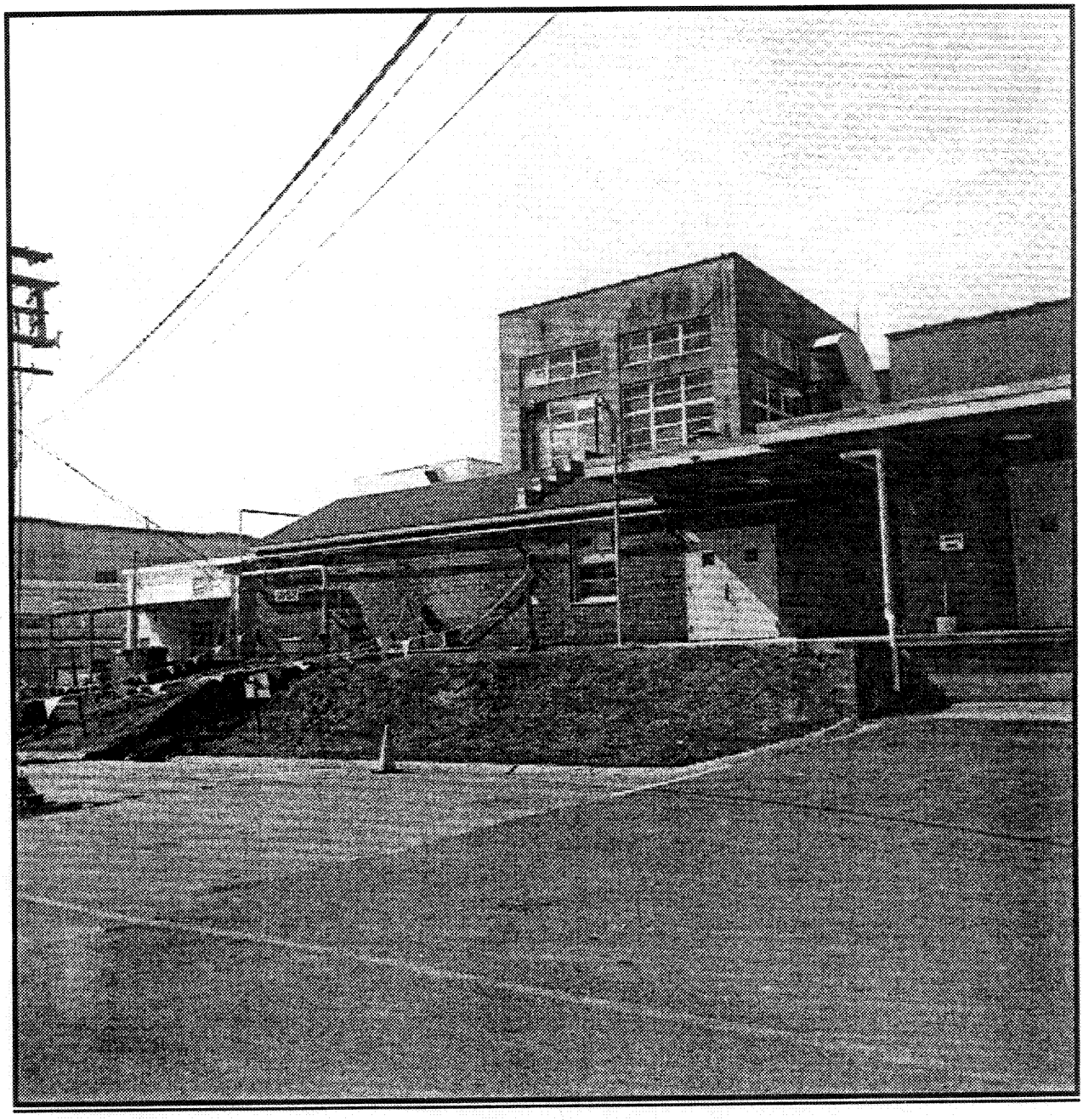


Figure 53: Building 9752 – Utilities Facility

BUILDING 9767-2

ARCHITECTURAL DESCRIPTION:

Constructed of wood frame, this small one story building features a flat roof and is covered with asbestos siding. Located on the northeast corner of Building 9206, this rectangular building is supported by a cast concrete foundation. The building's north facade features a pedestrian entrance comprised of paired, single light, hollow core metal doors. The building's east facade features original wood, four light sliding sash windows. The south facade contains paired wood doors, which are protected by a flat roof canopy constructed of a steel skeleton and supported by steel columns (this is actually part of Building 9206).

HISTORY:

Completed in August of 1945, this 1,800 square foot building houses a utilities facility.

SIGNIFICANCE:

This building is associated with the Y-12 Plant located on the Oak Ridge Reservation, which was originally developed during World War II. Building 9767-2 functioned as a utilities building for Building 9206 and, as an ancillary facility, furthered Y-12's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

The building retains historical significance to meet National Register Criteria. In consultation with the TN-SHPO, the HPS determined that Building 9767-2 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: To be determined

ASSESSMENT OF IMPACT:

Building 9767-2 serves as a utility building for Building 9206, one of the plant's main production facilities which is also slated for demolition. Building 9767-2 is located adjacent to Building 9206 in the heart of the historic district. Because of its central location and association with Building 9206, the removal of Building 9767-2 would have a moderate effect on the Y-12 Historic District.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9767-2 would require a detailed interpretive record prior to demolition. Building 9767-2 has a moderate historic significance and the interpretive effort will include a collection of available photos of the facility to document its life from construction through demolition, a collection of any available maps and drawings of the facility, and a detailed account of its historic missions and activities.

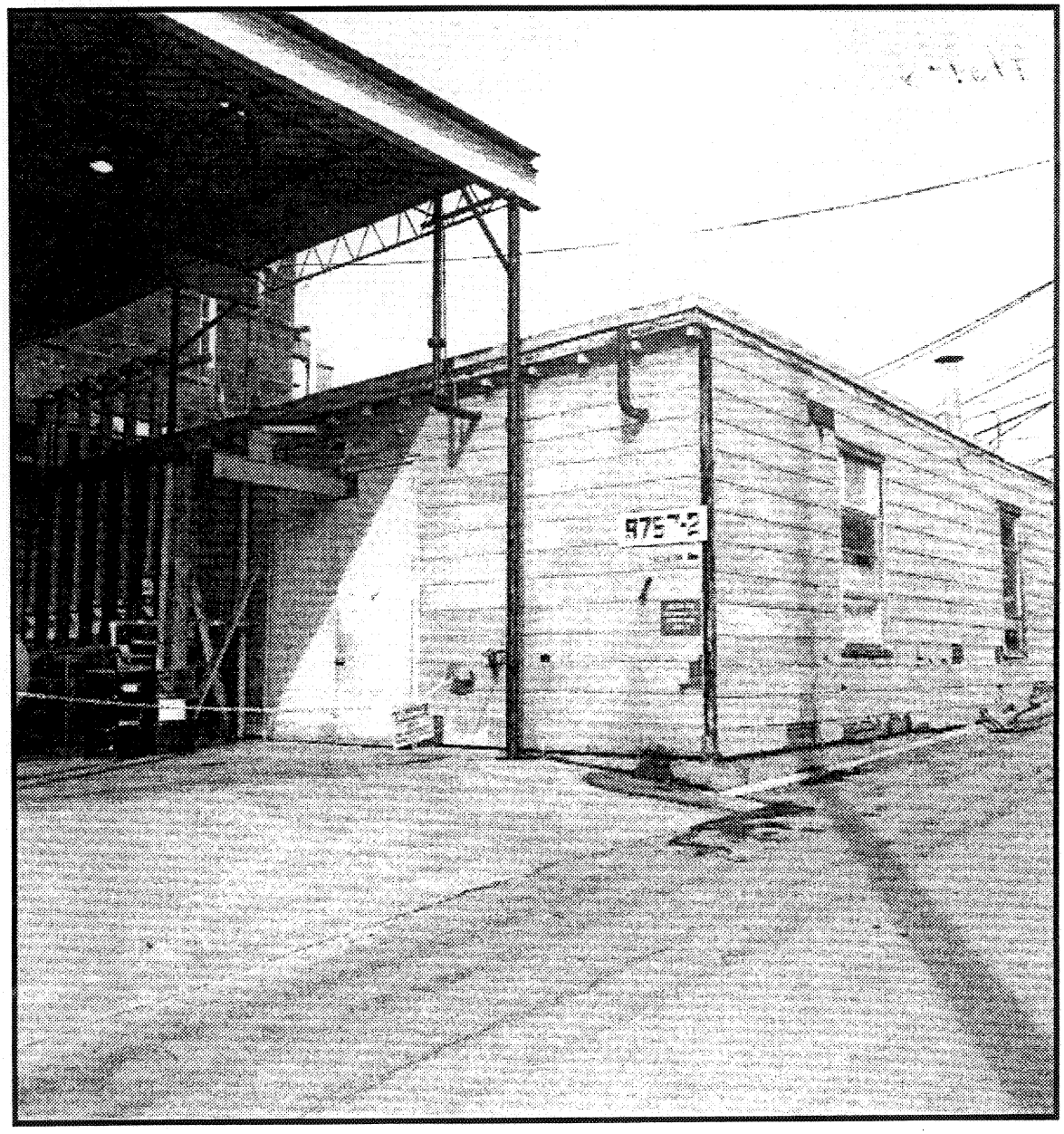


Figure 54: Building 9767-2 – Utility Building

BUILDING 9768

ARCHITECTURAL DESCRIPTION:

Constructed of masonry bearing walls with a wood framed flat roof, this small, one story building is supported by a cast concrete foundation. The rectangular building features centrally located entrances on the north and south facades. The entry on the north facade is an original, single, wood door with two vertical panels and a four-pane window, while the south facade entry is a double entry with metal doors and single-pane windows. Two windows flank each entry and are of four vertical pane, awning type with fixed upper and lower panes. A variety of mechanical equipment is placed on a cast concrete pad and located behind fencing adjoining the building on the east facade.

HISTORY:

Completed in July of 1945, this 1,200 square foot building is used as a utilities facility.

SIGNIFICANCE:

Building 9768 functions as a pumphouse for Building 9206, and as an ancillary facility, furthered Y-12's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

The building retains architectural and historical significance to meet National Register Criteria. Building 9768 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2007

ASSESSMENT OF IMPACT:

Building 9768 is a small utilities building and played a minor role in Y-12's historic operations. The building has limited architectural integrity and its removal would have a minor visual impact on the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9768 would require a minimal interpretive effort prior to demolition. Building 9768 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

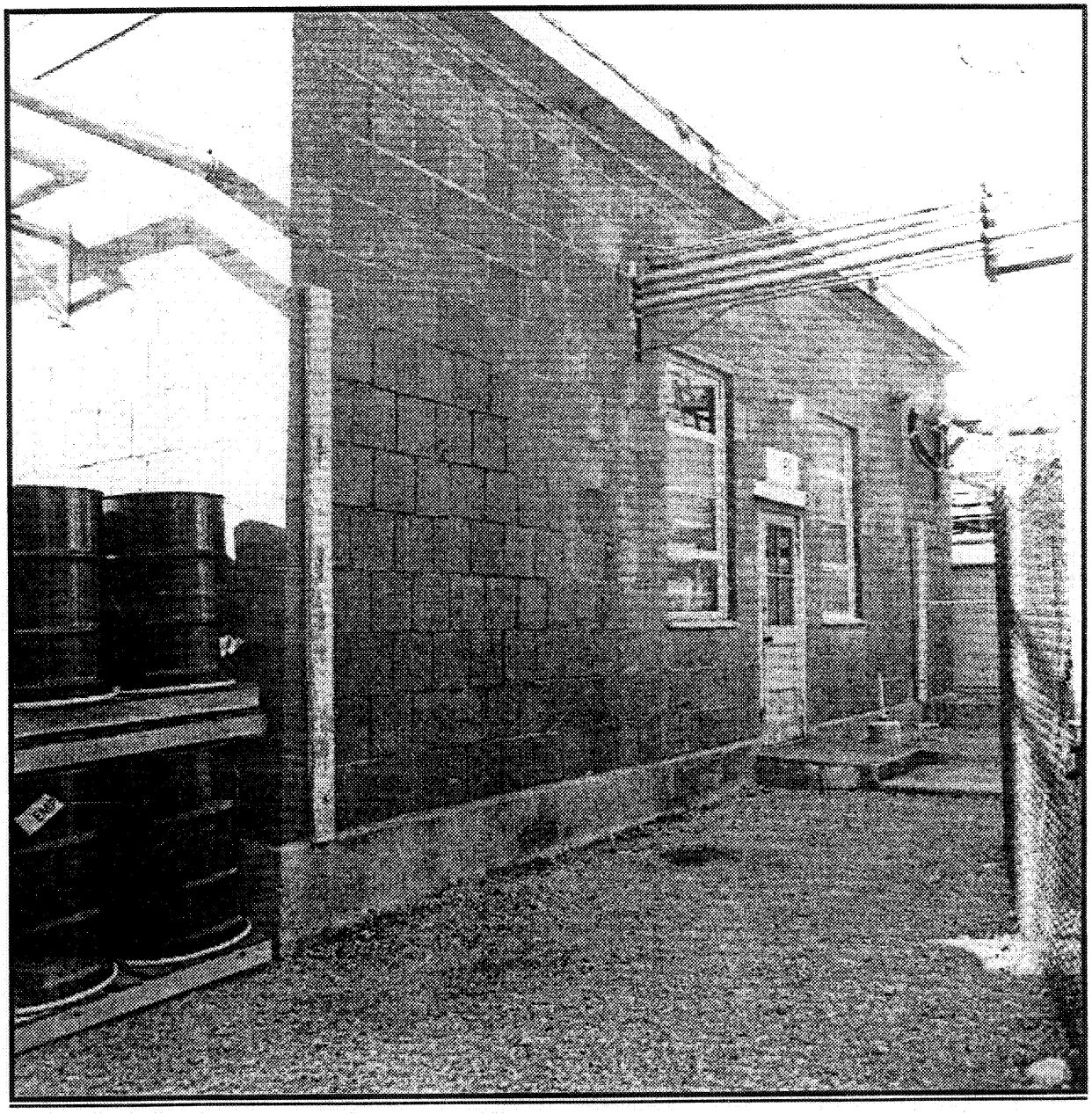


Figure 55: Building 9768 – Utilities Building

BUILDING 9770-2

ARCHITECTURAL DESCRIPTION:

Constructed of concrete block, this small, rectangular ancillary building features a gable roof with exposed rafter tails. The only fenestration is a single-panel wood door on the west facade. The diminutive building, very similar to Building 9770-1, is located in an alley between Building 9207 and Building 9210.

HISTORY:

Completed in August of 1945, this 155 square foot building houses a Radiation Source Facility and is an ancillary building in the 9207 Complex.

SIGNIFICANCE:

Building 9770-2 functioned as an utilities/valve house for Buildings 9207 and 9210 and, as an ancillary facility, furthered the plant's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9770-2 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the World War II government sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: 2005

ASSESSMENT OF IMPACT:

Building 9770-2 is an ancillary building within the Biology complex in the northeastern portion of the historic district. As a support building, its role in the history of the Biology Division and the overall Y-12 Plant has been minimal. Building 9770-2 is a small structure, and its removal would have a minor effect on the visual appearance and historic integrity of the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9770-2 would require a minimal interpretive effort prior to demolition. Building 9770-2 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

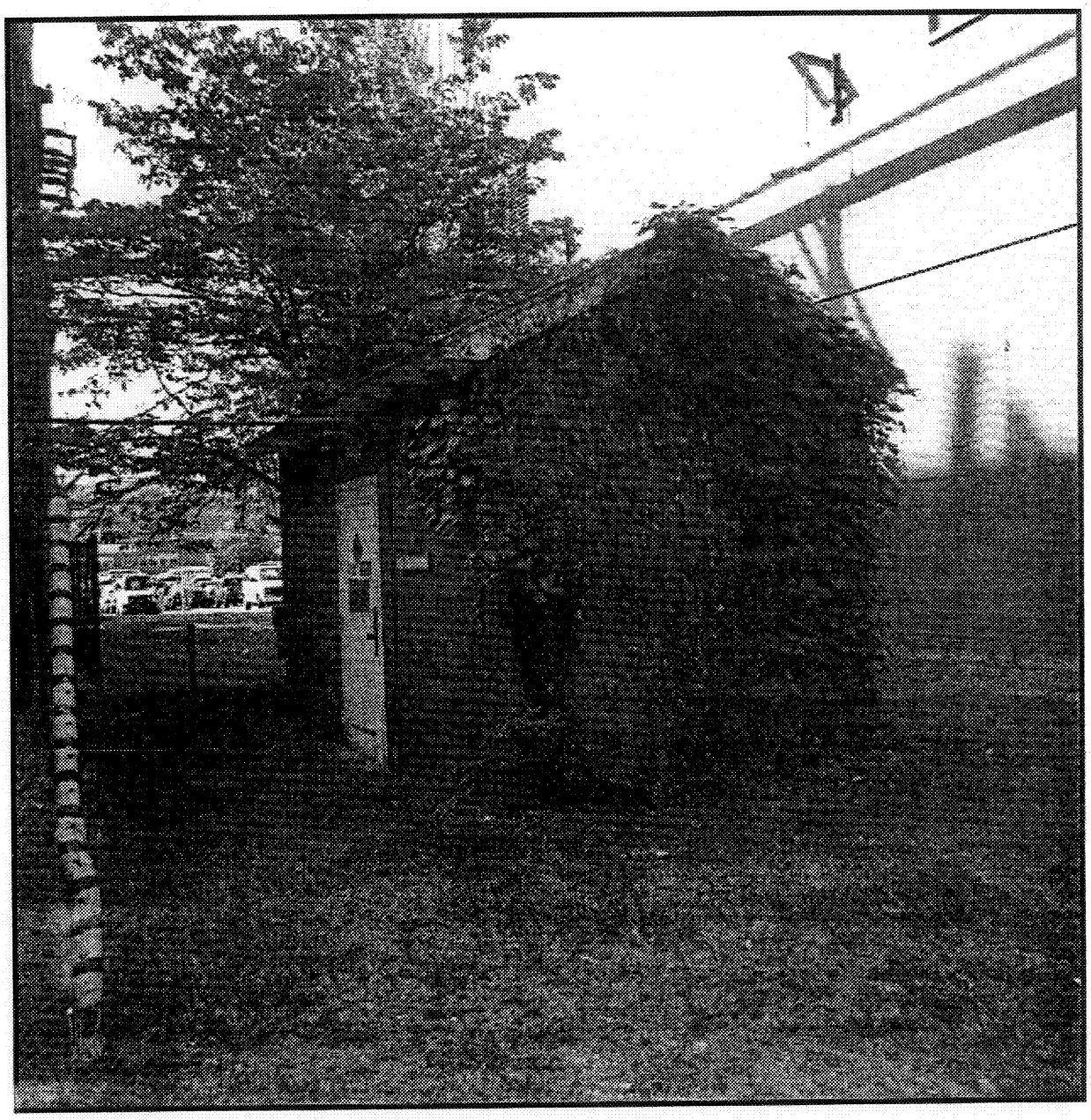


Figure 56: Building 9770-2 – Radiation Source

BUILDING 9802-2

ARCHITECTURAL DESCRIPTION:

Constructed of masonry bearing walls with a pre-cast concrete gabled roof, this small, one-story building is supported by cast concrete foundation. The building's walls are constructed of alternating rows of small brick-sized concrete blocks and standard-size concrete blocks with the corners consisting of a stack of the smaller concrete blocks. The rectangular building's gable ends exhibit asbestos siding and utility pipes enter the building from the east and west facades.

HISTORY:

Completed in November of 1954, this 166 square foot building houses a utilities facility.

SIGNIFICANCE:

Building 9802-2 functioned as a utilities building for Building 9204-4 and, as an ancillary facility, furthered Y-12's post-World War II mission of nuclear research and development. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9802-2 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the post-World War II government-sponsored scientific movement and early nuclear development.

PROPOSED DEMOLITION: To be determined

ASSESSMENT OF IMPACT:

This is a small utility building located near the western edge of the Y-12 Historic District. The building played a limited role in the history of the installation and is not a critical element to the historic district's integrity or streetscape. The removal of Building 9802-2 would have a minor effect on the historic district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9802-2 would require a minimal interpretive effort prior to demolition. Building 9802-2 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

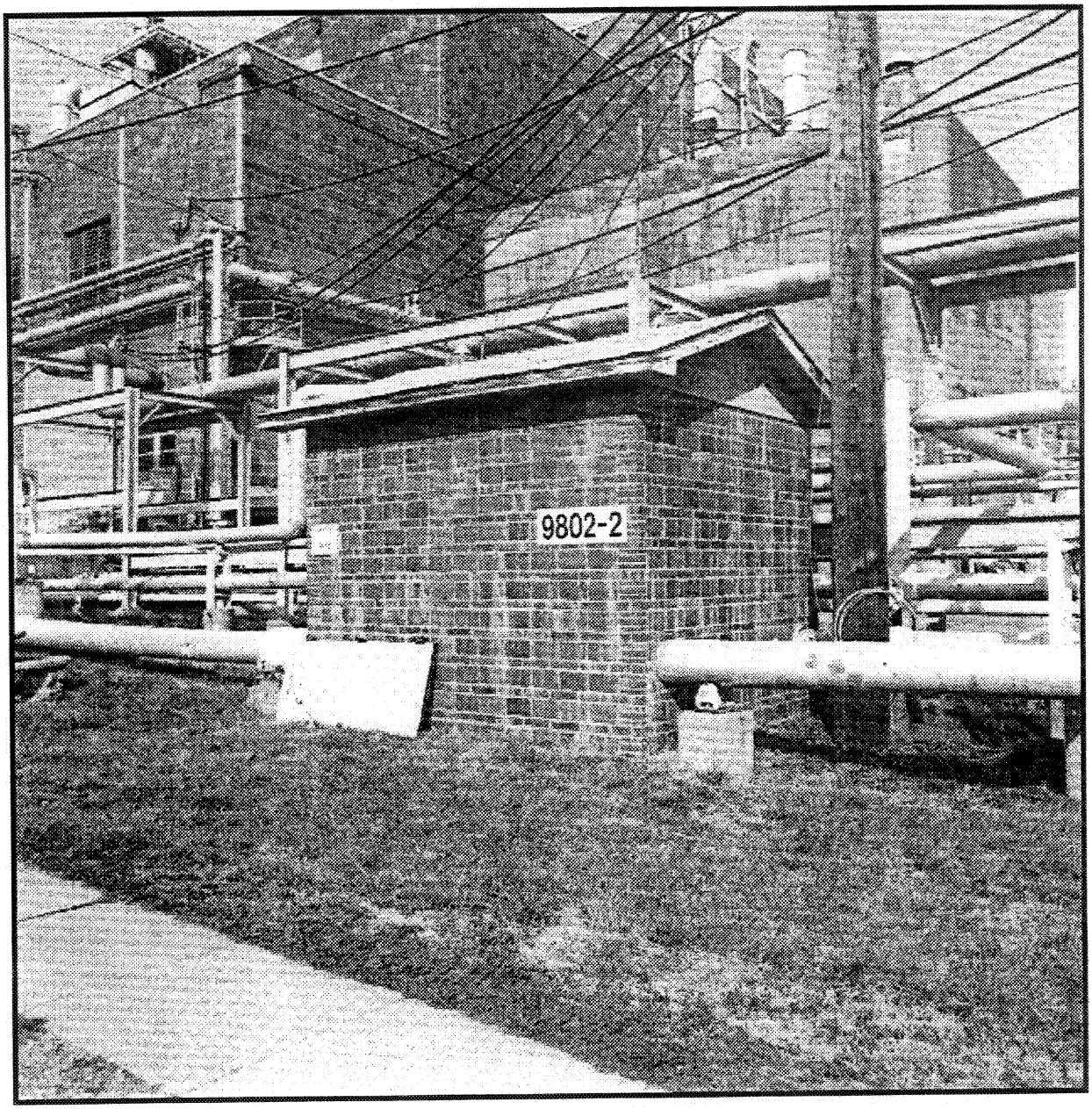


Figure 57: Building 9802-2 – Utility Building

BUILDING 9977

ARCHITECTURAL DESCRIPTION:

Constructed of a steel structural skeleton with exterior wall panels of transite, this small one story building has a slightly gabled metal roof. Located adjacent to the railroad tracks, the building is supported by a cast concrete foundation. The rectangular building's east facade features a solid, hollow core metal door -- there is no other fenestration. On the north facade, metal piping is attached directly to the building's face.

HISTORY:

Completed in July of 1943, this 80 square foot building houses a utilities facility and a Nitrogen Station.

SIGNIFICANCE:

Building 9977 functioned as a Utilities facility and Nitrogen Station and furthered Y-12's World War II mission of enriching uranium for the atomic bomb. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9977 is eligible for inclusion in the National Register under Criterion A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, it is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: To be determined

ASSESSMENT OF IMPACT:

This is a small utility building located near the southern boundary of the Y-12 Historic District. Building 9977 does not serve as a critical building to the historic district and its removal would have a minor visual effect to the district.

RECOMMENDED INTERPRETIVE:

The demolition of Building 9977 would require a minimal interpretive effort prior to demolition. Building 9977 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

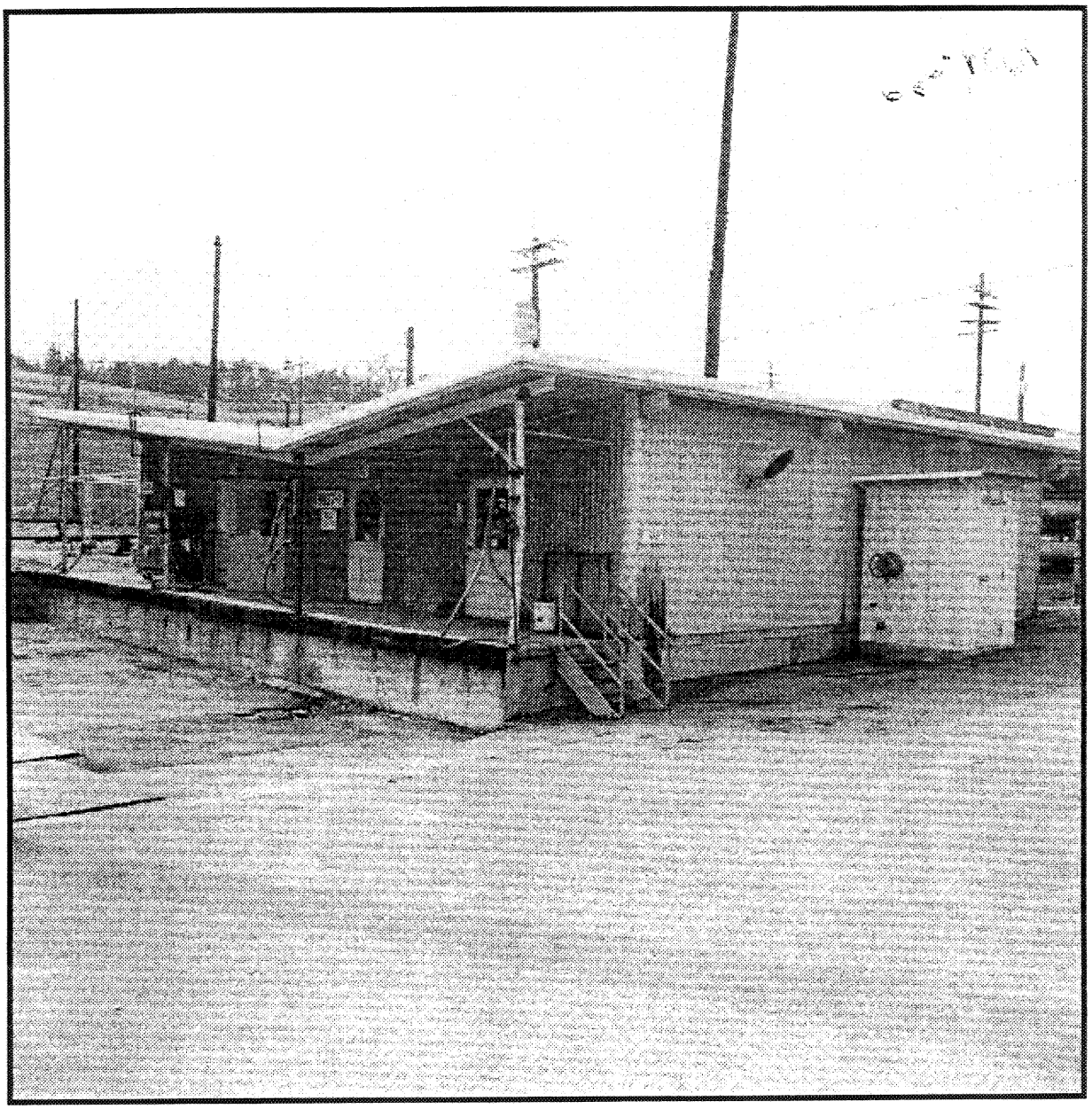


Figure 58: Building 9977 – Nitrogen Station & Utility Facility

BUILDING 9987

ARCHITECTURAL DESCRIPTION:

Constructed of masonry, this two-story, square plan building features a flat roof, and central, two story metal stairway. On the second floor, the stairway features pipe handrailing and flat metal roof. The building's doors are comprised of solid, hollow core metal. There is no other fenestration.

HISTORY:

Completed in June of 1945, this 1,550 square foot building provides Radiation Source storage and a Records Storage Vault.

SIGNIFICANCE:

This ancillary facility is composed of a standardized plan and retains architectural and historical significance. Ancillary facilities - pumphouses, guard posts, warehouses, and utility stations - were vital to the success of missions identified for the Y-12 Plant during World War II and the Cold War years. In terms of the logistics and the support provided Y-12's Alpha and Beta buildings, ancillary facilities contribute to the proposed historic district's sense of time and place.

Building 9987 is eligible for inclusion in the National Register under Criteria A and is included in the proposed Y-12 Plant National Register Historic District. Under Criterion A, the building is eligible for its historical association with the Manhattan Project, the post-World War II government-sponsored scientific movement, and early nuclear development.

PROPOSED DEMOLITION: 2011

ASSESSMENT OF IMPACT:

Building 9987 has served as a storage facility since its construction in 1945. The building is small in size and is located on the northern margin of the district boundaries. It does not serve as a critical building to the district and its removal would have a minor effect on the appearance and integrity of the district.

RECOMMENDED INTERPRETIVE EFFORT:

The demolition of Building 9987 would require a minimal interpretive effort prior to demolition. Building 9987 has a minor historic significance and the interpretive effort would consist of a file containing facility photos, available construction drawings, and a brief written physical description of the building and of its historic missions.

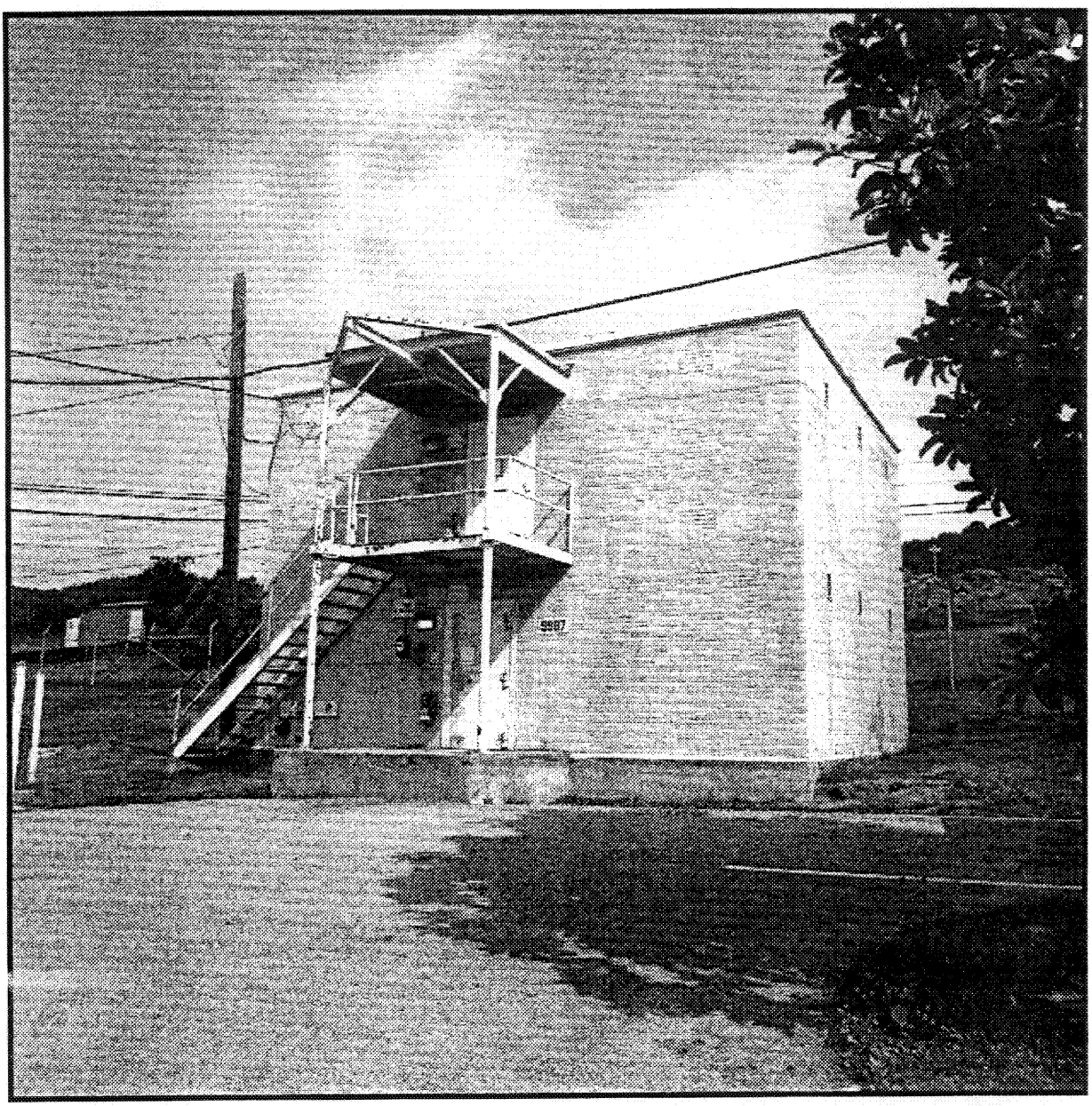


Figure 59: Building 9987 – Storage Facility

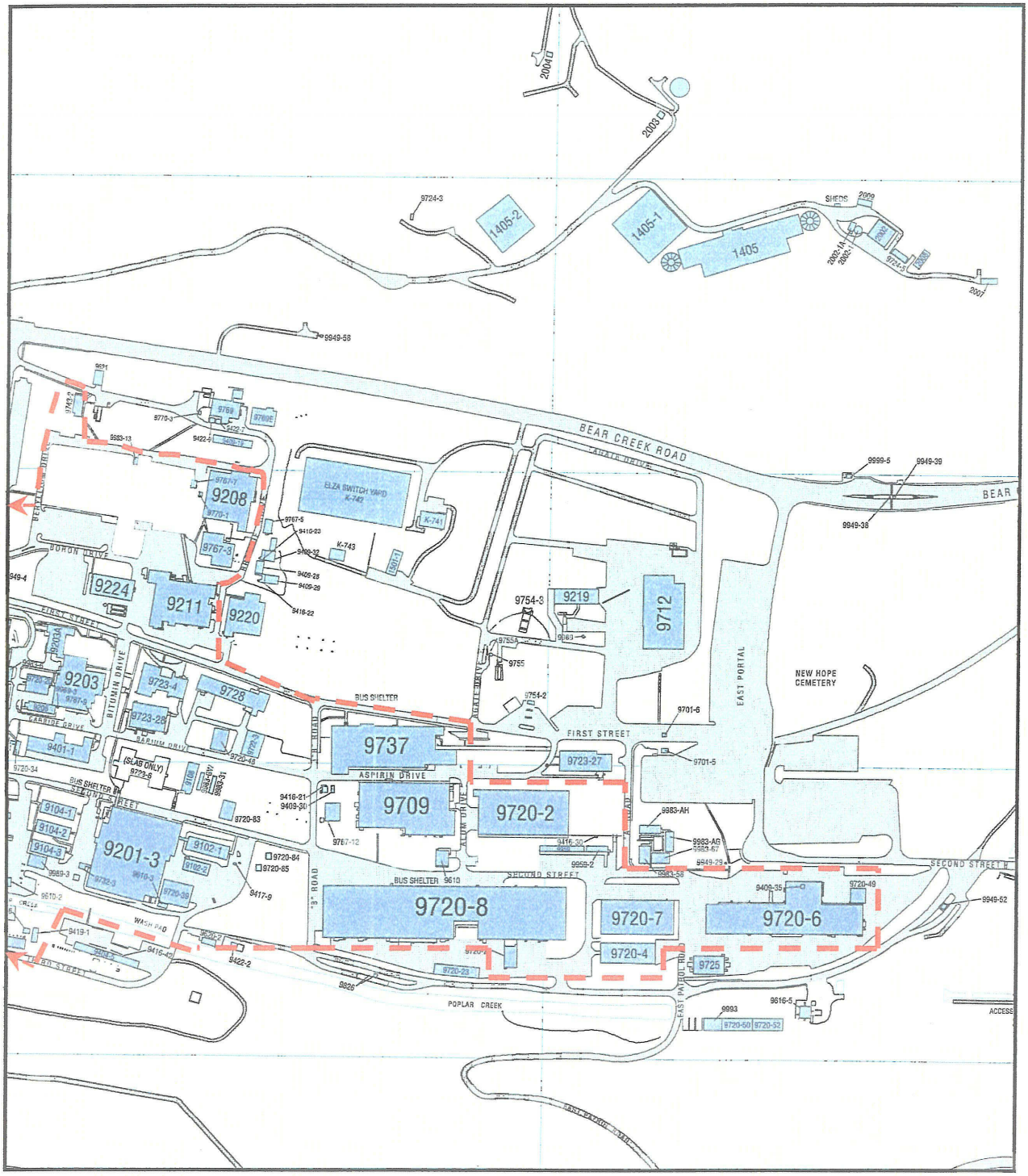


Figure 60: The east end of the Y-12 Complex would have this appearance if all of the buildings currently proposed for demolition were removed. The primary buildings removed in this section of the plant are 9207, 9210, and 9738. The proposed Y-12 Historic District is outlined in red.

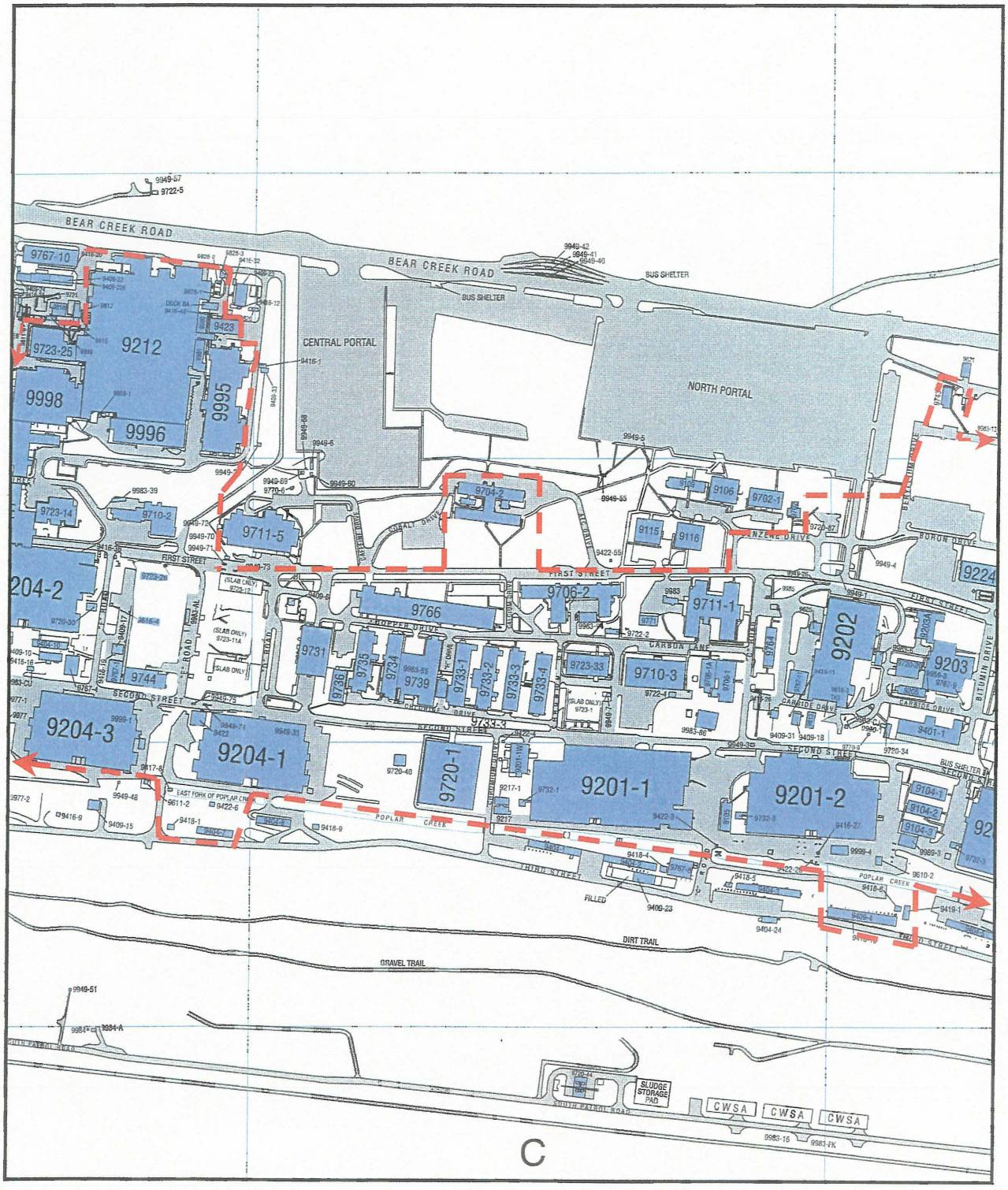


Figure 61: The central section of the Y-12 Complex would have this appearance if all of the buildings currently proposed for demolition were removed. The primary buildings removed in this section of the plant are 9206, and 9720-17. The proposed Y-12 Historic District is outlined in red.

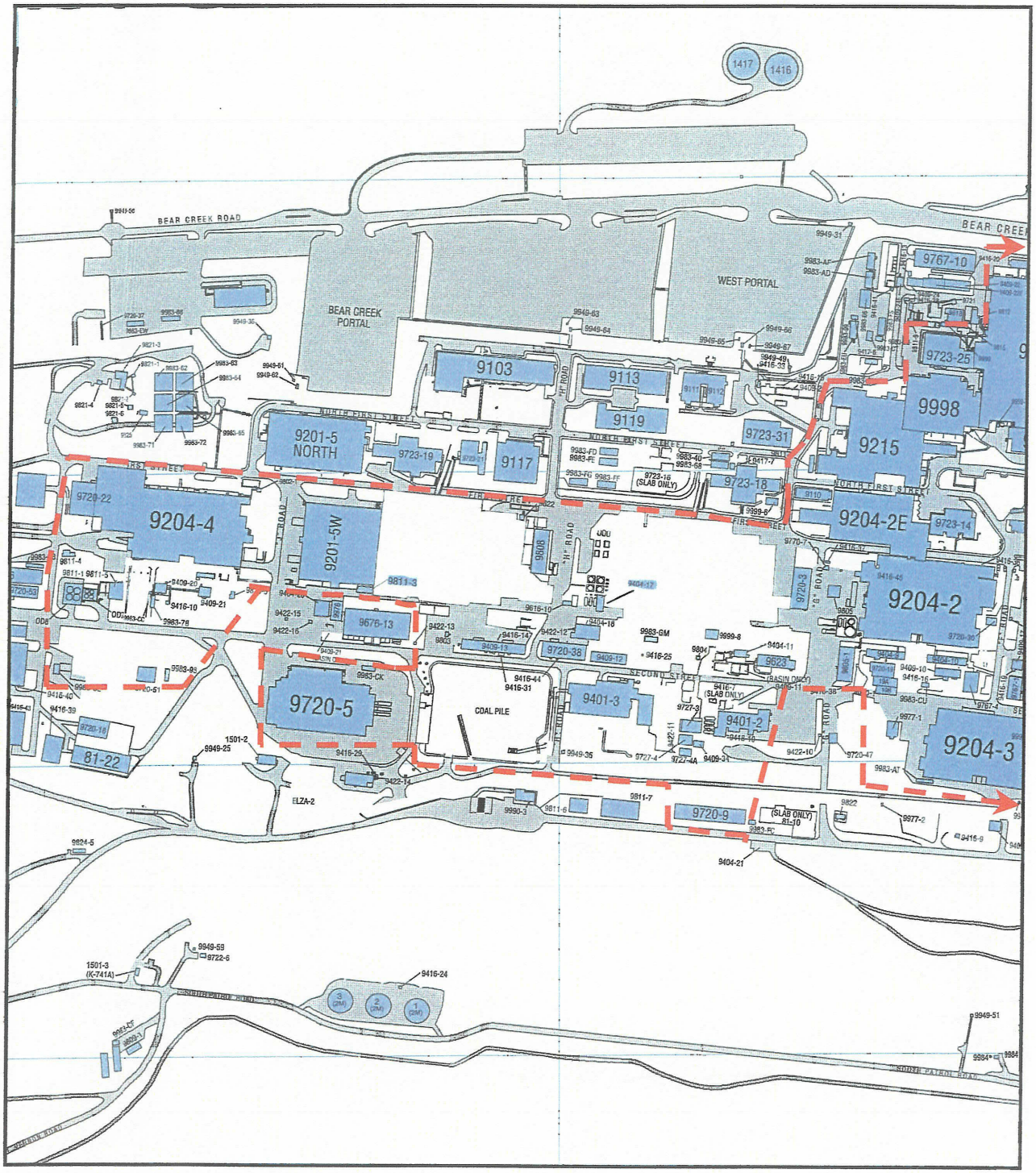


Figure 62: The west end of the Y-12 Complex would have this appearance if all of the buildings currently proposed for demolition were removed. The primary buildings removed in this section of the plant are 9201-4, 9201-5, 9720-12, and 9720-13. The proposed Y-12 Historic District is outlined in red.

7.5. *Proposed New Construction and Assessment of Impact*

Y-12's long-range Master Plan calls for a number of new facilities to be constructed on site to replace deteriorated, contaminated, and inefficient facilities. In the future, changes to Y-12's mission may necessitate other additional new construction. Since the historic district overlays the vast majority of the buildable area of Bear Creek Valley and greenfield building sites are limited, almost any new construction will impact the adjacent historic buildings and structures.

New construction within the historic district should not diminish the overall sense of time and place and should be compatible with existing, adjacent buildings.

As part of the FY03 Master Planning effort, Y-12 plans to develop ***architectural design guidelines*** to produce an overall site design that is unified in character. Future renovation and new construction will be based on the following outline of design parameters:

Mission

- World class facilities = world class work
- Support current missions and accommodate program growth and technology changes well into the 21st century.

Security

- Because of Y-12's unique mission within the National Security Complex, site and building security must remain the prime consideration.

Environment, Safety, and Health

- New construction will comply with all current codes and regulations.
- To the greatest extent economically and physically feasible, renovated and retrofitted historic facilities will be brought into accessibility and life safety code compliance without adversely impacting the quality of the facility. The general goal is to meet the same facility standards as new projects.

Maintainability

- New construction and major renovation should be based on the likelihood of a 50-year useful facility life.
- All building components should be selected and designed in a manner that encourages and eases proper maintenance.
- New or replacement materials, equipment, and systems will be selected to minimize operations and maintenance costs.

Economy

- Both construction cost and long-term sustenance costs will be reasonable and yield acceptable paybacks.
- Cost/benefit comparisons will be made to assist in choices between new construction and renovation of existing facilities and between various materials and systems.
- Use GSA standards where possible for determination of appropriate building size.

Flexibility

- Provide a flexible framework for fill-in and expansion projects
- Develop designs that recognize the likelihood of future mission changes; renovation and reuse are certainties.

Energy efficiency

- New construction and renovations will be based on DOE's energy standards.
- Unify and upgrade systems to a contemporary standard.

Work environment

- Provide a quality work environment that enhances productivity and helps to attract and retain the next generation of scientists and engineers.
- Physically integrate programs and departments to encourage interdisciplinary teaming.
- Provide amenities appropriate to needs of predominant age groups.

Aesthetics

- Materials
  - Predominant historic materials and construction are:
    - Concrete – exposed structural frame and reinforced
    - Brick – traditional red on historic structures
    - Hollow terra cotta glazed tiles
    - Large, multi-unit metal windows
    - Double-hung wood windows
    - Flat roofs with built-up roofing
    - Gable and shed pitched roofs with asphalt shingles
  - Limit or exclude materials that are visually disruptive
- Building palette
  - Simple, consistent color palette provides visual unity
  - Red brick, warm grays of concrete and roofing, and creamy yellow terra cotta
- Utilitarianism
  - Visual aesthetics were not a primary consideration in the original design of the Y-12 plant. The functional requirements for the original facility resulted in a variety of industrial-type structures. Future construction should recognize this legacy.
- Scale and massing
  - The character of the original development should be reflected in the placement, scale, proportion, and materials of any new construction. These buildings tend to be simple in massing.

Site/Circulation

- Transform the site into a campus.
- Facilitate site connectivity with transportation, circulation, and parking systems.
- Continue the small-town street gird (long blocks N/S, short blocks E/W) with buildings close to the sidewalk.
- Encourage the pedestrian experience and enhance the street level environment.
- Develop outdoor commons areas and a unified streetscape.
- Create a green infrastructure.
- Provide wayfinding mechanisms.
- Provide surface parking within reasonable walking distance to facilities.
- Develop a workable, cost-effective, internal transportation system.

Historic Integrity and Reference

- Preserve the legacy.
- Recognize Y-12 history by giving preference and protecting, where possible, existing historic facilities and features.
- Provide historic plaques that explain the significance of facilities and sites.
- Maintain the integrity of style, massing, and materials especially for any work within the historic zone.
- Refer to *The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Historic Preservation* to guide the design of alterations to historic structures.
- Recognize that it may be necessary to use a slightly larger space allocation for offices and other uses in older buildings.

- Substitute materials may be considered where original materials are no longer available or susceptible to decay, non-compliant, or difficult or expensive to maintain.
- New construction should take into consideration immediately adjacent historic structures and more distant structures of similar scale or use.
- Develop an entry experience that reflects historical significance of site.

Figure 63: The only major new building currently funded for the central section of the Y-12 Complex over the next ten years is the proposed Beryllium Manufacturing Facility and is outlined as green. The proposed Y-12 Historic District is outlined in red.

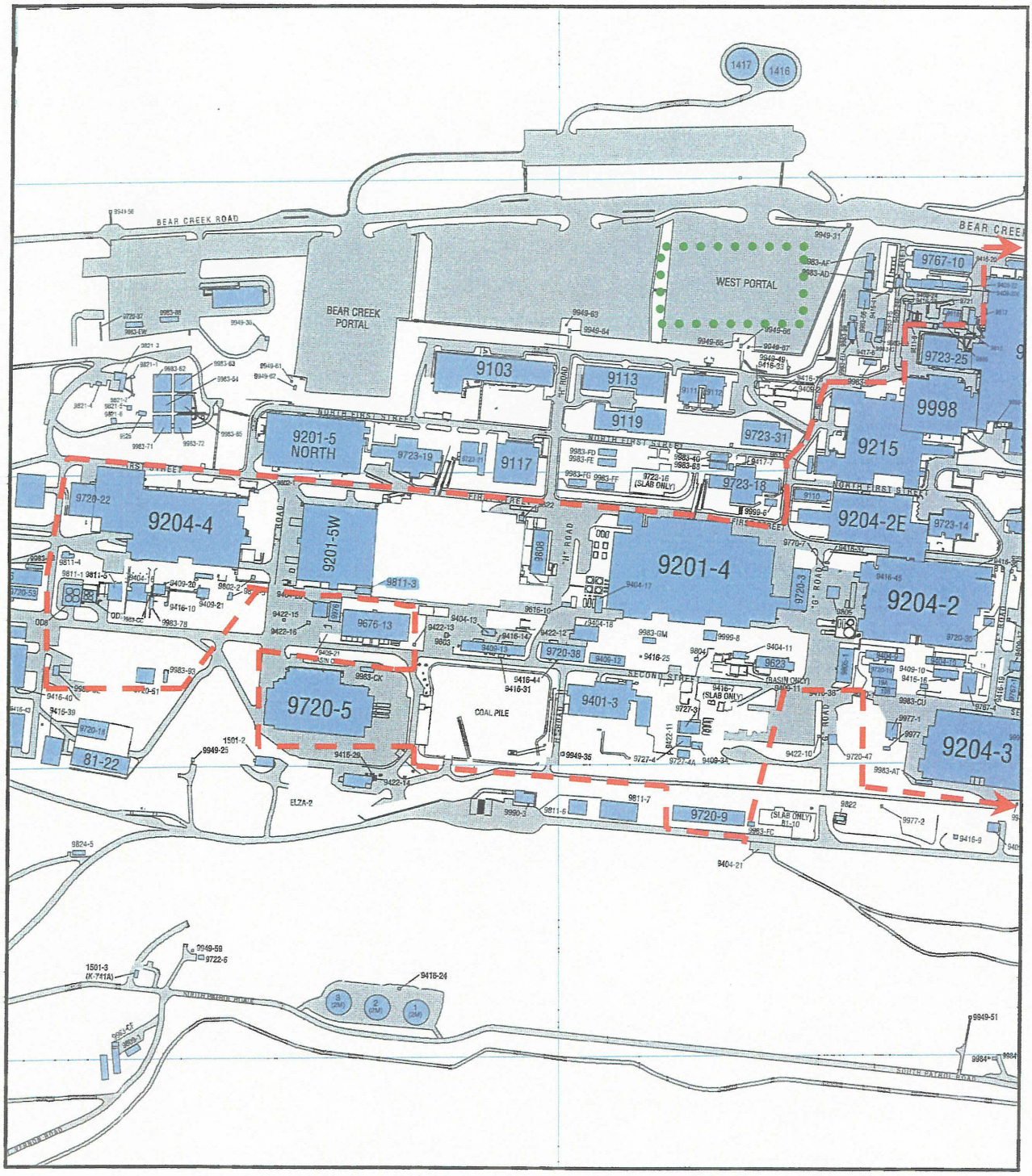


Figure 64: The only major new building currently funded at this time for the west end of the Y-12 Complex over the next ten years is the Highly Enriched Uranium Facility which is outlined as green. The proposed Y-12 Historic District is outlined in red.

7.6. ORNL Facilities at Y-12

While Y-12's long-range Master Plan calls for a number of new facilities to be constructed on site, another factor in Y-12's overall future planning and building management is the relocation efforts of the Oak Ridge National Laboratory (ORNL) mission functions performed at the Y-12 Complex site to the main campus in Bethel Valley. As a result of this action, many facilities no longer meeting ORNL's mission will become vacant with potential for reuse by BWXT Y-12. ORNL currently occupies nineteen buildings at the Y-12 Complex. Three of these buildings (9201-2, 9204-1 and 9204-3) are major structures constructed as part of the original Manhattan Project's Y-12 "Alpha and Beta Calutron" buildings. Another large grouping of buildings is known as the "ORNL Biology Complex" has some large structures as well.

The most significant of these ORNL at Y-12 buildings is Beta 3 (9204-3) which is the sole remaining building with all original calutrons still fully installed and presently in standby condition. Beta 3 is also identified as a potential building to be designated as being one of two "National Historic Landmark Status" buildings at the Y-12 Complex site. The DOE Office of Nuclear Energy has directed that the calutrons be maintained in an operable standby condition until a comparable replacement capability is established.

UT-Battelle provides building maintenance and environment, safety, and health functions for the ORNL at Y-12 facilities. As part the ORNL revitalization and consolidation plans, UT-Battelle, LLC plans to relocate nearly all of the ORNL research operations from the Y-12 Complex site to the main campus in Bethel Valley by FY 2006. For facilities at Y-12 operated by UT-Battelle, LLC, the responsibility for safe and compliant shutdown and long-term stewardship remains a UT-Battelle, LLC and the DOE Office of Science and Energy responsibility. Disposition paths currently being pursued for these buildings are: (1) Safe shutdown and cold standby; (2) Transfer to the DOE Environmental Management for demolition; and preferably (3) Transfer to NNSA and BWXT Y-12 responsibility for management and operation, provided there is a suitable NNSA mission requirement that can effectively use the space.

Other major buildings that UT-Battelle, LLC occupies at the Y-12 Complex site were also constructed in the 1940's. Building 9210, a steel and masonry structure completed in 1945 originally housed a vacuum process used for chemical refinement processing of uranium. This building later held laboratories of ORNL's Life Sciences Division and was the site of William and Liane Russell's radiation research on mice. Buildings 9207, 9211, 9220, 9224, 9743-2 and 9770-2 are also included in the "Biology Complex." Only one or two of these buildings have potential for reuse and most are deteriorated beyond economical repair. Buildings 9211 and 9743-2 located in the Biology Complex are already approved for demolition.

Building 9401-1, originally constructed as the Central Steam Plant for the Y-12 Complex, has been a used by both Y-12 Development and most recently by ORNL's Engineering Technology Division where basic engine research has been conducted. It is now empty and being evaluated for transfer to NNSA for future mission support.

As UT-Battelle, LLC continues to vacate these remaining buildings and complete operations, they will declared excess and transferred into a transition phase that prepares them for ultimate disposition. This transition phase includes initial evaluation for potential reuse by NNSA missions, deactivation, surveillance and maintenance, and decontamination/decommissioning. Deactivation involves identifying and eliminating hazards and placing the facility in a stable shutdown condition. The building is put in a state of minimum cost and minimum utilities required to maintain the integrity of the structure. Surveillance and maintenance activities occur that include inspection of the facility and routine and preventive maintenance actions required to sustain the property. Each facility's environmental,

radiological, and physical condition is assessed. The goal of ORNL's Facilities Revitalization Project is to minimize the surveillance and maintenance period. For facilities that are transferred to the DOE Environmental Management program, the surveillance and maintenance period is expected to be longer. Ultimately, if there is no future mission requirements for these buildings and as sufficient funding is made available, demolition of these facilities will be required. All of the buildings occupied by UT-Battelle, LLC on the Y-12 Complex site are categorized and assessed in sections 7.2. and 7.4

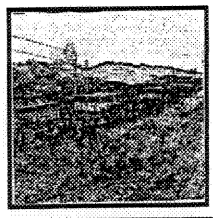
7.7. Office of Environmental Management Operations

Facilities associated with treatment, storage, and disposal of waste generated by Y-12 are currently managed by Bechtel Jacobs Corporation (BJC). IN FY 2004, the responsibility for managing newly generated waste from NNSA operations at Y-12 may be transferred to NNSA's Y-12 Site Office.

7.8. Summary

Y-12 has remained an evolving and active facility whose various missions require continuous construction and building modifications. The historic properties at Y-12 can be affected in a variety of ways. Due to the evolving mission of the facility, some historic buildings will no longer be used and the Historic Preservation Plan outlines future foreseeable actions for these facilities. Other facilities will require remodeling and regular maintenance to remain functional.

The Y-12 NSC Historic Preservation Strategy will be implemented through the combined application of historic preservation interpretive initiatives and the physical preservation of historic properties. Physical preservation will be based on sound comprehensive planning and NNSA mission directives. The forthcoming Y-12 Complex Interpretive Plan will be in place by the end of 2004 and will provide a set of interpretive initiatives to preserve the complex's historic properties. Y-12's *Strategic Plan* and *Ten-Year Comprehensive Site Plan* are updated annually, and the goals and objectives of the Historic Preservation Plan should be incorporated into future planning efforts.



8.0 Y-12 BUILDING MANAGEMENT

8.1. Overview

Historic buildings and structures at Y-12 are located within the boundaries of the National Register-eligible Y-12 Historic District that was identified in the 1995 survey. The district contains 135 buildings, and structure of which 77 are considered to be contributing to the character of the district. These buildings encompass the range of facilities located on the grounds of the Y-12 Plant and include Alpha and Beta process buildings, engineering and administration buildings, portals, pumphouses, warehouses, utility buildings, laboratories, etc.

The buildings within the Y-12 Historic District were constructed in basic utilitarian designs to accommodate the largely industrial nature of the facility. In the race to build atomic weapons, the facilities were constructed with the utmost speed using the quickest building methods available. Construction began at Y-12 in February 1943, and by August 1945 over 179 buildings had been built on the site. To construct buildings of this scale in the shortest time possible required that facilities be very simple. Hastily constructed, many of the buildings had an original estimated life span of fifty years.

Y-12's historic buildings reflect a variety of construction methods. Buildings range in size from small one-room ancillary buildings such as pumphouses to large industrial buildings three- to six-stories in height with large exhaust stacks and up to 562,000 square feet of interior space. Many are prefabricated metal buildings with metal wall panels or wood frame buildings with metal and transite wall panels, a semi-translucent, corrugated panel constructed of concrete and asbestos type material. Some buildings have masonry bearing walls of either concrete block, brick, or hollow-core tile construction materials. Roofs are predominantly flat structural steel or pre-cast concrete roof systems. A few have wood frame gable roofs. Most buildings reflect a rectangular plan and have cast concrete slabs or foundations.

8.2. Functional Use

The Y-12 Complex covers approximately 800 acres, nearly 600 acres of which are enclosed by perimeter security fences. The main site area is roughly 2½ miles in length and ½ mile wide. Security and emergency management buffer areas exist outside the main site but within the ORR. Real property includes more than 650 buildings and other structures with a floor area of approximately 7.5 million square feet. While NNSA is the site landlord and is responsible for approximately 72% of the floor space (5.4 million square feet), other DOE program offices have responsibility for the remaining 28%. Approximately 95% of the NNSA floor space is located in buildings considered active today, as defined in the DOE Facility Information Management System (FIMS). "Active" is further defined in this context as housing either an NNSA, SC, NE, or EM mission-required operational, administrative, technical, or support activities, or serve a material storage function. Situation assessments have revealed the following key points about the functions and infrastructure of today's Y-12 Complex:

- Y-12 has a manufacturing footprint that is oversized for the projected workload.
- Manufacturing operations are decentralized and service functions are spread throughout the site.

- Some manufacturing processes and equipment are obsolete, deteriorating, and being cannibalized for spare parts.
- While the majority of buildings are active, a significant amount of underused floor space exists—this space is conservatively estimated at more than 1 million square feet.
- Consolidation and relocation of some processes would permit PIDAS to be relocated to encompass a smaller area.
- Some maintenance and other support operations are decentralized and separated from the manufacturing areas they support.
- Y-12 has a utility infrastructure built for a mission entirely different from that of today and is sized to serve much larger capacities and technical needs. This situation provides opportunities for reduction in size, efficiency upgrades, replacement of aging infrastructure, and reduced operating costs.
- Y-12 contains numerous warehousing operations that store materials and equipment excess to Y-12's future needs.
- Persistent reuse of some facilities not designed for their current functions has resulted in workflow inefficiencies and higher gross-square-foot-per-person use cost ratios than the industry standards.
- Storage yards, scrap yards, and surplus and other low-value buildings occupy prime real estate that should be effectively reused for building new facilities. Obsolete and inefficient process and equipment technologies, when modernized, could further reduce overall facility maintenance, security and manufacturing costs.
- When ORNL vacates the Y-12 buildings it has occupied, more than 1.2 million square feet of floor space will become surplus. It may be in the best interests of the government to transfer some of these ORNL facilities to NNSA. Current planning indicates that all ORNL functions will return to the ORNL Bethel Valley site or other sites outside Y-12 by FY 2006.

8.3. Age of Facilities

The majority of the total Y-12 site floor space (approximately 70%) was constructed prior to 1950. Most of the original facilities have seen several changes in mission and have been operating for nearly 60 years. From the original mission of producing enriched uranium by electro-magnetic separation up to the nuclear weapons stockpile management mission of today, the majority of the infrastructure, though sometimes upgraded, has remained in continuous use. Through the 1970s and early 1980s, periods of new construction can be attributed to the start-up of new nuclear weapons programs. Beginning in the latter part of the 1980s, an increased focus on the environment, safeguards and security, and health and safety resulted in the construction of several service and support facilities. The construction chronology of the NNSA Facilities (5.4 M SF) is as follows: 1940s-20%; 1950s-13%; 1960s-15%; 1970s-8%; 1980s-35%; 1990s-9%; 2000s-0%. It has been more than 30 years since a new manufacturing facility was built, more than 15 years since the last significant upgrade to the vast utility infrastructure, and more than 20 years since the last major technology upgrade to manufacturing processes. This lack of investment has led to significant inefficiencies and maintenance requirements, and the necessity to carefully and thoroughly monitor and assess the physical condition of the facilities and supporting infrastructure. This is accomplished under the Y-12 Condition Assessment Survey (CAS) Program.

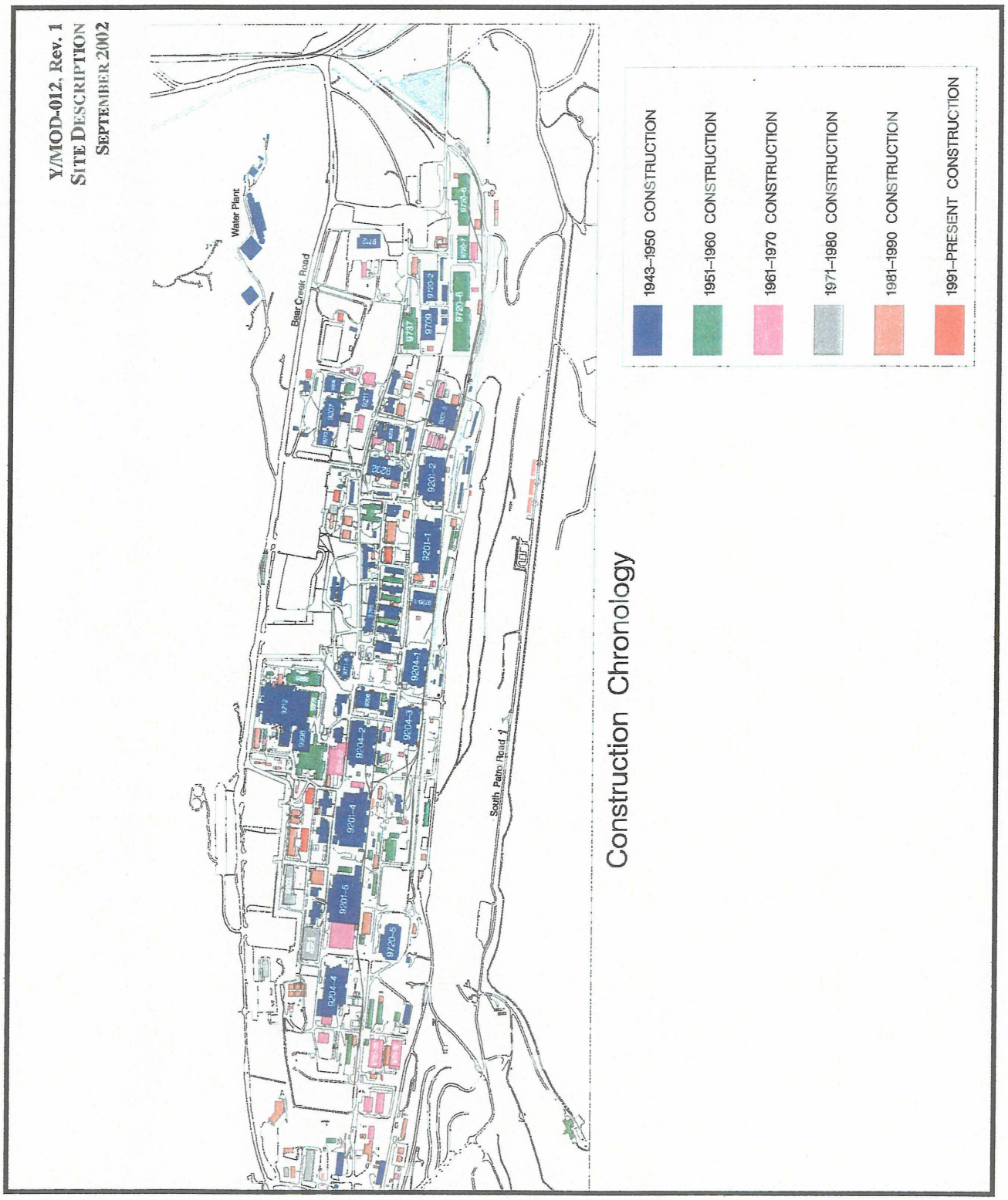


Figure 65: Construction Chronology of the Y-12 Plant *(map courtesy of Y-12 National Security Complex Ten-Year Comprehensive Site Plan).*

8.4. Maintenance Process

When minor deficiencies are identified, Maintenance Job Requests are generated for the Plant Maintenance Department to repair the deficiency, returning the deficient unit to its "as built" condition. Larger maintenance requirements in the facilities and infrastructure are addressed by the Deferred Maintenance program. There are five steps to Y-12's facility and infrastructure Deferred Maintenance process: Assessing, Prioritizing, Planning, Funding and Tracking. Assessing is accomplished with the Condition Assessment Survey program defined below. An interactive dialogue between the CAS Program and facility personnel ensures that the required maintenance is properly identified. After maintenance needs are identified, they are prioritized by considering the level of mission risk and the consequence of failure vs. the probability of failure. The result of this analysis is a CAS backlog of prioritized maintenance needs. Projects are then planned by grouping natural sets of CAS deficiencies into projects. As a part of planning projects that will involve facility modification or demolition, the proposed work is referred to the Y-12 NHPA Coordinator or the ORNL NHPA Coordinator for review and analysis of possible impact on historic preservation requirements. SHPO notifications and request for concurrence will then occur when appropriate as a part of project planning. The process for historic property management and procedural review is described in Chapter 11. All available funding sources are then applied to complete the prioritized projects, which are then carefully tracked to completion in cost, schedule and quality.

8.5. Facility Condition Assessment Survey Program

The Department of Energy's Condition Assessment Survey Program is the foundation for developing deferred maintenance actions and life cycle baseline estimates for facilities at the Y-12 Complex. Specifically developed for DOE to assess real property condition across the country, the CAS Program is based on the system assemblies that are utilized by a national construction estimating program. The work breakdown structure is comprised of the following systems:

- Footings
- Foundations
- Substructure
- Superstructure
- Exterior Closure
- Roofing
- Interior Finishes
- Construction
- Conveying Systems
- Mechanical Systems (HVAC Systems/Plumbing/Fire Protection)
- Electrical Systems
- Specialty Systems
- Site Utility Infrastructure

The CAS program involves visual inspections of buildings and infrastructure systems and components, and is based on the systems above. CAS deficiency and inspection manuals were developed corresponding to these systems. The condition inspection information is then uploaded into the Condition Assessment Information System (CAIS) for recording, tracking, reporting and analysis. CAS/CAIS definitions:

- Condition Code -The condition code is required by CAIS to evaluate the condition of each deficiency. One code rating is selected for each Inspection Unit. The code ratings, per DOE standards, are defined as follows:

    - Excellent: Performs to original specifications as measured using non-standard tests; easily restorable to "like new" condition; minimal routine maintenance at cost <2% of replacement value

    - Good: Performs to original specification as measured using historical data and non-standard tests; routine maintenance at cost <5% of replacement value.

    - Adequate: Performance meets requirements; some corrective and preventive maintenance required at a cost <10% of replacement value.

    - Fair: Performance fails to meet code or functional requirement in some cases; failure(s) are inconvenient; extensive corrective maintenance and repair are required at a cost <25% of replacement value.

    - Poor: Consistent substandard performance; failures are disruptive and costly; fails most code and functional requirements; requires constant attention; renovate or replace.

    - Fail: Equipment is not operating; equipment does not meet performance requirements satisfactorily.

- Urgency Code - The urgency code is also a required data field in CAIS. This code defines the time frame recommended by the inspector for repairing an Inspection Unit. This is the value utilized in determining which deficiencies fall into the time frame for consideration of deferred maintenance. One code rating is selected for each Inspection Unit. The code ratings, per DOE standards, are defined as follows:

    - Repair Immediately: Asset condition critical; initiate corrective action immediately

    - Repair in less than 1 Year: Asset condition serious; initiate corrective action within 1 year.

    - Repair in 1 to 2 Years: Asset condition degraded; initiate repair in 1 - 2 years.

    - Repair in 3 to 5 Years: Asset stable for period; integrate repairs into appropriate schedule.

    - No Repairs Necessary: Continue life cycle maintenance actions.

8.6. *Facility Information Management Systems (FIMS)*

DOE developed the Facility Information Management System (FIMS) as the corporate database for reporting, tracking and maintaining information related to all DOE real property assets. The annual call for deferred maintenance reporting requires that the generated values be uploaded into FIMS. Once the values and associated data have been uploaded, headquarters will take a snapshot of the values for each site. DOE/NNSA utilizes these values as justification to congress for obtaining maintenance funding for various sites. The values also allow for programmatic comparisons between sites and to monitor maintenance expenditures at each site.

8.7. Facility Condition Index.

In the overall assessment of facility conditions, a simple measure of the relative condition of a single facility or a group of facilities is required. The following formula is utilized by FIMS to obtain the Facility Condition Index for all facilities:

Facility Condition Index = Deferred Maintenance Cost / Replacement Plant Value (RPV)
The replacement plant value is automatically generated by FIMS based on the usage code and size of a facility. The RPV's were developed specifically for this task by a teaming effort between Parson's/Brinkerhoff and the RS Means companies, and were updated in FY 2001 to accurately reflect current construction costs. Only the deferred maintenance value is field entered, providing for a more consistent approach to generating values. The resultant values represent the percent replacement value described above for which repairs are required for a facility.

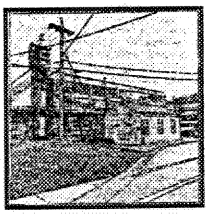
8.8. Other DOE Properties at Y-12.

Bechtel-Jacobs Corp., LLC is responsible for approximately 12% of the floor space in the Y-12 geographic area of responsibility. They generally do not conduct CAS inspections of their facilities located at Y-12. They coordinate their work at Y-12 to ensure that work conducted within their facilities with potential Y-12 impact is understood by BWXT Y-12. Likewise, the ORNL facilities within the Y-12 geographic area of the site comprise approximately 16% of the floor space. Commencing in FY03, ORNL will resume inspections of active facilities at Y-12. They coordinate their work at Y-12 to ensure that work conducted within their facilities with potential Y-12 impact is understood by BWXT Y-12. ORNL is responsible for National Register-eligible Building 9204-3.

8.9. Summary

Y-12 has an ongoing facility assessment and maintenance planning process to identify and prioritize facility maintenance needs across the site. In accordance with this process, facility maintenance needs of Y-12 historic properties with an ongoing mission need (see Chapter 7) are identified via the Y-12 Condition Assessment Program and are put into the maintenance planning process for implementation.

As a part of maintenance or project planning, work that has the potential to impact Y-12 cultural resources is reviewed by the Y-12 NHPA Coordinator or ORNL NHPA Coordinator as part of the National Environmental Policy Act (NEPA) review process. In accordance with the procedures outlined in Chapter 11 of this document, consultation with the State Historic Preservation Officer will be performed as part of the planning process when appropriate.



9.0 ARCHAEOLOGICAL SITE MANAGEMENT

9.1. General Consideration for Prehistoric and Historic Archaeological Sites

There are no known National Register-listed or -eligible archaeological sites at Y-12. Ground disturbance has taken place in most areas of the installation and the potential for archaeological sites is considered to be minimal. The Programmatic Agreement between the Department of the Energy and Tennessee SHPO requires the completion of archaeological testing prior to any proposed ground disturbance activities in previously undisturbed areas, or when property is transferred out of ownership or control of the DOE.

9.2. Emergency Discovery Procedures

9.2.1 Background - AHPA and 36 CFR 800

Protection of archaeological sites is primarily conducted by leaving such areas undisturbed if possible. If sites cannot be left alone, they should be excavated and artifacts should be removed and sent for museum curation. There are several laws in existence today, such as the Reservoir Salvage Act amended in 1974 and the Archaeological Resources Protection Act of 1979, which protect archaeological sites. These laws mandate identification of historic and prehistoric resources by Federal agencies whose activities may disturb or destroy archaeological sites.

The Archeological and Historic Preservation Act of 1974 (AHPA) was set up to supplement the Historic Sites Act of 1935. AHPA specifically provides protection for "historical and archaeological data which might otherwise be irreparably lost or destroyed" from floods, road construction, community construction, railroad and highway relocation or terrain alterations due to dams or Federal construction projects ("Preservation Law," p. I-39). As a Federal agency, DOE must follow certain procedures set up under AHPA. Before beginning or issuing a license for a construction project, the agency must notify the Tennessee SHPO in accordance with stipulations set forth in the Programmatic Agreement. Copies of the proposal will be made available for public inspection by the Tennessee SHPO. If the Tennessee SHPO concludes that damage or destruction of historic or prehistoric properties could occur, a survey must be conducted to record endangered properties, as well as surrounding areas that may be affected. If a property is discovered once an undertaking begins, AHPA may be substituted for Section 106 if the property is primarily of archaeological value.

Public Law 36 CFR 800 was set up by Congress to protect historic properties. This law governs Section 106, which is discussed in detail elsewhere within this report. Section 106 accommodates historic preservation concerns with the needs of Federal undertakings. Public Law 36 CFR 800 requires that Federal agencies evaluate all undertakings and strive to complete proposed actions with as little harm as possible to historic properties. According to the law, Federal agencies must provide the Advisory Council on Historic Preservation a reasonable amount of time to comment on undertakings and strive to comply with Council recommendations. Although Public Law 36 CFR 800 cannot stop a Federal agency from taking action, it does slow the process and allows involved parties an opportunity to mitigate undesirable outcomes. Among those who may be involved in the Section 106 process are the SHPO, the Council, the agency itself, Indian tribes and the public.

9.2.2. *Discovery Situations*

There are situations where historic or prehistoric sites are discovered only after a project has begun. In most instances, these sites are archaeological in nature and are discovered during ground-breaking activities. Sometimes late discoveries stem from effects on a historic property not identified until after a project has begun or is finished.

The preferred option for Federal agencies involved in an undertaking is to plan ahead. Assume there is always the possibility of a late discovery and decide ahead of time what to do should the situation arise. Advanced planning assures a minimal amount of disruption. Such plans should be documented in the MOA. In cases of no advanced planning, the agency has three options:

- *Compliance with Section 800.6.* Under this option, Y-12 either enters into consultation with the Tennessee SHPO and Council to develop an MOA or requests Council comment without an MOA. In either case, the Council must provide an expedited review.

- *Development of a plan.* Y-12 may develop plans to handle the discovery itself. Under this option Y-12 notifies the SHPO and Council of its plans as soon as possible. The Council provides initial comments within two days and final comments within thirty days.

- *Archeological and Historic Preservation Act (AHPA) compliance.* If the discovered property is primarily of archaeological value, Y-12 can comply with AHPA instead of Section 106. Y-12 must provide the Tennessee SHPO an opportunity to comment and submit a report to the Council after the work is finished.

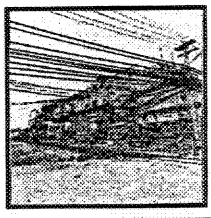
9.2.3. *Notification Procedures.*

Any time that a property is discovered after project work has begun, Y-12 must notify the Council. If Y-12 chooses its option to follow AHPA guidelines rather than Section 106, Council notification takes place after AHPA standards have been met and satisfied.

A letter to the Council should include information about when the site was discovered, where it is located, Tennessee SHPO comments, whether the discovery is National Register eligible, if the project will have an adverse effect on the site, and what Y-12 plans to do about the discovery. As in any situation requiring agency action, it is best to consult with the Tennessee SHPO about what actions to take. If Y-12 complies with Section 106, rather than AHPA, the Council must comment within an expedited period of time, providing its final comments within thirty days. Discovery procedures for consultation and creation of an MOA are the same as those described under Section 106.

9.3. *Summary*

No archaeological sites have been identified at the Y-12 Complex. The potential for archaeological sites is considered to be minimal at the Complex due to soil conditions and the extent of past ground disturbance. Future undertakings which are identified as impacting archaeological resources should follow guidelines set forth in the Programmatic Agreement between Y-12, the SHPO, and the Advisory Council on Historic Preservation.



10.0 TRAINING

10.1 Staff Training

The DOE ORO, NNSA, SC, NE, EM, and the prime contractor at the Y-12 Complex (BWXT Y-12 LLC) Cultural Resources Coordinators are trained in the interpretation and application of cultural resource laws and regulations. They have attended and completed Section 106 workshops conducted by the Tennessee Historical Commission and the Advisory Council on Historic Preservation.

As part of the responsibility of the Cultural Resource Coordinators, training is designed and developed for various site personnel (i.e. maintenance staff) to sensitize them to the special needs of the historic resources at the Y-12 Complex and to foster a spirit of cooperation and pride in their preservation.

10.2. Historic Property Training Opportunities

To effectively manage and care for Y-12's historic properties, DOE ORO, NNSA, and the Y-12 Complex prime-contractor personnel responsible for cultural resource compliance activities are provided technical training in the interpretation and application of cultural resource laws and regulations. Below are listed examples of a variety of available preservation training tools and opportunities. Preservation methods of the U.S. military are especially relevant to Y-12 as many U.S. Army and Navy sites have similar building types that date to the World War II era and face many of the same preservation, security, and cost issues that Y-12 must manage.

Advisory Council on Historic Preservation (Council)
The Advisory Council on Historic Preservation has prepared courses on "Preservation Law and Section 106 Compliance" and an "Introduction to Section 106 Review" which are presented for Federal agencies including the various branches of the military under the Department of Defense and the Coast Guard. This course is held annually at various locations throughout the country and course schedules are available from the Advisory Council Website provided below and from the Naval School and Civil Engineer Corps Officers (CECOS). For more information, please refer to their website at www.achp.gov/outreach.html

Tennessee Historical Commission (SHPO's Office)
The Tennessee Historical Commission, which is responsible for consultation with agencies, applicants, and interested persons relative to the Section 106 review process, periodically conducts Section 106 Workshops. For more information, please refer to their website at www.state.tn.us/environment/hist/sect106.htm.

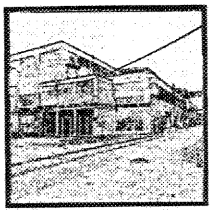
Department of the Navy Cultural Resource Program
The Department of the Navy offers historic preservation and cultural resource training under its Cultural Resource Program. Various training courses are offered annually such as "Historic Preservation Law and Section 106 Compliance" and "Introduction to Cultural Resource Management Law and Regulations." For more information, please refer to the Navy Cultural Resources Program website at www.dandp.com/enviroweb/cultural/

National Park Service

The National Park Service offers a training center which provides training courses focused on preservation construction services. They offer these programs to other federal, state, and local organizations as training venues. Technical consultations within the field, federal agencies, and with international organizations is also obtainable. For more information, please refer to the NPS website at www.nps.gov/training/HPTC/HPTC.html or call 301-663-8206.

10.3. Summary

DOE ORO, NNSA, SC, NE, EM and the prime contractor at the Y-12 Complex (BWXT Y-12 LLC) personnel are trained in the interpretation and application of cultural resource laws and regulations. To effectively manage and care for Y-12's historic properties a variety of preservation training options are available, and those of the U.S. military may be especially useful for Y-12 as many military sites have similar preservation issues.



11.0 Y-12 HISTORIC PROPERTY MANAGEMENT AND PROCEDURAL REVIEW

11.1. Y-12 Historic Property Oversight and Management

The Cultural Resource Management Plan (CRMP) completed for the DOE Oak Ridge Reservation (ORR) in 2001 contains provisions incorporated into a Programmatic Agreement (PA). This PA was among the Department of Energy Oak Ridge Operations Office, the Tennessee State Historic Preservation Officer, and the Advisory Council on Historic Preservation concerning the management of historical and cultural properties at the ORR. The CRMP outlines the responsibilities of DOE ORR in meeting its cultural resource requirements under Section 106.

Many of the provisions contained in the PA are applicable to historic building management and review at Y-12. The types of undertakings identified in the PA as potentially having an affect on historic properties include, but are not limited to, undertakings involving:

a.) construction of new or temporary facilities or permanent or temporary additions to existing facilities;
b.) decontamination and decommissioning (D&D) of facilities;
c.) replacement of equipment or facility components;
d.) facility renovations;
e.) modifications to facility use, operation, or function;
f.) routine maintenance activities;
g.) site characterization and remedial investigation activities;
h.) ground-disturbing activities;
i.) transfer, disposal, or lease of properties; and demolition of facilities.

11.2. Procedural Review

Historic property management at Y-12 is directed through the Environmental Compliance Department via the office of the National Historic Preservation Act (NHPA) Coordinator. The NHPA Coordinator works in conjunction with the NNSA and DOE ORR Cultural Resources Management Coordinators.

Historic resources at Y-12 are defined as the seventy-seven buildings and structures within the boundaries of the proposed Y-12 National Register Historic District that contribute to the character of the district. Contributing buildings and structures within the district are:

Alpha-1 (Building 9201-1)
Alpha-2 (Building 9201-2)
Alpha-3 (Building 9201-3)
Alpha-4 (Building 9201-4)
Alpha-5 (Building 9201-5)
Beta-1 (Building 9204-1)
Beta-2 (Building 9204-2)
Beta-3 (Building 9204-3)
Beta-4 (Building 9204-4)
9202
9203
9206
9207
9210
9212
9213
9215
9401-1
9401-3
9404-4
9404-6
9404-9
9404-10
9404-12
9404-13
Railroad Tracks
9404-16
9404-17
9404-18
9416-4
9419-2
9510-2
9616-3
9704-1
9704-2
9706-2
9710-2
9711-1
9720-5
9720-6
9720-7
9720-8
9720-9
9720-12
9720-13
9720-17
9722-2
9723-24
9723-25
9727-3
9729
9731
9732-2
9732-3
9733-1
9733-2
9733-3
9734
9736
9737
9738
9739
9752
9764
9767-2
9768
9770-2
9802-2
9803
9804
9805-1
9977
9977-1
9987
9996
9998

Effects to historic properties at Y-12 will follow procedures agreed upon by the U.S. Department of Energy, the Tennessee SHPO, and the Advisory Council on Historic Preservation (Council). This agreement will be formalized in a Programmatic Agreement in 2003. This review process includes a three-tier system of review for undertakings involving historic properties at Y-12.

Level One: Programmatic Exclusions

The following undertakings will not require review for Section 106 purposes by the SHPO because they will not have an adverse effect on Y-12 Complex historic properties. These actions will either be completed as a matter of course by the Y-12 maintenance department or building managers, or by the appropriate NHPA Coordinator. Level One activities are:

> Communications and Computer Systems: Siting, installation, modification, maintenance, repair, removal, or replacement of communications and computer systems, including telephone systems, computer and computer networks, and public address/warning systems, facsimile systems, microwave/radio systems. These actions might involve project design, procurement, and installation of communications systems or system components. Installation might include installing aboveground and belowground conduits, cable trays, support poles, manholes, and hub stations that contain distribution panels, wiring, electronics, power supplies, coaxial and fiber optic cables, and miscellaneous tie-ins to existing systems such as Broadbrand Communication Network, barcode readers, badge readers, electronic message signs, and computers/peripheral systems (including transmitters).

Electrical Systems: Installation, maintenance, repair, removal, modification, or replacement of Y-12 Plant and building electrical systems including (but not limited to) switchyards, building conduit, wiring and lighting, emergency lighting, circuits and wiring, meters, transformers, utility poles, crossarms, insulators, circuit breakers, capacitors and transmission lines.

Emergency Situations: Activities required by emergency situations (e.g., health and safety-related emergencies) as determined on a case-by-case basis, including those emergency activities in compliance with federal, state, or local regulatory requirements, including (but not limited to) Environmental Protection Act, Federal Facilities Act, Comprehensive Environmental Response Compensation Liability Act, Resource Conservation and Recovery Act, Superfund Amendments and Reauthorization Act, Occupational Safety and Health Act (OSHA), etc. Emergency activities that will have an effect on historic properties will be handled in accordance with 36 CFR Part 800.12.

Energy Conservation: Actions to conserve energy such as weather stripping, installation of interior storm windows, and addition of ceiling and wall insulation.

Environmental Monitoring: Installation, operation, maintenance, repair, replacement, or abandonment of environmental devices/stations including (but not limited to) monitoring wells and well-monitoring devices, monitoring weirs, flow meters, rain gauges, instrumentation/equipment buggies sampling devices, meteorological towers, geo-chemical/geophysical monitoring and survey devices, and actions necessary for conducting site monitoring and characterization activities (including but not limited to sampling water, soil, rock, flora, and fauna).

Fire Protection System: Routine installation, upgrades, replacements and/or modifications to include, but not limited to, fire doors, fire walls/barriers, fire dampers, exit lights, fire-protection systems, fire-alarm systems, sprinkler systems, anti-freezing devices in existing sprinkler systems, corridors, stairways; smoke detectors, including detectors that activate doors, fire hydrants and associated piping and emergency generators.

General Equipment: Installation, direct replacement or removal of equipment or building components. Maintenance, installation, relocation, removal and repair of equipment, building components, and associated systems, which include, but are not limited to the following:

A. Machine shop equipment such as jib cranes, motors, valves, shredders, compressors, pumps, castors, power supplies, lathes, saws, shears, presses, welding equipment, dust collectors, dryboxes, and vent systems.

B. Inspection, monitoring, laboratory and analytical equipment such as calorimeters, temperature and humidity chambers, refrigerators, freezers, blenders, grinders, polishers, blasters, X-ray generators, diffractometers, spectrometers, spectographs, spectrophtometers, chromatographs, desintometers, lasters, microscopes, balances, process controllers, indicating/recording devices, ultrasonic and plasma generating equipment, analyzers, viscometers, and measuring equipment.

C. Control equipment such as weirs, skimmers, glove boxes, hoods, stacks, filters, filter housings, fans, exhausts, bag houses, precipitators, and scrubbers.

***Note: This provision excludes equipment, machinery, or building components which are contributing elements to a property's historical significance.**

Habitat Protection: Actions in researching, protecting, restoring, or improving fish and wildlife habitat.

Hazard Prevention: Installation and maintenance required for hazard prevention, including fabrication, removal, installation, and repair of safety railings, machine guards, hand rails, guard rails, ladders, frames, and fences; installation of nonskid surfaces and anchoring floor mats; and grounding of structures and equipment.

Heating and Air Conditioning Systems: Installation, modification, and/or upgrades, maintenance, removal, repair, or replacement of heating/ventilating/air-conditioning systems and high-efficiency particulate air filters to (1) enhance workplace habitability; (2) provide for personnel safety and health enhancements (i.e. installing/improving fume hoods and associated collection and exhaust systems); and (3) ensure proper temperature control of buildings and equipment.

Leasing of Property: Leasing of historical properties when the lease would not involve, at any time, major modifications or alterations to the properties such that their historical integrity would be adversely affected.

Non-Contributing Properties: Operation, maintenance, or demolition involving any building or structure determined *not* to be a historic property either by consensus of the Department of Energy (DOE ORO) and the SHPO or as a consequence of a Formal Determination of Eligibility by the Keeper of the National Register.

Occupational Safety and Health Act (OSHA) Regulations and Permit Compliance: Installation, maintenance, repair, or replacement of equipment used in current operations designed to maintain compliance with permits and regulations of OSHA and the Americans with Disabilities Act.

Personnel Safety: Installation or modification of personnel safety systems and devices, including (but not limited to) safety showers, eye washes, fume hoods, radiation monitoring devices, sprinkler systems, emergency exit lighting systems, emergency ingress/egress routes; protective additions to electrical equipment; personnel accountability/assembly systems and stations; improvement to walking and working surfaces or areas; fabrication and installation of platforms, rails, shields and guards; and stairway modifications and installations.

Process and Laboratory Equipment: Installation, maintenance, modification, repair, storage, relocation, removal, or replacement of process or laboratory equipment and associated systems such as presses, rolling mills, foundry equipment, cranes, glove boxes and hoods, fans and tanks, ultrasonic cleaners, machine shop equipment, heat exchangers, ovens and furnaces, brazing and sintering equipment, cryogenic equipment, salt baths, centrifuges, bag houses and scrubbers, conveyors, motors, piping, valves, autoclaves, compressors, pumps, hydro-forms, recovery equipment, metal-forming equipment, inspection equipment, motor control centers, cyclone separators, humidifiers, vacuum pumps, molding and extruding equipment, filtration equipment, grinders, mill, and supercritical cleaning apparatus.

Removal of Asbestos: Asbestos removal and renovation activities, including cleanup, encapsulation, and removal and/or disposal of asbestos-containing materials from existing buildings and structures.

Removal of Polychlorinated Biphenyl Contaminated Items: Removal of polychlorinated biphenyl (PCB)-contaminated items such as electrical transformers and capacitors possibly requiring temporary removal of walls, ceilings, fences, power lines, or other obstacles that would prevent forklift or crane access to the item targeted for removal. Some transformers may have contaminated pads and/or soil around the base. The surrounding substrate will be sampled and, if determined to be contaminated, will be excavated and removed.

Routine Activities: Routine administrative, contractual, security, preventative maintenance, financial, or personnel activities.

Routine Plant Service Activities: Routine Y-12 Complex service activities to include, but not limited to: mowing and trimming of grass, shrubs, or trees; moving and assembling of furniture and equipment; snow removal; routine vegetation and erosion-control activities; janitorial and housekeeping services; small-scale use of pesticides; small-scale road, sidewalk, and parking lot repair; maintenance and repair of Y-12 Complex vehicles and heavy equipment; maintenance of Y-12 Complex safe/vaults and locks; busing and Y-12 Complex transportation; minor relocation of access roads; maintenance or repair of industrial machinery; maintenance, repair or installation of fencing; maintenance, repair or installation of indoor or outdoor signs; construction of scaffolding, calibration, testing, repair, and maintenance of laboratory and/or electronic equipment; corrective and preventative actions to maintain and preserve buildings, structures, and equipment in a suitable condition; and routine decontamination of tools, surfaces, and equipment.

Routine Repair and Maintenance of Buildings: Routine maintenance and repair including (but not limited to) mounting/hanging wall items, cabinet/shelf fabrication and installation, and elevator repair; repair or replacement of non-original paint, siding or roofing; and repair or replacement of non-original doors, walls, windows.
***Note: Original doors and windows and exterior paint should be replaced in-kind or use appropriate substitutes.**

Security Systems: Installation, maintenance, modification, removal, and repair of security systems, such as computer security, detection, monitoring, surveillance, and alarm systems including doors, walls, barriers, barricades, cameras, monitors, and shields.

Steam Condensate and Chemical Treatment Systems of Buildings: Modification to steam/condensate systems, including (but not limited to) repair or replacement of associated piping, pumps, and condensers to maintain system integrity; extension of systems to accommodate new construction or building modification; and repair of any associated chemical treatment systems.
***Note: This provision excludes removal of above-ground steam, condensate and other chemical treatment systems that are contributing elements to a property's historical significance.**

Supplied Air, Gases, and Liquid Piping Distribution Systems: Maintenance, repair, modification, relocation, and installation of distribution systems to include but not limited to nitrogen, argon, helium, oxygen, propane, natural gas, and cryogenic piping system, as well as equipment for gas cylinders.
***Note: This provision excludes the removal of above-ground supplied air, gases, and liquid piping distribution systems that are contributing elements to a property's historical significance.**

Training, Planning, and Tests: Training exercises; emergency preparedness planning; various tests and demonstrations including (but not limited to) transport packaging tests for radioactive/hazardous material, tank car tests, research and development demonstrations, and small-scale pilot demonstrations.

Water Systems: Siting, installation, maintenance, repair, removal, and operation of Y-12 Complex water systems including (but not limited to) water wells, cooling water systems, potable and process water systems, storm sewers, demineralizer, wastewater treatment systems, Y-12 Complex drainage, fire protection systems, and plumbing.

Waste Treatment, Storage and Disposal Activities: Operation and maintenance of waste treatment, storage, and disposal facilities; maintenance of landfills; spill cleanup activities; maintenance, repair or replacement of liquid retention tanks, dikes, and piping; and maintenance or repair of lagoons and small basins.

Level Two: Internal Review

The following undertakings will be reviewed within the Y-12 Complex by the appropriate NHPA Coordinator, and/or NNSA, and/or the Oak Ridge Reservation Cultural Resources Management Coordinators. These undertakings will not require further review by the SHPO or Advisory Council provided that the internal review of these undertakings is based upon information adequate to identify and evaluate affected historic properties, and that NNSA and DOE ORO have determined that these undertakings will either be no effect or no adverse effect based upon the Criteria of Effect and Adverse Effect enumerated at 36 CFR Part 800.5. Level Two activities are:

Repair and Maintenance of Buildings: Many of the Y-12 Complex historic properties have been altered with replacement doors, windows, roofs, etc. Where original architectural elements remain, necessary replacement or repair should be of in-kind materials and designs. All future repair or replacement of original exterior doors, exterior windows, exterior paint, roofing, siding, or any other character-defining elements of a historic property would be reviewed to ensure that in-kind material, size, dimension, color, texture, finish, and construction and fabrication detail are used. These activities should be done in accordance with the Secretary of Interior's Standards for Rehabilitation.

Repair and Modification of Previously Altered Interiors: Some of the Y-12 Complex historic buildings retain their original design and configuration, and many interiors have been remodeled into offices or other needed space. The interiors of the Y-12 Complex major production buildings maintain a unique high-bay area, which facilitated the historic processes of uranium enrichment, and are significant to the historic character of these buildings. Several interior sections adjacent to these high bay areas have been remodeled into office space. All proposed repair or modification to interiors would be reviewed to

ensure that such modifications do not effect or adversely affect any intact character-defining elements of the historic interiors.

Mothballing of Facilities: Actions involving the disconnection of utility services such as water, steam, telecommunications, and electrical power after it has been determined that continued operation of such systems will not be needed for safety or for the control of hazardous materials. The specific needs of the structure would be assessed to effectively mothball the structure per the National Park Service Preservation Brief on "Mothballing Historic Properties".

Repair, Modification, or Removal of Railroad Tracks: The railroad tracks that extend across the southern border of the Y-12 Complex were a vital component of the installation's successful operations during World War II and the Cold War. These tracks are currently unused and there are no plans to remove or modify them. Any undertaking that involves the repair, modification, or removal of these railroad tracks.

Steam Condensate and Chemical Treatment Systems of Buildings of Major Production Facilities: The conduits and piping systems associated with the Y-12 Complex major production facilities reflect the Y-12 Complex's historic configuration and operation. DOE ORO and NNSA have determined that some of these systems may be associated with the Y-12 Complex Cold War or World War II activities. Modification to steam/condensate systems associated with major production facilities, including (but not limited to) repair or replacement of associated piping, pumps, and condensers and repair of any associated chemical treatment systems to ensure that such modification does not adversely affect the exterior or character-defining elements of the interiors of historic properties.

New Construction: All new construction would be reviewed to ensure proposed designs would are compatible with existing adjacent historic properties and would not have an adverse effect to the historic properties.

Sale or Transfer of Property: Sale or transfer of historical properties when the sale or transfer includes deed stipulations requiring the management of the properties is conducted in compliance with the NHPA and undertakings involving modification, alteration, or destruction of the properties would be coordinated with the SHPO and/or the Advisory Council.

Level Three: SHPO Review

The following undertakings will be reviewed by the SHPO. These activities include those that have the potential to have adverse effects on the integrity of the historic properties and which may require mitigation. Undertakings that will require the review of the SHPO are:

Demolition of Contributing Buildings to the Y-12 Historic District

The demolition of any contributing building to the Y-12 Historic District, other than those identified in this document, the Y-12 Historic Preservation Plan (Section 7.0), or for which a formal agreement has previously been reached.

a. Should DOE ORO and NNSA determine that in order to carry out its operations or development at the Y-12 Complex, that it would be necessary to demolish historic properties, the SHPO would be notified and consulted to determine whether the operation

or development undertaking referent to the proposed demolition of the historic property may be avoided or minimized. Subsequent to this consultation, the SHPO shall respond within fifteen (15) working days as to its finding.

b. If the SHPO concurs in writing that the undertaking in question cannot be avoided or minimized, DOE ORO and NNSA Cultural Resources Coordinators will prepare the appropriate documentation for transmittal to the SHPO. Documentation will be developed and prepared per the graded approach described in Section 7.0.

c. If the SHPO disagrees in writing that the undertaking in question cannot be avoided or minimized, the appropriate NHPA Coordinator, NNSA and DOE ORO shall forward all documentation relevant to the dispute to the Council and initiate consultation pursuant to 36 CFR Section 800.6.

Major Modifications to Contributing Buildings in the Y-12 Historic District
Undertakings such as building repainting, or major modifications, repair or replacement of original doors, windows, roofing, or other architectural element that is not in-kind referent to the material, design, size, color, or fabrication. Any subdividing or other modifications to historic interiors, (such as the high bay areas of Y-12's major production buildings) that has been reviewed by NNSA and DOE ORO and has been determined to have adverse effects to historic properties will be coordinated with the SHPO.

New Construction :
The construction of new buildings adjacent to historic properties that has been reviewed by NNSA and DOE ORO and has been determined to have adverse effects to adjacent historic properties.

Unclassified Undertakings

For any undertakings proposed for Y-12 that are not classified in the three levels outlined above, the appropriate NHPA Coordinator shall proceed with Section 106 review of the undertaking under regulations enumerated in 36 CFR Part 800.5 through Part 800.7.

11.3. Documentation and Monitoring

a. The SHPO can review the decisions regarding Y-12 historic properties with the appropriate NHPA Coordinator relative to the Programmatic Exclusions at times mutually agreed to by DOE ORO and/or NNSA and the SHPO. Should the SHPO question whether a particular undertaking should be considered among the above-referenced Programmatic Exclusions, DOE ORO and/or NNSA and the SHPO shall make every effort to resolve the issue informally. If these efforts fail, DOE ORO shall refer the question to the Council. If the Council determines that the undertaking in question should not be considered as a Programmatic Exclusion, the undertaking will be reviewed in accordance with 36 CFR 800.5 through Part 800.7.

b. DOE ORO and/or NNSA, in consultation with the SHPO, may develop additions to the above-referenced list of Programmatic Exclusions that identify other types of undertakings that they mutually agree will be excluded from further Section 106 review subject to the conditions enumerated in the Programmatic Exclusion section. Proposals for such additions will be provided by DOE ORO to the SHPO. Upon its acceptance, the DOE ORO and/or NNSA and the SHPO will maintain records on these additions and submit them to the Council as amendments to this Agreement Document.

11.4. Historic Preservation Plan Updates and Endorsements

DOE ORO with support from its contractors must review the Historic Preservation Plan (HPP) in consultation with the SHPO and Council every five years and update as necessary. Of particular importance is a review of the procedures for historic property management to ensure that the process is working effectively and efficiently. When goals have been achieved, new goals or priorities may be adopted. Any changes or major rehabilitation work to historic resources should also be noted. These updates do not have to result in a comprehensive rewrite of the existing HPP. Instead, these updates can consist of attachments or appendices to the original plan.

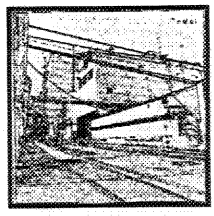
It is recommended that this HPP and later updates be endorsed by DOE ORO entities that have responsibility for historic properties at the Y-12 Complex. The plan and later updates should also be reviewed by the SHPO for their concurrence with the recommendations for historic property management and procedural review. Endorsement of the HPP and later updates by the SHPO will facilitate compliance efforts in the future.

It is also recommended that the HPP be used in the preparation of other master planning documents for the Y-12 Complex. This will ensure that Y-12's long-range plans will incorporate preservation concerns and principles for its Y-12's historic properties.

11.5. Summary

Historic properties identified at the Y-12 Complex consist of seventy-seven contributing buildings and structures within the proposed Y-12 Plant National Register Historic District. Construction or maintenance projects that have the potential to affect these properties are identified in the planning process and submitted to the site NHPA Coordinator for further review.

Cultural resource management at Y-12 is to follow the recommendations and procedural review outlined within the HPP. The procedural review will be formalized in a Programmatic Agreement between the U.S. Department of Energy, the National Nuclear Security Administration, the Tennessee SHPO, and the Advisory Council on Historic Preservation. The NHPA staff is to monitor cultural resource compliance efforts at the installation. The HPP is to be reviewed every five years and updated as necessary by all DOE ORO entities, the Tennessee SHPO, and the Advisory Council. Future planning initiatives at theY-12 Complex should incorporate the recommendations of the HPP.



12.0 SUMMARY AND ACTION PLAN

12.1. Historic Preservation Plan Summary

The Y-12 National Security Complex is a Federally-owned installation that has legal responsibilities for the identification, evaluation, and treatment of historic and archaeological properties under its jurisdiction. The National Nuclear Security Administration (NNSA), a quasi-independent agency within the Department of Energy, is the landlord program office having responsibility for the Y-12 installation. In addition to NNSA missions, the Office of Science and Energy, the Office of Nuclear Energy and the Office of Environmental Management have properties located at the Y-12 Complex

An intensive survey of historic resources was completed for Y-12 in 1995 (final version 1999). Following Tennessee SHPO review of the report, one historic district with ninety-six contributing buildings and structures was identified as meeting criteria for listing on the National Register of Historic Places. Since this time seventeen contributing buildings within the Y-12 Historic District have been approved for demolition. The district currently contains seventy-seven contributing buildings and structures. These include Buildings 9204-3 (Beta-3) and 9731, which are eligible for National Historic Landmark (NHL) status. The Y-12 Historic District has not been formally nominated to the National Register.

There are currently no known archaeological sites at the Y-12 Complex and recent studies indicate that the potential for archaeological sites at the Complex are minimal. However, it is important that Y-12 follow the emergency discovery procedures outlined in the HPP should an archaeological site be identified.

The Y-12 Historic Preservation Plan defines the preservation strategy for the Y-12 National Security Complex and is directed at all historic properties at the Y-12 installation. The plan also directs compliance with the NHPA and federal archaeological protection legislation at the Y-12 Complex. Each ORR entity (NNSA,DOE Oak Ridge Operations, DOE Office of Science and Energy, DOE Office of Nuclear Energy, and DOE Environmental Management) as well as the respective operating and integrating contractors, BWXT Y-12, UT-Battelle, LLC, and Bechtel Jacobs Company, have participated in the development of the HPP and will be committed to the Y-12 historic preservation program described in this plan.

Since the end of the Cold War, the Y-12 Complex has experienced significant challenges with respect to its facilities and infrastructure. These challenges include an oversized footprint for projected workload and missions, and a growing need for consolidation of operations to improve efficiency and effectiveness of missions.

To meet these challenges, long-range plans for the Y-12 Complex seek to modernize and consolidate operations, which calls for a more efficient use of space and facilities, as well as the disposal of nonessential facilities. Comprehensive planning for the Y-12 Complex is a dynamic process and occurs continuously, and recommendations from the Y-12 Historic Preservation Plan will be incorporated within future planning documents for the installation.

The Y-12 Historic Preservation Strategy ensures that historic preservation is an integral part of the comprehensive planning process. This strategy will be implemented through the combined application of historic preservation interpretive initiatives and the physical preservation of historic properties. Based on the dynamics of the planning efforts at Y-12 over the next five years, Y-12's existing historic properties have been categorized into the following four groups: (1) Future Mission Need, (2) Excess to Mission Need, (3) Future Mission Need Uncertain, and (4) Historic Status Re-evaluated. Physical preservation of buildings will be evaluated in the context of, but not necessarily limited to, continuing mission need, functional use, and economic considerations. This strategy recognizes that historic preservation must go beyond the preservation of physical structures - principally due to the long-range need for less space to perform the site's missions. The historic preservation strategy addresses the need to preserve more global historic features.

Currently, twenty-nine buildings that are contributing elements to the historic district have been determined to be excess to future mission needs and are proposed for demolition within the next ten years. The demolition of thirteen of these twenty-three buildings will have a minor effect on the integrity and appearance of the historic district. These thirteen buildings are: 9404-4, 9416-4, 9419-2, 9510-2, 9616-3, 9720-12, 9720-13, 9752, 9768, 9770-2, 9802-2, 9977, and 9987.

Buildings 9213, 9404-6, 9404-12, 9404-13, 9404-16, 9704-1, 9720-17, 9723-24, 9729, 9738, and 9767-2 are also among the twenty-nine buildings currently proposed for demolition. These eleven buildings add to the historic character and integrity of the district as representative examples of specific building types, their association with major production facilities and processes, and/or their key locations within the district. The removal of any of these buildings would have a moderate effect on the integrity of the district.

The remaining five buildings proposed for demolition within the next ten years are: 9201-4, 9201-5, 9206, 9207, and 9210. Buildings 9201-4 (Alpha-4), 9201-5 (Alpha-5) and 9206 are major production facilities associated with Y-12's historic operations. These buildings are core structures in the heart of the historic district, and are significant in conveying the character of the district. Buildings 9207 and 9210 are part of the complex of Biology buildings where ORNL scientists made important advancements in biology, genetics, and medicine during the Cold War years. The demolition of any of these five buildings would have a major effect on the historic district.

Interpretation is a key component of the Y-12 Historic Preservation Strategy. For each historic property at the Y-12 Complex that is proposed for demolition, a graded approach will be used to determine the level of interpretation to be performed on the building. This interpretive approach will reflect each building's degree of historical significance as either minor, moderate, or major. Y-12 will develop a detailed Interpretive Plan by the end of 2004. This plan will address a variety of interpretive efforts designed to preserve the "feel," "size," and "look," of the historic district and to comprehensively document Y-12's historical significance.

To capture Y-12's significance during World War II and the Cold War an oral history program of current and former Y-12 employees will be conducted. A crucial component of Y-12's history is the machinery and lab equipment that supported its operations during that period. As many of these items are no longer in use and have the potential to be discarded, extant machinery and equipment from this era needs to be inventoried and assessed for its historical significance. Y-12 will conduct and prepare an inventory report and assessment of its historic machinery and equipment no later than 2006.

Future undertakings at Y-12 will be assessed for their potential to effect historic properties through a three-level system of review. This procedural review is outlined in the HPP and will be formalized in a Programmatic Agreement between DOE ORO, NNSA, the SHPO, and the Council in 2003. Programmatic

Exclusions or activities that require no review by the SHPO are covered in Level One of the review process. These activities are basic daily maintenance and other activities that will have no adverse effect on historic properties. Level Two are those activities that will require internal review through the appropriate review authority. Activities covered in this level include the replacement of in-kind materials and architectural elements, repair or modification of exterior piping, conduits or heating and air conditioning units associated with major production facilities, and procedures that have the potential to effect the historic interiors, machinery, or lab equipment of historic properties. Level Three activities are those that will have a major effect on historic properties and will require review by the SHPO. These activities include demolition, major alterations or rehabilitations, and new construction in or adjacent to the historic district that has been reviewed by NNSA and DOE ORO and has been determined to have an adverse effect to historic properties.

The effective management of historic properties requires suitable training for key personnel responsible for maintenance and management of historic facilities. To effectively manage and care for the historic properties at the Y-12 Complex, DOE ORO, NNSA, and the Y-12 prime contractor personnel responsible for cultural resource compliance activities are provided technical training in the interpretation and application of cultural resource laws and regulations. As part of the responsibility of the Cultural Resource Coordinators, training is designed and developed for various site personnel (i.e. maintenance staff) to sensitize them to the special needs of the historic resources at the Y-12 Complex and to foster a spirit of cooperation and pride in their preservation.

Y-12 has an ongoing facility assessment and maintenance planning process to identify and prioritize facility maintenance needs across the site. In accordance with this process, facility maintenance needs of Y-12 historic properties with an ongoing mission need are identified via the Y-12 Condition Assessment Program and are put into the maintenance planning process for implementation. As a part of maintenance or project planning, work that has the potential to impact Y-12 cultural resources is reviewed by the appropriate NHPA Coordinator as part of the National Environmental Policy Act (NEPA) review process. Consultation with the State Historic Preservation Officer will be performed as part of the planning process when appropriate

In order to ensure the care and preservation of its historic properties, the HPP will be updated on a regular basis. Due to the changing nature of its missions, security requirements, and developing long-range plans, Y-12 will review the HPP and update as necessary no later than 2008 and every five years thereafter. In addition, all master planning documents for the facility will incorporate the recommendations of the HPP and the requirements of the Programmatic Agreement, making the preservation of its historic buildings a principal objective of the Y-12 Complex.

12.2. Action Plan

- For future mitigation purposes and to preserve Y-12's unique history for the public, the DOE entities will create and have in place an interpretive plan that will highlight the historic facilities of major historic significance at Y-12 and preserve the "feel", "size" and "look" of the Y-12 historic district. This plan should be completed no later than the end of 2004.

- The historic and archaeological resources management of Y-12 will be integrated with overall mission management and planning so that mission goals may be obtained without undue delay, and that significant resources may be preserved and maintained.

- There will be review authority for all projects that have the potential to affect historic and archaeological resources. The system of review will have three levels: (1) activities that require no

further review; (2) activities that require internal Y-12 review through the appropriate review authority; and (3) activities that will require review by the SHPO.

- Y-12 will prepare an inventory and assessment of its historic machinery and equipment no later than 2006.

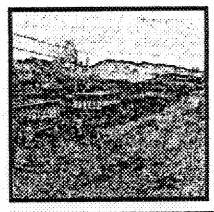
- Key personnel responsible for the care and management of historic properties at Y-12 will be trained in the interpretation and application of cultural resource laws and regulations.

- The Historic Preservation Plan will be reviewed every five years and updated as necessary.

- Recommendations of the Y-12 Historic Preservation Plan will be incorporated within future master planning documents for the installation.

12.3 Summary

The Y-12 Security Complex is an integral component in the history of nuclear research and development in the United States. The heritage of its significance in World War II and the Cold War is expressed in its built environment and landscape. As the missions and operations of Y-12 evolve over the coming decades, this legacy must be respected through the actions of continued preservation and maintenance, adaptive reuse, interpretation, and recordation. Such actions will enable the Y-12 Security Complex to preserve and maintain its historical legacy while continuing to be one of the nation's centers for scientific and nuclear advancement.



13.0 BIBLIOGRAPHY

Allardice, C. and Trapnell, E.R.
1974 The Atomic Energy Commission. Praeger Publishers, New York and Washington.

Advisory Council on Historic Preservation
1991 Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities. Advisory Council on Historic Preservation, Washington, D.C.

Bell, W.A. and J.G. Tracy
1987 "Stable Isotope Separations In Calutrons: Forty Years of Production and Distribution." Oak Ridge National Laboratory, Martin Marietta Energy Systems, U.S. Department of Energy. J.G.

Boland, B.G.
1989 "Guidelines for Evaluating and Documenting Properties Associated with Significant Persons." U.S. Department of the Interior, National Park Service, Interagency Resources Division, National Register of Historic Places, Washington, D.C.

Buck, A.L.
1983 A History of the Atomic Energy Commission. U.S. Department of Energy, History Division, Washington, D.C.

"Calutrons Resume Isotope Production,"
1995 Martin Marietta Energy Systems News, Volume 12, No. 3, 9 February: 1-2.

Case, J.M.
1968 "Y-12 Plant Today," Union Carbide Corporation - Nuclear Division.

Compere, A.L. and W.L. Griffith
1991 The U.S. Calutron Program For Uranium Enrichment: History, Technology, Operations, and Production, Oak Ridge National Laboratory, Martin Marietta Energy Systems, U.S. Department of Energy.

Construction for Atomic Bomb Production Facilities
1945 "Engineering News-Record." 13 December: 112-156.

DeCamp, D.
1988 Oak Ridge From Secret City to Science City. Oak Ridge.

Fielder, G.F.
1974 "Archaeological Survey with Emphasis on Prehistoric Sites of the Oak Ridge Reservation, Oak Ridge, Tennessee." Oak Ridge National Laboratory, Oak Ridge.

Fielder, G.F., S.R. Ahler, and B. Barrington
1976 "Historic Sites Reconnaissance of the Oak Ridge Reservation, Oak Ridge, Tennessee." Oak Ridge National Laboratory, Oak Ridge.

Gosling, F.G.
1990 The Manhattan Project: Science in the Second War. U.S. Department of Energy, Washington, D.C.

Groueff, S.
1967 Manhattan Project. Little, Brown, and Company, Boston, Toronto.

Groves, L.R.
1962 Now It Can Be Told. Harper and Brothers, New York.

Hewlett, R.G.
1978 "Federal Policy for the Disposal of Highly Radioactive Wastes from Commercial Nuclear Power Plants." U.S. Department of Energy, History Division, Washington, D.C.

Hewlett, R.G. and O.E. Anderson
1962 The New World, 1939/1946: Volume I, A History of the United States Atomic Energy Commission. Pennsylvania State University Press, University Park, Pennsylvania.

Hewlett, R. G. and F. Duncan
1969 Atomic Shield, 1947/1952: Volume II, A History of the United States Atomic Energy Commission. Pennsylvania State University Press, University Park, Pennsylvania.

Hewlett, R. G. and J. Holl
1989 Atoms for Peace and War, 1953-1961: Volume III, The Eisenhower Administration and the Atomic Energy Commission. University of California Press, Berkeley.

Johnson, C.W. and C.O. Jackson
1981 City Behind a Fence: Oak Ridge, Tennessee, 1942-1946. University of Tennessee Press, Knoxville.

Johnson, L. and D. Schaffer
1992 Oak Ridge National Laboratory REVIEW. Volume 25, Numbers Three and Four.

Jones, V.C.
1985 Manhattan: The Army and the Atomic Bomb. Center of Military History, United States Army, Washington, D.C.

Kugelmass, J.A. and J. Messner
1953 Oppenheimer and the Atomic Story. Harper and Row, New York.

Lawren, W.
1988 The General and the Bomb, A Biography of General Leslie R. Groves, Director of the Manhattan Project. Dodd and Mead, New York.

Lilienthal, D.
The Journals of David E. Lilienthal.

Love, Leon O.
1992 "The Early History of the Electromagnetic Separation of Large Quantities of Stable and Radioactive Isotopes," Unpublished Manuscript.

McClelland, L.F., J.T. Keller, G. P. Keller, R. Z. Melnick
1988 National Register Bulletin 30: "How to Identify, Evaluate, and Register Rural Historic Landscapes." U.S. Department of the Interior, Interagency Resources Division, National Register of Historic Places, Washington, D.C.

McCullough, D.
Truman. Simon and Schuster, New York.

McDonald, M. and J. Muldowny
1982 TVA and the Dispossessed, The Resettlement of Population In The Norris Dam Area. University of Tennessee Press, Knoxville.

"Oak Ridge Reservation Technical Site Information,"
1994 Site and Facilities Planning Department, Martin Marietta Energy Systems, U.S. Department of Energy.

"Oak Ridge Y-12 Plant Site Development and Facilities Utilization Plan,"
1984 Oak Ridge Y-12 Plant, Martin Marietta Energy Systems, U.S. Department of Energy.

Overholt, J. (editor)
1987 "These Are Our Voices, The Story of Oak Ridge 1942-1970." Children's Museum of Oak Ridge, Oak Ridge.

Parker, P.L. and R.F. King
ca. 1990 National Register Bulletin 38: "Guidelines for Evaluating and Documenting Traditional Cultural Properties." U.S. Department of the Interior, National Park Service, Interagency Resources Division, National Register of Historic Places, Washington, D.C.

Rhodes, R.
1986 The Making Of The Atomic Bomb. Touchstone Book, New York.

Robinson, G. O.
1950 The Oak Ridge Story. Southern Publisher, Kingsport, Tennessee.

Searcy, H.
1992 "A City Under Siege." The Philadelphia Inquirer Magazine. 9 August 1992.

Sherfy, M. and W.R. Luce
ca. 1990 National Register Bulletin 22: "Guidelines for Evaluating and Nominating Properties That Have Achieved Significance Within the Last Fifty Years." U.S. Department of the Interior, National Park Service, Interagency Resources Division, National Register of Historic Places, Washington, D.C.

Smyth, H.D.
1945 Atomic Energy for Military Purposes: The Official Report on the Development of the Atomic Bomb Under the Auspices of the United States Government, 1940-1945. Princeton University Press, Princeton.

Tennessee Historical Commission, Oak Ridge File
N.D. Construction in the United States. Atomic Mission.

Thomason, P. and K. Murphy
1991 "Historic and Architectural Resources of Oak Ridge." Multiple Property National Register Nomination for the Bear Creek Road Checking Station, Bethel Valley Road Checking Station, George Jones Memorial Baptist Church, Freels Cabin, Hackworth House, Jones House, New Bethel Baptist Church, Oak Ridge Historic District, Oak Ridge Turnpike Checking Station, and the Woodland-Scarboro Historic District."

Thomason and Assoc.
1993 "Historic and Architectural Analysis, Oak Ridge Associated Universities Properties, Oak Ridge, Tennessee." Thomason and Associates, Nashville.

1999 "Architectural/Historic Evaluation of the Y-12 Plant, Oak Ridge Reservation, Anderson County, Tennessee." Prepared for the Y-12 Plant, Oak Ridge, Tennessee, managed by Lockheed Martin Energy Systems for the U.S. Department of Energy.

U.S. Atomic Energy Commission
1962 "Major Activities in the Atomic Energy Programs." U.S. Government Printing Office, Washington, D.C.

1966 "Major Activities in the Atomic Energy Programs." U.S. Government Printing Office, Washington, D.C.

1968 "Annual Report to Congress of the Atomic Energy Commission for 1967." U.S. Government Printing Office, Washington, D.C.

U.S. Department of Energy Oak Ridge Operations
2001 "Cultural Resource Management Plan, DOE Oak Ridge Reservation, Anderson and Roane Counties, Tennessee." U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge Tennessee.

U.S. Department of the Interior
1982 National Register Bulletin Number 6: "Nomination of Properties Significant for Associations with Living Persons." U.S. Department of the Interior, National Park Service, Interagency Resources Division, National Register of Historic Places, Washington, D.C.

1991 "Why We Preserve--How We Preserve: Commemorating the 50th Anniversary of World War II." CRM, Theme Issue, Volume 14, Number 8. Washington, D.C.

N.D. National Register Bulletin 15: "How To Apply the National Register Criteria for Evaluation." U.S. Department of the Interior, National Park Service, Interagency Resources Division, National Register of Historic Places, Washington, D.C.

Y-12 "Bulletin"
1967 Union Carbide - "Y-12 Bulletin," 2-3 September: 1-3.

Y-12 Building Directory
1991 Oak Ridge Y-12 Plant Martin Marietta Energy Systems, United States Department of Energy.

Young, J.A.
N.D. "An Historical View of Oak Ridge: The Pre-Oak Ridge Communities and Katy's Kitchen." Oak Ridge Public Library, Oak Ridge Room.