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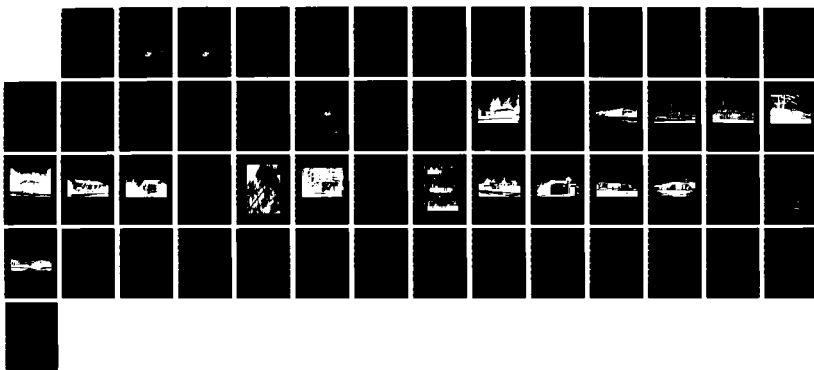
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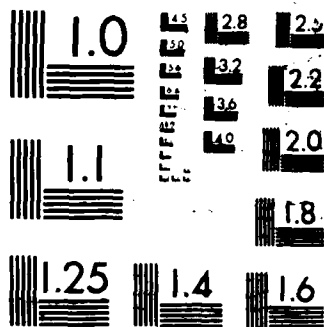
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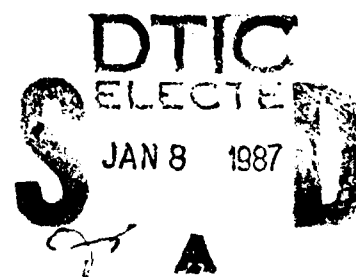
HISTORIC PROPERTIES REPORT:

LONGHORN ARMY AMMUNITION PLANT

MARSHALL, TEXAS.

FINAL REPORT

AUGUST 1984



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Building Technology Incorporated, Silver Spring, Maryland, and the
Historic American Buildings Survey/Historic American Engineering Record,
National Park Service, U.S. Department of the Interior.

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EXECUTIVE SUMMARY

The Longhorn Army Ammunition Plant (LHAAP) was built in 1942-1943 to manufacture trinitrotoluene (TNT) and expanded in 1944-1945 to manufacture propellants. It was one of 60 government-owned, contractor-operated plants constructed at the onset of World War II. Immediately following V-J Day, the LHAAP permanently suspended TNT production and temporarily halted all propellant facility construction. The plant remained idle until the Korean War. At that time, construction activities resumed and the plant's industrial mission expanded to include loading, assembling, and packing rocket motors and pyrotechnic ammunition. These operations have continued to the present as part of the Army's Armament, Munitions and Chemical Command (AMCCOM).

Located on a wooded, 8,492-acre site in east central Texas, approximately 15 miles northeast of Marshall, the facility currently comprises 452 utilitarian buildings, 151 of which date from World War II. Virtually all TNT and associated acid production facilities have been removed. A single, late 19th- or early 20th-century fishing and hunting clubhouse survives on the site, but it has been altered. There are no Category I, II, or III historic properties at the LHAAP.



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PREFACE

This report presents the results of an historic properties survey of the Longhorn Army Ammunition Plant (LHAAP). Prepared for the United States Army Materiel Development and Readiness Command (DARCOM), the report is intended to assist the Army in bringing this installation into compliance with the National Historic Preservation Act of 1966 and its amendments, and related federal laws and regulations. To this end, the report focuses on the identification, evaluation, documentation, nomination, and preservation of historic properties at the LHAAP. Chapter 1 sets forth the survey's scope and methodology; Chapter 2 presents an architectural, historical, and technological overview of the installation and its properties; and Chapter 3 identifies significant properties by Army category and sets forth preservation recommendations. Illustrations and an annotated bibliography supplement the text.

This report is part of a program initiated through a memorandum of agreement between the National Park Service, Department of the Interior, and the U.S. Department of the Army. The program covers 74 DARCOM installations and has two components: 1) a survey of historic properties (districts, buildings, structures, and objects), and 2) the development of archaeological overviews. Stanley H. Fried, Chief, Real Estate Branch of Headquarters DARCOM, directed the program for the Army, and Dr. Robert J. Kapsch, Chief of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) directed the program for the National Park Service. Sally Kress Tompkins was program manager, and Robie S. Lange was

project manager for the historic properties survey. Technical assistance was provided by Donald C. Jackson.

Building Technology Incorporated acted as primary contractor to HABS/HAER for the historic properties survey. William A. Brenner was BTI's principal-in-charge and Dr. Larry D. Lankton was the chief technical consultant. Major subcontractors were the MacDonald and Mack Partnership and Jeffrey A. Hess. The author of this report was Stuart MacDonald. The author would like to thank the many employees at the LHAAP who graciously assisted him in his research and field surveys. He especially acknowledges the help of the following individuals: on the government staff, Don Maley, Chief Engineer; George Simms, Security Officer; Bill Tunnell, Safety Engineer; and Dorothy Grant, Administrative Officer and Public Affairs Officer; and on the Thiokol Corporation staff, Jim Hartt, Program Manager; Dave Rayner, Chief Civil Engineer; and William Harrell, Real Property Inventory Draftsman. The author also would like to thank Inez Hatley Hughes, Director of the Old Courthouse Museum in Marshall, Texas, who generously assisted him in his archival research.

The complete HABS/HAER documentation for this installation will be included in the HABS/HAER collections at the Library of Congress, Prints and Photographs Division, under the designation HAER No. TX-8.

Chapter 1

INTRODUCTION

SCOPE

This report is based on an historic properties survey conducted in 1983 of all Army-owned properties located within the official boundaries of the Longhorn Army Ammunition Plant (LHAAP). The survey included the following tasks:

- . Completion of documentary research on the history of the installation and its properties.
- . Completion of a field inventory of all properties at the installation.
- . Preparation of a combined architectural, historical, and technological overview for the installation.
- . Evaluation of historic properties and development of recommendations for preservation of these properties.

Also completed as a part of the historic properties survey of the installation, but not included in this report, are HABS/HAER Inventory cards for 38 individual properties. These cards, which constitute HABS/HAER Documentation Level IV, will be provided to the Department of the Army. Archival copies of the cards, with their accompanying photographic

negatives, will be transmitted to the HABS/HAER collections at the Library of Congress.

The methodology used to complete these tasks is described in the following section of this report.

METHODOLOGY

1. Documentary Research

A concerted effort was made to locate published and unpublished sources dealing specifically with the history and technology of the Longhorn Army Ammunition Plant (LHAAP). This site specific research was conducted primarily at the AMCCOM Historical Office at Rock Island Arsenal, Rock Island, Illinois; the Old Courthouse Museum, Marshall, Texas; the Marshall Public Library; and the LHAAP government and contractor files.

On the basis of this literature search, a number of valuable sources were identified, including World-War-II-era construction drawings and reports. The Texas State Historic Preservation Office had minimal pertinent information.

Army records used for the field inventory included current Real Property Inventory (RPI) printouts that listed all officially recorded buildings and structures by facility classification and date of construction; the installation's property record cards; base maps and

photographs supplied by installation personnel; and installation master planning, archaeological, environmental assessment, and related reports and documents. A complete listing of this documentary material may be found in the bibliography.

2. Field Inventory

Architectural and technological field surveys were conducted in December 1983 by Stuart MacDonald. Primary assistance during the field survey was provided by Don Maley, Chief Engineer, LHAAP. Additional assistance and guidance was provided by Bill Tunnell, Safety Engineer, and George Simms, Security Officer.

Field inventory procedures were based on the HABS/HAER Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures.¹ All areas and properties were visually surveyed. Building locations and approximate dates of construction were noted from the installation's property records and field-verified. Interior surveys were made of the major facilities to permit adequate evaluation of architectural features, building technology, and production equipment.

Field inventory forms were prepared for, and black and white 35 mm photographs taken of all buildings and structures through 1945 except basic utilitarian structures of no architectural, historical, or technological interest. When groups of similar ("prototypical") buildings were found, one field form was normally prepared to

represent all buildings of that type. Field inventory forms were also completed for representative post-1945 buildings and structures.² Information collected on the field forms was later evaluated, condensed, and transferred to HABS/HAER Inventory cards.

3. Historical Overview

A combined architectural, historical, and technological overview was prepared from information developed from the documentary research and the field inventory. It was written in two parts: 1) an introductory description of the installation, and 2) a history of the installation by periods of development, beginning with pre-military land uses. Maps and photographs were selected to supplement the text as appropriate.

The objectives of the overview were to 1) establish the periods of major construction at the installation, 2) identify important events and individuals associated with specific historic properties, 3) describe patterns and locations of historic property types, and 4) analyze specific building and industrial technologies employed at the installation.

4. Property Evaluation and Preservation Measures

Based on information developed in the historical overviews, properties were first evaluated for historical significance in accordance with the eligibility criteria for nomination to the National Register of

Historic Places. These criteria require that eligible properties possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that they meet one or more of the following:⁴

- A. Are associated with events that have made a significant contribution to the broad patterns of our history.
- B. Are associated with the lives of persons significant in the nation's past.
- C. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
- D. Have yielded, or may be likely to yield, information important in pre-history or history.

Properties thus evaluated were further assessed for placement in one of five Army historic property categories as described in Army Regulation 420-40:⁵

- Category I Properties of major importance
- Category II Properties of importance
- Category III Properties of minor importance

Category IV Properties of little or no importance

Category V Properties detrimental to the significance
 of adjacent historic properties.

Based on an extensive review of the architectural, historical, and technological resources identified on DARCOM installations nationwide, four criteria were developed to help determine the appropriate categorization level for each Army property. These criteria were used to assess the importance not only of properties of traditional historical interest, but also of the vast number of standardized or prototypical buildings, structures and production processes that were built and put into service during World War II, as well as of properties associated with many post-war technological achievements. The four criteria were often used in combination and are as follows:

- 1) Degree of importance as a work of architectural, engineering, or industrial design. This criterion took into account the qualitative factors by which design is normally judged: artistic merit, workmanship, appropriate use of materials, and functionality.
- 2) Degree of rarity as a remaining example of a once widely used architectural, engineering, or industrial design or process. This criterion was applied primarily to the many standardized or prototypical DARCOM buildings, structures, or industrial processes. The more widespread or influential the design or process, the greater the importance of the remaining examples

of the design or process was considered to be. This criterion was also used for non-military structures such as farmhouses and other once prevalent building types.

- 3) Degree of integrity or completeness. This criterion compared the current condition, appearance, and function of a building, structure, architectural assemblage, or industrial process to its original or most historically important condition, appearance, and function. Those properties that were highly intact were generally considered of greater importance than those that were not.
- 4) Degree of association with an important person, program, or event. This criterion was used to examine the relationship of a property to a famous personage, wartime project, or similar factor that lent the property special importance.

The majority of DARCOM properties were built just prior to or during World War II, and special attention was given to their evaluation. Those that still remain do not often possess individual importance, but collectively they represent the remnants of a vast construction undertaking whose architectural, historical, and technological importance needed to be assessed before their numbers diminished further. This assessment centered on an extensive review of the military construction of the 1940-1945 period, and its contribution to the history of World War II and the post-war Army landscape.

Because technology has advanced so rapidly since the war, post-World War II properties were also given attention. These properties were evaluated in terms of the nation's more recent accomplishments in weaponry, rocketry, electronics, and related technological and scientific endeavors. Thus the traditional definition of "historic" as a property 50 or more years old was not germane in the assessment of either World War II or post-war DARCOM buildings and structures; rather, the historic importance of all properties was evaluated as completely as possible regardless of age.

Property designations by category are expected to be useful for approximately ten years, after which all categorizations should be reviewed and updated.

Following this categorization procedure, Category I, II, and III historic properties were analyzed in terms of:

- Current structural condition and state of repair. This information was taken from the field inventory forms and photographs, and was often supplemented by rechecking with facilities engineering personnel.
- The nature of possible future adverse impacts to the property. This information was gathered from the installation's master planning documents and rechecked with facilities engineering personnel.

Based on the above considerations, the general preservation recommendations presented in Chapter 3 for Category I, II, and III historic properties were developed. Special preservation recommendations were created for individual properties as circumstances required.

5. Report Review

Prior to being completed in final form, this report was subjected to an in-house review by Building Technology Incorporated. It was then sent in draft to the subject installation for comment and clearance and, with its associated historical materials, to HABS/HAER staff for technical review. When the installation cleared the report, additional draft copies were sent to DARCOM, the appropriate State Historic Preservation Officer, and, when requested, to the archaeological contractor performing parallel work at the installation. The report was revised based on all comments collected, then published in final form.

NOTES

1. Historic American Buildings Survey/Historic American Engineering Record, National Park Service, Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures (unpublished draft, 1982).
2. Representative post-World War II buildings and structures were defined as properties that were: (a) "representative" by virtue of construction type, architectural type, function, or a combination of these, (b) of obvious Category I, II, or III historic importance, or (c) prominent on the installation by virtue of size, location, or other distinctive feature.

3. National Park Service, How to Complete National Register Forms
(Washington, D.C.: U.S. Government Printing Office, January 1977).
4. Army Regulation 420-40, Historic Preservation (Headquarters, U.S.
Army: Washington, D.C., 15 April 1984).

Chapter 2

HISTORICAL OVERVIEW

BACKGROUND

The Longhorn Army Ammunition Plant (LHAAP) is a government-owned, contractor-operated installation situated on 8,492 acres in Harrison County near Karnack, Texas, approximately 15 miles northeast of Marshall (Figure 1). Its wooded terrain is bordered on the north and east by Caddo Lake. The plant was constructed in 1942-1943 to manufacture trinitrotoluene (TNT) and expanded in 1944-1945 to manufacture propellants. Immediately following V-J Day, the LHAAP permanently suspended TNT production and temporarily halted all propellant facility construction. Construction resumed in 1952 when the plant was reactivated for the Korean War. At the same time, the plant's industrial mission expanded to include loading, assembling, and packing rocket motors and pyrotechnic ammunition. These operations have continued to the present.

The LHAAP currently comprises 452 utilitarian buildings, 151 of which date from the 1942-1945 construction period (Figure 2). Virtually all TNT and associated acid production facilities have been removed. The plant's original propellant manufacturing machinery has been replaced.

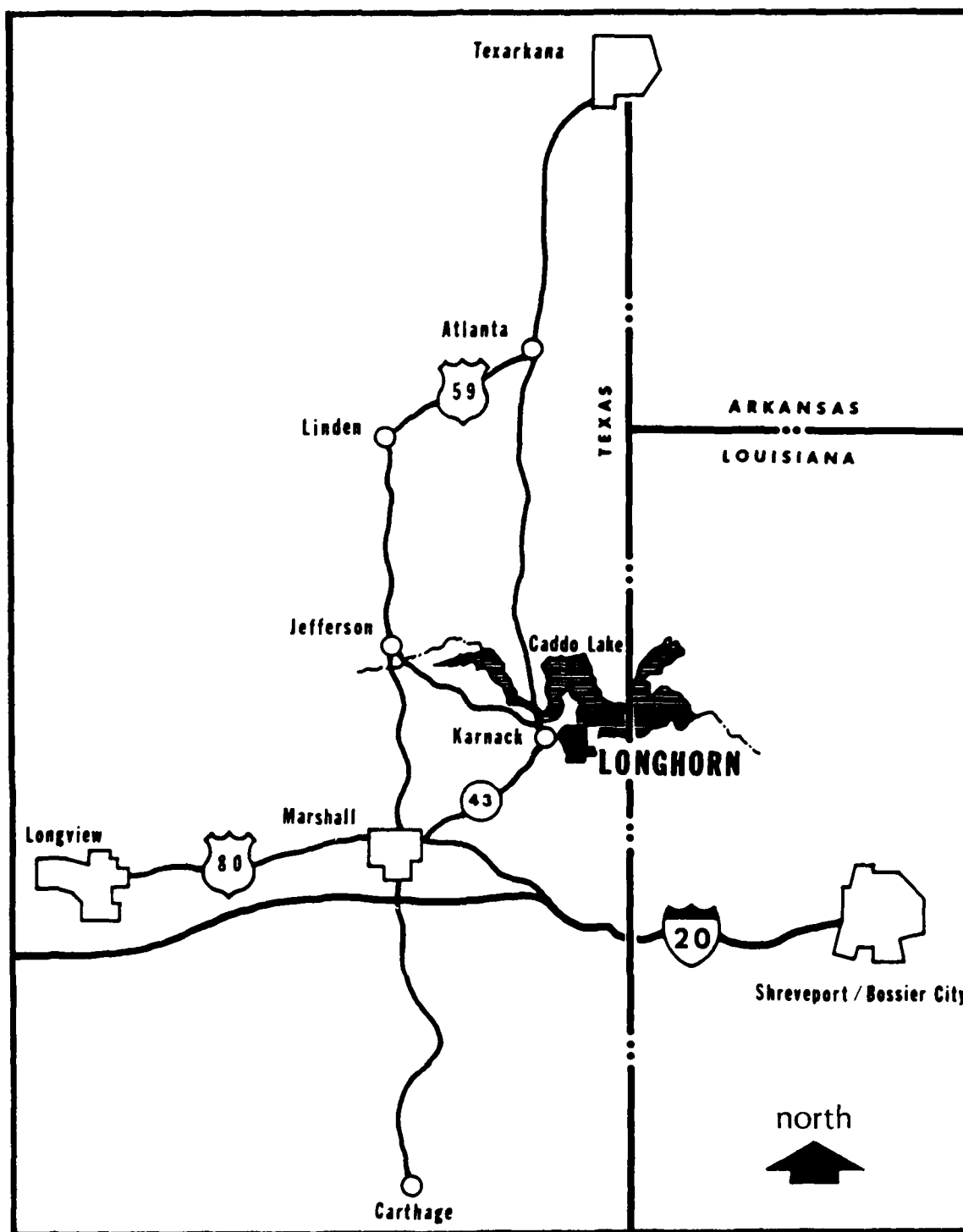


Figure 1: Longhorn Army Ammunition Plant. Location map.
(Source: Thiokol Corporation files, LHAAP.)

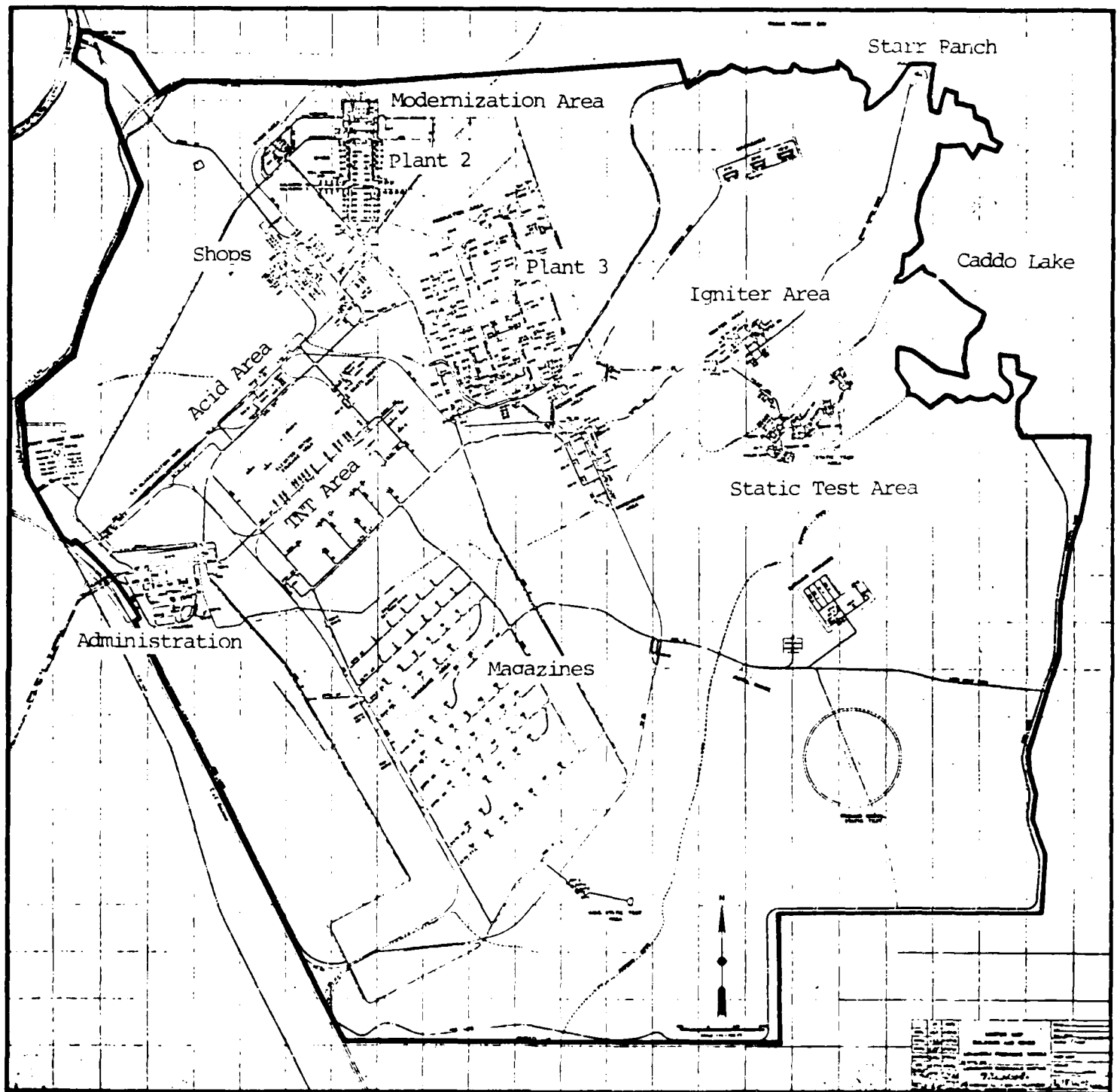


Figure 2: LHAAP. Site plan, 1961. (Source: Thiokol Corporation files, LHAAP.)

PRE-MILITARY LAND USE

Until the government acquired the site in December 1941,² the land had been used primarily for agricultural purposes, such as growing cotton. More than one-third of the 8,919.41 acres purchased were held by Thomas Jefferson Taylor, a local businessman and landholder.³ Approximately 84 acres fronting on Caddo Lake, the largest, natural fresh-water lake in Texas, were held by the Starr Hunting and Fishing Club. This property included Starr Ranch (Building 99Y/Figure 3), a remodeled, one-story clubhouse and summer kitchen dating from the late 19th- or early 20th-century.⁴ It is the only structure surviving from this earlier period and is now a recreation site for government and contractor personnel. The building is of stone masonry and wood frame design, and is architecturally undistinguished.

WORLD WAR II

When war broke out in Europe in the fall of 1939, the United States had virtually no industrial capacity for manufacturing military ammunition. As historians Harry C. Thomson and Lida Mayo observed in their authoritative work on American munitions production:

Only a handful of small plants were making propellant powder and high explosives, and there were virtually no facilities for the mass loading and assembling of heavy ammunition. American industry was just beginning, through educational orders, to learn techniques for forging and machining shells and producing intricate fuze mechanisms. The only sources for new artillery ammunition were Frankford and Picatinny Arsenals, while a few ordnance depots were equipped to renovate old ammunition. Private (military) ammunition plants did not exist, and, because of the specialized nature



Figure 3: LHAAP, Starr Ranch (Building 99Y), north elevation.
(Source: Field inventory photograph, 1983, Stuart
MacDonald, MacDonald and Mack Partnership.)

of the process, there were no commercial plants that could be converted to ammunition production.

To meet this situation the Ordnance Department took steps in the summer of 1940 to create something new in American economic life — a vast interlocking network of ammunition plants owned by the government and operated by private industry. More than 60 of these GOCO (government-owned, contractor-operated) plants were built between June 1940 and December 1942.

The Longhorn Army Ammunition Plant was one of the sixty.

On December 28, 1941, the Ordnance Department authorized Ford, Bacon and Davis, Incorporated, of New York City, to design and supervise construction of the LHAAP.⁶ E. I. duPont de Nemours and Company supplied production equipment and a standard TNT production facility design, designated the "U.S. six-line special."⁷ Work began on February 5, 1942. Within eighteen months the plant was complete, with a total of 319 buildings⁸ and a TNT production capacity of 360,000 pounds per 24 hours.⁹ Monsanto Chemical Company of St. Louis served as the operator.¹⁰ On August 15, 1945, the TNT operation permanently ceased, having produced approximately 400 million pounds of explosive during World War II.¹¹

The buildings at the LHAAP were strictly utilitarian in style, and were grouped by function into five principal areas dispersed throughout the site: Administration (Figure 4), Shops (Figures 5, 6, 7), Magazines (Figure 8), Acid (for producing nitric acid from anhydrous ammonia), and TNT.¹² The administration, shops, and magazine areas remain intact with few exceptions;¹³ however, virtually all TNT and associated acid production facilities have been removed (Figures 9, 10).¹⁴

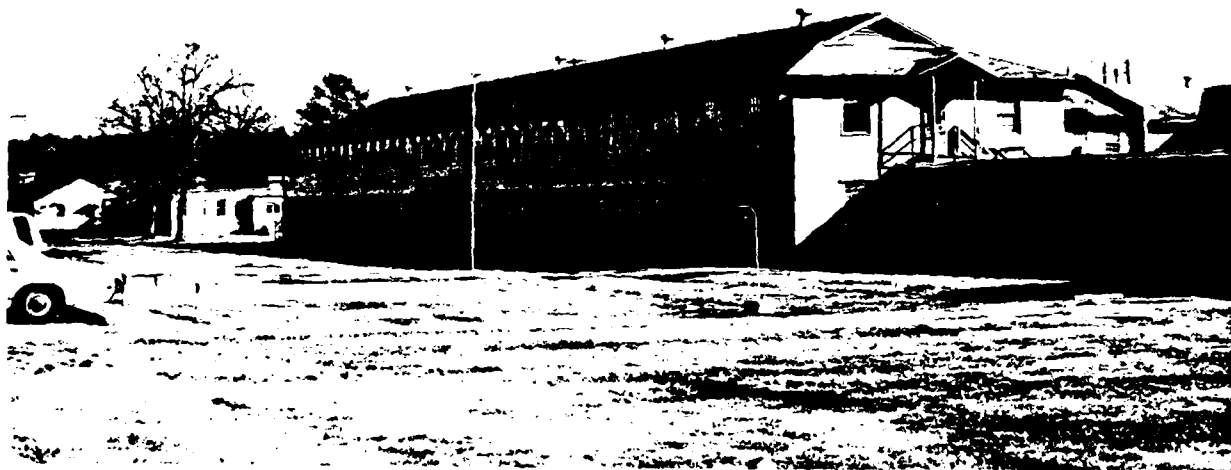


Figure 4: LHAAP, Administration Building (Building 703), north and west elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)

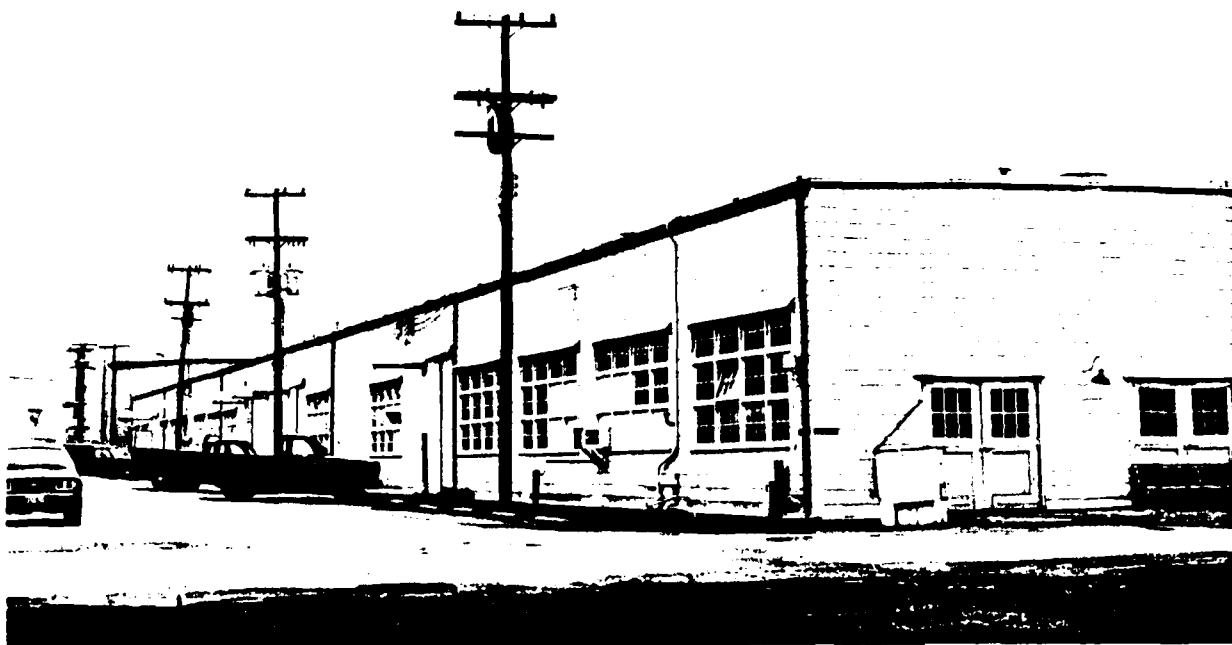


Figure 5: LHAAP, Metal and Woodwork Shop (Building 717), southwest and southeast elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)



Figure 6: LHAAP, Heating Plant (Building 401), northwest and northeast elevations. (Source: Field inventory photograph, 1980, Stuart MacDonald, MacDonald and Mack Partnership.)



Figure 7: LHAAP, Water Pump House (Building 414), east elevation. The pump house is located on Black Cypress Bayou, northwest of the Shop Area. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)



Figure 8: LHAAP, Richmond Magazine (Building 811-1), southeast elevation. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)



Figure 9: LHAAP, Air Compressor House (Building 451), west and north elevations. One of the few surviving buildings from the World-War-II-era TNT Area. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)



Figure 10: LHAAP, Record Storage Buildings (Buildings 308A, 308B), southwest and southeast elevations. The only surviving buildings from the World-War-II Acid Area. They may originally have been control buildings. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)

On November 7, 1944, the Army Corps of Engineers authorized Monsanto to design and supervise construction of a three-line, propellant fuel plant on the LHAAP site.¹⁵ It was designated Plant No. 2. Two principal areas comprised the new plant: a grid-like arrangement of propellant production buildings situated northeast of the TNT area (Figure 11); and, to the north, an intersecting linear arrangement of 62 propellant curing structures called mill houses (Building 212/Figure 12).¹⁶ Most of these buildings survive, although often in a substantially altered form. On August 21, 1945, the LHAAP was classified as a standby facility, and all construction activities were canceled. Of 211 buildings planned at Plant No. 2, only 66 had been completed, 121 were in progress, and 24 had not yet been started.¹⁷

The LHAAP remained idle from 1945 to the Korean War.

KOREAN WAR

On February 1, 1952, the Army reactivated the LHAAP production facilities for the Korean War.¹⁸ Universal Match Corporation of St. Louis, a major World-War-II supplier of aircraft signal flares and magnesium powder, was authorized to design, supervise construction of, and operate a load-assemble-and-pack facility for pyrotechnic ammunition.¹⁹ Through a combination of new construction and renovation, Universal transformed the mill house area of Plant No. 2 from a series of free-standing structures (Figure 12) to an interconnected, U-shaped, pyrotechnic production plant, designated the "horseshoe" area. Approximately 40 new structures and a 2,600-foot-long, connecting conveyor system were built.²⁰ From June 1952



Figure 11: LHAAP, Plant No. 3, looking northeast. This is the World-War-II-era propellant production area, then designated Plant No. 2.
(Source: Thiokol Corporation files, LHAAP'.)

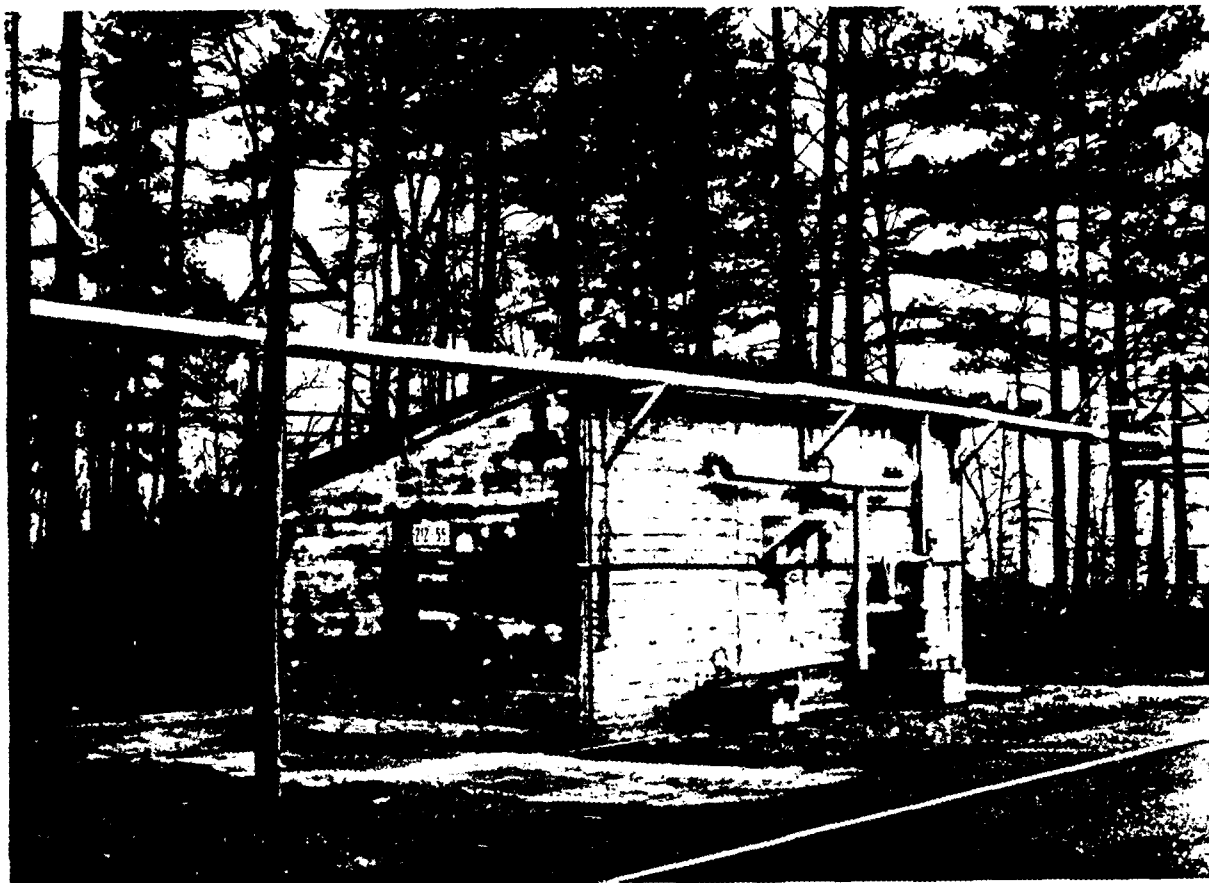


Figure 12: LHAAP, Mill House (Building 212-55), north and east elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)

through April 1956, the plant produced nearly 3.5 million pyrotechnic devices, including photoflash bombs, ground signals, simulators, and shell tracer elements.²¹

Both production and the contractor's tenure at the LHAAP ended in 1956, and Plant No. 2 was classified as a standby facility.²²

Concurrent with Universal's activities, Thiokol Corporation of Newtown, Pennsylvania, established a solid fuel rocket motor production facility at the LHAAP, which utilized the basic processing steps developed by Thiokol at Redstone Arsenal near Huntsville, Alabama (Figure 13). Building construction contracts were let in July 1953. Through remodeling and limited new construction, Thiokol rehabilitated the incomplete, World-War-II-era, solid propellant production area of Plant No. 2, and redesignated it Plant No. 3 (Figures 14, 15).²³ Production included both small and large rocket motors for tactical missiles such as the Honest John, Falcon, La Crosse, Nike Hercules (second stage sustainer units), and Sergeant.²⁴ Rocket motors for Pershing missiles (both first and second stages) followed, after repeated expansion of the plant's propellant mixing capacity during the late 1950s, and after the construction in 1959 of a 49,217-square-foot Main Rocket Motor Assembly Building (Building 45E/ Figure 16) and associated Static Test Building (Building 25T/Figure 17).²⁵

ROCKET MOTOR FLOW CHART

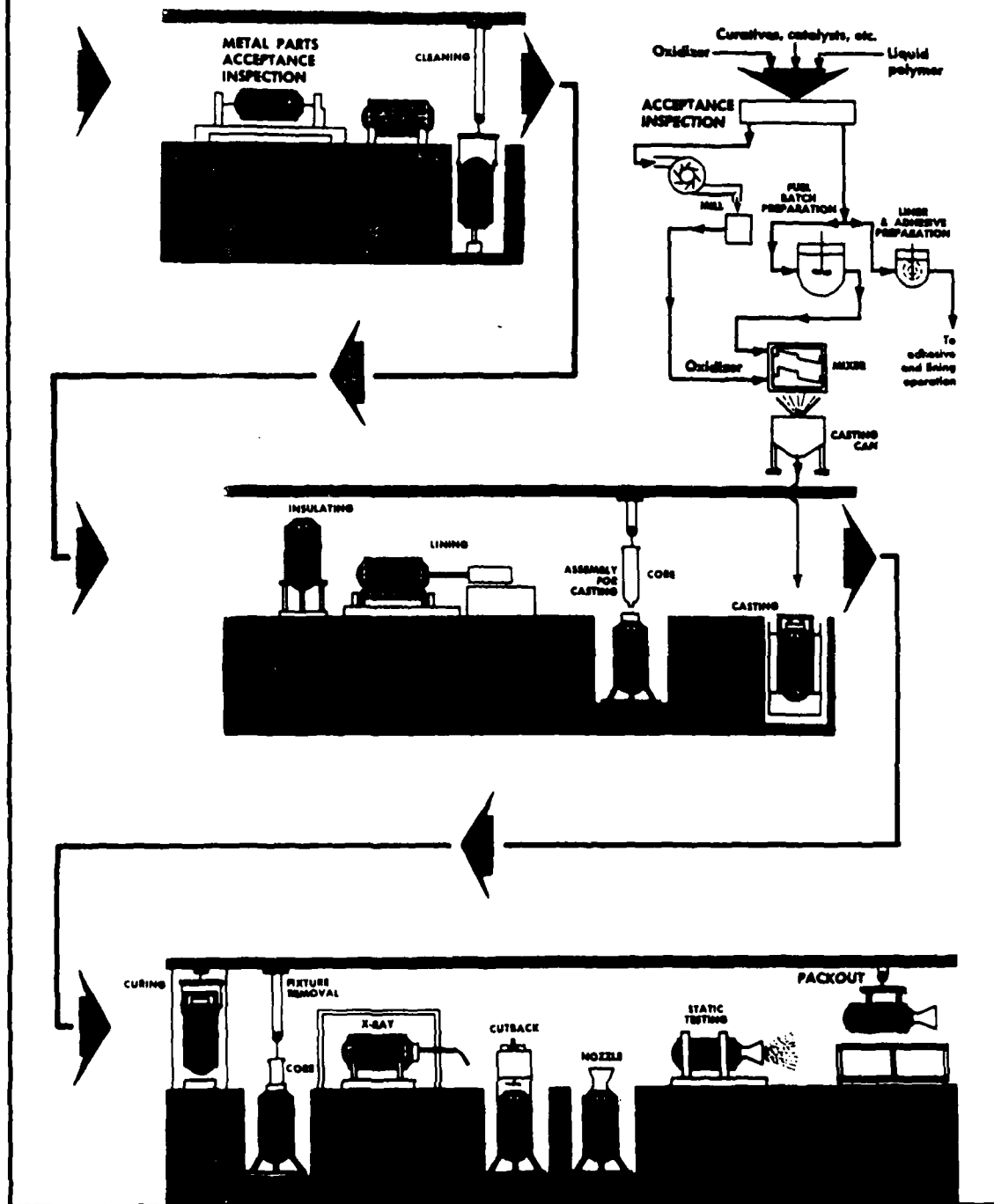


Figure 13: This flow chart illustrates the load-assemble-and-pack process for rocket motors at LHAAP. (Source: Thiokol Corporation, LHAAP.)



Figure 14: LHAAP, Plant No. 3, pressing and granulating building (Building 54G), south and east elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)

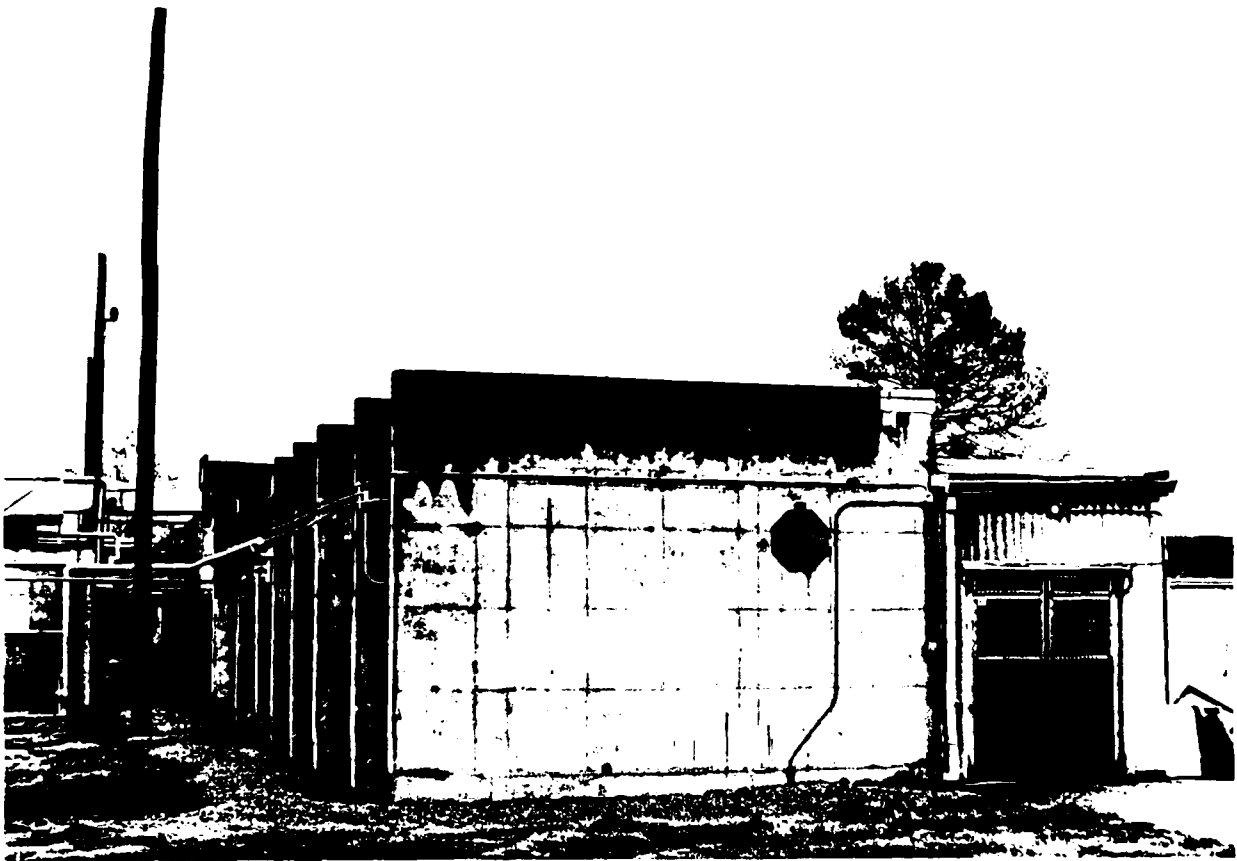


Figure 15: LHAAP, Plant No. 3/Igniter Area, signal assembly building (Building 16Y), northwest and southwest elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)



Figure 16: LHAAP, Plant No. 3, Main Rocket Motor Assembly Building (Building 45E), north and east elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)



Figure 17: LHAAP, Static Test Area, Static Test Building (Building 25T), south and west elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)

VIETNAM WAR TO THE PRESENT

In April 1963, Thiokol reactivated the pyrotechnic plant (Plant No. 2) to rework ground signals for the Vietnam War.²⁶ Production soon included illuminating cartridges for 60-mm, 81-mm, and 4.2" mortars, and 105-mm howitzers; illuminating projectiles for 155-mm howitzers; simulators; signals; and infrared flares (Figure 18). Through August 1983, the plant loaded nearly 45 million pyrotechnic devices.²⁷ Significant new construction during this period was limited to establishing an automated pyrotechnic plant in 1979, designated the "modernization" area, which is not yet in production (Figure 19). Currently Plant No. 2 remains in operation but production is well below full capacity.

Large-scale rocket motor production continued at Plant No. 3 through 1979.²⁸ At present, operations are intermittent.

TYPICAL ILLUMINATING/PYROTECHNIC AMMUNITION MANUFACTURING FLOW

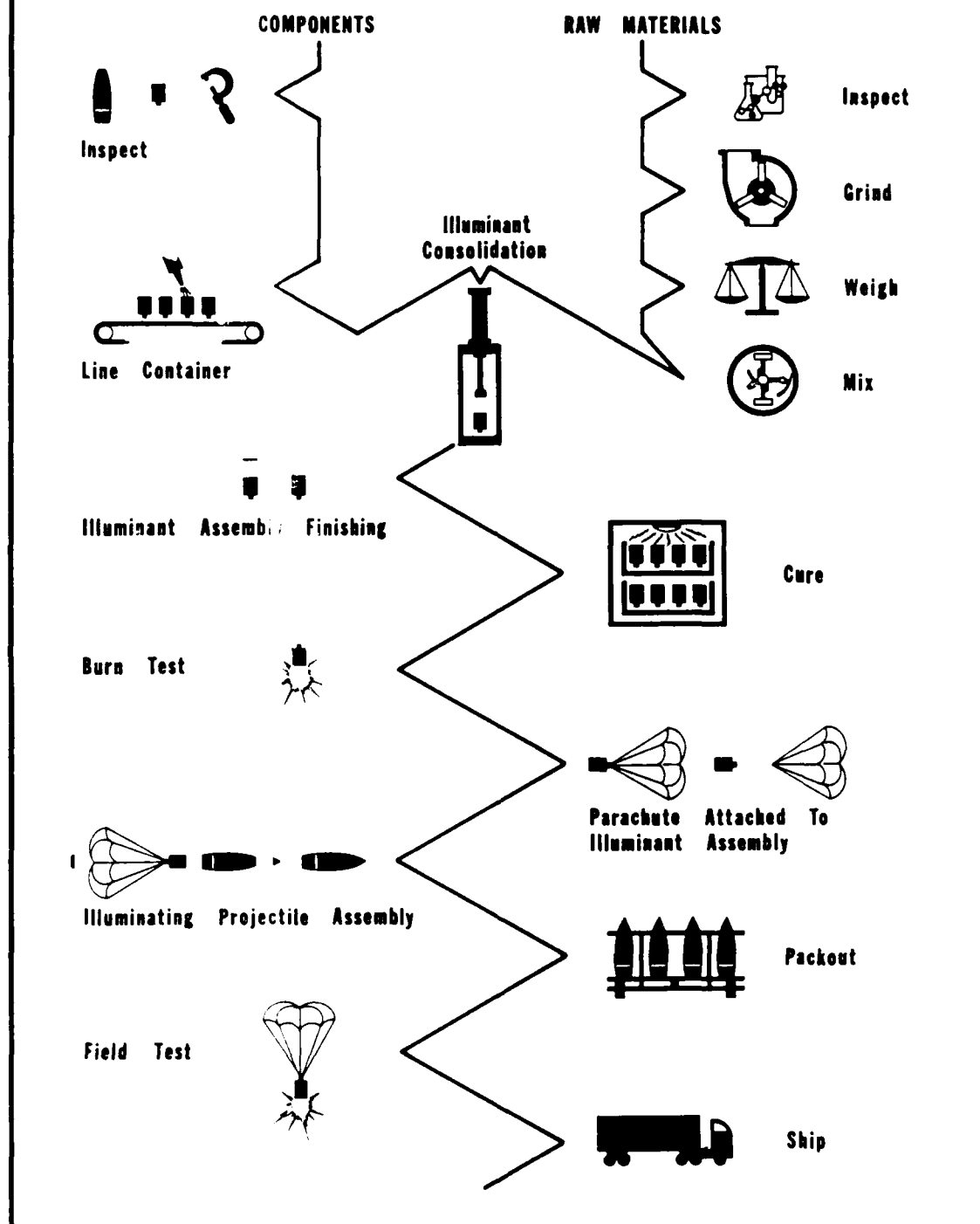


Figure 18: This flow chart illustrates the load-assemble-and-pack process for illuminating and pyrotechnic ammunition at LHAAP. (Source: Thiokol Corporation, LHAAP.)



Figure 19: LHAAP, Plant No. 2/"modernization" area, medium-caliber production loading building (Building P118), south and east elevations. (Source: Field inventory photograph, 1983, Stuart MacDonald, MacDonald and Mack Partnership.)

NOTES

1. Until July 1, 1963, the LHAAP was officially designated as the Longhorn Ordnance Works. The plant's current name is used throughout this report for the sake of brevity and clarity.
2. "DARCOM Installation and Activity Brochure," p. 1, unpublished, June 30, 1980, in government files, LHAAP.
3. Thomas Jefferson Taylor operated a store in Karnack, Texas near the present main plant gate, and was the father of First Lady "Lady Bird" Johnson. Of 98 separate parcels purchased by the government, 7 totaling 3,344.17 acres were owned by Taylor. A complete tract register is found in "Real Estate Map, Longhorn Ordnance Works," August 2, 1949, in Thiokol Corporation files, LHAAP. Also see "Completion Report, Jobs M1-1, M1-2, M1-3, and M1-4: Longhorn Ordnance Works," unpublished report prepared by U.S. Engineer Office, Denison, Texas, February 1943, in Thiokol Corporation files, LHAAP. Current plant acreage is 8,492, 427.41 acres having been transferred from government ownership.
4. The clubhouse was built by Amory Starr (1847-1906), a lawyer, political activist, and land agent headquartered in Marshall, Texas (he had settled in Marshall in 1872). The ranch served as a hunting and fishing lodge for entertaining friends and business associates. Starr cut a colorful figure, and no doubt startled his guests, when surveying his Caddo Lake plantation property from the prow of "an ancient Roman galley barge, emerging from narrow channels with black oarsmen pulling in unison" ("Starr's Galley Unique Site," Marshall News Messenger, November 10, 1979; "Starr Ranch' on Caddo Lake (Near) Marshall, Texas," undated typescript in Hockney Files, Harrison County Historical Society, Marshall, Texas; and "Amory R. Starr (1847-1906)," The Morning Star Special Edition, May 1894, in Harrison County Historical Society, Marshall, Texas). If any additional structures were on the current plant site prior to 1942, they are not documented. Only the Starr Ranch appears on a 1943 map of the installation ("Completion Report"). Three small cemeteries remain at various locations on the plant.
5. Harry C. Thomson and Lida Mayo, The Ordnance Department: Procurement and Supply (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1960), pp. 104-105.
6. "DARCOM Installation and Activity Brochure," p. 1. Responsibility for procuring the power house, boilers, and auxiliary equipment was transferred from Ford, Bacon and Davis to Stone and Webster Engineering Corporation of New York City. A discussion of contractual arrangements for LHAAP's initial construction is found in "Completion Report," n.p.

7. William Voight, Jr., "The Ordnance Department in World War II," p. 199, unpublished report on microfiche, 1945, in AMCCOM Historical Office, Rock Island Arsenal; and "DARCOM Installation and Activity Brochure," p. 1.
8. The project included 282 permanent and 37 temporary structures. A description of each building is found in "Completion Report." Also see "Industrial Facilities Inventory: Longhorn Ordnance Works," unpublished report prepared by Ford, Bacon and Davis, Inc., November 30, 1943, in AMCCOM Historical Office, Rock Island Arsenal. Preliminary headquarters were established at the National Guard Armory in Marshall. Temporary office construction began at the plant in February 1942, and in March the Administration Building was ready for initial occupancy ("The Story of Longhorn Ordnance Works — An Outstanding War Record," Marshall News Messenger, November 4, 1945; and "Completion Report").
9. TNT production capacity first was set at 200,000 pounds per 24 hours. On June 20, 1942, revised plans called for 360,000 pounds. A discussion of production capacity increases is found in "Completion Report." Of the six TNT lines planned, four operated by the end of March 1943. A fifth started in October 1944. Due to a lack of acid manufacturing facilities, the sixth never operated ("DARCOM Installation and Activity Brochure," p. 1.).
10. Monsanto also established offices at the National Guard Armory in Marshall. During construction, Monsanto personnel trained at Kankakee and Weldon Spring Ordnance Works and Keystone Ordnance Plant ("The Story of Longhorn Ordnance Works;" and Voight, p. 199).
11. Total TNT production figures vary from 396,963,000 pounds (Voight, p. 201) to 414,805,500 pounds (R. J. Hammond, "Profile on Munitions, 1950-1977," p. 72, unpublished report on microfiche, n.d., in AMCCOM Historical Office, Rock Island Arsenal).
12. The original plant layout is illustrated in "Map of Longhorn Ordnance Works," Drawing No. R-T14-M9.1 & M9.2, prepared by Ford, Bacon and Davis, Inc., January 25, 1943, in Thiokol Corporation files, LHAAP.
13. World-War-II-era staff housing and barracks areas have been removed from the LHAAP site.
14. A discussion of the possible disposition of LHAAP's production facilities immediately following World War II is found in "Industrial Facilities Inventory: Longhorn Ordnance Works," n.d., in AMCCOM Historical Office, Rock Island Arsenal. Production facilities were declared excess in 1953. Final disposition of the production plant was completed January 14, 1960 ("DARCOM Installation and Activity Brochure," p. 1).
15. "Industrial Facilities Inventory: Longhorn Ordnance Works Plant No. 2," p. 1, unpublished report prepared by U.S. Engineer Office, Tulsa,

Oklahoma, July 1946, in AMCCOM Historical Office, Rock Island Arsenal. Monsanto modeled LHAAP's propellant fuel plant after a pilot plant in Dayton, Ohio ("The Story of Longhorn Ordnance Works").

16. Plant No. 2's original layout is illustrated in "Layout of Building," Drawing No. E5400-005, prepared by Monsanto Chemical Company, February 16, 1945, in Thiokol Corporation files, LHAAP.
17. "Industrial Facilities Inventory: Longhorn Ordnance Works Plant No. 2," p. 1 (Section 11).
18. "DARCOM Installation and Activity Brochure," p. 2.
19. "Universal World's Largest Book Match Manufacturer," Marshall News Messenger, n.d., in scrapbook, Thiokol Corporation files, LHAAP.
20. "Universal," Marshall News Messenger, October 29, 1952.
21. "DARCOM Installation and Activity Brochure," p. 2.
22. "DARCOM Installation and Activity Brochure," p. 2.
23. "Basic Installation History: Longhorn Army Ammunition Plant, Marshall, Texas, December 15, 1941, to December 31, 1967," pp. 9-10, prepared by Thiokol Corporation, July 18, 1968, in Thiokol Corporation files, LHAAP.
24. "Longhorn Army Ammunition Plant," pp. 8, 22, prepared by Thiokol Corporation, n.d., Thiokol Corporation files, LHAAP.
25. "Basic Installation History," pp. 11-12.
26. "DARCOM Installation and Activity Brochure," p. 3.
27. "Longhorn Army Ammunition Plant," p. 12.
28. "Longhorn Army Ammunition Plant," p. 8.

Chapter 3

PRESERVATION RECOMMENDATIONS

BACKGROUND

Army Regulation 420-40 requires that an historic preservation plan be developed as an integral part of each installation's planning and long-range maintenance and development scheduling.¹ The purpose of such a program is to:

- Preserve historic properties to reflect the Army's role in history and its continuing concern for the protection of the nation's heritage.
- Implement historic preservation projects as an integral part of the installation's maintenance and construction programs.
- Find adaptive uses for historic properties in order to maintain them as actively used facilities on the installation.
- Eliminate damage or destruction due to improper maintenance, repair, or use that may alter or destroy the significant elements of any property.
- Enhance the most historically significant areas of the installation through appropriate landscaping and conservation.

To meet these overall preservation objectives, the general preservation recommendations set forth below have been developed:

Category I Historic Properties

All Category I historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for

nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category I historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category I historic properties should not be altered or demolished. All work on such properties shall be performed in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).
- b) An individual preservation plan should be developed and put into effect for each Category I historic property. This plan should delineate the appropriate restoration or preservation program to be carried out for the property. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulation. Until the historic preservation plan is put into effect, Category I historic properties should be maintained in accordance with the recommended approaches of the Secretary of Interior's Standards for Rehabilitation and

Revised Guidelines for Rehabilitating Historic Buildings² and in consultation with the State Historic Preservation Officer.

- c) Each Category I historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.³ When no adequate architectural drawings exist for a Category I historic property, it should be documented in accordance with Documentation Level I of these standards. In cases where standard measured drawings are unable to record significant features of a property or technological process, interpretive drawings also should be prepared.

Category II Historic Properties

All Category II historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category II historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category II historic properties should not be altered or demolished. All work on such properties shall be performed

in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).

- b) An individual preservation plan should be developed and put into effect for each Category II historic property. This plan should delineate the appropriate preservation or rehabilitation program to be carried out for the property or for those parts of the property which contribute to its historical, architectural, or technological importance. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulations. Until the historic preservation plan is put into effect, Category II historic properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings⁴ and in consultation with the State Historic Preservation Officer.
- c) Each Category II historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level

II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.⁵

Category III Historic Properties

The following preservation recommendations apply to Category III historic properties:

- a) Category III historic properties listed on or eligible for nomination to the National Register as part of a district or thematic group should be treated in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800). Such properties should not be demolished and their facades, or those parts of the property that contribute to the historical landscape, should be protected from major modifications. Preservation plans should be developed for groupings of Category III historic properties within a district or thematic group. The scope of these plans should be limited to those parts of each property that contribute to the district or group's importance. Until such plans are put into effect, these properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised

Guidelines for Rehabilitating Historic Buildings⁶ and in consultation with the State Historic Preservation Officer.

- b) Category III historic properties not listed on or eligible for nomination to the National Register as part of a district or thematic group should receive routine maintenance. Such properties should not be demolished, and their facades, or those parts of the property that contribute to the historical landscape, should be protected from modification. If the properties are unoccupied, they should, as a minimum, be maintained in stable condition and prevented from deteriorating.

HABS/HAER Documentation Level IV has been completed for all Category III historic properties, and no additional documentation is required as long as they are not endangered. Category III historic properties that are endangered for operational or other reasons should be documented in accordance with HABS/HAER Documentation Level III, and submitted for inclusion in the HABS/HAER collections in the Library of Congress.⁷ Similar structures need only be documented once.

CATEGORY I HISTORIC PROPERTIES

There are no Category I historic properties at the Longhorn Army Ammunition Plant.

CATEGORY II HISTORIC PROPERTIES

There are no Category II historic properties at the Longhorn Army Ammunition Plant.

CATEGORY III HISTORIC PROPERTIES

There are no Category III historic properties at the Longhorn Army Ammunition Plant.

NOTES

1. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).
2. National Park Service, Secretary of Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983 (Washington, D.C.: Preservation Assistance Division, National Park Service, 1983).
3. National Park Service, "Archeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines," Federal Register, Part IV, 28 September 1983, pp. 44730-44734.
4. National Park Service, Secretary of the Interior's Standards.
5. National Park Service, "Archeology and Historic Preservation."
6. National Park Service, Secretary of the Interior's Standards.
7. National Park Service, "Archeology and Historic Preservation."

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