PROGRAM COMMENT PLAN FOR ARMY WARFIGHTING READINESS AND ASSOCIATED BUILDINGS, STRUCTURES, AND LANDSCAPES

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1.0. Justification

The Department of the Army (Army) is undergoing a rapid transformation of its warfighting readiness activities, which encompass military training, testing, equipping, and industrial operations, along with their associated infrastructure. This modernization effort aims to create a leaner and more lethal force.[1]

The Army is requesting a program comment from the Advisory Council on Historic Preservation (ACHP) to urgently streamline its compliance with Section 106 of the National Historic Preservation Act (NHPA) and 36 CFR Part 800. This is essential to facilitate the rapid transformation and modernization of the Army, a process vital to maintaining warfighting readiness and national security. The Army's transformation aims to build a leaner, more lethal force capable of outclassing and outmaneuvering adversaries across all domains - land, air, sea, space, and cyberspace.

A critical component of transformation is the modernization of Army installations. New weapons systems and tactics necessitate updated training ranges and facilities. This may involve expanding ranges and updating range infrastructure, adding virtual reality training simulators, or constructing new urban warfare training facilities. New weapons systems, vehicles, and command-and-control networks require significant power and data infrastructure. Installations must be upgraded to provide the necessary capacity. Upgrading roads, railways, and airfields is critical for deploying and sustaining modern forces. Installations serve as laboratories for testing and evaluating new technologies and concepts in a real-world environment. Investing in recreational facilities, childcare centers, and healthcare facilities improve the quality of life for soldiers and their families.

The built infrastructure is as essential for the Army's readiness mission as is the natural infrastructure of our installations. The Army's readiness training for multi-domain operations, high intensity conflict, and development, testing, and fielding for modernization of combat systems all require unimpeded access to realistic natural landscapes and environmental conditions that Soldiers and materiel experience during combat. Army installations are the foundation upon which the Army's transformation is built. They provide the infrastructure, facilities, support services, and realistic natural environments necessary to enable the Army to modernize its equipment, train its soldiers, and maintain its readiness.

The current project-by-project review process mandated by Section 106 poses a significant impediment to the transformation and modernization efforts. The sheer scale of the Army's infrastructure, combined with the accelerating operational tempo of warfighting readiness

[1] See https://www.defense.gov/News/News-Stories/Article/Article/4172313/hegseth-tasks-army-to-transform-to-leaner-more-lethal-force/

transformation activities, has rendered this approach unsustainable. A program comment is necessary to enable the Army to efficiently transform warfighting and modernize its infrastructure and maintain its competitive edge in a rapidly changing global landscape.

This program comment offers a solution that protects historic resources while simultaneously enabling the Army to rapidly transform and modernize. It leverages the successful approach and processes of the Army's four ACHP-approved program comments for historic housing, which have demonstrably improved the quality of life for soldiers and their families, preserved the historic character of housing, and saved millions of dollars. The program comments for historic Army housing demonstrate that this approach can effectively balance historic preservation with operational needs. By extending our successful historic housing model to properties associated warfighting readiness activities, this proposed program comment achieves several crucial objectives:

- Enhanced Agility: The program comment replaces lengthy individual project reviews with standardized ACHP-approved processes, allowing the Army to respond more quickly to urgent operational demands and modernization requirements.

- Improved Stewardship: The program comment promotes a consistent and comprehensive Army-wide approach to managing historic properties, ensuring their long-term preservation through the application of proven best practices.

- Reduced Administrative Burden: The program comment significantly reduces the administrative burden on the Army, the ACHP, State Historic Preservation Offices (SHPOs), Tribes, and other stakeholders, freeing up resources for other preservation initiatives.

The proposed program comment is not simply a matter of administrative efficiency; it is a critical imperative for ensuring the Army's warfighting readiness and safeguarding national security. It provides a proven, effective, and responsible framework for balancing historic preservation with the urgent need to modernize Army installations and maintain a dominant fighting force. Additional information is at https://www.denix.osd.mil/army-pcwr/.

2.0. Overview and Development Process

2.1 Overview

The Army is a large, complex Federal agency comprised of the active Army, U.S. Army Reserves, and the Army National Guard, with a broad national defense mission to provide combat-ready military forces to deter war and protect the security of the United States. As the largest military department in the Department of Defense (DoD), the Army manages the largest portfolio of buildings and structures in the DoD and among all federal agencies.

The Army manages a vast infrastructure including 13 million acres and 135 installations. This includes over 9 million acres dedicated to military training and testing, over 350,000 buildings and structures totaling over 1.5 billion square feet, and extensive transportation networks.

Currently, 122,000 buildings and structures associated with the readiness mission are subject to Section 106 of the NHPA. The NHPA Section 106 project-by-project, step-by-step review process in 36 CFR 800 for an inventory of this magnitude is not sustainable.

ACHP's Section 106 regulation at 36 CFR 800 requires federal agencies to conduct a complex, project-by-project, step-by-step consultation process with SHPOs and others for all undertakings. This requirement stems from the original 1979 regulation which assigned SHPOs a central role in Section 106 project review because federal agencies then lacked in-house professional historic preservation expertise.[2] However, federal agencies now employ hundreds of historic preservation professionals and have sophisticated historic property management programs and plans. The Army currently employs over 300 historic preservation professionals at all levels within the department. Despite this significant shift in capabilities, the Army continues to be bound by the same lengthy, project-specific, step-by-step consultation process mandated by the ACHP's regulation, raising questions about its continued efficiency and efficacy. This program comment modernizes the approach to reflect the evolved capabilities of the Army.

The Army is dedicated to pursuing innovative policies, programs, and initiatives to improve historic properties NHPA compliance activities. The Army has a well-established historic preservation program and a strong record of innovative Section 106 compliance. For over 40 years, the Army has maintained preservation professionals on staff and has had internal regulations mandating historic preservation plans and procedures for NHPA Section 106 compliance. The Army's policy for NHPA compliance is in Army Regulation 200-1 Environmental Protection and Enhancement, and in Army FPO issued NHPA policy memoranda and program alternatives.[3] Responsibility for NHPA policy and compliance oversight at the Army headquarters level resides with the Army FPO in the Office of the Assistant Secretary of the Army for Installations, Energy, and Environment. Army commands and installations have professionally qualified historic preservation professionals that implement NHPA compliance activities.

The Army's record of successful innovation in Section 106 compliance has been recognized by the ACHP and is demonstrated by the Army's four existing program comments covering all the Army's 30,000 historic homes. Historic Army housing Section 106 compliance activities now occur internally, without individual project reviews and consultations with SHPOs.

The Army at all levels has worked cooperatively with stakeholders to enhance the state of historic properties management on Army lands. Notably, historic property inventories have been completed on a remarkable 65% of Army lands, with 84,000 recorded archeological sites under Army management and over 122,000 associated buildings and structures currently subject to NHPA Section 106 compliance. The Army employs qualified historic preservation professionals at all organizational levels and ensures that all historic preservation work at the installation level

[2] Cultural Resource Laws and Practice. Thomas King, Altamira Press, 2nd ed., 2004.
[3] Army NHPA policy memoranda and program alternatives may be found on the Army's Historic Preservation and Cultural Resources Management site at https://www.denix.osd.mil/army-cr/.

is executed by qualified professional personnel and contractors. SHPO-reviewed Integrated Cultural Resource Management Plans (ICRMPs) are maintained at 124 installations.

The current Section 106 compliance process on Army installations is inefficient, inconsistent, and at times detrimental to mission readiness. This inefficiency stems from a fragmented system of 115 individual Programmatic Agreements (PAs) and Memoranda of Agreement (MOAs), creating a labyrinthine regulatory environment where similar historic properties are treated disparately based on the subjective interpretations of various State Historic Preservation Officers (SHPOs), installations, and other stakeholders. This inconsistency is particularly illogical, as Army construction historically relied on standardized plans and designs, resulting in replicated building types nationwide.

While PAs are intended to streamline Section 106, their sheer number and individualized requirements have ironically achieved the opposite effect, necessitating repetitive, project-by-project consultations for even routine activities. The Army is regularly subjected to overly expansive mitigation requests, or excessive numbers of mitigations for single actions, often treating active military installations as if they were tourist attractions, rather than vital components of national defense.

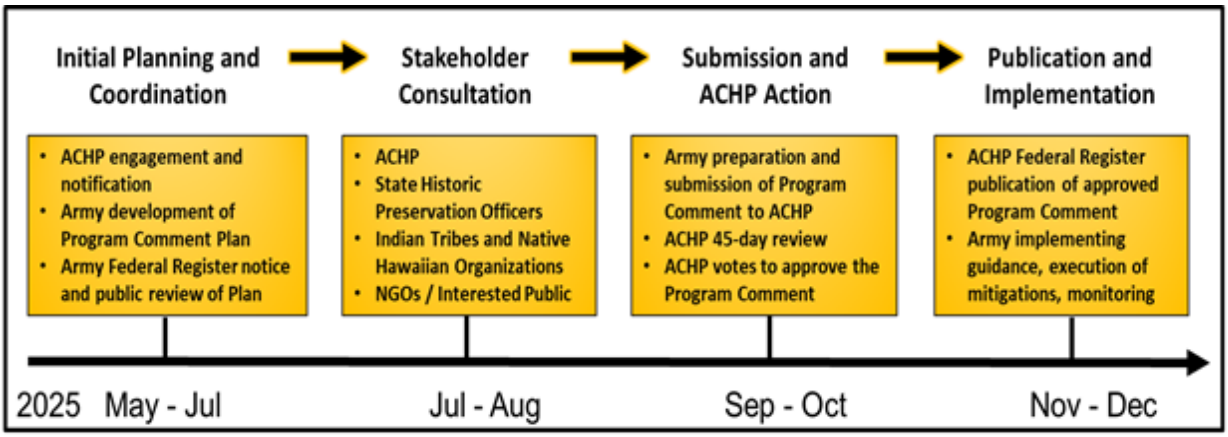
Furthermore, the implementation of existing Section 106 agreements frequently mandates the use of costly historic and in-kind building materials and specialized craftsmen for repairs and improvements, imposing museum-level restoration standards where more appropriate rehabilitation standards suffice. This restrictive approach fails to adequately consider the long-term financial implications for maintaining historic Army buildings and structures and disregards the availability of cost-effective substitute materials. The absence of a systematic approach for selecting building materials during maintenance, repair, rehabilitation, and renovation actions, compounded by the failure of SHPOs and installations to adequately consider the requirement that the Secretary of the Interior's Standards for Treatment of Historic Properties be applied with due regard for economic and technical feasibility (36 CFR 68.3), exacerbates this problem. Army PAs and MOAs lack a standardized process for considering the full range of appropriate building materials including alternative and less costly substitute materials permitted under the Secretary’s Standards for Rehabilitation (36 CFR 68.3(b)) and lack comprehensive design guidelines and a catalog of applicable building materials.

This unsustainable situation leaves the Army facing highly variable, costly, and overly restrictive standards under a fragmented Section 106 compliance system. This program comment is designed to remedy these critical deficiencies by providing a unified, consistent, and standardized Army-wide approach to managing historic properties. By extending ACHP-approved standards and guidelines currently applied to the Army's pre-1941 historic housing to all similarly aged buildings and structures associated with warfighting readiness activities, and streamlining compliance pertaining to archeological resources based on ongoing procedures, this program comment builds upon established best practices to ensure both the preservation of valuable historic resources and the unimpeded execution of the Army's mission. In short, this program comment is urgently needed to break free from the inefficiencies of the current system

and ensure the Army can rapidly transform, modernize**,** and maintain operational effectiveness in the most efficient and cost-effective manner possible.

2.1. Development Process

The Army is conducting extensive consultation with stakeholders during its program comment development. The Army's consultation is consistent with the intent and meaning of consultation in the Section 106 process as defined in 36 CFR 800.16(f). The Army will seek, discuss, and consider the views of all participants in the program comment consultation process and, where feasible, seek agreement with them regarding matters arising during the consultation. The Army is planning to submit the program comment to the ACHP no later than October 2025. The Army program comment development process follows a four-phase approach.



Phase 1 - Initial Planning and Coordination. Engagement with the ACHP began in May 2025 with formal notification of intent to seek a program comment. The Army FPO consulted with the ACHP and provided a draft of this program comment Plan for ACHP review. The draft Plan was also provided to the National Park Service for review and was internally reviewed by command and installation Cultural Resource Managers. On June 17, 2025, the Army invited over 800 stakeholders to consult on the planned program comment. That invitation to consult on this program comment was provided to all SHPOs, all Tribal Historic Preservation Officers (THPOs), all Federally recognized tribes, Native Hawaiian Organizations (NHO), and non-governmental preservation advocacy organizations. Based on the responses from stakeholders, the Army compiled a interested parties.

Phase 2 - Stakeholder Consultation. The Army is holding six consultation conferences during July and August with the identified interested parties. Key program comment topical areas are subject to detailed review and consultation with interested parties as each of consultation conferences. The six consultation conferences are as follows:

- 17 July 2025 – Introduction and Overview
- 24 July 2025 - Army Warfighting Readiness Activities
- 31 July 2025 - Historic Properties Management

- 7 August 2025 - Public review under NEPA
- 14 August 2025 - Mitigation of Adverse Effects and Administration
- 21 August 2025 –Consultation Summary / Closing Remarks

Phase 3 - Submission and ACHP Action. The Army Federal Preservation Officer (FPO) will prepare the program comment, incorporate public comments and stakeholder input, and submit it to the ACHP Executive Director. The ACHP will then initiate its own consultation process with SHPOs, THPOs, Indian tribes, and NHOs. The ACHP membership will then vote to approve, disapprove, or decline to act on the program comment within 45 days of submission as required by 36 CFR 800.14(e)(5).

Phase 4 - Publication and Implementation. If approved, the ACHP will publish a notification in the Federal Register, and the Army will implement undertakings according to the program comment's terms. If not approved, the Army will comply with Section 106 procedures at 36 CFR 800.3 - 800.7 and its MOAs, PAs, and AAPs.

3.0. Goal and Objective

3.1. Goal

The Army's goal for this program comment is to obtain programmatic compliance with NHPA Section 106 for the Army's warfighting readiness activities and the associated buildings, structures, and landscapes by means of the program comment alternative procedure under 36 CFR 800.14(e). In accordance with 36 CFR 800.14(e), the Army will implement this program comment and management actions in lieu of conducting individual project-by-project reviews.

3.2. Objective

The objective of the program comment is to achieve the goal in a manner that provides the appropriate balance between preservation and efficient, consistent, and cost-effective management. The goal and objective are met by the ACHP's approval of the program comment and the Army's implementation of it for its management actions.

4.0. Program Comment Intent and Implementation

4.1. Intent

This program comment recognizes that among federal agencies, the Army faces a unique and significant NHPA Section 106 compliance challenge. The Army is disproportionately affected by the NHPA Section 106 review process due to the scale of its infrastructure and the accelerating transformation and modernization demands on the Army warfighting readiness mission. The project-by-project review processes in 36 CFR 800.3 - 800.7 and Army installation-level Section 106 agreements is unsustainable and requires this program comment solution.

The category of undertaking addressed by this program comment is Army warfighting readiness activities defined as all military training, testing, equipping, and industrial activities, and management actions for modernization of all buildings, structures, and landscapes associated with those activities. This undertaking may affect historic properties.

In accordance with 36 CFR 800.14(e), the Army will implement this program comment in lieu of conducting individual undertaking reviews under 36 CFR 800.3 - 800.7, Army NHPA Section 106 Memoranda of Agreement (MOAs), Programmatic Agreements (PAs), and Army Alternate Procedures (AAP), for the activities and properties covered by this program comment.

This program comment applies to all Army warfighting readiness activities and associated buildings, structures, and landscapes of the Active Army, Army Reserve, and Army National Guard (federal actions).

This program comment is informed by extensive Department of Defense historic properties research and documentation and many installation-specific studies and analyses [4] and recognizes that these materials are suitable and appropriate mitigation measures.

This program comment meets the requirements of NHPA Section 110(f) by planning and requiring actions to minimize harm to National Historic Landmarks (NHLs) to the maximum extent possible.

This program comment implements the Secretary's Standards for Rehabilitation through the application of the Design Guidelines and the Building Materials Guidelines and Catalog in appendices C and D.

This program comment recognizes that the Secretary of the Interior's Standards must be applied in consideration of the economic and technical feasibility of each project per 36 CFR 68.3.

This program comment recognizes that the Secretary's Standards for Rehabilitation allow for the use of substitute building materials when the use of historic building materials and in-kind

[4] Examples: A 244-page annotated Cold War bibliography at https://www.denix.osd.mil/army-pcwr/ contains extensive references documenting Army and DoD-wide Cold War era historic properties. Also see: National Historic Context for Department of Defense Installations, 1790-1940, Volumes I-4. DoD Legacy Resource Management Program Project 92-0075 (1995); Military Training Lands Historic Context, USACERL, 2010; World War II Temporary Military Buildings, USACERL Technical Report CRC-93/01,1993; World War II and the U.S. Army Mobilization Program: A History of 700 and 800 Series Cantonment Program, Legacy Resources Management Program, USACERL; Army Ammunition Production During the Cold War (1946-1989) , US Army Environmental Command, 2009; Army Ammunition and Explosives Storage in the United States: 1775-1945, US Army Corps of Engineers, 2000; Unaccompanied Personnel Housing During the Cold War 1946-1989, US Army Environmental Center, 2003; Historic Context for DoD Facilities WWII permanent Construction, US Army Corps of Engineers, Baltimore District, 1997; Historic Context for DoD Facilities World War II Permanent Construction, US Army Corps of Engineers, Baltimore District, 1997; California Historic Military Buildings and Structures Inventory, US Army Corps of Engineers, Sacramento District, 2000; A Historic Context for the African American Military Experience, USACERL, 1998; Army historic contexts at https://aec.army.mil/Conservation/Cultural-Resource-Technical-Documents/.

building materials is not reasonably possible in consideration of the economic and technical feasibility of projects.

This program comment provides a systematic, standardized building materials selection procedure with guidelines that ensure the balanced consideration of repair of historic building materials or, where repair is not possible, the use of in-kind building materials or substitute building materials in management actions.

This program comment recognizes that substitute building materials are reversible and may be replaced with in-kind building materials to minimize any diminishment of historic integrity.

This program comment ensures that qualified historic preservation professionals support its implementation.

This program comment recognizes that ACHP, SHPO, Tribe, interested party, and the public's review of individual warfighting readiness activities and projects will occur through the public review procedures in the National Environmental Policy Act (NEPA).

This program comment applies the standards and guidelines from ACHP-approved program comments for pre-1941 historic Army housing to all pre-1941 buildings and structures associated with warfighting readiness activities.

The Army's program comments for historic housing[5] and related legislative authorities[6] remain in effect and are not changed or modified by this program comment.

This program comment evidences completion of the Army's NHPA Section 106 and 36 CFR 800 compliance for all Army warfighting readiness activities and management actions occurring on all buildings, structures, and landscapes associated with warfighting readiness activities.

4.2. Implementation

4.2.1. Army warfighting readiness undertaking. The Army warfighting readiness undertaking includes military training, testing, equipping, and industrial activities, and the management and modernization of the buildings, structures, and landscapes associated with those activities. Training prepares units and Soldiers for combat operations. Testing evaluates weapons and materiel performance, safety, and reliability. Equipping encompasses activities associated with providing Soldiers and units with the necessary materiel, systems, and resources to successfully

[5] Program Comment for Preservation of Pre-1919 Historic Army Housing, Associated Buildings and Structures, and Landscape Features; Program Comment for Department of the Army Inter War Era Historic Housing, Associated Structures, and Landscape Features (1919-1940); Program Comment for Department of the Army Capehart and Wherry Era Army Family Housing, Associated Structures, and Landscape Features (1949-1962); and Program Comment for Department of the Army Vietnam War Era Historic Housing, Associated Buildings and Structures, and Landscape Features (1963–1975).

[6] Fiscal Year 2025 National Defense Authorization Act, Section 2823 *Application of Certain Authorities and Standards to Historic Military Housing and Associated Historic Properties of the Department of the Army*.

accomplish their assigned missions. Industrial activities include activities at Army laboratories, depots, arsenals, and ammunition plants which include research, development, testing, evaluation, manufacturing, storing, and maintaining Army weapons and materiel. Examples of the types of warfighting readiness training and testing activities are in Appendix A.

4.2.2. Military landscape. Military installations are noteworthy because they are the only locations in the United States where military landscapes are presently active and continue to develop. While some current Army installations have been developing since the 19th century, many were established and expanded during World War II (WWII). The primary factor shaping and influencing the landscape of Army installations is the military readiness mission.[7]

The military mission drives the character of the military installation landscape. When military missions change, so does the physical development and appearance of installations charged with the execution of those missions. These changes are manifested on installations in different ways including any combination of construction, rebuilding, demolishing, excessing, reusing, or expansion. Military installations have also at times rapidly evolved in response to national defense crises. Military landscapes are continually evolving with changes in military mission, training, and advancements in battle systems and weapons technology. Readiness mission activities both create and occur on a military landscape, and those readiness mission activities must continue to occur to maintain the character these dynamic military landscapes.

4.2.3. Buildings, structures, and landscapes associated with the Army's warfighting readiness mission. This program comment covers management actions on all buildings, structures, and landscapes associated with Army warfighting readiness activities that are currently subject to NHPA Section 106 requirements and those that may be subject to Section 106 into the future. Appendix B provides best available information regarding the 122,000 buildings and structures associate with Army readiness activities that are currently 45 years of age and older, and the subset of 9,987 pre-1941 buildings and structures. Management actions occurring on these associated buildings, structures, and landscapes are maintenance, repair, rehabilitation, renovation, additions, new construction, abatement of hazardous materials, mothballing, cessation of maintenance, demolition, lease, transfer, and conveyance. All management actions on these properties will occur in accordance with the historic property management procedures in this program comment.

[7] Guidelines for Identifying and Evaluating Historic Military Landscapes. Construction Engineering Research Laboratory. Suzanne Keith Loechl, Susan I. Enscore, and Megan Weaver Tooker. ERDC/CERL TR-09-6, February 2009.
Looking at Military Landscapes: Definitions and Approaches. Woodward R. In: Renaud Bellais and Josselin Droff, ed. The Evolving Boundaries of Defense: An Assessment of Recent Shifts in Defense Activities. Emerald Publishing UK, 2014.
Military Landscapes. Edited by Anatole Tchikine and John Dean Davis. Harvard University Press. 2021.
Soldiers in the Garden: Managing the US Military Training Landscape. Rabung, E., & Toman, E. Landscape Research, 47(5), 598–610, 2022.

4.2.4. Historic Properties Management Procedures

4.2.4.1. Inventory, evaluation, determination of effect, and monitoring of historic properties

(a) Army installations will follow their current procedures for identification of historic properties within the area of potential effect of Army undertakings, evaluation of identified properties for eligibility for inclusion in the National Register of Historic Places (NRHP), and determination of the effect of undertakings on historic properties (i.e., no historic properties affected, historic properties affected, no adverse effect, and adverse effect), and monitoring historic properties. These activities will be conducted under the supervision of qualified preservation professionals and are generally supported through contract with qualified cultural resources management firms and organizations.

(b) To streamline processes, the identification, evaluation, determination of effect, and monitoring of historic properties will be implemented by Army installations and activities in lieu of project-by-project reviews and consultations required under 36 CFR 800.3 - 800.7, MOAs, PAs, AAPs for the activities and properties covered by this program comment. Review of individual projects by ACHP, SHPOs, Indian tribes, NHOs, and others occurs under the public review processes of NEPA.

(c) Inventory, evaluation, and mitigation of historic properties will consider the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation,[8] and any state-specific standards.

(d) Historic property management activities (including but not limited to inventory, evaluation, determination of the effect, monitoring, and mitigation activities) will not occur in areas where there is life safety risk including areas containing unexploded ordnance (UXO) such as designated impact areas and surface danger zones, and any contaminated areas, buildings, and structures where there is a risk of exposure to hazardous substances, hazardous materials, hazardous waste, or other contaminates. Adverse effects to any historic properties located in areas containing UXO or in contaminated areas are an acceptable loss in consideration of the Army's ongoing historic preservation program activities.

(e) Technical advice and Traditional Knowledge. Installations may at their discretion seek non-binding technical advice from SHPO staff and others, and may seek traditional knowledge from Tribal representatives, Tribal Historic Preservation Officers (THPOs), and Native Hawaiian Organizations.

(f) Installation-level exclusions or project exemption lists in Army MOAs, PAs, and AAPs will continue to be applied under this program comment. Installations may use any applicable exclusion or exemption found in any Army MOA, PA, or AAP. Such exclusions and exemptions

[8] Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. 48 FR 4476. Department of the Interior, 1983.

will continue to be applicable under this program comment after expiration of those MOAs, PAs, or AAPs.

4.2.4.2. Management of pre-1941 associated buildings, structures, and landscapes (properties constructed in 1940 and earlier)

The Army will follow the design guidelines in Appendix C and the building materials guidelines and catalog in Appendix D for management actions occurring on the exteriors of pre-1941 buildings, structures, and landscapes associated with the Army's warfighting readiness mission. These guidelines align with other ACHP-approved program comment guidelines for historic Army housing of the same age. For exterior maintenance, repair, rehabilitation, and renovation actions, the following procedure will be implemented to assist in selection of appropriate building materials:

(a) Characterize the historic building materials present in terms of condition, design, material properties, performance, safety, and presence of hazards such as lead-based paint, asbestos, and other hazardous materials;

(b) Determine if historic building materials can be repaired or if they must be replaced due to technical and financial feasibility factors. Consider health and safety factors, availability of historic materials and/or skilled craftsmen.

(c) If replacement is required, determine if there are material characteristics of the historic building materials that should be improved upon;

(d) Identify potential in-kind building materials and substitute building materials with reference to Appendix C and Appendix D (Building Materials Guidelines). Compile a short list of potential in-kind building materials and/or substitute building materials;

(e) Determine the technical feasibility of the potential in-kind and substitute materials by evaluating quality of life, health and safety considerations, and long-term durability of materials;

(f) Determine the financial feasibility of the potential in-kind and substitute materials including an assessment of costs that may impede full implementation of the project; and

(g) Select the appropriate in-kind building material or substitute building material in consideration of technical and financial feasibility and use the selected material.

4.2.4.3. Management of Interiors in pre-1941 associated buildings and structures

The significance of the interiors of pre-1941 Army mission associated buildings and structures are that they represent the ongoing evolution of interior spaces in response to changing military, technological, life, health, and safety requirements. To maintain their significance, the interiors must continue to develop and change in response to changing military needs.

The Army's pre-1941 buildings and structures have been in continuous use by the Army since their construction. The original interior floorplans have been modified. Current floorplans include rooms that were not features of the original design, new walls and partitions have been added that were not features of the original design. Floors, walls, and ceilings have been cut through and modified to add plumbing, electrical service, and heating and ventilation ductwork, plaster walls have been replaced with drywall, paint and plaster have been removed to create a new appearance.

Therefore, there is no review, special building material requirements or procedures, design guideline considerations, or special procedures for maintenance, repair, rehabilitation, renovation, and alterations to the interior spaces of pre-1941 buildings and structures.

4.2.4.4. Management of associated buildings, structures, and landscapes constructed during WWII and the Cold War era (1941-1989)

NHPA Section 106 compliance for many historic properties constructed during WWII and the Cold War periods has already been completed under the Programmatic Memorandum of Agreement (PMOA) for DOD World War II Temporary Buildings, Program Comment for Army Ammunition Production Facilities, Program Comment for Department of Defense WWII and Cold War Era Ammunition Storage Facilities, Program Comment for Department of Defense Cold War Era Unaccompanied Personnel Housing (UPH).[9] Extensive documentation of these representative properties exists in the inventories and historic contexts prepared for those agreements and many other individual studies and contexts of properties from this period (see footnote 4 for examples).

Management actions on associated buildings, structures, and landscapes constructed during World War II and the Cold War era (1941-1989) have been adequately addressed by existing documentation and are not subject to the historic properties management procedures of this program comment unless they are designated NHLs.

4.2.4.5. NHLs

NHPA Section 306107 Planning and actions to minimize harm to National Historic Landmarks states that prior to the approval of any undertaking that may directly and adversely affect a National Historic Landmark, Federal agencies will to the maximum extent possible undertake such planning and actions as may be necessary to minimize harm to the landmark.

There are 20 NHLs located on Army installations, including both individual NHL properties and NHL districts. Most of the Army's NHLs were constructed by the Army and continue to serve the Army's national defense mission. NHL districts at Fort Huachuca, Palm Circle, Fort Leavenworth, Fort Myer, and Fort Sill include Army family housing historic districts addressed under the Army's historic housing program comments. Of the five NHLs that date from 1941

[9] Referenced NHPA compliance agreements and historic contexts are located at https://www.denix.osd.mil/army-cr/army-dod-comments. Also see references in footnote 4.

and later (marked with an asterisk in the list below) four are covered by this program comment. The fifth, Pioneer Deep Space Station, Fort Irwin, CA is managed by National Aeronautics and Space Administration under their NHPA Section 106 PA for that property.

- Ladd Field NHL District, Fort Wainwright, AK*
- Fort Huachuca NHL District, Fort Huachuca, AZ
- Pioneer Deep Space Station, Fort Irwin, CA*
- National War College, Fort McNair, DC
- Yuchi Town Archeological Site, Fort Benning, GA
- Palm Circle NHL District, Fort Shafter, HI
- Wheeler Field NHL District, Schofield Barracks, HI
- Fort Des Moines NHL District, Des Moines, IA (Army is only responsible for specific contributing buildings)
- Rock Island Arsenal NHL District, Rock Island Arsenal, IL
- Fort Leavenworth NHL District, Fort Leavenworth, KS
- Launch Complex 33, White Sands Missile Range, NM*
- Trinity Site, White Sands Missile Range, NM*
- Watervliet Arsenal NHL District, Watervliet Arsenal, NY
- West Point NHL District, US Military Academy, West Point, NY
- Fort Sill NHL District, Fort Sill, OK
- Carlisle Indian School NHL District, Carlisle Barracks, PA
- Fort Douglas NHL District, Salt Lake City, UT (transfer out of Army ownership is currently underway)
- Fort Myer NHL District, Fort Myer, VA, and
- Quarters 1, Fort Myer, VA.
- Opana Radar Site, Kahuku Training Area, HI*

Army installations will avoid adverse effects to NHLs to the maximum extent possible in consideration of the exigencies of the military readiness mission. Warfighting readiness activities affecting NHLs will occur in accordance with the Secretary of the Interior's Standards and Guidelines for Federal Agency Historic Preservation Programs Pursuant to the National Historic Preservation Act (63 FR 20496) standard and guidelines at 4(j) National Historic Landmarks. The NHL standard and guidelines at 4(j) state when alternatives to avoid an adverse effect on NHLs appear to require undue cost or to compromise the undertaking's goals and objectives, the agency must balance those goals and objectives with the intent of Section 106.

4.2.4.6. Army Historic Properties Review Board (HPRB)

Army HPRB Establishment. An Army HPRB is established as a means for internal review, oversight, and issue resolution. The HPRB will be comprised of the FPO, Deputy FPO, and a representative from a relevant Army command. The FPO may request ad hoc participation of other individuals as appropriate to obtain special expertise or other viewpoints.

Army HPRB functions. The HPRB will be convened by the FPO in response to command-level request to address historic property management issues that cannot be resolved at the installation

or command levels. The FPO will issue a written determination considering the deliberations of the HPRB. If the FPO determination requires command and installation action, such action will be resourced and implemented by the command and installation. The HPRB will also be convened to review treatment plans for actions having an adverse effect to NHLs.

Treatment plans for adverse effects to NHLs. The HPRB will be convened to review all treatment plans addressing adverse effects to NHLs. The HPRB may request revision of the treatment plan. The treatment plan will implement standard mitigation measures identified in section 4.2.4.7. The FPO will issue a written endorsement of the NHL treatment plan in consideration of the deliberations of the HPRB. The FPO endorsed treatment plan will be resourced and implemented by the command and installation.

4.2.4.7. Mitigation Measures for Adverse Effects to Historic Properties

(1) The Army strives to avoid adverse effects to historic properties. Where adverse effects to historic properties cannot be avoided, the affected property will be subject to a treatment plan prepared by the installation. Treatment plans shall be cost effective and focus on mitigation of the adverse effect. Commands will review and approve treatment plans for non-NHL properties. Army installations will implement command approved treatment plans.

(2) Standard mitigation measures for buildings, structures, and landscapes. The Army will address adverse effects to buildings, structures, and landscapes associated with warfighting readiness activities through documentation prepared to the standards of the Historic American Building Survey (HABS), Historic American Engineering Record (HAER), Historic American Landscapes Survey (HALS) standards, or to equivalent State standards, as appropriate. For NHLs subject to adverse effects, installations will request the views of the National Park Service (NPS) regarding the level of HABS, HAER, or HALS documentation during NEPA public review periods. Once completed, such mitigation documentation will be made available to SHPOs and others, as requested, and will be retained by the installation in accordance with Army document management and retention requirements.

(3) Standard mitigation measures for archeological sites. The Army will address adverse effects to archeological sites by avoidance or data recovery excavations conducted in consideration of the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation, or relevant state-specific standards. An archeological site data recovery report will be prepared. Once completed, the archeological site data recovery report will when requested be made available to SHPOs, Tribes, and NHOs, subject to operational security review. Reports will be retained by the installation in accordance with Army document management and retention requirements. Diagnostic and significant artifacts and materials recovered from archeological sites and site records will be stored and curated following existing installation practices. In lieu of data recovery excavations, the Army may implement site protective measures such as capping or signage to mitigate, minimize, or avoid adverse effects, or by monitoring ground disturbing activities.

(4) Avoidance of duplication of effort. To maximize resource efficiency, the Army will avoid duplicating mitigation efforts for historic properties adversely affected by its actions. When developing a treatment plan for mitigation of adverse effects, the Army will determine if similar building, structure, landscape, or archeological property types have been previously documented or if known better-preserved examples exist on the installation or elsewhere. If adequate documentation or preserved examples sufficiently represent the adversely affected property, they will be incorporated into the treatment plan to avoid redundant mitigation efforts.

(5) Compensatory mitigation. The Army may implement compensatory mitigation in lieu of the standardized mitigation measures for adversely effected historic properties. Compensatory mitigation involves mitigative actions on properties other than those directly affected by the undertaking, or other types of creative offset mitigation activities. Army may implement compensatory mitigation on Army fee simple and leased property, federal lands withdrawn for Army military purposes, and properties with conservation easements. Compensatory mitigation proposals will be incorporated into treatment plans. Compensatory mitigation will not occur when standard mitigation options are implemented.

(6) The Army may issue contracts and carry out undertakings and management actions prior to the completion of mitigation measures so long as such actions do not preclude the eventual successful completion of the mitigation.

(7) Mitigation measures committed to in current PAs and MOAs but not yet carried out as of the date of ACHP approval of this program comment will be met by the relevant installation.

4.2.4.8. Army Readiness and Environmental Protection Integration (REPI) program

Encroachment from increasing development near Army installations can restrict military access to land, air, and water, hindering realistic training and testing activities crucial for warfighting readiness. The Army REPI program utilizes authorities provided under 10 U.S.C. § 2684a, 16 U.S.C. § 670c-1, and 10 U.S.C. § 2679 to mitigate encroachment pressures.

The Army REPI program uses conservation easements on properties outside installation boundaries to limit development and protect the Army mission. Because these easements are generally in perpetuity and restrict development, Army REPI project effects on historic properties are typically not adverse. The procedures for historic properties management in this program comment will be implemented by installations to meet NHPA Section 106 compliance for Army REPI actions including Sentinel Landscape actions.

4.2.4.9. Review and Comment on Individual Actions

Review and comment on individual actions covered under this program comment will be conducted through the public review process for NEPA documents and within NEPA public review timeframes. NEPA documents (as defined under NEPA) are Environmental Impact Statements (EISs) and Environmental Assessments (EAs).

Public review is a required part of the process for preparation of EISs and EAs. An EIS is used for actions with significant potential impacts, while an EA is used for actions with less significant or uncertain impacts.

Both EIS and EA development processes include mandated public reviews. EIS development period is limited by NEPA to two years, and EA development to one year. Public reviews occur during those NEPA document development periods.

4.2.4.10. Consultation with Federally Recognized Indian Tribes and Native Hawaiian Organizations

This program comment does not affect or alter in any way the Army's responsibilities under the Native American Graves Protection and Repatriation Act, American Indian Religious Freedom Act, or Executive Order 13007 Indian Sacred Sites, or applicable Treaties.

Army installations will continue Trust relationships with federally recognized Indian tribes. Army installations will continue to consult with federally recognized Indian tribes on a government-to-government basis in recognition of Tribal sovereignty. Army installations in Hawaii will continue ongoing respectful consultative relationships with NHOs. Army installations will take into consideration the significance that federally recognized Indian tribes and NHOs ascribe to historic properties of traditional religious and cultural importance.

Government-to-government consultations with federally recognized Indian tribes and consultations with NHOs on individual actions will occur during EIS and EA public review periods.

The Army strives to avoid adverse effects to known historic properties. Therefore, for the purposes of avoidance of adverse effects, Indian tribes and NHOs are encouraged to proactively identify the locations of historic properties, including those historic properties of traditional religious and cultural importance, during their consultations with Army installation representatives.

4.2.4.11. National Security Consideration

Recognizing that national security and military readiness may, in exceptional cases, necessitate deviations from standard Historic Property Management procedures, the Army FPO is authorized to intervene and conclude actions that significantly impede military readiness, impact property uses for military readiness purposes, or otherwise compromise national security. In such cases, compensatory mitigation measures will be implemented where feasible. All actions taken by the FPO under this provision will be reported annually to the ACHP.

5.0. Annual Report and Annual Meeting

On or before March 31st and for the first three years of implementation, the Army will provide an annual report on the program comment to the ACHP for the preceding year. The annual report

will identify any significant issues that may have arisen while implementing the program comment, how those were addressed, and how they may be avoided in the future. The annual report will also include an assessment of the overall effectiveness of the program comment. After the first three years of implementation, reporting for the remaining duration of this program comment will occur once every three years through the Army's submission to the ACHP Section 3 Report to the President under Executive Order (EO) 13287 Preserve America.

After its submission of the annual report and upon the ACHP's request, the Army will schedule a meeting with the ACHP and any other ACHP identified invitees to discuss implementation of the program comment. The meeting provides an opportunity for attendees to provide their views on the overall effectiveness of the program comment in meeting its intent and purpose. Annual meetings will occur for the first three years of implementation and may take place in-person, by phone, videoconference, or any combination of such methods.

6.0. Applicability

This program comment applies to all Army warfighting readiness activities including military training, testing, equipping, and industrial activities, and all buildings, structures and landscapes associated with those activities. Covered management actions occurring on the associated buildings, structures and landscapes include maintenance, repair, rehabilitation, renovation, additions, new construction, abatement of hazardous materials, mothballing, cessation of maintenance, demolition, lease, transfer, and conveyance. This program comment applies to the Active Army, Army Reserves, and federally supported readiness activities of the Army National Guard (including federally supported activities on state lands and properties).

This program comment is not applicable to properties that have previously been determined to be not eligible for inclusion in the NRHP in accordance with 36 CFR 800.4(c)(2), an applicable NHPA agreement document, or by a determination of eligibility pursuant to 36 CFR 63. If at a future date, properties previously determined not eligible for inclusion in the NRHP are reassessed and subsequently determined to be eligible for inclusion in the NRHP, NHPA Section 106 compliance for those properties shall occur by means of this program comment.

7.0. Execution and Effect

The Army will implement warfighting readiness activities and management actions on associated buildings, structures and landscapes in accordance with this program comment in place of any review and consultation procedures in 36 CFR 800.3 - 800.7 and Army PAs, MOAs, and AAPs. To further clarify program comment implementation; existing agreements are not voided, rather the program comment replaces the external review requirements in those existing agreements with the requirements of the program comment for the undertaking and properties covered by this program comment.

The program comment is a stand-alone NHPA compliance document approved by the ACHP. PAs and MOAs shall not be developed or amended to "implement" the program comment. The terms of the program comment are not subject to any change or further consultation in the

context of PAs, MOAs, other program comments, or other NHPA-related actions. Changes to the terms of the program comment can only be made following the amendment procedures of this program comment.

By the following this program comment, the Army meets its responsibilities for compliance under NHPA Section 106 regarding Army warfighting readiness activities and associated buildings, structures, and landscapes.

8.0. Duration

This program comment will remain in effect until such time as the Army determines that this program comment is no longer needed and notifies the Council in writing, or the Council withdraws the program comment in accordance with 36 CFR 800.14(e)(6) and this program comment.

9.0. Amendment and Withdrawal

The ACHP may formally amend this program comment after consulting with the Army, and other parties as it deems appropriate, as follows:

9.1. Amendment by Chairman, ACHP. The Chairman of the ACHP may amend this program comment to extend its applicability to the other military departments of the Department of Defense. The ACHP will notify the Army and will publish notice in the Federal Register regarding such amendment within 30 days after the Chairman's issuance of the amendment.

9.2. Amendment by Executive Director, ACHP. The Executive Director of the ACHP, after notice to the ACHP membership and with the agreement of the Army, may amend this program comment to adjust grammatical and typographical errors. The ACHP will publish notice in the Federal Register regarding such amendment within 30 days after issuance.

9.3. Other Amendments. Other amendments to this program comment are subject to agreement by the Army. The ACHP will publish notice in the Federal Register regarding such amendments within 30 days after issuance.

9.3. Withdrawal of the Program Comment. If the ACHP Chairman determines that undertakings are not being carried out in a manner consistent with this program comment, the ACHP Chairman may propose withdrawal of the program comment after consultation with the Army. Withdrawal of this program comment requires a majority vote of the full ACHP membership. The Chairman will notify the Army and will publish notice in the Federal Register within 30 days of any vote to withdraw. If this program comment is so withdrawn, the Army shall comply with the requirements of 36 CFR 800.4 – 800.6, or an applicable program alternative, for individual undertakings.

10.0. Definitions

The following definitions apply for the purposes of this program comment:

Abate or abatement means actions to eliminate, lessen, reduce, or remove hazardous and toxic materials, and unsafe conditions.

Army warfighting readiness activities means military training, testing, equipping, and industrial activities, and management actions occurring on the buildings, structures and landscapes associated with those activities. This is inclusive of all land management-related activities including but not limited to natural resources management such as silviculture, habitat management, fencing, and to UXO demolition and removal.

Associated buildings, structures, and landscapes means the buildings, structures, and landscapes associated with Army warfighting readiness activities. This includes but is not limited to the properties identified in Appendix B.

Compensatory mitigation means actions taken to offset the unavoidable adverse effects of an undertaking on a historic property. Compensatory mitigation may occur when mitigation actions on an adversely effected historic property are not financially or technical feasible, where there are national security implications, or other extenuating circumstances. Compensatory mitigation may occur through other mitigative activities involving other historic properties.

Economic feasibility means whether proposed measures to address effects on a historic property are financially viable and sustainable. It considers the costs of building materials, labor, mitigation (e.g., HABS, HAER, HALS documentation, archeological excavation, other preservation work) among other factors against the available funding and long-term financial resources to ensure the mitigation is realistic, achievable, and will effectively preserve or document the property's historical value.

Financial feasibly see definition of economic feasibility.

Health and safety hazards means buildings or structures that have any of the following conditions: damaged roofs or walls; non-functional or poorly functioning mechanical systems; unsafe common areas such as stairs; significant rodent, insect, or mold infestations; lead based paint exposure risks; asbestos exposure risks; risk of exposure to other chemical or environmental hazards; violations of health and safety codes and standards; damages due to fire, flooding, or natural disasters; and other conditions that present health hazards or make the building unsafe or uninhabitable.

Historic building materials means building materials that were used in the initial construction of a building, and for designated NHLs it means all materials within the period of significance.

Historic character means the same as the terms usage in the Secretary of the Interior’s Standards for the Treatment of Historic Properties at 36 CFR 68.

Historic district means the same as the term's definition in 36 CFR 60.3(d).

Historic property means the same as the term's definition in 36 CFR 800.16(l).

Imitative substitute building materials means modern, industry standard, natural, composite, and synthetic materials that that simulate the appearance, physical properties, and related attributes of historic materials well enough to make them alternatives for use when historic building materials require replacement. The terms imitative substitute building materials and substitute building materials are used interchangeably for the purposes of this program comment.

In-kind building materials means new building materials that are identical to historic building materials in all possible respects, including their composition, design, color, texture, and other physical and visual properties.

Industrial activity means activities at Army research laboratories, depots, arsenals, and ammunition plants involved in research, development, manufacturing, storing, and maintaining Army weapons systems and materiel.

Landscape and landscape features see definition of Military landscape and landscape features

Lease, transfer, and conveyance means the execution of lease, transfer, and conveyance documents for lease, possession, management, operation, and transfer of buildings out of Amry ownership. Includes execution of property transfers and conveyances of ground leases and property ownership.

Maintenance and repair means activities required to maintain the exterior of buildings, mechanical systems, and all exterior building features, elements, and materials in an operational state, or to bring them back to operating condition by repair or replacement of obsolete, broken, damaged, or deteriorated mechanical systems, features, elements, and materials on exteriors.

Management actions means maintenance, repair, rehabilitation, renovation, additions, new construction, abatement of hazardous materials, mothballing, cessation of maintenance, demolition, lease, transfer, and conveyance of Army buildings, structures, landscapes, and properties associated with Army warfighting readiness.

Military landscape and landscape features mean the landscape and landscape features on an Army installation uniquely shaped through human activity in support of military readiness missions. Includes the entire overall design and layout of installations including cantonments, training areas, testing areas, all buildings, structures, landscapes, facilities, and features therein, all industrial and manufacturing areas and properties therein, roadway circulation systems, plantings and landscaping, gardens, parade grounds, open spaces, playgrounds, recreational landscape features including but not limited to recreational and athletic fields, golf courses, fencing, parking areas, signage, site furnishings, parade grounds, lighting, sidewalks and curbing, driveways, setbacks, historic designed landscapes and features. Includes all visual elements and

viewsheds into historic properties and historic districts and out from any historic property or historic districts into other historic properties and districts, and all other landscape features. The term military landscape as used in the program comment is inclusive of all natural landscapes, designed landscapes, and landscape features.

Mitigation measures means any action that serves to address, reduce, minimize, or otherwise mitigate adverse effects on historic properties, and may include reports, historical documentation, recordation, other materials and activities, and compensatory mitigation measures.

Mothballing means an action to close and deactivate buildings and structures for an extended period, with the intent that the property would be brought back to a mission supporting operational status at some future time.

National Historic Landmark means historic properties formally designated by the Secretary of the Interior under the authority of the Historic Sites Act of 1935, that possess exceptional value in commemorating or illustrating the history of the United States.

Rehabilitation means, in accordance with the Secretary's Standards for Rehabilitation at 36 CFR 68.3(b), the act or process of making possible an efficient compatible use for a property through repair, alterations and additions while preserving those portions or features that convey its historical, cultural or architectural values. Includes actions to improve energy efficiency, address obsolete, damaged, deteriorated, or defective interior and exterior building materials and elements, and make other changes to improve the quality of life, health, and safety of residents. Rehabilitation includes additions, exterior alterations, and adjacent or related construction allowed under the Secretary Standards for Rehabilitation (9) and (10), provided they are in accordance with the design guidelines in appendix A.

Substitute building materials, see definition of Imitative substitute building materials.

Technical feasibility means an assessment of relevant factors to determine if an action, project, or product is suitable, practical, viable, and can be successfully implemented in consideration of military readiness requirements.

Testing or military testing means activities that evaluate weapons and materiel performance, safety, and reliability.

To the maximum extent possible means implementation of actions to the extent capable of being carried out with reasonable effort taking into account economic and technical feasibility.

Training or military training means activities that prepare units and Soldiers for combat operations.

Viewshed includes all the area visible from a particular location, viewing point, or series of viewing points. It includes all visual elements and surrounding points that are in the line of sight

from any location, viewing point, or series of viewing points and excludes all points and locations that are not visible and/or are obstructed by terrain, other natural features, man-made features, and points beyond the horizon. Includes all visual elements and viewsheds into historic properties and historic districts and out from any historic property or historic districts into other historic properties and districts, and all other landscape features. Viewsheds are addressed under this program comment as part of the military landscape and landscape features.

11.0. Appendices

Appendix A – Army Training and Testing Activities
Appendix B – Buildings and Structures Associated with Warfighting Readiness
Appendix C – Design Guidelines for Pre-1941 Buildings, Structures, and Landscapes
Appendix D – Building Materials Guidelines and Catalog for Pre-1941 Buildings, Structures, And Landscapes

Appendix A - Army Training and Testing Activities

The following includes representative examples of Army training and testing activities.

Training: Training activities include maneuvers and exercises involving ground disturbing activities that could affect historic properties. These activities generally occur on Army installations but may also occur off Army installations. A list and description of various types of training activities includes but is not limited to:

Mission Essential Task List (METL) Training: This is the cornerstone of warfighting readiness. Units train to proficiently execute their assigned METL, which are the tasks critical to their wartime mission. This training is progressive, starting with individual skills and building up to collective tasks.

Combined Arms Maneuver Training: Training that integrates different arms (infantry, armor, artillery, aviation, etc.) to achieve a common objective. This emphasizes coordinated movement, fire support, and communication.

Live Fire Exercises (LFX): Essential for building confidence and competence in using weapons systems under realistic conditions. LFXs progress from individual weapon firing to complex combined arms scenarios.

Situational Training Exercises (STX): Focused on specific tactical scenarios, STXs allow units to practice decision-making, execution, and problem-solving in a simulated combat environment.

Field Training Exercises (FTX): Extended exercises conducted in a field environment to simulate the challenges of sustained combat operations. FTXs test a unit's ability to plan, execute, and sustain operations under demanding conditions.

Urban Operations Training: Training in built-up areas to prepare for combat in urban environments, which presents unique challenges.

Air Assault Operations Training: Training to conduct airmobile operations, including helicopter insertions, extractions, and resupply.

Breach Training: Training to overcome obstacles, such as minefields and fortifications, to enable maneuver.

Counter-IED (Improvised Explosive Device) Training: Crucial for mitigating the threat of IEDs, which have been a significant factor in recent conflicts.

Combat Lifesaver (CLS) Training: Equipping Soldiers with the skills to provide immediate medical care on the battlefield.

Close Quarters Combat (CQC) Training: Training for fighting in close-range, confined spaces.

Electronic Warfare (EW) Training: Training to understand and counter enemy electronic warfare capabilities.

Cyber Warfare Training: Increasingly important training to defend against cyberattacks and conduct offensive cyber operations.

Joint Training Exercises: Training with other branches of the U.S. military and/or allied forces to improve interoperability and coordination.

Command Post Exercises (CPX): Simulation-based exercises that focus on training the command and staff functions of a unit.

Deployment Readiness Training Exercises: Exercises to test the unit's ability to deploy rapidly.

Emergency Deployment Readiness Exercises (EDRE): Unannounced exercises to test the unit's ability to deploy rapidly.

Mobilization Training Exercises: Exercises to simulate the process of mobilizing for deployment.

Combat Training Center (CTC) Rotations (NTC, JRTC): Intensive, realistic training exercises conducted at specialized training centers. These rotations provide units with a rigorous evaluation of their warfighting capabilities.

Mission Readiness Exercises (MRX): Exercises designed to assess a unit's ability to perform its assigned mission under realistic conditions.

Internal and External Evaluations: Regular evaluations to assess unit readiness and identify areas where additional training or resources are needed.

Testing: Army weapons and materiel testing ranges and facilities are dynamic and complex environments where a wide variety of activities occur, all aimed at evaluating the performance, safety, and reliability of weapons systems and related materiel (such as but not limited to obscurants, vehicles, detection systems, observation equipment, and processes). These activities can be broadly categorized as follows:

Live Fire Testing: This is the most common activity and involves firing weapons of all calibers, and types from small arms to large artillery, at various targets. The purpose is to assess accuracy, range, penetration, lethality, and overall effectiveness. This includes:

Direct Fire Testing: Testing weapons that are aimed directly at a target.

Indirect Fire Testing: Testing weapons that fire over a distance, relying on calculations and adjustments for accuracy.

Trajectory Analysis: Tracking the flight path of projectiles and other weapon systems to determine their range, accuracy, and consistency. This often involves sophisticated radar and optical tracking systems.

Penetration Testing: Firing rounds at different materials (armor, concrete, etc.) to determine the weapon's ability to penetrate various types of protection.

Explosive Ordnance Disposal (EOD) Range Testing: Testing procedures and equipment for detecting, neutralizing, and disposing of unexploded ordnance.

Extreme Temperature Testing: Exposing weapons and ammunition to extreme heat and cold to ensure they function reliably in all climates.

Humidity Testing: Evaluating the effects of high humidity on weapon performance, corrosion resistance, and ammunition stability.

Rain and Sand/Dust Testing: Simulating harsh weather conditions to assess the weapon's ability to function in adverse environments. This can involve rain towers, sandstorms, and dust chambers.

Salt Fog Testing: Evaluating the corrosion resistance of weapons systems when exposed to saltwater environments, simulating maritime operations.

Vibration and Shock Testing: Simulating the vibrations and shocks that weapons systems might experience during transport, handling, and use.

Endurance Testing: Firing weapons for extended periods to assess their durability and identify potential failure points. This can involve thousands of rounds being fired in rapid succession.

Component Testing: Testing individual components of a weapon system (e.g., firing mechanisms, sights, barrels) to identify weaknesses and ensure they meet performance standards.

Maintenance and Repair Testing: Evaluating the ease of maintenance and repair of weapons systems, including the tools and procedures required.

Usability Testing: Evaluating how easily and effectively soldiers can operate and maintain a weapon system. This includes assessing factors such as ergonomics, user interface, and training requirements.

Safety Testing: Identifying and mitigating potential safety hazards associated with weapon systems. This includes testing for accidental discharge, malfunction, and other potential risks.

Performance Under Stress Testing: Evaluating how soldiers perform with a weapon system under stressful conditions, such as fatigue, sleep deprivation, and exposure to combat noise.

Electromagnetic Interference (EMI) Testing: Evaluating the susceptibility of weapons systems to electromagnetic interference from other electronic devices.

Electronic Countermeasures (ECM) Testing: Testing the effectiveness of countermeasures designed to protect weapons systems from electronic attacks.

Cybersecurity Testing: Assessing the vulnerability of networked weapons systems to cyberattacks.

Target Acquisition and Tracking: Testing the ability of sensors and weapon systems to acquire, track, and engage targets.

Sensor Performance Testing: Evaluating the performance of sensors such as radar, infrared cameras, laser rangefinders, and detection systems.

Target Signature Management: Assessing the effectiveness of techniques to reduce the signature of targets, making them harder to detect.

Range Safety: Ensuring the safety of all personnel and equipment on the range. This includes establishing safety zones, safety shelters, enforcing safety procedures, and providing emergency medical services.

Training Area and Test Range management. This includes including Integrated Training Area Management (ITAM) activities.

Target Preparation and Maintenance: Preparing and maintaining targets for testing. This includes setting up targets, repairing damage, and collecting data on target impact.

Logistics and Support: Providing logistical support for testing activities, including transportation, fuel, ammunition, maintenance services, and instrumentation.

Materiel Testing: Research, development, test, and evaluation (RDT&E) of a variety of equipment and processes such as protective equipment, decontamination, detection systems, obscurants, and hazard monitoring.

Appendix B – Associated Buildings and Structures*

ALL ASSOCIATED BUILDINGS AND STRUCTURES 45 YEARS AND OLDER

Categories	Building/Structure Type	Number of Buildings	Number of Structures	Number of Linear Structures	Grand Total
Category 1	Operational and Training	6856	9178	1809	17843
Category 2	Maintenance and Production	4247	81	0	4328
Category 3	Research, Development, Test, and Evaluation	1237	1042	1	2280
Category 4	Supply	22380	3470	4	25854
Category 5	Hospital & Medical	322	0	0	322
Category 6	Administrative	2187	2603	0	4790
Category 7	Housing & Community	8046	2941	11	10998
Category 8	Utility & Ground Improvements	1701	10083	43730	55514
Totals		46976	29398	45555	**121929**

SUBSET OF BUILDINGS AND STRUCTURES CONSTRUCTED PRIOR TO 1941

Categories	Building/Structure Type	Number of Buildings	Number of Structures	Number of Linear Structures	Grand Total
Category 1	Operational and Training	596	579	13	1188
Category 2	Maintenance and Production	250	2	0	252
Category 3	Research, Development, Test, and Evaluation	87	57	0	144
Category 4	Supply	876	62	0	938
Category 5	Hospital & Medical	59	0	0	59
Category 6	Administrative	520	142	0	662
Category 7	Unaccompanied Barracks & Community	936	431	0	1367
Category 8	Utility & Ground Improvements	118	771	4488	5377
Totals		3442	2044	4501	**9987**

*Best available information as of 7 July 2025

Associated Buildings and Structures Categories

Army buildings, structures and linear structures are categorized into eight categories: operational and training; maintenance and production; research, development, test, and evaluation; supply; hospital & medical; administrative; unaccompanied personnel housing and support; utility & ground improvements.

Category 1. Operational and Training: category encompasses a diverse range of facilities supporting military operations, training, and infrastructure. It includes communication and information technology centers, air and sea operations buildings, training facilities (classrooms, firing ranges, simulators), headquarters and administrative buildings, logistics and maintenance buildings, safety and security structures, and reserve component centers. The facilities support a wide array of activities from command and control to technical training and operational readiness

- **Predominant Current Use Catcode Examples:** includes, but not limited to 11110, 11111, 11120, 11121, 11130, 11131, 11150, 11151, 11212, 11213, 11221, 11222, 11310, 11311, 11320, 11321, 11330, 11340, 11350, 11351, 11370, 11380, 11610, 12110, 12120, 12210, 12310, 12311, 12312, 12322, 12411, 12412, 12413, 12450, 12451, 12452, 12454, 12455, 12460, 12461, 12470, 12471, 12473, 12480, 12481, 12482, 12483, 12495, 12510, 12520, 12521, 12620, 12621, 12630, 12640, 13115, 13120, 13125, 13131, 13135, 13140, 13160, 13170, 13175, 13181, 13185, 13220, 13252, 13310, 13320, 13410, 13430, 13440, 13450, 13470, 13510, 13511, 13520, 13610, 13612, 13613, 13615, 13620, 13621, 13670, 13710, 14110, 14111, 14112, 14113, 14114, 14115, 14116, 14121, 14126, 14129, 14132, 14133, 14140, 14150, 14160, 14161, 14162, 14163, 14164, 14165, 14166, 14169, 14170, 14171, 14175, 14176, 14177, 14178, 14179, 14180, 14181, 14182, 14183, 14184, 14185, 14186, 14187, 14188, 14190, 14310, 14915, 14916, 14920, 14925, 14935, 14937, 14940, 14953, 14955, 14958, 14960, 14961, 14962, 14963, 14970, 14971, 14975, 15110, 15210, 15410, 15430, 15432, 15510, 15610, 15930, 16310, 16420, 16430, 16440, 17115, 17119, 17120, 17121, 17122, 17123, 17125, 17131, 17132, 17133, 17134, 17135, 17136, 17137, 17138, 17139, 17140, 17141, 17142, 17170, 17180, 17210, 17211, 17212, 17213, 17214, 17710, 17711, 17720, 17721, 17730, 17731, 17771, 17801, 17802, 17803, 17804, 17805, 17806, 17808, 17809, 17810, 17811, 17812, 17813, 17814, 17816, 17821, 17822, 17823, 17829, 17831, 17832, 17833, 17834, 17841, 17842, 17844, 17845, 17851, 17852, 17854, 17855, 17856, 17857, 17858, 17859, 17860, 17861, 17862, 17863, 17864, 17865, 17866, 17867, 17868, 17871, 17872, 17878, 17879, 17880, 17881, 17882, 17883, 17884, 17885, 17886, 17887, 17888, 17891, 17892, 17893, 17894, 17895, 17896, 17897, 17898, 17901, 17902, 17908, 17910, 17911, 17912, 17914, 17948, 17949, 17950, 17951, 17952, 17954, 17955, 17958, 17959, 17961, 17962, 17963, 17964, 17965, 17966, 17971, 17972, 17974, 17976, 17979, 17980, 17981, 17982, 17983, 17984, 17987, 17991, 17992, 17993, 17994, 17995, 17996, 17998, 17999
- **Examples:** includes, but not limited to Fixed Wing Runway, Paved; Runway / Fixed Wing - Unsurfaced; Rotary Wing Landing Pad, Unpaved; Fixed Wing Taxiway, Unpaved; Rotary Wing Parking Apron, Paved; Aircraft Maintenance Parking Apron, Paved; Aircraft Runway Holding Apron, Unpaved; Liquid Propane Gas Storage Tank, Above Ground; Pol Pipeline, Underground; Communication Lines, Above Ground; Flight Control Tower; Airfield Operations Building; Weather Station; Munitions Operations Management Building; Fueling/Pol/Wash Support Facility; Land Vehicle Fueling Facility, Ethanol 85 (E-85); Aircraft Fuel Storage Tank, Jet, Above Ground; Land Vehicle Fuel Storage Tank, Mogas, Underground; Radio Beacon; Instrument Landing System; Runway Lighting; Visual Approach Slope Indicator; Aircraft Arresting System;

Vehicle Test Track; Vehicle Defueling Facility; Pier; Bulkheads; Range Operations And Storage Building; Maneuver/Training Area, Heavy Forces; Impact Area Dudded; Automated Field Fire (Aff) Range; Known Distance (Kd) Range; Machine Gun Field Fire Range; Light Antiarmor Weapons (Law/At-4) Range Live; Field Artillery Scaled Range; Air Defense Gunnery Range; Live Fire Exercise Shoothouse; Hand Grenade Qualification Course (Nonfiring); Engineer Qualification Range, Nonstandardized; Leadership Reaction Course; Mine Warfare Area; Ship Loading And Unloading Mockup; Fire Fighting And Rescue Training Area; Personnel/Equipment Drop Zone; Obstacle Course; Land Navigation Course; Access Control Facility; Information Systems Facility; Simulations Center; Observation Tower.

Category 2 - Maintenance and Production: This category includes wide variety of maintenance and production facilities supporting military equipment, vehicles, and weaponry. It encompasses aircraft maintenance hangars and shops, vehicle maintenance facilities ranging from small arms repair to heavy gun shops, and specialized facilities for missiles, electronics, and radar. Furthermore, it includes production plants for ammunition, explosives, and various weapon components, as well as quality assurance and calibration facilities to ensure operational readiness.

- **Predominant Current Use Catcodes:** includes, but not limited to, 21110, 21113, 21114, 21115, 21117, 21120, 21130, 21140, 21210, 21330, 21340, 21406, 21407, 21408, 21409, 21410, 21411, 21412, 21413, 21414, 21415, 21416, 21417, 21418, 21419, 21435, 21440, 21441, 21445, 21458, 21462, 21470, 21510, 21520, 21522, 21530, 21540, 21610, 21612, 21622, 21630, 21632, 21640, 21642, 21650, 21660, 21670, 21710, 21712, 21730, 21835, 21840, 21845, 21850, 21855, 21865, 21870, 21872, 21879, 21881, 21882, 21885, 21887, 21910, 21922, 21925, 22125, 22210, 22410, 22412, 22430, 22510, 22525, 22530, 22535, 22537, 22548, 22610, 22612, 22616, 22618, 22620, 22622, 22624, 22625, 22626, 22628, 22630, 22635, 22638, 22640, 22650, 22655, 22660, 22665, 22670, 22680, 22685, 22810, 22930, 22960
- **Examples:** includes, but not limited to, Fixed Crane, Aircraft Maintenance Hangar, Aircraft Parts Storage, Vehicle Maintenance Facility, Depot Level, Munitions Demilitarization Facility, Ammunition Maintenance Facility, Depot Level, Steam Cleaning Facility, Depot Level, Rocket And Missile Maintenance Building, Ship Repair Shop, Component Cleaning Facility, Missile Maintenance Building, Area Maintenance Support Activity/Equipment Concentration Site, Weapon Quality Assurance/Calibration Facility, Depot Level, Munitions Maintenance And Renovation Building, Munitions Calibration Building, Electronics Maintenance Shop, Depot Level, Railroad Equipment/Engine Maintenance Shop, Engineer Maintenance Facility, Aircraft Production Structure, Combat Vehicle Assembly Plant, Small Arms Plant, Heavy Gun Plant, Propellant Charge/Cartridge Filling Building, Explosive Manufacturing Building, Chemical, Biological, Radiological Plant, Inert Renovation And Maintenance Building, Munition Production Building, Metal Parts Production, Ammunition Quality Assurance/Calibration Facility, Production, Special Weapons Plant, Leather/Textile/Clothing Plant, Ice Plant, Quarry/Rock Crusher Plant.

Category 3 - Research, Development, Test, and Evaluation: This category includes research laboratories for various scientific disciplines (chemistry, physics, metallurgy, human engineering, medical research), specialized buildings for different types of equipment and materials (aircraft, missiles, ordnance, chemicals, communication equipment), and testing facilities like climatic chambers and vibration test labs

- **Predominant Current Use Catcodes:** includes, but not limited to, 31010, 31015, 31020, 31030, 31040, 31050, 31060, 31065, 31066, 31071, 31110, 31210, 31220, 31410, 31510, 31610, 31620, 31710, 31720, 31730, 31740, 31810, 31820, 31910, 31920, 31930, 32110, 37110, 37120, 39014, 39018, 39024, 39028, 39030, 39034, 39038, 39040, 39064, 39068, 39069, 39075, 39076, 39080

- **Examples:** includes, but not limited to, Chemistry Lab; Greenhouse, R&D; Metallurgy Lab; Nuclear Physics And Chemical Lab; Physics Lab; Human Engineering Lab; Medical Research Lab; Climatic Chamber Building; Biosafety Level 3 Laboratory; Engineer R&D Laboratory; Aircraft And Flight Equipment Building; Astronautical And Geophysical Building; Guided Missile Building; Ground Transport Equipment Building; Ordnance Building; Chemical Equipment And Material Building; Ammunition/Explosives/Toxics Building; Communication Equipment Building; Detection Equipment Building; Electrical Equipment Building; Electronic Equipment Building; Nuclear Propulsion Building; Propulsion Systems Building; Nonmetallic Material Building; Lab And Test Building, General Purpose; Vibration Test Lab; Precision Machine Shop; RDT&E Range Buildings; RDT&E Range Structures.

Category 4- Supply (General and Ammunition/Explosives): This category combines all storage-related facilities, primarily for ammunition, explosives, and hazardous materials, categorized by operational level (Depot, Installation, Unit). It includes specialized magazines for different ammunition types, buildings for hazardous and radioactive materials, general-purpose storage, vehicle storage, and facilities with controlled environments.

- **Predominant Current Use Catcodes:** includes, but not limited to, 41121, 41123, 41130, 41131, 41140, 41141, 41150, 41180, 41210, 42104, 42107, 42110, 42120, 42150, 42170, 42180, 42181, 42182, 42183, 42184, 42186, 42210, 42215, 42225, 42230, 42231, 42235, 42240, 42250, 42260, 42280, 42281, 42283, 42285, 42286, 42288, 42310, 42311, 42410, 42510, 43211, 44110, 44130, 44135, 44150, 44160, 44180, 44181, 44182, 44210, 44215, 44216, 44217, 44220, 44222, 44223, 44224, 44226, 44227, 44228, 44230, 44240, 44250, 44260, 44262, 44263, 44271, 44288, 45110, 45210

- **Examples:** includes, but not limited to, Ammunition Storage Pad; Open Storage Area, Depot Level; Open Storage Area, Installation; Explosive Transfer Building, Depot Level; Earth Covered Magazine (Ecm); Fuse And Detonator Magazine, Depot Level; High Explosive Magazine, Depot Level; Smokeless Powder Magazine, Depot Level; Guided Missile Magazine, Depot Level; Igloo Storage, Depot Level; Above Ground Magazine; Small Arms Ammunition Magazine, Depot Level; General Purpose Magazine, Depot Level; Service Magazine; Ammunition Storage Building, Depot Level; Fuse And Detonator Magazine, Installation; High Explosive Magazine, Installation; Smokedrum Storehouse, Installation; Small Arms Ammunition And Pyrotechnics Magazine, Installation; Ammunition Storehouse, Installation; Ready Magazine, Installation; Fixed Ammunition Magazine, Installation; Special Weapons Magazine, Installation; Guided Missile Magazine, Installation; Igloo Storage, Installation; Ammunition Hut; Ready Munition Storage; Unit Small Arms Ammunition Storage, Installation; Ammunition Storage Other Than Depot Or Unit; Battery Cold Storage Building; Cold Storage Building, Installation; Storage Building, General Purpose, Depot Level; Controlled Humidity Warehouse, Depot Level; Hazardous Material Storage, Depot Level; Flammable Material Storehouse, Depot Level; Radioactive Storage Warehouse, Depot Level; Vehicle Storage Building, Depot Level; Aircraft Production Parts Storage, Installation; Storage Silo; Storage Building, General Purpose,

Installation; Storage Shed, General Purpose, Installation; Arms Building For Battalion And Above; Organizational Storage Building; Covered Storage Building, Installation; Central Issue Facility; Hazardous Material Storage Building, Installation; Controlled Humidity Warehouse, Installation; Flammable Material Storehouse, Installation; Underground Storage Facility, Installation; Radioactive Storage Warehouse, Installation; Vehicle Storage Shed, Installation; Vehicle Storage Building, Installation; Consolidated Housing Furniture Storage; Installation Storage Other Than Depot Or Organizational Jet Fuel Storage, Above Ground, Bulk; Jet Fuel Storage, Underground, Bulk; Diesel Oil/Jp8 Storage, Above Ground, Bulk; Diesel Oil/Jp8 Storage, Underground, Bulk; Gasoline Storage, Above Ground, Bulk; Gasoline Storage, Underground, Bulk; Liquified Gas Storage, Above Ground, Bulk; Fuel Oil Storage, Above Ground, Bulk; Liquid Storage Nonpropellant; Ammunition Storage Structure, Installation; Liquid Propellant Storage, Ammunition, Building; Liquid Propellant Storage, Ammunition, Tank; Open Warehouse, Depot Level; Vehicle Storage Facility, Depot Level; Oxygen Storage Facility, Installation; Acetylene Storage Facility, Installation

Category 5 - Hospital & Medical: This category includes facilities related to healthcare and medical services. It includes hospitals, clinics (dental, health, troop medical), laboratories, pharmacies, and veterinary facilities. Additionally, it covers support buildings like medical warehouses and ambulance garages, as well as administrative offices for medical commands.

- **Predominant Current Use Catcodes:** includes, but not limited to, 51010, 51016, 53020, 53025, 53040, 53045, 53060, 53071, 54010, 55010, 55011, 55012
- **Examples:** includes, but not limited to, Medical Center/Hospital; Medical Command Administration; Laboratory; Pharmacy; Veterinary Facility; Animal Shelter; Medical Warehouse; Ambulance Garage; Dental Clinic; Health Clinic; Army Health Clinic; Army Troop Medical Clinic

Category 6 – Administrative: This category includes administrative offices.

- **Predominant Current Use Catcodes:** includes, but not limited to, 61001, 61002, 61050, 61055, 61065, 61070, 61075, 69010, 69020, 69030
- **Examples:** includes, but not limited to, Administration Building, General Purpose; Flagpole; Information Stand; Facility Information Sign; Military Entrance Processing Station (Meps); Recruiting Station: Storefront; Administration Building, General Purpose; Waiting Area/In-Out Processing; Technical Library; Red Cross Building; Courtroom

Category 7 - Unaccompanied Personnel Housing and Support: This category encompasses an array of facility types found on military installations, covering essential services, housing, training, and support. It includes unaccompanied personnel housing (barracks), dining facilities, educational and religious buildings, law enforcement and confinement facilities, commissary, exchange, laundry, and physical fitness facilities.

- **Predominant Current Use Catcodes:** includes, but not limited to, 71420, 71450, 72010, 72111, 72114, 72115, 72121, 72122, 72170, 72210, 72212, 72310, 72360, 72410, 72412, 72510, 73010, 73011, 73012, 73013, 73015, 73016, 73017, 73018, 73019, 73028, 73030, 73032, 73046, 73050, 73072, 73073, 73075, 73080, 74003, 74006, 74009, 74010, 74011, 74012, 74016, 74017, 74019, 74020, 74021, 74022, 74023, 74024, 74025, 74028, 74029, 74030, 74031, 74033, 74034, 74035,

74036, 74040, 74041, 74046, 74047, 74048, 74049, 74050, 74051, 74052, 74053, 74054, 74055, 74056, 74058, 74060, 74062, 74065, 74066, 74068, 74069, 74070, 74072, 74075, 74076, 74078, 74079, 74080, 74082, 74085, 74087, 74089, 75070, 76010, 76011, 76012, 76013

- **Examples:** includes, but not limited to, Storage Building; Trailer Park Service Building; Army Lodging; Permanent Party (Pp) Unaccompanied Housing (Uh), Junior Enlisted & Junior Nco; Collective Training (Ct) Unaccompanied Housing (Uh), Open-Bay; Collective Training (Ct) Unaccompanied Housing (Uh), Mobilization; Institutional Initial Military Training (Iimt) Unaccompanied Housing (Uh), Non-Open-Bay; Institutional Post-Initial Military Training (Ipimt) Unaccompanied Housing (Uh); Permanent Party (Pp) Unaccompanied Housing (Uh), Senior Nco; Dining Facility; Dining Facility: Collective Training; Uh Laundry Building, Detached; Uh Miscellaneous Building; Permanent Party (Pp) Unaccompanied Housing (Uh), Officer; Collective Training (Ct) Unaccompanied Housing (Uh), Senior Nco And Officer; Collective Training (Ct) Hutment; Physical Fitness Center; Greenhouse; Golf Clubhouse; Golf Course Maintenance Building; Army Community Services Center; Community Activities Center; Conservation Building; Recreational Lodging; Library Branch; Library Main; Consolidated Open Dining Facility; Enlisted Open Dining Facility; Officer Open Dining Facility; Riding Stable; Exchange Branch; Exchange Cafeteria; Exchange Automotive Service Station; Exchange Main Retail Store; Exchange Maintenance Shop; Exchange Warehouse; Exchange Service Outlet

Category 8 - Utility and Ground Improvements: This includes various utility and environmental facilities crucial for infrastructure support. It includes buildings and structures for power generation and distribution, heating and cooling, water supply and treatment (both potable and non-potable), and sewage and waste management. The facilities cover a range of essential services, ensuring the proper functioning of installations.

- **Predominant Current Use Catcodes:** includes, but not limited to, 81115, 81117, 81121, 81150, 81160, 81230, 81241, 81242, 81320, 81350, 81360, 82117, 82120, 82130, 82150, 82210, 82220, 82221, 82240, 82310, 82410, 82610, 82625, 82710, 83110, 83112, 83113, 83120, 83130, 83140, 83150, 83180, 83181, 83210, 83220, 83240, 83310, 83312, 83320, 83410, 83420, 84110, 84125, 84130, 84141, 84150, 84210, 84215, 84330, 84450, 84470, 84472, 84510, 84610, 84620, 84710, 84720, 84730, 84740, 85110, 85120, 85130, 85150, 85210, 85211, 85212, 85213, 85215, 85216, 85220, 85221, 85225, 85230, 85710, 85715, 85720, 85725, 85730, 86010, 86110, 86120, 86130, 86140, 87110, 87120, 87130, 87140, 87150, 87151, 87171, 87210, 87224, 87230, 87250, 88010, 88111, 88120, 88221, 89111, 89113, 89115, 89120, 89121, 89123, 89126, 89127, 89131, 89133, 89141, 89144, 89148, 89150, 89210, 89215, 89220, 89225, 89230, 89240, 89250, 89260, 89270, 89280, 89310, 89320, 89330, 89340, 89410, 89510, 89520, 89530, 89550, 89560, 89570
- **Examples:** includes, but not limited to, Electric Power, Oil-Fired; Electric Power, Gas-Fired; Electric Power, Nuclear; Uninterruptable Power Supply; Standby Generator; Exterior Lighting; Substation; Electrical Switching Station; Transformers; Heating Plant, Dual-Fuel; Heating Plant, Oil-Fired; Heating Plant, Gas-Fired; Heating Plant, Steam; Gas Generating Plant; Air-Conditioning/Refrigeration Plant; Heat Pump; Primary Waste Water Treatment; Secondary Waste Water Treatment; Advanced Waste Water Treatment; Septic Tank And Drain Field; Raw Sewage Lagoon And Oxidation Pond; Industrial Waste Water Treatment Plant; Sewage Lift Station; Gravity Oil And Grease Separator; Water And Grit Separator; Incinerator Facility; Refuse Collection Facility; Recycling Facility; Sanitary Landfill; Hazardous Waste Landfill; Water

Treatment Plant; Filter Plant Facility; Water Well, Potable; Pump Station, Potable; Chlorinator Facility; Chlorinator Facility, Nonpotable; Water Source, Nonpotable; Pump Station, Nonpotable; Water Storage Tank, Potable; Reservoir, Potable; Water Storage Tank, Nonpotable; Reservoir, Nonpotable; Fire Protection Pond; Water Retaining Basin; Cantonment Area Roads, Paved; Vehicle Bridge; Organizational Vehicle Parking, Paved; Organization Vehicle Parking, Unpaved; Nonorganizational Vehicle Parking, Paved; Nonorganizational Vehicle Parking, Unpaved; Sidewalks, Stairs, And Walkways, Paved; Sidewalks And Walkways, Unpaved; Pad; Pedestrian Bridges; Training Area Bridge; Railroad Tracks; Railroad Bridge; Railroad Scales; Coal Trestle; Drainage Ditch; Dikes; Retaining Structure; Storm Water Retention/Detention Ponds; Fencing And Walls; Mechanical Security Barricade; Gate; Dam; Special Fire Extinguishing System; Power Plant Building; Compressed Air Plant; Sewage /Waste Treatment Building; Water Supply/Treatment Building, Potable; Monitoring Wells; Environmental Test Facility; Energy Management Control System (Emcs); Gas Storage Tanks; Traffic Signals; Fire Hydrants; Railroad Crossing Signals; Decorative Fountain/Pond; Lightning Protection System, Standalone; Utilidors; Cooling Towers; Imhoff Tank; Pollutant Catch Basin; Sewage Holding Tank; Waste Pol Storage Tank; Hazardous Waste Holding Tank; Fuel Product Recovery Tank; Power Substation/Switching Station Building; Environmental Test Laboratory; Plant/Utilities Building; Heating Plant Building; Refrigeration/Air-Conditioning Building; Combined Air-Conditioning/Heat Plant Building; Refuse And Garbage Building; Water Supply Building, Nonpotable; Water Storage Building; Shredder Facility; Cooling Towers Overhead Electric Lines; Underground Electric Lines; Steam Condensate Lines; Hot Water Lines; Hot/Chilled Water Lines; Steam Lines; Gas Pipelines; Chilled Water Distribution System; Sanitary Sewer; Combined Sewer; Industrial Waste Sewer; Water Distribution Lines, Potable; Supply Main, Potable; Fire Protection System, Non-Potable; Water Distribution Lines, Nonpotable; Cantonment Area Roads, Unpaved; Cantonment Area Tank Trails; Staging/Marshaling Area; Training Area Roads, Paved; Training Area Roads, Unpaved; Training Area Tank Trails, Paved; Training Area Tank Trails, Unpaved; Crane Tracks; Storm Sewer; Irrigation Facility; Pollutant Drainage System; Security Fence; Fire Alarm System; Flood Control Levee/Floodwall; Inert Gas Line; Compressed Air Line; Vacuum Line.

Appendix C - Design Guidelines for Pre-1941 Buildings, Structures, And Landscapes

The *Secretary's Standards* at 36 CFR 68 were developed to provide guidance for the appropriate treatment of historic properties and address four treatments: preservation, rehabilitation, restoration, and reconstruction. For all pre-1941 historic buildings and structures, the Army implements the *Standards for Rehabilitation*. Rehabilitation allows a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values. Per 36 CFR 68, the *Standards* are applied taking in consideration economic and technical feasibility of each project.

Purpose

The purpose of these *Design Guidelines* is to help maintain the historic and architectural character of associated buildings and structures, and landscape features.

Character-Defining Features

The character of a historic building is established by its form, size, scale, and decorative features. Character-defining features include the overall shape, style and design of the building, decorative details, as well as its associated buildings and structures, and landscape features. When identifying a building's character-defining features it is important to understand the features associated with a particular architectural style. Historic architectural styles used by the Army include Federal, Gothic Revival, Greek Revival, Italianate, Romanesque, Queen Anne, Craftsman, Colonial Revival, Spanish Colonial Revival. It is important to understand that any given example of pre-1941 Army buildings will not exhibit all character-defining features or materials of its architectural style, has been modified over time, and may exhibit features of several different architectural styles.

Historic Architectural Styles and Character Defining Features:

Federal 1780-1820, locally to 1840: Symmetry of façade with a central door, Side-gable or hipped roof, 6 over 6 double hung windows, elliptical fanlight or transom over door with sidelights, three-part window or Palladian window in center of upper floor, paneled door, cornice usually with dentil molding or other decorative molding, front porticos with classical columns, decorative details such as swags or festoons, quoins and pilasters, belt courses, curving stairs, dormers usually front gable, end chimneys, roof balustrades, cupolas.

Gothic Revival, 1840-1880: Steeply pitched gable roofs, parapets or castellated walls decorated vergeboards, windows extend into gables, 1 over 1 or 2 over 2 double hung windows or casement windows, pointed or arched windows, oriel or bay windows, drip mold for window crowns, tracery at top of windows, paneled doors, elaborate or simple towers and turrets, clover-like foils, one-story entry or full width porch.

Greek Revival, 1825 - 1860: Symmetrical, gabled or hipped roof, entry porch or full width porch supported by square or round columns, central door with transom and sidelights, elaborate door s urround or enframement, cornice with wide band of trim 6 over 6 double hung windows, three-part windows, window crowns or lintels.

Italianate, 1840-1885: Usually a low pitch hipped roof, sometimes front gable 2 or 3 stories, rarely 1 story, symmetrical or asymmetrical façade, groupings of windows, tall narrow arched or rectangular windows usually 1 over 1 or 2 over 2 double-hung sashes, one-story bay windows, window crowns hooded, bracketed or framed, half-glazed paired doors usually arched or rounded, square cupolas or towers, full-width porch or small entry porch, square columns or columns with brackets, wide overhanging eaves with decorative brackets.

Romanesque Revival, 1870—1900: Asymmetrical, hipped roofs with cross gables, masonry or stone walls usually with rough-faced or square stonework, sometimes polychromic stonework, polychromed slate roof, dormers, eyebrow, hipped and gabled rectangular windows, usually with stone transoms, rows of windows, usually deeply recessed, round-topped arches, towers usually round or square.

Queen Anne (1880-1910): Steeply pitched roof of irregular shape usually with a front facing gable, patterned shingles, cut-away bay windows, asymmetrical façade with partial or full-width porch usually one story high and extended along the side walls.

Colonial Revival, 1880—1955: Hipped or gabled roof, symmetrical or asymmetrical 2-stories, sometimes 1-story with a 1-story side wing, central entry door, paneled door with decorative crown supported by pilasters or columns, fanlights and sidelights, double-hung windows with multipane glazing in one or both sashes, paired windows, accentuated front entry sometimes with full-width porch or small portico.

Beaux-Arts (1885—1930) and Classical Revival (1900—1920): Symmetrical, 2+ stories, flat, hipped or mansard roof, masonry walls, Decorative details (quoins, pilasters or columns), decorative garlands, floral patterns and shields, pedimented and bracketed windows, roof balustrade, accentuated cornice.

Spanish Colonial Revival, late 19th century and early 20th century: Symmetrical or asymmetrical gabled, hipped or flat roof, multi-level roofs, overhanging eaves, stucco or adobe walls, usually red tile (barrel or flat) roof covering, mission shaped dormer or roof parapet, towers (round or square), quatrefoil window, arcaded entry porch, arches above windows and doors, balconies (open or roofed), decorative tiles.

Craftsman (1905-1930): Low pitched, gable roof (occasionally hipped)**,** unenclosed eave overhang, beams or braces under gables, full or partial-width porches with tapered columns.

International Style (1930s-1970s): Characterized by minimalist design, flat roofs, steel and glass construction, and a lack of ornamentation. Often seen in office buildings and institutional structures.

Guidelines General: Implementation of these guidelines is subject to the technical and financial feasibility of the recommendations. They do not apply to non-contributing pre-1941 buildings, structures, and landscapes, nor do they apply to buildings, structures, and landscapes constructed in 1941 and later.

Guidelines for Rehabilitation, Additions, Exterior Alterations, and Adjacent or Related Construction, and New and Replacement Construction

a. The appearance and character defining exterior features of pre-1941 buildings and structures will be maintained to the maximum extent possible during these activities.
b. Exterior alterations and additions will maintain overall historic character and will be compatible with the mass, form, character-defining features, and architectural style of the building. Ensure the size and scale of new additions in relationship to the building do not diminish, obscure or overwhelm the view and character of the historic building and / or viewshed out from or into any historic district(s).
c. Additions will be placed in the rear and on secondary elevations to maintain the front character-defining elevation and will be compatible with the scale, character-defining features, and architectural style of the associated buildings and structures, and landscape features.
d. Where removal of exterior character-defining historical materials or features is required, either in-kind or imitative substitute building materials may be used for replacement of removed or deteriorated or unsafe historic building materials.
e. Restoration of missing documented historic features is not required.
f. New additions, exterior alterations, and adjacent or related construction should not destroy historic materials, features and spatial relationships that characterize the property to the extent possible. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and the historic district.
g. New additions and adjacent or related construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.
h. New and replacement building construction will be compatible with the mass, form, character-defining features and architectural style of the existing buildings and structures, and the setting so as not to obstruct views out from or into any historic district(s).
i. New compatible construction that occurs as infill within the existing pattern of development serves to preserve the historic character of the associated buildings and structures, and landscape features.
j. New and replacement building construction may accommodate additional square footage (i.e., square footage beyond that of the surrounding historic buildings) in the rear and on secondary elevations of the building. New and replacement construction will maintain compatibility of the front elevation with the scale, setback, and spacing of the surrounding historic buildings and structures, and landscape features.

Guidelines for Windows and Doors

a. Maintain windows and their functional and decorative features including but not limited to the following: frames, sashes, muntins, sills, decorative jambs and moldings, hardware, shutters and detail materials such as stained glass, beveled glass, textured glass or tracery to the extent possible. If windows and their functional and decorative features are failing or present a lead-based paint or other hazard, encapsulate, abate (such as dip-stripping), or replace with in-kind or imitative substitute building materials.
b. Maintain historic doors and their functional and decorative features including but not limited to the following: frames, panels, glazing, sidelights, fanlights, sur- rounds, thresholds, hardware and screen doors to the extent possible. If doors and their functional and decorative features present a lead-based paint or other hazard, encapsulate or replace with in-kind or imitative substitute building materials.
c. When an entire window or door requires replacement, it is appropriate to replace using imitative substitute materials where in-kind materials are not technically or financially feasible.
d. Awnings may be installed over windows and doors but should not obscure or damage the windows, doors, or other character-defining features.
e. Storm windows can be installed but should not obscure character defining features of the window. For example, if a window is a double-hung sash, install a storm window with a horizontal divider that matches the location of the divider on the existing window.
f. Storm doors can be installed so that they do not obscure or damage the existing door and frame. Select storm doors compatible with the color and character of the existing door.
g. If entirely new window openings or door openings are required, they should be installed on secondary elevations (rear elevation or elevations not visible from the street). The new windows should be compatible with, but not duplicate, the building's historic windows and fenestration to avoid creating a false historical appearance.
h. Windows or doors that have to be covered for security and other purposes should be locked, cleaned, and covered on the exterior or interior rather than infilled with a permanent material such as brick or concrete, where security requirements allow.

Guidelines for Entrances, Porches and Details

a. Maintain historic entrances, porches and their functional and decorative features including columns, pilasters, piers, entablatures, sidelights, transoms, steps/stairs, railings, floors and ceilings.
b. Maintain and repair historic entrances, porches and their features through appropriate methods. If repair or replacement of historical materials presenting a lead-based paint or other hazard is required, encapsulate, or replace with in-kind or imitative substitute building materials.
c. If a portion of an entrance, porch or feature is deteriorated beyond repair or presents a lead-based paint or other hazard, it is appropriate to replace using imitative substitute materials where in-kind materials are not technically or financially feasible.

d. If replacement of an entire entrance, porch or feature is necessary, it is appropriate to replace using imitative substitute materials where in-kind materials are not technically or financially feasible.
e. It is inappropriate to enclose a historic front or primary entrance or porch. If enclosure of a historic entrance or porch on a secondary elevation is necessary, design the enclosure to maintain the historic character of the entrance. For instance, recess the enclosure behind columns, balustrades and other features and/or consider using glass instead of solid materials.

Guidelines for Roofs

a. Maintain historic roof coverings, functional and decorative features (including but not limited to cresting, dormers and chimneys) whenever possible.
b. Protect and maintain roofing materials through regular maintenance using appropriate methods, including removal of debris from roofs and cleaning and maintenance of gutter systems.
c. If a portion of a historic roof covering or feature is deteriorated beyond repair, it is appropriate to replace using imitative substitute materials where in-kind materials are not technically or financially feasible, less durable, or are less climate resilient.
d. If replacement of an entire historic roof covering or feature is needed, it is appropriate to replace using imitative substitute materials where in-kind materials are not technically or financially feasible. If a historic roof has already been replaced with modern materials, modern material shall continue to be used in future replacements.
e. Gutter systems should be compatible with the historic character of the building and/or historic district. In-kind or imitative substitute gutter materials may be used and should avoid concealing other architectural features to the extent possible. If replacement of gutters is needed, it is appropriate to replace using imitative substitute materials where in-kind materials are not technically or financially feasible.
f. Non-functional concealed, built-in gutter systems may be repaired with in-kind or replaced with modern exposed gutters similar to others in common use within the neighborhood or historic district. Installation of exposed gutters should avoid concealing other architectural features to the maximum extent possible.
g. It is inappropriate to apply new features (such as balustrades, cupolas and cresting) where none currently exist. Restoration of missing historic features or historic roofing materials is not required.
h. New roof features such as skylights, vents, solar panels, antennas, satellite dishes and mechanical equipment should be installed in areas not visible from the street if possible.
i. Dormers and additions to roofs will be compatible with the character of the building in size, design and scale, and will be located in areas not visible from the street if possible.
j. It is inappropriate to use temporary measures long term, such as exposed tarpaper as a finished roofing material. In addition, tar or asphalt products should not be used to patch clay tiles, slate, wood or metal roofs. In-kind or imitative substitute materials may be used as patch treatment.
k. If historic roofing material has previously been replaced with a different material, i.e., if a slate, wood shingle, or clay tile roof has been replaced at some point in time with asphalt

shingles, it is permissible to re-roof with asphalt shingles, i.e., with the modern building materials.

Guidelines for Foundations and Walls

a. Maintain historic foundations and exterior walls that contribute to the historic character of a building, including their functional and decorative features such as cornices, bays, piers and pediments.
b. Maintain and repair materials, details and features of foundations and exterior walls through appropriate industry standard methods.
c. If a portion of a foundation, exterior wall or feature is deteriorated beyond repair, replace with in-kind or imitative substitute building materials.
d. If replacement of an entire foundation, exterior wall, or feature is necessary, replace with in-kind or imitative substitute building materials.
e. It is generally inappropriate to introduce new features such as windows, doors, and vents to front elevation exterior walls. If new features are required, features should be installed on secondary elevations (rear or side elevations, or elevations that are not visible from the street) whenever possible.
f. When required, it is appropriate to remove and replace exterior wall materials or features including but not limited to panels, pediments, bargeboard and cornices with in-kind or imitative substitute building materials.
g. In-kind or imitative substitute materials may be used on exterior walls. Imitative substitute materials will simulate the dimensions and finish of the historical building materials.

Guidelines for Historic Designed Landscapes and Features

a. Maintain features of historic designed landscapes to the extent possible including but not limited to the relationship and spatial arrangement of the various components of the landscape, water features, circulation patterns, topography, vegetation, structures, site furnishings and objects. Avoid removing, obscuring or concealing such historic landscape features to the extent possible.
b. Maintain historic designed landscape features including but not limited to fountains, sculpture, site and street furnishings, monuments and gravestones, walkways, sidewalks, fences, walls, and hills, trenches and terraces to the extent possible. If all or a portion of a historic designed landscape feature requires replacement, it is appropriate to replace with in-kind materials or with imitative substitute building materials, where such materials are appropriate. Recreation of designed landscape features is not required. Installation of new fencing where none currently exists is allowable. Installation of new fencing or replacement of existing fencing is not subject to any specific design requirements or other criteria considering it is impermanent and removable. Repair and replace existing historic fencing with in-kind materials or imitative substitute building materials.
c. Maintain historic plant materials through appropriate methods to the extent possible. If replacement of historic plant materials is necessary, replace with the same or similar species where possible and practicable, or with selections from an installation's approved

plant material list (if such a list is available). Removal of historic plant material may occur when there is a threat of or ongoing impacts to buildings and infrastructure. It is acceptable to remove historic plant material, including non-native species that are not compatible with and impact significant climatic factors such as water availability.

d. If a portion of a historic landscape feature is deteriorated beyond repair, replace the damaged portion using in-kind historical materials or imitative substitute building materials, if financially or otherwise feasible.
e. Replacement of a documented historic landscape feature that is not currently existing is not required.

Guidelines for Historic Districts

a. Maintain character defining views and view sheds into and out of historic buildings and historic districts including scenic vistas and open space to the extent possible.
b. Retain the historic community plan of historic districts including but not limited to cultural or man-made features such as circulation systems, streetscapes and furnishings, designed landscapes, setbacks, and monuments and statues, as well as the natural features such as open space, wooded areas, rivers and landforms, to the extent possible.
c. Free standing solar arrays are acceptable within historic districts since they are reversable landscape elements.

Guidelines for Circulation Systems and Paving Patterns

a. Maintain character defining circulation patterns including but not limited to streets, sidewalks, alleyways, driveways, bridges and green space along with their features such as curbing, surface materials, orientation, and landscaping, to the extent possible.
b. Maintain historic planting strips between the sidewalk and street as well as medians, and avoid paving over existing planting strips or medians, to the extent possible.
c. If a portion of a historic circulation or paving pattern or feature is deteriorated, replacement with in-kind or imitative substitute building materials is appropriate.
d. Repaving existing paved streets, sidewalks, alleyways, driveways, and bridges is not subject to any specific design requirements or other criteria.

Guidelines for Force Protection

a. Comply with force protection standards in a manner that maintains character-defining interior and exterior spaces, materials, and features to the extent possible.
b. Install force protection systems and equipment such as security systems, cameras and surveillance equipment, lighting and other equipment in a manner that maintains character-defining features and materials to the extent possible.
c. If possible, locate small components of sensor and surveillance technologies under building eaves or inside light fixtures to minimize the impact to the historic fabric and visual impact of a building, district and associated buildings and structures, and landscape features.

d. Locate ventilation equipment or other force protection utilities on inconspicuous elevations, such as on the rear façade, to limit the visibility from the public right-of-way and, if possible, screen from view utilizing landscaping, fences or walls appropriate to the character of the historic building and/or district.
e. If possible, install new force protection measures such as security bars, grilles, and ventilation equipment in a reversible manner so that the system can be removed in the future with minimal damage to the historic building.
f. It is inappropriate to remove, conceal, damage or destroy historic materials, features and finishes of historic buildings or landscapes for force protection purposes unless it cannot otherwise be avoided.
g. All interior alternations proceed as determined by mission needs.

Guidelines for Routine Maintenance

a. Routinely inspect the roof to ensure it is weather tight. Missing roofing materials should be replaced, and holes repaired according to methods in these guidelines. In-kind or imitative substitute building materials may be used for replacement and repairs.
b. Routinely inspect walls and foundations for insect and vermin infestation, moisture, cracks, deterioration and settlement. If problems occur, repair according to methods in these guidelines.
c. Routinely inspect the windows and doors to make sure they are operable and sealed properly to prevent water intrusion.
d. Routinely inspect potential points for water intrusion such as crawl space openings, foundations and basement windows to make sure water is being diverted away from the building.
e. Routinely inspect potential points for moisture intrusion such as masonry wicking in moisture, and condensation from poorly ventilated attics.
f. Gutter systems should be routinely cleaned and inspected to ensure they discharge water away from the building and do not leak.
g. Ensure that painted surfaces have a sound non-lead-based paint film, including but not limited to the following: walls, windows, doors, and architectural details.
h. Avoid painting or sealing unpainted masonry, glass or metal surfaces since this could accelerate deterioration.
i. Repair loose architectural features including but not limited to the following: brackets, rafters, pediments, cornices, balustrades, shutters, storm windows and doors, and siding, to the maximum extent possible.
j. Repair damaged structural features, such as masonry settling, eaves and porch posts in a timely manner before further structural damage occurs. In-kind or imitative substitute building materials may be used.
k. Vegetation around the historic property should be maintained and pruned back from the walls and foundations at least 12 inches. Remove ivy or other vegetation from walls and remove overhanging tree limbs and branches.
l. Remove trees and other vegetation when necessary to prevent gutter clogging, drainage issues, damage to infrastructure, or for safety purposes.

m. Mechanical, electrical and plumbing systems should be routinely inspected to make sure they are operating efficiency and correctly.

Guidelines for Emergency Repairs and Disasters

a. It is appropriate to make temporary emergency repairs to pre-1941 buildings. The repairs should be done in a manner that will cause minimal harm to the historic property if possible. Appropriate temporary repairs include the use of tarpaulins, plywood and bracing timbers to stabilize and secure the building. Make permanent repairs as soon as possible.
b. Remove standing water from basements and crawl spaces; however, ensure that pumping water will not collapse foundations when groundwater is high.
c. Remove all water-soaked materials including insulation, wall- board and wall coverings.
d. Air dry the building with ventilation. Avoid systems that pump in super-dry air.
e. Remove debris from and around the historic property including damaged trees and overhanging tree limbs.
f. Remove loose and damaged plaster and replace with in-kind or imitative substitute building materials, replacement of plaster with drywall is acceptable.
g. Clean and sanitize historic features using non-abrasive cleaners.
h. Features that are deteriorated or damaged beyond repair may be replaced with in-kind or imitative substitute building materials, replacing only the damaged portion if possible.

Guidelines for Mothballing Buildings

a. Ensure that roofs are weather tight by replacing missing shingles or tiles and repair openings in an accept- able method. In-kind or imitative substitutive building materials may be used for missing roofing materials.
b. Gutters should be cleaned and inspected to ensure they do not leak and that they discharge water away from the building. Additionally, potential points of water intrusion such as basement windows and crawlspaces should be inspected and blocked to divert water away from the building.
c. Walls and foundation should be inspected for deterioration and damage. Make appropriate repairs to prevent moisture and water penetration This includes repointing of masonry surfaces and repainting of wood siding.
d. Entry points should be sealed by closing door and window openings using infill materials such as plywood, corrugated panels and metal grates or grilles. The installation of infill materials should not damage door and window openings and associated building features such as sashes, doors and frames.
e. Exterior doors should be reinforced and secured. If the historic doors would be damaged by adding reinforcement, temporarily remove the doors and replace with secure modern doors. Store historic doors on site for reuse if possible.
f. Shut off water utilities to the building and drain the pipes.
g. If the building has monitoring and alarm devices such as fire suppression systems, fire alarms and security alarms, they should remain operational, especially functional sprinkler systems.

h. Disconnect all electrical systems not necessary for security, fire prevention and/or ventilation.
i. Loose architectural and structural features such as brackets, porch posts, balustrades and mantels should be repaired. If repair is not feasible, document, and remove the features. Inventory and store the features in a manner that prevents deterioration if the features can be reused.
j. Pest infestation should be exterminated and properly seal off their access to the building, which includes properly screening chimneys, vents, grills and louvers with a heavy-duty wire mesh and termite treatments.
k. The building should be adequately ventilated. This will vary depending on the building, the climate and the building's freeze-thaw cycle. Solutions range from the covering of small openings with heavy duty wire mesh to forced air ventilation in humid climates.

Appendix D: Building Materials Guidelines and Catalog for Pre-1941 Buildings, Structures, and Landscapes

Using the Building Materials Catalog in Selecting In-Kind and Imitative Substitute Building Materials

The building materials selection procedure, the *Design Guidelines*, along with the *Building Materials Guidelines and Catalog* establishes a standard procedure and guidance, and a catalog for the selection of appropriate building materials for implementation of management actions on exteriors of pre-1941 buildings and structures.

Building Materials Guidelines and Catalog entries are provided for major components of the building design. Design considerations for each entry are derived from the design fundamentals of scale, mass, proportion, and materials to develop guidance for materials and component design that factor location, type, size, finish, and maintenance in their selection. Emphasis is placed on retention of the design integrity of the dwelling and surrounding district through a three-step process: identifying existing and/or historic applications; identifying design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project; and selecting in-kind or imitative substitute materials meeting the design considerations.

Building Materials Catalog Entries:

Foundations

The *Design Guidelines* support the repair and maintenance of historic materials used in foundations, when appropriate. In cases where replacement of foundation materials is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the size and finish of the historic building material are approaches authorized under the *Design Guidelines*.

Building foundations are the structural systems that support buildings. For the purposes of application of the *Design Guidelines,* foundations are limited to the elements of the foundation system that are visible at the base of a dwelling. These elements include exterior foundation cladding, piers, bulkheads, windows, and water tables.

The following discussion of treatments appropriate to the replacement of deteriorated foundations applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project; and 3) Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

Historic Use - Army foundation systems are generally excavated systems. Exposed foundation walls typically found in include concrete, brick, stone, and stucco.

Design Considerations: Five major factors should be considered in the selection of in-kind and imitative substitute materials simulating exposed foundation materials and design elements: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building and the associated historic district:

Location: The historic location and visibility of the work may be considerations in exterior foundation projects. Consider repair and/or replacement approaches that maintain the amount of foundation historically visible, particularly on elevations with the greatest prominence within the historic area. Select materials that simulate the historic foundation cladding type, when possible. The location of foundation features, such as bulkheads, windows and window wells, and exterior doors, should be retained, when possible, to maintain the design of the building and the pattern established by the design of the area. Consider the location of necessary mechanical systems adjacent to secondary or rear elevations.

Type: Retain or replicate the type and materials of the historic foundation when possible. Consider design strategies that may visually maintain the appearance of the original foundation type should foundation alteration prove necessary. Consider the integration of new facing finishes, such as stone and brick that match historic stone and brick in type in foundation projects. Consider the composition of historic concrete and stucco, which effects the material's visual character as well as permeability, density, and compressive strength. For example, concrete is composed of three ingredients: water, aggregate, and cement. Aggregate constitutes the majority of the concrete mix, up to 80 per cent by volume, and can be fine or course, ranging from sand to stone. Composition affects the visual characteristics of concrete. Consider matching those visual characteristics, when possible.

Size: Consider simulating the historic proportions of individual facing units and the height of the historically exposed foundation. For example, brick units should be repaired and/or replaced with units that simulate the width, length, and depth and coursing of the historic brick. Similar approaches should be considered in the selection of stone veneers, as possible.

Finish: Masonry, concrete, and stucco are materials that can be parged with a finish coat, painted, or left in their natural state. Simulating the color, texture, and reflective quality of the historic finish is recommended, when possible. Texture, such as rusticated or smooth finishes, can be the result of the manufacturing process or added during installation. Consider finishes that are comparable in color and type of finish with both the historic building design and with the surrounding historic district, where possible. In projects involving selective repair to exterior foundation walls, test patches of materials on less visible, secondary elevations should be considered, when possible, to assure their acceptability in the overall building design. Consider compatible mortar composition when repairing or replacing damaged mortar.

Design Maintenance: Foundations are vulnerable to moisture and structural or seismic movement. Cracking, spalling, water staining, mold, and unwanted vegetation can be symptoms of conditions that may affect the life expectancy of foundation projects and may compromise the appearance of the work over time. Water infiltration often is a contributing factor to appearance. Consider monitoring gutters, downspouts, flashing, and sprinklers regularly to encourage drainage away from the building to extend the installation appearance of foundation repairs and/or replacements.
Recommended Materials:

In-kind Repair and / or Replacement: In-kind replacement and repair of foundations is a treatment option identified in the *Design Guidelines*. In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *Preservation Brief 15 Preservation of Historic Concrete* and *Preservation Brief 22 The Preservation and Repair of Historic Stucco* particularly may be relevant to foundation projects.

Imitative Substitute Materials: Imitative substitute materials for repair and / or replacement of existing building components is a treatment option allowable under the *Design Guidelines* provided that the imitative materials are consistent with the *Design Guidelines* and consistent with the design considerations identified for the building element. Further guidance can be found in *Preservation Brief 16: The Use of Substitute Materials on Historic Exteriors.*

The following list provides examples of imitative substitute materials. This list is not intended to be comprehensive and is limited to the most common types of imitative substitute materials currently available. New materials and building products may be introduced in the future that meet the *Design Guidelines* and design considerations.

Manufactured Stone Veneer	Also known as architectural stone or veneer stone, manufactured stone veneer is an engineered product intended to look like natural stone. It is composed of a mixture of Portland cement, iron oxides, and aggregates. Manufactured stone veneer is light,

	uniform, and widely available. However, the color can fade over time and veneers are often brittle.
Veneer	Veneer is a thin layer of natural stone or brick typically applied over masonry or non-masonry surfaces. It is a durable product that often is less expensive than structural brick and stone.
Acrylic Stucco	Acrylic stucco, a synthetic stucco, is composed of acrylic resins and polymers. The material is designed to be applied over masonry or cement to replicate the texture and appearance of stucco. It is water-repellent, elastic, flexible, and durable. It is not prone to hair-line cracks or flaking. Acrylic stucco is produced with a variety of aggregates and custom textures. Acrylic stucco is produced with a range of colors and can be painted. Similar to traditional stucco, finish coats can be added. Acrylic stucco generally is more expensive than traditional, concrete-based stuccos. Acrylic stucco generally is not recommended for spot-repairs to historic stucco due to materials compatibility and aesthetic differences over time as materials age.
Masonry Block/Precast Stone	Precast stone, also known as masonry block, is a concrete product that is manufactured to simulate the appearance of natural stone. It can be customized to simulate the size and finish of historic units.
Precast Concrete Slab	Precast concrete slabs are molded concrete slabs, and in ideal conditions, fabricated off-site. The resulting product typically is stronger than slabs cast onsite because of variables such as weather and temperature. Precast slabs easily are installed and eliminate many labor costs associated with pouring concrete onsite.

Exterior Wood Cladding (Siding, Shakes, and Shingles)

The *Design Guidelines* support the repair and maintenance of historic materials used in exterior wall claddings, when appropriate. In cases where replacement of exterior wall cladding is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the size, design, and finish of the historic building material are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of deteriorated exterior wood cladding applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the

requirements of the project; and 3) Select in-kind or imitative substitute materials meeting the design considerations and Design Guidelines.

Historic Use: Exterior wooden claddings were used in historic Army buildings the as a primary wall material, as the exterior cladding in wings and additions, and as claddings for support structures, such as garages.

Board Cladding: Wooden board cladding visually is defined by milling and installation. Wood siding can feature smooth or rusticated textures; the size and width of the boards can vary greatly. Frequently wood siding is painted or stained. Typical fabrication and characteristics include Tongue-and Groove (Flush and interlocked), Clapboard / beveled (thicker on one edge), and Board-and-batten (Vertical planks with narrower planks, battens, placed over the seams).

Shingles: Visually, shingles and shakes are differentiated through the method used to produce them. Shingles should not be replaced with units that are visually shakes and vice-versa. Shingles are smooth and sawn on both sides; finish of drop edge may be straight or curved. Shakes are sawn on one side, rough on one side.

Design Considerations: Five major factors should be considered in the selection of in-kind or imitative substitute materials simulating exterior wood cladding: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building and the associated historic district:

Location: The historic use of wood siding in the overall building design and the visibility of the proposed work may be considerations in wood cladding replacement. Consider replacement installation limited to those areas of the building currently or historically finished in wood cladding. Particular care should be taken in selecting replacement materials for installation on primary elevations with the greatest visibility within the historic area.

Type: Cladding type often results in distinctive wall appearance. For example, drop siding features short runs of overlapping boards, tongue-and-groove siding comprises inter-connecting units that create a smooth surface, overlapping shingles create irregular wall textures. Replacement materials should be selected to simulate the type of historic cladding and to simulate the historic exterior wall appearance.

Size: The dimensions of the cladding type also are factors in the appearance of the exterior wall. Replacement cladding should approximate the overall height, width, and depth of the existing or historic fabric as closely as possible. Replacement that strives to replicate the dimensions of historic cladding, where possible, will contribute to the preservation of the overall design integrity of the individual building as well as maintain consistency within the historic district.

Finish: Pigment medium, texture, and reflective quality of finishes to exterior wood cladding can contribute to the visual character of the exterior building design and the historic district. Pigment mediums, including paint and stains, used in replacement should simulate the finish medium, texture, and reflective quality of the existing or historic materials, where possible. The selection

of paint or stain color should consider compatibility with the historic area. However, it is not necessary to utilize original colors that may have been determined through a chemical paint analysis. Elastomeric paints are designed to protect masonry surfaces and not appropriate for wooden elements.

Design Maintenance: The character of in-kind materials and imitative materials also may differ over time as the materials age. Selective replacement of deteriorated wooden cladding using imitative substitute materials may become more aesthetically apparent with time. Consider replacement strategies that limit or avoid the potential of unintended impacts to design integrity, when possible.

Recommended Materials:

In-kind Repair and / or Replacement: In-kind replacement of wood cladding is a treatment approach identified in the Design Guidelines. In-kind replacement of historic materials should be consistent with the Design Guidelines and design considerations identified for the element. Wood siding continues to be produced and is widely available. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *Preservation Brief 47 Maintaining the Exterior of Small and Medium Size Historic Buildings* particularly may be relevant to wood cladding.

Imitative Substitute Materials: Replacement of wood cladding with cladding fabricated in imitative substitute materials is an allowable treatment approach provided that the imitative substitute material meets the Design Guidelines and design considerations. Further guidance on material selection and installation can be found in *Preservation Brief 16 The Use of Substitute Materials on Historic Exteriors* and *Preservation Brief 8 Aluminum and Vinyl Siding on Historic Buildings: The Appropriateness of Substitute Materials for Resurfacing Historic Wood Frame Buildings.* The following list provides examples of imitative substitute materials for wood siding. Please note that the list of materials is anticipated to expand as new materials and products are introduced and become available.

Cellular Composite	Cellular composite siding is a comparatively new product on the market. Available for residential use for approximately a decade, it utilizes an interlocking installation system. The product is currently manufactured by less than five manufacturers; and, there is limited performance data on its durability over time.
Engineered Wood	Engineered wood is composed of compressed resin and wood chips. Generally, it is treated to protect against rot and termites; it does not rot. Additionally, it performs well under most weather conditions. The siding requires maintenance and painting.

Fiber Cement / Cementitious	Fiber cement is a cementitious material composed of cement, sand, water, and fiber. It is significantly heavier than other siding options making installation more difficult. Fiber cement requires periodic caulking between joints. Fiber cement can be textured to simulate natural wood and is generally factory finished. The material can be susceptible to chipping. It must be repainted approximately every 15 years.
Metal	Aluminum siding is light and easy to install. Aluminum siding requires regular maintenance and is prone to damage, denting, melting, warping, and expansion and contraction. Steel siding is considerably more durable, but heavier than its aluminum counterpart. Steel siding is susceptible to rust as well as similar damage as aluminum.
Vinyl	Vinyl is the most common imitative wood siding. It primarily is composed of polyvinyl chloride (PVC) resin. Vinyl is water resistant rather than waterproof and is subject to expansion and contraction with seasonal temperature changes. The benefits of vinyl are its wide availability, low price, versatility of color, texture, and size, familiarity, low maintenance, infrequent cleaning, and ease of installation. May be affected by extreme heat or cold.
Wood Composite	Wood composite is an innovative and environmentally friendly product. Composite typically is fabricated from a mixture of wood fiber, recycled plastic, and a binder. The materials are significantly lighter than wood; replicate wood grain, color or stain, and milling; and come in varying sizes and widths.

Exterior Masonry

The *Design Guidelines* support the repair and maintenance of historic materials used in exterior wall claddings, when appropriate. In cases where replacement of exterior wall cladding is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the size and finish of the historic building material are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of deteriorated exterior masonry cladding applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the

requirements of the project; and 3) Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

Historic Use: Historic masonry, defined in this section as brick, stone, and adobe typically was sourced locally during the Inter-War period. Masonry is composed of the masonry unit and the mortar and extends to all elevations. Generally, masonry is unpainted and can feature quoins and water tables. Early stone masonry construction typically was solid, but stone veneer also can be present in some buildings. It commonly is rubble arranged in courses. Brick masonry typically features extruded brick with consistent composition and firing resulting in uniform units. The use of adobe brick is typically limited to buildings in the southwest and includes site manufactured or commercial cast unstabilized adobe brick.

Design Considerations: Five major factors are suggested for consideration in the selection of in-kind historic materials or imitative substitute materials simulating exterior masonry cladding: location, type, size, finish, and design maintenance. Consideration of these factors will support maintenance of the overall historical and architectural character integrity of the building and the associated historic district, as appropriate:

Location: Exterior masonry can be a dominant design characteristic of dwellings and associated residential neighborhoods. Masonry frequently establishes the color palette and architectural rhythm of an area through standardized materials and standardized construction techniques. Consider the visibility of proposed improvements to both the building and to the area, as appropriate. Particular attention should be paid to the existing design of primary elevations and those elevations with the greatest prominence. Maintain existing patterns of structural bays, where possible. Limit new masonry work to areas historically containing exposed masonry, as possible.

Type: Consider matching the appearance of historic masonry as closely as possible. Replace brick with brick and stone with stone. Consider the source and characteristics of the historic material, where possible. Local clay mixes often produced standardized bricks in distinctive colors due to their chemical composition. Simulating historic stone type in replacement projects often is aesthetically desirable in executing repair, replacement, or additions to masonry buildings. Consider simulating the method of installation as well as the type of masonry unit. Coursing type generally refers to how the stone or brick units are laid in a wall. Typically, stone masonry can be coursed or uncoursed ashlar or rubble. Stone historically was laid either in organized rows or courses; or laid in a random pattern. Each technique resulted in a unique wall pattern, which should be matched when possible. Bricks are laid in courses as either stretchers (lengthwise) or headers (widthwise). These courses are described as the brick bond. The most common bonds are running (all stretchers), common (running bond with intermittent courses of headers), and Flemish (alternating stretchers and headers). Brick bonds are decorative as well as structural. Brick bonding patterns are features of the historic wall that should be matched, if possible. Also consider simulating the mortar type, width, and profile of mortar joints uniting historic masonry units in the overall wall, as appropriate. Matching mortar type can prevent further damage by utilizing a compatible material. The type and size of mortar joint used in a

masonry wall often is a design as well as a structural feature. Matching mortar profiles in projects, such as selective repointing, can contribute to projects that blend with the original wall.

Size: Consider the dimensions of the historic masonry units in repair and replacement projects. Replacement masonry should approximate the overall height, width, and depth of the existing units as closely as possible. Replacement that strives to replicate the dimensions of historic masonry units, where possible, will contribute to the preservation of the overall design integrity of the individual building as well as maintain consistency within the historic district.

Finish: Pigment medium, texture, and reflective quality of finishes of masonry cladding can contribute to the visual character of the exterior building design and the historic district. Mortar and masonry units have different finishes, both of which should be simulated, when repair or replacement become necessary. Wet, dried, and cured mortar produce different colors. Mortar joints, or the application or shape, may be concave, flush, beaded, weathered, extruded, vee, or raked. The color of brick is determined by the material and chemical compounds of which they are composed. Most commonly red bricks made primarily of sand, clay, and iron oxide are used in construction. Additionally, differently colored masonry units typically are used on the same building to create visual interest. Color can be used as a decorative element that is integral to the appearance of the building. Stone naturally occurs. The color can be specific to the quarry from where it was mined. However, typically, there is color variation within stones used on buildings. Additionally, buildings can be constructed with a range or selection of stone colors used with varying frequencies. Identify the color variation of masonry units and mortar before selecting in-kind or imitative substitute units that match historical patterns as closely as possible.
Design Maintenance: Historic masonry that is maintained in place should be repaired, replaced, and cleaned using methods that follow preservation guidance found in *The Secretary of the Interior's Standards for the Treatment of Historic Properties* and *Preservation Brief 2 Repointing Mortar Joints in Historic Masonry Buildings*. Matching historic walls in selective wall repair using imitative substitute masonry may pose challenges. Such challenges often lead to recladding full elevations. Consider how new in-kind and imitative substitute material will age over time. Differences between new and historic materials as they age can make acceptable finished work more obvious over time.

Recommended Materials:

In-kind Repair and / or Replacement: In-kind replacement of exterior masonry is a treatment approach identified in the *Design Guidelines*. In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *Preservation Brief 2 Repointing Mortar Joints in Historic Masonry Buildings* and *Preservation Brief 5 Preservation of Historic Adobe Buildings* are relevant to exterior masonry projects.

Imitative Substitute Materials: Replacement of exterior masonry with cladding fabricated in imitative substitute materials is an allowable treatment approach provided that the imitative

substitute material meets the *Design Guidelines* and design considerations. Further guidance can be found in *Preservation Brief 16 The Use of Substitute Materials on Historic Exteriors.* The following list provides examples of imitative substitute materials for masonry siding. However, there are limited imitative options available. Brick still is produced widely; stone also remains available. Please note that the list of materials is anticipated to expand as new materials and products are developed and become available.

Manufactured Stone Veneer	Also known as architectural stone or veneer stone, manufactured stone veneer is an engineered product intended to look like its natural counterpart. It is composed of a mixture of Portland cement, iron oxides, and aggregates. It is light, uniform, and widely available. However, the color may fade over time and the product is brittle.
Veneer	Veneer is a thin layer of natural stone, brick, or adobe bricks typically applied over a masonry or non-masonry surface. It is a durable product. Additionally, it is less expensive than brick, stone, or adobe.
Precast Stone, Stabilized adobe brick, Compressed adobe brick	Precast stone is a concrete product that is manufactured to simulate the appearance of natural stone. It can be customized to simulate the size and finish of historic units. Manufactured stabilized adobe brick is made from a mixture of water, coarse and fine sands, silt, clay and straw or animal hair as well as a stabilizing additive to provide extra protection against moisture and/or erosion and is used in lieu of unstabilized adobe brick. Compressed (or pressed) adobe brick is brick that has been mechanically pressed during manufacture. Caution should be exercised with the use of compressed adobe brick in the repair of buildings with unstabilized adobe brick. The high expansion rate of compressed bricks may lead to damage of unstabilized adobe brick.

Stucco Cladding

The *Design Guidelines* support the repair and maintenance of historic materials used in exterior wall claddings, when appropriate. In cases where replacement of exterior wall claddings is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the size and finish of the historic building material, are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of deteriorated exterior stucco cladding applying the *Design Guidelines* is based on a three-step process: 1) Identify

existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project; and 3) Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

Historic Use: Stucco is composed of a mix of mud, clay, lime, chalk, cement, and gravel. The composition of stucco can be unique to the building to which it is applied. Historically, stucco is applied in layers directly onto a substrate such as structural tile or masonry in stucco walls and foundations. Stucco also was applied over wood or metal lath. Stucco acts as a sealant for the building envelope, and when applied correctly and maintained, protects against wind and water damage. The material is fire resistant. Stucco siding was utilized as a finish limited to single stories in multi-story dwelling and applied as a cladding for the entire building envelope.

Design Considerations: Five major factors should be considered in the selection of in-kind or imitative substitute materials simulating exterior stucco cladding: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building and the associated historic district.

Location: Stucco exterior finishes often are character-defining design features. Consider maintaining areas of a building exterior that historically were finished in stucco with in-kind historic materials or with imitative substitute materials that will maintain the original design. Avoid the installation of stucco in areas where it was not historically used, when possible. Consider maintaining the original design for exterior wall finishes on visually prominent areas, such as facades, to maintain the historical and architectural character of the dwelling and associated historic neighborhood.

Type: Consider the composition of the historic stucco when repairing or installing imitative materials, as appropriate. Repairs using incompatible material may fail and can be visible despite appropriate installation. Consider consulting historic construction documents for historic stucco composition, when available. Composition also may be determined through the analysis of existing stucco.

Size: Stucco can include a fine or coarse grain substrate, which determine its texture. Fine-grain substrate results in a more plaster-like texture, while a courser grain results in a rougher finish. Consider matching existing stucco texture when consistent finish surfaces are desired.

Finish: Stucco finish coats and / or paint were applied to achieve the finish and color of the exterior surface. Consider simulating historic finishes, where possible. Historic stucco typically comprised three layers: the scratch, brown, and finish coats. Modern stucco generally is limited to one or two coats applied over fiber-reinforced stucco. The finish, top, coat provides the texture of the final stucco. Finish coats are determined by the tools used in application and can range from smooth to rusticated surfaces. Consider simulation of the historic finish in repair and/or replacement projects to achieve visual cohesion of the building's surface and within finishes found in the associated historic district.

Design Maintenance: Consider maintenance of existing stucco finishes using methods suggested in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings* and *Preservation Brief 22: The Preservation and Repair of Stucco*, when in-kind materials are project treatment options. Imitative substitute stucco materials include both "systems," such as multi-layer boards with a stucco-textured finish, and synthetic stucco. These imitative substitute materials generally are designed as whole-wall treatments for new wall construction. Matching existing wall appearance and imitative substitute materials can be challenging and differences between historic and imitative substitute materials may become visually obvious over time as the materials age. Consider finish coats or the addition of paint films to unify the aesthetic appearance of the wall, as appropriate.
Recommended Materials**:**

In-Kind Repair and / or Replacement: In-kind replacement of stucco cladding is a treatment approach identified in the *Design Guidelines.* In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *Preservation Brief 22 The Preservation and Repair of Historic Stucco* particularly may be relevant to exterior stucco projects. After 1900, most stucco in the United States was composed of Portland cement and lime (now gypsum). During the pre-1941 period, the typical stucco mix included: one-part Portland cement, two-and-a-half parts sand, lime totaling less than 15 per cent of the cement's volume, and enough water to make the mix workable. Generally, repair or replacement projects are limited to the area of damage. The root cause of damaged stucco typically is water infiltration or building movement. Damage and deterioration will continue to occur if water infiltration is not stopped. Monitor gutters and downspouts to assure that water is draining away from the surface of the building and that sprinklers and other watering systems are not spraying the building. These efforts can help prevent stucco damage and the unwanted growth of mold and vegetation. In buildings where stucco has been repeatedly replaced thereby creating a patchwork appearance, consider removing previous repairs prior to patching. Minor hairline cracks larger than .030 inches typically can be corrected with a thin skim coat of stucco. Caulk is not a long-term solution for material for repairs and generally, has a high failure rate. Stucco should be flush with the surrounding area and blended to be as seamless as possible. Consider using a compatible stucco mixture that simulates the density and porosity of the original material, when possible.

Imitative Substitute Materials: Replacement of stucco cladding with imitative substitute materials is an allowable treatment approach provided that the imitative substitute material meets the Design Guidelines and design considerations. Further guidance can be found in *Preservation Brief 16 The Use of Substitute Materials on Historic Exteriors.* The following list provides examples of imitative substitute materials for stucco siding. Please note that the list of materials is anticipated to expand as new materials and products are introduced and become available.

Acrylic Stucco	Acrylic stucco, a synthetic stucco, is composed of acrylic resins and polymers. The material is designed to be applied over masonry or cement to replicate the texture and appearance of stucco. It is water-repellent, elastic, flexible, and durable. It is not prone to hair-line cracks or flaking. Acrylic stucco is produced with a variety of aggregates, and custom textures are available. Additionally, it is produced with a range of colors and shades. It can be painted. Like historic stucco, finish coats can be added during installation. Acrylic stucco can be applied over Exterior Insulation and Finish Systems (EIFS) to provide a customized finish. However, acrylic stucco generally is more expensive that traditional, concrete-based stuccos.
Exterior Insulation and Finish Systems	EIFS is a multi-layer system that has both face-sealed and drainable versions. The drainable version includes a water-resistant barrier, drainage plane, insulation, reinforced mesh, water-resistant coat, and a topcoat. The face-sealed version does not include the drainage plane. EIFS is a lightweight, waterproof, malleable, insulating, and inexpensive material. Without correct installation, water easily can be trapped between the layers of the material causing mold, rot, rust, and, ultimately, failure. This issue is compounded by installation over substrates, such as wood, that also trap moisture and using the face-sealed version. In the past 20 years, EIFS has been reengineered to include weep holes, which has abated earlier serious issues with moisture; however, care should be undertaken to insure proper installation. Acrylic or traditional stucco can be applied on top to provide a custom finish.
Elastomeric Paint	Elastomeric, or acrylic, paint can be applied to newly installed acrylic stucco, EIFS, or fiber cement boards. However, it has limited use on historic stucco and should not be applied. It is only appropriate to apply cement-, latex-, or oil-based paints to historic stucco.
Fiber Cement Board	Fiber cement is composed of cement, sand, and cellulose fibers. It is a customizable material that allows for the application of stucco over the board. A skim coat can be applied to match the surrounding historic stucco. Additionally, some cement boards are manufactured with a stucco finish and are pre-primed for painting. Fiber cement boards often are manufactured to be water resistant and insulating. Additionally, it is durable. However, it is heavy and difficult to cut. Acrylic or traditional

	stucco can be applied on top to provide a custom finish.

Roofing

The *Design Guidelines* support the repair and maintenance of historic materials used in roofs, when appropriate. Associated elements to roofing include eaves, valleys, drainage features, pediments, cornices, brackets, chimneys, and flashing details. In cases where replacement of roof sheathing is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative materials that simulate the size and finish of the historic building material are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of deteriorated roof sheathing applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project; and 3) Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

Historic Use: Several types of roof sheathing historically was used in Army buildings including slate, clay tile, and metal. While roof form and material vary, associated elements tend to be limited to one or two historic materials. For example, historic drainage features such as gutters are most likely metal. Chimneys historically were clad in brick, concrete, or stucco.

Clay Tile: Clay tiles historically were produced by baking molded clay into tile. Installation includes pantiles, flat tiles, or field tiles. Pantiles are convex or rounded tiles, often grouped together generically as “pantiles”. These include Spanish tiles (sometimes referred to as “S” tiles) or the similarly shaped Mission or “Barrel” tiles. Flat, shingle tiles can either be flat or interlock at the top and on one side. Although the interlock holds them together, most interlocking shingle tiles also have one or more holes near the top for nailing to the roof sheathing. Plain or flat tiles require nailing and are not interlocked. Field tiles are those covering the majority of the flat surface of the roof. Some roof shapes, such as towers or turrets, require tiles of varying sizes, and some shapes or patterns of field tiles also require specially shaped finish tiles to complete covering the roof.

Slate: Slate is a fine-grained, foliated, homogeneous metamorphic rock manufactured as a tiled roofing material. The mineral composition of slate will determine the color and weathering properties.

Metal: Sheets of lead and copper have been used for roofing since classical times. Usually, metal roofs are applied large sheets joined with standing seams to prevent leaks. In the early 19th century, sheet iron coated with zinc, tin, or lead to prevent rust came into use. Later in the 19th century stronger corrugated panels of iron became common.

Design Considerations: Five major factors should be considered in the selection of in-kind and imitative substitute materials simulating roof sheathing: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building and the associated historic district:

Location: The historic use of roof sheathing in the overall building design and visibility of the proposed work are recommended considerations when choosing a suitable replacement material. Depending on material, it may be more feasible to replace an entire roof while, in some considerations, it may be more appropriate to replace only damaged shingles or tiles. Drainage features, such as gutters, are recommended to follow a similar path and placement unless such patterns no longer provide functional use.

Type: Sheathing type often results in distinctive roofing appearances. For example, pantiles are installed to produce a "barrel" or "S" shape, while flat tiles are installed to create a smooth, flat surface. Replacement materials should be selected to simulate the type of historic sheathing and to simulate the historic roof appearance through shape, texture, color, and installation. Ensure the use of compatible fasteners.

Size: The dimensions of the roof tile or shingle, drainage feature, and decorative feature also are factors in the appearance of the roof. Replacement shingles or tiles should approximate the overall height, width, and depth of the existing or historic fabric as closely as possible. Replacement that strives to replicate the dimensions of historic shingles or tiles, where possible, will contribute to the preservation of the overall design integrity of the individual building as well as maintain consistency within the historic district. Decorative features such as cornices or pediments are recommended to retain similar size and dimensions to historic units. Drainage features, such as gutters, also are recommended to retain similar size and dimensions unless functional use requires them to be expanded.

Finish: Roof shingles or tiles may be naturally colored or textured or painted and glazed. Pigment medium, texture, and reflective quality of finishes of the shingles or tiles can contribute to the visual character of the building design and the historic district. Pigment mediums, including paint and glazes, used in replacement sheathing should simulate the finish medium, texture, and reflective quality of the existing or historic materials, where possible. The selection of paint or natural-colored materials should consider compatibility with the historic area: both the dwelling roof and those of the historic district. It is important to remember asbestos shingles were designed as imitative substitute materials for slate and clay tile. Imitative substitute materials should simulate those slate or clay tile finishes. Decorative and drainage features are recommended to exhibit a similar texture, finish, and color as historic units. For example, replacing an historic copper gutter system with a white, vinyl gutter system will significantly alter the texture, color, and finish of the system and is not recommended.

Design Maintenance: When in-kind materials are selected as a treatment approach, consider roofing repair and replacement methods that follow preservation guidance found in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings* and *Preservation Brief 29: The*

Repair, Replacement, and Maintenance of Historic Slate Roofs and *Preservation Brief 30: The Preservation and Repair of Historic Clay Tile Roofs*. Consider selective repair of damaged units to prevent further failure, when possible. Consider stockpiling extra roofing used in repair or replacement projects for future work. Ready access to either in-kind or imitative materials used in earlier work can be cost efficient and assure materials match in future work.

Recommended Materials**:**

In-kind Repair and / or Replacement: In-kind replacement of roof sheathing is a treatment approach identified in the *Design Guidelines*. In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *Preservation Brief 4 Roofing for Historic Buildings, Preservation Brief 19 The Repair and Replacement of Wood Shingle Roofs, Preservation Brief 29 The Repair, Replacement, and Maintenance of Historic Slate Roofs, and Preservation Brief 30 The Preservation and Repair of Historic Clay Tile Roofs* particularly may be relevant to roof projects.

Imitative Substitute Materials: Replacement of roof sheathing with sheathing fabricated in imitative substitute materials is an allowable treatment approach provided that the imitative material meets the Design Guidelines and design considerations. Further guidance can be found in *Preservation Brief 16 The Use of Substitute Materials on Historic Exteriors.* The following list provides examples of imitative substitute materials that may meet the Design Guidelines and design considerations for roofing. Please note that the list of materials is anticipated to expand as new materials and products are introduced and become available.

Tile	Composite tile provides the same look as traditional clay and concrete shingle tiles but are lightweight and are installed without the need for structural roof modifications. Composite tile can be installed in cold and warm weather climates with no risk of cracking due to weatherization.
Engineered Wood	Engineered wood to replace wood shingles is composed of compressed resin and wood chips; generally, it is treated to protect against rot and termites. It is significantly less expensive than traditional wood shingles and does not rot. Additionally, it performs well under most weather. However, it requires painting and upkeep of color.
Fiber Cement	Fiber cement is composed of cement, sand, water, and fiber. It is typically more expensive and significantly heavier than other options, making installation more difficult. Additionally, fiber cement requires periodic recaulking of joints. It must be repainted approximately every 15 years.

Asphalt Composition	Asphalt composition tiles are the most common roofing material in the United States. Usually, asphalt shingles are made of either fiberglass or organic recycled paper-based products mixed with asphalt, which is then covered with colored mineral granules. These shingles can be manufactured to imitate a variety of roofing tiles including slate. While the cost is relatively cheap, averaging seven to twelve dollars per square foot, the lifespan averages 20 years and the material requires regular maintenance. Architectural asphalt shingles are produced to better simulate the appearance of the historic material.
Plastic and Rubber Composites, Membrane	Plastic and synthetic rubber composites are plastics that are strengthened with fibers, fillers, particulates, powders, and other matrix reinforcements to provide improved strength or stiffness. Several manufacturers produce plastic and rubber composites that are marketed as synthetic slate roof tile that simulate weathered slate tiles. Membrane is generally used on flat or low-sloped roofs.
Resin	Resin is a flexible material that can be used in both interior and exterior molding. It is resistant to insects and moisture and does not warp, crack, or deteriorate. It can be molded in custom shapes, nailed, glued, sawn, or drilled. It typically is heavier than PVC or vinyl.
Metal	Metal roofs typically are composed of steel, aluminum, or copper sheets with a baked-on finish. The thicker the material, the longer the metal roof will last. Coatings can imitate historic materials such as shingle, clay tile, or slate. The material is durable and lightweight.

Porches

The *Design Guidelines* support the repair and maintenance of historic materials used in porches, when appropriate. In cases where replacement of exterior porch materials is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the size and finish of the historic building material are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of deteriorated porches applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project;

and 3) Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

Historic Use: Porches historically are a highly visible aesthetic historic building component. Architectural and design elements of porches generally were dictated by the dwelling's overall architectural style and, occasionally, geographical location. Common elements of porches include supports, railings, porch coverings, awnings, port-cochere, decking, and stairs.

Supports: Supports are vertical beams, posts, or columns that support porch roofs. Typically, an inner core of solid timber or steel provides the required support. Supports generally are clad in masonry (stone or brick) or may be a decorative wood beam.

Railings: Railings are a guard, serving both a function and aesthetic purpose, designed to prevent people from falling from raised porches. Typically, a railing includes a rail and railing cap, and posts. Railings generally are constructed of wood, iron, or masonry materials. Masonry railing may or may not include balusters.

Stairs: Stairs are a construction element designed to bridge a vertical distance by dividing it into smaller vertical distances called steps. Steps may be straight, round, or consist of two or more straight pieces connected at angles. Exterior entry stairs generally are constructed of brick, stone, or wood.

Design Considerations: Five major factors should be considered in the selection of in-kind and imitative substitute materials: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building and the associated historic district:

Location: Consider the historic use and placement of porches in the overall building design and the visibility of the proposed replacement material. Consider limiting replacement to deteriorated areas of the porch, when possible. Consider the importance of the feature to the overall building design and the importance of the rhythm of identical porches to the neighborhood streetscape.

Type**:** Material type often results in distinctive characteristics and design elements. For example, a brick support column creates a distinct design, texture, and scale to the porch and dwelling. Replacement materials should be selected to simulate the type of historic materials used on the porch and replicate the porch's historic appearance as closely as possible.

Size: The dimensions of porch elements are factors that create the overall appearance of the entrance. Replacement materials should approximate the overall height, width, and depth of the existing historic elements as closely as possible. Projects that strive to replicate the overall porch design and the dimensions of historic elements, where possible, often are most successful in maintaining the historical and architectural character of the individual building and the associated historic district.

Finish: Color, texture, and reflective quality of finishes to porch materials contribute to the visual character of the exterior building design and historic district. Consider pigment mediums, including paint and stains that simulate the finish medium, texture, and reflective quality of existing or historic materials, where possible. Consider paint or stain colors that are compatible with those used in the surrounding historic area. Porch elements that were not historically painted, such as stone or brick, should not be painted.

Design Maintenance: The character of in-kind materials and imitative substitute materials also may differ over time from the original units as the materials age. Selective replacement of deteriorated brick, stone, cement, or wood elements using imitative materials may become more aesthetically apparent over time due to the speed at-which the material ages. Consider replacement strategies that limit or avoid the potential of unintended impacts to design integrity, when possible.

Recommended Materials:

In-Kind Repair and / or Replacement: In-kind replacement of porch elements is a treatment approach identified in the *Design Guidelines*. In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *Preservation Brief 45 Preserving Historic Wood Porches* particularly may be relevant to porch projects.

Imitative Substitute Materials: Replacement of porches and elements with imitative substitute materials is an allowable treatment approach provided that the imitative substitute material meets the *Design Guidelines* and design considerations. Further guidance can be found in *Preservation Brief 16 The Use of Substitute Materials on Historic Exteriors.* The following list provides examples of imitative substitute materials. Please note that the list of materials is anticipated to expand as new materials and products become available.

Vinyl	Vinyl column, railing, and balustrade units typically are an inexpensive imitative substitute material—about half the price of the wooden equivalent. However, vinyl is susceptible to size changes due to heat. Elements very in quality and durability. Vinyl can have a shiny "plastic" appearance that may not be appropriate in certain circumstances.
Manufactured Stone	Manufactured stone veneer is an engineered product intended to look like its natural counterpart. It is composed of a mixture of Portland cement, iron oxides, and aggregates. It is light, uniform, and widely available. The material is brittle and susceptible to color fading over time.

Veneer	Veneer is a thin layer of natural stone or brick typically applied over a masonry or non-masonry surface. It is a durable product and typically less expensive than brick and stone.
Fiber Cement Board	Fiber cement is composed of cement, sand, and cellulose fibers. It is a customizable material that allows for the application of stucco over the board. A finish, skim, coat can be applied to match the surrounding historic stucco. Some cement boards are manufactured with a stucco finish and are pre-primed for painting. Additionally, acrylic or traditional stucco can be applied on top to provide a custom finish. Fiber cement boards often are manufactured to be water resistant and insulating and retain high durability. However, the material is heavy and difficult to cut.
Fiberglass	Fiberglass is a durable and low maintenance reinforced plastic material that is composed of a woven material embedded with glass fibers laid across each other and held together with a binding substance. Railing and columns are manufactured using fiberglass and often are produced to simulate historic materials such as metals or wood. May expand and contract with extreme heat and cold.
Aluminum	Aluminum is a light, durable, and functional metallic material. The cost-effective material often is used in construction as it is long-lasting and does not require dedicated maintenance. Railing and columns are manufactured using aluminum and may include detailed elements to simulate wood carvings.
Molded Plastic	Molded plastic is an affordable and durable material manufactured for use as columns and railings. As the name suggests, plastic is molded to simulate carvings and detail elements in wood columns and railings.
Resin	Resin is a flexible material that can be used in both interior and exterior molding. It is resistant to insects and moisture and does not warp, crack, or deteriorate. It can be molded in custom shapes, nailed, glued, sawn, or drilled. It is heavier than PVC or vinyl.

Window Bays

The *Design Guidelines* support the repair and maintenance of historic materials used in window bays, when appropriate. In cases where replacement of window bays or their component parts is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the size, design, and finish of the historic building material are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of deteriorated window bays applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project; and 2) Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

Historic Use: Window bays include the sash, glass, surrounds, lintels and sills, storm or screen windows, and shutters. Some windows include decorative features such as leaded or stained glass. Window bays typically are located on all elevations and in dormers. They can vary greatly in size within one building; however, the type and variation of windows typically are consistent throughout a historic district. Window bays of varying design are found on pre-1941 buildings. Window replacement is a common modification to the Army inventory. Later window modifications include the installation of modern vinyl replacement units.

Design Considerations: Five major factors should be considered in the selection of in-kind or imitative substitute materials simulating windows: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building and the associated historic district:

Location: Windows influence both the visual design quality and functionality of a dwelling. Interior light, ventilation, and architectural style were considered in the development of building plans. Consider retaining historic patterns of structural bay openings in window projects to maintain the historical and architectural character of the building, when possible. Avoid infilling existing bays, when possible, and limit structural modifications to less visible rear and secondary elevations. Replacement window units should match the design of historic units as closely as possible. Consider establishing a standardized replacement design for all buildings historically constructed from the same standardized design to maintain the architectural character of the area.

Type: Windows are defined by both their sash and light arrangement. Common configurations include six-over-six, nine-over-nine, and one-over-one. Match window types in sash and light arrangement as closely as possible. Consider storm or screen windows that do not obscure the window design. Consider maintaining or simulating historic window features such as surrounds and transoms.

Size: The dimensions of the window bays include the overall height, width, and depth of the existing or historic fabric. Replacement units that strive to simulate the dimensions of historic

window bays, where possible, will contribute to the preservation of the overall design integrity of the individual building as well as maintain consistency within the historic district. Avoid the infill of structural window bays to accommodate units of smaller size when at all possible.

Finish: Pigment medium, texture, and reflective quality of window bay finishes are determined by their material. The finish can contribute to the visual character of the exterior building design and the historic district. Pigment mediums, including paint and stains, used in replacement should simulate the finish medium, texture, and reflective quality of the existing or historic materials, where possible. The selection of paint or stain color should consider compatibility with the historic area. However, it is not necessary to utilize original colors that may have been determined through a chemical paint analysis.

Design Maintenance: Wood and aluminum age differently than many imitative substitute materials. Selective replacement of window units and trim on an elevation may become more obvious over time.

Recommended Materials**:**

In-Kind Repair and / or Replacement: In-kind replacement of window bays is a treatment approach identified in the *Design Guidelines*. In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series, *Preservation Brief 9 The Repair of Historic Wooden Windows*.

Imitative Substitute Materials: Replacement of window units and trim with imitative substitute materials is an allowable treatment approach provided that the imitative substitute material meets the *Design Guidelines* and design considerations. Further guidance can be found in *Preservation Brief 16 The Use of Substitute Materials on Historic Exteriors.* The following list provides examples of imitative substitute materials for window bays. Please note that the list of materials is anticipated to expand as new materials and products become available.

Vinyl	Vinyl windows typically are the least expensive imitative material—about half the price of the wooden equivalent. Vinyl units can be energy-efficient and well insulated. The sash is very durable; frequently, the muntins and mullions are integrated between two panes of glass, which prevents damage to what typically is a delicate member. Vinyl is susceptible to expansion due to heat.
Fiberglass	Fiberglass windows, like vinyl, are lighter than wood; however, fiberglass has the added benefit of stiffness, which allows for a thinner unit. The windows are temperature stable and do not

	expand or contract, which helps prevent water infiltration. Units can be coated in wood veneer to better simulate the natural material and can be used as replacement for architectural features. Fiberglass windows approximately are 25 per cent more expensive than vinyl units. Fiberglass may fade over time.
Aluminum	Aluminum windows still are produced and can be substituted for historic wooden units or an in-kind replacement for aluminum. Aluminum windows can be clad in wood and painted to simulate the appearance of wooden units. Aluminum units are produced in many different sizes and styles. However, the units can be expensive, can corrode, and are not as widely available as other substitutive materials.
Resin	Resin is a flexible material that can be used in both interior and exterior molding. It is resistant to insects and moisture and does not warp, crack, or deteriorate. It can be molded in custom shapes, nailed, glued, sawn, or drilled. It typically is heavier than PVC or vinyl.

Exterior Entries

The *Design Guidelines* support the repair and maintenance of historic entries. In cases where replacement of entries is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative materials that simulate the size, design, and finish of the historic building material are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of deteriorated exterior entries applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project; and 3) Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

Historic Use: Entry units include doors, storm doors, screen doors, transoms, sidelights, fanlights, trim, thresholds, hardware, and surrounds. Historically, wood panel doors were installed at the entrance of pre-1941 buildings. Wooden doors have been retained at installations across the United States. Metal units, such as steel and aluminum, also are present.

Design Considerations: Five major factors should be considered in the selection of in-kind or imitative substitute materials simulating entries: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building and the associated historic district:

Location: Entrances are a major character-defining feature in the design of historic buildings. Main entries are of particular importance to the design character and often are the focus of architectural ornamentation that contributes to the architectural style. Original entry bays and associated architectural elements should be maintained when possible. Consider limiting entry modifications to rear and secondary elevations to maintain the architectural character of the main elevation and associated streetscape.

Type: Doors are classified by whether they contain panels or glazing and if they are single- or double-leaf. Panels and glazing are decorative elements common to doors. The number of leafs typically dictates the size of the opening. If door replacement becomes necessary, consider simulating the historic unit, including panels, glazing, and number of leaves, as closely as possible. Avoid entry units that include elements that were not part of historic units, as appropriate. Consider storm or screen doors that do not obscure the appearance of the entry. Maintain sidelights, transoms, and fanlights, where possible as well as the pattern of door glazing or panels.

Size: The dimensions of entries also are factors in the appearance of the exterior wall. Replacement entries and doors should approximate the overall height, width, and depth of the existing or historic fabric as closely as possible. Replacement that strives to replicate the dimensions of the historic entry, where possible, will contribute to the preservation of the overall design integrity of the individual building as well as maintain consistency within the historic district.

Finish: Pigment medium, texture, and reflective quality of finishes to entries can contribute to the visual character of the exterior building design and the historic district. Pigment mediums, including paint and stains, used in replacement materials should simulate the finish medium, texture, and reflective quality of the existing or historic materials, where possible. The selection of paint or stain color should consider compatibility with the historic area.

Design Maintenance: Wood and aluminum can age differently than imitative substitute materials. In cases where the replacement of entry elements with imitative substitute materials is required, consider replacement of the complete element to avoid obvious visual differences over time.

Recommended Materials:

In-Kind Repair and / or Replacement: In-kind replacement and repair of entries is a treatment approach identified in the *Design Guidelines.* In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings*.

Imitative Substitute Material: Replacement of entries with imitative substitute materials is an allowable treatment approach provided that the imitative substitute material meets the *Design Guidelines* and design considerations. Further guidance can be found in *Preservation Brief 16 The Use of Substitute Materials on Historic Exteriors.* The following list provides examples of

imitative substitute materials for entries. Please note that the list of materials is anticipated to expand as new materials and products become available.

Vinyl	Vinyl doors and architectural features typically are the least expensive imitative material—about half the price of the wooden equivalent. However, vinyl is susceptible to size changes due to heat. Typically, vinyl doors are sliding glass units.
Fiberglass	Fiberglass doors, like vinyl, are lighter than wood; however, fiberglass has the added benefit of durability and an insulated core. Units can be coated in wood veneer to better simulate the natural material. Fiberglass doors approximately are 25 per cent less expensive than vinyl units. Fiberglass tends to fade.
Metal	Aluminum and steel doors can be substituted for historic wooden units or an in-kind replacement for aluminum. Units can be hollow-core or solid-core. Most metal doors can be clad in wood to simulate the appearance of wooden units and are produced in many different sizes and styles. However, the units can be expensive and can corrode.
Resin	Resin is a flexible material that can be used in both interior and exterior molding. It is resistant to insects and moisture and does not warp, crack, or deteriorate. It can be molded in custom shapes, nailed, glued, sawn, or drilled. It typically is heavier than PVC or vinyl.

Designed Landscapes and Features in Cantonment Areas (not applicable outside of Army cantonment areas)

The *Design Guidelines* support the repair and maintenance of historic materials used in designed landscapes and circulation features, when appropriate. In cases where replacement of designed landscaping features is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the species, size, or finish of the historic material are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of landscape design features applying the *Design Guidelines* is based on a three-step process: 1) Identify existing and/or historic application; 2) Identify design considerations of location, type, size, finish, and design maintenance to be factored in the replacement as appropriate to the requirements of the project; and 3) Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

Historic Use: Designed landscapes and features historically served as aesthetic and functional site features in cantonment areas during the pre-1941 period. Built features, such as lighting,

fencing, hardscape and street furniture, may reflect the dominant architectural styles of the installation. Site designs were influenced by contemporary designs of the historic period and may have included street plans, building setbacks, sidewalks, and street trees. Plantings were specific to geography and climate.

Design Considerations: Five major factors should be considered in the selection of replacement materials or species in / for designed landscape features: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the setting the building and the associated historic district:

Location: The historic design of landscapes, circulation patterns, setbacks, plant materials, and communal landscapes contribute to the qualities of the area. Historic site and landscape designs often complement building designs. Consider the spatial divisions established in historic plans. These designs should be respected, where possible, to maintain the historic and architectural character of the area. Consider replacement elements that simulate historic designs and placement, where possible. Consider replacement plant materials from any approved installation list that are the same species as the original, if native and non-invasive, and planted following the historic landscape plans.

Type: Landscape type often results in distinctive residential streetscapes and environments. Historic landscape design uses plantings and built structures to enhance residential areas. The history of landscape design follows a progression similar to that seen in architectural design. Site and landscape designs were influenced by dominant styles in the field, and regional designs standards.

Size: The dimensions and spacing of landscape features are factors affecting the overall streetscape. Replacement materials should approximate the overall height, width, depth, and spacing of the existing or historic elements as closely as possible. Replacement that strives to replicate the placement and spacing of historic landscape design, where possible, will contribute to the preservation of the overall design integrity of the dwelling and historic district.

Finish: Materials utilized in landscape features such as fencing, pathways, and gazebos may have pigment medium, texture, and reflective quality of finishes which contribute to visual character of the landscape design and the historic district. Pigment mediums, including paint and stains, used in replacement should simulate the finish medium, texture, and reflective quality of the existing or historic materials, where possible. The selection of paint or stain color should consider compatibility with the historic area. However, it is unnecessary to utilize original colors that may have been determined through a chemical paint analysis.

Design Maintenance: The character of in-kind materials and imitative substitute materials may differ over time as the materials age. Consider the aesthetic differences that may become apparent over time in materials selection and maintenance protocols, when possible. Consider replacement strategies that limit or avoid the potential of unintended impacts to design integrity, when possible.

Recommended Materials:

In-Kind Repair and / or Replacement: In-kind replacement of landscape design features is a treatment approach identified in the *Design Guidelines*. In-kind replacement of historic materials should be consistent with the *Design Guidelines* and design considerations identified for the element. It may not be possible to source plant, materials that exactly match the historic species or material. Further, there also may be species or historic placements that are not appropriate to maintain or simulate in the modern era. Additional guidance is contained in the *Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings* and the *Secretary of the Interior's Guidelines for the Treatment of Cultural Landscapes*. State Historic Preservation Offices (SHPO) may also have guidelines regarding historic plant species. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *Preservation Brief 36 Protecting Cultural Landscapes - Planning, Treatment and Management of Historic Landscapes* particularly may be relevant to landscape and feature projects.

Imitative Substitute Material: Replacement of landscape features is an allowable treatment approach provided that the imitative substitute material meets the Design Guidelines and design considerations. The following list provides examples of imitative substitute for designed landscapes and landscape features. Please note that the list of materials is anticipated to expand as new materials and products become available.

Vinyl	Vinyl is an inexpensive imitative substitute material that can be used as a replacement for wood units (gazebos and bridges). Vinyl units can be finished with woodgrain to give the appearance of a wooden unit. Further, vinyl often is manufactured in a variety of sizes and dimensions to simulate historical units. However, vinyl is susceptible to size changes due to heat. While vinyl may be used to simulate wood fencing, the reflective quality and texture often noticeably differs from historic wood units.
Fiberglass	Fiberglass is a durable and low maintenance reinforced plastic material which is composed of a woven material which is embedded with glass fibers laid across each other and held together with a binding substance. Components for fencing, bridges, gazebos, and other built landscape features are manufactured using fiberglass and often are produced to simulate historic materials such as metals or wood.
Engineered Wood	Engineered wood is composed of compressed resin and wood chips. Generally, it is treated to protect against rot and termites; it does not rot. Additionally, it performs well under most weather conditions. Engineered wood may be used to

	simulate built wood materials and objects such as fences, bridges, and gazebos. The material requires maintenance and painting.
Aluminum	Aluminum units are available for fencing and bridges. Aluminum units generally have a metallic finish and likely will require paint to simulate historic units. Aluminum units are produced in many different sizes and styles. However, the units can be expensive, can corrode, and are not as widely available as other imitative substitute materials.
Manufactured Stone	Manufactured stone veneer is an engineered product intended to look like its natural counterpart. It is composed of a mixture of Portland cement, iron oxides, and aggregates. It is light, uniform, and widely available. The material is brittle and susceptible to color finding over time.
Veneer	Veneer is a thin layer of natural stone or brick typically applied over a non-masonry surface. It is a durable product and typically less expensive than brick and stone.
Xeriscape	Xeriscaping not a product, rather it is a form of drought tolerant landscaping made up of plants that need less irrigation than standard landscaping plants. Xeriscaping often takes the form of shrubs separated by mulch, small grassy areas and decorative stone pathways Xeriscaping typically involves limited or no turfgrass. Xeriscaping may be an option for enclosed backyards as long as drought tolerant plant species and placement do not deviate greatly or alter historic elements.
Resin	Resin is a flexible material that can be used in both interior and exterior molding. It is resistant to insects and moisture and does not warp, crack, or deteriorate. It can be molded in custom shapes, nailed, glued, sawn, or drilled. It typically is heavier than PVC or vinyl.

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