



Appendix B

BUILDING MATERIALS CATALOG FOR U.S. ARMY INTER-WAR ERA HOUSING (1919-1940)

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Introduction

Program Comment for Department of the Army Inter-War Era Historic Housing, Associated Buildings and Structures, and Landscape Features (1919-1940)

The *Building Materials Catalog for Army Inter-War Era Housing (1919-1940)* (*Materials Catalog*) provides supplementary guidance on the application of the **Design Guidelines for Army Inter-War Era Historic Housing (1919- 1940)** (*Design Guidelines*). The *Design Guidelines* are among the treatment measures developed under the **Program Comment for Department of the Army Inter-War Era Housing, Associated Buildings and Structures, and Landscape Features (1919-1940)** (*Program Comment*) to address the effects of management actions on Army constructed historic housing built between 1919 and 1940, and the setting where the housing is located. Management actions addressed under the *Program Comment* include: maintenance, repair, rehabilitation, renovation, abatement, mothballing, demolition, replacement construction, new construction, and lease and conveyance of these properties. The purpose of the *Program Comment* is to comply with Section 106 of the National Historic Preservation Act (NHPA); to improve the quality of life, health, and safety of military families living in Inter-War Era housing; and to maintain the housing's historic and architectural character.

The Army is tasked with balancing quality of life issues, health risks associated with lead-based paint and other hazards in historic housing, and the high costs associated with historical building materials with the requirement to preserve the historic and architectural character of historic housing. These priorities are accompanied by the high housing-management standards to support the military mission through well-maintained housing units that welcome new military families on a regular basis with minimal time between occupancies. The balance among these critically important issues and operational priorities is accomplished through implementation of the *Design Guidelines* and the use of both in-kind building materials and imitative substitute building materials.

The quality of imitative substitute materials has risen dramatically with advances in building and manufacturing technologies. In electing either option, in-kind or imitative substitute materials, the selection of materials and products that consider the design characteristics of the historic material or architectural element often is a critical factor in retaining the overall design character of the historic property.

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

Section 3.2.2. of the Program Comment, **Design Guidelines and Building Materials Catalog for Army Inter-War Era Historic Housing**, establishes overarching criteria and a step-by-step decision-making procedure for the selection of appropriate building materials for the rehabilitation and renovation of Inter-War Era housing. The procedure will also be applied to purchases of bulk or stock materials used in maintenance and repair actions. This will facilitate implementation of maintenance and repair actions and will appropriately standardize the materials used in this standardized design housing stock. Where Inter-War Era housing has been privatized, Army housing partners will implement the criteria and procedure. The overarching criteria for building materials selection are: When health and safety of military families is of concern, or when the initial or on-going use of historic building materials and in-kind building materials impacts the Army's ability to fully implement quality of life improvements to housing for military families, imitative substitute building materials will be considered for use only in a

manner that maintains the historic and architectural character of the historic housing and when consistent with the results of the following building materials selection procedure. The step-by-step procedure for selection of replacement building materials is:

- a. Characterize historic building materials currently present in terms of: design, material properties, condition, performance, safety, and presence of hazards such as lead-based paint, asbestos, and other hazardous materials.
- b. Determine if the health and safety of housing occupants is a concern due to unsafe or hazardous historic building materials.
- c. Determine if the costs associated with initial or continued use of historic building materials impacts the ability to fully implement quality of life improvements to the housing.
- d. Determine if a historic building material must be replaced due to deterioration, health and safety considerations, or financial impacts to quality of life improvements. (If historic building material replacement is required due to the material's deterioration, determine the cause of the failure to ensure that the new replacement in-kind or imitative substitute material will not fail for the same reasons that caused the historic building material to fail).
- e. If replacement of historic building materials is required, determine if there are material characteristics of the historic building materials that should be improved upon with use of in-kind building materials or imitative substitute building materials.
- f. Evaluate replacement in-kind building materials and imitative substitute building materials (i.e., replacement building materials) with respect to design and material properties using the Design Guidelines and Building Materials Catalog. Evaluate the expected performance, costs, and short and long-term cost/benefit considerations of the replacement building materials. Determine if the costs associated with use of in-kind building materials impacts the ability to fully implement planned quality of life, health, and safety improvements to the housing.
- g. Based on the analysis in f. above, compile a short list of replacement building materials from the Building Materials Catalog.
- h. Determine and select the appropriate replacement building material from the short list of materials. When an in-kind building material is determined to be the appropriate replacement building material, the in-kind building material will be selected and used. Exterior vinyl siding will only be selected and used after other replacement building materials are evaluated and determined not to be the appropriate replacement building material in accordance with these procedures.
- i. Document the evaluation and selection process.
- j. Write specifications for design and installation, and oversee project planning and implementation.

The *Materials Catalog* provides a methodology and guidance for implementing Section 3.2.2.4.f of the Program Comment decision-making procedure, as reproduced above. The methodology is designed for selecting in-kind and imitative substitute building materials will maintain the historic and architectural character of the housing unit and its setting. Catalog entries are provided for major components of the house 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 applying the *Design Guidelines* through a three-step process. This process includes:

- 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 and Design Guidelines.

The methodology provides a consistent approach to materials selection based on the *Design Guidelines* that considers historical design precedence, existing design conditions, and the ability of the proposed replacement material to harmonize with the building's historic and architectural character applying the design considerations. This paradigm offers the advantage of accommodating the consideration of new imitative substitute building materials as they are developed provided that they are consistent with the historic and architectural character of the historic property and encourages consistency with the *Design Guidelines* through well considered decision making. The process for amending the Materials Catalog is found in Section 8(b) of the *Program Comment*.

The guidance in this document also can be applied to new construction and new additions by identifying the design considerations of the primary historic residence and historic district and selecting in-kind or imitative substitute materials compatible with extant historic resources.

Maintaining the historic and architectural character of Army housing is an objective in planning management actions. In projects requiring the replacement of existing materials or the construction of new additions and buildings, both in-kind building materials and imitative substitute materials, may be selected applying the Design Guidelines for Army Inter-War Era Housing and guidance in the Materials Catalog.

Definitions: See *Definitions section of the Program Comment for Department of the Army Inter-War Era Historic Housing and Its Setting (1919–1940)* for definitions of all key terms used in this document.

1.0 Exterior: Foundations

- Design Guidelines: Section VII. Guidelines for Foundations and Walls

1.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

1.2 Historic Use in Inter-War Housing

Army housing during the Inter-War period utilized several types of foundation systems that were selected to respond to regional conditions and housing design. These types included excavated systems, foundation slabs, and building piers. Exposed foundation walls typically found in Inter-War Army housing include concrete, brick, stone, and stucco.

1.2.1: Concrete is a durable, inexpensive, ubiquitous material that is generally reinforced for strength. Concrete foundations found in Inter-War-era Army housing include poured, reinforced, concrete block, and piers. Examples of concrete foundations can be found at U.S. Army Garrison, Hawaii; Joint Base Lewis McChord, Washington; Fort Bliss, Texas; Fort Sill, Oklahoma; Hawthorne Army Depot, Nevada; Fort Riley, Kansas; and Fort Benning, Georgia.

1.2.2: Brick and stone foundations also are a common element in the historic housing inventory of the period. These exterior foundation finishes include nationally available materials as well as materials unique to the region. U.S. Army Garrison, Hawaii, features masonry foundations with local lava rock material.

1.2.3: Stucco-faced foundations also historically were found in Inter-War housing. Typically, stucco facing was applied to foundation systems utilizing stucco-clad structural hollow clay tile. Examples include residences at Aberdeen Proving Ground, Maryland, and Fort Benning, Georgia.

1.3 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.

1.3.1 Location: The historic location and visibility of the proposed 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 standardized design of the housing area. Consider the location of necessary mechanical systems adjacent to secondary or rear elevations.

1.3.2 Type: Retain or replicate the type and materials of the historic foundation - continuous, poured, or pier - when possible. Consider design strategies that may visually maintain the appearance of the original foundation type should foundation alteration prove necessary. For example, construction of new foundation walls behind historic foundation piers may visually retain evidence of the historic design. 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.

1.3.3 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.

1.3.4 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 house design and with the surrounding historic district, where possible. In projects involving selective repair to exterior foundation walls, test patches of proposed 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.

1.3.5 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.

1.4 Materials Guidance: Recommended Materials

1.4.1 In-Kind Repair and / or Replacement: In-kind replacement and repair of deteriorated 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. Standards for in-kind masonry and stucco repair are contained in *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. 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.

1.4.2 Imitative Substitute Materials: Imitative 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. |

2.0 Exterior: Wood Cladding (Siding, Shakes, and Shingles)

- Design Guidelines: Section VII. Guidelines for Foundations and Walls

2.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and Design Guidelines.

2.2 Historic Use in Inter-War Housing

Exterior wooden claddings historically were used in Army housing during the Inter-War period as a primary wall material, as the exterior cladding in wings and additions, and as claddings for support structures, such as garages. The U.S. Army Garrison, Hawaii, features both board-and-batten siding and horizontal wooden siding on its historic Craftsman style housing. Aberdeen Proving Ground, Maryland, contains Craftsman style houses featuring wood-shingle cladding. Colonial Revival style houses at Aberdeen Proving Ground historically featured clapboard siding. Common types of wood cladding used in Army housing include vertical board-and-batten, horizontal board siding, and shingles.

2.2.1 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
- Board-and-batten: Vertical planks with narrower planks, battens, placed over the seams

2.2.2 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: Smooth and sawn on both sides; finish of drop edge may be straight or curved.
- Shakes: Sawn on one side, rough on one side.

2.3 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.

2.3.1 Location: The historic use of wood siding in the overall house 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.

2.3.2 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.

2.3.3 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 house as well as maintain consistency within the historic district.

2.3.4 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.

2.3.5 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.

2.4 Materials Guidance: Recommended Materials

2.4.1 In-Kind Repair and/ or Replacement: In-kind replacement of deteriorated 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. Standards for in-kind repair are contained in *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. 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.

2.4.2 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.

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| 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 is manufactured to look like wood through texturing and surface resin. Such 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 increasingly produced to replicate wood grain rather than its stereotypically smooth, surface. 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. |
| 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. |

3.0 Exterior: Masonry (Brick and Stone)

- Design Guidelines: Section VII. Guidelines for Foundations and Walls

3.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

3.2 Historic Use in Inter-War Housing

Historic masonry, defined in this section as brick and stone, typically was sourced locally during the Inter-War period. For example, at Aberdeen Proving Ground, Maryland, residences were clad in local Port Deposit Granite. Masonry is composed of the masonry unit and the mortar and extends to all elevations. Mortars from this period frequently featured a high Portland cement content. Generally masonry is unpainted and can feature quoins and watertables. During the Inter-War era 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. Bricks in Inter-War housing typically were laid as running (all stretchers) or common (running bond with intermittent courses of headers) bond.

3.3 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.

3.3.1 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 house and to the neighborhood, as appropriate. Particular attention should be paid to the existing design of primary elevations and those elevations with the great-

est prominence. Maintain existing patterns of structural bays, where possible. Limit new masonry work to areas historically containing exposed masonry, as possible.

3.3.2 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.

3.3.3 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 house as well as maintain consistency within the historic district.

3.3.4 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 selec-

tion 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.

3.3.5 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.

3.4 Materials Guidance: Recommended Materials

3.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated 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. Standards for in-kind masonry repair are contained in *The Secretary of the Interior’s Standards for the Treatment of Historic Properties*. 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* particularly may be relevant to exterior masonry projects.

3.4.2 Imitative Substitute Materials: Replacement of deteriorated 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.

| | |
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| 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 or brick typically applied over a masonry or non-masonry surface. It is a durable product. Additionally, it is less expensive than brick and stone. |
| Precast Stone | 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. |

4.0 Exterior: Stucco Cladding

- Design Guidelines: Section VII. Guidelines for Foundations and Walls

4.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

4.2 Historic Use in Inter-War Housing

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. In Army housing of the period stucco typically, was applied to structural clay tile. It frequently is found on Army Inter-War housing in the southeast and southwest and on Mission, Spanish Colonial Revival, and Spanish Eclectic style buildings. Examples include Fort Benning, Georgia; U.S. Army Garrison, Hawaii; Hawthorne Army Depot, Nevada; Fort Sill, Oklahoma; and, Fort Bliss, Texas.

4.3 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.

4.3.1 Location: Stucco exterior finishes often are character-defining design features in individual housing design and in residential historic areas. 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.

4.3.2 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.

4.3.3 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.

4.3.4 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.

4.3.5 Design Maintenance: Consider maintenance of existing stucco finishes using methods suggested in the Secretary of the Interior's *Standards for the Treatment of Historic Properties* 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.

4.4 Materials Guidance: Recommended Materials

4.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated 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. Standards for in-kind stucco repair are contained in *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. 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 Inter-War period and prior to 1929, 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. Starting in 1929, the typical stucco mix included: five pounds of dry, hydrated lime; one 94-pound bag of Portland cement; at least three cubic feet of sand passed through a number eight screen; 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.

4.4.2 Imitative Substitute Materials: Replacement of deteriorated 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.

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| <p>Acrylic Stucco</p> | <p>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 than traditional, concrete-based stuccos.</p> |
| <p>Exterior Insulation and Finish Systems</p> | <p>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 top-coat. 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.</p> |
| <p>Elastomeric Paint</p> | <p>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.</p> |
| <p>Fiber Cement Board</p> | <p>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.</p> |

5.0 Exterior: Roofing

- Design Guidelines: Section VI. Guidelines for Roofs

5.1 Summary Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

5.2 Historic Use in Inter-War Housing

A variety of roof sheathing historically was used in Army housing during the Inter-War period. At Joint Base San Antonio, Texas, and Hawthorne Army Depot, Nevada, Mission style dwellings terminate in gabled and hipped roofing typically sheathed in clay tile. At U.S. Army Garrison, Hawaii, the Mission style dwellings may include clay tile roofing or wood shingles. Tudor Revival housing styles located at Fort Benning, Georgia, often terminate in front gabled forms and may be sheathed in slate or wood shingle. 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. Common types of roof sheathing used in Army Housing during the Inter-War period include asbestos shingle, clay tile, and slate.

5.2.1 Asbestos Shingle: Asbestos shingles are roof shingles made with asbestos cement board. Historically they were used as imitative substitute materials for clay tile or slate. Asbestos shingles, a longer-lasting, cost-effective alternative to traditional roofing materials, were more resilient to weathering and fire retardant than traditional roofing. Asbestos now is a recognized hazardous material that may require abatement.

5.2.2 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 “pan tiles”. 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.

5.2.3 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.

5.3 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.

5.3.1 Location: The historic use of roof sheathing in the overall house 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.

5.3.2 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.

5.3.3 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 house 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.

5.3.4 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.

5.3.5 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 Standards for the Treatment of Historic Properties* 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.

5.4 Materials Guidance: Recommended Materials

5.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated 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. Standards for in-kind roof repair are contained in the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. 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.

5.4.2 Imitative Substitute Materials: Replacement of deteriorated 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.

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| Composite 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 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 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. Fiber cement can be textured to mimic natural wood; however, it must be finished or stained after production. 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 | Plastic and 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. These units are produced in a variety of colors, dimensions, and textures to appropriately imitate weathered slate tiles. |
| 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, tile, or stone. The material is durable and lightweight. |

6.0 Exterior: Porches

- Design Guidelines: Section V. Guidelines for Entrances, Porches, and Details

6.1 Design Guideline Standard

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

6.2 Historic Use in Inter-War Housing

Porches historically are a highly visible aesthetic building component of Inter-War housing. Architectural and design elements of porches generally were dictated by the dwelling's overall architectural style and, occasionally, geographical location. The Carpenter Court Apartments at Fort Riley, Kansas, are a series of multi-unit Colonial Revival style dwellings constructed in 1927. Hierarchy in military rank is reflected in architectural expression, including the placement and use of porches. Officers housing may include raised entrances and enclosed porches at the façade and rear of the dwelling. At Hawthorne Army Depot in Hawthorne, Nevada, the 1930s Mission style housing are single-family dwellings with modest cut-out porches within the square building footprint. These porches are not raised or accessed by stairs and are bound by stuccoed half-walls and stuccoed columns. Common elements of porches include supports, railings, porch coverings, awnings, port-cochere, decking, and stairs.

6.2.1 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.

6.2.2 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.

6.2.3 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 poured concrete, brick, or stone; wood also is used.

6.3 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.

6.3.1 Location: Consider the historic use and placement of porches in the overall house 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.

6.3.2 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.

6.3.3 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 house and the associated historic district.

6.3.4 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, may not require additional finishes.

6.3.5 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.

6.4 Materials Guidance: Recommended Materials

6.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated 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. Standards for in-kind porch repair are contained in the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*. 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

6.4.2 Imitative Substitute Materials: Replacement of deteriorated 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.

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| Vinyl | Vinyl column, railing, and balustrade units typically are an inexpensive imitative substitute material—about half the price of the wooden equivalent. Vinyl units can be finished with woodgrain to give the appearance of a wooden unit. However, vinyl is susceptible to size changes due to heat. Elements vary in quality and durability. |
| 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. |

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| 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 typically is heavier than PVC or vinyl. |

7.0 Exterior: Window Bays

- Design Guidelines: Section IV. Guidelines for Windows and Doors

7.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

7.2 Historic Use in Inter-War Housing

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 standardized design are found on all Inter-War housing, with multi-light, double-hung, wood-sash windows being the most com-

mon. Examples of historic wooden windows in Army housing are found across the United States: U.S. Army Garrison, Hawaii; Hawthorne Army Depot, Nevada; Fort Bliss, Texas; Fort Riley, Kansas; Fort Benning, Georgia; and, Fort Belvoir, Virginia. Window replacement is a common modification to the housing inventory. Later window modifications include the installation of modern, energy efficient, vinyl replacement units. These types of windows have been installed at Aberdeen Proving Ground, Maryland. Aluminum windows also are present on Inter-War housing, and include those found in the family housing at Fort Bliss, Texas, where the aluminum units are historic replacements.

7.3 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.

7.3.1 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 house 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 housing area.

7.3.2 Type: Windows are defined by both their sash and light arrangement. The sashes commonly used in Inter-War housing include double-hung, casement, fixed, or slider types. 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.

7.3.3 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 house 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.

7.3.4 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.

7.3.5 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.

7.4 Materials Guidance: Recommended Materials

7.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated 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. Standards for in-kind window bay repair are contained in the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*. 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* and *Preservation Brief 13 The Repair and Thermal Upgrading of Historic Steel Windows* particularly may be relevant to window projects.

7.4.2 Imitative Substitute Materials: Replacement of deteriorated 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.

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| <p>Vinyl</p> | <p>Vinyl windows typically are the least expensive imitative material—about half the price of the wooden equivalent. Vinyl units are 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 windows can be finished with woodgrain to give the appearance of a wooden unit. However, vinyl is susceptible to expansion due to heat.</p> |
| <p>Fiberglass</p> | <p>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 tends to fade over time.</p> |

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| 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 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. |

8.0 Exterior: Entries

- Design Guidelines: Section IV. Guidelines for Doors and Windows

8.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

8.2 Historic Use in Inter-War Housing

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 Inter-War family housing units. Wooden doors have been retained at installations across the United States including Fort Benning, Georgia; U.S. Army Garrison, Hawaii; Fort Riley, Kansas; Aberdeen Proving Ground, Maryland; Hawthorne Army Depot, Nevada; Fort Sill, Oklahoma; Fort Bliss, Texas; Fort Belvoir, Virginia; and, Joint Base Lewis McChord, Washington. Metal units, such as steel and aluminum, also are present.

8.3 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.

8.3.1 Location: Entrances are a major character-defining feature in the design of historic housing. Main entries are of particular importance to the design character of Army housing and often are the focus of architectural ornamentation that contributes to the architectural style of the housing unit. 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.

8.3.2 Type: Doors are classified by whether or not 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.

8.3.3 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 house as well as maintain consistency within the historic district.

8.3.4 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.

8.3.5 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.

8.4 Materials Guidance: Recommended Materials

8.4.1 In-Kind Repair and / or Replacement: In-kind replacement and repair of deteriorated 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. Standards for in-kind entry repair are contained in the Secretary of the *Interior's Standards for the Treatment of Historic Properties*.

8.4.2 Imitative Substitute Material: Replacement of deteriorated entries 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.

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| Vinyl | Vinyl doors and architectural features typically are the least expensive imitative material—about half the price of the wooden equivalent. Vinyl doors can be finished with woodgrain to give the appearance of a wooden unit. 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. |

9.0 Exterior: Designed Landscape and Features

- Design Guidelines: Section X. Guidelines for Designed Landscape and Features

9.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated 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:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

9.2 Historic Use in Inter-War Housing

Designed landscapes and features historically served as aesthetic and functional site features that unify Army housing areas and connected them to larger installations during the Inter-War period. Built features, such as lighting, fencing, hardscape and street furniture, may reflect the dominant architectural styles of the installation and often incorporated pre-fabricated fixtures. Site designs for Army housing areas often were influenced by suburban design of the period and may have included curvilinear street plans, building setbacks to create private yards, sidewalks, street trees, and street lighting. Housing was standardized in plan and design with a hierarchy created by building size and housing type. Plantings were specific to geography and climate. The current approved plant list at U.S. Army Garrison, Hawaii, is based on historical plantings and differs from the species approved at Joint Base Lewis McChord, Washington, and Joint Base San Antonio, Texas.

9.3 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.

9.3.1 Location: The historic design of residential landscapes, circulation patterns, setbacks, plant materials, and communal landscapes contribute to the residential qualities of the family housing. 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 housing area. Consider replacement elements that simulate historic designs and placement, where possible. Consider replacement plant materials from the approved installation list that are the same species as the original, if possible, and planted following the historic landscape plans.

9.3.2 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, regional designs, and the historic housing program that emphasized standardization and suburban standards. Consider defining the historic design influences of the housing area and designing improvement projects consistent with earlier designs, as possible. Replacement materials should be selected that are similar in type to historic designs to simulate the historic appearance, when possible.

9.3.3 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.

9.3.4 Finish: Materials utilized in landscape features such as fencing, pathways, playgrounds, 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.

9.3.5 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.

9.4 Materials Guidance: Recommended Materials

9.4.1 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, playground, or lighting units 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. Standards for in-kind landscape and feature repair are contained in the Secretary of the Interior's *Standards for the Treatment of Historic Properties* and State Historic Preservation Offices (SHPO) may also have guidelines regarding historic plant species and spacing which no longer are appropriate. 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.

9.4.2 Imitative Substitute Material: Replacement of deteriorated landscape features 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 for designed landscapes and landscape features. Please note that the list of materials is anticipated to expand as new materials and products become available.

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| 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 fading 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 housing 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. |

10.0 Interior: Walls and Ceilings

- Design Guidelines: Section VIII. Guidelines for Interiors

10.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated historic materials used in ceilings and interior walls, when appropriate. In cases where replacement of ceilings and interior walls 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 ceilings and walls applying the *Design Guidelines* is based on a three-step process:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

10.2 Historic Use in Inter-War Housing

The majority of ceilings and interior walls in historic Inter-War housing were lath and plaster. Housing units may also have contained early examples of plaster board. These materials are no longer popular in modern construction for standardized housing. Plaster easily can crack and may require specialized repairs. Plaster typically was painted, wallpapered, or decoratively finished. Other materials that potentially were used as interior wall finishes include ceramic or concrete tile and wood paneling.

10.3 Design Considerations

Five major factors should be considered in the selection of in-kind or imitative substitute materials simulating interior ceilings and walls: 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.

10.3.1 Location: The *Design Guidelines* discourages altering historic ceiling heights through the installation of drop ceilings unless necessary. If drop ceilings are considered, they should be installed in a manner that minimizes damage to the historic ceiling when possible. The *Design Guidelines* also recognize that reconfiguration of interior plans may be necessary. Consider focusing reconfigurations in secondary living areas and maintaining historic plans in formal, public spaces, when possible.

10.3.2 Type: When possible, match the historic type of wall finish in improvement projects. When wall materials require replacement, consider in-kind or imitative substitute materials with surface finishes that simulates the historic surface. For example, tile is not a recommended imitative substitute material

for areas historically plastered and tongue-and-groove wood paneling is not a recommended imitative substitute for board-and-batten sheathing.

10.3.3 Size: It is recommended that replacement materials simulate the size of the historic unit. For example, if tiles are present, the replacement units should simulate the historic size and dimensions of the units to the greatest extent possible. It is recommended that the height, depth, and width of existing ceilings and walls be maintained, where possible.

10.3.4 Finish: Pigment medium, texture, and reflective quality of finishes to interior ceilings and walls can contribute to 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.

10.3.5 Design Maintenance: Cracks in plaster typically can be repaired with a skim coat of plaster. Larger repairs should be completed in-kind or with an imitative substitute material such as drywall. Plaster and drywall patches can blend into the historic material. Aesthetically acceptable replacement of individual tiles and wood panels with imitative materials can be challenging. Consider the compatibility of historic and imitative substitute materials in materials selection. Repairs may fail or become more obvious as materials age.

10.4 Materials Guidance: Recommended Materials

10.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated ceilings and walls 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. Standards for in-kind masonry and interior wall and ceiling repair are contained the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. 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 21 Repairing Historic Flat Plaster—Walls and Ceilings*, *Preservation Brief 28 Painting Historic Interior*, and *Preservation Brief 18 Rehabilitating Interiors in Historic Buildings* particularly may be relevant to interior wall and ceiling projects.

10.4.2 Imitative Substitute Materials: Replacement of deteriorated interior ceilings and walls with imitative substitute materials is recognized treatment approach provided that the imitative substitute material meets the *Design Guidelines* and design considerations. The following list provides examples of imitative substitute materials for interior ceilings and walls. Please note that the list of materials is anticipated to expand as new materials and products become available.

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| Drywall | Drywall is a commonly used material composed of gypsum. It can be easily and quickly cut and installed, and moisture- and mold-resistant options are available. Drywall is significantly less expensive than plaster. |
| Veneer Wood | Veneer wood is a thin layer of natural wood that can be applied over a surface. It is an inexpensive option for simulating wood paneling and easily can be installed over an existing material. |
| Patching Compounds | Patching compounds are formulated for plaster and drywall and aid in the repair of patches and cracks. The compound can be premixed or dry. It can be applied over the affected area once debris is removed, taped, skimmed, and sanded once dry, or it can be used to skim cracks. |

11.0 Interior: Flooring

- Design Guidelines: Section VIII. Guidelines for Interiors

11.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated historic materials used in interior flooring when appropriate. In cases where replacement of interior flooring 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 interior flooring applying the *Design Guidelines* is based on a three-step process:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

11.2 Historic Use in Inter-War Housing

The types of flooring utilized in Inter-War housing included wood, tile, terrazzo, and concrete. Other materials common during the Inter-War period included vinyl, linoleum, or carpet. Wood was the most frequently used flooring in Inter-War housing across the United States and can be found throughout the interior of houses. Tile, particularly ceramic tile, frequently was used in bathrooms due to its water resistance. Terrazzo, stone chips suspended in concrete or epoxy, was used in interior spaces, particularly in service areas. U.S. Army Garrison, Hawaii, features acid-stained concrete floors. The type of wood utilized typically was dictated by what

was available locally. Family housing at Aberdeen Proving Ground, Maryland, historically featured waxed oak floors. A review of archival records suggests the housing at Fort Riley, Kansas, historically had three-quarter-inch oak floors and ceramic tile bathrooms.

11.3 Design Considerations

Five major factors should be considered in the selection of in-kind or imitative substitute materials simulating flooring: 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.

11.3.1 Location: Flooring materials often differed depending on the historic room use within the dwelling. For example, tile typically is in the bathroom while wood is in bedrooms, living rooms, and dining rooms. The hierarchy of flooring by room should be maintained, as possible.

11.3.2 Type: Match historic flooring type, where possible. Consider similar wood species and tile type in flooring repairs, where possible. Maintain decorative installation, such as parquet, inlays, and borders, where possible. Consider the difference in seasonal expansion and contraction rates between historic flooring and imitative substitute materials in selecting materials for repair.

11.3.3 Size: Match the dimensions of flooring units to maintain the historical visual characteristics of the interior. For example, replacement tile units should simulate the historic size and dimensions to greatest extent possible. Match the size of historic standardized wood flooring in width and length, when possible.

11.3.4 Finish: The finish of the surface is determined by color and reflective qualities. These qualities typically are achieved through the application of paint, dye, or stain, glazes, and varnish. It is recommended that the color of historic surfaces be maintained or simulated as closely as possible, including historic paint schemes or stains. For example, terrazzo is composed of specific colors and ratios of stone chips suspended in concrete or epoxy; or, concrete can be stained with acid to imbue the material with consistent color. It is recommended that replacement or repair units simulate the historic visual composition of the material. It is recommended that the physical texture of a historic unit be simulated by the imitative substitute unit. Examples of texture include wood grain, beveled tiles or textured glazes, textured linoleum, nap, or smooth concrete. Consider refinishing wood flooring finishes for the room following repair to achieve a consistent finish.

11.3.5 Design Maintenance: Tile, wood, terrazzo, and concrete can develop hair-line cracks or chips. Typically, these materials can be patched. However, individual units of tile and terrazzo may require replacement if they become loose or present a hazard to residents. Replacing individual units is appropriate if done with imitative substitute or in-kind units that simulate the design criteria. Monitor the seasonal expansion and contraction rates of historic flooring and repairs for evidence of incompatibility that may result in buckling.

11.4 Materials Guidance: Recommended Materials

11.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated interior flooring 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. Further guidance on in-kind replacement can be found in *Standards for in-kind flooring repair* are contained in *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. 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 40 Preserving Historic Ceramic Tile Floors* and *Preservation Brief 18 Rehabilitating Interiors in Historic Buildings* particularly may be relevant to interior flooring projects.

11.4.2 Imitative Substitute Materials: Replacement of deteriorated interior flooring with imitative substitute materials 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 materials for flooring. Please note that the list of materials is anticipated to expand as new materials and products become available.

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| Laminate | Laminate is composed of 99 per cent wood high-density fiberboards laminated together with a photographic layer imitating wood planks or tile on top. The material is engineered to simulate the appearance and texture of traditional, natural wood flooring. It is a durable and scratch-resistant material. Installation utilizes interlocking edges and can be done quickly. The material is softer than vinyl and is considered a more pleasant material to walk on. However, it is not recommended for use in bathrooms because it is not water-resistant and is not as durable as vinyl alternatives. |
| Vinyl and Luxury Vinyl | Vinyl and luxury vinyl flooring is a wood plastic and polymer material; most vinyl options are waterproof. Vinyl can imitate wood, tile, or terrazzo. Rigid core and luxury vinyl are durable materials that simulate the appearance of traditional, natural wood, stone, and tile. Vinyl flooring can be applied directly over other flooring and has a more rigid feeling than laminate. Although more durable, vinyl typically is more expensive than laminate flooring. Installation uses interlocking edges and can be done quickly. |
| Engineered Wood | Engineered wood is composed of thin layers of wood and adhesives. In comparison to natural wood, it is less susceptible to humidity and expansion. When installed correctly, it can be as durable as natural wood. However, it dents easily and is not as durable as other imitative options. Engineered wood can be refinished a limited number of times. |

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| Linoleum Flooring | Linoleum flooring is composed of wood and linseed oil and can replicate wood, tile, and terrazzo. It is durable and typically lasts twice as long as vinyl flooring. However, it can fade over time. It is inexpensive, but difficult to install properly. Floors can be polished at least once a year to extend its lifespan. |
| Porcelain Tile Flooring | Porcelain tile flooring can withstand scratches, dents, moisture, and stains. However, porcelain installation can be difficult. Installation requires a perfectly smooth subfloor or the tile and grout can crack. Porcelain tile tends to be an expensive product that is difficult to repair or replace. The tiles can imitate wood, tile, and terrazzo. |
| Concrete Acid Stain | Concrete acid stain is a water-based liquid containing minerals and acid. The acid stain seeps into the pores of concrete causing a chemical response between the acid and available lime within the surface concrete. The color of the concrete is permanently altered once acid stained. Therefore, the acid stain method is durable and long lasting. Generally, concrete acid staining is a cost-effective and durable option for applying or matching consistent color to concrete floor surfaces. |

12.0 Interior: Features

- Design Guidelines: Section VIII. Guidelines for Interiors

12.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated historic materials used in interior features such as staircases, mantels built-ins, and trim, when appropriate. In cases where replacement of these interior features are desirable or necessary, either 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 interior features applying the *Design Guidelines* is based on a three-step process:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

12.2 Historic Use in Inter-War Housing

Interior features, such as staircases, mantels, built-in, and woodwork, historically were found in Army housing constructed during the Inter-War period. Interior features historically were made of wood, though examples of plaster trim, such as cornices and cove moldings, also survive.

12.3 Design Considerations

Five major factors should be considered in the selection of replacement materials simulating interior features: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building.

12.3.1 Location: Historic interior features such as stairs, built-ins, mantels, and trim, contribute to the architectural character of the building and should be retained when possible. Stairs and built-in units historically were designed to fit in specific footprints in the floorplan and placement often followed a design hierarchy with the most elaborate elements located in the most formal and public spaces. Trim historically was installed for aesthetics. Consider focusing replacement installations to those areas of the building currently or historically designed for interior features. Consider retaining or relocating features in plans for interior reconfiguration, as possible.

12.3.2 Type: Staircases and built-in units serve function and aesthetic purposes. Staircases, mantels, built-ins, and trim should retain their design and function, as possible. For example, avoid the enclosure of historically open staircases, where possible. Replacement materials should be selected to simulate the historic appearance of the element. Consider matching the level of architectural elaboration historically found in housing feature and avoid the selection of overly ornate features that may be out of character with historic design.

12.3.3 Size: Dimensions of interior features should be maintained, as appropriate. Replacement units should approximate the overall height, width, and depth of the existing or historic fabric as closely as possible. Profile, ornamentation, and unique designs also should be simulated as necessary. Replacement that strives to replicate the dimensions of historic units, where possible, will contribute to the preservation of the overall design integrity of the individual house. Avoid simplifying the feature through removal of moldings, where possible.

12.3.4 Finish: Pigment medium, texture, and reflective quality of finishes to interior fixtures can contribute to visual character interior. Pigment mediums, including paint and stains, used in replacement units 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 design; it may not be necessary to paint a surface that historically was not painted.

12.3.5 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 built-ins or plaster trim 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.

12.4 Materials Guidance: Recommended Materials

12.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated stair, built-in units, or trim, 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. Standards for in-kind interior feature repair are contained in *The Secretary of the Interior’s Standards for the Treatment of Historic Properties*. 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 17 Architectural Character—Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character* and *Preservation Brief 18 Rehabilitating Interiors in Historic Buildings* particularly may be relevant to interior feature projects.

12.4.2 Imitative Substitute Materials: Replacement of deteriorated interior features with imitative substitute materials 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 materials for interior features. Please note that the list of materials is anticipated to expand as new materials and products become available.

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| Vinyl | Vinyl is about half the price of the wooden equivalent. Vinyl can be finished with woodgrain to give the appearance of a wooden unit. However, vinyl is susceptible to size changes due to heat and easily wear with increased use. Vinyl is prefabricated for interior trim and base molding. |
| Engineered Wood | Engineered wood is composed of compressed resin and wood chips. Engineered wood often is sold prefabricated into risers and stairs and also can be used for built-ins. The lifespan of engineered wood stair units averages 25 years. |
| Medium- and High-Density Fiberboard | <p>Medium-density fiberboard (MDF) is a durable material less likely to become dented like other synthetic options. MDF built-ins typically are solid core units and may be custom ordered to fit unique spaces. It primarily is composed of discarded wood and other organic materials. The material is heavy and allows for noise control. Additionally, wood veneer can be applied; it also can be painted. MDF is less dense than HDF and more prone to warping.</p> <p>High-density fiberboard (HDF; hardboard) is a dense material composed of discarded wood, like MDF. HDF built-ins typically are solid core units and may be custom ordered to fit unique spaces. The material can be molded to mimic wooden units. Unlike MDF, HDF is manufactured with a wet process that allows the wood fibers to expand and bind. The material can be clad in wood veneer to simulate historic units. It is heavier and more uniform than MDF.</p> |

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| Hollow Board | Hollow board units include a hollow core supported by cardboard webbing clad in wood veneer and are manufactured as built-ins. The units can be dented easily, but are durable if treated correctly. Typically hollow board are flush units and do not include panels. They are not insulating, do not promote fire safety, and do not provide soundproofing. |
| 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. |

13.0 Interior: Doors

- Design Guidelines: Section VIII. Guidelines for Interiors

13.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated historic interior doors, when appropriate. In cases where replacement of interior doors is desirable or necessary, either the in-kind replacement of historic materials or the installation of imitative substitute materials that simulate the size, style, type, configuration, 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 interior doors applying the *Design Guidelines* is based on a three-step process:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative substitute materials meeting the design considerations and *Design Guidelines*.

13.2 Historic Use in Inter-War Housing

Interior doors in Inter-War housing were wooden, interior grade units of standardized design. Such elements are documented at Aberdeen Proving Ground, Maryland, and at the U.S. Army Garrison, Hawaii. Interior door units include the door, frame, transoms, hardware, and thresholds.

13.3 Design Considerations

Five major factors should be considered in the selection of in-kind or imitative substitute materials simulating interior doors: 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.

13.3.1 Location: Consider retaining historic interior doors in their original location, where possible. Replacement doors should simulate the original design of the element in their original location, as possible.

13.3.2 Type: Interior doors are classified by door design, operation, and number of leaves. Major designs include paneled, flush, and louvered. Door operating types include bifold, sliding, hinged / hung, or pocket doors. The number of door leaves in a unit typically is reflected in the size of the opening. Simulating the historic unit in design, operation, and number of leaves should be considered in replacement, when possible.

13.3.3 Size: Consider matching the dimensions of all components of the door unit in repair and replacement projects. Avoid the addition of infill panels in door bays to accommodate door units that differ in size from the original units, where possible.

13.3.4 Finish: Pigment medium, texture, and reflective quality of finishes to interior doors contribute to visual character of the interior's design. 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.

13.3.5 Design Maintenance: Monitor in-kind or imitative substitute replacement elements in the door unit to assure that new materials are compatible in seasonal expansion and contraction rates with retained elements. Consider adjustments for smooth operation, as indicated.

13.4 Materials Guidance: Recommended Materials

13.4.1 In-Kind Repair and / or Replacement: In-kind replacement of deteriorated interior doors 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. Standards for in-kind repair and replacement are contained in the Secretary of the Interior's *Standards for the Treatment of Historic Properties. Preservation Brief 18 Rehabilitating Interiors in Historic Buildings* particularly may be relevant to interior door projects.

13.4.2 Imitative Substitute Materials: Replacement of deteriorated interior doors with imitative substitute materials 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 materials for interior doors. Please note that the list of materials is anticipated to expand as new materials and products become available.

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| Molded | Molded doors are solid core units that are lighter than wood; a common material for molded doors is fiberglass or plastic. They are durable and offer insulation. Units are molded to have the appearance of wooden doors and can be coated in wood veneer to better simulate the natural material. |
| Medium- and High-Density Fiberboard | <p>Medium-density fiberboard (MDF) is a durable material less likely to become dented like other synthetic options. MDF doors typically are solid core units. It primarily is composed of discarded wood and other organic materials. The material is heavy and allows for noise control. Additionally, wood veneer can be applied; it also can be painted. MDF is less dense than HDF and more prone to warping.</p> <p>High-density fiberboard (HDF; hardboard) is a dense material composed of discarded wood, like MDF. HDF doors typically are solid core units. The material can be molded to mimic wooden units. Unlike MDF, HDF is manufactured with a wet process that allows the wood fibers to expand and bind. Doors typically are molded of the material. The material can be clad in wood veneer to simulate historic units. It is heavier and more uniform than MDF.</p> |
| Hollow Board | Hollow board doors include a hollow core supported by cardboard webbing clad in wood veneer. The doors can be dented easily, but are durable if treated correctly. Typically, hollow board doors are flush units and do not include panels. They are not insulating, do not promote fire safety, and do not provide soundproofing. |
| Fiberglass | Fiberglass doors are lighter than wood and have the added benefit of durability and an insulated core. Units can be coated in wood veneer to better simulate the natural material. However, fiberglass tends to fade. |

14.0 Interior: Fixtures

- Design Guidelines: Section VIII. Guidelines for Interiors

14.1 Summary of Design Guideline

The *Design Guidelines for Army Inter-War Era Historic Housing (1919-1940)* support the repair and maintenance of deteriorated historic interior fixtures, when appropriate. In cases where replacement of interior fixtures is desirable or necessary, either the in-kind replacement of historic fixtures or the installation of imitative fixtures that simulate the size, type, style, and finish of the historic building element are approaches authorized under the *Design Guidelines*.

The following discussion of treatments appropriate to the replacement of interior fixtures applying the *Design Guidelines* is based on a three-step process:

- Identify existing and/or historic application;
- 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
- Select in-kind or imitative materials meeting the design considerations and *Design Guidelines*.

14.2 Historic Use in Inter-War Housing

Interior fixtures historically were used in Army housing during the Inter-War period as functional and aesthetic elements providing lighting, heat, and accessibility. Fixtures are found in all Inter-War housing unit and include, but are not limited to: lighting units, heating elements such as radiators and floor grates, and hardware such as knobs and hinges. Fixtures generally reflect architectural style and commonly available fixtures from the period of construction. It is anticipated that fixtures original to Inter-War housing have had a high rate of modification or removal over time accompanying the replacement of heating and cooling systems, and quality of life improvements.

14.3 Design Considerations

Five major factors should be considered in the selection of replacement units for interior fixtures: location, type, size, finish, and design maintenance. Consideration of these factors will support retention of the overall design integrity of the building.

14.3.1 Location: Ability to support current building systems, quality of design, and condition should be considered in decisions involving the maintenance, repair, or replacement of interior fixtures. Original fixtures contribute to the historic character of an interior and should be maintained in their original location, where possible. Fixtures of particularly high quality or unusual design may be aesthetic assets. Substantially deteriorated standardized fixtures that do not meet current safety requirements may require substantial investment to retrofit. Consider replacement elements that duplicate the locations of fixtures in historic lighting, hardware, and systems schedules.

14.3.2 Type: Consider developing an inventory of house fixtures to identify the types of surviving original fixtures. Consider retaining the best-preserved examples of the types of fixtures found in the building, as appropriate. Simulating the design character of new fixtures should be considered in fixture replacement.

14.3.3 Size: The dimensions of the interior fixtures also are factors in the appearance of the interior design. Replacement fixtures should approximate the overall height, width, depth, and placement of the existing or historic fixture as closely as possible. Replacement that strives to replicate the dimensions of historic fixture, where possible, will contribute to the preservation of the overall design integrity of the individual house.

14.3.4 Finish: Pigment medium, texture, and reflective quality of finishes to interior fixtures like lighting and hardware, contribute to the historic design and integrity of the house interior. Pigment mediums, including paints and glazes, used in replacement should simulate the finish medium, texture, and re-

flective quality of the existing or historic materials, where possible. The selection of paint or glaze 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.

14.3.5 Design Maintenance: Consider supplementing historic fixtures with new fixtures with simulated designs where supplementary service is desirable. Monitor the condition of antiquated and/or obsolete fixtures on a regular basis to assure their safety.

14.4 Recommended Fixtures

14.4.1 In-Kind Repair and / or Replacement: In-kind replacement of interior fixtures is a treatment approach identified in the *Design Guidelines*. In-kind replacement of historic fixtures should be consistent with the *Design Guidelines* and design considerations identified for the element. Standards for in-kind repair and replacement of fixtures are contained in the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*. Detailed guidance on in-kind repair and replacement of historic materials has been developed by the National Park Service in their *Preservation Briefs* series. *National Park Service Preservation Brief 3 Improving Energy Efficiency in Historic Buildings*, *Preservation Brief 17 Architectural Character—Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character*, *Preservation Brief 18 Rehabilitating Interiors in Historic Buildings*, and *Preservation Brief 24 Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches* particularly may be relevant to interior fixture projects.

14.4.2 Imitative Substitute Materials: Replacement of deteriorated interior fixtures with imitative substitute materials is an allowable treatment approach provided that the imitative substitute material meets the *Design Guidelines* and design considerations. Fixtures are manufactured as individual units and likely will require care and planning in simulating the type, size, finish, and design of the historic unit.

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| Aluminum and Nickel | Light fixtures, outlet covers, and hardware such as door knobs, handles, and hinges are produced in the metals, aluminum and nickel. Aluminum and nickel are lightweight, corrosion resistant, cost-effective metal materials. |
| Plastic and Rubber Composites | Plastic and 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 for lighting trim, outlet covers, plumbing fixtures (such as wash basins and sinks) and certain door hardware. These units are produced in a variety of colors, dimensions, and textures. This material requires minimal maintenance, has a lifespan of 50 years, and is easy to install. |
| Steel | Steel is an alloy of iron and carbon and, sometimes, other elements such as chromium. Because of its high tensile strength and low cost, steel is often marketed and manufactured for lighting, certain hardware, and plumbing fixtures (such as wash basins and sinks). |