



## 20<sup>th</sup>-Century Building Materials and Suitable Substitutes: Exterior Materials (Legacy 15-707)

### Abstract

The aim of this project is to provide a useful tool that will assist Department of Defense (DoD) Cultural Resource Managers (CRMs), facility planners, architects, and engineers responsible for the maintenance and repair of historic twentieth-century buildings in complying with Section 106 of the National Historic Preservation Act (NHPA). This project focuses specifically on three exterior material types commonly used during twentieth-century construction of DoD facilities: concrete, corrugated metal, and asbestos-cement. The resulting technical report provides a discussion on the history of the three aforementioned material types, a discussion on common problems encountered with the materials, and maintenance and repair considerations; and identifies suitable substitute replacement materials that meet the Secretary of the Interior's Standards for the Treatment of Historic Properties (SOI Standards). In addition, the report provides the steps for coordinating associated projects with respective State Historic Preservation Offices (SHPOs) and consulting parties. The conclusions of the study were drawn utilizing archival research, documentary research, and data analysis, as well as case studies of select DoD installations throughout the Mid-Atlantic region.

### Project Specifics

A survey of DoD CRMs in the Mid-Atlantic and New England regions, from Virginia to Maine, was undertaken as part of the FY13 Legacy Project 13-707, *20<sup>th</sup>-Century Building Materials and Suitable Substitutes: Windows*, which identified exterior materials as presenting challenges to maintaining historic twentieth-century DoD buildings. As a result, this document focuses on suitable substitutes for the following twentieth-century exterior material types: concrete, corrugated metal, and asbestos-cement.

The aim of this report is to serve as a useful tool that will assist DoD CRMs, facility planners, architects, and engineers responsible for the maintenance and repair of historic twentieth-century buildings in complying with Section 106 of the NHPA. This report takes preservation standards into consideration. It provides a summary of evaluating maintenance and repair options for historic exterior materials. When replacement is warranted, this report identifies in-kind available or acceptable substitute materials that meet the SOI Standards.

This report also presents the history of each particular material type, identifying their unique characteristics and special circumstances that led to their development, as well as the key manufacturers that historically produced them. When an adverse effect cannot be avoided, the history presented on each particular material type can be utilized to prepare mitigation documentation, such as Historic American Buildings Survey/Historical American Engineering Record (HABS/HAER) surveys and other associated documentation.

**Description of geographic setting:** Mid-Atlantic and Northeastern United States, from Virginia to Maine.

## Tech Note: 15-707

**Principal investigators:** Samantha Driscoll and Pam Anderson (A.D. Marble); Heather McDonald Robbins (Naval Facilities Engineering Command, Mid-Atlantic)

**Partners:** N/A

**Service branch:** Navy

**Project location:** Mid-Atlantic and Northeastern United States, from Virginia to Maine

**Installation size:** N/A

**Installation primary mission:** N/A

**Project dates:** June 2015 through April 2016

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*Concrete panels are a character-defining feature of this building at NSA Bethesda, Maryland.*



*Corrugated metal is a character-defining feature of this building at Picatinny Arsenal, New Jersey.*



*The corrugated asbestos-cement panels are a character-defining feature of this building at NSF Indian Head, Maryland.*

### **Purpose/Need**

In architecture, exterior materials like roofing and cladding are often the defining characteristic of a style, time period, or method of construction. In particular, for buildings that are not high style, exterior cladding or roofing can sometimes be the only character-defining feature. Although materials like concrete, corrugated metal, and asbestos-

cement were designed for utility and not for aesthetics, they are character-defining features on countless buildings of the twentieth century. A survey of DoD CRMs in the Mid-Atlantic and New England regions, from Virginia to Maine, identified twentieth-century exterior material types as presenting challenges to maintaining historic twentieth-century DoD buildings. Three twentieth-century exterior material types were identified as most problematic: concrete, corrugated metal, and asbestos-cement. As a result, this document focuses on maintenance, repair, in-kind replacement, and suitable substitutes for these three exterior material types.

### **Approach**

In order to prepare a report that was manageable in terms of approach and budget, the geographical limits of study were confined to the Northeast and Mid-Atlantic regions, from Maine to Virginia; however, it is anticipated that the findings presented will generally be applicable to other geographic areas that use concrete, corrugated metal, and asbestos-cement in their historic twentieth-century buildings.

The approach to the project was an extension of the previous methodology of the FY13 Legacy Project *20th-Century Building Materials and Suitable Substitutes: Windows* (Legacy Project 13-707), in which a CRM survey questionnaire, on-site research, and installation visits identified exterior materials as problematic. The next step was a review of National Park Service (NPS) briefs and other documentation regarding the rehabilitation or replacement of twentieth-century building materials. On-site investigations were completed at various DoD installations, and the corresponding SHPOs were contacted for further information. The methodology took into account lessons learned from the previous project, which guided the organization of this report.

### **Results**

The project evaluated the feasibility of in-kind replacement, as well as identified suitable substitute materials when applicable. The report concluded that maintenance, repair, and replacement of historic twentieth-century exterior material are not without challenges. While keeping historic materials in place is the ideal scenario, the feasibility varies between the study materials. Concrete can be repaired and replaced in-kind, as concrete remains readily available and customizable. The repair or replacement materials should match the color, aggregate, and composition of the historic concrete when possible. No suitable substitutes were identified. Corrugated metal can be replaced in-kind, as corrugated metal also remains available and customizable, though compatible metals should be used. The historic design and appearance should be maintained through color and corrugation rhythm. Asbestos-cement cannot be replaced in-kind, as it is no longer produced in the United States. Asbestos-cement may be replaced with either fiber-cement products or corrugated metal to avoid adverse effects. The report also provides a list of manufacturers that can assist with supplying historically sensitive materials. In addition, the report presents the history of the three particular exterior materials that can be used toward the preparation of mitigation documentation.

### **Benefit**

This project will help expedite Section 106 compliance. The report provides a protocol that explains the factors that should be considered in determining the maintenance, repair, or replacement of historic exterior materials. This report provides a summary of evaluating repair versus replacement options for historic exterior materials. When replacement is warranted, this report identifies acceptable substitute materials that meet the SOI

Standards, as well as minimization measures that are acceptable to respective State Historic Preservation Offices (SHPOs), thereby avoiding or minimizing adverse effects to historic properties and ultimately preserving their historic integrities while enhancing future sustainability. By balancing preservation concerns with federal regulations and program needs, the DoD can continue to ensure the long-term viability of the thousands of historic twentieth-century buildings within its inventory.

### **Recommendations/Lessons Learned**

DoD installations responsible for historic twentieth-century buildings are challenged with balancing preservation needs, future sustainability, and federal regulations. Common issues with each of the three exterior material types were identified. Concrete can crack and spall, requiring regular maintenance checks. If improperly maintained, corrugated metal steel will corrode. Asbestos-cement panels can become friable once weathered or damaged, and cannot be replaced in-kind, as the material is no longer produced in the United States.

All exterior material projects should evaluate alternatives that avoid replacement of the historic material while meeting the defined project need. Such avoidance measures include appropriate repairs for each material. When replacement is the only option due to a failure of the material, in-kind replacements should be chosen for both concrete and corrugated metal. Asbestos-cement cannot be replaced in kind, and fiber-cement or corrugated metal should be chosen as the suitable substitute.

When adverse effects cannot be avoided and replacement is the only viable option, the report also presents the history of the three particular exterior material types, identifying their unique characteristics and special circumstances that led to their developments and the key manufacturers that historically produced them. This history can be used toward the preparation of mitigation documentation.

### **Communications**

The report will be posted to the DoD Environmental, Safety and Occupational Health Network and Information Exchange website (DENIX) upon approval for release by the DoD Legacy Office.