

TECHNICAL PRESERVATION GUIDELINES

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HISTORIC BUILDING ROOFING

CAROLINE ALDERSON

INTRODUCTION

One of the features that commonly distinguishes historic public buildings from other historic structures is the quality of the roofing. Long life cycle materials such as slate, clay tile and sheet metal traditionally offered the best value for the investment of public funds and contributed to the dignified appearance these federal buildings were designed to convey.



FIGURE 1 Clay tile roofing dominates and unifies aerial views of Washington's Federal Triangle, a vantage point also enjoyed by visitors to the Old Post Office tower in the center of the complex. Tile roof repairs require special care to achieve consistent color distribution across an entire roof.

This guide focuses on preservation-appropriate solutions for repairing, upgrading and replacing slate, metal, and clay tile roofing on sloped surfaces of historic buildings and clay tile historically used to provide a durable, walkable roof surface at many pre-World War II public buildings. Given the availability of detailed guidance elsewhere, this guide references useful resources for historic buildings and focuses on challenges commonly encountered in GSA historic building projects, with the goal of promoting approaches and design solutions that have made these projects preservation successes. **Comprehensive guidance on historic building roof repair and restoration is available online in the National Park Service technical preservation website at www.nps.gov/hps/tps/publications.htm.** Traditional Building magazine, available online at traditional-building.com, is a useful resource for locating specialized materials and services for historic building projects of all types. Every issue includes a section on historic building roofing products.

Guidance for meeting energy conservation goals through green roofing, installation of photovoltaic solar panels, and

other energy conserving measures is available from GSA's Office of Federal High Performance Green Buildings.

All projects affecting historic building restoration zones require review by GSA's Regional Historic Preservation Officer (RHPO), beginning early in project planning, to ensure that design scopes, qualifications, and budgets address preservation compliance requirements. Projects consistent with the recommendations in this guide will be determined to have no adverse effect on the qualities that may qualify the building for the National Register of Historic Places. Include a completed GSA Section 106 Compliance Report-Short Form with each design submission to document the preservation design issues and solutions for RHPO clearance.

Roofing characteristics to be considered in planning GSA historic buildings projects include:

- Visibility, color, texture, size, and range of original roofing materials
- Historic roofing material durability and performance characteristics
- Roof configuration, including eave detailing
- Method(s) of attachment
- Original ornamental features such as finials and acroteria

FEDERAL GUIDES AND STANDARDS

Every successful GSA historic building project begins with review of the specific building's Building Preservation Plan (BPP) or Historic Structure Report (HSR) to ensure that GSA teams involved in developing project requirements and overseeing design and execution are well informed on the building's preservation goals at the earliest stages of project planning and design. The BPP or HSR identifies spaces of architectural importance and character-defining features to be preserved. BPPs and HSRs also outline restoration goals for altered facades and sites, sometimes including original detail drawings of roofing materials or details as a basis for restoration.

Standards and guidance for all federal projects involving historic buildings are provided in the Secretary of the Interior's

Standards for Rehabilitation and guidelines for applying the standards published by the National Park Service (NPS), U.S. Department of the Interior (DOI Standards). NPS has also published a variety of detailed briefs and technical guides addressing a range of roofing materials and issues. NPS publications of particular value to GSA roofing projects include:

- Preservation Brief Number 4: Roofing for Historic Buildings
- Preservation Brief Number 29: The Repair, Replacement, and Maintenance of Historic Slate Roofs
- Preservation Brief Number 30: The Preservation and Repair of Historic Clay Tile Roofs
- *Metals in America's Historic Buildings*, 1992 edition

All NPS briefs are available free online at www.nps.gov/hps/tps/publications.htm. Books such as *Metals in America's Historic Buildings* may be purchased online from the Government Printing Office. NPS technical publications may be ordered online through the GPO bookstore at bookstore.gpo.gov under "Buildings, Landmarks, and Historic Sites."

The Historic Preservation Education Foundation compiled a comprehensive *Roofing Handbook for Historic Buildings*, for the NPS Roofing Conference and Exposition for Historic Buildings, held in Philadelphia, PA in 1999. The handbook includes specifications, resources, NPS briefs and well-illustrated articles relating to historic roofing materials, technology, and project planning. The handbook is out of print, but is often available from architectural book retailers such as Stephen Schuyler's online bookstore for building trade professionals, at <http://www.rarebookstore.net/cgi-bin/schuyler>. Some articles are available individually online, including "A Primer on Clay Tile Roofing Inspection and Material Selection," by John Dascher, CSI, online at www.rci-online.org/interface/2002-01-dashner.pdf.



FIGURE 2 Damaged or missing features such as decorative acroteria should be repaired or replicated as part of a major roof project.

lished preservation standards used throughout the world, are the principal goals of:

- maintaining authenticity, by
- doing no harm to historic materials,
- designing changes sympathetically, and
- restoring historic facades, settings and spaces correctly, based on historic documentation.

MATERIALS AND INSTALLATION

Historically accurate execution of roofing details is important to the appearance and performance of historic building roofs. Matching the coloring and color variation in original clay tile roofing remains one of GSA's principal roof restoration challenges. Very dark slate can also be difficult to match using domestically available slate; researching international sources is sometimes necessary. Reproduction of decorative details such as acroteria involves highly specialized skills. Historically accurate execution of roofing details is important to the appearance and performance of historic building roofs. For these reasons, **all projects involving repair, restoration or replacement of sloped roofs at historic buildings or historic clay tile flat roofing require the services of a preservation architect or architectural conservator to:**

- assess historic roofing conditions and design intent,
- prepare specifications,
- locate and confirm the availability of appropriate replacement materials,
- review sample materials, and
- oversee execution of restoration work.

Professional qualification requirements and scopes of work for preservation design professionals and architectural conservators are available online at www.gsa.gov/historicpreservation>Project Management Tools under "Qualification Requirements for Preservation Architects and other Specialists" and "Preservation Design and 106 Compliance Scope of Work." Repair and installation of historic and traditional roofing materials such as slate, tile and metal roofing requires specialized construction skills. Accordingly, all such design specifications need to include Competency of Restoration Specialist requirements mandating restoration experience involving similar materials and methods used successfully in historic buildings projects of comparable complexity. Competency specifications and project-specific skill requirements are also available at www.gsa.gov/historicpreservation>Project Management Tools under "Competency Specifications for Preservation Construction Contractors."

Central to the DOI Standards, which are based on estab-

Supplier data must confirm that new roofing materials meet

specified performance requirements, matching historic roofing performance characteristics to the extent possible. Except in cases when historic design or detailing flaws need to be revised to improve the roof or building's overall performance, A/E and contractor submissions should confirm that original attachment methods and roof detailing, especially at eaves and locations where materials join, replicate original roofing details and design intent. Missing features such as decorative acroteria and roof finials should be replicated and reinstalled as part of major roof repair or replacement projects.



FIGURE 3 Repair and installation of slate, clay tile and metal roofing requires specialized construction skills. Competency of Restoration Specialist requirements reduce GSA risk by limiting competition to firms having successful experience with historic building projects of comparable complexity.

Allow ample time for review of multiple sample submissions and custom fabrication that may be necessary to procure matching materials. When matching clay tile is not readily available, custom fabricated clay tile using a color-matched slip has resulted in an acceptable color match.

Design and installation of variegated roofing requires special care to achieve consistent color distribution across the entire roof. Require matching not only the colors of the historic roofing but replication of the overall color distribution pattern. Removal and relaying of historic roofing is sometimes necessary to mix old and new for a well integrated result.

Various metals have been used in roofing historically, but changes in technology and the manufacturing process have altered some of the choices for replacement. Where the roof surface was historically painted the composition of the base metal is of secondary importance. Stainless steel has been available for some time as a more durable alternative to the traditional mild steel base for terne coating. All terne-coated steel is now made with zinc rather than the traditional lead.

Advances in the development of sheet metals have increased the range of preservation and environmentally-appropriate roofing choices offering improved performance and the ability to closely match the visual properties of historic roofing. Lead-free, terne-coated stainless steel, for example, can be painted to match a historically painted roof surface, but does

not require painting, for superior durability, where limited maintenance access or ability justifies the modest additional expense of using a harder, somewhat less workable, material. As with any roofing project, proper specification, detailing, and installation are critical to a historically accurate roof appearance and optimal performance.

Special care must also be taken to ensure the compatibility of adjoining materials and materials in a common drainage path, to prevent potential corrosion caused by dissolved salts or galvanic action between dissimilar metals. Pressure-treated decking, for example, can introduce salts harmful to metal roofing.

HISTORIC PAVING

Some historic buildings feature historic clay tile roofing laid in a bituminous membrane for waterproofing and tile adhesion. Attempts to salvage and reuse these tiles have generally not proven worthwhile, given the labor intensiveness of removing tile from mastic and waste rates exceeding 75 percent. As an alternative, some projects where roofing areas are visible from adjoining historic buildings or where flat roofing remains an important tenant amenity have used quarry tile-topped concrete pavers installed as part of a new protected membrane roofing system. A life cycle cost advantage of these roofing systems is that the membrane can be easily accessed for repair and the finished roofing material can be reused repeatedly. However, successful adhesion of the finish tile resulted only when the tile topped pavers were plant fabricated in a single casting process. In this fabricating process, tiles were placed on partially set concrete pavers, shaken to remove bubbles and improve the bond between tile and concrete, and allowed to finish setting as one paving unit. Field applied paver-tile assemblies have not proven durable.

GREEN ROOFING & PHOTOVOLTAIC PANELS

Living roofs benefit the environment, reduce fuel consumption for heating and cooling, and can serve as a tenant amenity, especially in combination with walkable surfaces, for flat roofed areas of historic buildings. Some buildings may require assessment and structural reinforcement to support the additional weight of a green roof. For guidance on specific applications, contact GSA's High Performance Green Buildings program.

Many historic buildings have flat roofed areas suitable for installing photovoltaic panels to reduce the building's dependence on fossil fuels. Where the panels will not be visible from grade and can be installed without harming historic roofing such as clay tile, the installation will be considered

as having no adverse effect on the qualities that may qualify the building for the National Register of Historic Places.

SKYLIGHTS

Many historic buildings include skylights designed to admit daylight to interior cores, underground spaces and other windowless areas. Roofing projects may provide opportunities to improve the thermal performance and life cycle of these assemblies while improving the marketability of windowless workspaces. Explore restoring covered over skylights in occupied locations where they provide the only source of daylight. Where funding for restoration is not available, skylights should be stabilized to protect the building from infiltration and retained in place to allow for the possibility of future restoration.



FIGURE 4 Include repair or replication of skylights concealed by previous roof repairs to improve the marketability of windowless workspaces.

For additional guidance on integrating daylight design, electrical illumination, architectural design and mechanical systems, refer to P100 6.8 Interior Lighting, Daylighting, and Control Systems. See also NPS Preservation Note 44 *Natural Light in Historic Buildings*.



FIGURE 5 Sample review of materials, repair techniques and mockups ensure successful projects.

EXECUTION & DOCUMENTATION

For all roofing work within historic building restoration zones, be sure to specify sample review of any new materials and repair techniques and require a mock up installation of new materials or assemblies for RHPO review, prior to overall fabrication and installation, to ensure that preservation design criteria have been met. Budgeting time and funding for mock ups helps to ensure against cost increases and delays that occur when a planned solution falls short of GSA expectations.

We encourage designers to help us promote model solutions that demonstrated historic preservation best practices and conserve GSA's historic buildings. Toward that end, the Center for Historic Buildings invites readers to share images and information documenting their own project successes for the benefit of future updates to this guide (contact caroline.alderson@gsa.gov).

For additional guidance and building specific information, contact your RHPO (see www.gsa.gov/historicpreservation>Contacts for a current listing).