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## *PRESERVATION IN THE CARIBBEAN: OLD SAN JUAN FORTIFICATIONS*

San Juan National Historic Site is located in Puerto Rico, a self-governing Caribbean island that is freely associated with the United States of America. The historic site comprises the principal fortifications of the city of Old San Juan. All the fortifications are on San Juan island except for one detached unit on Cabras Island on the west side of the San Juan Bay. The city of Old San Juan is located on the western side of the 615-acre San Juan Island, which is connected by causeways to the greater metropolitan area. Old San Juan serves as both, the capital of Puerto Rico and the headquarters for the municipal government. Old San Juan today is an extremely congested urban center, consisting predominantly of mixed commercial and high-density historic residential areas with little open space. Most of the public's open areas are administered by the National Park Service and the grounds made up the Cultural Landscape of Fort El Morro (ill. 1, 2 and 3).

The fortifications of San Juan have evolved over more than four centuries. The National Park Service administers and owns the cultural resources which now comprise the 75-acre national historic site. The Cultural Resources measure approximately 2.5 miles of massive stone walls which literally enclose the old city. Two of the world's most impressive fortifications – El Morro, which guards the western approach and provided ocean defense and access control to the bay of San Juan, and San Cristobal, which guards the eastern approach and land defense (ill. 1-3). A third fortification is located on a 3.4-acre detached unit of the historic site. The site contains a small fort, called El Cañuelo, which was constructed across the bay from Old San Juan to provide cross fire over the mouth of the bay and prevent enemy landings on the western side of the harbor.

Although San Juan National Historic Site was established by the Secretary of the Interior in 1949, it remained under the control of the Department of the Army as part of the Fort Brooke Military Reservation until September 1961, when a major portion of the fortifications were transferred to the Department of the Interior.

A cooperative agreement was signed between the Department of the Interior and the Commonwealth of Puerto Rico in 1976, the agreement which defines more clearly the areas of jurisdiction and responsibility between the National Park Service and Puerto Rico Commonwealth, the

agreement has essentially established a "good-neighbor" policy.

### CULTURAL SIGNIFICANCE

All of the components of the national historic site are included on the National Register of Historic Places, which denotes sites of historical, architectural, archeological, or cultural significance to the history of the United States. On 1984, the San Juan Fortifications, La Fortaleza and San Juan National Historic Site, were officially accepted to the World Heritage List of the United Nations Educational, Scientific, and Cultural Organization because of its outstanding universal significance.

### MANAGEMENT ISSUES

During the Third International Symposium for Historic Preservation in the Caribbean, the Management of San Juan National Historic Site felt that the most significant recommendation found in the Historic Structures Report (HSR) should be presented. Field testing had just been completed and they wanted to include the opinion of as many experts in preservation as possible. The presentation included a lecture with slides, a site visit to review field testing sites, stucco color samples, and first hand laboratory test results. The presentation was made to architects, masons, engineers, landscape architects, and other professional preservationists. I would like to present the findings and conclusions.

### SAN JUAN HISTORIC STRUCTURE REPORT: STUCCO PROJECT

According to NPS, an Historic Structures Report (HSR) is a report that completely documents a primary historic structure and guides the treatment of the cultural resources. A thorough HSR combines documentary research with materials' investigations, and clearly describes the cultural resource's evolution and their architectural components. An HSR places the cultural resource within an historical framework, identifies its character-definitive features, and provides recommendations for preservation, conservation, or restoration treatment, as the case may be. The site and the



landscape are usually included for a total understanding of the resource.

The HSR, for El Morro, San Cristobal, and the City Walls became one of the largest research projects ever undertaken by the National Park Service. The team included persons not only from the North Atlantic Regional Office in Boston (Massachusetts), but also persons from the Southeast Regional Office in Atlanta (Georgia), the Washington Office, and private consultants, including Columbia University's Center for Preservation Research.

Research and field work began in 1986, and was documented through photography. Almost every wall and surface were photographed. The study dealt with every tunnel, every bastion, and every sentry box. Hundreds of docu-

However, this study determined that during the approximately 350 years of construction techniques or materials, only in the late twentieth century changes were noticeable.

For the study we took more than 600 samples of mortar, stucco, and plaster to assist in dating the various elements that comprise the fortifications. Mortar analysis is considered a "destructive" investigative technique, since it extracts a small portion of mortar, stucco, or plaster to determine the amount of sand, clay, lime, and portland cement (if any) used in the original mix.

Under microscopic examination, we found a variety of sands, limes, and aggregates, including crushed brick and sea shells.

Various forms of cements materials are found throughout the fortifications. The term 'mortars' is used in the HSR to



Puerto Rico, Castle San Felipe del Morro, guardian of the Bay of Old San Juan City

ments were researched, some going back to the 1500's, the research team often having to translate the archaic and complex military terms. Hundreds of representative mortar and paint samples were extracted from this vast system of fortifications. The completed three volume work became known as 'The Historic Structure Report for the Fortifications of San Juan, Puerto Rico.'

Many materials of construction were discussed and analyzed as part of the HSR, but for the purpose of this paper only mortar and its close relatives – stucco and plaster – will be discussed. Initially, it was presumed that different materials were used over time for different building campaigns. Thus, a study of materials would have led to the production of a key by which fortification elements could be dated.

describe these materials in general. Mortar is broken down specifically as bedding mortar, *bormingón*, and of course, plaster and stucco. A bedding mortar is used to bind the *mamposteria* (or rubble), generally consisting of the sandstone or brick substrate within the walls. *Hormigón*, as used historically, is a poured mix with pulverized brick that was used for roofs, terrepleins, and similar areas that needed to be more impermeable to water penetration. The mix that was applied with a trowel to coat the wall substrate was referred to as "plaster" if it was an interior wall, or "stucco" if it was an exterior wall. Sometimes the exterior stucco is referred to as "pargetting". Because not all areas of the fortifications can be easily designated as interior or exterior, the term "stucco" was generally used in the HSR for all the wall surfaces.



The knowledge of the materials used in San Juan was necessary for understanding the current conditions of the fortifications and for assessing the durability of materials; it was certainly required for making preservation recommendations. The composition, the manner of fabrication, the tooling of finishing, and the method used to impart the color are all significant factors that have to be known or determined in order to replicate, patch, or replace any section of wall covered with stucco.

Stucco was applied to masonry structures as a means of protecting them and their porous substrate from the erosive effects of weathering. The stucco received the brunt of weathering and was intended to deteriorate over time; periodic restuccoing kept this sacrificial surface layer intact. It is not known exactly how many restuccoing campaigns oc-

## CONCLUSIONS

The multi-volume San Juan HSR was completed in late 1991. It had been expanded and modified in many ways, and tailored to attempt to meet the needs of the park and those in charge of preserving the fortifications. One of the key chapters of the report was the "Recommendations" section:

1. All historic fabric from the Spanish period, the lighthouse at El Morro, and the 20th-century harbor defenses should be preserved.
2. Restoration should consist primarily of removing non-historic features and re-establishing protective wall coatings.
3. Rehabilitation should focus primarily on safety and secur-



*Puerto Rico, entrance bridge to the Castle San Felipe del Morro*

curred following the late 18th-century construction, or how much surface area was restuccoed later in the 19th century. Archival sources, and examination of existing stuccoes, confirmed that at different times the walls of the fortifications were covered with either redbeige or white stucco, and that the walls may have been left without stucco for periods of time as well. However, the stucco that was applied in the early 19th century, during the last major resurfacing that occurred during the Spanish period, is beige-white in color.

Following the early 19th-century restuccoing, a yellow-ocher finish was applied to the exterior surfaces. Much of this thin, pigmented lime wash coating remains today, but is eroded, streaked, and stained.

ity issues. Accommodating visitor facilities and park operations should be considered in non-historic, or less significant, structures.

The general treatment recommendations for the San Juan fortifications was to "preserve significant historic features, existing prior to 1961". The advantage of this approach was to preserve the greatest amount of extant historic fabric (ill. 18). It would avoid the issues of documentation needed to satisfy the standards for restoration that would be required to reconstruct with a minimum of conjecture. Preservation would be consistent with the General Management Plan and NPS policies. This approach would allow interpreting Spanish-period features without destroying significant 20th-century features.