

From Natural to Artificial: Vernacular housing in the Spanish Caribbean

Beatriz del Cueto¹

¹ Doctoral candidate in Architecture, Building, Urbanism, and Landscape, Escuela Técnica Superior de Arquitectura, Universitat Politècnica de València, Spain, bdelcue@doctor.upv.es.

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Abstract

*The Spanish American War of 1898 and the colonization of the Spanish Caribbean (Cuba, Puerto Rico, and the Dominican Republic) by the Government of the United States (U.S.), brought about changes to local vernacular housing. The Spanish colonizers substituted indigenous traditional means and methods of construction and replaced them with continental techniques and new materials. The U.S. occupation produced yet another transformation through the extensive use of portland cement which became the protagonist for their new domestic architecture. Even though cement had been introduced into the region two decades prior, to build industrial structures and through the importation of pre-manufactured new materials made with cement, it was slowly accepted for residential buildings, being promoted as fireproof, vermin-proof, and with the strength to resist hurricanes and earthquakes. Erection methods were faster, the dwellings were lighter, and built with the use of repetitive methods facilitated by reusable molds. Catalogs produced in each of these territories with the new prefabricated cement architectural elements would maintain the *essence* of the vernacular translated into cement and reinforced concrete. These architectural evolutions are traced with the use of historic archival materials: cartography, architectural layouts, photography, and extant contemporary representations.*

Keywords: vernacular housing, construction molds, portland cement, Spanish Caribbean.

1. Introduction

The islands of Cuba, Hispaniola (geopolitically Haiti to the west, the Dominican Republic to the east) and Puerto Rico, constitute a major part of the group known as the Greater Antilles and linguistically and culturally constitute the Spanish Caribbean: Iberian colonies for 400 years.

During the five millennia prior to the Spanish colonial era, there was insular exchange by indigenous groups of trade amongst the Antilles. The area was partially populated from the South American continent, bringing with them cultural settlement traditions inhabited by groups organized at the level of chiefdoms. Their houses surrounded a common open communal plaza. For at least 1,000 years before the arrival of the

Europeans, they successfully used their environs where the raw material for their structures was found and readily available year-round in a tropical climate with few changes. The indigenous dwellings, called *bohíos*, provided solar and water shelter as climatological protection (Fig. 1). Their construction, was described by Friar Bartolomé de las Casas, as chronicler of the Indies:

...some houses very well made, made of straw (top of royal palms) and wood, and these had a plaza with a walkway to the sea, very clean and straight, made like a street and the walls are of intercrossed cane or weave...and near the sea was a high lookout tower, where ten or twelve people fit, made in the same general manner... (de las Casas, 1965).

The roofing for their dwellings were *yaguas* or palm fronds which are the base of the branch of the Royal Palm (*Roystonea Borinquena*) endemic to the islands of the Caribbean, for its water repellent properties and great size: 1.5 mts. in length by 0.60 mts. in width. Chroniclers described the construction of *bohíos* as durable:

The houses were constructed over beams or tree trunks, that were fixed into the ground, a distance of two to three paces from one another in oval form, cuadrilateral or oblong, according to the site disposition... All the construction of these was secured, instead of with nails, with wild reeds (*bejucos*) which are flexible and of great duration. (Abbad y Lasierra, ed. 1971).



Fig. 1. Pre-columbian bohíos (Source: Benzoni, 2017).

2. Transformation of this Vernacular housing

The evolution of vernacular housing in the Spanish Caribbean from pre-Columbian times to the early 20th century, and particularly, the natural and artificial materials used in their construction, summarizes the influences of those who built it, exhibits adaptation to locally available natural and/or artificial building materials, and demonstrates site-specific climate protection. Oftentimes small in scale and common-looking to the inexperienced viewer, these dwellings incorporated changes slowly, and became repetitive in design.

Adapted from the *bohíos* described for the Amerindian tribes of these island-territories, the first Spanish settlements were primarily composed of wooden structures covered by *yaguas*, and/or ceramic curved tiles or *tejas* (Fig. 2).



Fig. 2. *Velorio* painting by Francisco Oller, Museo Universidad de Puerto Rico (1893).

The natural building materials were easily available in the abundant forests that surrounded their villages, but nails and clay tiles were imported from Spain. Even though The Spanish Crown insisted that the settlers to the New World build structures “in stone”, meaning permanent in character, they did not follow these mandates except for public buildings and upper-class individuals. (Pantel et.al., 1986)

The construction was principally done by indigenous slave labor, and in subsequent periods it was supplanted by black slaves. The evolution of *bohíos* also resulted in dwellings for the black population of slaves with a volume of just one space also utilizing *yaguas* to cover roofs and walls (Fig. 3). Without a doubt, the housing of early Spanish settlements in these islands was influenced by those who built it and must have resembled the indigenous and black *bohíos*. Permanent settlements were established where there were good sources of building materials nearby: “...there is in it much stone for buildings...that there is much limestone for the making of lime (and with regards to the site)...very good and firm soil to construct on, many stones, lime, and wood.” (Coll y Toste, 1916)

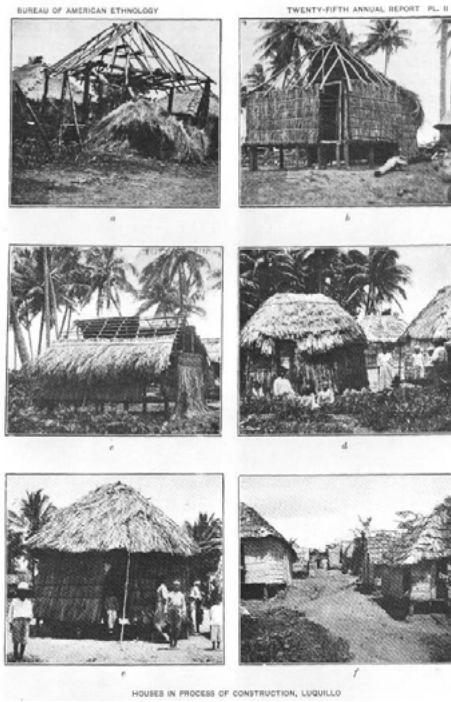


Fig. 3. Bohios for rural coastal communities (Source: Fewkes, 1907).

These wood dwellings persevered despite two Royal Decrees in 1514 and 1538, that required that “citizens” with indigenous slaves, should build in stone, which signified durability. (Pantel et.al., 1986). Historic documents relate, without discrimination, that permanent structures meant those built in *mampostería* (rubble-masonry), *tapiería* (mud-wall), *cantería* (ashlar masonry) and *cal y canto* (stone masonry). The raw building material for these early houses (wood, palms, lime, mud, limestone, sand; or produced from natural sources: brick and sugar cane bagasse - useful for their hydraulic qualities when mixed with slaked lime) were available in these tropical island-territories.

In general, these same materials, with varying construction specifications, were utilized throughout subsequent centuries for institutional and larger scale buildings as well, and up until the late 19th century with the advent of artificial or plastic stone (names given to portland cement).

Apart from this new “colonial” housing, many of the settlers opted for inhabiting the *bohios* that had been abandoned by the indigenous and black people. The framework of these structures was utilized as a base and renovated to serve the necessities of the new residents. Oftentimes, windows, interior partitions and even wood flooring were added. (del Cueto de Pantel, 1990).

As clearly illustrated in a 1766 map of Old San Juan in Puerto Rico (Fig. 4), most houses bordered the street layout of the towns, and the area behind the houses was used as a *corralón* (common yard). In these open spaces crop cultivation took place, domestic animals were raised, clothes were washed, and rainwater collection was also carried out of common wells or cisterns for the surrounding houses.

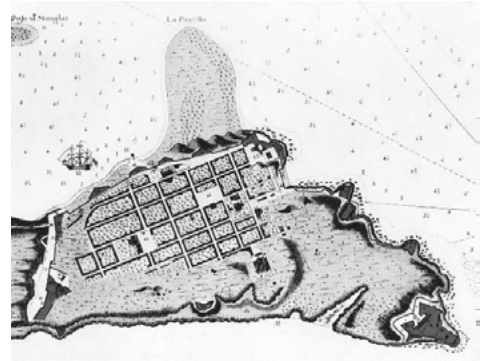


Fig. 4. Map of San Juan, Puerto Rico, National Archives Puerto Rico. (Source: de la Rueda, 1766).

Written historic texts by chroniclers of the 18th century, like Andre Pierre Ledrú, described the houses and social classes of the inhabitants in Puerto Rico:

The city offers three different types of houses: the ones for rich people are generally spacious, with large doors and windows to give the place air renovation, constructed of stones, adorned with a large balcony and covered with a flat roof and that is paved with brick: these species of flat roofs, have the advantage of collecting the rain waters that are conducted to very large cisterns

for domestic purposes, serving at the same time as a terrace for leisure use during all times of the year...The neighbors that only enjoy medium fortune, the merchants and the craftsmen live in small rubble-masonry houses, roofed with brick and only one story high...The last social class is housed in huts constructed of cane and palm bark and covered with palm fronds. These huts form the exterior boroughs of the cities. (del Cueto de Pantel, 1990)

In the mid 19th century, the islands reached their apex in material and cultural progress due to a significant rise in sugarcane production. The *bohios* or houses of non-permanent construction were replaced and eliminated for the most part, due to the implementation of local ordinances and regulations. (Pantel et.al., 1986). The required town housing was to be constructed in rubble and/or stone masonry to avoid the spread of fires and become more resistant to natural disasters (Fig. 5). It is then when the roofs became flat *azoteas* and prevailed due to their utility as rain water collectors which was stored in underground cisterns. Their construction was a framework of hardwood beams, crossed by narrow wood slats and two to three alternate layers of thin roofing brick, that was then protected by a hydraulic, water-resistant *argamasa* layer.



Fig. 5. Rubble-masonry houses. (Source: a. Mignucci Giannoni, 1981, b. Photo by author 1982).

When the citizens reached economic stability, the common yard or *corralones* started to disappear. Dwellings became independent of their surrounding community since each housed its own interior patio (Fig. 6). The rooms opened and ventilated through this interior open space, where daily chores such as water collection and clothes washing took place. The houses became individual entities. As recurring elements, there was always the entrance vestibule or *zaguán*, and the interior patio, with size or distribution being of no importance. Façade decoration was simple and consisted of balconies facing the street, cornices, as well as protruding rectangular or half-arched ornamental borders for window and doors as solar protection.

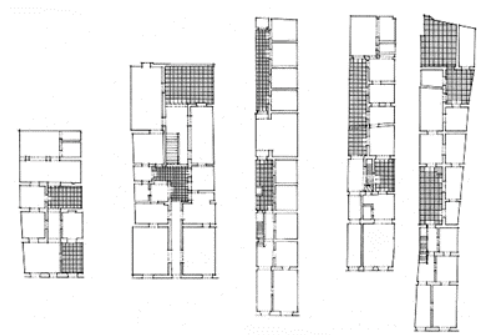


Fig. 6. Interior patio of different rubble-masonry houses in San Juan, Puerto Rico. (Source: Mignucci Giannoni, 1981).

3. Construction Technologies and materials evolve from natural to artificial

From the 16th to 19th centuries, commercial exchange continued between the Caribbean's Spanish colonies and Spain, until the Spanish-American War of 1898, which turned Puerto Rico and Cuba into U.S. territories. There were also two failed U.S. incursions into the Dominican Republic between 1910 to 1930. At the dawn of the 20th century, cultural and commercial interchange between the Spanish Caribbean increased with immigrant businessmen from the U.S. and Catalonia which imported not only the newer artificial or man-made cement building materials, but also brought the arrival of artisans and master builders knowledgeable with their production and use.

In general, most references of the same four centuries point out that there were two types of vernacular houses: those made of wood, and those built of more resistant techniques such as rubble-masonry, ashlar masonry, stone masonry, mud wall or wattle and daub. (del Cueto de Pantel, 1990). Both indigenous, colonial, and transitional housing types were built with natural materials whenever possible, even though wood was considered temporary, and those erected with hard raw materials, were considered permanent. In some coastal sites, there existed a predominance of red clay, and wood from the nearby mangroves, which were resistant to water, their natural environment. Inland settlements contained limestone, sand, clay, and excellent hardwood. In addition to the variations of these types, the construction continued to depend on the technical knowledge of the labor force, whether indigenous, black and/or European.

Two great events characterized the urban development of the capital cities of the three islands at the end of the 19th century. The first was the 'liberation' of the growing cities, marked by demolishing their surrounding defensive walls which prevented their physical expansion. The other was the Spanish-American War which eliminated Spanish sovereignty and regulations from their last colonies in the New World.

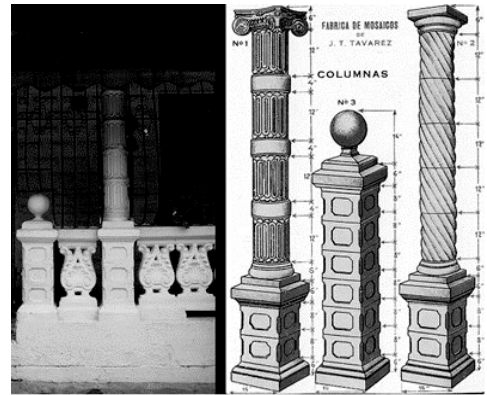
The drastic socio-cultural and economic modifications that resulted from this war, and the accelerated changes produced at the turn of the century, created considerable variations to vernacular housing. The 20th century brought with it the influence and traditions of continental North America as these became territories of the United States.

4. Artificial materials and building technologies in the 20th century

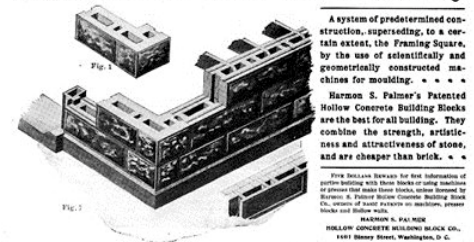
The beginning of the 20th century in the Spanish Caribbean was a moment when everything and anything seemed possible. The recovery of the region after long periods of war and economic depression had set the stage for an era that would

embrace new trends with non-restrained passion. That passion, a natural and innate characteristic of the region's inhabitants, would result in "eclectic-modernist" architectural expressions that were like the islands themselves: exuberant, colorful, audacious, and exciting.

Between approximately 1880 and 1910, the importation of cements from the Old World to the Spanish Caribbean, started to substitute the traditional lime and hydraulic mortars. With cement also came prefabricated materials (Fig.7). The "modernizing" furor was then augmented by successful structural achievements from the United States. Professionals in the construction industry that immigrated to these three islands during the colonization periods, whether Spanish or from the U.S., established themselves as part of the temporary foreign governments and industry leaders. They also brought their technical knowledge to the new lands that they conquered, or settled.



Harmon S. Palmer's Method of Concrete Building.



HARMON S. PALMER HOLLOW CONCRETE BUILDING BLOCK CO.

Fig. 7. Cast-stone architectural elements and cement block ads. (Tavárez and Palmer product catalogs 1921 and 1908).

Portland cement substituted the vernacular colonial housing of the region built with natural materials. This early 20th century molded vernacular dwelling, "...a product of industrialization applied to architecture...with an infinite series of combinable elements, such as columns, balconies, ornament, as well as roofs and walls made with molds and portland cement..." (Chateloin-Santiesteban, 2007) quickly filled new neighborhoods, usually located in the outskirts of the capital cities. The new cataloged cement architectural kit of prefabricated parts would help the original designs evolve, while maintaining interior layouts, and the front balcony as a recurring and important element for cultural communication.

During the Spanish colonization, as well as the subsequent American occupations of these island-territories, the influx of innovative and oftentimes unknown building processes that these foreigners brought with them would be tested on the new lands. That implied an educated effort at understanding their different and often unknown physical conditions. These included their geography and geological events - earthquakes, hurricanes, tsunamis; a climate - constantly hot and humid; flora, fauna, fungi, and wood-eating insects; all contributing factors that influenced building design (del Cueto, 2016). Foreign interventions included importing not only technological know-how regarding the design and erection of structures, but also building materials, tools, and equipment from their countries of origin. The presence of North American Companies, producing some of the basic building materials they needed in the new regions themselves, also helped to develop working relationships, and facilitated construction means and methods.

After the war, during a period of increased economic wealth and growth, the construction projects of these island-countries would benefit from the fast-setting properties of portland cement. Despite the local establishment of cement factories in the new territories, cement continued to be imported from the U.S. up to the 1920s. Portland

cement, which was already known and used in the region, became an integral part of the formula for the novel structural designs and technologies brought by the North Americans.

The innate characteristic of cement setting especially well in an extreme wet and humid climate as well as in hot weather, made it the perfect material for innovative products in these tropical regions. Structural components, building facades, as well as interiors were immensely impacted by architectural elements made possible through the moldable characteristics of the portland cement mix, which provided infinite possibilities, allowing all shapes, forms, and even color in the mix (Fig. 8).

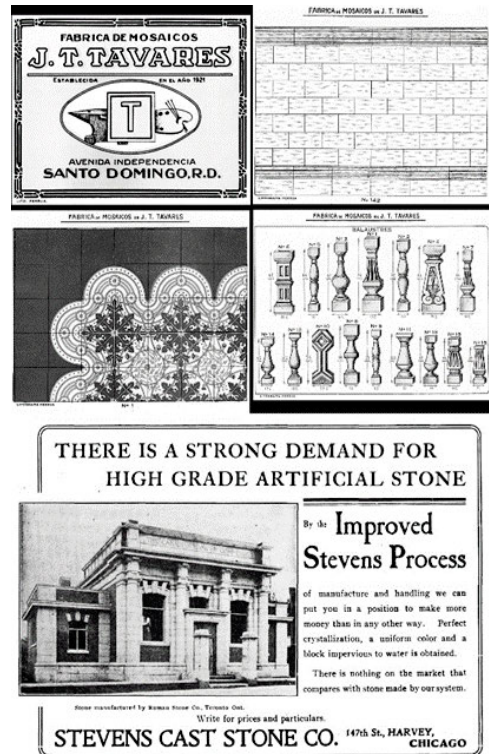


Fig. 8. Molded cement architectural elements produced by the Tavárez and Stevens companies. (1921 and 1906).

Prefabricated and rapidly produced building components, manufactured in these molds by less experienced hands (versus those of experienced stonecutters), facilitated installation and price-competitiveness. (Zardoya-Loureda, 2001).

During the first decade of the 20th century, there were two main accepted processes used to manufacture any type of molded artificial stones, that which included blocks as well as ornate cast stone (hollow architectural elements made with a cement mix): the dry-tamped method and the wet process. The wet method, mostly used for cast stone ornamentation, required finer aggregates and even color to provide a better likeness to the finished appearance of carved natural stone (Stevens, 1906). Both techniques were provided by American manufacturers who had established profitable businesses and applied one or both methods to fabricate these building components.

In the facades where these units were used, it was extremely difficult to discern whether in fact these were natural or man-made architectural elements. Being able to fully fill the cast stone units with concrete, also added structural rigidity to the building envelope. Original construction documents for the concrete houses built during this period specified: “...All facade walls, moldings, cornices and decorations of all floor levels shall be artificial stone made of cement, manufactured by the “Stevens” process...” (Archivo Nacional de Cuba, 1919). Cuba, having a factory to manufacture these building materials, facilitated and accelerated the building process, not only locally, but for their nearby island neighbors, the Dominican Republic and Puerto Rico.

Molded architecture with prefabricated components, converted “artificial stone” manufacture into a profitable business throughout the region. Innovative decorative schemes could be multiplied using molds which facilitated mobile architecture elements, “...the mold was a proper element of industrialization applied to an infinite series of architecture, repeatable and combinable, an architecture to be consumed and assimilated by the social masses that marked the 20th century...” (Chateloin-Santiesteban, 2007). One could consult a catalog and rapidly select the preferred combination of ornaments and building components for your design (Fig. 9).



Fig. 9. Ornate façade in Remedios, Cuba using molded cast-stone decoration. (Photo by author 2018).

A considerable number of Spanish businessmen, especially Catalonians, had established construction companies or building materials suppliers and were responsible for introducing new techniques and services to the building industry (Fig. 10). During the first three decades of the 20th century, in the main cities of the Spanish Caribbean the so-called decorative details’ factories for housing were “...workshops which not only produced ornamental pieces but construction elements such as roofs, concrete blocks...and hydraulic mosaics” (Baroni, 2003).



Fig. 10. Installation of Catalanian-inspired hydraulic cement mosaics or tiles. (Source: del Cueto, 2016).

The American companies had resorted to building cement or reinforced concrete floors, walls and oftentimes roofs as well, whenever they could, despite the use of premade, manufactured and ready-made materials.

Molded and multi-faced cement block was also used for wall construction. "Reinforced concrete work meets there with popular approval, as it lends itself so much to the local desire for strength, solidarity and permanence in architectural construction." (Butler, 1915).

More importantly, the local masons, having worked in mud-wall and rubble-masonry dwellings, were proficient in the use of formwork and molds for any type of construction. This is evidenced in:

The numerous American corporations that are busy developing the natural resources of the islands are favorable to concrete as a building material, and much of the heavy construction that has been carried on in the past three years has involved the use of immense quantities of Portland cement. (Concrete, 1909).

5. Conclusion

Basically, the transformation of vernacular housing in the Spanish Caribbean evolved from its indigenous and European roots into a general-western tradition or prototype with the introduction of artificial building materials such as cement. The DNA of millenary vernacular housing could not, however, disassociate itself from its environmental and geographical realities. Needing no protection from temperate climate changes (i.e., cold, and freezing winters), thick walls, small windows, and heavy load-bearing roofs were unnecessary. The Islands lack of dangerous animals also made the need for solid walls even less vital. Therefore, vernacular dwellings in the Spanish Caribbean evolved and transformed in their basic building materials, but never really changed their main purpose in the tropics: protection from the sun and rain. As such, though the materials and building techniques transformed through time, their function, as a fundamental part of vernacular dwellings, as well as protection from nature's elements, and daily living, has remained constant.

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