RESTORATION OF THE HOUSES OF OURO PRETO, MG, BRAZIL

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Abstract. Ouro Preto, old capital of the state of Minas Gerais – MG, is one of the most important and symbolic cities in the Brazilian history and culture. Its formation process, its rich cultural heritage, the successive efforts for its preservation have been object of study and attention of not only experts but also of national and international authorities. The city was declared National Monument in 1933, protected by the National Historic and Artistic Heritage Institute (IPHAN) in 1938, and it was the first Brazilian city declared as Mankind’s Cultural Heritage by Unesco, in 1980. Ouro Preto, as well as other “gold villages” in Minas Gerais, has a peculiar formation, not abiding by radial or nuclear urban organizations that were traditional in the Colonial Brazil. Its organic and linear configuration has anticipated the urban development, nowadays known as conurbation, i.e., the formation of a city through the connection of many close urban centers. In Ouro Preto, it is meant cultural landscape to be preserved the unique set composed by the rich architectural and urban collection and the entire landscape frame of its surroundings, listed by IPHAN, reason why this set had its value as universal mark of the human creation recognized. According Sylvio de Vasconcellos [1], the constructions marry perfectly with the local topography, the colors and the shapes of roofs, mingling with its own soil, its gables, molding to buttresses or heightening the natural hills. This article aims to analyze the result of restoration interventions in several houses that have a special meaning for the city, which are Baronesa, Folklore, Gonzaga, Inconfidentes, Rocha Lagoa houses and Solar Baeta Neves. An architectural reading of each House will be made, examining the material and building systems used in their constructions; their meanings for the city and the heritage designation process, the surrounding environment at various periods, and the physical, functional and visual relationships with the city. Regarding the recent restoration works, the following will be examined: causes of deterioration, diagnosis and state of conservation, interventions that have taken place over the years, the project, and intervention methodology. In the conclusion the interventions undertaken will be analyzed in light of modern principles of preservation of cultural heritage.
1. INTRODUCTION

The buildings objects of this paper were restored by the Monumenta Program of the Cultural Ministry of Brazil. This recuperation program of the urban cultural patrimony, today named Growth Acceleration Plan –PAC of the Historical Cities is an intergovernmental action combined with the society to preserve and value Brazilian culture and promote the social and economical development with sustainability and life quality for all citizens. The program confirms significant results obtained from the increase in Brazilian Cultural Politics, specially the implementing of the Monumenta, in which Ouro Preto was one of the first cities to be included.

The Baronesa, Folklore, Gonzaga and Inconfidentes houses, Casarão Rocha Lagoa and Solar Baeta Neves are inserted in the perimeter placed under governmental trust by IPHAN and are all used by public offices; The Baronesa by IPHAN and the others by various Ouro Preto city hall offices. Excepting the Inconfidentes house, all the others have two floors and a mixed system of construction, predominating foundations and structured walls made of stone masonry on the first floor and on the second floor the internal and external walls are made of bricks or a mix of mud-and-straw. On the mix of mud-and-straw, where the buildings are from the colonial period, the construction has an interlocked system, that is, all the elements compose the structural stability of the building. As to the painting, it follows the Iberian tradition, whitewashing on the walls, wooden frames painted with tempering in strong colors, with the door frames in white and the irons in black. Also excepting the Inconfidentes house, all the others are located in the historical center and have their implantation in the public via alignment. The Baronesa, Folklore and Gonzaga houses have a land occupation characteristic of the colonial period where the side walls were built on the land limit and the free areas in the back of the houses. The Casarão Rocha Lagoa and Solar Baeta Neves do not have side walls on the land limits. In general, the ventilation and light spans are in arched doorway and straight wickerwork, with glass frames, mainly internal sheets, of simple wooden cushions. The flags appear on some doors, with or without glass covering.
2. A BRIEF HISTORIC BACKGROUND

The Baronesa house, dated from the end of the XVIII century, located at Tiradents Square, belonged to the Camargos Baron’s family who donated it to IPHAN in December 27, 1941. The building was constructed in two floors, with three spans in the upper floor and four in the first one, with a left side access to the service area of the house. This later received a complement on the upper floor, with two windows following the existing typology: door-balcony. In the beginning of the XIX century, the first floor was already used as a residence, hosting commercial storages, services and slave rooms (senzalas). This floor was also used as an animal shelter and had a less improved treatment comparing to the upper floor, with dirt or stone floors and only one room with a wooden planking floor. The upper floor had the front part designated for social activities- living room, dining room and even a possible domestic chapel. The floors are of long wooden planks, wooden linings (“saia e camisa”, in skirt and shirt) and the ceiling with cornice and molded all around it. The Baronesa house is a two-storey house that has suffered modifications and additions along the time, which its final typology assumes an inverted “L” form. It is characterized by its impressive volume, with balanced proportions in its horizontal and vertical dimensions. The balcony on the front façade is formed by the extension of the wooden beams which support the upper floor, creating a small balance. On the main façade, there is a body rail made by an iron detailed fence that due to its continuity (without any interruption) in all the façade extent, seems to have been adopted after the frontal expansion of the residence. At the construction time, the residences had a wooden fence, which might have been the preliminary one of the Baronesa house. The roof has a wooden structure with ceramic tiles in one or two water compositions with two gables. On the first decades of the XX century the attic roof had already been altered with a modification of the roof inclination to allow a better use of that space. The building suffered many interventions along the time but kept its typology and constructive technique. The backyard is composed of landings and a small slope of the natural terrain.
The Folclore house is named after its new way of being used which is of a cultural mark. It’s located at the Antônio Dias Square, it is a two-storey house with a typical typology of Ouro Preto houses at the end of the XVIII century. Originally, the residential use did not suffer great modifications, only a little remodeling in the 40’s decade. Some adaptations were made in the XIX century such as the substitution of the wooden body rail by an iron one and the introduction of glass on the frames. Its façades are simple, the main one has a three door-balcony on the upper floor and three openings on the bottom floor, with two windows and a side door. The upper floor had the front part designated for social activities-living room and bedrooms. The floors are of long wooden planks, wooden linings (“saia e camisa”, in skirt and shirt) and the ceiling with cornice and molded all around it. Following the two-storey houses typology, the stairs to the upper floor of the house are transversal to the building, developed all in one. The house is implemented in a land with a steep declivity with long and narrow forms. The backyard is composed of little landings and slopes and extends to an alley next to a stream. The Folclore house hosts the Cultural Promotion Directory of the Cultural and Patrimony Municipal Secretariat.

The Gonzaga house located on Claudio Manoel Street is a XVIII century building, in a colonial style, where the poet, inspector, general ombudsman (1782-1788) and Inconfidente Tomás Antônio Gonzaga lived. The house was active since the last headquarters of the XVIII century as Ombudsman’s Office of Vila Rica District and was one of the probable places of the Inconfidência Mineira Conspiracy in 1789, which foresaw the separation of Brazil from the Portuguese Colony. The upper floor was designated for home living, the bottom one for the houses of order and the annex for the slaves. The building was implemented in an irregular land in an “L” shaped form. The main façade, crowned by a cymatium, has two doors, a principal one and another with access to the basement; a window in the basement, five windows on the bottom floor and six windows with balconies on the upper floor. The entrance hall has floor, walls and stone stairs. At the back of the house there is a grassed yard composed of various levels and above street level. There is a water fountain like a little pond and there is a beautiful panoramic view of the Itacolomy Peak. The Gonzaga house has gone through many adaptations to host different public institutions and today is the main office of the Municipal Tourism Secretariat and Public Archives of Ouro Preto City Hall.
The Inconfidentes house is a small farm or country site located on the half slope of Morro do Cruzeiro, an upstream of the Funil River. Built in the XVIII century, the house named “Boas Vistas” country house was after the Inconfidência Mineira Conspiracy called Inconfidentes House. It belonged to Lieutenant Colonel Francisco de Paula Freire de Andrade, who was the brother-in-law of José Álvares Maciel who, like Freire, was one of the most important Inconfidentes. Although it has gone through many interventions, its original typology and building system were not disfigured. In 1930 the building was donated to the Municipal Council in 1974, in ruins, it was restored by the Ouro Preto City Hall (Prefeitura Municipal de Ouro Preto PMOP), becoming a host house for the official visitors. Recently, it has become The Inconfidentes House Museum.

The oldest reference to the Rocha Lagoa House is found in the Apropriation of Lands Book (livro de Tombos de Terrenos Foreiros) in 1806. It is registered in it that Vicência Moreira de Oliveira had a house on the downhill street that goes to the São José Chapel”. The house had many owners, among them Cel. Francisco Teixeira Amaral, who was the Municipal Council president for three times, and then it started to be called Rocha Lagoa in 1977. The Rocha Lagoa House implemented on a great declivity street, is a building that uses the construction system of mud-and-straw in its original building and partitions on the over-elevations. It was originally built with two floors and an upper elevation built afterwards, also receiving some annexes at the back of the house. On the bottom floor it has six windows and two doors and on the upper floor a rhythmic succession of eight windows. The original roof was in four waters as well as the roof built on the part that was over-elevated. The inclined backyard has little dimensions today. The Rocha Lagoa House currently hosts the Cultural and Patrimony Municipal Secretariat.

The Solar Baeta Neves was built at the end of the XIX century, on the Funil Stream banks. The land is situated at the Estação Square and was acquired in 1890 by the Baeta Neves family. The two-storey house has walls structured in solid blocks masonry, covered with a mixed powder, some internally decorated and originally painted with white washing. It has wooden windows, doors, stair, floors and coverings. Contemporary to the period of the railroad introduction, the Solar Baeta Neves has the ornate characteristic of an eclectic architecture. Repeating the typology and symmetry of the colonial two-storey houses, the building has a pyramidal roof, the floors and coverings are installed over wooden beams which usually cover small holes. These are the architectural characteristics of the construction time: presence of the decorated stone over the upper vain, done in painted mortar showing a masculine human figure surrounded by phitomorfs; floors covered with hydraulic tiles on the bottom hall, external frames with internal flags in two sheets, floor and ceiling decorated in the main room of the upper floor and half painting in the corridors. Of the architectural elements used in the colonial architecture, there is the presence of rails, barring and wedges in washed rocks. It has a three water covering with a wooden structure with colonial type tiles, covered windows in arcs with external guillotines and balconies protected by iron rails. Currently, The Solar Baeta Neves hosts the Municipal Environment Secretariat. All the mentioned houses have, with more or less degree of outstanding, an importance in the urban cultural landscape of Ouro Preto.
3. STATE OF CONSERVATION

The houses in Ouro Preto were all in a very bad conservation state. Their different degradation degrees were due to the following facts: wear and degradation of the construction materials, lack of preventive maintenance and wrong interventions suffered along the years. There was no use incompatibility in these buildings; therefore, this was not a factor responsible for the degradation. Their degradation degrees varied according to maintenance or restoration interventions. Another important degradation factor, especially on the colonial period houses built with wooden structures and mud-and-straw, is the intense traffic of vehicles in the city, whose vibrations cause cracks that allow the water to enter, which accelerates even more the buildings degradation process. Of the houses in question, the Folclore was the one with the worst conservation state followed by Baronesa, Solar Baeta Neves, Gonzaga, Inconfidentes and Rocha Lagoa House. In general terms, the main conservation problems were: precarious state, in some cases beginning of instability of the wooden structures, especially on the roofs; water infiltration and general cracks; degradation of the architectonic elements, especially the wooden ones and an advanced degradation state of the installations, mainly the electrical and hydraulic-sanitary ones.
The works were composed of the following steps: a rigorous architectonic survey mapping the damages, analyses of the construction materials through murals and pictorials prospection; diagnoses of the deterioration causes; identification of the building systems and the various transformations through which the buildings suffered along the years.

These works were essential to elaborate an intervention methodology and a complete restoration project that had as its main objectives: recover the historical and architectonic aspects; the shapes, volume, aspects and the original internal spatiality of the buildings; modernize the installations and infra-structure according to their new destination use; save the national memory.
4. INTERVENTIONS

The restoration works started in 2002 on the Folclore and Baronesa houses; both works were carried out in more than one stage. The Folclore House was done in two stages, the house itself and then the backyard, concluded in 2003 and 2011, respectively. And the Baronesa house in three stages concluded in 2003, 2006 and in 2008, respectively: the house itself, followed by the backyard and then the ceiling in the main room. The work on the Gonzaga house was done in one stage, beginning in 2004 and concluded in 2005. Afterwards, the Inconfidentes Houses (2008-2010) and Rocha Lagoa House (2009-2010) works were also done in one stage.

Figs. 14, 15. The Baronesa and Folclore houses, restored. Archive IPHAN, Ouro Preto.

On the restoration works the main actions concentrated on the recovering of the roofs, done in all the houses, treatment, strengthening and consolidation of the wooden structures, which was done in the Folclore and Baronesa houses, paintings according to the original colors and the substitution of electrical and hydraulic-sanitary and telephone installations, also done in all houses.

Figs. 16, 17. The Gonzaga and Inconfidentes houses restored. Archives IPHAN, PMOP, Ouro Preto.
Many architectonic elements were restored like cymatium, balconies, stairs, ceiling coverings, floors, wooden frames, floor in washed rocks, and on the colonial ones, the walls in mud-and-straw. Modern materials were used in the substitution of all installations, highlighting the spaces designated cold areas – dining rooms and bathrooms, which acquired current aspects. In some interventions, because they had a better performance or in function of the new needs of usage, different materials from the ones used on the original architecture, were used, like steel in part of the structures as in the Baronesa house and tempered glass on walkways covers, as in the Gonzaga house.

In the Folclore and Baronesa houses there were treatments done on the backyards. The intervention on the Baronesa house backyard gave back its original characteristics with the recovering of the stone walls, stairs and floors which were covered by the vegetation. Through the archeological excavations some bases of buildings from the beginning of the XVIII century, before the implementation of Tiradentes Square, were revealed. Another important intervention on the Baronesa House was the recovering of the bowl lining formed by inclined and trapezoidal surfaces, rectangular in the center, typical of the colonial architecture of Minas Gerais. On this element of greater relevance of the house, decorative paintings that were covered by another sheet of paint were revealed.

5. CONCLUSIONS
These interventions should highlight the principal conservation problems and challenges in the restoration of buildings of the Brazilian colonial period. The main problems that we faced in the conservation were: humidity and the ways of treating it; the diversity of xylophagous insects and fungi and ways of exterminating them; the use of techniques and materials compatible with the consolidation of old structures; and heavy vehicular traffic and suggestions for reducing its impact on the buildings.

Interventions with inadequate materials that prevent respiration of traditional materials, the existence of closed and non-ventilated spaces, as well as the use of cooling systems that create
significant temperature variation between internal and external surroundings all contribute to the presence of humidity. The continual action of humidity results in the complete deterioration of the original construction materials. This causes wooden structures to rot, facilitating infestations of xylophagous insects and fungi and resulting in the physical deterioration and consequent instability of the structure. The loss of structural elements in the building leads to new non-distributed forces, generating unanticipated loads that result in collapse.

In addition, appropriate use of the building and interventions made according to criteria that take into account the characteristics of the building are important factors in preservation. For instance, the maintenance of natural ventilation and the use of materials compatible with the original must be considered. In this regard, the use of plaster and lime whitewash or mineral tints, instead of cement and PVA-based or acrylic painting, allows the original materials to breathe and prevents the accumulation of humidity internally.

Those problems which are hard to solve are related to permanent sources of humidity such as those resulting from the direct contact of old building materials with humid soil. The solution adopted for wooden floors involves the revival of the use of air chambers consisting of a ventilation space between the wooden floor and the soil. This solution, widespread in traditional Brazilian architecture, is usually ignored in inappropriate restorations and interventions that set wooden floors directly onto the pavement, leading to wood-rot and infestation of xylophagous insects in the structure. In the case of structures in direct contact with humid surfaces underground or supporting structures in hilly places, the solution has been to provide natural ventilation, and, on occasion, even separate the floor from the walls in order to reduce effects of humidity.

Xylophagous insects and fungi, which find optimal conditions for reproduction in the warm and humid climate of Brazil, are the major cause of deterioration in wooden structures. The most commonly found are dry-wood termites, soil termites and borers. The most common immunization methods we used consist of application of chemical substances with a clorpirifos, permethrin or deltamethrin base, by brushing, spraying, dusting, fogging, injecting or immersing. For new pieces, preventative autoclave sterilization is employed. Applications by brushing or spraying have been more prevalent as they are more economical and easier to apply. However, they offer lower protection since their action is restricted to the surface. More efficient methods are the use of chemical barriers and immunization by immersion, but they are highly controversial since they can contaminate soil and freatic groundwater. The chemical barricade method consists of isolating the building from the termite colony with termiticides. Immunization by immersion consists of soaking the pieces in tanks containing the same chemicals. Another method little used here is the setting of attractive cellulose traps around the building that are later replaced by bait with delayed-effect insecticide or substances that interfere with growth of the insects and that are taken as food into the colony.

The experience acquired in many restoration works in Ouro Preto has demonstrated that correct analysis of a problem is essential in order to avoid expensive, complex interventions. The consolidation of old structures can only proceed after taking into account the physical features and original materials of the building. An investigation of the causes of structural instability may begin with the identification of physical modifications that may have occurred within the structure, such as the raising of freatic groundwater levels or leaks from public or neighboring drainage networks which may cause changes in soil resistance. As the foundations of buildings built in the Brazilian colonial period were generally made with stone masonry, bricks and lath-and-plaster, the treatment will depend on a correct diagnosis of the problem, in the majority of cases caused by inappropriate use or poor conservation of the buildings.
The ground is usually consolidated and/or stabilized by mixing earth with cement or lime, and then compacted. In foundations and structures made with stone masonry, the wall is rebuilt with the same material, while the joining and filling in of gaps, known as breaches, is sufficient to stabilize the structure.

Damage to building structures caused by the traffic of heavy vehicles is common in historic Brazilian cities, especially in Ouro Preto, leading to the instability of buildings, which can be verified by noticeable, long and permanent cracks. This problem has been solved by projects that organize the traffic, prohibiting heavy vehicles from historic centers; this includes buses outside of peak hours. The use of squares as parking areas decharacterizes historic places, prioritizing vehicles instead of pedestrians.

Interventions for the conservation of Brazilian colonial architecture have demonstrated that rigorous research into the causes of damage and accurate diagnosis are essential to achieve adequate restoration and the eventual preservation of the objects’ cultural authenticity. The construction materials currently in use in Brazil, like baked-clay bricks, concrete structures, cement mortar, plastic mass, acrylic, latex or PVA-based paints etc., when used in old structures, make them degenerate since these materials are generally incompatible with those originally used in the Brazilian colonial architecture.

In Brazil there is some resistance to the use of traditional construction materials and building systems. Lath-and-plaster and the use of lime plaster in painting or in coating mortar are perceived as low-quality construction methods, since they are used by poorer, rural populations. We have encountered the replacement of lath-and-plaster by hollow bricks, wooden structures by wooden-covered concrete (aiming at imitating the original), the recovering of stone pillars with concrete and then with regular-cut stones – idiocies aimed at disguising incorrect interventions. Such slap-dash techniques are practiced by professionals who ignore traditional construction techniques and use improvised methods such as covering brick vaults with asphalt, a solution used for paving modern building, that in fact accelerate the degeneration of original materials.

This does not mean a return to the exclusive use of historic techniques, as some technicians opposed to the use of traditional materials and techniques, such as that of hydrated lime mortars in restorations, would imply. In fact, it is a matter of finding adequate, modern materials and techniques appropriate for historic buildings. As an example, we can point to the use of silicate-based mineral painting, instead acrylic or PVA-based paints, which is as beneficial to the original materials as whitewashing with lime plaster.

Our experience has demonstrated that simple and routine actions such as cleaning, roof maintenance, whitewash, systematic inspection for termites, and repairs using construction materials and systems compatible with the original ones have been efficient.

Considering humidity as one of the most serious degeneration agents in old buildings in Brazil, since it attracts xylophagous insects into wooden pieces, especially structural ones, leading to their collapse, we believe that some traditional architectural techniques and solutions may not be forgotten or ignored in order to avoid historical buildings’ degeneration. We for instance mentioned the air chambers under the ground floors and the easy-to-make water-drainage systems in places where water runs down, like windowsills. Wood, as a highly hygroscopic material, while under continuously humid conditions, will get rotten, attracting xylophagous insects and leading to a possible infestation throughout the building.
Architectural solutions that reduce humidity in buildings and wooden structures are extremely important to their conservation. Therefore this conservation depends precisely on the use of techniques and materials from the Brazilian colonial architecture.

With the conservation actions above mentioned, it is frequently possible to avoid certain complex techniques with questionable results, such as chemical barriers, the insertion of superstructures and application of high-technology products without either taking into account the original structures or being sure of the real efficacy of those techniques for the old materials. We have observed that in places where the materials were not affected by weathering or human action, the building system—even those made of earth and, thus, the most vulnerable—remains intact and well preserved. An exhaustive investigation of damages, with a detailed diagnosis of the causes for degeneration, has resulted in both careful and successful interventions, with no loss of the intrinsic features of the cultural objects.

That knowledge of and respect for the traditional building techniques of Brazilian architecture, combined with the adoption of new materials compatible with the physical/chemical properties of the original and consideration of the final appearance of the complex, may be the fundamental premise underlying the preservation of the Brazilian colonial architecture. Generally traditional building technology does not involve high costs. This is a positive feature since economic aspects are crucial in a context where the financial resources available are insufficient for preserving the invaluable cultural collection of a continental-size country such as Brazil.

We finally conclude the restoration works of the Monumenta Program – now PAC in the historical Cities - had the advantage of approaching all conservation problems of each cultural good. In the past, most interventions were done without a complete restoration projects. Also, for many reasons, they did not cover the totality of the cultural goods, solving only part of their conservation problems. However, due to the fragility of the constructive system, composed of mud-and-straw, age of the buildings and the various causes of degradation already mentioned, there is a need to implement a rigorous program for the maintenance of these buildings. If this does not happen, in a few years there will be a need for new restoration works. Although the interventions and projects have followed the modern principles of restoration, there is a necessity to face the degradation causes of the cultural goods in a broader way that are out of the building itself, in the urban sphere, as in the case of traffic of vehicles. This necessity coincides with another demand that is to extend the program from the punctual action to action in the urban and territorial dimensions. Only then the PAC of historical Cities will achieve its real objective that is the preservation of the rich urban and cultural patrimony of Ouro Preto and Brazil.

REFERENCES
[1] Archive of Monumenta Program em Ouro Preto, MG and Brasília, DF.