Rehabilitation of Buildings in Historic Center
São Paulo Building, São Paulo, Brazil

ROSIO FERNÁNDEZ BACA SALCEDO¹, BRUNO ARRUDA²

¹Architecture, Arts and Communication Faculty, UNESP - University of Sao Paulo State, Bauru, Brazil
²Architecture and Urban Course, UNESP - University of Sao Paulo State, Bauru, Brazil

ABSTRACT: In front of the demand for housing in the historic center of São Paulo, São Paulo City Council during the negotiations of 2001 to 2004 and from 2005 to 2008, through the Residential Leasing Program (PAR) rehabilitated some buildings for housing social interest, including the São Paulo Building. The paper aims to analyze: architectural interventions made in the São Paulo Building for residential suitability, degree of preservation of the building, rehabilitation, operation costs, characteristics of the beneficiaries and housing quality. Methods: To analyze the architectural and the degree of preservation were discussed concepts and theories on equity, housing, restoration, rehabilitation and consulted the legislation on architectural heritage in the historic center of São Paulo. The degree of preservation of the building was analyzed by comparing between the initial project and the rehabilitation project. The quality of housing was analyzed through the following indicators: m²/house, m²/user, Number of users/bedroom, environmental comfort, safety, accessibility. In order to know the socioeconomic characteristics of users, questionnaires were applied in 2011. Results: The proposed indicators can contribute to policies, programs and projects aimed at improving the quality of social housing in buildings of historic, architectural heritage preservation and contemporary use.

Keywords: rehabilitation, historic centers, architectural heritage, social housing, housing quality.

INTRODUCTION
Historic centers primarily represent the original route of the city and are urban and architectural structures that express political, economic, social, cultural and technological demonstrations of the social, cultural and technological formations from various historical periods [1].

The residence space is the shelter or habitat of human, the permanent stage of leisure activities, entertainment and general services for users connected to the habits and practices of a society, its architecture being built space [2]. From Santo Domingo Resolution assumes the social and political commitment of residence in the historic centers. It is recommended that programs of intervention and rescue of the historic centers should bring total sanitation solutions that allow the retention and improvement of the existing social structure. [3]

The Venice Charter defines restoration as "an operation that must be exceptional. It aims to preserve and reveal the aesthetic and historical monument and is based on respect for original material and authentic documents. It ends where the hypothesis starts. On the presumed level of restoration, all work that supplements recognized as essential for aesthetic or techniques reasons will stand out from the architectural composition and must bear the mark of our time. The restoration will be preceded and accompanied by an archaeological and historical survey of the monument". [4].

While rehabilitation is "an action that preserves as much as possible, the existing built environment (small properties, fragmentation in the division of land, old buildings) and thus also concerns the uses and respects of the residential population. The necessary reform of the existing infrastructure to adapt to new needs seeks not deform the inherited built environment. A necessary reform in the existing infrastructure to adapt it to new need demand does not characterize the built environment legacy. In buildings it seeks to make "minimal intervention" necessary to ensure environmental comfort, accessibility and structural safety [5].

SÃO PAULO: RESIDENTIAL LEASING PROGRAM
The city of São Paulo is located in the southeastern region of Brazil, latitude 23° 37', longitude 46° 39', altitude 802 m, characterized by a warm humid climate [6].

The devaluation of downtown São Paulo caused by the escape of companies and banks to other sub centers,
among other things, led to a deterioration of a part of urban facilities and the decline of property value. In addition to the limited public investment in community facilities, housing, public transportation, among others, urban degradation formed 6.219 empty homes in 1991 and 10.062 in 2000 [7].

The historic center of São Paulo increasingly loses its population, mainly middle and high-income families, migrating to other areas. So the Brazilian Institute of Geography and Statistics (IBGE) data shows: in 1980 [8] the historical center had a population of 93.873 inhabitants and in 2000 was reduced to 67.833.

Furthermore, in 2000, 28.85% of formal employments in the municipality of São Paulo were at the center of the city, with 27.14% earning more than 15 minimum wages, 26.31% of 5 to 10 minimum wages and 21.13% up to 3 minimum wages. Workers in the city center and the historic center of São Paulo prefer to live near the workplace to avoid transport costs, traveling time and fatigue.

Faced with the demand for social housing in the historic center, the City Council of São Paulo during the terms 2001 to 2004 [9] and from 2005 to 2008, through the Residential Leasing Program (PAR) tried to combine the construction of houses with the preservation of architectural heritage, some vacant buildings were rehabilitated for affordable housing, including the Sao Paulo Building.

The Residential Leasing Program (PAR) is a federal government program created in 2001, Law No. 10.188 on 12/02/2001 [10], has as administrative agent to the Caixa Economica Federal (CEF). It is intended for the construction and renovation of housing for lease for 15 years to families with income less than six minimum wages, with an option to purchase at the end of the period. Families pay monthly lease rates with values equal to 0.7% of housing prices, with increases of 0.041% per year, ensuring a secure tenant, his heirs or cancellation of the property, if death or permanent disability occurs [11]. The Prefecture of Sao Paulo, the Department of Housing and Urban Development (SEHAB) and Metropolitan Housing Company (COHAB), management 2001-2004, in partnership with CEF implemented the PAR. The São Paulo Building forms one of the buildings rehabilitated and reformed.

METHODOLOGY
For an analysis of information on housing quality criteria were established for the following indicators: degree of preservation of the building, housing previous condition, area per housing, built area per inhabitant, area of room, number of people per bedroom and environmental comfort.

To determine the degree of preservation of the building is accessed legislation on architectural heritage in the historic center of São Paulo (CONDEPHAAT). The analysis is done by comparing the original project with the project of rehabilitation of the building.

The previous condition of the user's residence is an important factor in whether the current housing conditions improved. 15 m² was considered as a minimum built area per inhabitant [12] and the following values are used for the analysis: Optimal: more than 25% above the established minimum area. Good: up to 25% at or above the established minimum area. Bad: 25 % below the established minimum area. Terrible: more than 25% below the established minimum area. See Table 1.

Table 1: Range of values for the built-up area per inhabitant

<table>
<thead>
<tr>
<th>Built Area/ inhabitant</th>
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<th>Bad</th>
<th>Terrible</th>
</tr>
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<tr>
<td>≥18,8m²</td>
<td>15,0</td>
<td>11,3 to 14,9m²</td>
<td>≤15,0m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤11,2m²</td>
<td>15,0</td>
<td>18,7m²</td>
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Furthermore, the analysis of housing area is based on the house area needed to accommodate the furniture and the usage area. The proposal was considered the minimum ideal, since the minimum requirements as established housing areas is insufficient to accommodate the furniture and their use. Best: more than 25% above the minimum established. Good: up 25% at or above the minimum established. Bad: up to 25% below the established minimum. Terrible: more than 25% below the minimum. See Table 2.

The analysis of the number of inhabitants was made considering the following indicators: Optimal when bedroom houses one people or couple, well when houses two people. Good when houses two people. Regular when houses three people. Bad when houses 4 people and Terrible when houses more than 4 people.

The proper orientations of the room’s windows in the apartment is very important for thermal comfort, health of residents, space heating in winter or minimize the environmental temperature in the summer to avoid the proliferation of organisms, molds, humidity, among others. The ideal orientation for each type of comfort was established in accordance with the application temperature and latitude of Sao Paulo [13]. The actual orientation of the window of each room was removed from the ground floor of the residence of the housing project.

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The scale of values corresponding to the degree of thermal comfort of each room is: Optimal - when the actual orientation of the window corresponds to the ideal orientation recommended; bad - when the actual orientation of the window does not correspond to the ideal orientation; terrible - when the room has no window or when it has internal window. See Table 3.

Table 2: Ideal minimum area for housing and scale of values

<table>
<thead>
<tr>
<th>Type of ambient</th>
<th>Ideal Area m²</th>
<th>Scale of values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Best</td>
</tr>
<tr>
<td>Living / Dining</td>
<td>18.00</td>
<td>≥22.60</td>
</tr>
<tr>
<td>Kitchen</td>
<td>6.00</td>
<td>≥7.60</td>
</tr>
<tr>
<td>Couple bedroom</td>
<td>12.00</td>
<td>≥15.10</td>
</tr>
<tr>
<td>Bedroom 3 person</td>
<td>14.00</td>
<td>≥17.60</td>
</tr>
<tr>
<td>Bedroom 4 person</td>
<td>19.00</td>
<td>≥23.90</td>
</tr>
<tr>
<td>Living / Dining</td>
<td>38.00</td>
<td>≥47.60</td>
</tr>
<tr>
<td>Bedroom Couple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living / Dining</td>
<td>48.00</td>
<td>≥60.10</td>
</tr>
<tr>
<td>Bedroom 3 person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom</td>
<td>3.00</td>
<td>≥3.70</td>
</tr>
<tr>
<td>Disabled bathroom</td>
<td>5.60</td>
<td>≥7.10</td>
</tr>
<tr>
<td>Laundry</td>
<td>2.30</td>
<td>≥2.90</td>
</tr>
</tbody>
</table>

Source: SALCÉDO & SILVA, 2005

Table 3: Scale values for sunshine of rooms in the residence

<table>
<thead>
<tr>
<th>Type of Ambient</th>
<th>Scale of values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Best</td>
</tr>
<tr>
<td>Conjugate, Bedroom, Living Room</td>
<td>N, NE, E Another direction</td>
</tr>
<tr>
<td>Kitchen</td>
<td>N, L, SW, NE, SE</td>
</tr>
<tr>
<td>Laundry</td>
<td>E, N, W</td>
</tr>
<tr>
<td>Bath</td>
<td>All</td>
</tr>
</tbody>
</table>

CASE STUDY: BUILDING REHABILITATION OF SÃO PAULO

History
The São Paulo Building is located between Avenues 23 de Mayo and 9 de Julio in Anhangabaú, historical center of Sao Paulo. It is located in the heritage area protected by the Council of Defense of the Historical, Archaeological, Artistic and Tourism of the State of São Paulo (CONDEPHAAT).

The São Paulo neoclassical hotel, 21 floors downstairs, author unknown, was opened in 1946, reached its glory between the years 1950 to 1960. Walls lined with Italian marble and travertine marked the history of the hotel in the city to be the first offering bathroom in all rooms. In the late 70's, metro works underground movement brought down the guest and the hotel fell into decline. After being vacant and abandoned for more than 30 years, the building was occupied by the housing movement in the region.

The Municipal Administration of São Paulo through the PAR and in agreement with the CEF restored and renovated the São Paulo Building for social housing. The project was conducted by the company Factory Urban Studies Center and City Projects. The housing units were for the Movement of the "Forum of Tenements" in the downtown region of the city and the people registered on the website of the COHAB. The 152 housing units were given to beneficiaries in December 2006.

Restoration, rehabilitation and operating costs
The São Paulo Building owned by the Prefecture of São Paulo was donated to the PAR. The constructed area is 8,102.14 m², the total cost of the project was budgeted at R$ 4'672,491.00, the works were completed in May 2006. The minimum area of the housing units is 25.9 m² and the maximum area 44.38 m², the average cost of the unit is R$ 30,161.09 [14]. The project of adequacy for residential use was made by Factory Urban Center of Studies and Projects of the City and the construction was made by Seta Construction and Trade Ltd. Interventions in the building can be appreciated in Fig. 1.
In the building were planned adaptation of the nursery school in the 1st and 3rd floor, a health unit on the ground floor and 2nd floor, with independent access and use for social housing from 4th to 21st plants. From 4th to 21st plants were adequate to accommodate 152 housing units distributed with the following characteristics: 26 homes with an environment for multiple use (living room, bedroom, kitchen, bathroom) with areas between 25.70 m² to 26.05 m², 90 apartments with one bedroom with areas between 25.90 m² to 36.32 m², 31 apartments with two bedroom with areas between 40.86 m² to 49.81 m² and 5 apartments with one disabled-accessible bedroom with 34.40 m² area [14] (Fig. 2).

Technology and materials used in the rehabilitation
In the rehabilitation of the São Paulo Building was used the following technologies and materials: in the masonry were used ceramic blocks and blocks of cellular concrete. In environments such as bathroom and kitchen wall tiles were used 20 x 20 cm white color. In environments such as living room a PVA latex paint was used, and in environments such as bathrooms and kitchen was used acrylic paint. Hardwood floors in good condition were recovered and in the other areas were prepared to place the carpet flats. In wet areas was chosen ceramic floor 20 x 20 or 30 x 30cm, slate and granite. The window frames are metal and glass smooth 3 or 4 mm thick, smooth wooden doors of a sheet of 0.70 x 2.10 m. The electrical and hydraulic installations were completely redone for safety and compliance with current standards. Were also installed gas distribution networks with individual metering and supply branch to the point of the kitchen [15].

Level of preservation
In facades, doors, windows, iron doors and ancient ironwork were restored as well as the original elements of the reception as flooring, marble columns and walls that were in good condition. In the interior trim were recovered floors, window sills and ledges. For the division of housing units were used cellular concrete blocks. Stairs and two of the three original elevators providing direct access to the floors were kept. The elevator off was adequate for some housing laundries.

Characteristics of the beneficiaries
Questionnaires were applied in the period from 07 to 09 of September 2011. Each application of the questionnaire lasted an average of 30 minutes. From a universe of 152 families were interviewed 60. Respondents and their families make a total of 130 people. [16].

Heads of households are identified as follows: 61.7% are women, 33.3% are in the range of 40 to 49; 58.3% were single and 28.3% are couples; 46.3% have complete secondary education; 48.3% are from the Northeast; 65% work in the service sector, 77% have a monthly income of up to 3 minimum wages. With respect to families, 67.7% are young and adults (15 to 64), 26.9% are children and adolescents, and 5.4% are elderly (65 and over). In most housing units 60.0% live up to two people,
28.3% live three people, 10% live 4 people and 1.7% five people.

ANALYSIS OF THE QUALITY OF HOUSING IN THE SÃO PAULO BUILDING

The quality of housing was analyzed from the following indicators: housing previous condition, area per dwelling, built area per capita, built area per room, number of people per bedroom, environmental comfort, safety and accessibility.

Most respondents (96.7%) said they lived in: single-family home with relatives, rented apartments, overcrowded houses, shantytowns, group home rented or leased.

When asked: If your current home improved in relation to the previous, the majority said yes. The answers were: it is better located, it is close to work and the market, used to pay rent and now you can own, because he lived in overcrowded housing, pensions or occupations, and / or the belief that the place is more safe and quiet.

The area is satisfactory when housing holds up to two people. However, when it comes to a family with three members or more, the area per dwelling is insufficient for the development of activities, once the housing area per unit ranges from 25.70 m² to 49.81 m².

In relation to apartment’s area, most bedrooms, 50.9%, have area good, 35.1% is terrible and 14.9% is bad. Most kitchens, 68.3% have areas bad, 15.0% is good and 16.7% is best. Most bathrooms, 90.4% have regular bad, and 9.6% is good. Most laundries, 55.0%, have best area, 31.7% is good and 13.3% is bad. (Fig. 3).

The built area per capita is among best at 53.3%, terrible in 20.0%, good in 16.7% and bad in 10.0%. In most households live up to two people, however, when the housing members live more than three per built area is between terrible and bad, being insufficient for the implementation of activities and accommodation of furniture. (Fig. 4).

Most of the bedrooms are optimal (76.0%) because it hosts a person or couple, 9.3% regular, 6.7% good, 6.7% is bad and 1.3% is terrible. Whereas the area of bedroom should be a space for rest and privacy to the body after a day's work, this is compromised when more than three people share the same apartment. (Fig. 5).

The built area per room is between terrible and bad, being insufficient for the implementation of activities and accommodation of furniture. (Fig. 4).
The location of the São Paulo Building, in the historic center, close to public transport (metro, bus) allows easy access, plus the proximity to services, commerce and leisure. Accessibility to housing is through the elevators and stairs.

Security in the building is considered regularly by the majority of respondents, 38.3%. This can be explained because the porters are exchanged constantly, almost every week. So they let enter any strangers in the building, without any identification.

CONCLUSIONS

The São Paulo City Council through the Residential Lease Program rehabilitated the São Paulo Building for social housing. Original facades were restored and materials of the internal spaces of the building which were in good conditions. They were used traditional materials and techniques for the adequacy of housing. They were also reinstated the hydraulic and electrical systems, as well as installing gas distribution networks with individual measurement per housing unit.

With the restoration of São Paulo Building was possible to attend some needs of the beneficiary families as housing finance with affordable monthly payments, types of housing, affordability, safety, proximity to local employment, public transport, trade and services. In relation to the previous home, all claim that conditions improved, but still not satisfactory, as compared to the Code of Works and the ideal proposal, areas are small relative to meet the demands that are often over 4 people (usually couples with children). Households with multiple use environments, with one bedroom or two bedroom apartments have small areas, insufficient for the development of activities, accommodation and movement of furniture. Therefore there is need for all housing units have at least one bedroom with an area sufficient to meet the needs of families and should be considered the number of members per family.

In relation to the environmental comfort, the windows of the bedrooms and living room have good guidance. Generally, the kitchens have windows facing into the hallways and all bathrooms have only ducts, leading to high consumption of electricity during the day.

We suggest that future public programs and projects of social housing should carry out considering the following guidelines: the location of the buildings to be rehabilitated must be close to the beneficiaries working local, transport and community facilities. Consider the socio-economic needs of families for the sizing of the areas of rooms and housing units, windows in all rooms with appropriate guidance, apartments with a minimum of one bedroom, implantation of a system for solar energy collection, use of collection systems and water treatment, collection and recycling of rainwater, sensors that minimize water consumption and electricity, use of materials and structural systems of low energy, increased subsidies and low interest financing for the rehabilitation of buildings. Such measures, at first glance, can be considered unfeasible due to its high cost; however, it will generate long term benefits to the residents and economic return to investors. Thus, programs and projects will ensure the quality of social housing and Social Residential Leasing Program will be legalized as a viable alternative to improve the quality of social housing in historic districts, preserve and rehabilitate the architectural heritage with contemporary uses.

ACKNOWLEDGMENTS

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REFERENCES


