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## **INDUSTRIAL ARCHAEOLOGY AND BRAZILIAN INDUSTRIAL HERITAGE**

The objective of this paper is to illustrate the preservation of the Brazilian industrial heritage in the context of the world industrial heritage movement. Initially, the development of industrial archaeology as a field during the last five decades is documented. In the second section, the definitions and scopes of industrial archaeology are discussed, and its contribution to the preservation of industrial heritage is reviewed. In the third section, industrial heritage is analyzed in the context of the international charters. Finally, the preservation of industrial heritage is addressed in the Brazilian context.

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# Industrial Archaeology and Brazilian Industrial Heritage

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Industrial archaeology is a recent interdisciplinary field of study that has had an influence on our understanding, documentation, and preservation of the industrial past. This includes “buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, transport and all its infrastructure, as well as places used for social activities related to industry such as housing, religious worship or education” (ICOMOS 2003, sec 1). This paper aims to document the major developments in this field in the past five decades and to show how they have shaped the preservation and reuse of industrial heritage projects in Brazil and around the world.

## INDUSTRIAL HERITAGE AND INDUSTRIAL ARCHAEOLOGY

In 2003, the Nizhny Tagil Charter for the Industrial Heritage defined industrial archaeology as “an interdisciplinary method of studying all the evidence, material and immaterial, of documents, artifacts, stratigraphy and structures, human settlements and natural and urban landscapes, created for or by industrial processes. It makes use of those methods of investigation that are most suitable to increase understanding of the industrial past and present” (ICOMOS 2003, sec 1).

The term industrial archaeology was first used in 1896 in Portugal in an article entitled “*Arqueologia Industrial Portuguesa: Os Moinhos*” by Francisco de Sousa Viterbo.<sup>1</sup> However, over time, Great Britain, the birthplace of the Industrial Revolution, gained renown as a pioneer in industrial heritage. Michael

Rix, then a professor at the University of Birmingham, is widely recognized as the first person to use the term industrial archaeology. In a 1955 publication, he calls for the need to record and preserve the material traces of industrialization before they disappear (Rix 1955; Hudson 1966; Cordeiro 2004). An increasing interest in industrial tradition can be noticed in that period. For instance, in July 1957, *The Architectural Review* dedicated a special issue to British industrial constructions from the late eighteenth century and first half of the nineteenth century. This “architecture dominated by functional considerations,” exhibited in anonymously designed warehouses, factories, and mills, is admired as anticipating the functionalism associated with modern architecture.

The destruction of important traces of the Industrial Revolution and subsequent urban transformations had aroused local concern. Moreover, allusions to the widespread interest in the historical phenomenon that began in England and expanded around the world supported arguments about the importance of this cultural heritage.<sup>2</sup> In 1959, the Council for British Archaeology (CBA) created the Industrial Archaeological Research Committee (IARC) to record and catalog industrial sites and monuments (Buchanan 1982; Santacreu Soler 1992).<sup>3</sup> The British also published the first specialized periodical on the subject in 1964, the *Journal of Industrial Archaeology*, edited by Kenneth Hudson, a pioneer in this field. Discontinued in 1974, it returned in 1976 as *The Industrial Archaeology Review*, later only *Industrial Archaeology* (Hudson 1979, 2002-2003).

At first, British interest was focused on the period 1760-1830.<sup>4</sup> However, industrialization reached different countries at different times, which implied that setting a start and end date was practically impossible.<sup>5</sup> Hudson

defines industrial archaeology as “the organized, disciplined study of the physical remains of yesterday’s industries and communications,” adding, “it would be a great pity and a great handicap if its boundaries were to become too rigid” (Hudson 1966, 19-21).

Nevertheless, for several years, a greater emphasis was placed on defining the scope of industrial archaeology than on devising strategies for the preservation of industrial heritage. The lack of a theoretical framework, particularly during the 1960s, and the poor quality of records collected between 1960 and 1981, were among the main problems facing the British. According to Cordeiro (2004), during the 1960s, as it sought recognition as an autonomous area, industrial archaeology was almost devoid of theory (Grant 1987, 116). However, in the late 1960s, Buchanan’s surveys of practices in industrial archaeology fostered a change in the concept of historical heritage, which, until then, had not considered material evidence left by industrialization. These remains became part of a cultural heritage that would have legal recognition, an administrative structure, and regional and national protection (Santacreu Soler 1992).

Initiatives for the preservation of industrial heritage were also being carried out in the United States, Germany, and Sweden in the 1960s. After 1970, France, Belgium, Italy, and Portugal followed suit. In the United States, the Historic American Buildings Survey (HABS), begun in 1933, was the first federal preservation program to document America’s architectural heritage. In 1965, the Smithsonian Institution, HABS, and the American Institute of Architects (AIA) jointly initiated studies. In 1969, the National Park Service (NPS), the American Society of Civil Engineers (ASCE), and the Library of Congress established the Historic American Engineering Record (HAER) to document historic sites and structures related to engineering and industry. Currently, HABS and HAER prints and photographs form one of the largest collections in the Library of Congress. They include technical drawings, writings, and high-resolution photography, documenting achievements in architecture, engineering and design in the United States.

In 1971, the Society for Industrial Archeology (SIA) was formed in the United States, which has since sought “to promote the study, appreciation, and preservation of

the physical survivals of our industrial and technological past” (SIA 2011). The SIA was created primarily to encourage interdisciplinary interests surrounding industrial heritage. Motivated by the organization of a seminar on industrial archaeology in 1967, in which the keynote speaker was the archeologist Kenneth Hudson, in 1971, the SIA was made official at the Smithsonian Institution in Washington at a conference that brought together professionals from different fields. The objectives set for this organization were published in its first newsletter and emphasized the following three points: “1. interdisciplinary exchange of information from those working in industrial archeology and their projects; 2. the generation of bibliographical information having pertinence to the field; 3. education: to create a public awareness of the need for preservation, surveys, and the other objectives of industrial archeology, through schools, museums, etc.; and, by public and governmental lobbying, the effecting of such objectives as industrial preservation, appropriation of funds for surveys, etc” (Hyde 1991). SIA considered industrial archaeology as a field separate from historical archaeology, thus justifying the new organization.

In Brazil, discussions for the preservation of industrial heritage were promoted later than in other parts of the world. Although currently in an early phase, the initiatives for the study and preservation of the vast industrial heritage of Brazil, especially relating to its world importance in the production of items such as coffee and sugar, are gradually growing. Interest in studying and preserving industrial remains began through case studies reported in 1976 by Warren Dean’s academic publication on the *Fábrica São Luiz* in Itu, the first factory to employ steam power in 1869 in the State of São Paulo. Studies by Ruy Gama, such as *Engenho e Tecnologia* (Sugar Mill and Technology, 1983) and *A Tecnologia e o Trabalho na História* (Technology and Work in History, 1986), made a significant contribution to the history of technology for the enhancement of industrial heritage.

Brazil’s academic debate and international exchange on the subject was promoted in 1986 through the first national meeting on history and energy organized by the department of historical heritage of the State of São

Paulo Electricity Company (Eletropaulo). This meeting attracted 631 participants, among them students, energy authorities, academics, and researchers. Presentations by Ulpiano Bezerra de Menezes, Ruy Gama, Eddy Stols from Belgium, and José Manuel Lopes Cordeiro from Portugal addressed aspects of industrial archaeology and debated the preservation of industrial heritage.

Community organizations also lobbied for the preservation of factory buildings and railroad stations, requiring registration at municipal or state levels. This led to the establishment of standards and technical principles for the preservation of these monuments, such as the Charter of Campinas, a manifesto produced in 1998 by a group of specialists in the history of technology (Grupo de Estudos da História da Técnica - GEHT) from the State University of Campinas (UNICAMP), which signed a commitment with recommendations for the preservation of industrial heritage in particular.<sup>6</sup> Academic studies on industrial archaeology and industrial heritage have grown over the last ten years, most of them in the fields of architecture, history, and sociology at the University of São Paulo and State University of Campinas (especially as master's theses and doctoral dissertations).<sup>7</sup>

It is important to point out the differences between the Brazilian and European-American process of industrialization. In Brazil, the nineteenth century saw the first attempts at industrialization, while the Industrial Revolution arrived as a dominant production system after the 1930s.<sup>8</sup> One of the earliest forms of architectural expression in colonial Brazil emerged in sugar plantations. Ruy Gama (1988, 253), a pioneer in the discussion of industrial heritage in Brazil, criticized a general tendency to adopt the concept of industrial archaeology and analyze the industrialization process in Brazil as proposed by the British, focusing on the installation of the textile industry. In Brazil, Gama believes that pioneer sugar production in the sixteenth century was the beginning of the process.

Despite an ongoing attempt to define industrial archaeology between the 1950s and the 1980s, current worldwide studies on the subject are largely focused on numerous case studies, with very few efforts at

synthesis and comparison (Palmer and Neaverson 1998; Kühn 2009). In some places, the expression "industrial archaeology" prevails, in others, "industrial heritage." The term industrial heritage comprises the remains of an industrial culture, while industrial archaeology is an interdisciplinary method of studying the industrial past (material or not). Nevertheless, industrial archaeology and industrial heritage have often been treated as synonymous.

## THE INTERDISCIPLINARY APPROACH TO INDUSTRIAL ARCHAEOLOGY

As any new area of knowledge, industrial archaeology has faced questions about its coverage and criticism about its autonomy. In the early 1970s, the objectives, geographical and chronological settings, and methodologies to be used in the new discipline were widely discussed. These discussions included not just the field of archaeology but also other fields, such as history, social science, architecture, and engineering, demonstrating that this new area was not restricted to archaeologists but extended to all those interested in the survey, registration, and preservation of the vestiges of industrialization.<sup>9</sup>

As soon as the term archaeology began to be associated with industries, objections were raised. The term industry was linked to a phenomenon no more than two centuries old; the term archaeology related to the distant past (Hudson 1966). Questions emerged regarding the definition of the scope and the period of industrial archaeology. If it covered remote periods such as the Paleolithic era, where activities considered industrial were performed, it would justify the use of the term archaeology itself.<sup>10</sup> If not, the study would be restricted to a certain historical period, beginning with the industrial revolution. Arthur Raistrick (1973), who advocated a broader definition of industrial archaeology covering all forms of industrialization from pre-Roman to the present, recommended that industrial archaeology be considered only in connection with studies that required traditional methods of archaeology. When these methods were not used, he suggested calling it industrial recording.

During the first stage of the development and acceptance of the discipline, emphasis was laid on the listing and description of sites over analysis. This lack of a consistent methodology was also observed by Grant (1987). Hudson (1966) pointed out that among some archaeologists, industrial sites demanding excavation were considered more prestigious than others. According to Palmer (1990), industrial archaeology was recognized as a discipline mainly by archaeologists, rather than historians. Alfrey and Putnam (1992) noted the lack of emphasis on the experience and organization of working life.

As a result of these critiques, industrial archaeology began emphasizing the analysis and preservation of the remnants of the Industrial Revolution, and the simple listing and description of industrial sites was eschewed in favor of interdisciplinary knowledge. This was especially significant because it would integrate the vision of archaeologists and historians often considered inconsistent, "resulting in a more coherent history, with broader perspectives" (Moberg 1969, 200). According to Buchanan, industrial archaeology also reconciled the study, research, recording, and excavation of industrial sites with the historical aspect of all available sources (physical, documentary, oral) in order to rebuild a more accurate overview of the past (Buchanan 1982). Hudson (1967, 9-11) notes the difference between industrial history, "which can be written entirely from printed or manuscript sources," and industrial archaeology, "which is based on a systematic fieldwork, on the organized study of physical remains," and that "complements the literary sources, so that the resulting facts and conclusions are more reliable than they would have been if we had been compelled to rely on either literature or archaeology alone." Industrial archaeology thus became a holistic way of looking at a period of human history using all the evidence available (Palmer and Neaverson 1998, 15).

Hudson (1966, 21) notes the interdisciplinary (co-ordinating subject) approach to the study and preservation of the industrial past:

the architects, the engineers, the social historians, the economic historians, the planners, the member of preservation societies, all have valuable contributions to make towards

a better understanding of our industrial past, and the existence of coordinating subject, even if it bears as explosive and paradoxical a name as Industrial Archaeology, makes it easier for them to become conscious of their common interests and to function in a better informed, more discriminating and more effective way when attempting to influence official decisions or to tap public funds.

Kühl (2004) seconds this interpretation, defining industrial archaeology as a multidisciplinary effort to study the physical, social, and cultural manifestations of industrialization in order to reveal, value, register, and preserve them.

For Aracil (1982), industrial archaeology can free history from the slavery of written sources. According to Alfrey and Putnam (1992), since it suggests an alliance of particular histories based on artifacts, along with a grand conceptual dimension such as the archaeology of the industrial period, industrial archaeology is at once indispensable in curatorship and a key science for understanding contemporary society. Guedes (1999) defines it as an area of study of the industrialization process through the systematic examination of monuments and artifacts that survived the exploitation of this process. Cordeiro (2004) considers this method an effective strategy for the investigation of the recent past.

Nevertheless, even with the progress in clarifying objectives, scope, methods of study, and recording, and, above all, in specifying the concept of industrial heritage, industrial archaeology still called for greater understanding. The addition of science brought undeniable contributions to this new area.

## **INDUSTRIAL HERITAGE: FROM VENICE TO THE NIZHNY TAGIL CHARTER**

The first international conference for the conservation of industrial heritage was held in 1973 in Ironbridge, an industrial complex in Britain that hosts the world's first iron bridge (1776-1779). However, it was not until the Third International Conference on the Conservation of Industrial Heritage,<sup>11</sup> held in 1978 in Grangarde, Sweden,

that the International Committee for the Conservation of the Industrial Heritage (TICCIH) was officially established to promote international cooperation in the fields of preservation, conservation, location, research, documentation, recovery, and training in all aspects of industrial heritage. The TICCIH currently has offices in more than fifty countries and also serves as the special advisor to the International Council on Monuments and Sites (ICOMOS). International meetings are organized every three years to discuss issues pertaining to industrial heritage.

In the XII International Conference of TICCIH held in Nizhny Tagil, Russia, in July 2003, the Charter on Industrial Heritage was approved. This charter clarifies terms and concepts related to industrial heritage and offers guidelines for its preservation. The analysis of successive charters, from the Venice Charter (1964) to the Nizhny Tagil Charter (2003), allows a better understanding of conservationist thought and its influence on issues such as industrial heritage.

Discussions on the preservation of the remains of industrial activity emerged in the 1960s simultaneous with the debate on cultural heritage itself, a period called "patrimonial cult" by Choay (2001). In 1964, a broad concept of heritage was outlined in the Venice Charter, a document drafted during the Second International Congress of Architects and Technicians of Historic Monuments. In this document, the notion of historic monument goes beyond great works to include modest buildings of cultural importance. It also emphasizes the setting in which a civilization or a historic event occurs, a significant step toward the enhancement of industrial heritage. In charters prior to Venice, the definition of historic monuments was generally restricted to single constructions, while surrounding areas and urban context were not regarded as having intrinsic value. As one might notice in the first Athens Charter, adopted at the First International Congress of Architects and Technicians of Historic Monuments (1931), elements that dotted the industrial landscape were considered harmful in the valuation of monuments.<sup>12</sup>

The recognition that architectural heritage includes not only individual buildings of exceptional quality and their surroundings but also all areas of towns or villages of historic or cultural interest that are significant to the

valuation of industrial heritage is finally reaffirmed in the Declaration of Amsterdam, drawn by the Congress on European Architectural Heritage in 1975. However, it is still general practice to preserve only a small portion or sample of industrial complexes, such as chimneys and isolated buildings. Because of their large scale, proposing new uses for these complexes is difficult. The Venice Charter recommends reuse as a facilitator for the conservation of whole complexes (ICOMOS 1964).

In 2003, the Nizhny Tagil Charter on Industrial Heritage addressed concerns specific to industrial heritage: definition of industrial heritage; values of industrial heritage; importance of identification, recording, and research; legal protection; maintenance and conservation; education and training; and presentation and interpretation (ICOMOS 2003).

In addition to isolated buildings, the Nizhny Tagil Charter considers their surroundings, industrial complexes, and the industrial landscape, noting the importance of both the tangible and the intangible. Regarding reuse, the charter recommends that before any intervention, sites and artifacts should be documented and recorded and the material made available in public archives. It supports the reuse of industrial sites for new purposes, while recommending respect for original uses (ICOMOS 2003).

One of the main problems that has disabled industrial areas and represents a challenge in their preservation, is their large scale and the difficulty in proposing new uses. The development of museums of science and technology on existing unused industrial sites ("total environment museums") has been successful. The main objective of these museums is the preservation of industrial heritage through adaptive reuse and the increased awareness of the general public about industrial processes and their legacy. The German Mining Museum in Bochum, Germany, and the Foundation of the Ironbridge Gorge Museum in England, which were both established in the 1960s, are pioneering examples. The Coal Mine Museum of Argenteau-Trimbleur, Belgium, which was converted into a tourist complex in 1980, the *Écomusée*<sup>13</sup> of Le Creusot-Montceau-les-Mines redeveloped in France in the late 1970s, the Museum of the Fabric of Saint-

Etienne, also in France, which opened to the public in 1989, and Museu de la Ciència i de la Tècnica de Catalunya (mNATEC), which was established in 1990 in an old wool factory in Terrassa, Spain,<sup>14</sup> are examples of initiatives to protect and reuse industrial heritage (Santacreu Soler 1992, 13-28).

In the United States, initiatives for the preservation of industrial heritage have been developed through tax incentives and a public and private collaboration. In San Francisco, California, two old industrial complexes were converted into shopping centers in the late 1960s: Ghirardelli Square (1967), by Wurster Bernardi & Emmons, adapted from an earlier chocolate factory, and The Cannery (1968), by Joseph Esherick & Associates, transformed from a former Del Monte cannery (Ghirardo 1996) (Figs. 1, 2).

On the eastern seaboard, Lowell, Massachusetts, an older textile town, is another great testimonial to urban renaissance.<sup>15</sup> Its Lowell's Market Mills of 1882-1902, with 280,000 square feet of space, was converted in the 1980s into a gallery, studios, shops, ethnic restaurants, and 230 housing units (by a private consortium). The city also houses the American Textile History Museum, one of the largest museums of its kind in the world, accredited by the American Association of Museums since 1973 and reopened in 1997 after a renovation of its historical building. The Massachusetts Museum of Contemporary Art is another good example of the preservation of industrial

heritage. In 1999, the museum was opened in a converted nineteenth-century factory in North Adams. The feasibility study for this museum was led by the renowned architects Simeon Bruner, Frank Gehry, Robert Venturi, and David Childs of Skidmore, Owings & Merrill. In New York State, the industrial communities of Troy, Waterford, Cohoes, Green Island, and Watervliet along the Hudson River have been brought together by a charitable organization founded in 1972 to promote the preservation and adaptive reuse of the region's industrial heritage (Binney 1990).

### THE BRAZILIAN CASE

Brazil is a pioneer in protecting Latin American national heritage. The Brazilian National Institute of Historical and Artistic Heritage (IPHAN) was founded in the 1930s with the sole intention of safeguarding the national historical and artistic patrimony of Brazil.<sup>16</sup> However, interest in the formal study and preservation of industrial heritage in Brazil is relatively recent compared to concerns for cultural heritage in general.

The Brazilian expression *tombamento*<sup>17</sup> identifies the government's role in enacting specific legislation to preserve property of historical, cultural, architectural, environmental, and emotional value for its people. The word refers to the archives of Torre do Tombo in Lisbon, Portugal, where the property of the Crown in colonial



Fig. 1. Ghirardelli Square, San Francisco, California, 2009 (All photographs by author, unless otherwise noted).



Fig. 2. The Cannery, Fisherman's Wharf, San Francisco, California, 2009.

times was registered.<sup>18</sup> The *tombamento* (registration) prevents the property/heritage from being destroyed or diminishing its integrity. IPHAN is responsible for enforcing the act at the federal level; any citizen or public entity can put forth a request.<sup>19</sup>

Although the theoretical aspect of Brazil's industrial heritage gained attention relatively late, in 1938, even before discussions directly related to the preservation of industrial heritage, the ruins of Fábrica de Ferro Patriótica, the first iron factory in Brazil, located in Ouro Preto, were registered by IPHAN as a historical testimony to the iron production in the country. In 1964, concurrent with the first theoretical publications in Europe, a single action supporting the industrial heritage was achieved through the registration and consequent protection of the remnants of the Real Fábrica de Ferro São João de Ipanema (Royal Iron Factory) by IPHAN in Iperó, São Paulo.<sup>20</sup> This action, which seems to anticipate a positive governmental response toward the recognition of industrial heritage, however, is rare (Fig.3).

Brazil is one of the few countries with an industrial site on the World Heritage List. In 1980, UNESCO designated the premises of Ouro Preto, a former colonial mining town founded at the end of the seventeenth century as a consequence of the search for gold, as a World Heritage Site.<sup>21</sup> The city had previously been considered a national heritage site by decree n. 22928 of 1933. However, the designation

of Ouro Preto as a national and World Heritage Site is due more to its artistic and architectural elements, its vernacular architecture, and its social and political history than to its industrial elements, such as the mines and ruins of the Patriótica iron factory. Only in recent years have the mines and ruins of the iron factory begun to be valued as part of Brazil's industrial heritage (Figs. 4, 5).

With respect to architectural projects for the reuse of industrial buildings, two precursors are significant: the restoration of the Solar Unhão in Salvador in the early 1960s by the Roman-born Brazilian architect Lina Bo Bardi and the adaptive reuse of the old powder warehouse in Curitiba into an arena theater by the architect Abraham Assad in 1971. The Solar Unhão, a sugar complex established in the sixteenth century on the shores of Bahia de Todos os Santos, was modified in the seventeenth century and again in the nineteenth century, when it became one of the first manufacturing centers of the country. The complex, which included a Big House, church, slave quarters, warehouses, and piers, was designated a national heritage monument in 1943 and, in 1959, the restoration and the project to house the Museum of Popular Art was begun. Bardi's intervention was also a forerunner in the implementation of the so-called critical restoration. This concept was formulated in the 1940s in Europe and was developed by theorists Cesari Brandi, Roberto Pane, Renato Bonelli, and Paul Philippot. It is based on

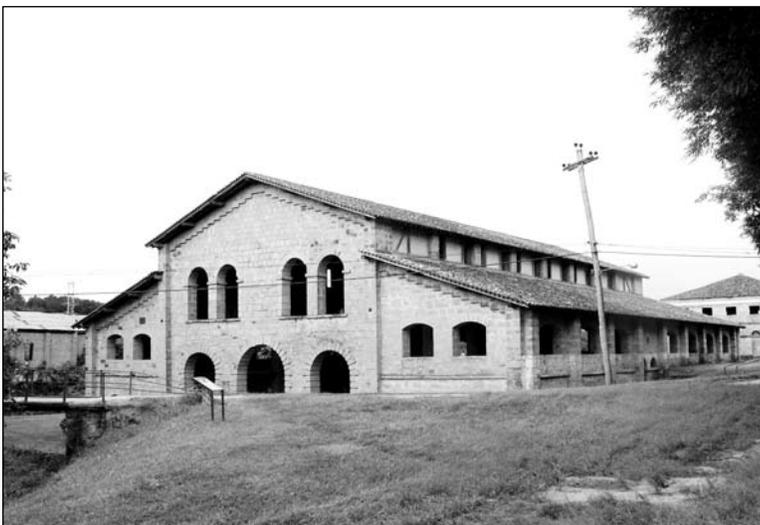


Fig. 3. Real Fábrica de Ferro São João de Ipanema (Royal Iron Factory), Iperó, Brazil, 2008 (Photograph by Romário Silva Jr.).



*Figs. 4, 5. Ouro Preto, Brazil, 2004. In 1980, UNESCO placed the town on the World Heritage List.*

the dialectical relationship between the aesthetic and the historic value of the work. Restoration as a critical act considers each intervention as unique and therefore requiring singular criteria and methods. In search of a unified and expressive image, critical restoration agrees to complete the work with missing elements and, if necessary, to remove items. In the Unhão intervention, Bardi sought to recover the fundamental characteristics, showing the transformations and other functions that the sugar complex underwent over the years. Some equipment and buildings from the nineteenth century were maintained and restored while some were torn down, like the porch of the church, which was built in

the nineteenth century; still others were added, like the wooden staircase designed by the architect for the Big House (Figs. 6, 7).

The city of São Paulo stands out as a focal point for the development of Brazilian industrialization. Likewise, the city has hosted discussions on industrial heritage and adaptive reuse projects. The leisure and sports complex designed by Lina Bo Bardi for the Social Service for Commerce (SESC-Pompéia) at Vila Pompéia became a reference for the preservation of industrial space through adaptive reuse. The site was partially occupied by brick constructions from the late 1930s, built by the German Mauser Bros. drum factory. The

factory was closed, changed hands, and later housed the assembly line for Gelomatic refrigerators (IBESA). In 1968, SESC bought the area, by then an abandoned site, intending to build a new complex. After the purchase, however, SESC used the existing buildings, which were in precarious condition. In 1976, Bardi was commissioned to transform the area into a leisure and sports center. During a tour, she was impressed by the existing reinforced concrete structures:

Entering for the first time into the then abandoned Pompéia Steel Drum Factory, in 1976, what awakened my curiosity in the light of a possible restoration to transform the property into a leisure center, were the rationally distributed sheds following English designs from the beginning of the European industrialization in the mid-nineteenth century. What really fascinated me however was the elegant, precursory concrete structures. Fondly remembering pioneer Hennebique, I immediately thought it to be our duty to preserve the building (Ferraz 1994, 220).

Thus, the initial idea of demolishing the old industrial buildings gave way to the proposals of Bardi and Renato Requixa, then director of the Regional Department of SESC-São Paulo, to create a new use for them.<sup>22</sup> To define this work, which opened in 1982, the architect chose the term “industrial archaeology” instead of “recycling,” which she deemed to be inaccurate.<sup>23</sup> In Bardi’s intervention, one can distinguish the old industrial construction from the architect’s proposals by observing the different materials and shapes. In addition to the adaptive reuse of the existing constructions, Bardi designed two new buildings connected by four bridges to house a sports center with four multisport courts, swimming pool, changing rooms, and cafeteria. A large cylindrical water tower was also erected, made of exposed concrete in a slightly tapered conical form, 75 meters high, which references the old chimney demolished before the intervention (Fig. 8).

Due to the acknowledged success of the Pompéia design, later interventions were made, including some by SESC, such as the Belenzinho in São Paulo and



Fig. 6. Solar do Unhão, Salvador, Brazil, 2003, an old sugar complex converted into a museum in the early 1960s. The adaptive reuse project was carried out by Lina Bo Bardi (Photograph by Fernando Atique).



Fig. 7. Staircase designed by Lina Bo Bardi for the Solar do Unhão Museum, 2010 (Photograph by Natália Sampaio).



Fig. 8. SESC Pompéia, São Paulo, Brazil, 2005. The conversion of an old factory into a leisure center was entrusted to Lina Bo Bardi in 1976.

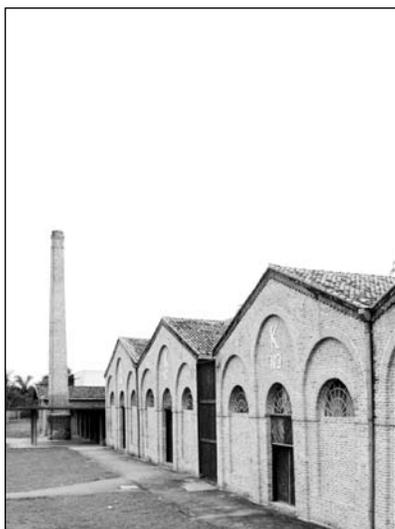
Nova Friburgo in the State of Rio de Janeiro, following a similar concept. Two architects trained under Bardi, Francisco Fanucci and Marcelo Ferraz, who are the leaders of the Brasil Arquitetura Studio, are now carrying out her legacy. Among several of their successful projects of adaptive reuse is the KKKK Complex in Registro, on the southern coast of São Paulo. The complex was registered as a historic monument by the State of São Paulo heritage agency in 1987. In 1995, Fanucci and Ferraz prepared an architectonic study to convert an old rice-processing complex from the 1920s into a cultural and educational center. According to the architects: “restoring the complex with the tools of ‘industrial archeology’ would contribute to giving some self-esteem back to the residents of Registro and also serve to revive an entire area of the city that was underdeveloped and held memories only of the floods and other related problems brought by the waters” (Fanucci 2008, 49) (Figs. 9, 10).

The debate on industrial heritage was brought back to the fore in 1999, during the Second International Meeting on History and Energy, organized by Fundação Patrimônio Histórico da Energia de São Paulo (São Paulo Energy Heritage Foundation). The

main objective was to promote the debate about the transformation in the energy sector, including new forms of management, prospects, and policies for preserving this heritage. Among the presentations, José Amado Mendes’s “A New Perspective on Cultural Heritage, Preservation and Rehabilitation of Industrial Installations” debated the need for the requalification of certain spaces, adapting them to new functions to promote cultural tourism (Mendes 1995).

In March 2003, a group of professionals met for the first time and organized a provisional committee for the preservation of the industrial heritage in Brazil, promoting an open debate on industrial preservation using the internet. The idea for the creation of this committee came up in informal discussions by professionals in the fields of history, sociology, and architecture, which also included labor leaders, about the rapid destruction and deterioration of buildings and industrial areas.

In June 2004, The Committee for the Preservation of the Industrial Heritage in Brazil (TICCIH - Brazil) was formalized, aiming to act as a network for the exchange of expertise and to influence the public agenda in the debate on the preservation of the industrial heritage. It also sought to promote dialogue among community



*Fig. 9. KKKK (Kaigai Kogyo Kabushiki Kaisha) Complex in Registro, Brazil, 2010. This old rice-processing complex from the 1920s was converted into a cultural and educational center, based on a project developed by the Brasil Arquitetura Studio during the 1990s (Photograph by Leandro Ribeiro).*



*Fig. 10. KKKK Complex in Registro, Brazil, 2010 (Photograph by Ricardo Silva, 2010).*

organizations, businesses, universities, and agencies responsible for heritage and various levels of government. Furthermore, it served as an organization for the study, research, and dissemination of the preservationist cause, linking communities, civic organizations, business associations, and trade unions, both in preserving this heritage and in the search for alternatives. In November of the same year, the committee, along with associate professors Silvana Rubino and Cristina Meneguello, organized the 1<sup>st</sup> National Meeting on Industrial Heritage, which took place at the State University of Campinas (UNICAMP) in Campinas.

Progress in studying, recording, and preserving the industrial heritage has been made, although on a small scale, by governmental agencies and community organizations. At the national level, about fifty listed monuments, which include mills and sugar mills, farms, power stations, train stations, viaducts, bridges, factories, worker villages, and warehouses, can be considered part of the industrial heritage. Besides these, a dozen factories, mills, warehouses, and a distillery are part of the regional industrial heritage. The State of São Paulo Council for the Defense of the Historical, Archaeological, Artistic and Tourist Heritage (CONDEPHAAT) has also listed three bridges, a viaduct, two power stations, and sixteen train stations and transportation-related structures. In addition to these, the Fundação Patrimônio Histórico da Energia de São Paulo (São Paulo Energy Historic Heritage Foundation), also called the Fundação Energia e Saneamento (Energy and Sanitation Foundation), has promoted and preserved the historical records of the State of São Paulo's energy sector, and the Bunge Memory Center has handled the preservation of their historical collection in the food industry. The Energy and Sanitation Foundation was also responsible for the restoration of four small hydropower stations built between 1895 and 1940. This foundation also maintains two museums dedicated to the energy sector in the cities of Itu and Jundiaí. In addition, important initiatives have been made by community associations for the preservation of railroad stations and equipment.

A group of specialists in the history of technology, GEHT/ UNICAMP (1998), highlighted the positive initiatives taken by the official registration of this

heritage in Brazil, including: water towers, houses for tea processing, rural complexes, dikes, factories, hangars, sugar mills, railroad complexes, silos, and power stations.

Other examples of adaptive reuse of industrial buildings are the Usina do Gasômetro in Porto Alegre, SESC Belenzinho, Cotonifício Crespi, Estação Júlio Prestes and Estação da Luz in São Paulo, Engenho Central in Piracicaba, the former Adamastor Textile Factory and Olivetti Factory in Guarulhos, Lupo Shopping Mall in Araraquara, Brasital Factory in Salto, SESC Nova Friburgo in Nova Friburgo, Paiol Theatre in Curitiba, Mascarenhas Textile Company in Juiz de Fora, São João Ceramic Factory in Recife, and the Dannemann Cultural Complex in São Félix, Bahia (Fig. 11).

Still, there are industrial heritage sites that struggle for financial support. The Paranapiacaba company town is an example. In the mid-nineteenth century, the São Paulo Railway, a privately owned British company, established this town and a hillside funicular system over the Atlantic's green mountains to transport coffee



Fig.11. Interior of the Olivetti Factory, Guarulhos, Brazil, late 1960s, originally designed by Marco Zanuso in 1957. During the 1990s, Olivetti sold the factory to a third party, who converted it into a shopping mall in 2007 (Photograph courtesy Associazione Archivio Storico Olivetti, Ivrea, Italy, <http://www.storiaolivetti.it/>).

beans from inland plantations to the port of Santos on the southern coast. The site today belongs to the municipality of Santo André-SP and was registered in 1987 by the State of São Paulo Heritage Council (CONDEPHAAT) and in 2002 by IPHAN, a federal agency, as a national heritage site. The World Monuments Fund placed Paranapiacaba on a watch list in 2000 and 2002 to raise awareness about the government's effort. As a national heritage tourist village, Paranapiacaba has found it difficult to maintain itself financially. In 2010, a museum sponsored by the Associação Brasileira de Preservação Ferroviária (ABPF) (Brazilian Association of Railroad Preservation) was closed for lack of electricity. Several houses in the former workers' village, previously rented by the city administration for both commercial and residential purposes, are not maintained and have been a constant target of squatters (Mazzitelli 2010).

Despite the abundance of examples of the reuse of buildings and industrial areas, Brazil lacks experience in the preservation of industrial sites as museums, such as those designed in Europe, for machines and manufacturing processes. The few examples of museums of science and technology were not originally designed for the preservation of industrial heritage and are located in universities or research centers, such as the Museum of Science and Technology at the Catholic University of Rio Grande do Sul in Porto Alegre, and the Museum of Science and Technology of the School of Mines in Ouro Preto. In this context,

however, it is important to note the singular experience of the Museu de Artes e Ofícios (MAO) (Arts and Crafts Museum) in Belo Horizonte, which is one of the biggest labor and technology-related museums in the country. This museum, inaugurated in December 2005 in an old railroad station, was supported through a public-private partnership made possible by the Brazilian Rouanet Law, which encourages private investments to help finance cultural projects. This law enabled several companies such as Companhia Vale do Rio Doce, Cemig, Furnas, and Telemar to sponsor the museum project.<sup>24</sup> The recently inaugurated Museu das Minas e do Metal (MMM) (Mines and Metal Museum), also in Belo Horizonte,<sup>25</sup> is another example of public-private collaboration. A historical building from 1897 was expanded and adapted by the architects Paulo Mendes da Rocha (2006 Pritzker Prize) and Pedro Mendes da Rocha and the curator Marcello Dantas to house a large collection of mining and metallurgy, documenting in an innovative and playful way the two main economic activities of the state (Fig. 12).

Brazil, however, is only now consolidating theoretical, methodological, and practical knowledge about its industrial heritage. Many examples of its industrial past are abandoned to destruction, including warehouses, mills, factories and their machinery, railway lines, and old stations. In addition, traces of industrialization are rapidly destroyed in the expansion and shift of economic activities or by urban growth.



*Fig. 12. Museu das Minas e do Metal (Metal and Mines Museum), Belo Horizonte, Brazil, 2010 (Photograph by Fernando Lara).*

## BRAZIL'S SUGAR INDUSTRIAL HERITAGE

Sugar was the first economic activity established in Brazil. Its production was one of the main reasons for the Portuguese colonization during the seventeenth and eighteenth centuries, and its far-reaching impact included the construction of roads, mills, factories, ports, dwellings, chapels, and workshops, as well as the purchase of forests, the building of watercourses, and the use of slave labor. Toward the end of the nineteenth century, the scale of sugar production increased with the introduction of modern plants and the establishment of more than two hundred settlements, most of them as company towns. Sugar settlements were an urban-rural hybrid, with both agricultural and industrial features, connecting the industrial with the residential (Campagnol 2008).

As a sector of the agro-industry, sugar exerted substantial influence on land use and settlements from the seventeenth through the mid-twentieth century. Since the 1960s, however, in the context of the overall modernization of the country, many sugar company towns in Brazil were changing profoundly. A growing urbanization has allowed some cities to expand toward sugar settlements and an easier transport of people to and from sugar factories. The transformations of some family firms into corporations, especially after the 1970s, led to the dissolution of the family-business model. Consequently, many factories and housing units have been dismantled. Neoliberal practices and a high unemployment rate have drastically reduced the number of workers living close to plants; in the same way, single-family houses have been replaced by poor quality dormitories. The migration of workers to adjacent urban areas to search for jobs in sugar factories that no longer provide housing has led to the development of slums in these areas.

Nevertheless, the sugarcane industry still marks the landscape in several regions in Brazil. High chimneys emerge among the green-cane, sometimes emitting the smoke that reveals activity and sometimes only marking a former facility. Although the sugar industry of the late nineteenth and early twentieth centuries includes a variety of buildings and disabled and abandoned

factories, none of them has been registered at the national level.<sup>26</sup> In São Paulo, supported by a state agency, only one sugar-cane-related building has been registered, a distillery in Lençóis Paulista. In Piracicaba, the Piracicaba Sugar Company was recognized as a historic site and listed by the municipality in 1989, and since 2009, its registration has been recommended to a state agency (CONDEPHAAT). Since the 1980s, this area inspired several adaptive reuse proposals by renowned Brazilian architects, such as Oscar Niemeyer, Carlos Bratke, and Paulo Mendes da Rocha. Two new adaptive reuse projects were announced in September 2009 and January 2010. The first is the conversion of part of the Piracicaba Sugar Company's industrial complex into a thematic Museum of Sugar and Alcohol,<sup>27</sup> and the second, by Brasil Arquitetura, will transform one of the buildings in the same complex (Warehouse #6) into a public theater. Since 2009, Brasil Arquitetura has also been responsible for the adaptive reuse of one of the state's oldest sugar complexes, located amid the sugarcane fields of Sertãozinho, São Paulo. With over a dozen buildings, mainly from the early 1900s, which still house part of the original machinery, the complex aims to be the first National Museum of Sugarcane. The project is still raising funds through a public and private collaboration supported by the Rouanet Law. Lastly, in 2003, the city of Santa Bárbara d'Oeste designated the Santa Bárbara Sugar Company as a heritage monument. However, almost all the workers' housing was demolished for real state development, and some of the industrial buildings have been used, with minor rehabilitation, for temporary community events (Figs. 13, 14, 15).

Heritage preservation demands selection, which requires criteria. One should know, above all, the importance of what is preserved, and therefore a prior study, survey, and record are needed. Sugar production, both colonial and modern, as a focus of industrial archaeology, requires the attention of Brazil's authorities.<sup>28</sup> The preservation of sugar company towns as a whole is difficult to achieve, because of the scale of the enterprise and the diversity of buildings. This requires an extensive and strategic program for adaptive reuse and an efficient cultural heritage policy.

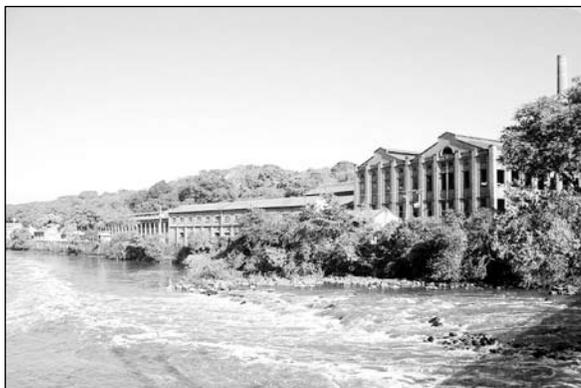


Fig. 13. Piracicaba Sugar Company, Piracicaba, Brazil, 2006 (Photograph by Lucas Decina).

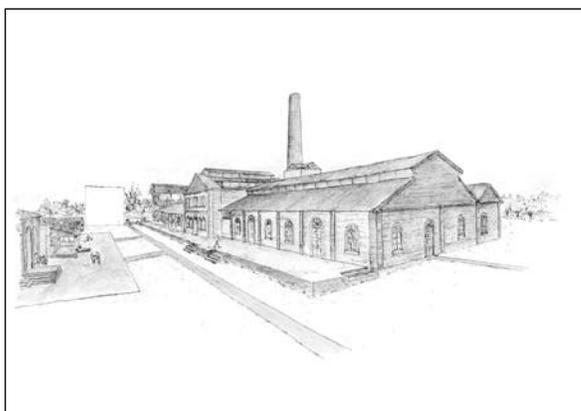


Fig. 14. A sketch of the Museum of Sugarcane in a rural zone of Sertãozinho, Brazil, 2009 (Drawing by Brasil Arquitetura Studio).



Fig. 15. Santa Bárbara Sugar Company, Santa Bárbara d'Oeste, Brazil, 2006.

## FINAL CONSIDERATIONS: PRESERVATION AND ADAPTIVE REUSE

In conclusion, industrial archaeology is, by definition, an interdisciplinary method of studying the industrial past and present. The development of this new area has brought undeniable contributions to the preservation of industrial heritage through the scientific documentation of the past and adaptive reuse. This includes a thorough understanding of what can be considered as industrial heritage, which means defining the criteria for its evaluation and the methodology for its preservation. The safeguarding of an area or building is the next step toward preservation. The last step is finding a use to justify the preservation of industrial areas. This problem involves urban planning and demands a detailed study demonstrating potential historical and cultural value. This further reaffirms the interdisciplinary nature of this field. Thus, Industrial archaeology is an important means for bringing together different areas of specialization for a holistic understanding and enhancement of heritage.

However, the push toward preservation and reuse of industrial heritage is challenging. In several countries, as urban land becomes more precious with increasing demands for housing, infrastructure, and other amenities, the preservation and reuse of large industrial sites becomes more difficult. Another important challenge is the financial investment required for projects of this nature. General public awareness and local initiatives both by the government and private investment could help overcome this problem.

In Brazil, the preservation of the industrial past has not received the same recognition as its festive traditions, exuberant resources, and colonial and modern architecture. Despite several actions favoring the preservation of industrial heritage, the methodological approach focusing exclusively on this aspect of heritage is only now being developed. The initiatives to systematically study, record, and preserve industrial heritage, especially as it relates to Brazil's importance in the production of items such as sugar, coffee, and iron, are currently in the nascent stage. Moreover, adaptive reuse and protection through registration at the national level require more public attention.

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#### ENDNOTES

- In this article, the author inquired, "there is archaeology of art, why not archaeology of industry?"
- However, the defining moment that moved public opinion in favor of protecting these monuments occurred in 1962, when the Euston Arch, which was erected by Phillip Hardwick in 1838 at the main station of the London-Birmingham railway, faced demolition. According to Rix (1967, 13), the monument "symbolized the feeling that the early railway pioneers had of locomotive power as a mystical transformer of the social scene. It was beautiful."
- In 1963, the CBA initiated a program of systematic recording by setting up the Industrial Monuments Survey, collecting about 30 thousand records over a period of two years, which led to the creation of the National Record of the Industrial Monuments (NRIM). In 1965, the Centre for the Study of the History of Technology took over the inventory, and in 1981, it was moved to the Royal Commission on Historical Monuments of England (Cordeiro 2004).
- It is conventional to use the term Industrial Revolution to designate a period where a series of technological advances began to be deployed in the production system, largely transforming industry and increasing productivity. According to the Charter on Industrial Heritage, "the Industrial Revolution was the beginning of a historical phenomenon that has affected an ever-greater part of the human population, as well as all the other forms of life on our planet, and that continues to the present day" (ICOMOS 2003).
- The Charter on Industrial Heritage states "the historical period of principal interest extends forward from the beginning of the Industrial Revolution in the second half of the eighteenth century up to and including the present day, while also examining its earlier pre-industrial and proto-industrial roots. In addition, it draws on the study of work and working techniques encompassed by the history of technology" (ICOMOS 2003, sec 1).
- The GEHT's (Group of Studies of the History of Technology) central concern is the conservation of cultural property, called "utilitarian buildings and facilities," which are linked to trades, professions, and industries (see GEHT 1998 – the statement is in defense of utilitarian buildings and facilities).
- It is important to notice the academic studies by Kühn (1998, 2004, 2009), Andreatta (1997, 1999), Zequini (1999), Gunn and Correia (2005), Meneguello and Rubino (2005), Fonseca (2007), Campagnol (2008), and Rufinoni (2009).
- After the Portuguese arrived in the sixteenth century, sugar was the first economic activity established in Brazil. In the eighteenth century, a gold rush marks the economy. The extraction of gold increased rapidly until the 1750s, when its exports peaked. The exports declined sharply in the last quarter of the eighteenth century after gold deposits became depleted. When Brazil became independent from Portugal in 1822, coffee was the mainstay of the economy, followed by sugar, accounting for, respectively, over 60% and about 10% of the country's exports between 1881 and 1891. By the late 1930s, coffee production had been reduced drastically. The period between 1930 and 1956 is known as the Brazilian "Industrial Revolution" (Lima 1989; Fausto 1995).
- Among some early general works on industrial archaeology, see Rix (1967), Hudson (1966), Moberg (1969), Buchanan (1982), Raistrick (1972), Cossons (1975), and Major (1975).
- Position taken, for example, by Arthur Raistrick (1973).
- The Second International Conference for the Conservation of the Industrial Heritage in 1975 took place in Bochum, Germany.
- The Athens Charter specially recommends "the suppression of all forms of publicity, of the erection of unsightly telegraph poles and the exclusion of all noisy factories and even of tall shafts in the neighbourhood of artistic and historic monuments" (ICOMOS 1931, sec III).
- The French *Écomusées* (open-air museums or Eco-museums) are different from the Bochum and Ironbridge proposal to retrieve the industrial heritage. This proposal was debated in 1976 during the symposium Industrial Heritage and Contemporary Society: Places, Monuments and Museums that took place in Le Creusot. Its intention was to give a social dimension to the policy of conserving industrial remains, given the scant interest in the concepts of conservation and heritage. According to Santacreu Soler (1992, 17-18), these remains are intended to constitute a geographical area that is itself an important document on the industrial period, and in its center, a museum of man and industry.

14. The Catalonia Museum of Science and Technology (mNATEC) was an initiative of the Catalan Association of Industrial Engineers in the 1970s, which established the Association of the Museum of Science and Technology and of Industrial Archaeology of Catalonia in 1979. The intention was to unite forces to preserve industrial heritage. In 1982, the Culture Department of the Generalitat began to take over the project, and, in the following year, it purchased the Aymerich, Amat i Jover mill to house the actual museum.
15. In 1978, 137 acres of a central area of the city, including 5.6 miles of canals, was designated a national historical park.
16. In Latin America, IPHAN is the oldest organization devoted to the official preservation of cultural heritage. As a federal organ, it serves as a base for the creation of state and municipal organs for the protection of cultural heritage. It was created (as SPHAN - Office of National Historical and Artistic Heritage) in the late 1930s in a cultural context marked by the modernist movement and the establishment of Getúlio Vargas's authoritarian Estado Novo. Together, the historic monuments registered via these three entities – federal, state, and municipal – preserve a sample of Brazil's significant cultural artifacts. The creation of a federal office for heritage protection was entrusted to Rodrigo Melo Franco de Andrade, who worked in collaboration with other distinguished modernist intellectuals, such as Oswald de Andrade, Manuel Bandeira, Afonso Arinos, Lucio Costa, and Carlos Drummond de Andrade (see Fonseca 1997).
17. The equivalent term used in this paper is registration.
18. Brazil was part of the Portuguese Empire until 1822.
19. As analyzed by Choay (2001) in Europe and Fonseca (1997) in Brazil, the practice of preservation became a topic of public interest only after concrete threats of destruction and a rise in nationalism. The federal agency IPHAN has a responsibility to protect, preserve, and disseminate Brazilian cultural heritage.
20. The reason for the registration was "industrial archaeological remnant of the first functional complex for the exploitation and manufacture of iron in the country" Process (0727-T-64).
21. In 1978, UNESCO considered the Wieliczka Salt Mine in Poland the first World Industrial Heritage Site. In Latin America, the following industrial and technical heritages are placed on the World Heritage List: Bolivia: City of Potosí (1987); Brazil: Historic Town of Ouro Preto (1980); Chile: Humberstone and Santa Laura Saltpeter Works (2005) and Sewell Mining Town (2006); Cuba: Archaeological Landscape of the First Coffee Plantations in the South-East of Cuba (2000); Mexico: Historic Town of Guanajuato and Adjacent Mines (1988), Historic Centre of Zacatecas (1993), and Agave Landscape and Ancient Industrial Facilities of Tequila (2006).
22. At the time of SESC-Pompéia's renovation, Bardi and her team tried unsuccessfully to convince SESC to purchase a site next door, which was being developed as two apartment buildings and a shopping mall. Since construction on the site had stopped, the hope was to be able to demolish the partly finished project to maintain the integrity of SESC-Pompéia. Unfortunately, since SESC was not registered at the time, the shopping mall was eventually completed and currently blocks the north façade of the SESC (Fragelli 1989, 58).
23. According to a *Jornal da Tarde*'s article of February 1981, "Lina Bo Bardi does not like the word recycling, which she considers inaccurate, false. She prefers Industrial Archaeology to describe this massive undertaking, which she worked on daily for two years, taking care of every detail to avoid any desecration" (Receita... 1981).
24. The Rouanet Law allows taxpayers (both private citizens and businesses) to make donations or sponsor cultural projects and get a tax credit proportional to the value of the donation.
25. Opened in June 22, 2010, the museum was sponsored by EBX Group (Museu... 2011).
26. Sugar-related heritage registered by IPHAN at the national level comprises 29 sites from the seventeenth and eighteenth centuries and mostly includes Big Houses and chapels, and, rarely, buildings that housed the mills, but no machinery has been registered.
27. The Instituto Brasil Leitor is in charge of the project. Pedro Mendes da Rocha is in charge of the architectural design.
28. See Campagnol (2008) for an example of documentation of sugar industry artifacts.

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