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Railroad workshops and deposits: identification and analysis of some São Paulo railroad companies (1867–1930)

Abstract

The main objective of this paper was to identify and to analyze the material characteristics of the railway workshops built in the State of São Paulo between the 1867s and 1930s. This research is justified by the importance of this type of construction and the great gap of national studies about industrial architecture, mainly related to the railway workshops. For the survey, we prioritized the most economically important companies and those with the most documentation. The administrative reports of some São Paulo railway companies were consulted in order to identify the location of their workshops; 19th century railway treatises were consulted to understand some aspects of workshop space as well national bibliography specialized in industrial and railway architecture. This work resulted in a map of the location of the workshops found, from which we were able to identify issues related to the implantation, architectural composition, materials and some foreign suppliers.

Keywords

Industrial buildings. Railway workshops. Inventory.

http://dx.doi.org/10.11606/issn.2317-2762.posfau.2019.145345

Pós, Rev. Programa Pós-Grad. Arquit. Urban. FAUUSP. São Paulo, v. 26, n. 48, e145345, 2019.

OFICINAS E DEPÓSITOS FERROVIÁRIOS: IDENTIFICAÇÃO E ANÁLISE DE ALGUMAS COMPANHIAS FÉRREAS PAULISTAS (1867-1930)

Resumo

Este trabalho teve como principal objetivo identificar e analisar características materiais das oficinas ferroviárias construídas no estado de São Paulo no período entre 1867 e 1930. A pesquisa se justifica pela importância desse tipo de edificação e pela grande lacuna de estudos nacionais em relação à arquitetura industrial, principalmente relacionados às oficinas ferroviárias. Para o levantamento, foram priorizadas as companhias de maior relevância econômica e as que dispunham de maior número de documentação. Foram consultados relatórios administrativos de algumas companhias férreas paulistas a fim de identificar a localização de suas oficinas e tratados ferroviários do século XIX para compreender alguns aspectos da espacialização das oficinas e bibliografia nacional especializada em arquitetura industrial e ferroviária. Este trabalho resultou em um mapa de localização das oficinas encontradas, através do qual foi possível identificar questões referentes à implantação, composição arquitetônica, materiais e alguns fornecedores estrangeiros.

Palavras-chave

Edifícios industriais. Oficinas ferroviárias. Inventário.

1. Background

Railroad workshops played an important role in everything related with railways, having supported railroad operation and expansion. In the State of São Paulo, up until the latter decades of the 19th Century, those workshops represented some of the few places developing industrial activities, "*from foundry and maintenance activities to the production of heavy equipment*" (OLIVEIRA, 2012, p. 201).

Though this paper does not focus on preservation related issues, protection to this type of building has been noticeably scarce. Nationwide, 102 railway assets have been protected by the IPHAN, the Brazilian Institute for the National Historic and Artistic Heritage, 62 of which were railroad stations and only three workshops—namely the Jundiaí and Companhia Paulista de Estradas de Ferro (*São Paulo Railroad Company*) units and, indirectly, the Paranapiacaba village and Mairinque (included in the vicinities) facilities (OLIVEIRA, 2017). Remarkably, only the Jundiaí workshops comprised the main object of protection, whereas the other preservation efforts focused respectively, on residences and the railroad station. The very term "workshop" is not to be found amongst the assets listed by the CONDEPHAAT, the Historical, Archaeological, Artistic and Touristic Asset Defense Council of the State of São Paulo. In most situations, the term "*conjunto da estação*" (T.N. – station complex) was used in reference to the various buildings that could compose a railroad complex starting from the station, even when it included some locomotive deposit or maintenance workshop—such as the Botucatu workshops. It all goes to show that this typology is not the object of specific protection in São Paulo or in Brazil—nor is it so in a comparison with railroad buildings (such as passenger stations) or even with railway complexes.

The relevant bibliography in industrial and railway architecture makes scarce reference to this type of building. Breaking new ground as more rigorous investigation into the railway architecture, Küll's renown studies of 1998 and 2009 delved into the railway stations between Santos and Rio Claro. However, academic studies have not been pushed henceforth. Bem's (1998), Cruz's (2007), Finger's (2013), Guazzelli's (2014), Lucas's (2010), Morais's (2002), Silva's (2014) and Souza's (2015) looked into railroad industrial typology prioritizing stations and residences, but failing to cover workshops; if and when, they addressed the matter superficially. Comparatively, existing studies are distinguishable: there is Rita Francisco's dissertation (2007), approaching Companhia Mogiana's workshop typology, and the texts by Soukef (2016) and Torrejais (2016), analyzing the different phases of CPEF's workshops in Jundiaí. There are other dissertations addressing railway or asset history, but not from the viewpoint of industrial architecture.

Given the bibliographic deficiency in this theme, this text is an attempt to surface architectural aspects and some issues concerned with importing railroad design and workshop materials in a broad manner, in a way that ought to encourage further studies. The purpose here is to identify São Paulo railroad

workshops in the State's railroad company reports and to characterize, however superficially, workshops in service of the three largest companies. The timeframe adopted ranges from 1867 to 1928, the period when the São Paulo State experienced the greatest railway expansion and the workshops under focus here were built.

2. Railroad workshops

Remarkably, no Brazilian bibliography describing the early workshops in detail was found, but railway treatises were identified as literature concerned with spatializing those buildings. A library collections assessment in the three old Brazilian engineering schools (Escola Politécnica do Rio de Janeiro/1856, Escola Politécnica de São Paulo/1876 e Escola de Minas de Ouro Preto/1876) revealed an expressive amount of such bibliography—most of which, in the French language. The olden works in those collections refer to 1834: *Leçons faites sur les chemins de fer à l'Écelle des ponts chaussées en 1833-1834*, by Mirand; *Manuel du constructeur de chemins de fer*, by Ed Biot (1834); and *Traité pratique des chemins de fer*, authored by Nicholas Wood—the original version of which was in English, dated 1825. The latter, however, did not address workshops. The studies mentioned in every one of those collections include *Cours de chemins de fer*, by C. Brika (1894); *Traité complet des chemins de fer*, by G. Humbert (1891); *Traite d'exploitation des chemins de fer*, by A. Flamache and A. Huberti (1885); *Traite pratique de l'entretien et de l'exploitation des chemins de fe*r, by Charles Goschler (1865); *Traite de la construction des ponts et viaducts pour routes et chemins de fer*, by Romain Morandiere (1874); *Traite des chemins de fer*, by Moreau (1898); *Cours de chemins de fer*, by Vicaire and Maison (1899) and *Chemins de fer notions generales et economiques*, by Leon Leygue (1892), in addition to a variety of Perdonnet's works. In the two Polytechnic schools, there are various volumes of *Construction des canaux et des chemins de fer*, by Graef (1861); *Manuel pratique des poseurs de voies de chemins de fer*, by Henri Salin (1875) and *Notes prise au cours de chemins de fer*, by Sévène (1876)[1]. These collections also include pieces by Couche (1867), Demoullin (1896) and Deharme and Pullin (1895), among others.

Some railway treatises referred to the workshops with names such as "ateliers" (workshops) and "dépôt" (deposits where repair work was performed), a differentiation that starts with Perdonnet's oeuvre (1856). Less frequent, the term "remises" (deposits for the storage of wagons and the like) appears as an equivalent to workshop, because a small size workshop was usually attached to those buildings. The three types were broadly described as a large space housing the maintenance machinery, but, beyond that simplicity, some recommendations were made in an effort to improve the space.

Some authors contend that rooftops above workshop space are related with their function: *shed* is the more common term for areas where adjustment, repair and other related types of work is performed, and *lanternim* (T.N. – ridge vent) is more common for car and wagon "remises" (PERDONNET, 1860; MOREAU, 1898; BRICKA, 1894). In the latter case, ridge vents have been observed as the main air exchange solution and, though Perdonnet (1860) mentions the lighting purpose, Bricka (1894) recommends ridge vents be closed

[1] Among other authors, professors of the *École Nationale des Ponts et Chaussées* included: Charles Bricka (1845-1899); Louis Sévène (1823-1883); Romain Romandiere (1809-1875); Pierre Dominique Bazaine-Vasseur (1809-1893); Charles-Joseph Minard (1781-1870); François Jacqmin (1820-1889).

with shutters and that lighting be provided with "verre de châssis", a zenith lighting alternative that can be compared to *sheds* (BRICKA, 1894). One such example is the Montabon dome, located in the northwest of France.

For workshop floors, bitumen was recommended (except for hot areas); also recommended were ceramics, cement or even compacted dirt. However, Sanchiz's work (2018) points at the use of wood in some Brazilian workshops. Structures should preferably be made in iron, and closed by bricks, whereas rooftop material should depend on the activities to be performed in each setting (GOSCHLER, 1872; MOREAU, 1898; BRICKA, 1894). Nevertheless, foundation structures should not be neglected because of the trepidation to which both the workshops and the other buildings would be subjected (BRICKA, 1894; GOSCHLER, 1872).

Another concern in the railway treatises was workshop spatialization as a result of relevant technology. When it comes to space distribution, the architecture of an industrial site needs to abide by the work dynamics in order to be a functional rather than an exempted program, subordinate to production. As a consequence of mechanical energy, for instance, machine distribution was limited by pulleys and lathe axes. For safety purposes, belts were recommended to be underground (MOREAU, 1898; BRICKA, 1894). Technological aspects determining industrial architecture were also observed by Neaverson & Palmer (1998) in European industries.

This study sought to identify where in the São Paulo territory were the railroad workshops belonging to the companies operating in the state as of the mid 19th Century. That effort was based on data contained in administrative reports by the following companies[2]: Companhia Paulista de Estradas de Ferro (CPEF), Companhia Mogiana de Estradas de Ferro (CMEF), Estrada de Ferro Sorocabana (EFS)[3], Companhia Ituana de Estradas de Ferro, Companhia União Sorocabana e Ituana and Noroeste do Brasil (NOB). No access could be secured to reports from Central do Brasil, São Paulo Railway (SPR) and Estrada de Ferro Araraquara; other sources were therefore used to identify those workshops (such as CONDEPHAAT's and IPHAN's lists of assets).

Based on the available documentation, 40 workshops could be identified in the São Paulo territory and traces of another 10 were found. Among those 50, the term "workshop" (*oficina*) was employed in their reports to designate assembling workshops rendering highly relevant services and the term "deposit" (*depósito*) was used to designate buildings that served either as deposits or as small repair workshops, a distinction that is made in some railway treatises. Based on this distinction, the workshops found in this research effort were classified in three groups, according to the variety of services they provided: "large size workshop", comprising workshops providing multiple services, such as assembling, retrofitting and the like; "deposit-workshop", comprising those that were used for rolling stock storage and that performed repair work; and "simple deposit", comprising those that provided services in isolation, such as carpentry and the repair of parts. For workshops whose activities and classification changed with the years, the more detailed period in the reports was considered.

[2] All reports read for this study are found on the Memória Ferroviária (*Railroad Memory*) project website. Available at: <http://www.rosana.unesp.br/#!/pesquisa/laboratorio-de-patrimonio-cultural/projetos/projeto-memoria-ferroviaria-pmf/apresentacao/>

[3] To facilitate reading, the acronym EFS was adopted as reference to the company, even in the period when it was called Companhia Sorocabana.

Remarkably, the total number of workshops was obtained from reports produced between 1869 and 1928, and those workshops did not necessarily exist at the same time, since some were built to replace others. Also noteworthy is the fact that this study did not comprise telegraphic workshops because these were not associated to car and wagon repair work related services.

The QuantumGIS software was used to make a map from the information thus obtained, specifying workshop location as mentioned in the railroad company reports, which was superposed to a São Paulo railway map. In Figure 1, greater building concentration is observed on lines belonging to the SPR and CPEF, more precisely in the section spanning from Santos to Araraquara. Those workshops, however, belong to various companies.

Some scenarios were offered to explain this situation. From the technical roll-out standpoint, Perdonnet (1865, p.477-9) sustains that there were no rules in Europe for locating workshops along the railway and choice of workshop site was usually based on value, with preference given to lower cost sites[4]. When it comes to the *dépôts*, the small repair workshops, they were usually built at

[4] "On voit que les ingénieurs des grandes lignes ne semblent pas s'être attachés essentiellement à placer les ateliers en un point déterminé de la ligne, tel que le serait le milieu ou l'une des entrémités. Ils les ont établis tautôt sur un point, tantôt sur un autre : partout où l'on a pu acquérir à um prix raisonnable de vastes terrains voisins de la ligne, et se procurer sans trop de difficultés des approvisionnements et des ouvriers. (...) Mais, d'un autre côté, ils occupent dans ces gares un terrain ordinairement très-précieux, et si la gare est dans l'intérieur d'une ville, les ouvriers ne peuvent se longer et se nourrir à proximité qu'à grands frais" (PERDONNET, 1865, p.478).

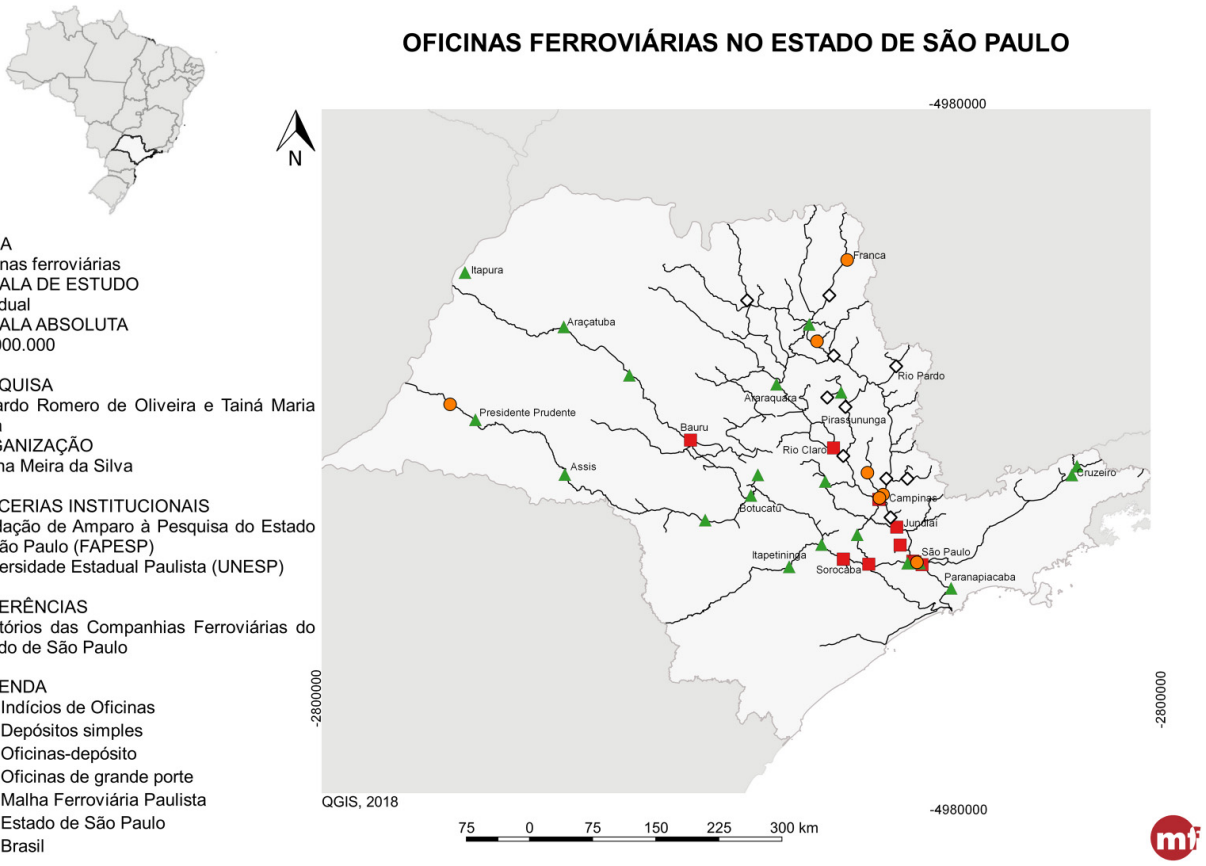

Figure 1 – Map of railway location in the State of São Paulo. Source: developed by Milena Meira Silva from the QGis tool with data collected by Tainá Maria Silva and Eduardo Romero de Oliveira, 2017.

methodical distances such as 25km and 40km, which increased as technologies progressed.[5] In Brazil, in the cases at hand, distances vary from one company to another: approximately 312km between the Campinas workshop (CPEF's Km 0) and the Ribeirão Preto workshop (Km 312.5 of the CMEF trunk line), 133km between the Rio Claro workshops (Km 133.8 of the CPEF trunk line) and the Jundiaí workshops (CPEF's Km 0.8), or 56km between the workshops of the Paranapiacaba Village (Km 30.3 of the SPR trunk line) and São Paulo's Lapa workshops (Km 86). In the 1920's alone, the five EFS new workshop plans established a minimum 150km distance between them.

In terms of Brazil's historical context, their implementation seems to have followed the line expansion dynamics or transport demand circumstances for a company's workshop construction or enhancement. Quantitatively speaking, 2/3 of the maintenance structures were built between 1867 and 1903 (31 workshops and deposits). In even greater numbers, they are distributed along the right margin of the Tietê river, from Santos to Franca; another four, belonging to EFS and to Companhia Ituana, were on the left margin, evidently reflecting lines and branches of the older companies with greater network density. At the same time, this workshop concentration would correspond to the region Milliet named as "central", known for its massive coffee production from the 1840's to 1890's (MILLIET, 1941 apud MATOS, 1990).

In addition to making location related comments, this study attempted to understand some construction aspects of a certain group of workshops. The three oldest railroad companies from the State of São Paulo were selected as the ones that provided the most information about their workshops: CPEF, founded in 1869; CMEF, founded in 1873; and EFS, founded in 1873. That selection represents a little more than 70% of the total number of workshops involved, and it required investigating the reports produced since the companies were founded until the early 20th Century.

[5] "Dans l'origine, les dépôts étaint très-rapprochés. Ainsi, sur le chemin d'Orléans, ils se trouvaient généralement écartés de 25km seulement, et, sur celui Lyon, on s'était attaché à ne pas les placer à des distances de plus de 40km. Le materiel se perfectionnant, la capacité des tenders augmentant et les machineistes acquérant plus d'habileté, on a pu augmenter le parcours des machines et éloigner advantage les dépôts" (PERDONNET, 1865, p.479).

2.1. Some workshops observed

The first **EFS** workshop was built in Sorocaba, around 1874, and its proper location could not be determined (COMPANHIA SOROCABANA, 1874). The Mairinque workshops were built around 1900, enlarged in 1910, refurbished in 1947, and are currently listed as state and national heritage (SILVA, 2017).

By the end of the 19th Century, EFS kept only three workshops. In the 1920's, however, the company recognizes the workshops were falling short of the demand and resorts to the services of other private expert companies (ESTRADA DE FERRO SOROCABANA, 1924; 1025), which soon enough led them to announce a strategy: split up their line into five "*Inspetorias de Tração*" (drive inspections) in a way that reduced flow from large repair and assembly workshops (ESTRADA DE FERRO SOROCABANA, 1925, p.16). Those efforts corresponded to a more homogeneous workshop structure whereby five cities set apart by varying distances could receive similar workshops that would meet their individual division demands. The cities of choice were: Assis (Figure 2), Sorocaba, Itapetininga, Botucatu and Itu.

Figure 2 – Assis workshops built in the early 1920's and the architectural model replicated in the five Drive Inspection workshops. Collection: Memória Ferroviária, 2017.

Figure 3 – Ruins of the Iperó workshops built around 1928 and a simulation of the ridge vent roof. Collection: Eduardo Romero de Oliveira, 2010.

Up until 1928, the company had 16 workshops in the State of São Paulo (including the ones incorporated in the Ituana company purchase in 1898), the most outstanding of which were Sorocaba and Mairinque, that provided wagon assembling services. Sorocaba's current workshop buildings were designed in 1925 by engineer Homero Barbosa de Assis Martins (ESTRADA DE FERRO SOROCABANA, 1925)[6] and construction was finalized in 1929. These new buildings followed the same architectural standard as in the five "*Inspetorias de Tração*", a model corresponding to the use of reinforced concrete and a ridge vent roof structure. Despite the similarities among Sorocaba buildings and new workshops, there are no records proving that engineer Homero Barbosa had designed the previous ones.

Another remarkable example, the Iperó workshop (Figure 3) was built in late 1920's and was smaller than the Drive Inspection workshops. Though they have a single nave, there is style repetition, with a façade that merely emulates a ridge vent—since there was no ridge vent on a two-slope wooden roof.

CMEF actually hired CPEF's services before building their first workshop, which operated machinery that had been ordered from the United States and Europe (COMPANHIA MOGYANA, 1878). There were three most important workshops for the CMEF: the Campinas workshop, the Ribeirão Preto workshop and the Uberaba workshop – the latter being in the State of Minas Gerais. The Ribeirão Preto workshops were built around 1884 for the purpose of performing minor repair work (COMPANHIA MOGYANA, 1884), but, as years went by, they even did repair work that the company classified as "*medium repair*" (COMPANHIA MOGYANA, 1901, p.120). The workshops and the station were deactivated in 1965 and the area was transferred to the municipality. The space is currently occupied by the Ribeirão Preto City Council and the bus terminal.

In Campinas, though a single chief engineer was nominated, there were at least three CMEF workshops: the first one was built around 1876 and went so far as to provide some construction services (COMPANHIA MOGYANA, 1877; 1882; 1884); the second one was allocated to the Anhumas Station and had a provisional and emergency nature (COMPANHIA MOGYANA, 1889); and the third one was located near the Guanabara Station and was built in 1893

[6] Homero Barbosa de Assis Martins was a civil and mine engineer. He later was a full professor at the São Paulo Polytechnic School, in 1939, in the Eletrotechnic Department, and in the Electrotechnic Institute of the São Paulo Polytechnic School in 1941 (CORREIO PAULISTANO, 1939; 1941). The Sorocaba workshop design can be seen in the Engineering Institute's Newsletter (1928).

(COMPANHIA MOGYANA, 1893). The workshop corresponding to the one that is currently listed as municipal heritage was built in 1903. The workshops were built in order to "avail from the existing buildings" and were conceived to operate with electrical power, an innovative technology at the time (COMPANHIA MOGIANA, 1902, p.145; FRANCISCO, 2007).

The latter of those workshops stands out in architectural terms. Currently protected as municipal heritage, the complex was designed by Carlos Stevenson and erected in brickwork with relief ornaments on the upper part of the buildings. Some sections exhibit two slope roofs with a fascia while the others are topped by a ridge vent type of roof (FRANCISCO, 2007). Since that workshop was designed for electrical equipment, the technology "allowed for more equipment layout possibilities and more types to be used": cranes, for instance, optimized and facilitated the work to be done, in less time (OLIVEIRA, 2012, p.203) (Figure 4).

Four cities were eventually identified as where CMEF workshops had been allocated at different periods of time and with different levels of rolling stock repair; furthermore, there are indications of another three workshops in different locations within the State. Still, no architectural similarities were observed in the workshop buildings.

Concerning the **CPEF**, four workshops and indications of another three were identified in various sites within the State, the most important of which were Jundiaí workshops and the Rio Claro workshops. The Rio Claro workshops were built by the Rio Claro Company and bought by the CPEF in 1888 (COMPANHIA PAULISTA, 1888). Those workshops operated as metric rolling stock repair and

Figure 4 – Companhia Mogiana de Estradas de Ferro workshops, Campinas, 1910. APESP Collection.

Figure 5 – Companhia Paulista workshops, Jundiaí, 1918. Source: PÉREZ, 1918.

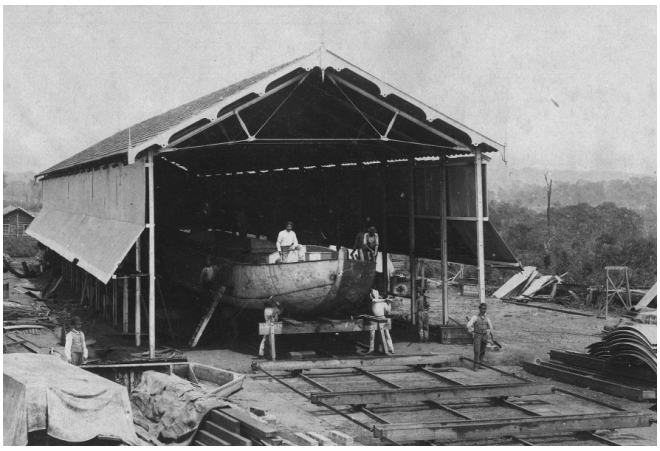

Figure 6 – Porto Martins workshops, n.d. Collection: Museu da Companhia Paulista.

assembly site and part of their space is currently used by América Latina Logística (ALL). Remarkably, the CPEF workshops also performed repair and maintenance activities for other companies.

The Jundiaí workshops (Figure 5) were built in 1892 to replace an older one located in Campinas, which was eventually demolished (COMPANHIA PAULISTA, 1903). It was erected in brickwork with steel columns and trusses, and closed with French roof tiles and glass (COMPANHIA PAULISTA, 1896). Lighting was provided through large windows and a jagged rooftop. The ensemble is now partially used, as it houses some sections of the Jundiaí Municipality Buildings, the Companhia Paulista Museum, a Poupatempo (T.N. – an expedited citizen document service) unit and a Technology College unit (FATEC).

Built around 1884 for the repair of rolling stock. As described in the company's report, this workshop was built with old rails, closed with galvanized iron plates and covered with French tiles (COMPANHIA PAULISTA, 1886). Also identified in the reports of other companies, this roughness of materials points at functionality as a constructive maxim.

Figure 7: Iacri railroad station, São Paulo, with rail structure. Collection: Felipe Deo and Guilherme Costa, 2018.

Figure 8: Iacri railroad structure, São Paulo, composed of rails with the inscription "*Krupp 1906 E F Sorocabana*". Collection: Tainá Maria Silva, 2017.

Concerning materials, reuse of old rails is observed as a common practice among CPEF, CMEF and EFS. According to their reports, damaged rails gained new functions with less wear and tear, such as lamp posts, roof trusses and culvert beams. CPEF actually used old rails in the construction of short span bridges and also in a rudimentary dam system (COMPANHIA PAULISTA, 1885; 1907). EFS, however, reused old rails to replace wooden lamp posts (ESTRADA DE FERRO SOROCABANA, 1882), often chose to sell them (ESTRADA DE FERRO SOROCABANA, 1919; 1921; 1925) and, though the reports never mention use of that material as structure, this use could be observed, as shown in Figures 2017 and 8.

We also observed that, on occasion, CMEF and CPEF imported materials from North America and Europe. EFS's administrative reports do not contain any register of imported materials being bought for the construction of their workshops, and the company was limited to importing rolling stock.

3. Suppliers

Knowing that railroad companies resorted to foreign companies for the construction of their workshops, some issues had to be understood about suppliers and import logistics—among the ones we could identify when looking into the documentation. Concerning the import logistics, CPEF's 1871 report informs that the process was usually done in two different ways: by sending a trained employee to Europe or by a "*lump sum commission*", which was a type of outsourced purchase. The former involved sending the most skilled engineer to the purchase site, with enough freedom to choose the brand and the product, to keep track of the manufacturing process, to negotiate values and delivery dates, and to replace any occasionally damaged product before shipping it to Brazil. The latter involved hiring several intermediaries who would carry out different activities (COMPANHIA PAULISTA, 1871). Later on, CPEF hired London company *Fry Miers & Co*, who were correspondents centralizing this type of service (COMPANHIA PAULISTA, 1877).

Concerning vendors and suppliers, identified from CPEF and CMEF reports, we have observed that they exported materials not only for the workshops, but also for other purposes, such as the construction of bridges.[7] The *De Bergue and Co*, for instance, founders located in Salford, England, built iron railroad bridges (GRACE'S GUIDE..., s.d.), produced parts for railroads (such as roller bearings) and supplied materials for CPEF's first workshop in Campinas (COMPANHIA PAULISTA, 1871). Another example is North American *The Phoenix Bridge & Co*, which produced the metal parts for CPEF's workshop rooftop structures in Jundiaí, according to the workshops' original construction plans (REVISED..., 1892), in addition to having been commissioned, at a later moment, to provide the metal structure for the Mogi Guaçu river bridge (COMPANHIA PALISTA, 1902), which is being used to this day and age.[8] That was an outstanding supplier in the United States, operating from 1813 to 1962 with iron exports and developing expertise in bridge construction around 1860, when they started to export metal parts by creating a low-cost market of bridges that could be ordered from a catalog (WINPENNY, 1996).

German *Brückenbau Flender*, experts in bridges at the time, operated in that same manner: they sold the metal structure for CMEF workshops in Campinas as well as a mild steel superstructure for another CMEF bridge (COMPANHIA MOGIANA, 1904).

Silva comments that some countries usually imported iron materials for in situ assemblage and that was more common in cities "*whose countryside was still in a phase of exploration*". This was due to the fact that the national steel industry was irrelevant in the 19th Century (SILVA, 1988, p.45 e p.82). All of São Paulo railroad companies whose data were obtained were in the habit of replacing wooden bridges with metal ones. However, metal bridges were not always imported, because they could be assembled in companies that had reusable materials (such as rails).

4. Final considerations

The main purpose of this research was to identify railroad workshops in the State of São Paulo and to analyze some of their units. The bibliographic assessment made in Brazilian polytechnic schools enabled us to identify that national studies on railroad workshops can be based on that literature which, though abundant, is not vastly explored in the field of industrial architecture. However, identifying the 50 structures and making a map helped us to pin the workshops as a relevant factor that, however, does not strictly follow what is indicated in Perdonnet's text (1865). Though vastly used by national researchers, the latter neglects that issue.

Concerning materials and methods, companies supplying materials to the workshops proved not to be the same ones that supplied materials to the stations. The method used to build workshops is similar to the method used for the construction of bridges, the most important of which received imported materials and, in some cases, imported design as well. Less important workshops (and bridges) where local—and mostly recycled—materials were

[7] Remarkably, national studies on railroad bridges are scarce; however, there is some related information in the reports issued by the various São Paulo railroad companies, such as CPEF, which keeps in the Paulista Company Museum Collection in Jundiaí a wealth of bridge plans and photographs, and NOB, which even attached to their reports drawings of the rivers to be spanned.

[8] *Phoenix Bridge* exported yet another bridge to the city of Recife, Pernambuco (GERODETTI and CORNEJO, 2005).

used indicate functionality as the construction maxim. However, there are some visible specific aesthetic concerns at CMEF and CPEF in their main workshops. It does not suffice to conclude, at the current research stage, whether EFS workshop homogeneity is due to the use of a single design or indeed an aesthetic concern. For all cases, however, similarities among Brazilian railroad workshops and the French railway treatises of the 19th Century are not limited to coincidence.

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Acknowledgments
The authors acknowledge the São Paulo Research Foundation (FAPESP) for their funding of the current research that led to this text: Process n. 2016/15921-2 and Process n. 2017/10302-5, São Paulo Research Foundation (FAPESP).

Editor's note
Submission: 17/04/2018
Acceptance: 06/012/2018

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