WORLD CONFERENCE ON TIMBER ENGINEERING 2025
BRISBANE, AUSTRALIA
Advancing Timber for the Future Built Environment

USE OF AMAZONIAN HARDWOOD IN TIMBER STRUCTURES - BRAZIL

Roberto Lecomte [1], Sheila Beatriz [2]

ABSTRACT: The Mato Grosso Timber Production and Export Industries Centre (CIPEM) is the union of eight forest-based employers' unions, whose purpose is to organize and strengthen the sector. It encourages the productivity and conscious consumption of wood and its forest-based products regarding the current legislation and in a sustainable basis. Cipem covers 100% of the native wood producing municipalities of Mato Grosso state and it is at vanguard of sustainable forest management in Brazil. Aiming to demonstrate the several possibilities of building with Amazonian hardwood, some structural systems were designed and built to be exposed in national and international fairs, highlighting the use of lesser-known species. Their main characteristics are the fast assembling based on its constructive rationalization, with the maximum exposure of the huge variability of Amazonian species managed by Cipem. Wood species were selected according to market strategies and their physical and mechanical properties were considered. Each wood piece used in the timber structures was properly identified by management control protocols. The visual experience of the timber structures is enriched by the several colours and textures that are typical from Amazonian woods. The design and build of Amazonian timber structures is evidence of the flexibility of this sustainable and locally sourced materials. Also, wood is the only choice for a renewable and sustainable building material and forest-based materials are desirable for their strength, durability, beauty, and cost-effective construction.

KEYWORDS: Amazonian hardwood, timber structures, cost-effective construction.

1 – INTRODUCTION

CIPEM is the entity that represents the forestry sector in the state of Mato Grosso and its objective is to organize and strengthen this sector. The entity promotes the productivity and conscious consumption of wood and forest-based products in a sustainable way, in accordance with current legislation and in harmony with the environment. Within this philosophy and with the aim of promoting the use of Amazonian wood in the construction sector, some structural systems were designed and built to be exposed in national and international fairs.

Timber structures made of Amazonian hardwood were designed according to the following premises:

- Use of hardwood and softwood species managed in the market by CIPEM highlighting color, texture, and workability of Amazonian wood.
- Definition of constructive solutions that allow successive assembly and disassembly of the timber structures.
- Rationalization of dimensions of the wood pieces according to structural modulations.
- Use of metal free timber connections like half-lap joints and biscuit joints.

2 – BACKGROUND

The use of Amazonian wood in Brazil is increasing but it’s still surrounded by prejudice, as Brazilians in general associates logging activities in the northern region to forestall fire and deforestation. Wood products from planted forests are identified as “reforestation wood”, meaning that wood products from native forests are not sustainable, and this idea is highlighted by professionals from construction area as architects, engineers, and contractors in general.

[1] Roberto Lecomte, Casacerta Architecture Design & Building, Brasília, Brasil, roberto.lecomte@gmail.com

[2] Sheila Beatriz, Casacerta Architecture Design & Building, Brasília, Brasil, sheilabtriz@gmail.com

https://doi.org/10.52202/080513-0619

At the same time Brazilians are well known because of its preference of barbecue and in general people don't mind if the meat comes from deforested areas in the Amazon region. According to several institutions livestock is responsible for more then 70% of deforestation in our northern region and logging is responsible for 5% of the total amount of deforestation.

Forest management is one of the key strategies to keep the amazon forest alive and the consumption of forest-based products adds value to our forests. With this philosophy Cipem promotes and stimulates the use of native wood and the construction sector can be a strategic partner to that purpose. Based in these premisses Cipem supported the design and execution of several timber structures made of Amazonian wood aiming to highlight the use of this raw material in the building sites.

3 – PROJECT DESCRIPTION

To attend national design expositions like Casacor 2019 and 2021 in Brasília, Brazil, and national and international fairs as Feicon in São Paulo and Carrefour du Bois 2024 in Nantes, France, four different timber structures were designed and built by using Amazonian hardwood as the main structural material. Timber structures were prefabricated and assembling designs were required, and it was considered the weight of each element aiming to a manual and fast assembling.

Wood came from different exploitation regions and this diversity represents the eight forest-based employers' unions that are organized by CIPEM. Wood species were selected according to CIPEM's priorities related to market strategies and aiming to promote lesser-known essences. Physical and mechanical properties were considered regarding specific uses in the structures.

Timber structures were made of Garapeira (*Apuleia sp.*), Tauari (*Couratari sp.*) and Cumaru (*Dipterix sp.*). Wood flooring and walls were made with Tauari (*Couratari sp.*), Roxinho (*Peltogyne sp.*) and Cumaru (*Dipterix sp.*). Secondary structures and components were made of Angelim Amargoso (*Vatairea sp.*), Cedro Rosa (*Cedrela odorata L.*), Cumaru Rosa (*Dipterix odorata*), Freijó (*Cordia goeldiana Huber.*), Ipê Amarelo (*Tabebuia sp.*), Itaúba (*Mezilaurus itauba*), Jatobá (*Hymenea sp.*), Maçaranduba (*Manilkara sp.*), Muiracatiara (*Astronium lecointei Duke*), Roxinho (*Peltogyne sp.*) and Orelha de Macaco (*Enterolobium contortisiliquum*). NLT (Nail Laminated Timber) walls and flooring panels were made of Amescla (*Trattinnickia burseraefolia*) and Marupá (*Simarouba amara*).

3.1. CASACOR BRASÍLIA 2019

The first timber structure was designed and built in 2019 and it was assembled at the Casacor Brasília 2019, a nationally recognized design exposition that takes place in several Brazilian cities and in same countries in South America. Demanded by CIPEM and called "Terraço Amazônia" it was designed as an outdoor facility where the visitors could experience the richness of colours and textures that come from the Amazonian woods together with the strongness of hardwood structures. Figures 1, 2 and 3 show the finished building.

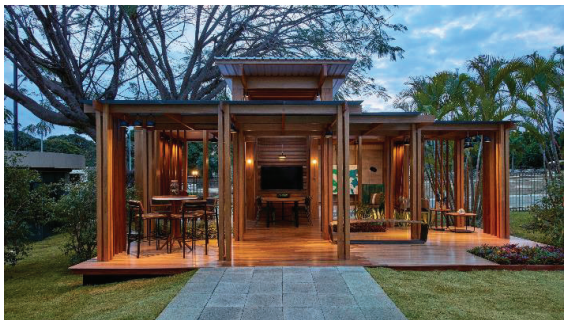

Figure 1: Terraço Amazônia

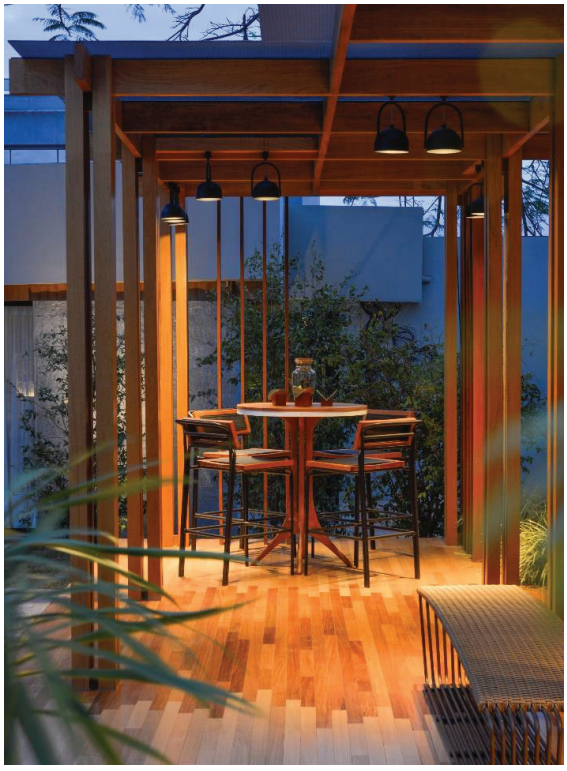

Figure 2: Internal view showing timber structure and flooring

https://doi.org/10.52202/080513-0619

3.2. CASACOR BRASÍLIA 2021

The second timber structure was designed and built in 2021 and it was assembled at the Casacor Brasília 2021. It was named "Wood Office", and its conception was influenced by the pandemic period. The idea was to create a working space that could be assembled in the green areas that are very characteristic of many houses in Brasília.

Totally made of Amazonian hardwood and softwood, this facility is easily assembled and offers an unusual experience with different colours and textures that come from our forests, aiming to transmit the wellness related to the presence of wood. The building is illustrated in Figures 3, 4, 5, 6.

Figure 3: Wood Office

Figure 4: Internal view showing wood colors

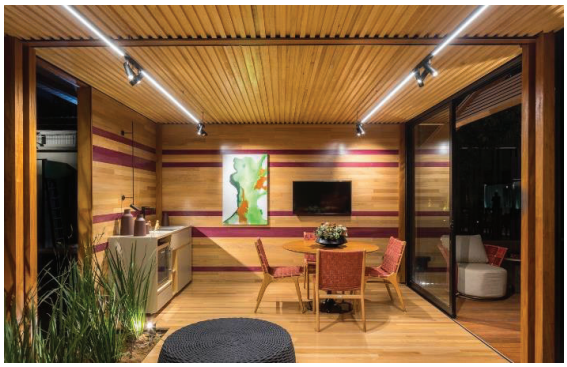

Figure 5:Wood ceiling made of Marupá NLT

Figure 6: Timber structure is made of Garapeira wood

Figure 7: Internal view

Figure 8: External view

https://doi.org/10.52202/080513-0619

3.3. CARREFOUR DU BOIS 2024

Carrefour du Bois is one of the most prestigious wood fairs in Europe and with the aim to promote the use of Amazonian wood in the building sector it was designed a stand totally made of several hardwood and softwood species. The design was conceived with two main areas of interest, a central area with heavier and higher structures and a gallery where wood products are exposed, creating a dynamic exposition of Amazonian timber structures as shown in Figures 9, 10, 11, 12, 13 and 14.

Figure 9: 3D image of Cipem's stand highlighting colors and textures of Amazonian wood

Figure 10: 3D image of the stand

Figure 11: 3D image

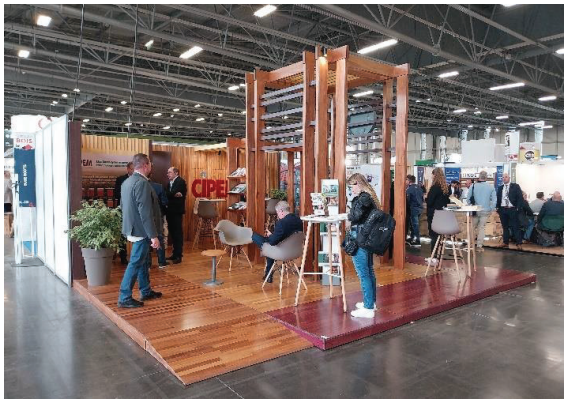

Figure 12: View of the assembled stand at Carrefour du Bois

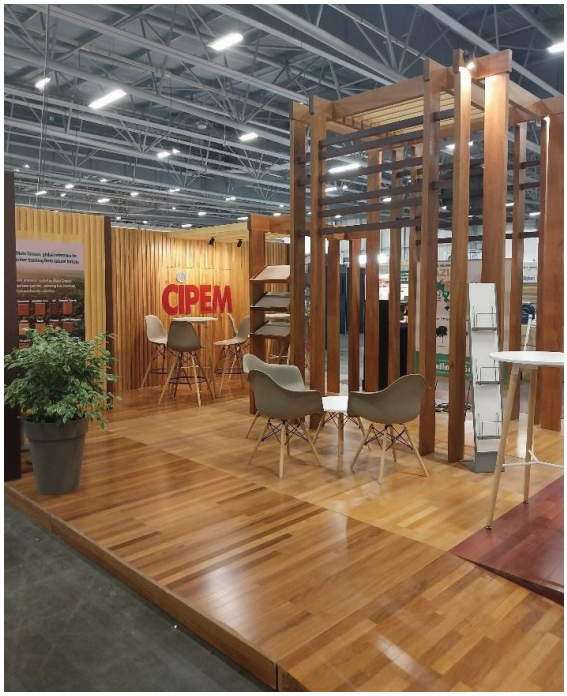

Figure 13: The stand was assembled in 6 hours

Figure 14: Internal view showing different patterns of wood flooring

https://doi.org/10.52202/080513-0619

3.4. FEICON 2025

Feicon is one of the main fairs in Latin America dedicated to the building sector and the event offers high quality technical content for professionals from all links in construction and architecture fields. It also offers industry professionals networking opportunities and access to the main innovations in the sector.

A stand was proposed to the event and it was conceived with “real” wood as all the components like timber structures, flooring and wall panels were made of Amazonian hard and softwood. Figures 15, 16. 17, 18, 19 and 20 shows the booth.

Figure 15: Main entrance of the stand

Figure 16: External view of the timber structure

Figure 17: External view

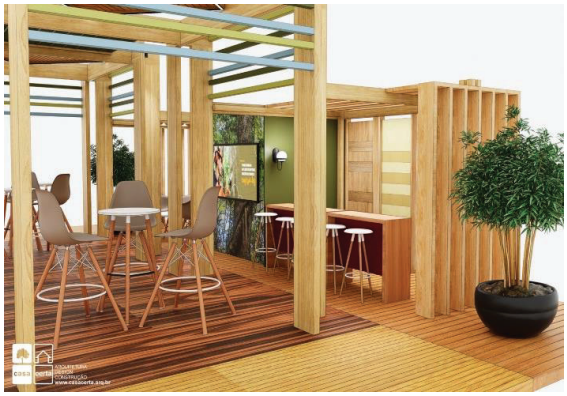

Figure 18: Main entrance of the stand

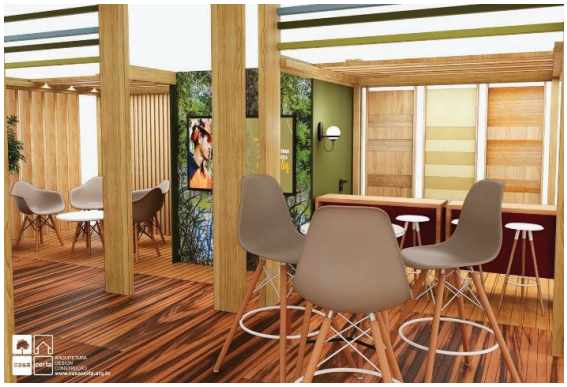

Figure 19: Central area with muiracatiara flooring

Figure 20: Aerial view of the stand

4. CONCLUSIONS

The experience of designing and building timber structures with Amazonian hardwoods and softwoods confirms the several possibilities of building with this raw material. The reduction in the assembling time which is typical of the prefabricated structures is added to the aesthetics given by the presence of wood, making it very competitive against other building materials.

https://doi.org/10.52202/080513-0619

The use of timber structures is evidence of the flexibility of this sustainable and locally sourced material. It should be pointed out the importance of demystifying the use of timber structures as “non-ecological” in our country, because wood is the only choice for a renewable and sustainable building material and wood materials are desirable for their strength, durability, beauty and cost-effective construction.

5 – ACKNOWLEDGMENTS

The authors thank CIPEM for the support in all stages of the conception and building of the stand, as well as in the presentation of this article.

6 – REFERENCES

[1] Camargos, J.A.A., Coradin, V.T.R., Czarneski, C.M., Oliveira, D., and Meguerditchian. “Brazilian Trees Catalog”. IBAMA (2001), Brasilia.

[2] IBDF. “Amazonian Timbers: Characteristics and Utilization”. CNPq (1981), Brasília.

[3] IBDF/DPq/LPF. “Amazonian Timbers: characteristics and utilization. Curuá-Una Experimental Forest Station” (1981). Brasília.

[4] CIPEM. “Sales Magazine” (2017). Cuiabá.

[5] Melo, J.E. and Camargos, J.A.A. “Wood and its uses” (2016). SFB/LPF/MMA. Brasilia.

[6] Mello, R.L. “Designing with wood: a new approach. MasterThesis (2007). UNB. Brasilia.

[7] Melo, J.E., Valle, I.R.M., Mello, R.L., Souza, M.R.“Popular wooden house” (2002). IBAMA. Brasília.