

Analysis of use of lumber of angelim-iron species and cupiúba in Construction in Boa Vista/RR.

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Abstract— The wood is used as construction material from antiquity. It's a raw material in abundance in nature. This article has as objective the use of wood angelim-iron species and cupiúba in the processes of construction of the city of Boa Vista/RR, in relation to the durability and sustainability, aiming at cleaner production, with low environmental impact and the reduction of waste generated in construction. The methodology will have a descriptive approach, bibliographical, documentary and field. At the end, the research conducted in the field, presents a proposal for improving the use of the material in buildings, which approaches the problems of this material.

Keywords— Iron angelim; cupiúba; Lumber; Construction.

Análise do uso da madeira serrada das espécies angelim-ferro e cupiúba na Construção civil em Boa Vista/RR.

Resume— A madeira é usada como material de construção desde a antiguidade por ser uma matéria prima em abundância na natureza. O presente artigo tem como objetivo analisar o uso da madeira de espécie angelim-ferro e cupiúba nos processos da construção civil do município de Boa Vista, em relação à durabilidade e sustentabilidade, visando uma produção mais limpa, com baixo impacto ambiental e a redução de resíduos gerados na construção civil. A metodologia terá uma abordagem descritiva, bibliográfica, documental e de campo. Ao final, a pesquisa realizada em campo, apresenta uma proposta de melhoria na utilização do material nas construções, no qual, aborda sobre os problemas desse material.

Palavras-chave— Angelim-Ferro; Cupiúba; Madeira Serrada; Construção Civil.

I. INTRODUCTION

It's believed that the problems in the timber market will sawn lack of standardization of parts and the lack of observation of the rules governing the sector. For the mistaken identification of the species sold is a common

limitation, this way, the consumer can buy lower quality pieces of wood for a higher price.

In a study conducted by Amazon in 2005, along with timber-producing northern Brazil, the quality of the product was identified as the most demanding national and

international buyers. Then appeared requirements as competitive prices and on time delivery. On the other hand, it was identified that employers believe that the legal origin and forest certification requirements are less important (MAGAZINE OF WOOD, 2006).

Wood is one of the oldest materials used in construction, to be renewable, it's considered a sustainable product and has great potential in construction. But in 2008, more than 720,000 square kilometers of the Amazonia had been deforested, an area equivalent to almost three times the size of the state of São Paulo. The deforestation of the Amazonia, besides endanger their survival, contributes to make the country the largest emitter quarter of greenhouse gases on the planet, since 75% of our emissions come from land use and deforestation of our forests (IBAMA, 2017).

Faced with this above mentioned problem, it was thought in the choice of this work matter arose from the need to understand how the woods are used in civil constructions of angelim-iron species and cupiúba that are quite commercialized in the city of Boa Vista/RR, as Barbosa et al. (2019), annex document deforestation the authorization number with 1401.5.2017.00098. Therefore, this artic seeks to present proposals to reduce the waste timber in the works, this will help people to reuse the wood and thus bringing a more sustainable and economically viable to users.

The objective of this study was to analyze the use of angelim-iron wood species and cupiúba in the processes of construction of the city in relation to durability, sustainability and practicality, aiming at cleaner production, with low environmental impact and the reduction of waste generated in construction. And the specifics objectives were performing a literature were on the material; to survey the works of Boa Vista / RR in order to check the use of the material in the municipality; and present a proposal to reduce wood waste in the works of the municipality, with a focus on sustainable use.

II. THEORETICAL REFERENCE

Wood as a building material

The wood has been used since the beginnings of civilization, it's an excellent product during and after construction. As Molasses (2014), besides having very great qualities as raw material for other industrial products, wood into a work can be used at various stages, from foundations to finishing.

The main advantages of the material are: mechanical resistance to compression and tensile stress,

high mechanical strength in relation to its own low weight, low cost, low specific gravity, easy workability, good thermal and acoustic insulation, and resistance to shocks. The disadvantages of the construction materials have as the loss of properties and arising secondary internal stress due to drying problems and moisture; heterogeneity; easy to decay; fuel and be subject to decay (molasses, 2014).

According to Vasco (2018), wood can be used in various elements of a building, either on a temporary basis as formwork for concrete, anchors and support and scaffolding in the final use that has frames to function, stairs, beams, columns, rafters, floors, roof and decorations.

The materials before they are applied in construction must have their examined properties and evaluated according to their specifications and standards, in order to avoid problems during a work or future losses, and this should happen precisely with wood, so that it performs well, either for structural use or not, you should check the physical and mechanical properties of wood, because its performance and endurance are connected to these properties (Rodrigues, 2018).

In Brazil, the lumber is still the main product of wood used in construction, while in developed countries the panels have more meaningful participation (Zenid 2011, p.2).

For White (2013) wood is an aesthetically attractive structural material because it allows develop innovative building solutions, robust, creative, and a great quality for a number of challenges in search of new structural systems.

Physical and mechanical properties of wood

Each species of wood has its own characteristics, and they, physical and mechanical, which are very important to evaluate the woods that will be employed in a particular location, whether in construction, furniture, musical instruments, and other various applications.

The physical properties are subdivided in moisture content, density, shrinkage, fire resistance, natural durability and chemical resistance. Thus, the knowledge of the mechanical properties is very important because it allows a safer choice of wood species that will be applied in a given function, so that there are no any problems. The mechanical properties vary according to the main directions (longitudinal, radial and tangential) and are subdivided, according to the author in compressive strength parallel fibers, strength parallel fibers, the normal compression the fibers, the normal draw the fibers, shear, inlay, splitting and bending (Correia, 2019).

Wood of species angelim-iron

As Nahuz et al (2013), the angelim-iron wood, it's a wood whose scientific name *Dinizia excelsa Ducke*, known as other names such as angelim, angelim-red, angelim-false, angelim-stone, angelim-stone-True, coal-beetle, hardwood, iron honeycomb, big hive. It's found in several regions of Brazil: Acre, Amapá, Amazonas, Pará, Rondônia and Roraima. Workability is considered difficult, but obtain a good finish and it's easy to turning and drilling, features regular performance, dry moderately well outdoors and its natural durability is highly resistant to attack by wood-destroying organisms (fungi and insects).

Its use in construction applies in: External Heavy: bridges, posts, piers, posts, pillars, crosses, dormant rail, port works; heavy internal: beams and rafters; internal light: window frames; Internal light: decorative and structural.

Wood of species cupiúba

The timber cupiúba has a scientific name *Goupia glabra Aubl*, with the popular names copióva, cupióba-pink, peniqueiro, north peroba, stink peroba, vinagreiro. It's in various regions of Brazil: Amazon, Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia and Roraima. Wood is evaluated as easy to work with manual equipment or machines. It's easy to saw, turning, screwing and flattened. Finishes well and accepts the glue isn't suitable

for the manufacture of plywood because it contains cracks in the log, good accepting paint, varnish, kneading and polishing, use of no drilling nails can cause cracks, air drying is slow drying the oven has fast occurrence of defects and their natural durability is moderate to decay fungi and termites (Nahuz et al, 2013).

Its use in construction is to the application: External Heavy: bridges, posts, props, props, fence posts and crosspieces; heavy internal: beams and rafters; external light: frames rafters, battens, the battens and trims; Interior light: structural.

Brazilian rules

Regarding the dimensions and classification of pieces of lumber, there are three that specify ABNT, namely: NBR 7203: 1982 (Lumber and processed); NBR 7190: 1997 (wooden structures Project); and NBR 14807: 2002 (lumber parts - Dimensions). However, as Oliveira et. al. (2008), it's observed that there is a conflict between these rules, analyzing the NBR 7203 standards: 1982 and NBR 14807: 2002 realize is that if you disagree with the dimensions of designated pieces to plank, plank, beam, board, batten and clapboard, and the NBR 7190: 1997, shows that the minimum size of rafters and battens mentioned by NBR 14807: 2002 to disagree, too, in all the minimum thicknesses of common parts with the NBR 7203: 1982 in Table 1.

Table 1 - Comparison of dimensions and classifications between the relevant standards.

STANDARDS					
	NBR 7203: 1982		NBR 7190: 1997	NBR 14807: 2002	
Parts	Thickness (cm)	Width (cm)	Minimum thickness (cm)	Thickness (cm)	Width (cm)
Transom	> 7.0	> 20.0	Not specified	7.1 to 16.1	> 16.1
Board	4.0 to 7.0	> 20.0	Not specified	3.9 to 7.0	> 16.1
Beam	> 4.0	11.0 to 20.0	5	4.0 to 8.0	8.1 to 16.0
joist	4.0 to 8.0	8.0 to 11.0	5	Not specified	Not specified
Rafter	4.0 to 8.0	5.0 to 8.0	2.5	4.0 to 8.0	5.0 to 8.0
Board	1.0 to 4.0	> 10.0	Not specified	1.0 to 3.7	> 10.0
lath	2.0 to 4.0	2.0 to 10.0	2.5	2.1 to 3.9	2.0 to 9.9
lath	<2.0	<10.0	Not specified	1.0 to 2.0	2.0 to 5.0
Ripão	Not specified	Not specified	Not specified	1.5 to 2.0	5.1 to 7.0
prop	Not specified	Not specified	Not specified	7.0 to 8.0	7.0 to 8.0

Source: Oliveira et. al (2008).

In accordance with the NBR 7190:1997, so that the wood is accepted for structural use, its resistance must be

according to the specifications of the project, so it will be automatically accepted if the design and implementation are agreed standard.

However according to the standard mentioned above, running all carpentry work should be done by skilled enough workers and experienced and should be perfectly checked the settings of all the connecting surfaces, and if the assembly does not perfectly fit the links should be replaced. Because wood is an organic material, is subject to biodeterioration, to prevent rapid deterioration of parts, some care must be taken such as suitable preservative treatment, ease of flow of water and vent nearby and parallel faces.

Lumber storage in construction site

According to Floria (2011), storage is a major step in the processing timber from cutting the log until its end use, because the product goes through various stages of storage, having the function of controlling the moisture content. The wood can be stored in sheds, whether open or closed, or outdoors, with a well-ventilated place, drained and vegetation-free that can prevent air movement should be stacked horizontally with partitions and on a certain height ground.

Waste wood in construction

According to Filho (2006), in buildings in general, there is a variety of materials for use in a work that generates debris that causes pollution, but as the wood is different, despite the waste isn't considered rubbish, but, organic waste.

As Filho (2006), wood is highly recyclable, and leftovers can be taken advantage of, sawdust turns coal pressed and the other parts can be harnessed for use in domestic uses as fences, bracings, cases, packaging, furniture, etc., but this doesn't justify the waste because the consequences observed in the environment, such as destruction of forests, not to mention the economic loss can cause.

The construction today presents itself as a large generator of waste, which often causes environmental damage. According to Silva et. al (2016), wood residues have no specific destination, for having extended service life for reuse, but when it's no longer possible, waste is burned or discarded in dumpsters. One of the methods most commonly used by constructors is to send the wood can't be used for pottery, with burning producing ceramic brick. Any and all wood waste has a high energy content and can easily be used as fuel for power generation, thermal or electrical or decorative furniture with recycling of the material, thus making it more sustainable.

The Resolution No. 307 of 2002 National Environmental Council (CONAMA) classifies the residue of wood as: Class B - recyclable waste to other destinations, such as plastic, paper, metal, plaster and wood.

III. METHODOLOGY

The article began with the analysis of the use of lumber from angelim-iron species and cupiúba in Boa Vista/RR, with visits in the constructions sites in the city, checking the use of the material and presenting proposals to reduce the waste timber in the sites the municipality, in order to focus on its more sustainable use, reducing waste.

The research was descriptive approach, bibliographical, documentary and field. And for better understanding of wood in construction sought relevant information in articles, theses, dissertations, websites, norms and laws in order to obtain technical knowledge about the topic discussed.

To obtain the data collection was carried out a survey in the constructions sites of Boa Vista/RR, through visits, in which, to obtain successfully during the inspection in the sites, it was searched bibliographic researches on the topic discussed was done accordingly. After that, identifying the type of material, took the measurements of the parts through a measuring tape, and after it was found at construction sites as was done storing the pieces of angelim iron wood species or cupiúba, verifying that the final destination of this wood and/or leftover pieces of wood used temporarily.

Moreover, there was wooden structure design project according to NBR 7190: 1997 and analyzed after the three standards that specify the dimensions and classifications of lumber pieces, which are:

- NBR 7203: 1982 (Lumber and processed);
- NBR 7190: 1997 (wooden structures Project);
- NBR 14807: 2002 (lumber parts - Dimensions).

Checking the dimensions of marketed wood parts are standardized according to current standards or not, to avoid waste.

To better understand the lumber pieces and species of angelim iron timber and cupiúba closely was visited a timber selling parts, where it was possible to analyze the wood species research and their respectively dimensions as shown in Figure 1 .



Fig.1 - Analysis of the wood and iron angelim cupiúba.

Source: Author (2019).

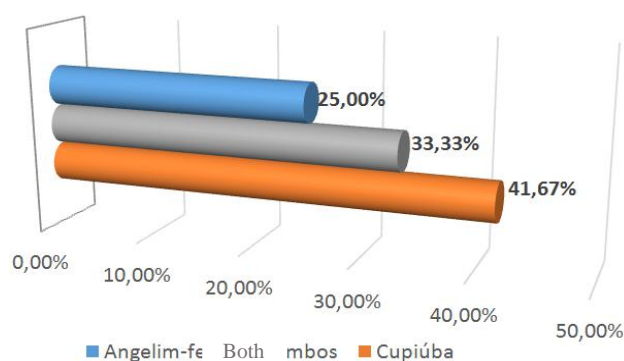
Data collection for the survey in the works, started from a questionnaire, as Appendix A, where it was possible to apply by visiting 28 works on movements in the city, in the neighborhoods: Carana, Cauamé, Center, Centennial, Satellite Town, Said Solomon allotment and Paraviana, but only 24 constructions sites were being used to sort of angelim-iron wood and cupiúba acquired in municipal timber.

The aim of the research also with the visited constructions sites is to inform how it's being used wood in construction so that it can have a longer life, if it's being reused, and if they aren't using the wood temporarily more at the right stage construction, how it will be discarded, thus presenting a proposal to reduce waste.

IV. ANALYSIS OF RESULTS

It was visited 28 constructions sites, which use the angelim-iron wood or cupiúba in order to see how it was being used pieces of wood sawn in the sites. In this way, in chart 1 are asked to charge the work of 24 sites, which wood species were being more used, where 10 sites had cupiúba species (41.67%); 8 sites in both had the two species (33.33%); and 6 pieces had angelim iron species (25%).

Chart 1 - Quantity of the species in the work.



Source: Author (2019).

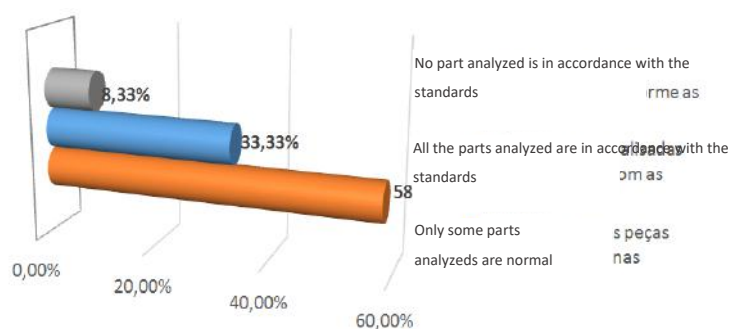
In the second stage of the research in the field, although the companies badly knew of the nomenclature of the woods, this result matches Oliveira et al. (2008) that many reproaches for naming occurred for exceeding the maximum dimensions weren't a few situations where the failure occurred because the piece has not reached the minimum dimensions stipulated by the standard. This can be considered as a very negative result, since this lack of minimum dimensions occurs in structural parts and it's closely linked to the safety of persons.

In order to provide consumers the opportunity to purchase a product more suitable and encourage an

entrepreneurial and responsible consciousness in business, from compliance, there was a dimension of analysis of pieces of wood sawn in the constructions sites in order to verify that they comply with the ABNT NBR 7203: 1982, NBR 7190: 1997 and NBR 14807: 2002.

Thus in chart 2 gave the following results: 58.33% with only a few pieces are the rules, in which the error was in the majority in one piece with slat naming, with width > 7cm; 33.33% of the 24 works verified, reached all dimensions of standards; and only 8.33% was no piece according to the rules.

Chart 2 - Dimensions of pieces of wood sawn in the works of the municipality.



Source: Author (2019).

These results are consistent with Atanasov (2011), although there are specifying dimensions in norms ABNT and part names, they are ignored by the sectors of production and trade of timber sawn and processed. Often, it was observed that entrepreneurs and workers do not see in their classifications concepts, differences between plank, beam and joist. The same was observed for the relationship between batten and slat.

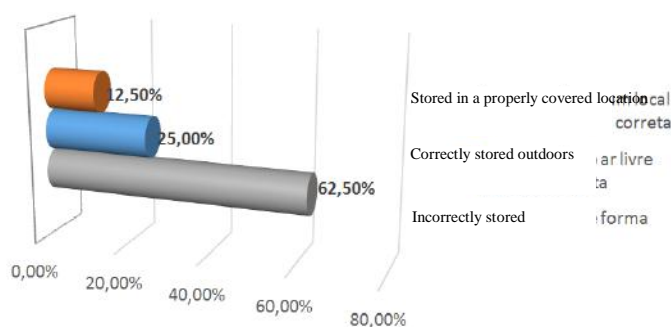
It can be observed that the three different standards that address the lumber issue contradict to specify dimensions for the same naming parts. This is observed between the NBR 7203/1982, and NBR 14807/2002, which differ in dimensions designed to plank, beam, board, batten and slat, and NBR 7190, this time in relation to the minimum size of rafters and battens

mentioned by NBR 14807 and all the minimum thicknesses of common parts with the NBR 7203.

These dimensions and nomenclature differences observed by Oliveira et al. (2008) between the ABNT go against the process of encouraging standardization. For owners who wish to follow the ABNT, is the question of which follow. It is reasonable to believe that the latest standard should be correct, however, according to ABNT, all the rules in question are currently valid. In fact, the NBR 14807 is more complete than the NBR 7203 and more consistent with the nomenclature of reality found in this study, but the results show that neither is widespread.

In order to check how the pieces of wood were being stored, according to chart 3, there is 62.50% and were stored incorrectly, 25% are properly stored outdoors; 12.50% stored in a covered place correctly.

Chart 3 - Quantity of the types of stores.



Source: Author (2019).

It was observed on-site visit that most pieces of wood sawn were all stacked horizontally flat against the ground, with no low battery holder, the woods can't get in touch with the ground, as changes in the moisture content of wood as rain, may suffer fungal attack and insects, warping, deformation and swelling of the wood. This is consistent with Oliveira et al. (2008) which was found during visits that 33.3% of companies do not properly store their wood stocks. In such cases, it was observed that the coverage is

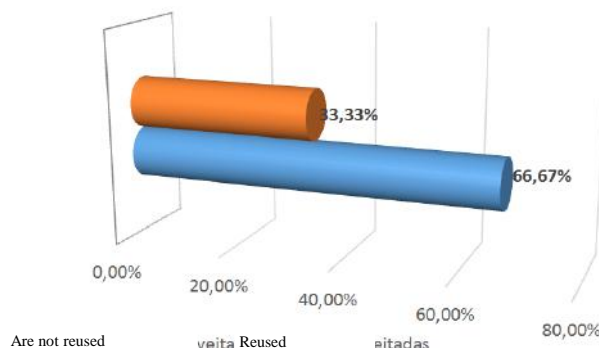
partial, or inefficient, or just the parts are stacked in yards with no cover against sun and rain.

Being a natural product, wood parts suffer from insect and fungus attacks. They also absorb moisture and can easily deform, warp or swell. according to standard the pieces of wood should be stored stacked, spaced at least 15 cm from the ground and covered in places protected from moisture and rain.

In chart 4, it was asked to parents in the work, which the final destination are given the parts used for forms, shoring, scaffolding and others, where the 24

constructions site visited, 66.67% of those in charge said reused wood that would not use more temporarily in the site; however 13.33% said they are not reused.

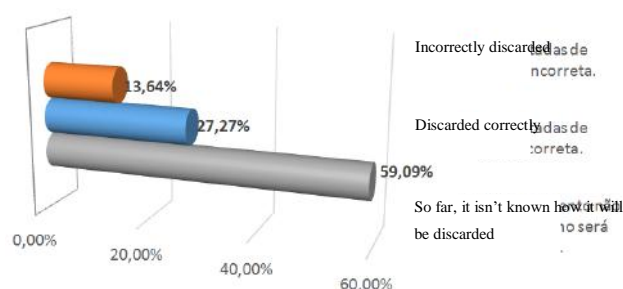
Chart 4 - Reuse of parts.



Source: Author (2019).

In chart 5, found in the sites, like the pieces of wood used temporarily will be discarded, and the results of this research were 59.09% do not know how it will be discarded; 27.27% rule correctly; and 13.64% rule incorrectly.

Chart 5 - Quantitative on disposal of parts.



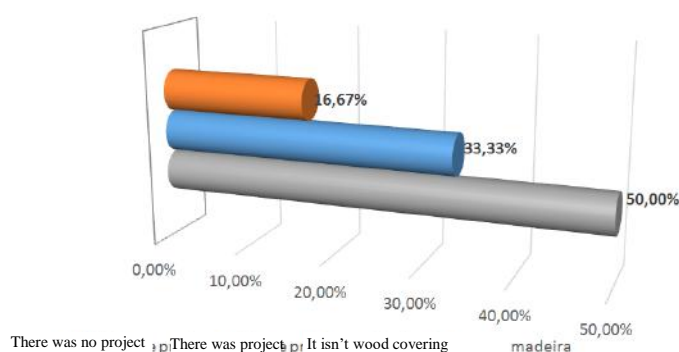
Source: Author (2019).

It's observed that most of the construction sites that do not know how it would be done disposal correctly, either through the city, any company that recycles wood or that the pieces were donated to other sites in progress were being thrown into a corner the sites anyway, consequently, were affecting the properties of wood, as were flat on the

ground, catching rain, other waste weights on top and everything.

Already in chart 6, found out how many of the 24 sites visited, have wooden cover, and there was a design project to perform according to NBR 7190: 1997. Thus, it was obtained that 50% coverage is wood, there project 33.33%; and 16.67% no project.

Chart 6 - Quantitative raised on the cover design project.



Source: Author (2019).

In this chart, it's possible to observe that the four sites visited, equivalent to 16.67% of total recorded sites, didn't have a cover design project for the residence, this isn't good for the residents because the lack of design, it can cause serious problems in the structures, as a filler for high-withstand structure makes it necessary to adapt the capacity of parades have a good channeling of rain water, so that infiltrations and moisture are avoided that might jeopardize the structure.

Based on the survey study, it was noted that most of the sites were wood waste left in a corner of the site, as shown in Figure 2 below.



Fig.2 - Some examples of waste wood found in the works.

Source: Author (2019).

As a result, introduced to reduce waste generated by constructions, it's recommended that these parts for reuse during construction, is due to ladders, scaffolding, and the like, if needed. You can also call the town hall of the city to take these spoils, or call any company carrying out recycling of material to make furniture, decorative objects, logistic supports, among other things, for the Resolution No. 307 / 2002 CONAMA, wood is classified as Class B - recyclable waste.

Another solution is relative sizes of lumber pieces, which, through research, notes that not all were in their

correct dimensions, according to the NBR's in this way would be better if they followed the rules, to further take advantage of the log of wood, avoiding waste by cutting more than is indicated in the rules.

V. FINAL CONSIDERATIONS

A survey conducted in Boa Vista/RR analyzed the use of pieces of lumber angelim-iron species or cupiúba to be the most used to structure, in which it was pointed out some problems of this study, which notes that the disposal is done incorrectly, even not knowing what will be the final destination of the same, being thrown in a corner of the construction, leaving at risk employees; and the lack of some works, a structural design of the roof in order to avoid an accident.

Thus, it's suggested to check what the correct dimensions before the nomenclatures of parts; the lack of a good storage of the woods in the constructions, not to harm the construction with wood with fungus, warped, swollen, etc. consequently doesn't have a greater expense and delaying construction;

By the lack of supervision and ensure the reuse good pieces in temporary use, even being in the final phase of the construction, it can be donated to other buildings or recycling the material, it's suggested to seek regulations that standardize these materials studies.

With this article, it's suggested to future articles on the topic discussed, such as: analyze how do the cutting of the log, noting that it complies with current standards the dimensions of the parts; how to make the drying of green wood to become dry wood; to examine how is made the recycling of waste pieces of lumber species studied.

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ANNEX A



DIREF - Diretoria de Florestas

FEMACT/RR - Fund. Est.do M.Amb.Ciência Tecn. de RR

AUTORIZAÇÃO PARA USO ALTERNATIVO DO SOLO AUTORIZAÇÃO DE DESMATAMENTO

Nº da Autorização: 1401.5.2017.00098

Emissão/Autorização: 23/8/2018

Validade: 23/8/2019

1. DADOS DA AUTORIZAÇÃO

Detentor: CHRISTIANE ARAÚJO SILVA

CGC / CPF: 909594262-72

Resp. Técnico: VALDEMIR PEREIRA DE MELO FILHO

Protocolo: 162010015771701

Área Autorizada: 226,618 ha

Latitude / Longitude: 1° 8' 2,8" / 59° 21' 10,4"

2. DADOS DA PROPRIEDADE

Denominação: FAZENDA DEUS É FIEL III

Área Total: 1194,589 ha

Endereço: TRAVESSÃO DA VICINAL 07, ENTRE RIOS, GLEBA BALIZA

Município: CAROEBE

Latitude / Longitude: 1° 11' 21,7" / 59° 21' 36,2"

Área de Reserva Legal: 930,791 ha

Área de Pres. Perm.: 31,101 ha

Proprietários: CHRISTIANE ARAÚJO SILVA

CGC / CPF: 909594262-72

3. OBSERVAÇÕES

A OBRIGAÇÃO DA REPOSIÇÃO FLORESTAL ESTÁ BASEADA NO DECRETO Nº 52/2005, ART. 14
LAUDO TÉCNICO DE VISTORIA DCF Nº 49/2018;
PARECER TÉCNICO DCF Nº 198/2018;
PARECER JURÍDICO Nº 352/2018.

4. ESPÉCIES AUTORIZADAS / VOLUME AUTORIZADO

Abacateiro / Persea gratissima Gaertn.	6,674	m3	Mulacoatiara / Astronium lecontei Ducke	7,787	m3
Aburana / Pouteria hispida Eyma	2,728	m3	Orelha-de-macaco / Enterolobium schomburgkii (Benth.) Benth.	44,762	m3
Apoila-cavalo / Lueheopsis rosea Burret	5,152	m3	Parica / Schizolobium amazonicum (Huber) Ducke	8,410	m3
Amepa / Parahancornia amapa (Huber) Ducke	16,201	m3			
Amarelão / Qualea dinizii Ducke	32,991	m3			
Amesole / Trattinnickia burseraefolia (Mart.) Willd.	14,469	m3			
Andiroba / Carapa guianensis Aubl.	25,490	m3			
Angelim-amargoso / Vataireopsis speciosa Ducke	46,124	m3			
Angelim-ferro / Dinizia excelsoa Ducke	3617,445	m3			
Angelim-pedra / Hymenolobium complicatum Ducke	525,701	m3			
Angico-branco / Piptadenia foliolosa Benth.	64,633	m3			
Cachimbelo / Couratari guianensis Aubl.	13,631	m3			
Caferana / Erisma catcaratum (Link) Wurm.	101,781	m3			
Cambará / Erisma uncinatum Wurm.	185,356	m3			
Cedroarana / Cedrelia catenaeformis Ducke	69,266	m3			
Cumarú / Dipteris odorata (Aubl.) Willd.	23,728	m3			
Cuplube / Ocupia glabra Aubl.	959,818	m3			
Escorega-macaco / Calycophyllum spruceanum Benth.	6,091	m3			
Estopetro / Eschweilera coriacea (DC.) S.A.Mori	115,706	m3			
Faveira-branca / Parkia multijuga Benth.	56,089	m3			
Faveira-vermelha / Parkia paraensis Ducke	111,735	m3			
Guariuba / Clatis racemosa Ruiz & Pav.	2,897	m3			
Jarana / Lecythis chatacea O.Berg	32,404	m3			
Jatobá / Hymenaea courbaril L.	59,907	m3			
Louro-aritú / Licaria aritú Ducke	3,061	m3			
Louro-gamela / Ocotea rubra Mez	11,474	m3			
Louro-preto / Ocotea neesiana (Miq.) Kosterm.	271,379	m3			
Magaranduba / Manikara huberi (Ducke) Chevalier	2707,232	m3			
Mandicão / Didymopanax macrocarpum (Cham. & Schltdl.) Seem.	8,712	m3			
Mirindiba / Buchenavia grandis Ducke	5,585	m3			

5. MATÉRIAS - PRIMAS AUTORIZADAS / VOLUME AUTORIZADO

TORA	9174,999	m3
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CARIMBO E ASSINATURA DA AUTORIDADE COMPETENTE

IMPORTANTE:

- O uso irregular desta Autorização implica na sua cassação, bem como nas sanções previstas na legislação vigente.
- Esta Autorização não contém emendas ou rasuras.
- Cópia desta Autorização deverá ser mantida no local da Exploração para efeito de fiscalização.
- Os volumes autorizados para exploração são de inteira responsabilidade do Técnico Analista.
- Os volumes autorizados correspondem ao volume geométrico.

2ª via - PROCESSO

3ª via - ARQUIVO

1ª VIA

APPENDIX A

Questionnaire used for data collection, the works in Boa Vista / RR.

1 - What kind of wood used in the work?

Angelim Iron () cupiúba ()

2 - Check the dimensions of the lumber pieces sold are standardized according to current regulations.

STANDARDS					
	NBR 7203: 1982		NBR 7190: 1997	NBR 14807: 2002	
Parts	Thickness (cm)	Width (cm)	Minimum thickness (cm)	Thickness (cm)	Width (cm)
Transom	> 7.0	> 20.0	Not specified	7.1 to 16.1	> 16.1
Board	4.0 to 7.0	> 20.0	Not specified	3.9 to 7.0	> 16.1
Beam	> 4.0	11.0 to 20.0	5	4.0 to 8.0	8.1 to 16.0
joist	4.0 to 8.0	8.0 to 11.0	5	Not specified	Not specified
Rafter	4.0 to 8.0	5.0 to 8.0	2.5	4.0 to 8.0	5.0 to 8.0
Board	1.0 to 4.0	> 10.0	Not specified	1.0 to 3.7	> 10.0
lath	2.0 to 4.0	2.0 to 10.0	2.5	2.1 to 3.9	2.0 to 9.9
lath	<2.0	<10.0	Not specified	1.0 to 2.0	2.0 to 5.0
Ripão	Not specified	Not specified	Not specified	1.5 to 2.0	5.1 to 7.0
prop	Not specified	Not specified	Not specified	7.0 to 8.0	7.0 to 8.0

Source: Oliveira et. al (2008).

A) () All parts are analyzed according to the standards.

B) () Only a few parts are analyzed in the standards.

C) () None of the parts is analyzed according to the rules.

3 - With respect to storage of the sawn timber pieces, such as being stored?

A) () stored outdoors correctly.

B) () stored on a covered place correctly.

C) () stored incorrectly.

4 - The pieces of wood used for shapes, bracings and the like are reused?

Yes () No ()

5 - After the wooden parts are no longer used on a temporary basis, as will be the disposal of the parts?

A) () is made of correct form, by contacting the town hall, with the material recycling companies, or donating pieces of wood to other works.

B) () is done incorrectly.

C) () Until now no one knows how it will be done disposal.

6 - There was a structural design project of the residence of coverage, according to NBR 7190: 1997? (Note: If the cover is made of wood).

Yes () No () Not wooden cover ()