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Construction and Demolition Waste Management Practices at Construction Sites

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***Abstract* —** *Most of the construction and demolition waste is disposed of in irregular or clandestine landfills, causing environmental, social and economic impacts. These impacts cause damage to the environment, society and public administration, since they cause silting up of rivers, obstruction of public roads and generate expenses with collection and cleaning. The objective of this study is to present practices applied on construction sites for the reduction and final disposal of waste (CDW) through an analytical-descriptive and qualitative field research, conducted in three construction companies located in the city of Manaus-Amazonas. Photographic records were used for simple and georeferenced images, in addition to the application of specific questionnaires. In the three companies evaluated (A, B and C), it was observed that only one correctly practiced the disposal of waste, while the other two did not know the laws and obligations regarding the correct management. Due to this problem, a new flowchart was defined with new stages of construction planning, based on CONAMA Resolution 307/2002, which defines waste management in terms of planning, responsibilities, practices, procedures and resources. Graphic materials containing good practices for waste management (RCD) were manufactured and disseminated in companies A, B and C, aiming at reducing, reusing or recycling waste on construction sites. The graphic materials, which were also disclosed through internal lectures, also presented alternative solutions through constructive technologies for storage, conditioning, transportation and reuse of waste.*
***Keywords* — Construction and Demolition Waste, Waste Management, Demolition at Construction Site.**

I. INTRODUCTION

Civil construction is an extremely important sector for a country. In addition to being an indicator of the economic situation, it is directly related to the Gross Domestic Product (GDP), which reveals how the growth of a given location is.

The 2018-2022 Industry Strategic Map, released by the National Confederation of Industry (CNI), can make Brazil double the growth speed of the economy. According to the entity, the goals of the document can take the Brazilian per capita income from the current US$14,000 to US$30,000 in 24 years. Without the proposed initiatives, the country would take 50 years to reach this level [11].

As the construction sector moves forward in accordance with the development of humanity, it is important that it is always updated. This happens through the use of new processes and materials, allowing greater productivity at a lower cost.

The growth of the civil construction market, driven by social programs, ease of financing, evolution of technologies and growth of Brazilian per capita income, made the sector reach the best moment in its history.

In recent decades, the Civil Engineering market has also experienced a real explosion in jobs, with growing investments and government programs such as the Growth Acceleration Program (PAC), which invested in infrastructure projects and works, the 2014 World Cup, the 2016 Olympics, among others.

The Construction Confidence Index (ICST) of Fundação Getúlio Vargas (FGV) advanced 1.5 points in October 2018, reaching 81.8 points, as can be seen in figure 1, which shows a quarterly average from August 2010 to May 2019 [12].

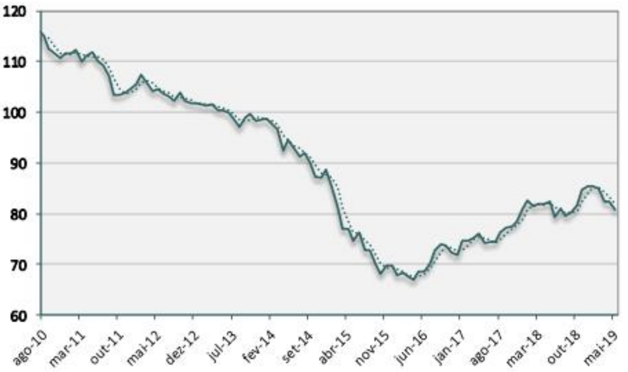

Fig. 1- Quarterly Average [12].

The growth of the portfolio of contracts boosted the consecutive high in the indicator, which is also measured by the Getulio Vargas Foundation (FGV). With confidence in recovery, the future scenario shows great expectations.

In this sense, the Expectations Index (IE-CST) grew 2.3 points and reaches 91, strongly influenced by the increase in expected demand for Civil Engineering. The Gross Domestic Product (GDP), which is the sum of all goods and services produced in the country, grew 1.6% and expanded 1.2% in construction [12].

Growth is expected for 2019, according to financial institutions. The evolution of demand indicators and expected employment can be seen in figure 2, where there is a high demand for jobs in the area of civil construction.

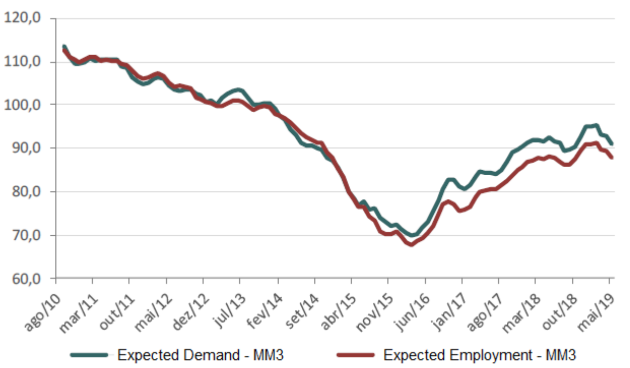

Fig. 2 - Evolution of Demand Indicators and Predicted Employment [5].

Simultaneously and directly proportional to the progress of civil construction, the high consumption of natural resources and the generation of construction and demolition waste (CDW) also increased exponentially, causing numerous environmental, social and economic impacts, when collected and disposed of inappropriately.

The waste that makes up the construction site's rubble, commonly called limestone or shrapnel, is a mixture of vegetation, soil, aggregates, wood, cardboard, plastics, glass and metals. Such waste is usually contaminated with domestic waste of the need for consumption and human dumping. In the worst case, it is mixed with hazardous waste, such as painting equipment or maintenance products for machinery and equipment. Thus, all volume of debris becomes dangerous and difficult to dispose of.

Analyzing from the environmental point of view, the main impacts caused by the illegal disposal of CDW are siltation, contamination of watercourses and aesthetic impact. Regarding the social impact, several dangers are listed, from the obstruction of sidewalks and public roads, to possible damages to the community, due to the physical, chemical and biological properties of CDW. In addition, there is an economic impact due to the waste and public cost of cleaning and transportation.

The digital era adds even more to the segment, providing a new reality for professionals and technologies that create amazing possibilities. In short, industry 4.0 is the main trend today and an almost mandatory step for businesses that want to gain more space in the market.

Many technological projects are using RFID technology for purposes of warehouse control, location of materials and people, control of entry and exit of products, vehicles, people, identification of tools, among others. Its main advantages are: speed, precision, reliability in data transmission, high degree of control and inspection [16].

Another very urgent need today is related to sustainability. Conserving energy, improving air quality, making actions less polluting, encouraging recycling and using eco-friendly raw materials are examples of good sustainable practices. The construction industry can contribute to the adoption of sustainable processes and, consequently, the protection of the environment and the transmission of positive messages to the external public.

With this, the federal government instituted Law 12.305/2010, establishing the National Solid Waste Policy (PNRS), regulated through Decree-Law 7.404/2010, referring to CDW, including their economic, social and environmental dimensions [5].

In this sense and aiming to solve the problem previously elucidated, this study aims to present practices applied at the construction site for the reduction and final disposal of CDW through a field research of analytical-

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descriptive and qualitative character conducted in three construction companies located in the city of Manaus-Amazonas.

II. THEORETICAL FRAMEWORK

2.1 LEGAL BASIS

By the Brazilian Association of Technical Norms (ABNT) NBR 10004:2004, solid residues are defined as residues in solid and semi-solid states, which result from activities of industrial, domestic, hospital, commercial, agricultural, service and sweeping origin. This definition includes sludge from water treatment systems, those generated in equipment and pollution control facilities, as well as certain liquids whose particularities make it unfeasible to release it into the public sewage network or water bodies, or require solutions for this technically and economically unfeasible in view of the best available technology.

CONAMA Resolution 307/2002 defines CDWs as discharges resulting from construction, renovation, repair and demolition of civil construction works and resulting from the preparation and excavation of land, such as: bricks, ceramic blocks, concrete in general, soil, rocks, metals, resins, adhesives, paints, wood and plywood, ceilings, mortar, plaster, tiles, asphalt pavement, glass, plastics, pipes, electrical wiring, etc.

By law 12.305, of August 2, 2010, solid residues are classified according to their origin and dangerousness.

Since the approval of Resolution 307 of CONAMA, there has been an advance in the search for reduction of environmental impacts caused by CDW. Allied to this resolution, a set of laws and public policies, in addition to technical standards form a package of measures aimed at the correct management of waste, aimed at reducing environmental, social and economic impacts.

2.2 WASTE GENERATION

Damage caused during transportation, receipt and storage, as well as loss of building materials on construction sites through waste during the execution process are decisive steps for the generation of CDW.

Among the many factors that contribute to the generation of CDW are the problems related to the project, such as the lack of definitions and/or satisfactory details, lack of precision in the descriptive memorials, low quality of the materials adopted, low qualification of the workforce, inadequate handling, transport or storage of materials, lack or inefficiency of control mechanisms during the execution of the work, the type of technique chosen for construction or demolition, the types of materials that exist in the construction area and finally the lack of reuse and recycling processes at the construction site.

Figure 3 shows the CDW generation rates by activity. In addition to new construction, which is responsible for 21% of the amount of CDW, the main activities generating CDW are expansion, with 20% of the total, and renovation and demolition, with 59% and generally carried out in an informal manner.

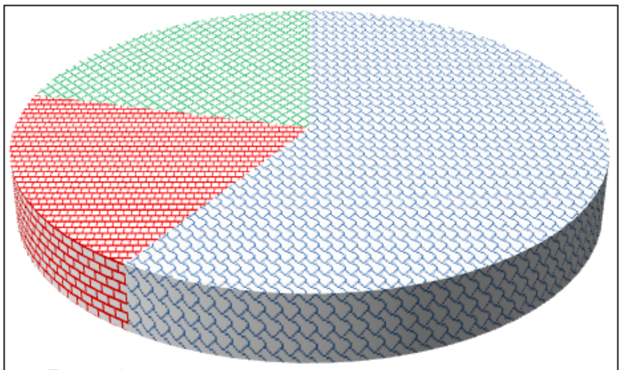

Fig. 3 - Indexes of CDW Generation [22].

Reforms made with the hiring of small contractors are the responsibility of CDWs and, although they generate small volumes, the large number of reforms, often illegally, is responsible for the high CDW generation rate. In most cases, CDW are transported improperly and discarded in inappropriate places, bringing discomfort to the surrounding population, since along with CDW, various solid wastes are also discarded [22].

2.3 WASTE MANAGEMENT

Aiming at minimizing environmental impacts, CONAMA Resolution 307 establishes that municipalities should prepare an Integrated Management Plan, considering the capacity to generate waste. For small volume generators, the Municipal Management Program is applied. In the case of large generators, the Construction Management Project should be applied, emphasizing procedures for sorting, conditioning, transportation and destination (PINTO, 2005).

In order to these plans to be elaborated, it is essential to elaborate a diagnosis contemplating the waste generating source, the different generators and the quantification of CDW [2]. CONAMA establishes that the waste generators prioritize not generating, later, reuse, recycling and final disposal [5].

Also in this resolution, the main parameters for the correct management are the definitions of classes and destination of residual material, as well as guidelines for

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the preparation of the Management Plan for Civil Construction Waste (PGRCC).

2.4 REDUCTION, REUSE AND RECYCLING

As determined by CONAMA resolution 307, preference should be given to the non-generation of waste, then work is done on the reduction, reuse, recycling, treatment and proper final disposal [5].

Thus, reduce, reuse and recycle are the main concepts to be emphasized, forming what is known as 3 R's, also known as pillars of Resolution 307 of CONAMA [18].

- Reduction

In order to reduce waste, adequate planning is required for each stage of the work, from the acquisition of materials to internal distribution. Building efficiently implies directly in a lean production that, in turn, implies savings, both for the consumption of material and for the use of financial resources.

For the reduction to happen, some factors must be observed and avoided, such as: choice of technology, which will influence the higher or lower generation of losses; design failures; lack of standardization in the execution of services; inadequate storage and transport of materials at the construction site [4].

- Reuse

Careful use of reusable materials provides economic and environmental advantages. The absence of the practice of reuse and recycling of materials can be considered as the main cause of waste generation [17].

The possibility of reuse and the economic viability of waste recycling should receive special attention, since costs with acquisition of new materials, removal and disposal can be avoided if an appropriate waste treatment system is applied [22].

- Recycling

The practice of recycling is adopted in several countries of the European community and intensified in Germany after the Second World War. However, in Brazil this practice is little known, with few recycling plants installed in the states of the southeast region [18].

Based on the principle of sustainability, the practice of recycling implies a reduction in the consumption of natural resources and the maintenance of raw materials, avoiding unnecessary extraction and preserving the environment [4].

Many advantages can be obtained through the practice of recycling: preservation of natural resources with the replacement of these by transformed aggregates; reduction of landfill areas due to the decrease in the volume of waste to be deposited; reduction in energy expenditure and generation of employment and income [18].

2.5 WASTE STREAM

When waste generation occurs, specific conditions must be established, aiming at the initial and final conditioning, internal and external transport and final conditioning of the waste [22].

- Initial conditioning

The initial packaging must be performed near the internal transport site and equipped with devices with lids in order to avoid contamination with residues of different classes [17]. In specific cases, the collected waste should be taken directly to the final disposal site.

- Internal and external transportation

The transportation of CDW, when well executed, reduces waste management costs and the risks to which employees are exposed. Basically, there are two modes of transportation on a construction site: internal and external. Internally, it occurs at the limits of the construction site, while externally, it is characterized by the removal of waste from the construction site, and may also be performed by third parties [20].

Internal transportation is usually performed by the workers themselves, who collect the waste and send it to the temporary storage site. For each type of waste generated, there is an adequate form of internal transport.

As for external transport, this is usually performed by outsourced companies, specialized in this service and equipped with specific equipment for this transport, as shown in figure 4:

Fig. 4 - Poliguindaste Truck With Collector Boxes.

At this stage, the service of waste transportation is regulated by specific contracts, where the types of waste, the frequency of transportation and the values are provided. It is important that, in the service contracts, the construction company provides that the destination certificates and environmental licenses are transferred to the construction companies and that restrictions are provided in case of noncompliance by the service provider. It is up to the service provider to present documentation proving compliance with the legal requirements [20].

- Final Packaging

In order to facilitate the removal and final disposal, the final conditioning of the waste must ensure that the segregation and recycling conditions are maintained [18].

During the course of the work, changes may occur to the final conditioning conditions. However, the success of waste management, with regard to final conditioning, depends on respect for the set of factors mentioned [22].

For the final conditioning, table 1 provides conditioning options for the various types of waste.

Table 1 - Options for the final conditioning of waste Source: Adapted from Pinto [21].

Final packaging of waste	
Type of waste	Final packaging
Concrete blocks, ceramic blocks, mortar blocks	Preferably in stationary buckets.
Wood	Preferably in marked bays, stationary buckets can be used.
Plastics (packaging bags and piping chips)	In signposted bags.
Cardboard and paper	In signposted bags or in bales, kept in covered places.
Metal	In signposted stalls.
Sawing	Bins for the accumulation of bags containing the waste.
Plaster lining and carton boards	In stationary buckets, respecting the segregation condition in relation to the masonry and concrete waste.
Soils	In stationary dumpsters, preferably separated from masonry and concrete waste.
Facade and protection screens	Dispose of in a placeof easy access and request the removal to the recipient.
EPS	Bins for the accumulation of bags containing the waste.
Hazardous waste	In duly marked bays and for the restricted use of workers who, during their activities, handle this waste.
Remains of uniforms, boots and rags without contamination by chemical products	In bags for other waste.

2.6 DISPOSAL OF WASTE

Civil construction companies face a serious problem when it comes to the destination of CDW. The lack of legislation addressing the issue drives generators to dispose of waste in an inappropriate or irregular manner [17].

Improper disposal is responsible for generating problems of degradation and contamination, as well as generating costs. It is worth mentioning that the responsibility for waste is the responsibility of the generator.

Some factors are essential for waste disposal solutions, and there must be a combination of environmental commitment and economic viability, in order to ensure sustainability.

2.7 ENVIRONMENTAL IMPACTS

Renovations and demolitions, usually carried out by small generators (owners) in an informal manner, are responsible for about 75% of CDW [22], as can be seen in figure 5:

Fig.5 - Renovations and demolitions generating CDW [15].

Of this amount, approximately 50% of the generated debris is being disposed of inadequately, causing problems such as depletion of landfills, siltation, contamination of streams, surface and ground water, proliferation of insects and rodents and obstruction of roads [4], as can be seen in figure 6:

Fig. 6 - Obstrução de via por deposição

Public authorities act performing services of collection and storage with costs of transportation and final disposal of waste. However, this practice does not solve the problem, since it is not possible to remove all waste generated.

On the other hand, the collection of waste encourages the continuity of irregular disposal in places served by the public authorities. Therefore, it is necessary to have an integration between public authorities, waste generators and transporters in order for waste management to be effective [22].

As for the consumption of natural resources, the civil construction industry is responsible for large negative environmental impact given the large consumption of resources such as extraction of deposits, which consume excessive amount of electricity, deforestation and alteration of landfills. This excessive consumption of resources results in a large amount of waste, making its management a highly complex activity [17].

III. MATERIALS AND METHODS

3.1 TYPE OF STUDY

The study is an analytical-descriptive field research, since the results were obtained through visits to the construction sites with photographic survey and application of questionnaires.

The field research aims to examine and collect information directly from the surveyed population, requiring from the researcher a direct meeting. In this case, the researcher needs to go to the space where the phenomenon occurs, or occurred and gather a set of information to be documented, in this case the use of photographs [14].

Referring to analytical research, the study involves the in-depth evaluation of available information in an attempt to explain the context of a phenomenon [13].

As for the descriptive researches, they are characterized as studies that seek to determine status, opinions or future projections in the responses obtained. The techniques used to obtain information are quite diverse, highlighting the questionnaires, interviews and observations. Their valuation is based on the premise that the problems can be solved and the practices can be improved through the description and analysis of objective and direct observations [13].

3.2 PLACE WHERE THE RESEARCH IS CARRIED OUT

This research was carried out in three construction companies, located in the southern zone of the city of Manaus, in the state of Amazonas, Brazil.

3.3 MATERIALS USED

The Power Shot SX280 HS camera was used for photographic recording, which records images with georeferencing.

The MS Excel software, the main spreadsheet editor, was used to prepare tables and graphs. For the generation and manipulation of images, AutoCAD®, from AUTODESK, and CorelDraw®, from Corel Corporation, were used. It is noteworthy that these softwares were used in student versions.

3.4 WORKING METHODS

In order to meet the proposed objectives, the research was developed through two stages: literature review and field research.

In addition to the literature review, carried out in that study, an analysis was carried out on the legislation on civil construction waste and on the possibilities of its correct management in the city of Manaus. Three construction companies, located in the city of Manaus, were willing to cooperate with this work. Construction sites were visited with special attention to the application of new construction technologies and waste management practices.

During the research, a photographic record of machinery and equipment was made, as well as the construction and waste management practices at the construction sites. The methodological process can be better observed according to the flowchart of Figure 7:

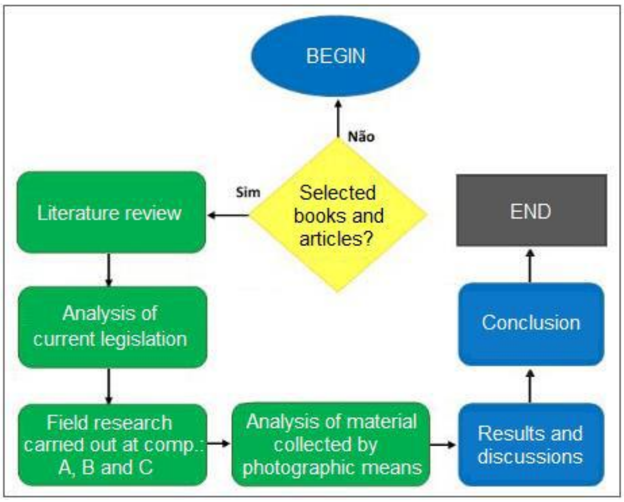

Fig. 7 – Flowchart of the Methodological Process.

IV. RESULTS

4.1 WASTE MANAGEMENT ON THE CONSTRUCTION SITE

CONAMA Resolution 307/2002 defines waste management as a management system that aims to reduce, reuse or recycle waste, including planning, responsibilities, practices, procedures and resources.

After literature review, a flowchart was conceived concerning the stages of the work planning, as can be seen in figure 8:

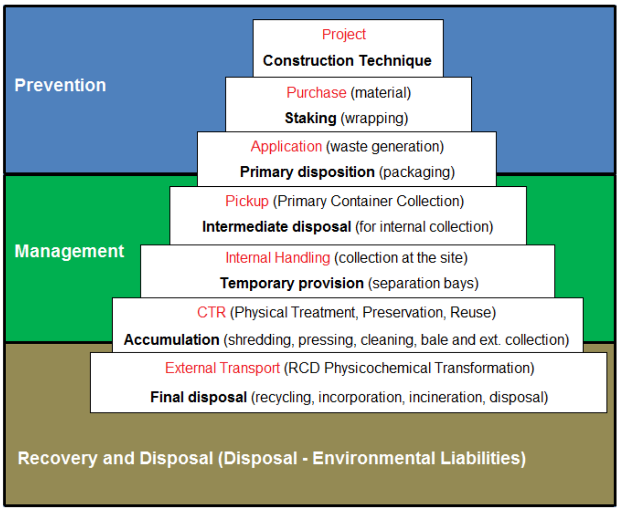

Fig. 8 – Flowchart of the stages of construction planning.

The first measure of waste reduction, without a doubt, is planning, with regard to purchase, storage and transportation. Then it is the application techniques that, during the construction process, determine the volume of CDW generated, as well as, at the end, the order and organization of the construction site and, especially, the areas of waste, which enable the reuse and recycling of CDW.

The management of waste at the construction site is directly linked to the waste of materials and execution of construction elements. The choice of a constructive system and the correct storage of materials at the construction site are important tools in the prevention of waste generation.

- Construction Technologies

The use of pre-molded constructive elements allows a great reduction in the generation of waste, since other materials do not need to be used, such as wires, wood and nails. It is worth mentioning that for the option of pre-molding in places other than the construction site, the transportation of the elements deserves special care, because if transported improperly, the possibility of damage should be considered.

The molding of construction elements on site is another important factor regarding the generation of waste on construction sites. This practice enables the reduction of waste generation, since damage caused by external logistics can be avoided. For internal transport, the equipment must be specific to each operation.

Figure 9 shows the preparation of shapes for molding inspection boxes. It should be noted, however, that the molding sites are not far from the application sites of the molded elements on site. In figures 10 and 11, it is obtained molded parts in loco. Figure 12 shows the molding of paving blocks molded in situ.

Fig. 9 - Preparation of forms for molding inspection boxes.

Fig. 10 - Miscellaneous inspection boxes molded in situ.

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Fig. 11 - Covers for inspection boxes molded in situ.

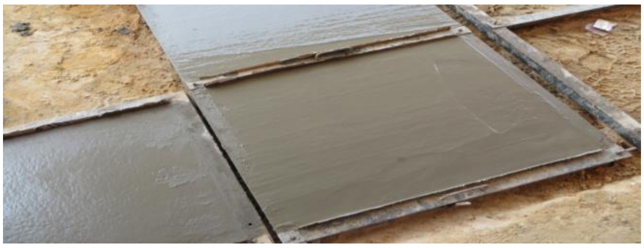

Fig. 12 - Paving blocks molded in situ.

- Storage of Materials

The correct storage of materials provides verification, stock control and facilitates their use, avoiding loss and, subsequently, the generation of waste. In order to determine the correct storage of materials, it is necessary to observe basic criteria. Among the criteria, the following can be highlighted: classification, in accordance with CONAMA resolution 307/2002; frequency of use; maximum stacking and distance between places where the material is applied.

Even though the storage spaces are smaller, it is possible to carry out the correct storage. For this, it is necessary to identify the intensity of use and maintain the preservation of operational spaces. As an example of material storage, figures 13 and 14 portray this activity.

Fig. 13 - Proper storage of tubes and steel bars.

Fig. 14 - Proper storage of building blocks.

4.2 WASTE CONDITIONING ON CONSTRUCTION SITES

The waste, when generated, should receive adequate treatment with respect to the flow at the construction site. Initially, they should be conditioned as close as possible to the generation points, as shown in figure 15:

Fig. 15 - Initial Conditioning of Waste.

The collection and transportation of waste on construction sites should be the responsibility of employees. For internal transport, employees should use trolleys, as shown in figure 16, for horizontal transport. An alternative for the vertical transport of waste is the installation of ducts along the floors.

Fig. 16 - Carriage of Waste.

The temporary disposal must be done as determined by CONAMA resolution 307/2002. The residues must be separated in bays and by class, as can be seen in figure 17:

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Fig.17 - Waste Conditioning Bays.

Still thinking about the reduction of waste generation, it is recommended the use of equipment that allows the non-occurrence of rework. In addition to providing productive gains and well-being to employees, the use of equipment such as trenchers (figure 18) and mortar projectors (figure 19) allows precision in the execution of work avoiding the need to rework.

Fig. 18 – Trencher.

Fig. 19 - Mortar projection.

4.3 WASTE FOR REUSE ON CONSTRUCTION SITES

The correct handling of waste inside the construction site allows the identification of reusable materials, which generate savings both by dispensing with the purchase of new materials and by avoiding their identification as waste and generating removal costs.

Correct sorting enables the reuse of waste for the transformation of aggregates with the use, for example, for instance, concrete and ceramic waste crushers, as can be seen in figure 21. However, for the transformation of waste to be viable, the following aspects must be examined: possible applications for recycled aggregates on site; technological control over the aggregates produced; cost of natural aggregates and cost of waste removal.

Only after analyzing the economic feasibility of the aspects listed above, the decision to recycle waste at the construction site will be concluded.

Fig. 20 - Waste Shredder for Aggregate Transformation.

4.4 TRANSPORT DESTINATION OF CWD GENERATED AT THE CONSTRUCTION SITE

When the waste generated cannot be reused, it must be transported by collecting companies, through appropriate equipment. The residues generated are still of responsibility of the generators, however, the transporters are also responsible for the destination and management of the residues. The final destination chosen will depend on each type of waste.

The variables commonly evaluated in the definition of the final destination of waste are as follows: Type of waste; Classification of waste; Quantity of waste and Costs of treatment or disposal methods.

The waste shall be disposed of according to the classification and what determines the resolution 307/2002 of CONAMA. The carrier shall have a document that specifies the origin and destination of the waste to be presented to the inspection, if necessary. The company or the person responsible for the work must file a copy of the document.

The solutions for the disposal of the waste must combine environmental commitment and economic viability, ensuring sustainability and the conditions for the reproduction of the methodology by the builders.

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Reducing environmental impacts should be an objective to be achieved by engineering. For this, simple solutions must be studied and implemented. Among these solutions, the following stand out: alteration of the project aiming at reducing the consumption of resources in the use phase; replacement of disposable equipment by others of greater durability; recycling and reuse of generated waste; product design and planning of production systems aiming at avoiding losses [18].

A construction becomes sustainable, from the environmental point of view, when it is based on the prevention and reduction of waste generated through the application of clean production methodologies [3].

4.5 EVALUATION OF THE ANSWERS TO THE QUESTIONNAIRES

In the three companies evaluated (A, B and C), it was observed that only one company correctly practiced the disposal of waste, while the other two did not know the laws and obligations regarding the correct management.

Regarding the answers to the questionnaires applied, it was observed that, concerning waste management, Company A showed a constant concern of managers in properly disposing of waste, separating it, performing sorting and allocating it in bays for temporary storage, facilitating the possibility of transformation and reuse, as well as the disposal to companies specialized in waste treatment and recycling according to the classes defined by Resolution 307/2002, as can be seen in figure 22:

Fig. 21 – Management of Residues of Company A.

For the other two companies, a booklet was prepared and presented, with good practices for managing CDW on construction sites, as can be seen in figure 22:

Fig.22 – Booklet of Good Practices.

V. CONCLUSIONS

The impacts caused by inadequate management of CDW highlight the construction sector, often classifying it as the largest generator of waste. The correct management of construction and demolition waste is a constant effort in the application of the 3 (three) R's: Reduce, Reuse and Recycle. However, it is emphasized that the objective of the builder is not to generate waste, which, consequently, implies changes in the constructive culture adopted by most of the builders.

CONAMA Resolution 307/2002 is the main legal document related to the management of CDW, however, it is inefficient when it comes to adequate waste management, since it is not complied with by a large number of builders and the public administration.

During the preparation of this work, it was sought to identify practices adopted by construction companies in Manaus aiming at the correct management of CDWs with regard to the reduction of generation and adequate final disposal.

In the companies visited, it was observed that the application of construction techniques, different from conventional techniques, is a constant practice. The application of pre-molded or molded construction elements in the construction site and the use of equipment that allows the non generation of CDW are applied, resulting in the reduction of the CDW generation index.

Regarding management, there was a concern of managers to properly dispose of waste, separating it, performing sorting and allocating it in bays for temporary storage, facilitating the possibility of transformation and reuse, as well as the disposal to companies specialized in waste treatment and recycling according to the classes defined by Resolution 307/2002.

Finally, after verifying the practices adopted by the companies visited, a booklet was prepared, an attached document, with good practices for managing CDW on construction sites.

As negative results obtained through this research, it can be mentioned: the lack of support from the public sector, mainly regarding the inspection of the destination of CDW and incentives regarding the use of transformed aggregates. The lack of options for the treatment of hazardous waste should also be highlighted.

In general, the objectives were achieved, considering that the companies show continuous interest in the application of new construction techniques and waste management practices. However, much remains to be done to ensure that CDW is managed correctly, especially Class D waste.

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