

Practical application of the PGRCC in constructions in the city of Recife

Aplicación práctica del PGRCC en las construcciones de la ciudad de Recife

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ABSTRACT

The importance of civil construction for the global economy with multiplier effects is indisputable, generating, for each direct employment, at least four indirect ones, bringing positive effects to the trade balance of the countries (ABIKO et al, 2005), however, it is considered as a which accounts for 50% of the CO₂ released into the atmosphere and approximately half of the solid waste generated in the world.

In Brazil, in order to improve waste management, specific legislation was created through CONAMA Resolution 307/2002 and Law 12,305 / 2010, bringing, among others, the Integrated Program for the Management of Construction Waste and Rationalization of Production Processes, inducing a improving the quality of life of the population by controlling pollution and contamination of air, water and soil caused by inadequate removal, treatment and final disposal of solid wastes.

Keywords: Waste Management Program in Construction (PGRCC), Solid Waste, Check list.

RESUMEN

La importancia de la construcción civil para la economía mundial con efectos multiplicadores es indiscutible, generando, por cada empleo directo, por lo menos cuatro indirectos, trayendo efectos positivos a la balanza comercial de los países (ABIKO et al, 2005), sin embargo, es considerada como una que representa el 50% del CO₂ liberado a la atmósfera y aproximadamente la mitad de los residuos sólidos generados en el mundo.

En Brasil, con el fin de mejorar la gestión de los residuos, se creó una legislación específica a través de la Resolución CONAMA 307/2002 y la Ley 12.305 / 2010, trayendo, entre otros, el Programa Integrado de Gestión de Residuos de la Construcción y Racionalización de los Procesos Productivos, induciendo a una mejora de la calidad de vida de la población mediante el control de la contaminación y la polución del aire, el agua y el suelo causada por la inadecuada eliminación, tratamiento y disposición final de los residuos sólidos.

Palabras clave: Programa de Gestión de Residuos en la Construcción (PGRCC), Residuos Sólidos, Lista de Control.

1 INTRODUCTION

Figure 1 shows the environmental impacts generated by civil construction, ranging from the extraction of raw materials to the appropriate disposal of waste.

Figure 1. environmental impact of civil construction



Source: Oliveira (2009)

According to Souza et al. (1998), "the losses of materials may originate at different moments within the useful life of a project. They can be simplified into three major phases when undertaking a project: during execution, during use, and during deconstruction.

In the execution phase, a project generates a lot of debris, such as mortar, sealing components and other materials that can be reused or recycled for the following purposes: conservation of non-renewable raw materials, reduction of energy consumption and costs, minimization of pollution, preservation of the environment, and improvement of the population's health and safety, resulting in a solid corporate image for the companies.

The Management Plan for Civil Construction Waste - PGRCC has the objective of solving the inadequate disposal of waste that not only degrades the environment but also brings problems to the population's health.

Figure 2 represents a model of an integrated management plan for the Civil Construction of a Municipality.

Figure 2. Organization of the CCR Integrated Management Plan



Source: Lima and Lima (2009)

2 CIVIL CONSTRUCTION WASTE MANAGEMENT PROJECT - PGRCC

In the city of Recife to obtain the Construction Permit, in addition to the architectural, structural, fire, electrical and plumbing projects, among others, it is necessary to prepare the Project for Management of Civil Construction Waste - PGRCC that can be prepared by large generators or by specialized engineering companies. Based on CONAMA Resolution 307/2002 and Federal Law 12.305/2010 - Brazil's National Solid Waste Policy, the guidelines and criteria of the Management Program of Civil Construction Waste in the municipality of Recife were established according to Law No. 17072 of 03/01/2005 and subsequently by Municipal Decree No. 27.045/2013 in which the Municipal Plan for Integrated Management of Solid Waste of the Municipality of Recife was stipulated.

According to Pinto (2005) and Gusmão (2008) the PGRCC has the following stages:

1. Planning: Compatibility of projects (exactness in elevations, levels and heights); Clear specification of materials and components and adequate detailing of projects;

2. Characterization: Identification and quantification of the residues;
3. Sorting or segregation: done at the origin and responsibility of the generator or in areas licensed for this purpose, respecting the waste class;
4. Conditioning: Initial and final conditioning with the generator's responsibility, ensuring, if possible, the materials' reuse and recycling conditions;
5. 5. Internal transportation of the RCC's - responsibility of the generator (to be done by carts, load elevator, winch, cranes and tubulões) in accordance with the class of the residue, technical standards and legislation in effect;
6. Final disposal in accordance with the type and class of waste:
 - a) Class "A" - Leftovers of masonry, concrete, mortar and soils. Sorting areas. Transshipment, recycling areas or RCC landfills. Disposed of in sorting areas, overflow, recycling areas or RCC landfills.
 - b) Class "B" - Wood scraps, metal, plastics in general, plaster and paper. They can be sold to companies, NGOs, cooperatives or selective collection associations.
 - c) Classes "C" and "D" - Paints, solvents, oils, etc. Materials that must go to specialized companies licensed by the environmental agencies and counting on the involvement and responsibility of the generators, suppliers and transporters, according to NBR 10.009:2004.
 - d) Organic Waste - systematic collection of municipal responsibility

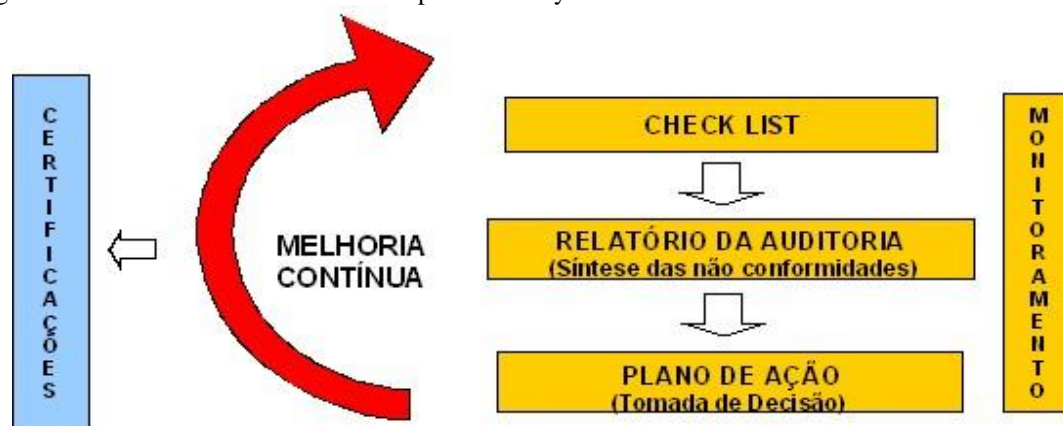
In order to implement the PGRCC, the following activities are required: inaugural meeting, planning, qualification of the agents (suppliers of devices and accessories, transportation companies and residue recipients), PGRCC monitoring plan with the purpose of controlling the generation, conditioning, transportation and the preventive and educational actions referring to the residues defined and presented on a schedule (activities X time). The PGRCC of a certain work must be integrated to its organizational structure, be part of it. If the company has a Quality Program (ISO certifications), Environmental Management System (SGA), 5S, or others, the PGRCC must be inserted in the company's context, being important to define only one work, preferably in the initial phase, for the implantation of the Pilot Project in order to validate the methodology to be adopted for all the company's works.

3 THE IMPORTANCE OF THE CHECK LIST IN THE PGRCC

The monitoring of the PGRCC is done through check lists that have the function of facilitating the continuous evaluation of the program performance.

According to Guerra (2009) and Pinto (2005), the performance assessment of the work must be done by audits through periodical checklists (Figure 3), where the following parameters will be evaluated, among others: cleaning, segregation and committed destination of the residues. This information will serve to generate a decision making report for the correction of the non-conformities observed both on the job site (internally) and in the transportation and final destination (externally), as well as to establish training courses to supply the system's deficiencies and a comparison of the current situation with the previous ones, serving as a parameter to measure the system's evolution.

Figure 3: Flowchart of the Continuous Improvement System



4 CASE STUDY IN RECIFE

4.1 COMPANY GENERAL DATA

Company: A.

Company Address: Recife-PE.

Responsible Technician: X

Co-responsible engineer: Z

Company Summary:

Founded in 1983, with construction activities in the areas: residential and commercial, with more than 80 built enterprises totaling 1.1 million m², operates in the states of Pernambuco, Rio Grande do Norte, Ceará, Alagoas and Bahia.

The philosophy and management is based on the Integrated Organizational Management System with the following programs:

Quality Management: ISO 9001

Occupational Health and Safety Management: OHSAS 18001

Human Resources Management

Environmental Management (Environmental Management Project, selective waste collection and use of materials, and internal RCC courses: ISO 14001

The Integrated Organizational Management System is monitored by the internal audit team, composed by

Engineer - Coordinator and responsible for the Check lists in the works and the civil engineers Fulana and Beltrana.

4.2 DATA FROM THE PROJECT TO BE STUDIED

Through a pre-scheduled visit, on 11/23/2018, the following information was obtained:

a) The PGRCC was prepared by the coordinating engineer and the monitoring and auditing of the Integrated Management System (SGI) is done bi-monthly in all construction sites and in the central office: customization, coordination, SAT, supplies, projects, SGI and budget.

The IMS monitoring includes:

- Check list in each construction site
- Internal Audit Report reporting all the non-conformities found on site
- Action Plan - generated with the information from the check list and the internal audit report, the action plan has the objective of pointing out the critical points and the corrective actions of the system

b) Multifamily development to be monitored: Edifício ABC

- Responsible engineer: X
- Address: Recife - PE
- Total Built Area: 17,630.66 m²
- T. Area Terrain: 2.961,07 m²
- Estimated average number of employees: 50 - Hours worked: 44 hours per week
- Number of employees: 72 (9 administrative and 63 production)
- Floors: T, V1, V2, 1st to 35th and covered (Attic) - Totaling: 38 floors + Attic.
- Start of the work: May 2018 with completion scheduled for October 2020 (according to the work schedule).

4.3 CCR CLEANING AND SEGREGATION CHECKLIST

It was verified that Building A had its entire structure completed, with the exception of the attic, which was in the framing and formwork stage; peripheral masonry in the 32nd type; balcony counterframes in the 26th and 27th types: the performance of the enterprise was evaluated in relation to the cleaning, segregation, and committed disposal of waste by means of a check list.

According to the check list provided by Ambitec, all possible observations regarding cleaning, segregation and committed destination of residues were noted down, and there was also a photographic record for a better analysis of the current situation and for evaluation through grades on each floor evaluated. (according to the attached check list). Soon after it was generated a performance report (as attached) with the conformities and non-conformities, indicating the way to improve the quality of the PGRCC.

5 CONCLUSION

It can be seen that the construction company will have no major difficulties in improving the performance of the PGRCC management, because the company is already consolidated in the real estate market and was one of the first companies in the construction industry to work with the Integrated System of Organizational Management in Pernambuco, which has been bringing higher quality of its processes and products, obtaining as a final result the satisfaction of its customers.

It is suggested the implementation of a plant for the reuse of solid waste from civil construction, which could be done with the partnership of other companies in the industry, or the City Hall of Recife, as was implemented in the City Hall of São Gonçalo, Rio de Janeiro through Law No. 714/2017.

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