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RESEARCH ARTICLE OPEN ACCESS

SELECTION OF THICK COAL SEAM MINING METHOD USING ANALYTIC HIERARCHY PROCESS

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ABSTRACT

In thick coal seams, it is very important to select the correct mining method. Choosing a wrong method may be very costly to the company. All the factors affecting the mining method and the relations in between should be considered. When there are many factors under consideration, Analytic Hierarchy Process (AHP) is a very useful tool to analyze them. By use of AHP, errors that show up in conventional methods are minimized. In this study AHP is employed to select the mining method in a thick coal seam. The proposed approach starts with identifying the alternative mining methods that are applicable in thick coal seams. Then all the criteria affecting the mining method and the relations between them are defined by experts of the system. Finally AHP is used to find the method with the highest performance according to the selection criteria defined. Within this study the highest performance scores belong to Multi-slice retreatment longwall with filling (M4), Multi-slice retreatment longwall with caving (M3), Multi-slice advanced longwall with filling (M2) and Room and pillar (M9).

Keywords: Mining method selection, Analytic Hierarchy Process, Thick Coal Seam.

I. INTRODUTION

Since all the natural resources of Earth are scarce, it is of crucial importance to make the best use of mine reserves. Therefore, selecting the right mining method becomes a subject. When selecting the mining method in a mine, the goal is to choose the one which is most suitable in terms of technical, economical properties, national benefits and work safety. By this way, natural resources can be best used while the firm operates with maximum income. In addition, it may be very costly to change the mining method after starting operation.

Selection of mining method is the most important phase in planning an underground mine. In thick coal seams, there are quite a number of alternative mining methods and factors to select one of them. Among these selection criteria, production efficiency, seam properties, rock properties, ore recovery, economy and work safety can be listed.

Each mining method has its own advantages and disadvantages in terms of the selection criteria. It is very hard, time consuming and prone to errors to consider all the alternative mining methods with all the criteria and make a good selection without the help of scientific methods. In this case, Analytic Hierarchy Process (AHP) is a powerful tool to consider the alternative methods, the selection criteria, their interrelations and analyze them to come to a decision.

In this study, AHP is employed to select the most suitable mining method for a thick coal seam. Nine alternative mining methods are identified. Total of 20 selection criteria under five main groups are defined. The best mining method according to these criteria is selected. Figure 1 gives the hierarchical structure of the problem under study used in AHP.

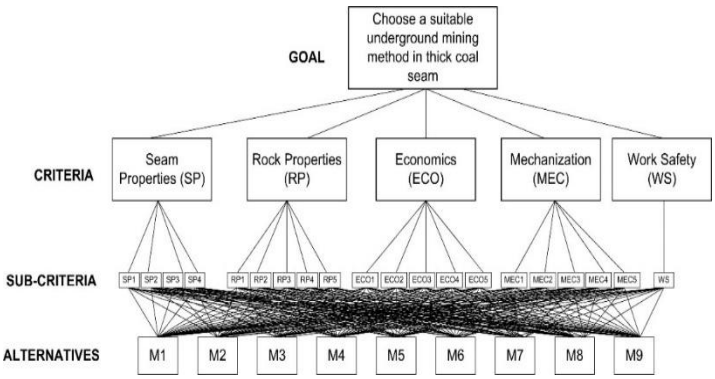


Figure 1: Hierarchical structure of the problem under study.
Source: Authors, (2019).

The rest of the paper is organized as follows. Section 2 gives a brief literature survey on the studies that have employed decision making tools in mining method selection. In Section 3, the proposed approach is explained in detail. Discussions and recommendations are given in Section 4. Finally, conclusion is given in Section 5.

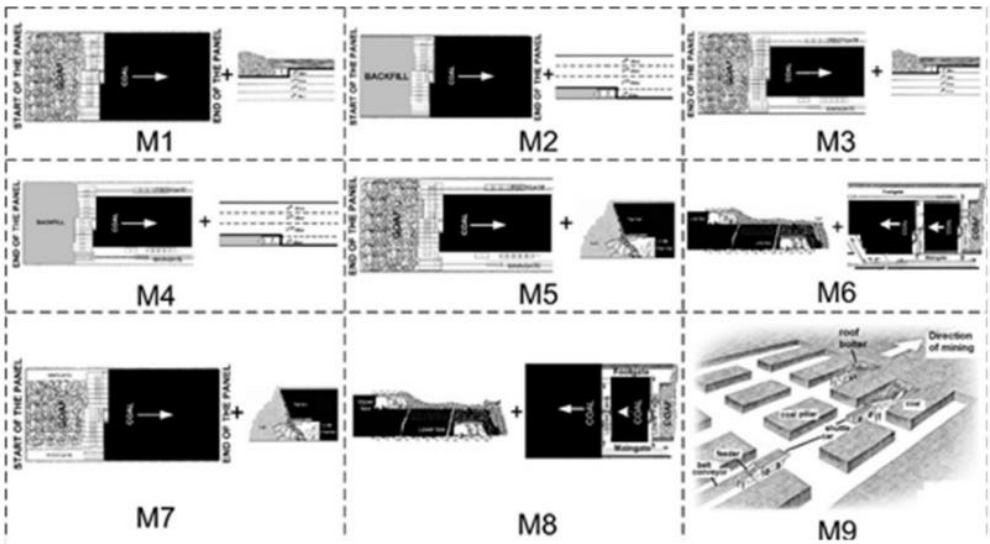
II. LITERATURE SURVEY

In literature, there are a number of studies considering selection of mining methods or studies. A variety of decision making tools have been used in these studies. Proposed one of the first classification systems [1]. Suggested a selection chart for mining method selection [2]. Developed a selection chart based on the geometry of the deposit and the ground conditions of the ore zone for selecting mining method [3]. Proposed a numerical approach in method selection [4]. Modified the Nicholas' system and developed the UBC mining method selection process [5]. Used Yager's [6] method for selection of an optimum coal transportation system from pit to the power plant [7]. Used Yager's method and AHP method for mining method selection [8]. Used the AHP method for selection of open cast mining equipment [9]. Used two methods, an AHP based fuzzy multiple attribute decision-making method and fuzzy dominance method, to select the optimal mining method for Gol-Gohar iron mine in Iran [10]. Used AHP method and analyzed five different mining scenarios; drilling technology investment analysis, ground support design, tunneling systems design, shaft location selection and mine planning risk assessment [11]. Used the AHP method for the selection of a new alumina cement plant [12]. Used a hierarchical multi-dimensional objective system similar to AHP to select the more suitable mining method for the ELI and GLI coalfields in Turkey. Two mining methods compared on the basis of 19 criteria [13]. Developed a decision support system using AHP for the optimal environmental reclamation of an open-pit mine [14]. Applied AHP to select the best location for a concrete plant [15]. Used AHP to select site for limestone quarry expansion in Barbados [16]. Employed Yager's method and AHP to determine the optimum plant location for a new natural stone factory [17]. Used AHP based fuzzy multiple attribute decision-making methodology to select the most suitable underground mining method for the Ciftalan Lignite Mine in Turkey. Five possible mining methods were compared on the basis of 18 criteria [18]. Analytical Hierarchy Process is used to compare mechanized mining methods and conventional mining methods in the South African platinum mining industry [19]. Employed multicriterion optimization methods to select an optimal underground chromite mining technique [20]. Emloyed Fuzzy Analytic Hierarchy Process with TOPSIS to select the optimum mining method [21]. Proposed a methodology for group decision-making using AHP with cluster analysis for coal mine safety management in China [22].

III. PROPOSED APPROACH

Identifying the Alternative Mining Methods for a Thick Coal Seam

Coal seams which cannot be produced at once economically and technically can be called thick coal seams. With the developing technology today, seams thicker than 6m are called thick coal seams. In this study, Mining methods that are applicable in thick coal seams are considered. These methods can be classified into three as multi-slice longwall (MSL) methods, longwall top coal caving (LTCC) methods and room-and pillar method. (Analysis is made according to the assumption that pillars are recovered.) In addition the mining methods are distinguished according to advanced or retreatment longwalls and caving and filling characteristics. In this manner nine mining methods are identified for thick coal seams. The list and schematic representations of the methods are given in Figure 2.



M1: Multi-slice advanced longwall with caving **M2**: Multi-slice advanced longwall with filling **M3**: Multi-slice retreatment longwall with caving **M4**: Multi-slice retreatment longwall with filling **M5**: Retreatment longwall top coal caving from bottom face **M6**: Retreatment longwall top coal caving from upper-lower face **M7**: Advanced longwall top coal caving from bottom face **M8**: Advanced longwall top coal caving from upper-lower face **M9**: Room-and Pillar method (Pillar is recovered)

Figure 2: Alternative Mining Methods in Thick Coal Seams Defining the Selection Criteria

Source: Authors, (2019).

The second step in AHP is to define the selection criteria. In other words, the second step is to define the factors that the selection of mining method will depend on. In this study five main groups of factors are defined. These are Seam Properties (SP), Rock Properties (RP), Economy (ECO), Mechanization (MEC) and Work Safety (WS). Total of 20 selection criteria are defined under these five groups. The list of the criteria is given in Table 1.

Table 1: Main Group Factors and Sub-criteria.

Variable code	Criteria
Seam Properties	
SP1	Thickness of seam
SP2	Dip of seam
SP3	Coal combustion characteristic/Methane emission
SP4	Condition of dirt band
Rock Properties	
RP1	Compressive strength of coal
RP2	Compressive strength of hanging wall
RP3	Compressive strength of footwall
RP4	Mine depth
RP5	Subsidence
Economics	
ECO1	Cost and Productivity
ECO2	Dilution/Coal loss
ECO3	Reserve
ECO4	Investment amount
ECO5	Production amount
Mechanization	
MEC1	Adaptation to mechanization
MEC2	Aquifer condition
MEC3	Qualified manpower
MEC4	Selective mining
MEC5	Easiness of work organization
Work safety	
WS	Work safety

Source: Authors, (2019).

Generating the Pairwise Comparisons.

In the third step, pairwise comparisons are generated by experts of the system. At this step, first the pairwise comparisons of the main groups are made. Then, pairwise comparisons of subcriteria within each main group are generated. Pairwise comparisons are made based on a scale of five. Afterwards, the analysis is made by Expert Choice software [23] to give the weights of each criteria and the inconsistency values of comparison matrices.

The comparison matrix of the main groups can be seen in Table 2 below. Since these matrices are symmetric according to the diagonal, only half of the matrix is filled. When the matrix is examined, it can be seen that work safety (WS) and seam properties (SP) are of equal important for the selection of mining method. In addition, seam properties (SP) is strongly more important than rock properties (RP), more important than economics (ECO) and absolutely more important than mechanization (MEC). Similarly, all other comparison values can be seen in Table 2.

Table 2: The comparison of main group factors

	SP	RM	ECO	MEC	WS
SP	1	3	2	5	1
RM		1	0.5	3	0.5
ECO			1	2	0.5
MEC				1	0.2
WS					1

Source: Authors, (2019).

The comparisons are made by expert of the system. But still, there may exist inconsistencies. Therefore the pairwise comparison matrices should be checked for inconsistencies. The inconsistency ratio of the main group comparison matrix (Table 2) is found to be 0.05 by Expert Choice software. As long as this ratio does not exceed 0.1, the matrix is accepted to be valid. In addition, the weights of the main groups are also computed by Expert Choice. The weight coefficients and the inconsistency value can be seen in the software output in Figure 3.

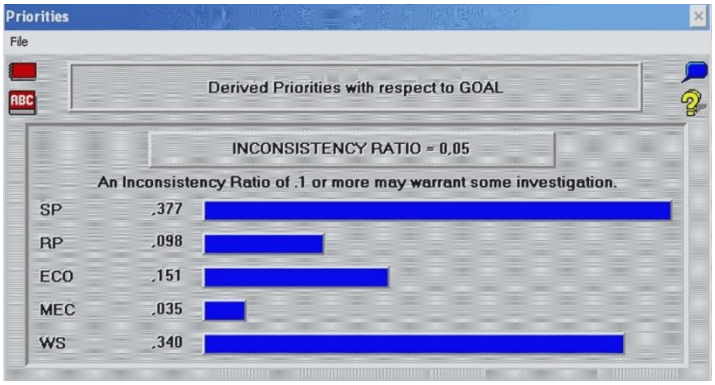


Figure 3: Expert Choice output, analysis of main groups.
Source: Authors, (2019).

After handling main groups comes the subcriteria comparisons. The pairwise comparison matrices of seam properties, rock properties, economics, and mechanization can be seen in Figure 4 respectively. Since there are no subcriteria for work safety, there exists no comparison matrix for it. From Figure 4, it can easily be understood that the most important factor is thickness of seam (SP1) among the four factors defined. Similarly, in rock properties group, compressive strength of hanging wall (RP2) is determined to be the most important factor. In the economics group factors, amount of reserve (ECO3) is the most important factor. Finally, adaptation to mechanization (MEC1) is set to be the most important criteria in mechanization group.

The comparison of Seam Properties

	SP1	SP2	SP3	SP4
SP1	1	3	4	5
SP2		1	3	5
SP3			1	2
SP4				1

The comparison of economics properties

	ECO1	ECO2	ECO3	ECO4	ECO5
ECO1	1	2	0.33	0.33	0.33
ECO2		1	0.25	0.50	0.20
ECO3			1	2	2
ECO4				1	1
ECO5					1

The comparison of rock properties

	RP1	RP2	RP3	RP4	RP5
RP1	1	0.50	2.00	4	3
RP2		1	3	5	4
RP3			1	2	3
RP4				1	0.50
RP5					1

The comparison of mechanization properties

	MEC1	MEC2	MEC3	MEC4	MEC5
MEC1	1	2	2	3	3
MEC2		1	1	3	4
MEC3			1	3	3
MEC4				1	1
MEC5					1

Figure 4: The comparison matrix of criterias.
Source: Authors, (2019).

The analysis of these comparison matrices are made and the outputs are given in Figure 5 below. As seen from Figure 5, the inconsistency ratios of all four matrices are less than 0,1 which leads us to the result that all matrices are valid. In addition, the weights of each criterion can be seen in the figure. However, these weights are the values within the group.

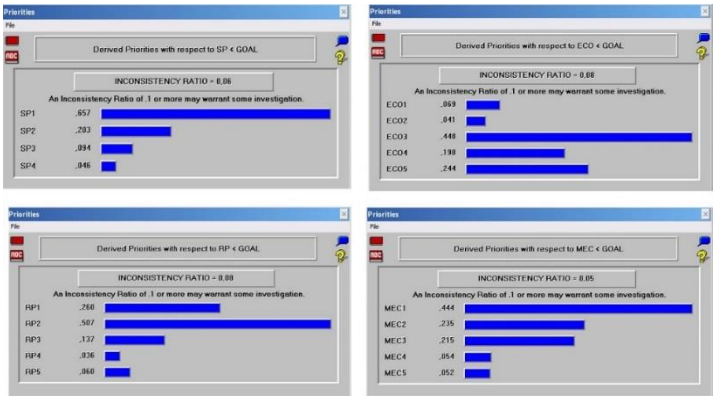


Figure 5: Expert Choice outputs, analysis of sub-criteria within each group.
Source: Authors, (2019).

Computation of Weights and Inconsistency Check

In this step, the overall weight of all criteria is computed as well as the overall inconsistency ratio. The Expert Choice output displaying the overall inconsistency ratio can be seen in Figure 5. The overall inconsistency ratio turns out to be 0.06. That is the model built by AHP is consistent and valid. The weights of all criteria in the end of the overall analysis are given in Table 3.

Table 3: Final weights of selection criteria.

Selection Criteria	Importance Ranking from AHP
SP1	0.222
SP2	0.068
SP3	0.032
SP4	0.015
RM1	0.030
RM2	0.058
RM3	0.016
RM4	0.004
RM5	0.007
ECO1	0.014
ECO2	0.008
ECO3	0.089
ECO4	0.039
ECO5	0.048
MEC1	0.021
MEC2	0.011
MEC3	0.010
MEC4	0.002
MEC5	0.002
WS	0.304

Source: Authors, (2019).
Selecting the Best Method.

After finding the weights of the selection criteria, overall performance of each mining method should be computed. In order to do so, each alternative mining method is given a performance score in terms of each criterion. All the performance scores of methods can be seen in Table 4. The scores are given over 10. That is, for example, multi-slice advanced longwall with caving (M1) takes 5 over 10 in terms of work safety (WS). The values in the table can be interpreted in the same manner.

Table 4: Performance scores of mining methods in terms of each criteria (over 10).

		Alternative Mining Methods								
		M1	M2	M3	M4	M5	M6	M7	M8	M9
Selection Criteria	SP1	7	7	9	10	6	6	4	4	7
	SP2	5	7	6	9	7	7	5	5	4
	SP3	6	8	7	10	6	5	5	4	7
	SP4	7	7	9	8	7	7	7	7	9
	RM1	6	7	7	9	6	5	5	5	7
	RM2	6	8	7	10	5	6	4	5	7
	RM3	6	8	7	10	5	6	4	5	7
	RM4	7	8	7	10	7	7	7	7	7
	RM5	6	9	7	10	5	5	4	4	3
	ECO1	6	8	7	10	5	6	4	5	8
	ECO2	7	9	8	10	5	6	4	5	6
	ECO3	8	9	8	10	4	5	4	5	7
	ECO4	6	5	6	5	9	7	9	7	8
	ECO5	10	8	10	8	7	8	7	8	7
	MEC1	6	6	10	7	9	9	8	8	9
	MEC2	8	8	8	8	9	8	9	8	8
	MEC3	7	8	7	9	6	6	5	5	6
	MEC4	7	9	7	9	4	4	4	4	8
	MEC5	3	5	4	5	9	8	8	7	8
	WS	5	7	6	8	5	4	3	4	7

Source: Authors, (2019).

The last step is to compute the overall scores of each alternative mining method. This is computed by taking the weighted average of performance scores. The weights are as given in Table 3. Overall score of multi-slice advanced longwall with caving (M1) is found to be 6.275 as given in Equation 1.

$$\text{OverallScore}_{M1} = P_{M1} * W \quad (1)$$

where,
W: Weight matrix of selection criteria (from Table 3).
PM1: Performance matrix of method M1 (from Table 4).

$$W = \begin{bmatrix} 0.222 \\ 0.068 \\ 0.032 \\ 0.010 \\ 0.03 \\ 0.058 \\ 0.016 \\ 0.004 \\ 0.007 \\ 0.014 \\ 0.008 \\ 0.089 \\ 0.039 \\ 0.048 \\ 0.021 \\ 0.011 \\ 0.010 \\ 0.002 \\ 0.002 \\ 0.304 \end{bmatrix} \qquad P_{M1} = [7 \;\; 5 \;\; 6 \;\; 7 \;\; 6 \;\; 6 \;\; 6 \;\; 7 \;\; 6 \;\; 6 \;\; 7 \;\; 8 \;\; 6 \;\; 10 \;\; 6 \;\; 8 \;\; 7 \;\; 7 \;\; 3 \;\; 5]$$

The overall scores of all alternative methods are listed in Table 5. As seen from the table, method M4 (multi-slice retreatment longwall with filling) turned out to be the best method

according to these criteria. In addition, methods M3 and M2 (multi-slice retreatment longwall with caving and multi-slice advanced longwall with filling) obtain the second and third highest performance scores. According to this analysis, multi-slice retreatment longwall with filling is the most suitable mining method and can be selected for thick coal seam mining.

Table 5: Overall scores of alternative mining methods.

Mining Method	Overall Performance
M1	6.275
M2	7.302
M3	7.372
M4	8.866
M5	5.765
M6	5.541
M7	4.379
M8	4.793
M9	6.890

Source: Authors, (2019).

IV. DISCUSSION AND RECOMMENDATIONS

In this study, 20 criteria are grouped under five main groups. Firstly, main groups criteria are evaluated and then their effects on the methods are analyzed and finally mining method selection is made according to the AHP approach. Making the evaluations of all these criteria and alternative methods is both vey hard and prone to errors. Therefore AHP method, which is a powerful tool for multi-criteria decision making problems, is used to evaluate all 20 criteria and 9 mining methods to come to a decision in mining method selection.

As a result of evaluations, seam properties (SP) and work safety (WS) are the most important criteria. SP is certainly important in terms of economical and technical reasons. Work safety is much more important compared to other metalic mines due to gas, dust problems and collapse probabaility.

Results of AHP approach leads to the decision of mining method selection. But, it should be noted that mine conditions are different in every formation. Hence, mine conditions and engineering experiences should not be ignored when the approach developed in this study is used for another mine.

V. CONCLUSIONS

In this study, mining method selection is made in thick coal seam mining using AHP method. In contrary to, convetional approaches, AHP method is rapid, reliable and do not require much data. AHP method will contribute to the company in terms of efficiency. In order to obtain a reliable conclusion, all criteria should be evaluated realistically. This can be easily done by experts of the system as in this study.

According to the results of AHP method in this study, the highest performance scores belong to Multi-slice retreatment longwall with filling (M4), Multi-slice retreatment longwall with caving (M3), Multi-slice advanced longwall with filling (M2), Room and pillar (M9). Therefore, these methods are advised to be considered at the first planning of the thick coal seam mines. In addition, M4 method is better than other methods according to work safety and economy. Results of this study, are assessed as suitable in terms of mining techniques and economics. AHP method is used in decision mechanisms in mining in a successful way.

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RESEARCH ARTICLE OPEN ACCESS

PDCA APPLICATION AS A MANAGEMENT TOOL IN PROFESSIONAL QUALIFICATION COURSE

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ABSTRACT

Today we have several technological management tools, but still many projects or processes do not fit in any of them, the purpose is to report how simple, easy and effective to use the PDCA Cycle and help in decision making, guiding the path to improvement continuous management of processes or projects. The aim of this paper is also to elucidate the importance of the tool applied in the professional qualification course of Residential Hydraulic Installer of SENAI Demóstenes Travessa School, showing benefits in the acquisition of inputs and consequently lower financial expenses and environmental impacts.

Keywords: PDCA, Economics, Management, Application.

I. INTRODUTION

There is a clear need for planning around activities in any field of work, with a view to the continuous development, improvement or control of processes and products. Thus, the PDCA Cycle emerged in the 1920s, created by Walter A. Shewart, and spread by William Edward Deming from the 1950s in Japan, where it also became known as the "Deming Cycle".

The PDCA Cycle can be used within management system standards in any organization to ensure business success, regardless of area or department, and to achieve goals on an ongoing basis. The cycle is also comprehensive, as a device that can recognize new setbacks or progress with each cycle, always aiming at continuous improvement [1].

Planning is to predict the problems and cease them, in order to understand all the variables that may influence the desired results, but to adopt the present decisions to improve the future results [2].

The PDCA cycle of all management tools is one of the most widely applied in the world, to confront problems and extend the level of excellence in companies. Therefore, in this paper I will report what it is, what its use is and how the cycle can influence the results.

Contemporary time with the great competitiveness for space, companies need to innovate and adapt, introducing procedures to be able to produce more and better, investigating their weaknesses and strengths; they should also measure their performances, after all "what is not measured is not management" [3].

The purpose of the cycle [4] is to make the processes involved in the management execution clearer and more agile, indicating the causes of the problems and possible solutions to them, as well as assisting in the organization. It is divided into four stages: PLAN, DO, CHECK and ACT.

This work was developed with the objective of elucidating the applicability of the PDCA management tool and its respective importance, bringing benefits such as economy and lower environmental impacts when applied in the Residential Hydraulic Installer course at SENAI Demóstenes Travessa School, which is aimed at following the construction, and that follows the standards of the National Service of Industrial Learning - SENAI throughout Brazil.

II. DEVELOPMENT

A case study will be presented where I applied the PDCA tool, in order to have a continuous improvement, carried out at SENAI Demóstenes Travessa School, and aimed to reduce the

waste of WELD PVC, SCREW PVC, SEW PVC, CPVC and PPR included in the practical classes of the professional qualification course of Residential Hydraulic Installer and consequently have a financial return for the institution, due to lower purchases of these inputs, as well as lower environmental impacts.

The teaching team that teaches the course embraced the implementation of the management tool facilitating the achievement of good results that will be presented in this work, helping to reduce waste without compromising the quality of learning of students, maintaining the same standard.

The tool was applied to the item pipes, one of the most expensive inputs and used in the Residential Hydraulic Installer course. The study and application of this tool can later also be implemented in other items or other professional qualification courses, mobilizing the importance of management and management.

The proposal to apply this management tool is also to show the importance and the advantages that it provides, through meetings, changes of customs and methods, discussed and evidenced in the planning phase of the PDCA tool, and can optimize a process if it impairs the development of the project even, bringing substantial benefits.

The results of the implementation of the PDCA tool conducted in the professional qualification course of Residential Hydraulic Installer at SENAI Demóstenes Travessa School were quantitative and collected data that will be presented below.

The objectives were planned in the class that started on May 17, 2019 and ended on June 28, 2019, and have already been applied to the subsequent class that started on June 17, 2019, in order to look for less waste and impacts emphasizing in the tube item, applied in the course practices.

PLAN Step: According to [5], planning means that managers think in advance about their actions and goals, and that their actions are based on some technique, plan or logic, not deductions.

To start the application of the PDCA methodology the problem / improvement was identified, which is the waste / disposal of pipes used in the Residential Hydraulic Installer course, with the goal of Reducing the Acquisition of Weldable PVC, Threadable PVC, Sewer PVC, CPVC and PPR per course started.

Faced with this obstacle, the goal was set to implement improvement, modifying some procedures that occurred during the course, such as waste management and reuse of pipes, creation of standard project in the practical class of pipe cutting, storage place of the pipes that will be reused, term and value.

It was analyzed during the course that began on May 2, 2019 and ended on June 28, for 15 students, the materials request worksheet requested by the teacher who used in practical classes. It requested 8 Weldable PVC pipes 25mm, 8 Weldable PVC pipes 32mm, 6 Threadable PVC pipes 3/4", 7 PVC pipes Sewer 40mm, 7 PVC pipes Sewer 50mm, 7 PVC pipes Sewer 75mm, 7 PVC pipes sewer 100mm, 6 CPVC pipes 22mm and 7 PPR pipes 25mm both 6 meters long.

It includes in the course lesson plan the practical execution of pipe cuts and installation of cold, hot water and sewage systems.

One of the first practical activities that the student develops is to make three cuts in each tube, in order to qualify them in this procedure, the measure was defined by the teacher, who requested 30 cm cuts.

After the student knows the entire process of residential plumbing, the last activity is the execution of a cold, hot and sewage system project where he reads an already standard floor plan and executes, and for these projects the pipes Most of them are over 1 meter long.

Immediately after each execution of the requested tasks, the systems are disassembled and the tubes are disposed of at a separate collection site.

At this collection site I observed several tubes in which they could be reused in practical cutting classes, avoiding acquisitions / expenses and reducing environmental impacts.

It was also analyzed with the faculty that teaches this course, the possibility of creating a cutting project, standardizing this process, determining smaller gauges in order to reuse the tubes of the final projects discarded by the previous class.

The planning was made to be implemented and applied in the next classes, having an immediate deadline in order to bring an economy in this input.

Step DO: As planned, tubes with gauges larger than 30 cm that had already been discarded were selected to be reused, creating a place inside the hydraulic laboratory for storage, as shown in figure 1.

Figure 1: Part of the tubes selected for reuse.
Source: Authors, (2019).

We also standardized the practice of pipe cutting with a design, as shown below, already implemented in the later class. We observed a reduction in the consumption of tubes pertinent to the students' practices, consequently saving and lower environmental impacts.

CHECK step: With the selection of tubes larger than 30 cm that would be discarded by the previous class, we reused and applied to the posterior class in the tube cutting practices, shown in figure 2, already using the standard cutting design, thus avoiding purchases and tube cuts in which it was stored in a location within the hydraulic laboratory.

Figure 2: Students reusing the pipes in the practice of cutting.
Source: Authors, (2019).

ACT Step: In the class that starts the PDCA cycle, the implementation of the tool was planned, the student requested for the practical classes 63 tubes, totaling an estimated total cost of R$ 3534.56.

The faculty worked together in a disciplined manner, applying the PDCA tool, to make the necessary changes outlined in the plan step, succeeding in its first implementation, and ready to start a new cycle while maintaining or improving results.

We can observe that it was no longer using 18 tubes, maintaining the same practices and characteristics, without harming the quality of the course, obtaining a savings of 29.25% in the tubes used, about R$ 1033.64, according to TABLE 1.

Table 1: Pipe acquisition chart before PDCA tool implementation.

First Class: Before Implementing PDCA	Tube Quantities : Cutting Practice	Tube Quantities: Cold and Hot Water System Assembly Practice	Total Tubes: By Type.	Unitary value	Total Amount: Per Tube
Weldable PVC Pipe 25mm	3	5	8	R$ 16,99	R$ 135,92
Weldable PVC Pipe 32mm	3	5	8	R$ 48,52	R$ 388,16
3/4"Threaded PVC Pipe	3	3	6	R$ 68,89	R$ 413,34
PVC Sewer Pipe 40mm	3	4	7	R$ 34,87	R$ 244,09
PVC Sewer Pipe 50mm	3	4	7	R$ 59,56	R$ 416,92
PVC Sewer Pipe 75mm	3	4	7	R$ 65,49	R$ 458,43
PVC Sewer Pipe 100mm	3	4	7	R$ 76,90	R$ 538,30
CPVC 22mm Tube	3	3	6	R$ 79,80	R$ 478,80
PPR 25mm Tube	3	4	7	R$ 65,80	R$ 460,60
	Total Pipes:		63	**Custos Total:**	R$ 3.534,56

Source: Authors, (2019).

Once planned, the goals were put into practice by separating the tubes for reuse, creating a deposit site within the hydraulics lab, standardizing a cutting design, and aligning all information with students who teach the same course. With this, we get a positive result, ready to restart a new PDCA cycle, ensuring uninterrupted improvement.

The analysis below shows the reduction in the purchase of new tubes, requested by the student in the bill of materials, from 63 to 45 tubes used in practical classes, obtaining a difference of 18 tubes considering an estimated cost reduction of R$ 3534.56 to R$ 2500.92, about 29.24% less, as shown in TABLE 2 and shown in Figure 3.

Table 2: Pipe acquisition chart after PDCA tool implementation.

First Class: Before Implementing PDCA	Tube Quantities: Cutting Practice	Tube Quantities: Cold and Hot Water System Assembly Practice	Total Tubes: By Type.	Unitary value	Total Amount: Per Tube
Weldable PVC Pipe 25mm	1	5	6	R$ 16,99	R$ 101,94
Weldable PVC Pipe 32mm	1	5	6	R$ 48,52	R$ 291,12
3/4"Threaded PVC Pipe	1	3	4	R$ 68,89	R$ 275,56
PVC Sewer Pipe 40mm	1	4	5	R$ 34,87	R$ 174,35
PVC Sewer Pipe 50mm	1	4	5	R$ 59,56	R$ 297,80
PVC Sewer Pipe 75mm	1	4	5	R$ 65,49	R$ 327,45
PVC Sewer Pipe 100mm	1	4	5	R$ 76,90	R$ 384,50
CPVC 22mm Tube	1	3	4	R$ 79,80	R$ 319,20
PPR 25mm Tube	1	4	5	R$ 65,80	R$ 329,00
	Total Pipes:		45	**Custos Total:**	R$ 2.500,92

Source: Authors, (2019).

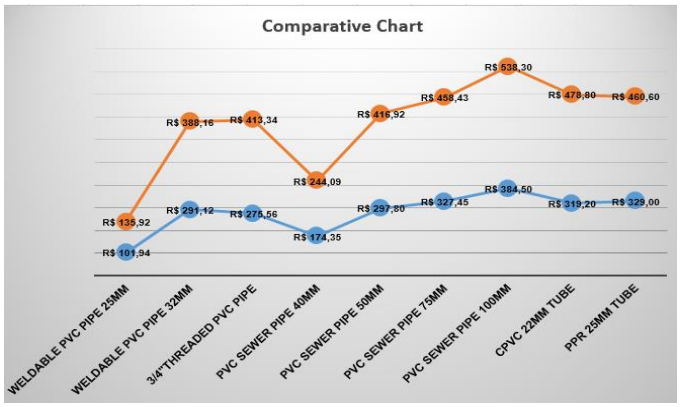

Figure 3: Comparative graph of spending.
Source: Authors, (2019).

Given the implementation of this PDCA management tool within the professional qualification course, we had an optimization of the pipe item consumption process, bringing financial benefits and lower environmental impacts.

III. CONCLUSIONS

It was important to note that at the end of the PDCA Cycle, it must be restarted to ensure uninterrupted improvement of the processes or services to which the tool was applied, taking full advantage of the tool, bearing in mind that this process can be redone as often as necessary, focusing on a single process or others in a given activity, seeking optimization, since their information is cumulative, emphasizing that the cycle is a continuous process.

Tool phases must be constantly evolving and should not be left behind. Only then will the process and activity improvements be visible to everyone, bringing the expected results.

Thus, PDCA cycle shows in the strategic management of companies its greatest application potential, because the tool works on the day-to-day problems through the use of all the inherent solutions to the method, the problems that damage the companies survival are pointed out, prioritized by their level of value and the negative impact it has on the business, where they will be dealt with effectively, with actions that will block the negative causes raised, improving the next service or production cycle, bringing satisfaction to all.

IV. ACKNOWLEDGMENTS

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I thank all the people who contributed in some way to the development and realization of this work, especially the coordination of the SENAI Demóstenes Travessa School and the Braulio Cardoso de Mattos Educational Institution - FASERRA.

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RESEARCH ARTICLE OPEN ACCESS

IMPORTANCE OF WORK SAFETY IN PROFESSIONAL QUALIFICATION COURSES: REDUCTION IN LABOR ACCIDENT RATE

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ABSTRACT

The use of Personal Protective Equipment (PPE) is a method of preventive action against accidents at work, with a purpose to preserve the individual from the threats to his individual health and safety. The objective of this work is to elucidate the success of the methodology applied in the student body of the SENAI Demóstenes Travessa School, regarding the use of PPE in professional qualification courses, preventing and raising awareness among students seeking knowledge to apply in the labor market or in their personal lives, I try in view that, the school is focused on the follow-up of construction, one of the sectors that most accidents occur.

Keywords: PPE; Workplace safety; Construction; Teaching, Professional Qualification.

I. INTRODUTION

Occurrences of occupational accidents are ancient facts, however, their teaching by Occupational Hygiene and Safety only gained prominence in society after the Industrial Revolution, due to the imposition of regulating the premises of labor such as labor laws and Regulatory Standards, and with therefore, to prevent the eventualities of accidents and occupational diseases. In addition to the physical injury to the employee and the suffering for their family members, the occurrence of occupational accidents has economic, socio-environmental and political consequences for the whole society [1].

Civil construction is one of the oldest sectors and always undergoing modifications, especially the Personal Protective Equipment [2] that is included in the construction process.

In Brazil, over the course of several decades, there was a high computation of accidents at work, especially in construction, as it is one of the sectors that most captures employees of various levels of knowledge because it covers various sectors. Consequently, it has inevitably contributed to the ranking of occupational accidents. This ranking has been reduced due to the numerous and expressive efforts of companies, employees and especially the government, in which it discusses and elaborates rules to make the lives of employees safer, healthier and healthier. The Statistical Yearbook of Accidents at Work - SYAW highlights: According to Article 19 of Law No. 8,213, of July 24, 1991, "an occupational accident is what occurs when working at the service of the company or a domestic employer, or the work of the special insured, causing personal injury or temporary or permanent functional disturbance". It can cause from a simple removal, loss or reduction of work ability, even the death of the insured [3].

Our educational institution supports all its employees in accordance with the requirements of the Ministry of Labor and Employment - MLE, however, because it is a vocational education institution, it also contributes to the fall of this statistic of occupational accidents, which prepares its students to act splendidly in the formal or informal job market.

The use of Personal Protective Equipment is a substantial preventive action method and is vital for the protection of the student body in the practice of vocational courses. PPE can eliminate or reduce the risks that exist in the learning environment, where the execution process sometimes follows the same characteristics found in the job market, as well as preventing accidents from becoming more severe and harmful.

Not only the supervision and awareness of use practiced in the company by the Internal Accident Prevention Commission - IAPC and the faculty, but also the training of students on how to

use and maintain PPE correctly in which it is passed on in theoretical and practical classes.

This work was developed with the objective of showing the magnitude of the methodology of teaching of professional qualification of SENAI Demóstenes Travessa School, which is focused on the follow-up of civil construction, and that follows the standards of the National Service of Industrial Learning - SENAI of all Brazil, instructing its student body objectively and clearly, in which it is inserted or will enter the active labor market, showing them and making them aware of the importance of the use of PPE as well as the norms, thus contributing to the drop in rates accidents at work across the country.

II. DEVELOPMENT

This article highlights some principles of renowned authors in the area of occupational safety, developing issues related to the importance of awareness and the use of personal protective equipment, linked to the teaching of professional qualification, having contributed to the reduction of the rate of occupational accidents job.

Safety at work is indispensable for companies when it indicates conditions of risk to the health of employees, so the resulting item brings convictions and reports about safety. Chiavenato clarifies that occupational safety is the way to prevent accidents, eliminating unsafe circumstances and instructing employees to use PPE [4].

Conservation and awareness of the use of Personal Protective Equipment can reduce workplace accidents or cause minor harm to the health and well-being of the employee in the event of an accident, as noted above, always emphasizing occupational safety. Marras ensures that the awareness program serves to signal risks and ensure the life and integrity of employees, however, this awareness is not only given through the government, companies or between employees. Raising awareness of the use and conservation of PPE among other safety mechanisms can also be sought in SENAI's professional qualification courses, which contributes to the reduction of the national occupational accident ranking, with the objective of enabling, raising awareness and training splendid form its student body that acts or will act in the formal or informal labor market. These actions of preservation of the life of the collaborator together, bring economic advantages, because the expense that the company has for the removal due to work accidents minimizes. However, taking advantage of Marras' main idea: “accident prevention is the best the company has to do [5]”.

The methodology used was a field research, where I applied a questionnaire to the student body of the school before starting the professional qualification course, was also taken into account the experiences and observations lived in the daily teaching of SENAI Demóstenes Travessa School, which has the following in the area of construction, one of the sectors with the highest causes of occupational accidents. The school receives numerous students from different social levels, ages and educational levels, seeking vocational training courses to add skills to their curriculum or personal life, applying the knowledge acquired in the formal, informal or even personal labor market.

The teaching staff of SENAI Demóstenes Travessa School is highly trained and qualified, strictly following the national standardization of SENAI - National Service of Industrial Learning and also the guidelines of the Ministry of Labor and Employment, of SESMET - Specialized Services in Engineering of Occupational Safety and Medicine, NR 04 and IAPC - Internal Accident Prevention Commission [6], obtaining the mastery and the ability to transmit and promote the professional and technological education with innovation, contributing to increase the competitiveness of the Brazilian and helping to reduce the ranking of occupational and regional accidents in the country, emphasizing and making their students in the classroom or laboratory aware of the correct use and handling of PPE - Personal Protective Equipment, according to NR 06 or following the correct procedures of security.

Every effort to reduce the ranking of occupational accidents revolves around three aspects: the government, the employer and the employee, in which they work collectively to avoid damage and harm. For years these numbers of occupational accidents have been falling, according to the table of the Statistical Yearbook of Accidents at Work [3].

Chapter 1 - Brazil and Major Regions
1.1 - Number of occupational accidents, by registration situation and reason according to the National Classification of Economic Activities (NCEA), in Brazil 2015/2017

NCEA	AMOUNT OF WORK ACCIDENTS																	
	Total			With Registered WAC												No Registered WAC		
				Total			Reason											
							Typical			Path			Work Disease					
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Total	622.379	585.626	549.405	507.753	478.039	450.614	385.646	355.560	340.229	106.721	108.552	100.685	15.386	13.927	9.700	114.626	107.587	98.791

Figure 1: Work accident report in Brazil and Major Regions.
Source: Adapted from [3].

Chapter 4 - Amazonas
4.1 - Number of occupational accidents, by registration status and reason, according to the National Classification of Economic Activities (NCEA), in the state of Amazonas - 2015/2017

NCEA	AMOUNT OF WORK ACCIDENTS																	
	Total			With Registered WAC												No Registered WAC		
				Total			Reason											
							Typical			Path			Work Disease					
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Total	8.495	7.293	6.670	6.070	4.982	4.567	4.413	3.620	3.464	1.025	1.009	882	632	353	221	2.425	2.311	2.103

Figure 2: Work accident report in the Amazon.
Source: Adapted from [3].

The purpose of the research is to show that it is not only through these factors that work accidents can be reduced, and can be optimized within a vocational education institution, helping to reduce the work accident rate, which is not highlighted in the scientific literature, considering that many students have already gone through professional qualification obtaining greater awareness. According to the School Management System - SMS in 2018 there were 647 enrollments in vocational training courses only at SENAI Demóstenes Travessa school and in 2019 until June were 335.

A questionnaire was applied to 44 students at the beginning of the professional qualification course and their answers were analyzed, whether or not they are active in the labor market, after which the questionnaire was reapplied at the end of the course. The questions of the questionnaire are fundamental and paramount to ensure better work safety within a corporation, when there is mastery and awareness of them, thus contributing to the reduction of occupational accidents. Much was unaware of a simple verification of the Certificate of Approval - CA of an PPE for example.

Even if the government is implementing regulations, laws or enforcement sometimes unsuccessfully due to the high demand for labor market activities, even if companies train their employees in their corporations, there may still be a gap in awareness and the importance of using them of the PPE. Employees who are at the front of the service end up crashing out of neglect or the obscure way that their safety and health at work training was transmitted and absorbed, if any. Incorrect information, manipulation and conservation of PPE's, for example, can lead to an accident at work, causing the employee to leave or even die.

In addition to the fact that our staff is well qualified and trained, always undergoing retraining, the lesson plan of any professional qualification course includes Occupational Safety, objectively and clearly raising awareness of our students, as shown in the image below.

8 Basic Contents:	9 Partial Hours:
1 Safety, Quality and Environment in Construction: **1.1 Safety at Work:** 1.1.1 Basic Concepts (Understanding NR - 18); 1.1.2 Hygiene and Safety at Work; 1.1.3 Causes of Accidents; 1.1.4 Accident Prevention; 1.1.5 Preliminary Risk Analysis; 1.1.6 Ergonomics and Accessibility ABNT NBR 9050; 1.1.7 Personal and Collective Protection Equipment (Notions NR-06).	25h

Figure 3: Course outline, Safety, Quality and Environment.
Source: Adapted from [8].

The courses are divided into two moments, the theory made in the classroom where is passed on all information according to laws, rules and procedures, the duties and rights of the employer as the employee.

In the practical classes of the courses is the moment where the student will apply and simulate in the laboratory situations that will find in their work environment, having the assisted support of the teacher where reinforces and continues the awareness about the procedures and the importance of following the rules and the use of PPE, studied in theoretical classes.

The results of the field research carried out with the students who were training at SENAI Demóstenes Travessa School were descriptive and gathered data that will be presented below.

The questionnaire was applied on the second day of the professional qualification course and later at the end, in order to seek an understanding of occupational safety, emphasizing personal protective equipment and capturing information about the importance of the study of occupational safety within professional training.

In the first application of the questionnaire 44 students performed. Of these, 42 are male and 2 females, with 2 having completed elementary school, 37 having completed high school, 4 having completed higher education and 1 student did not report their level of education. Student ages range from 18 to 56 years.

The students who were willing to answer the questionnaire trained in vocational courses focused on civil construction. Of these, twenty-seven have reported employment and seventeen are unemployed.

The analysis below shows the degree of knowledge of the students before starting the professional qualification course.

Table 1: Questionnaire with 8 questions, 44 students answered, first application.

QUESTION	QUESTIONNAIRE	YES	NO
1	Do you know what Personal Protective Equipment - PPE is?	40	4
2	Do you know the importance of using PPE?	38	6
3	Do you know the employer's obligations regarding the use of PPE?	29	15
4	Do you know the employee's obligations regarding the use and handling of PPE?	30	14
5	Can you tell if the PPE used in your work activity is appropriate?	33	11
6	Do you know what an EPI Certificate of Approval - CA is?	19	25
7	Have you been trained in the use and conservation of PPE?	27	17
8	Are you aware of the damage that can occur in a work accident when you do not wear PPE?	39	5

Source: Authors, (2019).

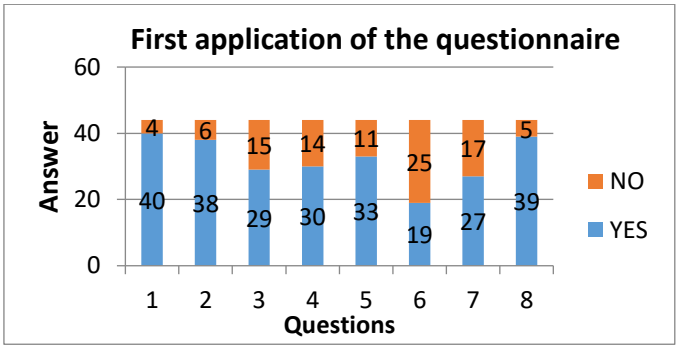

Figure 4: Graph, result of the first questionnaire application.
Source: Authors, (2019).

In the second application of the questionnaire 35 students performed. Of these, 33 are male and 2 females, 31 of which have completed high school and 4 have completed higher education. Student ages range from 18 to 50 years.

The students who were willing to answer the questionnaire were trained in vocational courses focused on civil construction. Of these, twenty-three have reported employment and twelve are unemployed.

The analysis below shows the degree of knowledge of the students at the end of the professional qualification course.

Table 2: Questionnaire with 8 questions, 35 students answered, second application.

QUESTION	QUESTIONNAIRE	YES	NO
1	Do you know what Personal Protective Equipment - PPE is?	35	0
2	Do you know the importance of using PPE?	35	0
3	Do you know the employer's obligations regarding the use of PPE?	34	1
4	Do you know the employee's obligations regarding the use and handling of PPE?	35	0
5	Can you tell if the PPE used in your work activity is appropriate?	35	0
6	Do you know what an EPI Certificate of Approval - CA is?	34	1
7	Have you been trained in the use and conservation of PPE?	35	0
8	Are you aware of the damage that can occur in a work accident when you do not wear PPE?	35	0

Source: Authors, (2019).

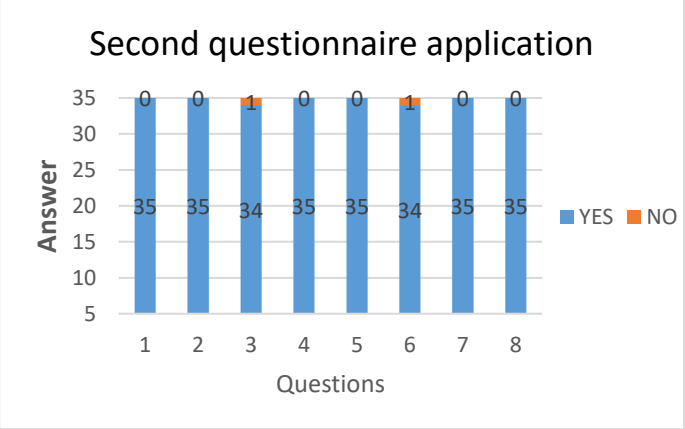

Figure 5: Graph, result of the second questionnaire application.
Source: Authors, (2019).

Employees need to know exactly why and the importance of using personal protective equipment at work, the application of a method of awareness is necessary, and this is present in the vocational training courses of SENAI Demóstenes Travessa School. In order to implement the methodology of awareness in a work environment, the collaboration of all is first requested, making them follow the guidelines and information acquired in the course. The degree of safety in an organization is acceptable and satisfactory when it ensures and takes care of the occupational health of its employees [7].

III. CONCLUSIONS

Based on the results of the applied questionnaire, it can be considered that this field research contributes to evaluate the importance of the employment of the Occupational Safety in the professionalizing courses in the professional qualification institutions, using as model the SENAI Demóstenes Travessa School that through the qualifications, helps in reducing the rate of occupational accidents, as the course plan includes the content mentioned above.

The school not only empowers the student for his or her specific role, but also raises awareness, displays and practices workplace safety guidelines by emphasizing the importance of laws, regulations and the proper use of PPE, thereby helping to reduce the rate of accidents.

In the comparison of the questionnaires we saw that shortly after the end of the vocational training course there was a considerable increase in knowledge and awareness about work safety, reaching almost 100% in the YES answer. It also took into consideration that of the 44 students evaluated 27 reported that they are employed, about 61% and, even in the company, had a deficit in knowledge on Work Safety, which could be a potential index of work accident.

IV. ACKNOWLEDGMENTS

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I thank all the people who contributed in some way to the development and realization of this work, especially the coordination of the SENAI Demóstenes Travessa School and the Braulio Cardoso de Mattos Educational Institution - FASERRA.

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RESEARCH ARTICLE OPEN ACCESS

USE OF INDIVIDUAL PROTECTION EQUIPMENT IN CIVIL CONSTRUCTION

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ABSTRACT

The use of Personal protective equipment (PPE) is extremely essential for any activity that is prone to occupational hazards and / or illnesses that could threaten the safety and health of the worker. The construction market has grown abundantly in recent years, and consequently the risk of accidents in this work environment as well. There are several reasons for this growing increase in accidents at work, among them is the Contracting Company that does not provide correctly the equipment of personal protection for its employees and the lack of commitment and interest of the employees in the use of protective equipment. The objective of this study is to evaluate the use of individual protection equipment in the construction company in a given service rendering, which includes the construction of reinforced concrete wall and drainage network installation, observing the methods used for adhesion and control of the use of PPE. Although the work is short-term and the accident risk is high, in the course of the work up to the date of delivery, a satisfactory result was obtained both for the Company and for the employees involved in the activities, as it had no accident of job.

Keywords: Individual Protection Equipment; Contributors; Accident.

I. INTRODUTION

The terms of safety at work is an item of great importance in all the industrial activity, aiming to decrease the consequences that cause dangers to labor activities. This occurred in a natural way, since human beings are possessed the instincts of caution of life. And today, as humans most of the time they are inserted inside of organizations that generally amid labor, are the companies, it is natural for people to seek to protect themselves in daily activities, however, there are always some people who do not give due weight to your own health and safety.

Safety at work can be understood as the sets of measures that are adopted to minimize accidents at work, occupational diseases, as well as protect the integrity and the ability to work of the employee, within some measures we have the collective and individual protection equipment. In the field of civil construction, security depends almost exclusively of your labor, because most of the time the developer receives the individual protection equipment and it turns out your trivializing use by lack of knowledge and trust other in your belief that the accident will never happen yourself, the fact of relying on directly from the developer should cooperate for a better security management in companies, but it is one of the economic sectors with the highest rate of accidents.

In this context, this study aims to demonstrate the importance and necessity of the use of personal protective equipment for employees in construction, to reduce the number of accidents, and, in addition, to sensitize employees to the same are responsible for your safety and your coworkers and also assist in the identification of occasions that can give risks and thus help correct the errors.

II. DEVELOPMENT

According to the [1], for the purposes of good job of NR, considered personal protective equipment-PPE, any device or product of single use used by the worker, for the protection of risks likely to threaten the safety and health at work. The personal protective equipment, national or imported manufacturing, may only be marketed with the certificate of approval-CA, carried out by the competent national agency for safety and health at work of the Ministry of labor and employment [1].

The individual protection equipment (PPE), can be divided in terms of body area to protect: head protection (helmet), hearing protection (ear plugs or ear protectors noise and caps), respiratory Protection (masks, devices filters own against every kind of air contaminant: gases, aerosols), ocular and facial Protection (goggles, face shields and masks), hand and arm protection (gloves, made in various materials and sizes as the risks against which you want to protect: mechanical, chemical, biological, thermal or electric), protection of feet and legs (shoes, shoes, boots, sneakers, appropriate for the risks against which you want to protect: mechanical, chemical, electrical, and fall), protection against falls (belts parachute systems security, belts) [2].

Figure 1: Personal Protective Equipment.
Source: [2].

Figure 1 presents some PPE ´ s used to protect the worker's body area, shows the helmet, earplugs, earmuffs, seat belts, gloves, goggles and boots roughing of security.

The construction environment makes use of these groups of PPE's, and most of those described in NR-6 because it is a sector which brings together activities focus on services that present risks due to contact with water, heights, with electricity, in addition to the risks the works of demolition, excavation, masonry, flooring and coatings application, carpentry and metalwork that encompass the activities developed in construction [3].

The use of this type of equipment should only be done where it is not possible to take measures to eliminate the risks of the environment in which it develops the activity, i.e. when the collective protection measures are not viable, efficient and sufficient for mitigation of risks and do not offer complete protection against the risks of industrial accidents and/or occupational diseases and work. As the CPE does not depend on the will of the worker to suit your purposes, this has a higher preference for use of PPE since collaborates in the process while minimizing the negative effects of a working environment that presents a number of risks to the worker. When employees do not use the correct PPE ´ s, the risk of an accident is drastically high, most of the time the accident ends up causing personal injury or functional disturbance may cause death, temporary or permanent reduction or loss, the ability to work.

Collective protection equipment is used in the workplace for security protection while a group of people perform certain task or activity, as an example of collective protection equipment (CPE) we can mention: Protection networks, security flags (such as plates and warning signs, or color), fire extinguishers, Wash eyes, safety showers, Fans, first-aid Kit. In Figure 2 are explicit some of these items used in collective protection of the worker.

At the construction site, the protection of all employees is the application of the CPE, which "are performances, equipment or information that serve as obstacle between the risk of accident and the workers. In a more open vision, are all security measures adopted in a work to protect one or more persons. " [4].

Figure 2: Collective Protection Equipment.
Source: [3].

As the [1] about the availability of personal protective equipment, determines that the undertaking is obliged to equip employees for free, PPE according to the risk present in the activity developed by the employee, in great condition and functioning, in the following situations: the whole time as the action) of a general nature not provide full protection against the risks of industrial accidents or occupational diseases and work; b) during the time that collective protection measures are being implemented; and, c) to meet emergency situations [1].

One of the tasks required by NR-6 [1], as the responsibility of the employee fit to even obey the following recommendations: use personal protective equipment only for the purpose of protecting your health and safety; keep and keep saved; inform along the company and/or person in charge about any changes that make the use of inadequate PPE and meet properly the employer's determinations and training under the personal use.

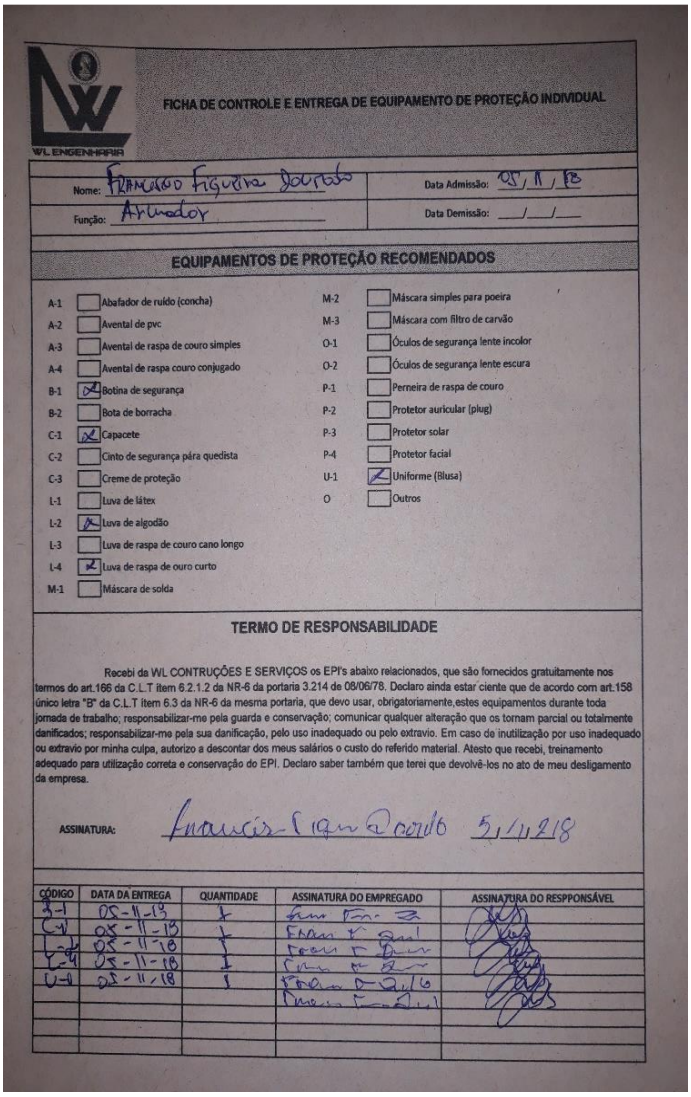
III. METHODOLOGY

The location of the case study is in a small business that will hold a service of building wall in reinforced concrete and installation of drainage network, according to table II of NR 4-specialized services in safety engineering and occupational medicine (104,000-6) - [5], the service to be provided has the degree of risk 4. The total number of employees is less than 50, so you do not need the need for security and engineer or occupational physician, however, the contractor has provided a security technician at work to follow the activities to be performed to ensure the integrity of the company and protect employees from the risk of accidents.

In principle it was asked of service provider contracts for labor and occupational health certificate to all employees (ASO), then was asked to plug individual protection equipment to ensure that employees would be getting the PPE ´ s according to each activity to be performed so that the supervision charged using the same, PPE is of paramount importance to have control in the management of the equipment, an ideal PPE contains her information from each item of PPE available, certificate of

approval (CA) informed, validity, the amount received by the employee, the employee's signature field and your responsible.

The staff of the service provider has civil engineer, construction workers, cleaners and shipowner. Each employee received your PPE according to the activity to be performed, the protective equipment in common for all employees were uniforms, boots, safety helmets, gloves and sunscreen.



FICHA DE CONTROLE E ENTREGA DE EQUIPAMENTO DE PROTEÇÃO INDIVIDUAL

WL ENGENHARIA

Nome: Francisco Figueira Dourado — Data Admissão: 05/11/18

Função: Armador — Data Demissão: ___/___/___

EQUIPAMENTOS DE PROTEÇÃO RECOMENDADOS

A-1	☐	Abafador de ruído (concha)	M-2	☐	Máscara simples para poeira
A-2	☐	Avental de pvc	M-3	☐	Máscara com filtro de carvão
A-3	☐	Avental de raspa de couro simples	O-1	☐	Óculos de segurança lente incolor
A-4	☐	Avental de raspa couro conjugado	O-2	☐	Óculos de segurança lente escura
B-1	☑	Botina de segurança	P-1	☐	Perneira de raspa de couro
B-2	☐	Bota de borracha	P-2	☐	Protetor auricular (plug)
C-1	☑	Capacete	P-3	☐	Protetor solar
C-2	☐	Cinto de segurança pára quedista	P-4	☐	Protetor facial
C-3	☐	Creme de proteção	U-1	☑	Uniforme (Blusa)
L-1	☐	Luva de látex	O	☐	Outros
L-2	☑	Luva de algodão			
L-3	☐	Luva de raspa de couro cano longo			
L-4	☑	Luva de raspa de ouro curto			
M-1	☐	Máscara de solda			

TERMO DE RESPONSABILIDADE

Recebi da WL CONTRUÇÕES E SERVIÇOS os EPI's abaixo relacionados, que são fornecidos gratuitamente nos termos do art.166 da C.L.T item 6.2.1.2 da NR-6 da portaria 3.214 de 08/06/78. Declaro ainda estar ciente que de acordo com art.158 único letra "B" da C.L.T item 6.3 da NR-6 da mesma portaria, que devo usar, obrigatoriamente,estes equipamentos durante toda jornada de trabalho; responsabilizar-me pela guarda e conservação; comunicar qualquer alteração que os tornam parcial ou totalmente danificados; responsabilizar-me pela sua danificação, pelo uso inadequado ou pelo extravio. Em caso de inutilização por uso inadequado ou extravio por minha culpa, autorizo a descontar dos meus salários o custo do referido material. Atesto que recebi, treinamento adequado para utilização correta e conservação do EPI. Declaro saber também que terei que devolvê-los no ato de meu desligamento da empresa.

ASSINATURA: Francisco Figueira Dourado 5/11/218

CÓDIGO	DATA DA ENTREGA	QUANTIDADE	ASSINATURA DO EMPREGADO	ASSINATURA DO RESPPONSÁVEL
C-1	05-11-18	1		
C-4	05-11-18	1		
L-4	05-11-18	1		
U-1	05-11-18	1		

Figure 3: Control and Delivery Record of PPE.
Source: Authors, (2019).

Figure 3 presents the record of personal protective equipment that was created and used by the service provider as requested by safety technician.

Safety technical guides start employees and managers at every step of the job, such as digging the ditch to insert the flanges of reinforced concrete has requested a report on stability of ditch, if the depth of the ditch was more than 1, 25 m and in the construction of the wall led owners to put protection on the ends of the rods correctly, charged the use of personal protective equipment for employees, it was observed that the staff didn't want to use PPE ´ s correctly, not for lack of training, but not to feel comfortable in the use of the same, some said that the PPE ´ s facing the execution of its activities, others claimed that the equipment were nonsense and trivialized using the same, however, the security technician charged so intense so that they use the protective equipment and at the same time informing what are the consequences if the officials stopped using the PPE ´ s, making explicit that failure to use greatly increases the risk of accident at work endangering your health and that if the developer would continue insisting on not using PPE ´ s would be prompted the shutdown.

Figure 4: Staff using the PPE´s.
Source: Authors, (2019).

Figure 4 presents two staff using the individual protection equipment, PPE ´ s are basic to any low-risk activity to be performed in construction such as: uniform, Boots, gloves and helmet safety.

IV. RESULTS AND DISCUSSION

This study confirmed part of the results found in the literature. With regard to PPE, it may be noted that the use of individual protection equipment is extremely important, because at the end of the work there was no accident, although officials feel bothered by the use and then stop using the PPE ´ s, the coach was always security around inspecting the activities of employees.

In the civil construction market companies to comply with labor laws, most often provide PPE ´ s, but does not maintain security professionals in your picture, favoring thus the risk of injury, so it is possible to confirm that without a safety professional at work risk of accident in construction site is high, because if I didn't have the intense collection of professional with broader knowledge in the management of documents and equipment, possibly something more serious would have happened, even the term of work being short and the amount of lower officials.

V. CONCLUSIONS

With the results obtained, it can be concluded that the use of personal protective equipment is the determining factor for the success of any company that seeks a good security management with a focus on minimizing the risks of accidents at work.

Employees are the most critical to prevent accidents at work, because they are at the tip of the executions of the labor activities, the company may have a security copy framework, however, if the employee does not cooperate in the use of personal protective equipment the risk of accident is enormous leading so failure in management and security. However, all parties have a huge responsibility for the safety of all workers, the company has

obligation to provide personal protective equipment correctly and free of charge, providing a professional competent to supervise workers in the execution of its services and lastly as mentioning previously the employees must use PPE ´ s as has the regulatory standard-NR 6.

An important suggestion for future work is that you can use search tools, such as a more detailed questionnaire with personal questions to workers about the main reason not to use the protective equipment and they are for your own protection.

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RESEARCH ARTICLE OPEN ACCESS

MANAGEMENT INTEGRATION PLAN IN A CIVIL CONSTRUCTION COMPANY

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ABSTRACT

Currently, the subject of Project Management has received great evidence in the business world due to the competition dispute and increasing competitiveness, which makes the business organizations present solutions more quickly and efficiently to external stimuli, in civil construction has been growing the concept of project management with the purpose of having term, quality, profit in the services rendered. With this vision, several tools, methodologies and even organizational entities have been developed with the purpose of ensuring that the projects achieve the expected results. Thus, with several processes and tasks, the project integration management area has high professional relevance, ranging from the elaboration of the scope, through the monitoring and control of the project, and ends in the organization of the final materials, as well as in the lessons learned. Thus, the article will present a project integration plan developed by a construction service provider, the integration plan aims to meet Project management, Time management, Cost management, Quality management and Human resources and their respective controls.

Keywords: Project Management; Integration; Management.

I. INTRODUTION

The management of integration is the aggregation of methodologies to meet, define, distinguish, combine, unify and structure the project management mechanisms within the groups of project management processes (initiation, planning, execution, monitoring and control and closure). The inverse of the other knowledge areas of project management, the management of integration is an assignment specifies the project manager. Thereby, cannot be attributed to another professional. On the other hand, in managing costs, for example, involve a budget specialist in the management of integration only project manager is able to assume this function with responsibility. After all, he's the only one who has a general understanding of the project and can observe in detail and very well the connections between steps.

Project integration management collaborates effectively in the provision of resources, maintains, demands, provides a plan to achieve the goals of the project, finds solutions to potential problems in the project, and between other important characteristics. To sum up, the major interest of this area of knowledge is certify that all plans are tending towards the same goal of the project, and verify that there are no failures or discordant subjects that need to be worked out. The management of integration, therefore, aims to ensure the understanding between the various areas of knowledge from initiation until the closure of the project.

The Guide Project Management Body of Knowledge (PMBOK) is one of the dominant references in project management, because integrates in a structure that identifies and conceptualizes processes, areas of expertise, tools and techniques. The PMBOK considers managing a project on application of skills, tasks and knowledge in order to meet your requirements. Such management techniques can be applied to all types of projects, regardless of the economic market, the size of the staff involved, deadlines and budgets [1].

This study highlights the implementation of a plan of integration of project used by a service provider of construction business, targeting management tools in order to achieve the objective of the project.

II. DEVELOPMENT

The project is as a temporary interest, IE finite. It has, therefore, beginning and end well established and produced to

achieve a unique objective, that is. a specific effect that makes it unique. The projects are run by people, with obstacles and designed, executed and checked over your lifecycle. So simple, it is possible to affirm that the designs differ from processes and operations, because these latter are continuous and repetitive, while the designs have unique character [2].

For a better sense of the importance of the projects, just understand that for any institution reach its goals, it will need organized efforts. And that is beneficial since the construction of a new factory until the expansion of an operation, for example.

The application of integration management in projects provides excellent benefits for organizations, because we have an upgrade in the communication between the Manager and other employees ceasing rework, personal damage and unnecessary costs. Another benefit to be highlighted is the creative prevention, because it turns out that emerging creative solutions before problems actually happen [3].

The management plan of integration projects is divided into six steps that interact with each other, which are:

- **Preparation of the opening of the project**: the focus is on the structure of a document that allows the start of the project or a phase. This is the opening of the Term project (OTP), seen as the kick needed to the planning of the work. It also means that all the initial requirements, with stakeholders, must be documented;
- **Development of the management plan**: The relevance of this step is to determine how it will be conducted at project management. Are documented all the necessary actions to establish, prepare, integrate and manage the plans of all the knowledge areas;
- **Guidance and execution management**: responsible for conducting Phase, with procedures and guidelines regarding the performance of the tasks laid down. The Manager must monitor the details of the project as the allocation of resources, performance, technical, changes, acquisitions and possible corrective actions;
- **Monitoring of work performed**: lead and adjust the project to check whether the objectives set at the beginning are being fulfilled. This part is critical to the identification of potential in time, resources, results and project scope;
- **Integrated control of changes**: in the fifth case, Change requests are analyzed. From a given stream, stimulated and known by all, such requests may be approved or rejected. The great advantage is that the requests are treated in integrated mode, reducing the impacts on final delivery of product or service;
- **Closure of the project or phase**: the last step takes care of the formal closure of the project (or phase), pointing to the conclusion of all acquisitions, activities and sale of assets. With this, the resources for the job are released and relocated in other actions.

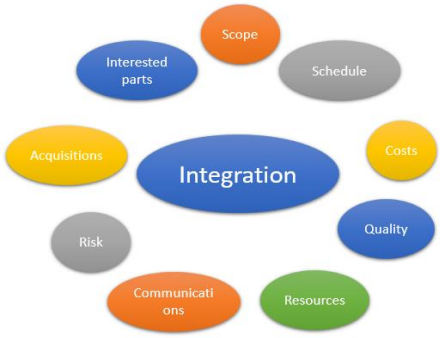

Figure 1: Integration Management-Processes and people.
Source: Adapted from [3].

Figure 1 presents the integration of project management that includes coordination of all processes and interfaces of the areas included in your cycle. As a result, organizations tend to reach their goals with greater safety, agility and quality in interlocking steps [4].

III. METHODOLOGY

The project aims to carry out the services of building wall in reinforced concrete and rainwater drainage network according to the application requested by the client in a secure manner, with quality and deadline.

Thus, were created control methodologies and project management in order to have a project running efficiently and effectively to ensure customer satisfaction.

The service provider is a company engaged in the business of construction and has an excellent staff trained to consulting and perform your work according to your project.

IV. APLICAÇÃO DO PLANO DE GERENCIAMENTO DA INTEGRAÇÃO DE PROJETOS

The company developed your Management Plan in order to serve its clients with projects and services aimed at the security and overall quality of the project, with honesty to work and deliver what they promised with transparency in contracts run and respecting the deadline so together with the client, with it aiming to be true in all actions and information.

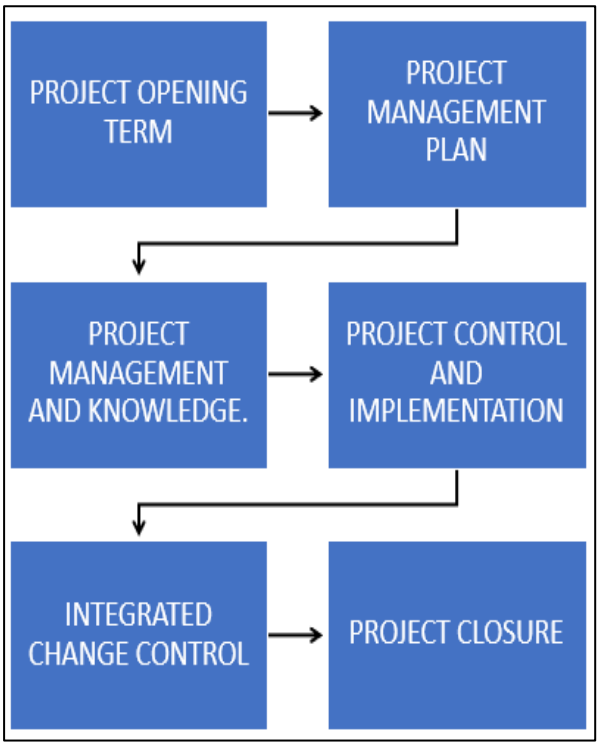

Figure 2: Flowchart (Project Integration Plan).
Source: Authors, (2019).

Figure 2 demonstrates each step of the Integration plan used by the service provider in order to use the tool and obtain the best benefit in planning.

Table 1: Project Opening Term.

LOGO	**Date** : 25/11/2018
	Strategic objective: Perform and Respect each project milestone .
	Project name: construction and repair
	Client: Contractor
Sponsor: Contractor	**Project Manager**: Civil Engineer
PROJECT DATA	
Justification	There are two walls that need to be demolished and built new in reinforced concrete .
	The drainage network is totally damaged.
Goals	Demolish the block walls and build new .
	Install a new drainage network .
	Run the service within certain .
Product description	91 m will be built of reinforced concrete wall with h = 1, 20 m and l = 0, 25 m, the columns will be executed with 12, 5 mm steel and the vertical and horizontal mesh with steel 10 mm
	The drainage network will be feet, made with reinforced concrete manholes, 600 mm tube.
	Will be applied to the drainage network sand; clay and the floor is of hexagonal block 30x30x10cm.
Resources needed	Materials: Lumber, pvc pipes, metal anchors, bindim blanket, Readymix concrete, sand, clay, 25Mpa gravel, and steel Board .
	Equipment: concrete mixer, Circular saw, Hammer and Drill .
	Labor: Civil Engineer, Construction coordinator, Mason, Servant, Carpenter and Shipowner .
Deadline	30 days straight
Investment	.....
PROJECT MANAGER DATA	
Responsibility	Monitor the implementation of the services and answer the client's request.
	Make purchases of supplies and equipment.
	Perform payment of labor.
Authority	Have complete freedom as to service and local authorities.

INTERESTED PARTIES			
NAME	**POWER**	**INTEREST**	**EXPECTATIONS**
Contractor	Client	High	Have work performed within certain quality.
Civil Engineer	Hired	High	Make wishes come true/customer expectation.
APPROVALS			
AUTHOR		**REVIEWER**	**APPROVER**
Civil Engineer		Civil Engineer	Contractor

Source: Authors, (2019).

According to table 1, it is possible to understand how the application of the term project opening, it informed the project data containing your background, purpose, description, required resources, term, investment, the parties concerned and their responsibilities.

Table 2: Project Management Plan.

PROJECT MANAGEMENT		
WORK PACKAGE	**DESCRIPTION**	**RESPONSIBLE**
Project management and execution of the services	Application of knowledge, skills and techniques in the execution of the contracted activities to achieve the set goals of the project based on the existing standards to achieve quality of service.	Project Manager and Civil Engineer .
analysis	Survey and study in place for the development of activities and services.	Construction site coordinator.
Procurement of materials and equipment	Quote, analysis, purchase and delivery of equipment and supplies required.	Construction site coordinator.
Development	Specifications, testing, documentation and control the executions of services.	Civil Engineer.
Deployment	Execution of side Walls and drainage network.	Skilled labor.
Closure	Adjustment, correction and evaluation of the project.	Project Manager, Civil Engineer and coordinator of works.
Delivery	Deliver project/completion of service contract by the customer.	Project Manager.

Source: Authors, (2019).

The table 2 presents the project management plan, it was informed the conduce of the project, stating how the project will be executed, managed, monitored and closed.

The project manager together with your strategic team (Civil Engineer and coordinator of works) will make available to the client monitoring reports and that will contain the information about the term, and elapsed time of the work, in case of change in scope the project manager must come in direct contact with the client to the appropriate approvals and knowledge.

As for service, it is your responsibility to follow up and guide the Civil Engineer labor to perform the service in accordance with the current standards of ABNT, the safety of its employees is applied in your scope.

The modifications shall be adopted in accordance with the procedure laid down in the Integrated Control of changes and will only be carried out with the necessary approvals delivered with the proper authorization of the client.

In the context of the project, changes may occur for various reasons, the factors that cause changes may be:

- Changes in the constructive process defined in project;
- Changes requested by Stakeholders to increase or reduce functionality in product design;
- Changes requested by the client;
- Changes proposed by the project team in order to meet the technical particularities that may arise during the development;
- To enter/change a new component (software or hardware) in order to meet the needs of the business.

These variations impact absolutely in scope, time and quality of the project. In order to establish clear procedures and formal, if necessary the creation of Change management process.

This procedure is a collection of documented devices that define the steps through which the official documents of the design can be changed. This process includes working papers, monitoring systems, scope, various requests and approval levels necessary for authorizing changes.

These "Changes" must also be documented so as not to cause further problems to the project and the client.

Table 3: Project Management and Knowledge.

PROJECT KNOWLEDGE		
FUNCTION	**PROFILE**	**COMPANY**
PROJECT MANAGER	Civil Engineer, knowledge of project management methodology, experience in infrastructure projects, Supra and drainage Network structure, communication skills and interpersonal skills	HIRED
CONSTRUCTION SITE COORDINATOR	Civil Engineer, experience in infrastructure projects, Supra and drainage Network structure, experience in purchasing/procurement of inputs and equipment, communication skills and interpersonal skills.	HIRED
MASON	Construction experience on reinforced concrete.	HIRED
SERVANT	Construction experience on reinforced concrete.	HIRED
POINT GUARD	Experience in building in reinforced concrete, steel structure frame.	HIRED
CONCRETE MIXER OPERATOR	Experience in concrete walls, pillars, beams and match the stroke set by Civil Engineer .	HIRED
CLEANING ASSISTANT	Deliver project/completion of service contract by the customer, clean and organized .	HIRED

Source: Authors, (2019).

The table 3 displays the specifications and guidelines regarding the implementation of the activities to be carried out in project.

Monitoring and control as the implementation of the project will be of full responsibility of the Civil Engineer, being responsible in transmitting such information to the project manager.

Team members will be subject to periodic review and performance that should follow the following indicators, such evaluations will be performed by the Civil Engineer, will apply a 0 to 10 for each indicator set in the control of execution of the Project.

The survey of materials, supplies, equipment, effective will be done daily for the General control of the terms that occur in the work.

Table 4: Control and Execution of the Project.

CONTROL OF THE EXECUTION OF THE PROJECT		
BOOKMARK	**DESCRIPTION**	**PERIOD.**
COMMITMENT	Involvement in the activities of the project developing and improving its capabilities	DIARY
CONFLICT RESOLUTION	Ability to solve problems with people involved in the project	DIARY
COMMUNICATION	Interaction and objectivity on the information generated and exchanged during development of the project.	DIARY
DEADLINES AND COSTS	Ability to manage time and costs in the project	DIARY
CREATIVE AND INNOVATIVE	Present attitudes and ideas different from routine but that present positive results.	DIARY
CHANGE MANAGEMENT	Flexibility in the face of changing situations or decisions	DIARY

Source: Authors, (2019).

In table 4 are the way to control the quality of the project was defined through the Scope, requirements and Costs, indicators, metrics and meta.

The Change request is used whenever you identify a change and that can be incorporated into the Project.

Any Intervenor may detect a need for change in the execution of the project. In any case, the project manager is responsible for drawing up the standard form of Change request. It is the responsibility of the project manager together with your team to evaluate the impact of strategic changes, align, and get the best way for your deployment, checking previously if the change is really needed.

Once detected the change and displayed on the form, the project manager will evaluate the impact on the project. The project manager will have up to 1 (one) working day to perform the analysis of change, showing the delivery of same. The evaluation process will be observed the following:

- Change in tasks that were hit so far;
- Change in the agreed delivery times;
- Resources needed to carry out the changes;
- The pricing changes, reflected in the form.

Done all these procedures, the project manager will submit your request or request for change to the client and should review and approve such request (the change will only be carried out with the approval of the customer).

Table 5: Form (Change request).

LOGO	DATE -
	N° -
	PROJECT NAME -
	START AND FINISH -
Change Requested By	
Date of Request	
Information About the Change	
Description of the Proposed Amendment	
Description of the Reasons for the Amendment	
Impacts if the Change is not Implemented	
Alternatives to Consider	
Change in Cost	
Budgeted Total Cost	
Total Revised Cost	
NOTE :	
PREPARATION	
DATE :	NAME/SIGNATURE :
APPROVAL	
DATE :	NAME/SIGNATURE :

Source: Authors, (2019).

The table 5 presents a Change request form, it was created with the purpose to register the entire change, identify the impact, time, costs, determine the best alternative to effect change, and obtain the approval of Actors previously, before starting any action associated with.

The project will be considered as terminated only after formal approval between the project manager and client, which will see through the project documentation if the deliveries actually were performed according to the specified and all items in the

scope were contemplated. To do so, will be completed the term of termination of the project below, which should be signed and filed in the finally Project documentation the project is only terminated with the approval of the client.

Table 6: Project Closure Document.

PROJECT CLOSURE DOCUMENT		
LOGO	DATE -	
	Nº -	
	PROJECT NAME -	
	START AND FINISH -	
DELIVERIES		
SERVICES	DELIVERY DATE	
ACCEPTED _____ _____ CLIENT PROJECT MANAGER		

Source: Authors, (2019).

V. RESULTS AND DISCUSSION

The Integration Plan of construction and repair Project was developed in a coherent and effective to meet best the client and the contractor get maximum control of your services and deadlines.

Therefore, the contractor will meet both customer expectations as the expectation of the same run their services safely and in accordance with the regulatory standards.

The project seeks to meet the project management, time management, Cost management, Quality management and Human Resources and their respective controls.

The more control we have over our process, more savings and satisfaction to meet the client will be serviced efficiently facilitating the execution of the services of its employees and answering directly the deadline agreed between contractor and Signed.

VI. CONCLUSIONS

Project management is increasingly in notoriety on universal vision. The deprivation rapid results associated with the increased competition and difficulty of the business world makes the competence in project management is an important success factor for the Organization.

These elements imply still on duty if organizations build capacity to coordinate, manage and control their activities in order to respond in the best way possible, to external stimuli. Such peculiarities are closely linked to project management and to the success of the implementation of the organizational strategies.

In this way, projects can be defined as a way to plan, execute and control actions aimed at the implementation of strategies. The better the management of these, the better the results and benefits achieved.

The result obtained by applying the integration management was satisfactory, as the work occurred in accordance with the planning meeting customer expectation, the only step that management was not used was the request control change.

Through from study, available to other organizations in this segment, civil construction, a plan of integration projects that do not demand large or expensive resources, not requesting the hiring of consultants, experts, equipment for your deployment.

VII. ACKNOWLEDGMENTS

First the God who always blessed me of grand way, putting the angels in my life so I can accomplish my goals.

My father Luzinaldo Peixoto da Silva that with your unconditional love, lost nights of sleep, resigned for goals I could reach my, turned me into a man of character and success.

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RESEARCH ARTICLE OPEN ACCESS

THE SYSTEM FOR THE STUDY OF HEALTH AND THE SAFETY OF THE POPULATION ON WATER QUALITY OF THE CACHOEIRA GRANDE WATER LOCATED IN THE SÃO JORGE NEIGHBORHOOD IN MANAUS CITY

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ABSTRACT

For a long time, water was considered only as a means of consumption for the survival of living beings. I was not concerned about its quality for its own consumption. But over time, due to many deaths from drinking non-potable water, there have been various adaptations and technologies have emerged for better consumption and treatment of this material. The objective of this research is to analyze the water quality of the Cachoeira Grande stream located in the São Jorge neighborhood in the city of Manaus in order to know the health and safety of the residents and the general population of the Amazonian capital. The analyzes were performed through the physical, chemical and microbiological characteristics of the water collected in three distinct points, near the margins of the stream. The results analyzed were already obvious and yet were disturbing, since there is a great neglect that concerns society in general.

Keywords: Water, Quality, Features.

I. INTRODUTION

The most precious asset that the world's population has is water. Through its use, it meets numerous personal needs involving economic activities such as social, agricultural and industrial. It is through her that we have been able to stay alive since the beginning of time.

[1] The water is a fundamental substance in biological functions as it acts as a solvent for human body fluids and as a transport medium for ions and molecules in cellular functions, as well as regulating body temperature. About 70% of the human body is made up of water. [2] Drinking water is generally constant in its composition, although some microbiological and physicochemical variables may interfere with quality. The presence of pathogens in water and / or how they occur: collection, transportation, storage and general use are factors that compromise the quality of water consumption.

However, its misuse has been more studied in recent years due to the concern with its quality. [3] There is a need to frame water resources at different quality levels as they are assigned to multiple uses.

The main sources of contamination through water resources are sewage from untreated cities that are discharged into rivers and lakes; landfills that affect groundwater, rain-fed pesticides being dragged into rivers and lakes, miners that release chemicals such as mercury into rivers and streams, and industries that use rivers as carriers of their waters toxic, waste showing that such actions bring problems that are difficult to solve [4].

Given the above, this research performs water quality analyzes of the Cachoeira Grande stream in the São Jorge neighborhood of Manaus. Within the scope of this project, the health and safety of the population, living there is determined.

II. BIBLIOGRAPHICAL REFERENCE

II.1 WATER QUALITY

Water is one of the most widely distributed compounds in the earth's crust and covers about 70% of it. It is the essential and indispensable element for the maintenance of life, not only for its

peculiar characteristics, but for the fact that no metabolic process occurs without its direct or indirect action. Under these conditions, it is essential that its presence in the environment be in appropriate quantity and quality for its subsequent use [5].

[6] The geological, geomorphological and vegetation conditions in the drainage basin, the performance of terrestrial and aquatic ecosystems and human action may alter water quality. Anthropogenic actions are those that have the greatest impact due to the release of pollutant loads in water systems and the change in land use ends up causing direct interventions in the river system.

The term water quality does not only address the state of water purity, but also the physical, chemical and biological characteristics and depending on these characteristics, various destinations for water are determined. The water quality of a given water resource is evaluated depending on the substances present in the water, called water quality parameters. Such substances characterize the conditions in which water are found, for various uses, including its preservation in the environment [7].

The main concern regarding water quality is certainly related to human consumption. One of the biggest risks to our health is fecal contamination. This is why microbiological analysis of water is so important [8].

[8] Worldwide contaminated water, often associated with poor sanitation, kills about 1.6 million people during the year. According to the Ministry of Health, the cost generated for the treatment of diseases transmitted by contaminated water in Brazil is equivalent to US $ 2.7 billion per year.

Figure 1 below shows the reality of water quality in most streams in the Amazonian capital in the middle of urbanization.

Figure 1: Water quality of the Cachoeira Grande stream in the São Jorge neighborhood in Manaus with the naked eye.
Source: Authors, (2019).

II.2 ENVIRONMENTAL DEGRADATION AND SOURCES OF POLLUTION

The legislation that conceptualizes environmental degradation in Brazil is Law Nº. 6.938 of August 31, 1981, which provides for the National Environmental Policy, which deals with the adverse alteration of environmental characteristics [9]. With the increasing degradation in watersheds, aquatic ecosystems end up serving as deposits of a great diversity and quantity of man-made pollutants, whether by air, soil or directly in the watersheds. Thus, pollution of the aquatic environment, caused directly or indirectly by man, produces deleterious effects such as: harm to living beings, danger to human health, negative effects on aquatic activities (fishing, leisure, etc.) and damage to water quality with respect for use in agriculture, industry and other economic activities [10].

Figure 2 below demonstrates the lack of awareness of both the population and public agencies regarding the neglect of Urban Solid Waste (MSW) in the streams of Manaus.

Figure 2: Urban Solid Waste (MSW) disposed in the Cachoeira Grande stream in the São Jorge neighborhood of Manaus.
Source: Authors, (2019).

II.3 CONSUMPTION AND NON-CONSUMPTIVE USES OF WATER

The importance of water is not only related to its functions in nature, but to its role in human health, economy and quality of life. From a cultural point of view, water also plays an important role in building and growing civilizations, such as the Mesopotamian and Egyptian civilizations that developed along the Tigris and Euphrates and Nile rivers, respectively [11].

[12] Water uses are classified as consumptive and non-consumptive uses. This classification occurs according to the amount of water demanded and the qualitative and quantitative losses generated after the uses.

[13] The consumptive use is that in which a certain amount of water is withdrawn from the springs, which after being used, is returned in smaller quantity and / or with inferior quality, causing qualitative and quantitative damages. [14] In Brazil, the consumptive uses of water are distributed in irrigation (63%), human supply (18%), industrial sector (14%) and animal use (5%). The high water consumption in this type of activity causes significant losses, leading to waste and contamination of both surface and groundwater. In fact, efficient use in the irrigation process can control the damage caused to water resources and soil.

Water from industrial use can carry toxic wastes such as heavy metals and debris from decomposing materials.

Non-consumptive uses use water in their own springs without having to remove it from the catchment system; or after their capture, return fully to their sources. For example, electricity generation, navigation, effluent dilution, fishing preservation of flora and fauna and recreation [15].

They are directly related to water quality, especially those intended for primary contact recreation, such as swimming, water skiing and diving, which must follow the standards set by [16]. However, all these activities (advisory and non-advisory), to a greater or lesser extent, pose risks to the aquatic environment when handled without proper control and enforcement.

III. MATERIAL AND METHODS

III.1 AREA OF STUDY

This study was conducted in the São Jorge neighborhood, west of the Amazonian capital - Manaus. Its geographical

coordinates of latitude are 3º 106' 458" South and of longitude are 60º 029' 169" West. According to the census of the Brazilian Institute of Geography and Statistics (IBGE), its population is 21,643 inhabitants [17]. The figure 3 below shows the territory of the neighborhood highlighted in red with about 292 hectares of territory.

Figure 3: Geographic localization of the territory of São Jorge neighborhood in Manaus.
Source: Adapted from [18].

It is noted that only a part of the stream was conducted because the length of this stream is huge from which it cuts through the city, passing through almost all areas of Manaus.

Figure 4 below shows the location where the collections were made for this study, in this case, the Cachoeira Grande stream, in the São Jorge neighborhood.

Figure 4: Place where the water samples were collected from the stream.
Source: Adapted from [18].

IV. APPLICATION OF STUDY

IV.1 SAMPLING

The procedures adopted for the analysis of physical, chemical and microbiological parameters of the collected water meet an empirical investigation model, based on testing procedures and controls of some monitoring study variables used in laboratories.

Figure 5 below points out the collection points for the analysis of the water quality of the Cachoeira Grande stream.

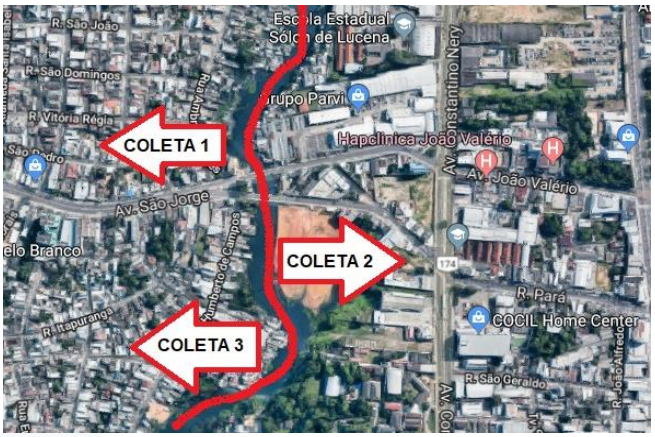

Figure 5: Collection points for water quality analysis of the Cachoeira Grande stream.
Source: Adapted from [18].

IV.2 WATER CHARACTERISTICS, MONITORING AND ANALYSIS VARIABLES.

The water analysis can be defined in 3 categories [8]:

a) Physical tests: indicate properties detectable by the senses;
b) Chemical tests: determine the quantities of mineral and organic substances that affect water quality;
c) Microbiological tests: show the presence of bacteria and other microorganisms, characteristics of fecal contamination.

IV.2.1 PHYSICAL ANALYSIS.

For the physical analysis of the water collection points of the stream, the following characteristics were observed and recorded color, turbidity, total solids (dissolved or suspended), odor and taste.

IV.2.2 MICROBIOLOGICAL ANALYSIS.

At this stage of this research, one can consider the most important of all analyzes. Microbiological analysis, in relation to the collected water, shows the presence or absence of pathogenic microorganisms, either by fecal contamination (human or animal feces) and / or indicators of sewage contamination, which can be by a series of intestinal pathogens. , whether bacteria, viruses or parasites called coliforms. The major concern is that they can cause various diseases of bacterial origin such as diarrhea, typhoid fever, intestinal infection, bacillary dysentery, acute gastroenteritis, cholera, including death.

[8] Drinking and treated water should not contain pathogenic microorganisms. In practice this means that it should not be possible to detect the presence of any coliform in any 100 ml sample.

IV.2.3 CHEMICAL ANALYSIS.

In the chemical analysis of the water it evaluates the presence of a selected group, where it can be identified: the Hydrogen ionic Potential (pH), the temperature, the hardness, the alkalinity, the acidity, the Dissolved Oxygen (DO) and metals, as well as Nitrogen Total (NT) and / or Total Phosphorus (PT).

V. RESULTS AND DISCUSSION

In research with data collection or experimental using interviews, medical records, assessments of people or animals it is necessary to insert the main results obtained with the development

of the research. Figures and tables can be inserted. It is important to highlight that in systematic literature review research, the work may also be presented with results and discussion.

V.1 WATER CHARACTERISTICS, MONITORING AND ANALYSIS VARIABLES.

V.1.1 PHYSICAL ANALYSIS.

Table 1 below shows the characteristics of suspended solids in water is very large due to the amount of material collected, as well as the other characteristics are present in the samples, such as color, turbidity, odor and taste.

Table 1: Physical characteristics of the quality of the water collected in the Cachoeira Grande stream.

Collected Water Characteristics - Physics	**Sampling**		
	1	**2**	**3**
Color	Present	Present	Present
Turbidity (NTU)	1,8133	1,6867	1,7600
Odor	Present	Present	Present
Flavor	Present	Present	Present
Complementary Features			
Total Suspended Solids (mg / L)	55,8777	62,1111	41,8444

Source: Authors, (2019).

V.1.2 MICROBIOLOGICAL ANALYSIS.

Table 2 below shows that the sample 3 collected in the Cachoeira Grande stream, in relation to the microbiological analysis of total and fecal coliforms, showed no presence of microorganisms; it may be because of the water current and / or being a little distant from homes or not. Further study could be certain.

Table 2: Microbiological characteristics of the water collected in the Cachoeira Grande stream.

Collected Water Characteristics - Microbiological	**Sampling**		
	1	**2**	**3**
Organic Matter (mg / L)	1,2	1,8	1,6
Total Coliforms	Present	Present	Absent
Fecal Coliforms	Present	Present	Absent

Source: Authors, (2019).

V.1.3 CHEMICAL ANALYSIS.

For the chemical analysis, a conventional method available at pool and equipment stores was firstly used for the analysis of Hydrogen Potential (pH) of which no collected samples are acceptable and may have alkalinity and / or acidity as shown in Figure 6, below.

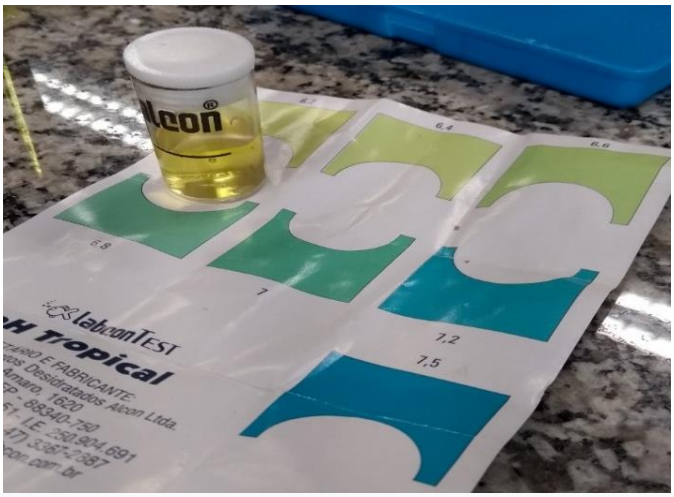

Figure 6: Preliminary chemical analysis of water pH by the pool method.

Source: Authors, (2019).

From this result (figure 6, above) specific analyzes were performed as shown in table 3 below.

Table 3 - Analysis of the specific chemical characteristics of the water collected in the Cachoeira Grande stream.

Collected Water Characteristics - Chemistry	**Sampling**		
	1	**2**	**3**
Temperature (ºC)	29,0	27,5	28,5
Dissolved Oxygen - OD (mg/L)	2,6	3,0	2,8
Total Nitrogen (NT)	Present	Present	Present
Total Phosphorus (PT)	Present	Present	Present
Toughness (mg/ L)	17,1	14,6	16,0
Hydrogen potential (pH)	4,8	8,6	4,0
Alkalinity (mg/ ppm)	140	160	130
Acidity	Present	Absent	Present
Metals	Absent	Present	Present

Source: Authors, (2019).

VI. CONCLUSIONS

Having clean water is essential for the survival of every living being on this planet. Not knowing if it has a good quality for consumption is a death sentence.

In previous centuries, when there was no treatment of sewage, drainage, septic tank, among other methods and means of treatment of water, many people died due to numerous diseases transmitted by contaminated water be it coliforms, acidity, alkalinity and so on. we saw in this research. Even in the current century, a recent study by the Brazilian Institute of Geography and Statistics (IBGE) shows that the state of Amazonas is the 5th state of Brazil without water and / or sewage treatment, which becomes alarming and worrying for the population. in relation to public health in the state, of which most of the responsible public agencies deal with this situation with much disregard.

With this in mind, this research found what was already obvious, a poor quality of water from the streams (igarapés) that run through the state capital where 80% of them serve as city sewage without any treatment. Less than 40% of the sewage water is treated and / or returned to the population to be consumed again, which results in a concern about the health and safety of the residents of the city of Manaus and especially of the studied area, São Jorge neighborhood. The results found here were already

expected, but the technical feasibility of this research aims at this concern, emphasizing, even if it is for a minority of the population, the kind of treatment that residents of the Amazonian capital generally treat our most precious asset, Water.

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RESEARCH ARTICLE OPEN ACCESS

PROPOSAL FOR INTERVENTION THROUGH REBA FOR THE PREVENTION OF WORK-RELATED OSTEOMUSCULAR DISORDERS (WRMS)

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ABSTRACT

This study presents a bibliographical review about the evaluation of the main complaints of the attendants of a real estate company located in the city of Iranduba/AM. to designate the set of injured musculoskeletal alterations, affected by the workers. To evaluate the main indicative complaints of WMSD. The research was conducted in the internal facilities of the company object of this study. Where a questionnaire was applied with the aid of the REBA tool. The sample of this research was composed by 6 collaborators who work in the company attendance in the morning and afternoon shifts. Data collection took place in June 2019. The data collected through this study indicated important indications of the body regions most susceptible to musculoskeletal disorders related to the profession of attendant.

Keywords: Ergonomics. DORT. Prevention.

I. INTRODUTION

This study has as guiding assumption that health increasingly needs investments for its prevention. Given the inadequate working conditions offered to employees in the companies, the International Labor Organization (ILO) has considered the problem as a discussion, and during the last years has made recommendations regarding occupational hygiene and safety, whose objective is to promote the adequacy good working conditions as a way to prevent Work-related Musculoskeletal Disorders (DORT).

In order to understand the practical and theoretical benefits in improving the complexity of the relationship between man and work, the concept of Ergonomics arises, whose purpose is to act directly or indirectly on people's quality of life. Within this context is the relevance of this study, which aims to evaluate the main pain complaints of employees of a company located in the city of Iranduba / AM., Where it will be treated here as Company "X".

Within this scenario emerges the question to be answered in this research: What factors contribute to the emergence of DORT? Thus, this study assumes the objective of making an ergonomic analysis in a real estate company using the ergonomic tool REBA. Within this scenario, it is relevant to take care of the Occupational Safety Engineering professional, who, besides detect or confirm, its function is to alert to the problem and prevalence of problems arising from the profession, presenting prevention strategies and seeking to raise attention to self-care in health.

Since the ergonomic approach proposes prevention measures from what employees do to protect their own health against the risks present in the workplace. In this sense, Maciel et al. (2015) comments that ergonomics has played a fundamental role in preventing workers' conditions, as it allows the evaluation of working conditions and environments, proposals and implementation of technical and administrative solutions, thus reducing the frequency of DORTs.

For the academic this study becomes important, mainly because the world market scenario is increasingly demanding and lacking of qualified professionals, who understand particular aspects that involve the WMSDs. The research will also contribute to the generation of research sources based on data collected in current articles and published works in order to inform the actual practice of Ergonomics in the prevention of DORT's.

II. DEVELOPMENT

This study presents the study about the evaluation of the main pain complaints of Company X employees, where it is pointed out that the work-related musculoskeletal disorder (DORT), This is the nomenclature currently used most by occupational health and medical researchers to designate a set of injured musculoskeletal changes suffered by workers resulting from their professional practice. [1].

According to Ramos (2014), such disturbances are currently becoming the main cause of removal of workers from their duties in all countries, thus gaining the status of the newest epidemic in the world. In Brazil there are few studies on the prevalence of WMSDs, according to IBGE information, WMSDs are among the most prevalent occupational diseases registered in Brazil.

This lesion can be defined as a work-related syndrome, characterized by the occurrence of various concomitant or not concomitant symptoms, such as pain, paraesthesia, heaviness, and insidious fatigue usually appearing in the upper limbs, but may also affect lower limbs [2].

Among the most common complaints related to WRMS are localized, radiated or generalized pain, discomfort, fatigue, and heaviness. In the most chronic and severe cases, excessive sweating of the hands and allodynia may occur (sensation of pain in response to non-harmful stimuli in normal skin).

Usually the symptoms are insidious in evolution until clearly perceived. It is often triggered or aggravated after periods of increased work or long hours and in general, the worker seeks ways to maintain the development of his work, even at the expense of pain. The decrease in physical capacity is perceived at work and outside of it in daily activities [3].

These are closely related to the fast pace of work, which often has no pauses for recovery, with insufficient rest to compensate for the wear and tear caused by their inadequate working hours, the work of attendants is directly or indirectly causing the development of the work. DORT's [4]. In the studies by Ramos (2014), the author points out that, Among the activities most related to DORTs These include services for workers including telemarketing, cashier, typing, bookkeeping, assembly of small parts and components, footwear, sewing, packaging, telephone operators, treadmills, cooks, cleaning workers, dental assistants. cane cutters, quality control, butler, whip assembler, image pipe assembler, machine operation, computer terminal operation, administration assistant, accounting assistant, telex operation, typing, bricklayer, secretary, administrative technician, kitchen worker, butler, electrician, clerk, cashier, receptionist, janitor, lab helper, tipper and vulcanizer.

The risk factors of WRMS cannot be analyzed independently, as they interact with each other and must always be analyzed in an integrated manner. They involve biomechanical, cognitive, sensory, affective and work organization aspects. For example, organizational factors such as workload and rest breaks can control frequency and intensity risk factors [3].

However, it should be emphasized that the prognosis depends on early diagnosis and treatment and the removal of the work that causes the morbid process, since only in these circumstances is it effective. In the most severe states, injuries are irreversible and disabling and mental distress can be intense. Thus, the workers' lack of information about this disease is a factor that makes its evolution not the best possible, leading to irreversibility with the consequent incapacity for work. Thus, the importance of health professionals to elucidate the worker as much as possible, avoiding superficial or confusing orientations, as the patient may not take his or her disease seriously, due to its insidious onset (RAMOS, 2014).

Although the Unified Health System (SUS), in recent years, has advanced greatly in ensuring citizen access to health care actions, only from 2003 the national policy guidelines for the area began to be implemented [2]. Between the Strategies for the implementation of Comprehensive Occupational Health Care, the implementation of the National Network for Integral Occupational Health Care stands out. The creation of these measures had as its guiding axis, the importance of occupational health for the development of any institution, in this sense physiotherapy is of vital importance and one of the main resources in the treatment of WMSDs [5].

The research was conducted at the internal premises of a real estate company located in the city of Iranduba / AM. Where a questionnaire with 10 objective questions was applied in order to achieve the objectives proposed by this study. The sample of this research was the collaborators who perform the function of attendants in the company object of this study, located in the city of Manaus / AM., It met the Resolution 466/2012 of the National Health Council.

Data collection was performed by capturing images (static and dynamic) of the activities developed during the work of the attendants, using a camcorder and a digital camera. adjusted to capture a profile image of the individual.

The search in electronic databases (SciELO and LILACS) was performed using the terminologies registered in the Health Sciences Descriptors (Decs) created by the Virtual Health Library, namely Ergonomics, Physiotherapy. DORT Prevention. Data analysis and tabulation were performed using Microsoft Office Excel version 2007 software, and the data were expressed as a percentage.

After data collection and analysis, both in the subjective and objective methods, hypotheses were raised about possible occupational risks. The possible diagnosis of the postures acquired by the radio broadcasters, the working conditions, acquired habits, stressful movements and the work organization will guide the discussions of this research.

The real estate agent works in the realization of purchase, sale and administration of real estate. Administrative Assistant's main activity: whose role is to enter contracts, enter and check out the miscellaneous document system, spreadsheet creation, customer receipt, and industry organization.

For the development of this study, it was decided to make use of Rapid Entire Body Assessment (REBA), which was developed by Sue Hignett and Lynn McAtmney, was published in Applied Ergonomics in 2000. This method allows the analysis of the postures adopted in the work, of applied forces, types of movements or actions performed, muscle activity, repetitive work and the type of grip adopted by the worker when performing the work.

a) Division of the body into segments to be individually coded, and evaluates both the upper limbs, the trunk, the cervical spine and the legs.

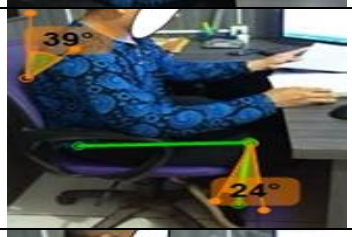
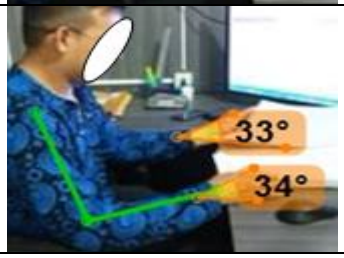
b) Analyze the repercussion on the postural load and load management performed with the hands and other parts of the body.

c) The result determines the level of risk that can cause injuries, establishes the required level of action and the urgency of the interventions.

d) Evaluate the duration of the excessive task and the composition of other elementary operations, secondary to the postures and movements recommended.

e) Record the different postures adopted by the worker during his workday, and capture in photographs and annotations in real time if possible.
f) Identification among all registered postures, those considered most significant or "dangerous" for subsequent evaluation with the REBA method.
g) Completion of the REBA evaluation form.
j) Refer to table A for score.
k) Consultation of the action level, risk and urgency of action corresponding to the calculated final value.
Initially, the activities performed by employees within the company object of this study were analyzed, as follows (Chart 1):

Table 1: Action Plan - Ergonomic Improvements.

SEQUENCE OF TECHNICAL ACTIONS			
ACTIVITY	**POSTURE REQUIREMENTS**	**BODY PARTS**	**IMAGE**
I. Sitting, filling out spreadsheets is carried out of documents.	- Extension – 0º – 20º.	- Trunk	
II. Sitting performing, closing the work plan.	- Flexion – 0º - 20º.	- Neck	
III. Sitting performing, closing the work plan.	- Flexion – 30º - 60º.	- Legs	
IV. Sitting, performing various document analysis.	- Flexion / Extension - 0º-20º.	- Arms	
V. Sitting performing light flexing movements with the forearms in the organization of documents.	- Flexion – 60º - 100º.	- Forearm	
VI. Sitting, analyzing work plan, performing flexion movements with fists.	- Flexion - Extension - 0º - 15º.	- Fist	

Source: Authors, (2019).

The employee of Rama Real Estate Purchase and Sale - Eireli performs an administrative function in which the activities applied by him are described in (Table 1) in the activity tab, in the postural requirements tab are placed the angles that serve as parameters for an ergonomic analysis according to tool REBA, In the body parts tab are the components that will be analyzed using the parameters established by the REBA ergonomic tool already described in the requirements tab, given the information contained in (Table 1) it will be possible to say the level of action and the level of risk that the employees of the Rama are exposed.

Generally, employees in the administrative sector are responsible for entering contracts, entering and writing off the miscellaneous document system, creating spreadsheets, receiving customers, and organizing the industry. Among the main aspects of difficulties described by the interviewees, 100% (n = 6) described wrist discomfort. Following the activity performs:
a) Monitors the flow of contracts in the system;
b) Answer phone calls.

Analyzes were performed using the ergonomic tool REBA (RAPID ENTIRE BODY ASSESSMENT), the employee's analyzed trunk member at the time of the administrative activities already described in this article was within the scoring range 2 where -> 0 ° -20 ° flexion / extension, the neck limb was within the scoring range 1-> 0 ° -20 ° flexion and the leg limbs were within the scoring range 1 where the position of the collaborator indicated that he was sitting on the bilateral support.

After analyzing the trunk, neck and legs, the same ergonomic tool (REBA) was used to analyze the following limbs; arm, forearm and wrist. The arm was within the range 1 -> 0 ° -20 ° flexion / extension, the forearm was within the range 1-> 60 ° -100 flexions and the wrist were in the range 2,> 15 ° flexion / extension.

After analyzing the members of the collaborator's body already described above, the load / force, grip and activity scoring tables determined by the REBA ergonomic tool were used to reach the conclusion that the collaborator is in range 2 as shown in (Table 2).

Table 2: Risk and Action Level - ergonomic improvements.

Action level	**Punctuation**	**Risk level**	**Intervention and further analysis**
0	1	Very low	It is not necessary
1	2- 3	Low	May need
2	4-7	Medium	Required
3	8-10	High	Required ready
4	11-15	Very high	Immediate acting

Source: Authors, (2019).

It was not identified during data collection, productivity pressure and / or fast pace. The administrative assistant works on business hours, meeting the needs of the client, from Monday to Friday from 08h to 17h, Saturdays from 08h to 12h, in compliance with the mandatory workload of 186hs monthly, 40hs weekly, meeting the CLT regime. The Administrative Assistant's routine does not have intense static movements or sudden upper / lower limbs, trunk, wrist / neck.

According to the company, concerns about pain complaints have been increasing, since this fact comes playing on paper important in the work development process, which can lead to the incapacity and possible death of the employees.

Thus, it is understood that occupational ergonomic management programs can be developed by the company focusing on the organization of work and / or worker. To this end, it was leaving at the premises of the company with the manager, the proposal of an ergonomic improvement action plan, as described below:

Table 3: Action Plan - Ergonomic Improvements.

What (improvement to deploy)	Do not perform sudden movements during activities / Maintain posture correction while sitting while performing the worksheet filling activity, Providencia.
Why (expected results)	Minimize physical wear, prevent injuries and illness in the worker.
Who (responsible)	SESMT
When (date)	Immediately.
How (procedure)	According to ergonomic analysis.
How much (R$)	x

Source: Authors, (2019).

This plan is justified by the fact that the configuration of the Administrative Assistant's activities is conditioned to perform most of his workday in the sitting position with slight movements of the upper / lower limbs, trunk, neck and wrists. Faced with this scenario the company can make use of physical therapy strategies, thus increasing the frequency and intensity of positive emotional states. However, it is noteworthy that WMSD can be linked to the work environment in which the individual is inserted.

III. CONCLUSIONS

Based on the analysis of this study, this study suggests the implementation of a program of Labor Gymnastics (GL), whose objective will be the promotion of health benefits for the attendants. Thus, increasing willingness to work and interaction among colleagues, as well as decreased pain complaints.

But to achieve such benefits, the company and its employees must be aware of the individuals who guide GL. This will consist of trained physiotherapy professionals for proper exercise programming and orientation.

In a final analysis it is discussed that the elaboration of educational programs for the prevention and recurrence of WMSDs through GL, which physics should be directed in order to trigger knowledge, attitudes and behaviors compatible with the area of activity.

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RESEARCH ARTICLE OPEN ACCESS

IMPROVEMENT OF THE CONSTRUCTION PROCESS WITH IMPLEMENTATION OF REGULATORY STANDARD No. 35 (NR-35): CASE STUDY

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ABSTRACT

In many construction texts, the risk of falling becomes worrying, often overlooked and / or overlooked as an employee or employee. The MTE (Ministry of Labor and Employment) presents 30% of occupational investments that occur each year and falls from a height. In order to reduce the rate of falls, a Regulatory Standard No. 35, located for work at height, with a reference capacity for this work was created. safety. And with the expansion over the years, an increasing number of accidents have been added, and so on, increasingly frequent. This work aims to implement a Regulatory Standard - NR 35 for an improvement of the work execution process.

Keywords: Standards (NR-35), Construction, Safety work.

I. INTRODUTION

With the warming of the construction sector not taking place in recent years, A large number of jobs were needed to meet all the demand. Offered As well as the significant increase in demand for labor, it is having to be more on a job of flower beds works, that due to own nature of the work that entails risks and may result in accidents of all kinds. Other determining factors that affect the industry are: employee turnover, ham as in environments, work processes, and as part failure to comply with basic worker protection standards [1].

With the growth of the construction industry it was observed that this The sector is one of the ones with the most accidents without work, so it is necessary to review the ways in which work is performed and the creation of standards that minimum security settings to be implemented to decrease a number of accidents. For this on June 8, 1978 was Ordinance No. 3.214, as Regulatory Standards, which have the purpose of to regulate occupational health and safety procedures. Such parameter standards for the different activities you can perform your activity to the best of your ability and with the maximum productivity, reducing / eliminating accidents. Beyond The rights and duties of employees and employers. [2].

This work aims to implement the regulatory standard (NR35), in order to better the process of execution of the works and bring benefits and safety to employees of a particular company.

II. DEVELOPMENT

The Brazilian scenario is very conducive to the wind sector and some characteristics conspire to this, such as the properties of the winds that have predominantly uniform direction throughout the year and constant across all seasons, thereby making it far more profitable and productive than in compared to a European plant for example, where its winds do not have such good properties and also the cost savings due to auctioning policies making it one of the cheapest energy sources in the country today [3].

Over the past twelve years, the average percentage of its share in the product gross domestic product (GDP) was approximately 5.1%.[3] In 2011, this percentage 5,8% and 21% of the industrial sector's contribution to this index.

When considering the entire productive chain of Industry Civil Construction, which includes the production and marketing

of materials, services, machines and equipment, comes to 8.1% of the same indicator, or R $ 297.6 billion.

For [5]"work safety is the science that operates on prevention of industrial accidents resulting from operational risk factors." [5] As stresses, there are numerous situations of risk in working environments that are liable to cause accidents at work, and therefore, the deployment of analysis of risk factors in all activities, with the objective of identify such aggressive factors and promote all the necessary prevention measures.

For [7] according to, security means a trust in loss prevention, a State and a condition of protection. Safety includes the prevention of early way of accidents by applying preventive and corrective measures risk conditions that can lead to accidents. [1]

According, [5] the accident at work is defined as: from a legal standpoint, the work is what accident occurs at work in the service of the company, causing personal injury or functional disturbance that causes the death or loss or reduced , permanent or temporary, of the capacity for work (art. 19 of the law 8,213/91).

The following will be presented concepts extracted from NR-35, NR-18, NR-6, as well as information goes up individual protection equipment, preventive measures and preliminary analysis of risks.

II.1 REGULATORY STANDARD N° 35

The Regulatory Standard (NR-35) establishes the minimum requirements of security to the employee involved directly and indirectly in work at height, all that, involving the planning, execution and organization. Not correct application of NR 35 may be related to lack of information or even the resistance to change the habits that were fairly entrenched, especially when workers are used to dealing with time, causing it to not notice the imminence of the risk and end up failing to carry out safety procedures. So, the importance of supervision, too.

[4] Responsibilities according to NR-35 (2012), it is the responsibility of the employer to ensure the implementation of the protective measures laid down in this standard, to ensure the realization of the risk analysis and, where applicable, the issuance of the work permit-EN; Develop operating procedure for routine activities of work at height; ensure prior assessment of the conditions in the place of work at height; adopt the necessary measures to monitor compliance with the protective measures laid down in this standard by the contractors;

Responsibilities according to NR-35 (2012) [3] it is the responsibility of the employer to ensure the implementation of the protective measures laid down in this standard, to ensure the realization of the risk analysis and, where applicable, the issuance of the work permit-EN; Develop operating procedure for routine activities of work at height; ensure prior assessment of the conditions in the place of work at height; adopt the necessary measures to monitor compliance with the protective measures laid down in this standard by the contractors;

As stated in the Manual to Aid in the interpretation and application of the NR 35, work at height is, therefore, any work performed within higher level to 2.0 m (two meters) of the reference surface and providing risk of falling. Access activities and output of the worker of this site should also respect and meet this standard. [3] All activities with risk for workers must be preceded by analysis and the worker must be informed about these risks and the protective measures implemented by the company, as it establishes the NR1. The provisions of NR35 doesn't mean it should not be adopted measures to eliminate, reduce or neutralize the risks in the work carried out at a height less than or equal to 2, 0 m.

In compliance with the guidelines established in NR 35, the employer and the employees involved in the construction industry, will be contributing to the prevention of industrial accidents caused by falls in work at height, with adequate security, accidents can be avoided . Job security is a set of technical measures, educational, psychological and medical used to prevent accidents, is eliminating unsafe conditions of the environment, is instructing or convincing people the use of practices preventive. [2]

Safety and hygiene are key factors in the prevention of accidents and the protection of employee health, since their actions and guidelines can prevent human suffering and economic waste harmful to the companies and to the own country. [6] The health and safety of employees constitute one of the main bases for the prevention of appropriate work force. Simple, hygiene and safety are two related activities, in order to ensure conditions able to retain the degree of employees ' health. [1]

II.2 PERSONAL PROTECTIVE EQUIPMENT-PPE

Personal protective equipment-PPE are specified and regulated by Regulatory Norm nº 6. The same sets IPE as "any device or product of single use used by the worker, for the protection of risks likely to threaten the safety and health of the worker." The company's duty to the free provision of PPE's to employees, and must be in perfect condition and operation. The NR-6 highlights that all personal protective equipment must have the certificate of approval-CA, approved by the Ministry of labor and employment. The types of PPE's are defined as the services or risks that may threaten the health and safety of employees. By NR-6 defines the IPE as protection on the part of the body, being the following:

1) Head protection: hood and helmets;

2) Eye and face protection: safety glasses, face shields, welding mask and face shield;

3) Respiratory protection: masks and filters;

4) Upper limb protection: gloves, hoses, clamp and BA;

5) Lower limb protection: footwear (boots and footwear), socks, leggings and pants;

II.2.1 EPI FOR HEAD PROTECTION

In accordance with Annex I of NR 6, helmet and hood are used for head protection. The helmets Act protecting against impacts from objects on the skull, electroshock and protection of the face and skull against operatives thermal. While the hood protects the skull and neck against risks of thermal sources, abrasive agents and scorers, in addition to protection against moisture originating from operations with use of water. Figure 01 shows a helmet.

Figure 1: Protection helmet for head.
Source: [8].

II.2.2 PPE FOR FALL PROTECTION WITH DIFFERENCE OF LEVEL

The security belt with locking device-fall is the PPE required in activities at height. The security belt with locking device-protects the user against falls in operations with vertical or horizontal movement. Other personal protection device used in work at height is the security belt with lanyard.

Figure 2: Safety Lanyard with energy absorber and type safety belt parachutist.
Source: [8].

Figure 03: Device used to lock retractable fall.
Source: [8].

II.2.3 SCAFFOLDING

In construction, in many phases of a work you must use scaffolding to perform certain tasks, however, these scaffolds should follow NR18 regulations to ensure total security to the worker. In your item 18.15, regulatory standard stipulates the operational requirements of the scaffolding, such structures need to be properly sized to support the workloads that are subject. The installation of the floor scaffolding must be level and have full lining, slip-resistant, and secured safely. The wood used in the scaffolding must be dry and of good quality, without knots or cracks. Around the perimeter of the scaffold you must use railing systems and footer, except for the side in which you work. The item 18.15 on scaffolding, regulating the requirements and restrictions of use of the various types of scaffolding, then listed some subitems:

II.2.3.1 SCAFFOLDING SIMPLY SUPPORTED

According to the standard work on scaffolds is prohibited on the periphery of the building without adequate protection secured to the structure of the same. It is prohibited the displacement of structures of the scaffolding with workers about the same. The structure of the scaffolding must be secured to the building by means of mooring and trucking in order to resist efforts to that subject. The towers of scaffolding may not exceed in height, 4 (four) times the smallest dimension of the base of support, if not cable-stayed.

II.2.3.2 SCAFFOLDING FACADE COMPOSITE

The scaffolding facade composite should not receive loads higher than those specified by the manufacturer. Your load must be distributed evenly, without obstructing the movement of people and be limited by the resistance of the covering of the work platform. The vertical access to the scaffolding facade composite should be made on the corporate ladder your own structure or through access tower. Scaffolding facade composite panels intended to support the floors and/or work as locking, after assembled to amounts, must be counterparts or locked with screws, brackets or similar.

II.2.3.3 MOBILE SCAFFOLDING

Scaffolding castors must be fitted with locks to prevent accidental displacement. The mobile scaffolding can only be used on flat surfaces.

II.2.3.4 SCAFFOLDING IN SWING

The scaffolding in the balance sheet should have fixing system to the building structure capable of supporting 3 (three) times requesting efforts. The scaffold structure must be properly brace and anchored, in such a way as to eliminate any oscillations.

The item of 35.5 NR 35 establishes that the IPE, anchoring systems and accessories must be specified and selected considering your efficiency, comfort, the applied load. Personal protective equipment shall be subjected to periodic inspection in order to observe any defects and deformations. And always before starting the activities the EPI, anchoring systems and accessories should be inspected.

All who submit defects or imperfect should be discarded and unused. In accordance with item 35.5.3, the seat belts must be of type parachutist and have device for anchoring system connection. Throughout the risk exposure, the worker must be connected to the system. In addition, the lanyard and the device crashes falls must be fixed above waist level, ensuring fall height restriction and ensure that, in case of a fall, minimize the chances of workers striking the bottom structure. The NR35, requires the use of energy absorber in the following situations: fall factor greater than 1, the length of the lanyard is greater than 0.9. The anchor points must be selected by professional enabled, must possess resistance to withstand the maximum load applicable and be inspected for your integrity.

III. METHODOLOGY

The proposed work was accomplished through a visit in loco and the Office in a company in the business of construction and a critical and reflective about the scientific subject obtained from the references.

The company is taken as a reference to this study is located in the city of Manaus/AM and works in the construction business, where information was obtained for the completion of this work. The company is a company in the business of construction. Your CNAE-4120-4-00 as NR-4 Specialized Security Service and occupational medicine-SESMT, company's risk grade 3 and due to the number of employees, the more the level of risk it is necessary to have 1 (one) professional job security. This organization is considered of medium businesses and has as its main activity the maintenance and renovation of buildings and building corrective federal agencies.

In the process of this work, there was an interview with the technique of job security along with the safety engineer Job, to see how it runs the work of staff running the service on time, which allowed the deepening of knowledge and qualitative results concerning the handling of standard Regulate within this company.

The activities carried out today by the company is cleaning the facade, painting in schools and various other work at height resulting urgently the implementation of regulatory standard Nr 35.

During the process of drafting this article was carried out a questionnaire with the safety technique for analysis of what the company follows for regulatory standard NR-35:

Table 1: Simplified questionnaire Results to standard NR 35 – data collection.

DESCRIPTION	YES	NO
In all work involving risk of falling above 2 m are obeyed the NR 35?		X
The company develops regularly work at height activities?	X	
There are operational procedures for the routine activities of work at height?		X
Exists in the company prior study of the conditions in the place where it will be executed the work in time?	X	
The company adopts necessary measures for the realization of a safe job?		X
The company adopts necessary measures to track compliance with the protective measures laid down in this standard to contractors?		X
Workers have access to up-to-date information about the risks and control measures?	X	
The company ensures that any work at height only begins after adopted protection measures defined on NR 35?		X
The company ensures the suspension of work at height when checking situation or unforeseen risk condition, whose elimination or immediate neutralization is not possible?	X	
The company establishes a system for the authorization of workers to work at height?	X	
The company ensures that all work at height is carried out under supervision, whose shape will be defined by risk analysis according to the peculiarities of the activity?		X
The company ensures the Organization and archiving of documentation provided in NR 35?		X
Workers with the dispatch procedures on work at height, collaborating with employer?	X	
Workers have the right to interrupt its activities by exercising the right of refusal, where they find evidence of serious and imminent risks to your health and safety or that of others, communicating to your superior immediately hierarchical, that it will make the appropriate measures?		X
The workers are instructed to protect your health and safety and that of others who may be affected by your actions or omissions at work?		X
The employer promoted workers ' capacity for work at height?		X

Source: Authors, (2019).

After the collection has been found that the company does not have an integrated system for regulatory norm nº 35, and does not have enough documentation for this work at height, was proposed the deployment of standards aimed at safety and convenience for enterprise and employee.

Figure 4: Worker in work without equipment.
Source: Authors, (2019).

And the lack of integrated system of regulatory standard number 35 made the developer of this comp to suffer a serious accident as the diary below technical report of enterprise security.

The data obtained in this diary shows the lack of enterprise and professional preparation to run such services on time which resulted in the crash of the professional of this company.

Table 2: Diary of works (the crash Reports).

Tasks performed	
Description	Comments
Application of mass execution and external and internal painting of the school Fr. silvio.	
Attachments:	
	
Occurrences	
Description	Type of Occurrence
EDMILSON DOS SANTOS accident occurred on stairs metallic, where the same was running a grid painting 2 meters from the floor level, unfortunately scareware ladder on the concrete floor, causing a sudden drop from the developer to the ground, the same f Hi oriented does not move and not anybody touch it, until the arrival of medical team (SAMU), medical team arrived at the crash site quickly, conducted mobilization procedures led the developer to the hospital closest accompanied with represent of the company.	ACTIVITY CARRIED OUT WITH DIFFERENT LEVEL BEING HELD ONLY BY ONE DEVELOPER AND INATTENTION.

Team involved		
Code	Description	Quantity used
	CIVIL ENGINEER	1,0
	MASTER BUILDER	1,0
Equipment's utilized		
Code	Description	Quantity used
	HELMET	1,0
	GLOVES	2,0
	MASK	1,0
	SAFETY GLASSES	1,0

Source: Authors, (2019).

The non-conformities observed in this condition match the lack of preparation of the company and its employees to carry out

work at height, lack of PPE and specific devices to perform activity in time, in addition to failing tests to verify that the specific person who will perform in service time fit for activity. The PPE and assistance to perform such activities as scaffolds, stairs became the biggest ally of the professionals who are constantly exposed to risks in the workplace, case of forest workers.

In General, the use of individual protection equipment and devices to aid generates a lot of benefits to workers and employers. Based on that what has been proposed for this company, was the regulatory standard NR 35 deployment to all employees and agents of the company, as the process below should be elaborated a prior assessment serves to determine what and where are the risks related to fall inside the construction site. For both, the NR 35 requires hear all activities that will happen during the work. This procedure must be done by professional work safety enabled.

Figure 5: Worker on scaffolding in the height of 2 meters.
Source: Authors, (2019).

IV. RESULTS AND DISCUSSION

As the data collected was proposed the implementation of the regulatory rule no. 35 for the company described, with the following step:

1) Make the prior assessment to find out what and where are the risks related to fall inside the construction site. Request specific medical examinations to work at height. For both, the NR 35 requires hear all activities that will happen during the work. This procedure must be done by professional work safety enabled.

2) Assign responsibilities as the NR 35, when prior assessment, it's time to determine responsibilities. For NR 35, both the company as an employee have responsibility in avoiding accidents with drop in height.

3) Educate workers about the NR 35, after assigning responsibilities, we need to ensure that people know what to do. Therefore, an important step in the implementation of NR 35 concerns the capacity building and training. The responsibility to train the employees of the company. Is the contractor must offer training for your employees perform the work at height. Ensure the program is practical and theoretical training. The minimum hours are 8 hours. Classes must happen within working hours.

4) Require the use of PPE specified by NR 35, awareness should involve the importance of personal protective equipment. The use of PPE is critical to the successful implementation of NR 35. Also, in this case the responsibilities are shared. The employer is obliged to provide and the employee is required to wear PPE determined by NR 35. According to NR 6, "the company is required to provide free of charge to employees the appropriate PPE to the risk. The PPE must be in perfect condition and operation.

5) Keep always updated procedures as well as any process, security procedures need to be updated periodically. Only in this way will remain valid and efficient to ensure safe work at height. The NR 35 requires that the company provide up-to-date information about the risks and control measures. And this is not done only by preliminary security dialogue, which precedes each activity. When new solutions to carry out work at height are adopted, the worker needs to be updated. That means investing in courses, training and guidance in accordance with the requirements of NR 35.

6) Archive and organize the documentation that the company complied with all the requirements of NR 35, have to prove that to the surveillance. And not just during the work, but for up 25 years after your conclusion. Ensure that documents are always organized and archived in a secure location. The use of management systems helps in this task.

7) Count on the aid of technology to manage is very beneficial to construction companies keep full control over the requirements of NRs, in particular the NR 35. To increase process efficiency, it is possible to use automated systems

Such steps take place in review the programmed procedures, revise the procedures programmed with study and planning of actions to perform and equalize the understanding to eliminate doubts and adopt safe working practices. Warn about other possible risks and not foreseen in the previous security instructions and discuss the Division of tasks and responsibilities, and list potential problems that result in changes in the service or procedures and identify real problems and that may have been ignored during the selection of work safety equipment, disseminate knowledge to create motivation and engagement. After the preliminary assessment, it's time to determine responsibilities for each. For NR 35, both the company as an employee have responsibility in avoiding accidents with drop in height. To meet the requirements of NR 35, it is essential to check whether the company has authorization process for workers who perform work at height, if it causes all work at height is carried out under supervision.

The format of supervision is defined by risk analysis. In other words, consider the peculiarities of each activity. If the same account with processes for organizing and archiving of documentation provided by NR 35, with processes for organizing and archiving of documentation by NR 35 if the same did the risk analysis (RA) and, where applicable, the issuance of the work permit (EN). To avoid accidents in work at height, NR 35 requires that employees also do your part and follow the norm: Exercise your right to refuse when they find that there are serious and imminent risks. The NR 35 requires that the worker report the fact immediately to your superior, ensure both the safety of your other people affected by your actions or omissions at work and comply with the requirements of NR 35 on work at height and collaborate with the employer in the implementation of security measures required by NR 35.

The awareness of workers about the NR 35 is very important to assign responsibilities, it is necessary to ensure about what to do. The NR 35 determines that the content of training must contain a minimum of rules and regulations applicable to the work at height, risk analysis and preventing conditions, potential hazards inherent to the work at height, Prevention and control and systems, equipment and procedures for collective protection. However, after the analysis of the visit we found that it is necessary the implementation of NR 35, viewed the improvement of safety and awareness of same, considering that most of the time the lack of preparation of the professionals result and big accidents.

V. CONCLUSIONS

Over the years, the search for worker protection has become in the construction industry, in view of the constant concern for the safety of the worker, because the thread does not have a culture and not make this issue as important

Thus, the need to use the knowledge in the relentless pursuit of solutions, through the improvement of security and the use of EPI's, be they individual or collective, however, what is observed is that even providing safe conditions of work and safety equipment, we still need to train the employee to the execution of its activities, as well as inspect it. This protection must be applied to all those who make the work happen, from the developer to the President of a construction company.

Taking as a basis the regulatory norms, which we assist in the preparation of plans, safety projects, work orders, etc. and who are always evolving to increasingly help us avoid greater risks This work then sought to show prevention measures for working at heights that enable the minimization of accidents at work and to preserve the integrity of the health of workers from the analysis and highlights analyzed in the study, it is recommended the implementation of regulatory standard for this company and collection of responsible for preventive actions, technical requirements and standards, to eliminate and/or minimize the incidence and accidents, unsafe acts and unsafe conditions.

VI. ACKNOWLEDGMENTS

God who taught me along this walk that was never luck, was always He, everything is for him, everything is from Him, who allowed me to realize a dream that was no longer my, yes it is a beautiful dream he had for my life, yet he all my gratitude For life and achievements.

My mother Francisca Nilza Ribeiro da Silva who never absolutely denied me nothing that has given up countless dreams and achievements to devote to my projects. To my father, Arnaldo Alves Taumaturgo who taught me to be strong, warrior, and that my mind and me to my person gave me the opportunity to become what I am to my brother Mateus da Silva Taumaturgo who is alongside all the achievements of our family.

Thank you for the Cardoso de Mattos-Fassera Higher Education Institute and the professionals who contributed to this work.

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RESEARCH ARTICLE OPEN ACCESS

IMPLEMENTATION OF A WASTE MANAGEMENT PLAN IN THE CONSTRUCTION SITE IN MANAUS: CASE STUDY

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ABSTRACT

The civil construction sector in Manaus is in continuous growth, just walk through the city and observe the excessive amount of construction, repairs and renovations. As a result, the development of techniques and methods to make sustainable day-to-day activities sustainable has intensified since the practice of reuse of construction waste is the worldwide trend towards mitigation of environmental problems. The reuse system is the technique that has been adopted by construction companies with the objective of lowering the environmental impact, as well as the reduction of costs with the creation of other new products of the same rhyme, which ensures the success of sales of the products in the construction market. As Manaus does not yet have a recycling and processing plant, as provided for in the COMANA Resolution since 2002 for these wastes, companies are at the mercy of the will of others that can easily lead them to places that are inappropriately used illegally. It should be noted that the survey carried out a survey of waste entering and leaving the worksite in the city of Manaus and proposed a roadmap for the implementation of a solid waste management plan to improve and correct waste disposal.

Keywords: Environment, solid waste, construction waste.

I. INTRODUTION

The large amount of waste generated and the inadequate disposal your refer to the urgent need for a joint action of society – public authorities, industrial and construction sector organized civil society – in the search for solutions that aim to minimize the environmental impacts, preserve natural resources, and improve the quality of life in urban areas from economic and sustainable works [1].

The final disposal of the waste is disposed of inappropriately, in your vast majority in landfills, contributing to proliferation of vectors compromising the environment and public health. The city of Manaus, capital of Amazonas, is no exception in this respect. The search for a solution to the problem of final disposal of waste generated by the accumulation and lack of proper handling of solid waste has aroused discussions, pressure from environmental agencies and prosecutors, mobilizations and intense search for alternatives aimed at the sustainable balance of the environment.

The development of techniques and methods for enabling the sustainability of day-to-day activities in construction sites is becoming a global trend for the mitigation of environmental problems caused by inadequate drops. The practice of recycling is being one of the alternatives of construction industries, being the most effective way for the low environmental impact, as well as reducing costs with the creation of other new products with the same raw material securing reuse of material or even just reusing them. Some benefits can be identified, such as: reduction in the consumption of fresh raw material; of areas required for landfills; the volume of solid waste, among other spaces mainly on the banks of the water present in the urban perimeter of the city of Manaus. [2].

During the construction process, whether at the beginning of the work, when the Assembly of the construction site, the first movements of land for the construction of any work, the generation of the first waste that linger until the completion of the construction of building with the waste of materials of finishes.

Thus, this work aims to raise and show the setting of the solid waste disposal and environmental aspects, that the city still

does not have a recycling plant for these materials or even a proper system of collection, handling, packaging and destination less impressive and seek alternatives in the development of a solid waste management plan aimed at the sustainable balance of the environment.

II. DEVELOPMENT

The solid waste management, in the context of improper final destination, according to [3] produces large environmental impacts, causing pollution of surface and groundwater, soil and air contamination and proliferation of diseases; are not only an aesthetic problem, but also represent a serious threat to man and the environment, decreasing considerably the useful spaces available.

The sound environment is of fundamental importance for a better quality of life for people within the cities, so it is necessary to carry out the integrated management of solid urban waste in the management of municipalities, whereas the inadequate conditioning of waste entails environmental and social damage, with the most serious health-related. Because, as the Agenda 21 document, from the discussions that occurred during the United Nations Conference on environment and development, promoted by the UN in Rio de Janeiro in 1992.

Currently nearly 5.2 million people – including children – 4 million die every year from diseases related to the trash. Half of the urban population in developing countries have no solid waste dump services which makes the handling of it.

In Brazil, as the Panorama of solid waste produced by [4] the numbers regarding MSW generation offers a yearly total of 79.9 million tons in the country. The [4] has identified that the comparison between the amount of MSW generated and the amount collected in 2015, which was of 72.5 million tons, resulting in a coverage of 90.8% collection for the country, which leads to about 7.3 million tons of residue without collecting.

Such improper disposal given to solid urban waste in the country, the waste is not collected by the urban cleaning service is dumped in rivers, streams and vacant lots or green areas in cities. Such waste provisions carried out inappropriately offer several implications on the environment and consequently on human health.

According to [5] "is currently demonstrated clearly the relationship between the proliferation of certain diseases and inadequate solid waste management". Therefore, the functioning of the management system and management of municipal solid waste of quality, as well as the contemplation of this service in the city in your entirety, substantially contributes to the minimization of various environmental impacts the urban quality of life of people has a direct relationship with the environmental health.

From the promulgation of the National Sanitation Policy, instituted by Federal law 11,445 from 05 June 2007, has been a concern with the management of solid waste, is jointly with the Brazilian solid waste Policy, established by the 12,305 Federal law of 02 August 2010 complements the regulatory theoretical solid waste management in the country, which shows a change in the Brazilian scenario as the measures taken the problem of municipal solid waste.

According to [6] municipal solid waste (MSW), under the Federal law n ◦ 12,305/2010, include household waste, that is, those originating from domestic activities in urban homes and urban cleaning residues, which are originating in the sweeping, cleaning of public places and public streets, as well as other urban cleaning services.

According to [7] worldwide, the construction sector stands out as the largest consumer of natural resources, mainly in mortar and sand and larger waste generator, so is considered one of the major causes of impacts environmental. Due to the lack of awareness and negligence of the population, many wastes are deposited in inappropriate places, cause various risks and environmental impacts, such as proliferation of vectors of diseases, siltation of streams and rivers, and therefore visual pollution, causing damage to the city and disorders like that and citizens [7].

According to [8], in the municipality of Caçapava (SP) are generated 100 t/day of RCC and dumped in inappropriate locations, without any form of reuse, these residues, which could improve the local economy when well handled. One of the main actions aimed to change this framework was the publication of the CONAMA resolution No. 307 of 2002, which classifies the waste into 4 classes (A, B, C and D) establishing the purpose of the use of the 3Rs (reduce, reuse and recycle), as well as other guidelines as the generator is responsible for the proper disposal of this waste among other purposes.

Due to the problems encountered by the great generations of RCC has several viable solutions to minimize environmental impact. Today there are many technologies for total or partial recycling construction waste with economic viability, reducing cost in the purchase of raw materials and in new raw material extraction. [9] So the RCC remains a problem and becomes a sustainable outlet for shortages of some materials extracted from natural resources.[10]

With recycling of RCC life cycle closes within the construction sector, being of great importance, bringing a balance between the demand and the availability of the by-product. [11]

According to [12] the recycling of waste is one of the most important management variables, since the generation of these is inevitable and that the processing with reinsertion of recyclable materials in the production cycle makes the economy more sustainable. According to the author, many are the advantages of recycling to society, such as: conservation of natural resources; energy saving; reduction of volume of landfills; reduction of pollution; job creation; reducing the cost of environmental control by industries; increased durability and economy of currencies.

However, one cannot defend the recycling only by environmental aspect. It is necessary to understand recycling as productive activity, because it generates employment, income and knowledge. In addition, recycling must be economically profitable, which would make the activities more attractive to the business community. [10]

III. METHODOLOGY

The proposed work was accomplished through a bibliographical research and on-the-spot visit in a company in the construction business and a critical scientific civil and reflective on the subject that were obtained from the references.

The company is taken as a reference to this study is located in the city of Manaus/AM and works in the construction business, where information was obtained for the completion of this work.

This organization is considered of medium businesses and has as its main activity the maintenance and renovation of buildings and building corrective federal agencies. In the process of this work, had a visit in loco a work with reform and preventive and corrective maintenance, which were estimated time of a month, with obtaining result through applications of interviews, as well as a survey that allowed the deepening of knowledge and qualitative results relating to the generation of wood waste in the organization. In addition, described the ins and outs of the steps in the process of

maintenance, as well as the waste from those steps. The interview was applied to responsible (civil engineer) by containing questions that addressed the forwarding process and treatment of wood waste, and on the operating conditions of the company on environmental issues.

The company cited above, requested that didn't have your name published, but gave extensive information and contribute to improve and this work solutions. Figure 1 shows where the company cited in the present work, services and reform in Manaus.

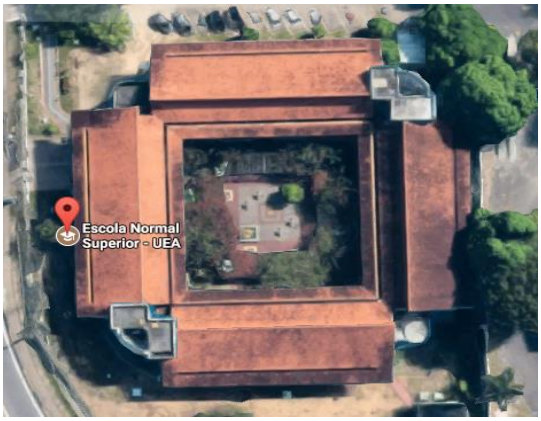

Figure 1: Higher Normal School – UEA – Where is made the provision of maintenance service and retirement.
Source: [13].

On-the-spot visit, the company cited earlier building maintenance service on higher education school-UEA with the object of building maintenance of the institution, and this maintenance is subdivided in stages, which were reported qualitatively all entries (inputs), outputs and waste generation, as described in table 1:

Table 1: Steps Performed by the Company, With their Respective Inputs, Outputs and Wastes.

Process steps	Entries (Inputs)	Out (Products)	Waste
Block masonry	Block, sand, cement, sand and mortar	Maintenance of the wall	Block and mortar
Pipes	Water, sewer, electricity.	Pipes	Pipes PVC
Finish (floor, wall and lining)	Plaster, paint, solvent and plaster	Floor, wall and ceiling.	Plaster, paint, solvent and plaster
Coverage	Wood, tile and Grout.	Coverage	Wood, tile and grout.
Final Finish	Mortar, glass, wood, paint and plaster.	Finishing	Mortar, glass, wood, paint and plaster.

Source: Authors, (2019).

During the visit it was verified the process that runs the same, since the start of the stage, is being disposed of some wastes come from work.

For a better understanding of the process of building maintenance activities are briefly described below: – maintenance of:

1) Block masonry wall, the parts requested in the survey of the said company.

2) Pipe-removal of damaged pipes and placing new pipes.

Figure 2: Facade of the Building of the UEA, Demonstration of termination of work.
Source: Authors, (2019).

3) Finish (floor, wall and ceiling)-was made necessary in order to repair and protection of appearance improvement.

4) Finish (floor, wall and ceiling)-was made necessary in order to repair and protection of appearance improvement.

5) Finish (floor, wall and ceiling)-was made necessary in order to repair and protection of appearance improvement.

IV. RESULTS AND DISCUSSION

During the visit it was analyzed that the company does not have a correct disposal for wastes from the works, everything was exposed the solution to the problem, being necessary to the implementation of a solid waste management plan or PGRS, as are known, are implementing national policy instruments which contribute to a greater control of the disposal of waste by the public authorities. The preparation of these plans by the Government will help to improve the selective collection of solidarity already implemented by many institutions.

It is understood, therefore, that public institutions should draw up their plans, since the selective collection, based on Decree No. 5,940/2006 and therefore may improve the actions already implemented aimed at management and allocation environmentally appropriate. This, no doubt, will contribute to increase the quality of recyclable and income generation of collectors of recyclable materials. It should be noted that public bodies must be geared to promote exemplary actions that have as their purpose the sustainability.

Environmental education should be understood as one of the basic instruments are indispensable in the process of environmental management, providing a permanent reflection, being necessary to train and empower each participant as co-responsible for management of the actions deployed. The plan must incorporate:

• 1st phase: Municipal Waste Management Programmer of construction, designed, implemented and coordinated by the municipality;

• Step 2: construction waste management, elaborated and implemented by the generators.

The projects of construction waste management are developed and implemented by the generators not framed within the Municipal programmed of construction waste management. Presents itself, then, a suggested script for preparing the project, as

well as a model for separation of waste in a construction site. What would be proposed to the company, would be a plan of solid and liquid waste produced by the works, the separation of each residue in their respective collections.

Table 2: Proposal for Allocation and Actions and Waste – (sustainable alternatives).

Residue	Fate and actions
Dump steel, concrete, mortar, finishing materials, brick, tile, shackles, fabrics, cardboard, plastics, wood	Is prohibited the burning of trash or any other material inside the construction site. All debris will be collected, stored in suitable location for your subsequent withdrawal. The steel scrap can be stored separately. Will be provided by the responsible for cleaning equipment needed for debris removal.
Material from the experience of the construction site containers, paper, plastics, rags, scraps of food.	The waste generated in the areas of experience must be placed in containers (wastebaskets) and collected and stored in plastic bags and placed in suitable location for the subsequent recoil.
Dust and light splashes of waste plaster, plaster dust, dust of Earth	Will be provided by the responsible for cleaning equipment needed for your removal. During the removal of rubble, unloading and transportation of materials should be taken care of to avoid excessive lifting Dust and their attendant risks.
Sewage and wastewater	Sewage and wastewater (rainwater, excavations, etc.) should be collected separately, through independent systems. All sewage generated by the construction site will be collected through the existing connection. The toilets, sinks and drains are connected directly to the existing sewer network:

Source: Authors, (2019).

Whereas the construction waste generators must be responsible for the activities of construction, renovation, repair, and demolition of structures and roads, as well as those resulting from the removal of vegetation and soil excavation .

Classification and Separation model in the construction site for the implementation of the selective collection of waste in a work, suggests the following steps:

Step 1: planning of actions to take effect and where they will be deployed, in order to target efforts to that the goals are reached.

Step 2: mobilization of personnel, which can be made by means of lectures, supplemented by posters, messages on pay stubs and other appropriate means.

Step 3: characterization of RCCs generated in the main phases of the work, being variable during your implementation. 03 table illustrates the main waste generated at each stage of the work and the most appropriate destination.

Table 3: Plan and Strategy for the implementation of collection.

ITEM	MATERIAL	CLASS	DESTINY
1	Construction steel	B	Marshalling yard of recycled
2	Aluminum	B	Marshalling yard of recycled
3	Wire	B	Marshalling yard of recycled
4	Sand	A	Inert landfill/Recycling
5	Sand	A	Inert landfill/Recycling
6	Hardened mortar	A	Recycling at Work
7	Hot Asphalt	B	Inert landfill
8	Cellular concrete block	A	Inert landfill
9	Common Concrete block	A	Inert landfill
10	Reinforced Concrete	A	Inert landfill
11	Hardened concrete	A	Inert landfill
10	Effluents, sludge and septic tank cleaning	D	Sewage treatment station (ETE)
11	Wire or aluminum cable	B	Marshalling yard of recycled
12	Wire or copper wire	B	Marshalling yard of recycled
13	Plaster	C	Create specific landfill
14	Plasterboard	C	Create specific landfill
15	Melamine blade	C	Landfill
16	Bodywork contaminated	D	Storage/industrial Landfill
17	Broken crockery	A	Inert landfill
18	Wood without chemical	B	Bakery ovens/boiler
19	Lumber	B	Bakery ovens/boiler
20	Vibrator hose	B	Landfill
21	Asphalt blanket	C	Landfill
22	Glass wool blanket	C	Landfill
23	Excavation material	A	Landfill

Source: Authors, (2019).

Step 4: assessment of the feasibility of the use of the components of the rubble.

Step 5: development of the entire process and arrangements relating to agreements, contracts, licenses, authorizations and other documents that allow the use of construction waste;

Step 6: development and documentation of procedures adopted for selection, packaging, dispatch and removal of waste. Provide containers for packaging materials to be segregated. On each floor, if applicable, must be taken to separate collection container, identified as the material to be selected. On the ground floor, cubicle installation is important to accumulate the collected

waste. The normalization of the default colors for the residue is given by Conama resolution 275/2001. Selective collection in construction site.

Step 7: establishment of transport logistics to removal of selected waste, in order to avoid accumulation in the construction site, which may discourage the separate collection. The selective collection of the waste from construction with the segregation in origin is of utmost importance for the functioning of the inert landfill, which can only receive class A waste.

Step 8: training of all those involved, through training. We also need specific training directed to officials who will make the removal of the waste from construction of containers for the stalls.

After this deployment the improvement in solid waste collection it is important to involve people with experience to aggregate in the strengthening of the issue as a way to recycle people with information and procedures updated, according to the strategies and logistics management.

It is essential that this reasoning is absorbed by all involved of the company and of the various sectors, and should become a standard knowledge of notions of selective collection seamlessly. Strategies for dissemination of knowledge and preparation of the servers, staff employees, students and visitors should include: training, sensitization and awareness, communication, development of multipliers and records of indicators.

Table 4: Plan and Strategy for the implementation of collection.

STRATEGY	BOOKMARK
Communication and training	Perform periodic training with employees (waste management, rational use of water and energy and good corporate practices);
Survey of waste management process	Check list of waste management applied to each sector and steps of the process, to highlight the improvements to be implement
Satisfaction survey	Questionnaire applied to the agents involved (sectors, servers, staff, General Services staff, students, guests)
Operational Procedures	Create warning system regarding incorrect disposal and, if possible, involve the cleaning crew through feedback of information

Source: Authors, (2019).

The development of the Action Plan is a management tool used for planning and allows the monitoring of the implementation of various activities so diversified and comprehensive, accessible and language having circulation in the quest to strengthen the waste management team, helping to achieve certain goals and objectives.

Some actions and initiatives implemented are important and recommended for correct waste management effectiveness on the part of the management team, committed to spreading knowledge and care processes. CITES, for example, the revision of the strategies used to assist the achievement of the goals of this PGRS as practices are adopted.

V. CONCLUSIONS

Solid waste the work generates, can be recycled and used in the actual construction site. With the deployment of equipment for recycling not only reduces costs, but it helps to preserve natural resources and minimize the environmental impacts caused by the construction sector. Noting that natural aggregates are finite and exhaustible resources, so viewing a future replacement for recycling will be something optional and will be mandatory.

On what was discussed, this study sought to show the construction waste generated on construction sites in order to characterize them as the on-site visit carried out within the company, we can observe that in spite of the efforts of those responsible for company to give a correct destination in the trash, the company has just not doing the correct disposal. What was raising as a solution for this company was the implementation of the waste management Plans Construction solid-PGRSCC, in the company, the ultimate destination of much of the material generated goes to the municipal landfill.

By the fact of Manaus for does not have a Municipal waste management Plan of construction, nor a WEEE recycling plant that is part of the plan, each construction company adopts its means to practice the techniques of reuse and recycling to reduce the impacts to the environment and consequently reducing costs.

VI. ACKNOWLEDGMENTS

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RESEARCH ARTICLE OPEN ACCESS

REVITALIZATION PROJECT MANAGEMENT: A CASE STUDY IN THE CAMPOS ELÍSIOS SET SQUARE

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ABSTRACT

Regarding the historic squares of the city, several have reached a stage of total degradation others have disappeared or suffer from overuse or misuse. Methodology: bibliographic and field research. Revitalization deals with a series of steps that lead a given space to have new efficiency, a new sense of usability, improving its surroundings in order to provide its residents and visitors a better living and leisure space. The proposal has a modern architecture following the standards of reforms that are currently being made in all major cities of the country, among its modifications include the implementation of outdoor gym, playground, ramps designed within accessibility standards, tactile floor installation, etc. The cost of the project will be R $ 255,837.02 plus BDI rate of 23.89%, lasting 60 days for its completion.

Keywords: Revitalization proposal; Square; Projects.

I. INTRODUTION

Throughout history, the squares have always served as a meeting place for city dwellers, true public spaces for coexistence. The beauty of a square is constituted from its history, its landscape design and its urban design.

The integration between morphology, aesthetics and appropriation is what allows the formation of squares, such as symbolic spaces, places of memory, soul of the city. This is how we can understand the sentence above, because, in antiquity, cities were formed from their living spaces. To belong to the city, to be a citizen, to inhabit the meeting places, to share the worship, to attend the assemblies, to attend the parties, to accompany the processions, to experience the spaces, participating in public life. The square symbolized the city itself, as it was in this space that daily activities were developed[1].

A well-structured square, with attractive new urban furniture, adequate living space and accessibility, increases its usability for its residents, increases its share of visitors and makes its region an attractive for entrepreneurs to expand or start new businesses, enriching their locality.

The term "revitalization" is used when an area (space) acquires a new function, where its main objective is to transform existing areas into an entertainment and leisure space in order to promote reforms in the physical structure of public facilities through the planning of new measures. Its main activity is the buildings that constitute historical heritage, squares, buildings, among other areas, underutilizing or replacing degraded or abandoned areas, through the process of recovering old uses and urbanistic or natural attributes.

In a brief analysis of the locality, it was noted that, although there is a large and public space, there is a lack of new and attractive environments for the community, the square in question has a basic profile with benches and sidewalks, it needs to be improved to the point of becoming a reference in and around the neighborhood.

The need for improvement led the project to be implemented in order to make Campos Elíseos Square a reference point in the region and create a significant increase in its use, consequently increasing the commercial number in its vicinity.

Given the above, the overall objective is to develop a revitalization proposal of the square of the Champs Elysees square so that it can contribute to relevant improvements for the local population. And as specific objectives: Reach the population with

the construction of a free playground and outdoor gym on site; Make the square economically viable in the future, using as reference the squares of Avenida Nilton Lins and square of the Dom Pedro complex; Define a price breakdown table for project execution

The project aims not only to improve the Campos Elíseos Square, but also to serve as a starting point for innovating the existing square models in the neighborhood, creating something new for the region, refining the old one that can be reused, exposing urban innovations, improving thus the interaction between residents, bringing more security and new options for well-being and leisure for the community.

II BIBLIOGRAPHIC REVIEW

II.1 DEFINITIONS SQUARE

The squares, over time, taking into account the various aspects that involve them, such as definition, functions, uses and conceptions, have undergone significant changes. However, it is agreed that, despite the changes imposed by time, the squares still represent a public space of great importance in urban daily life [2].

Its origin is linked to the agora of Greece-commercial, administrative and political centers of the ancient Greek polis, where were discussed issues important to the lives of citizens. The agoras, derived from the Roman Imperial Forum and the great piazze and squares of major European cities [3].

In Brazil, the squares began to appear around the churches. The most sumptuous residences, the most important public buildings, the main commercial establishments, were all built near these public places that also served as a link between the community and the parishes. In our country, the term square is more related to garden spaces, while for dry spaces - such as European piazze and plazas - it has been adopted to call them broad, courtyards or yards. According to [4], one of the first gardens to be built in Brazil was the Rio de Janeiro Public Promenade, designed by Valentim da Fonseca e Silva and inaugurated in 1783.

In Manaus, the first public square was located near the former Mother Church of Our Lady of Conception and the São José da Barra do Rio Negro Fortress, the initial landmark of the occupation of the City [5]. This area is currently part of the Centro neighborhood and is located near Governador Vitório, Viscount de Mauá, Tamandaré, Bernardo Ramos, Gabriel Salgado and 7 de September avenues. there was an indigenous cemetery. It was later called Largo da Trincheira, a name believed to refer to a trench - a narrow, long channel, dug into the ground - that existed in its vicinity. At that time, this street extended from the current Nove de Novembro Square to Dom Pedro II [6].

In the Barra do Rio Negro City Plan, of 1844, raised by Captain Lieutenant Raphael Lopes Anjo (Library of the Army / RJ), as [7] this space appears as Largo do Pelourinho, a name that was possibly attributed to him. that was why there was a pillory in that area: a pillar of stone or wood where criminals and slaves were bound and punished. From the second half of the nineteenth century, the terrain of this square began to be subdivided, resulting from this process, two squares that exist to this day and will be addressed later: Dom Pedro II and Nove de November. Another public place considered one of the oldest is Largo da Campina, whose records indicate its existence since the 1840s. It was named after its location in the then Campina neighborhood - later called São José - in the area today. comprised of the current Epaminondas Avenue and Padre Ghislandi, Luiz Antony and Dez de Julho streets in the Center [8].

II.2 FIRST SQUARES OF MANAUS

II.2.1 NOVEMBER 15TH SQUARE

It was formerly called the Empress's Square, and a 5ndo n was built there around 1857. It stretched from the Brazilian street to the Empress's gamboa or stream. President Adolfo Lacerda (later devised the construction of a new 5ndo n and a 5ndo, between gamboa and the palace bridge. [9] The square was widened by Epaminondas de Mello in 1865, expropriating the block of houses next door. This same 5ndo n5nte ordered the restoration of the remaining wetlands, with land taken from the seminary courtyard, where a bank of Brazil branch is today.

In 1868 the square was completely grounded and, the following year, paved, for a total of over 800m², and was built the ramp of the empress's 5ndo. Subsequently, the 5ndo of the quay and the 5ndo n of Praça da Imperatriz were contracted, which was completed in 1871.

In 1870, the first seedlings of imperial palm trees, sent from Rio de Janeiro, and which remained there for many years, were planted there 5ndo n São Vicente Island. At the top of the square was the building where in the future would operate store 22 paulista [10].

II.2.2 OSWALDO CRUZ SQUARE

One of the most beautiful postcards that ever existed in the city, but which succumbed to the "development" and the carelessness of the public administrators and the population itself, this street initially extended from the old Brazilian street, nowadays Avenue Sete de Setembro. to the banks of the Olaria stream - arm of the Espírito Santo stream - next to the old provincial brickyard, and is therefore called Largo da Olaria. In the Plan of Villas de Manáos and Ega, raised

in 1845 by Raphael Lopes Anjo, this space already appears with the name of Praça da

Joy [11]. With the beginning of the Olaria creek grounding in the 60's of the 19th century, an area formed in front of the new Nossa Senhora da Conceição Matrix that was being built - and bordering the Espírito Santo creek, Praça da Imperatriz in honor. to Mary of Bourbon Sicily and Braganza, wife of the emperor Dom Pedro II.

From then on, both Lararia da Olaria and the new landed area had the same nomenclature [12]. In 1870, seedlings of palm trees, imported from Pará, were planted in the stretch of the old Largo da Olaria. Two decades later, on November 11, 1890, the municipal superintendent José Carlos da Silva Teles, at the proposal of the intendant Pedro Guilherme Alves da Silva, changed the name of the whole street to Praça 15 de Novembro, in honor of the first anniversary of the Proclamation of the Republic. In order to enlarge the area and complement the beautification project of this square, Governor Eduardo Ribeiro sanctioned Law 36 of July 29, 1893, which authorized the expropriation of buildings located on the banks of the Negro River. grounding your area. between November 15th Square and then Tenreiro Aranha Square, now November Nine.

II.3 SQUARES THAT HAVE ALREADY BEEN REVIEWED

Billiards Park is an urban park located in Manaus, on the banks of the Mindú stream, with the limits of Djalma Batista and Constantino Nery avenues and the Mindú and Cachoeira streams. It was inaugurated on October 24, 2006, by the Manaus City Hall, the

city's anniversary, with the objective of offering leisure to the population, while preserving the environment [13].

Revitalized in 2010, Saudade Square is the newest historic street to be returned to the people of Manaus. Built over 100 years ago, the square had undergone several interventions over the decades, being totally uncharacterized. For its revitalization, it was restored its original layout, where several lines, from all corners of the square, lead directly to the central monument of Terreiro Aranha, the first president of the Province of Amazonas, imposingly supported by a large marble altar adorned. with bronze shields [14].

Although relatively small, Praça da Saudade is an extremely pleasant place that, surrounded by trees and gardens displaying hundreds of yellow flowers, has become a popular spot in central Manaus. You can grab a quick bite at one of two on-site diners, or simply read a book sitting in one of its many benches. Besides that, for being located in an area with tall buildings, it is the best location in the city center to watch the sky during the evening.

Opposite the square is the building of Atletico Rio Negro Club, one of the state's soccer teams. On the site, about a hundred years ago, there was a cemetery, hence the popular name of the square.

III. MATERIAL AND METHODS

For a correct project implementation, it is necessary to follow specific standards conditions related to the materials that will be used and in the execution of the appropriate services.

For this project were consulted articles, monographs, projects, in addition to the following technical and regulatory standards; [15] ABNT NBR 6118/2014, [16] ABNT NBR 5682/2005, [17] ABNT NBR 5733, [18] ABNT NBR 12284, [19] ABNT NBR 1 367 [20] ABNT NBR 9050/2004. There will be a need for an engineer to oversee the execution of the project, a contractor to organize the services to be performed without doubt during the work and guard 24 hours to ensure safety on the construction site and other employees in the progress of the project. Work.

The services described in the project must be performed by qualified and qualified professionals, strictly following each step described in the project, and the materials to be used need to be of excellent quality to achieve a good return on safety and durability of the project as a whole.

IV. APPLICATION OF STUDY (REVITALIZATION PROPOSALS)

Stage where task sequence will be carried out, following the norms for a quality execution and within the proposed schedule.

IV.1 PRELIMINARY SERVICES

This item is intended to expose the initial activities required to begin project implementation. Some of them, such as temporary installations, demolition and demolition waste removal, land clearing, earthmoving (if leveling is necessary) and checking the surrounding conditions, as this is a work near homes. All services must be performed according to Brazilian NBRs and NRs regulatory standards.

IV.1.1 INSTALLATION OF THE CONSTRUCTION SITE

Construction site facilities must be in accordance with regulatory standard NR18 and Brazilian Standard NBR 12284, which deal with conditions in the workplace and living areas respectively.

- For the office, a container with toilet, dimensions of 2.20 in width, 2.50 in height and 6.20 in length will be used, made of steel sheets and coated for better thermal and acoustic comfort on the construction site.
- For the warehouse, a container with dimensions of 2.20 in width, 2.50 in height and 6.20 in length will be used, made of steel sheets and coated for better thermal and acoustic comfort on the construction site.
- For refectory, a container with dimensions of 2.20 in width, 2.50 in height and 6.20 in length will be used, made of steel sheets and coated for better thermal and acoustic comfort on the construction site.
- Provisional water installation, to meet the needs of the construction site, will basically be cold water and sewage. They should be requested from the competent bodies by the technical responsible, so that there are no interruptions in the supply of the work in progress.
- There is many equipment that use electric energy, with this affirmative the temporary installation of electric energy is necessary that meets the needs of the construction site. Table 1 exemplifies some equipment with their respective powers, which are commonly used in construction.

Table 1: Equipment power and supply system.

Equipment	Power (hp)	System
Winch	7.5 - 15	Three phase
Concrete mixer	3.0	Three phase
Water pump	3.0	Three phase
Electric saw	2.0	Three phase
Cutting machine	2.0	Three phase
Vibrator	3.0	Three phase

Source: [21].

- Installation of signpost, indicating details of the work and inscriptions provided by the inspection. The plate will have an area of approximately 10m², will be made of galvanized steel and installed in a space of good visibility and readable to the public.
- Plywood cladding of the order of 2.5m and impact resistant minimum 60kgf / m² will be used to surround the site, will be installed on the road 0.50cm from the curb, following the requirements of Regulatory Standard NR18.

Perimeter = (26.28m + 5.40m + 52.76m + 4.02m + 27.58m)
Perimeter = 116.04m
Area = 116.04 x 2.20m; Area = 255.29m²

IV.1.2 MATERIAL REMOVAL AND DEMOLITION

When there are constructions in the place where the work will be performed, it is possible to use part of the existing material. In some cases, nothing is reused, and needs demolition services.

NBR 5682 - "Contracting, Execution and Supervision of Demolitions" [ABNT, 1977], details some requirements for the contracting and licensing of demolition work, care that must be taken before, during and after the work and execution steps.

a) Removal of stacked and unmoved curb: Perimeter = 3.13m³.

b) Sidewalk demolition: Area = 500.97 m².

c) Gutter removal: A = 41.96 m².

d) Grass removal on slabs: Volume = 894.02 m³.

e) Removal of concrete benches (3.0 x 0.40 x 0.15): Total = 7 units, with volume = 1.26m³.

f) Post removal: Total = 1 unit.

IV.1.3 TRANSPORT OF MATERIALS

Service responsible for the transportation of all material and debris resulting from the removal and demolition services, local and accumulative waste during the work, for the cleaning and preparation of the land, with Average Transport Distance (DMT) up to 30km, by tipper.

(a) Mechanized tipping truck loading: Volume = 544.19m³.

IV.2 SOIL SERVICES

Earthmoving services can be understood as a set of excavation, loading, transporting, unloading, compacting and finishing operations carried out in order to move from natural terrain to new desired topographic conformation.

This item involves planning and organization that are essential to minimize environmental impacts. It defines where there will be excavations of slopes (slopes) and where landfills will be made, without margin for improvisation. Earthmoving should be organized so that volumes of mowing or digging are utilized on the ground itself, reducing boot-off.

IV.2.1 OUTDOOR GYM

a) Conventional leasing of the work by means of jig, whose total area is of 1 33,64m²

b) Land preparation as; leveling and soil compaction.

IV.2.2 PLAYGROUND

a) Conventional leasing of the work through jig, whose total area is 99.70m²

b) Land preparation as; leveling and soil compaction.

IV.2.3 SIDEWALK

a) Manual excavation of the area, up to a depth of 1.5 meters, using the 30kg bundle to strongly apex the trench bottoms:

Volume = 500.97m² x 0.08m

Volume = 40.08 m³

b) Layering of land in layers using a bulldozer, up to 30m distance.

c) Trench bottom trimming with 30kg bundle, in successive layers with a maximum height of 20cm, to avoid cracks and unevenness.

TOTAL = 500.97 x 15%

Area = 75.14 m²

IV4.3 INFRASTRUCTURE

This item will deal with the set of elements responsible for supporting the structure and all the processes that will still be performed and equipment that will be installed.

IV.3.1 OUTDOOR GYM

Space that will be used to practice functional exercises / physical activities, with free equipment, installed to meet the need of residents for better conditions of well-being.

a) Concrete ballast Fck = 20Mpa

Volume = L xbxe, where: L = Perimeter = 4 x 14.804 = 59.22m

Volume = 59.22 x 0.40 x 0.05

Volume = 1.18m³

b) Concrete block masonry with mortar, cement, lime and sand (1: 1/2: 8) and measuring 15x20x40cm. Area = 23.69m ^{2}

Area = 0.40 x 59.22

Area = 23.69m ^{2}

IV.3.2 PLAYGROUND

Space reserved for leisure, with free toys, installed to meet the need of residents for fun and leisure of their children and special people.

a) Concrete ballast Fck = 20Mpa

Volume = L xbxe

Where: L = Perimeter = 4 x 14.804 = 59.22m

Volume = 59.22 x 0.40 x 0.05

Volume = 1.18m³

b) Sand Ballast:

Volume = $V_{Excavation} - V_{Ballast} - V_{Masonry}$

Volume = 32.87 - 1.18 - 23.69x0.10

Volume = 29.32m ^{3}

IV.3.3 SIDEWALK

Existing pavement areas already paved will be removed in the demolition process. New implementations of sidewalks with structural blocks will be made, which will be settled on a layer of compacted sand in the area already signaled for its execution.

a) Sand Ballast: Volume = 459.36m³

IV.4 PAVING

a) Preformed curb laying: Perimeter = 466.18m

b) interlocked block of concrete, type holland, 10cm, 20Mpa without pigment and dimensions (9,8x10,0x19,8cm): Area = 459.36m²

c) Tactile alert and directional floor, according to Brazilian Standard NBR 9050/2004. It should be installed perpendicular to the direction of travel, in a color and texture contrasting with the rest of the adjacent floor: Perimeter = 197.47 m.

d) Ramp for Special Needs Carriers (PCD's), as specified in [20] . Size 2m x 1m.

Total = 2 units

IV.5 FACILITIES AND APPARATUS

IV.5.1 FACILITIES

a) Wooden bench with iron frame, concrete base, painted with enamel paint and varnish:

Total = 12 units.

b) Steel structure trash can with 01 paper bin 50 liters.

Total = 12 units

IV.5.1 APPLIANCES TO BE DEPLOYED AT THE OUTDOOR GYM

Guiding board for outdoor fitness equipment;
Hybrid triceps machine;
Hybrid bike tower;
Triple walk simulator;
High bar;
Hybrid bench press;
Leg press ;
Hybrid biceps;
High row;
Hybrid shoulder wheel for 6 positions.

IV.5.2 DEVICES TO BE IMPLANTED IN THE PLAYGROUND

Iron carousel, 6 seater, painting with synthetic enamel, ø1,50m:
House with slide and climbing net:
Triple Seesaw:
Triple balance:

IV.6 LIGHTING

Petal lamp with 4 luminaires, 400w x 220v steam lamps and ballasts:

IV.7 LANDSCAPE

Grass Batter Plates:
Area = 590.45m²
Regional tree supply with h = 2.00m

IV.8 FINAL SERVICES

Final cleaning of the work: Area = 1,247.20m²

V. RESULTS AND DISCUSSIONS

The proposed revitalizes ç will of the Campos Eliseos square is estimated at (US $ 255.837.02). Thus, it is a project to improve cond ESSONS the square, that is, the locals as well as, the nearby, will make use of an organized and revitalized site after the completion of the project.

The government and the city may carry out the project by dividing the costs for the execution as a whole. The project is essential for the place, as it is in a precarious situation and unable to be used by the residents.

The Campos Elísios square revitalization project will provide leisure and entertainment for the population, as others who have already gone through these processes, such as:

Thus, with the park and the square of longing, the square located in Campo Elísios, after its revitalization, will provide besides leisure, comfort for the population and pleasant moments with the family.

Children will also have their reserved spaces, with the installation of various equipment that will provide moments of entertainment and play among in locus children, as well as a safe fun.

With the support of the government and the city, the project has to be carried out, as well as implemented for the well-being of the population of Campos Elísios, so everyone wins with the implementation of the project, because it is a public space that needs revitalizations. and maintenance so that the population can enjoy the environment.

VI. CONCLUSION

Understanding the importance of a public space where leisure activities, physical activities and culture can be performed is the great challenge faced in big cities, we show in our work that we have always had squares and gardens linked to the history of our city and its peak in the century. Past governors and emperors have always attached importance to this type of construction.

It is relatively understandable today that municipalities have other priorities or other problems that they think are more important to solve given the economic crisis and low municipal revenues.

The concern was all about how to demonstrate to the city and to the population that it is possible to do a revitalization using a low budget and bringing the community of Campos Elísio to discuss and propose their ideas and suggestions always with a view to improving the place.

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RESEARCH ARTICLE OPEN ACCESS

DIMENSIONING OF WALKWAY IN REINFORCED CONCRETE

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ABSTRACT

Walkways are scaffolding erected to cross natural or artificial barriers and take care of the passenger's own safety. There are walkways over rivers, lakes, roads, railroads, valleys and also as connections between buildings, which aim at the physical distance between pedestrian flow and disorders that individuals are not able to cope with, such as water currents, the height of buildings and vehicles at high speed. The theme "Design of Reinforced Catwalk" aims to demonstrate how the design of a reinforced concrete walkway, showing the possible pathologies that may occur in these structures. The article followed the precepts of exploratory study, through bibliographic research, was developed from material already prepared, consisting of scientific articles. It has been found that it is important to consider the permanent load of the element. In the case of walkways, the load must be established in addition to its own weight, by variables that are part of the physical framework itself, other fixed overloads, such as: concrete slab, steel structures, paving, railing, signs, among others. . As for pathologies, it was concluded that the best option to prevent pathological conditions is prevention. Prevention is generated not only by a project or execution within the quality parameters, but mainly by a structural maintenance program. These programs play an important role in any structure, facilitating the verification of structural deterioration states and favoring the reduction of treatment costs. These procedures will certainly prevent the formation of marked and widespread pathologies.

Keywords: Reinforced Concrete, Walkway, Scaling, Pathologies.

I. INTRODUTION

A walkway can significantly decrease the number of run-over accidents in a given neighboring area. However, in order to fulfill its function, the structure must be in good working order, with an effective conservation, and it must also have a design that attracts the user's attention, that is, to make the user confident and safe in its crossing [1].

When the basic design is elaborated, it is important to analyze the structural systems of preambular research so that the design of the work is exquisitely combined with the site and various surrounding buildings, where appropriate. For this phase, it serves as a database a planialtimetric survey, surveys, geometric design of the crossing, number of passers-by at peak time etc.

Pedestrian flow is greatly reduced if a walkway is erected in an improper location due to lack of planning. Therefore, a good research or case study is important for walkway design, a strategically appropriate deployment site, top quality materials for both architectural design optimization and optimum structural design that allows for simplified maintenance [1].

The theme "Design of Reinforced Concrete Walkways" is fully justified as the construction of a walkway brings great benefits to the traffic, which reduces the time of crossing, favors drivers, who will also reduce the travel time by not having to stop at the signs.

The work followed the precepts of the exploratory study, through bibliographic research, which, according to [2] is developed from material already prepared, consisting of scientific

articles. In the selection of articles, the following steps were followed: evaluation of titles, evaluation of abstracts and reading of the full text.

The theme has the main objective of demonstrating how the design of a reinforced concrete walkway is presented, presenting the possible pathologies that may occur in these structures.

II LITERATURE REVIEW

II.1 CATWALKS

Walkways are definitive frameworks that, in addition to providing a cross between two points, can positively cooperate with the environment in which they are planted or mint an emblem for the region, a fact that must be taken into account when designing the project [3].

According to the Brazilian Traffic Code, the footbridge is the proposed work of art for pedestrian crossing. As [4] is a work for accessibility to buildings, furniture, spaces and urban equipment.

According to [5] footbridge is a long frame, for crossing natural and / or artificial barriers only for pedestrians and / or cyclists.

[6] ensures that the walkway allows crossing and secures a crossing with complete safety. Pedestrian walkways, according to [4], need to be provided with ramps, ramps and ladders, ramps and elevators or ladders and elevators for their transposition, and the ramps, stairs and elevators comply with this same norm.

Footbridges, or pedestrian bridges, are specific works of art temporarily or permanently built, proposed to overcome natural and / or artificial obstacles. In archaic times such transposition tools were architected in rope and wood, in the form of beams, braced beams, and simple reinforced beams. Civilization brought with its stone bridges even before the Christian period. Around the beginning of the 19th century, arched cast-iron bridges appeared, followed by wrought iron and steel materials, giving rise to the first large beam bridge with wrought iron cellular section [7].

The walkways can be evaluated and qualified mainly by four variables: Type of access, type of board, type of fences and type of structural system used.

According to [8] the access can be made in three level situations: two ends in the same planes of the pedestrians; only one end on the same level as the pedestrian walk; two ends at unequal heights of pedestrian walkways.

As for the board, [9] states that "a platform or bridge board is the part that immediately supports the road function elements, such as railways, tracks, sidewalks, ducts, etc.".

The function of the board is to directly assess the loads passing through the bridge. Structural systems are stipulators of the most important qualities of catwalks, they can determine their shape and plastic expression and give specifications or conditions concerning spans, supports, accesses, jigs and assembly processes [10].

The various types of catwalks can be categorized by the material used, the size of its span or the structural system employed. One of the most widely used structural systems is that of beams, which operate essentially with shear forces and bending moment [9].

For [8] the structural conformation of the beams is of the simplest, fundamentally constituted by only one element supported or embedded in columns or bases in the ground. The beam system is the most effective and cheap for small spans (10 to 25 meters), with low production, painting and maintenance costs, as well as ease of installation, requiring the use of light equipment and little intervention in local traffic.

II.2.2 ARMED CONCRETE

Concrete is conceptualized as an artificial rock created or developed from the combination and subsequent hardening of a binder (cement), water, fine aggregate (quartz sand), coarse aggregate (gravel), with or without chemical additives [11].

According to [12], the concrete execution steps are: characterization of the concrete component materials and according to NBR 12654; concrete dosage study; adjustment and verification of the concrete trace; concrete preparation.

The term "structural concrete" is one that alludes to the full spectrum of all concrete applications as a material used in structures.

III. RESEARCH METHODOLOGY

This work was developed from the research of the development concepts of the catwalk project, the concrete concepts were raised, from this concept, the elements such as catwalk design, dimensioning and the main pathologies were developed.

IV. STUDY APPLICATION

In this item will be presented the main elements of the development of a catwalk project, will be demonstrated from bibliographical references.

IV.1 DESIGN OF A CATWALK

For the design of a footbridge design, the points listed in the National Department of Transportation Infrastructure (DNIT) Rail Services Instruction No. 219 may be exceeded and considered for a variety of footbridge species and are not restricted to of railway crossing.

According to [13], the catwalk design must appreciate ways to deviate from its misuse. According to [14], some elementary directives allow catwalk designs a great aesthetic target. Such as, for example, the choice of appropriate geometry for the catwalk cross sections; option for light railing; opting for details that maintain the cleanliness and strength of the work.

Pedestrians may be encouraged to use catwalks by implanting flower boxes, railings, chains or other devices, which are seated to guide individuals to the catwalk, offering a little more charm or liveliness to this element. Pedestrians may be compelled to use walkways for physical hindrances that prevent the crossing of the runway, such as tall concrete walls and wire enclosures [1].

Positioning a catwalk is of vital value given that there is a certain aversion on the part of people to use them. According to the National Department of Roads [14]:

The generally undisciplined user should be practically compelled to use the catwalk; To do this, access ramps must begin and end at points of natural attraction such as street intersections, factory exits, schools, etc.

[...] Without a blocked road, without a heavy traffic, without favorable topographic conditions and without the existence of well-defined points of attraction, the walkway will be little used and will only serve to stifle the public clamor that arises when run over.

The place to be built a walkway may also influence the choice of the construction method followed, as it may not be

appropriate to temporarily interrupt one or more lanes in the street for the proper support or shoring of the work.

The Special Works Design Manual of the now defunct National Roads Department of 1996 provides some basic precepts that allow for aesthetically successful catwalk designs:

a) availability of areas for development of access ramps;

b) greide continuity throughout the work: central section and access ramps;

c) choice of a continuous structural system and, if possible, provided;

d) choice of suitable geometry for walkway, ramp and pillar cross sections;

e) choice of light railing;

f) choice of details that preserve the cleanliness and durability of the work;

g) The details chosen should be in proper proportion to the rest of the structure, emphasizing their lightness with artifices such as presentation of faces exposed on different planes, harnessing the favorable effects of natural shadows, etc.

Feedback is important as it will provide the minimum horizontal or vertical clearance required for vehicles to travel under the catwalk and continue to travel safely in the traffic lane. Thus, the measures of the template will define the sizes of the free spans of the work. The Urban Crossing Geometric Design Manual indicates in simplified tables the vertical and horizontal templates to be followed:

Table 1: Minimum Vertical Template.

Roads	**Vertical template (m)**
Expressways	5,50
Arteries that act as extensions of the national road system	5,50
Other arterial ways	4,50

Source: [15].

Table 2: Width of rolling tracks.

Track Category	**Rolling Track Width (m)**	
	Desirable	**Minimum**
Expressways	3,60	3,50
Arteries *		
Directive speed 60-80 km / h	3,60	3,50
Guideline speed 50-60 km / h	3,50	3,30
* Values exclusive width adjacent to curb, reserved for gutter, with a minimum value of 0.30 m.		

Source: [15].

Table 3: Width of shoulder for expressways and some primary arterials.

Number of lanes per direction	**Minimum width of shoulders (m)**	
	Internal	**External**
2 or 3	1,20 (0,60)	3,00* (2,00)
4 or plus	3,00 (1,00)	3,00* (2,00)
* Preferably 3.50 m, where an hourly volume of trucks is expected to exceed 250 vehicles.; ( ) minimum values under strict conditions.		

Source: [15].

Regarding the cross section, to define the cross section of the catwalk superstructure board it is necessary to check the laws, rules or manuals of good practice alluding to this type of structure. As recommended [15] “Pedestrian paths should have a minimum width of 2.40 m. Larger widths may be needed for exceptionally high pedestrian volumes, as they are in the central areas of large cities and around sports stadiums.”

However, [16] recommends a slightly larger width, stating that "The latest DNER catwalk designs show a tendency to adopt a very satisfactory overall width of 2.50 m."

Regarding the structural aspect of the option for the cross section, [7] points out some variables that interfere with decision making:

a) size of the gap referred to the structural system adopted;

b) available structural height or desired leanness, expressed as l: h or li: h, in case of continuity, where li = approximate distance between points of zero momentum (Mg);

c) construction process, available means, equipment, etc;

d) economics of the chosen construction process. Slender structures require a higher consumption of steel than less slender ones; On the other hand, the consequences on the ramps must be taken into account.

e) ratio q: g = moving load: eigen weight. Large values of q: g imply, in the case of prestressed concrete beams, additional amounts of concrete in the tensile flange, such as the adoption of double T or coffin sections.

The railings, on the other hand, are frames located on the side edges of the catwalk board with the purpose of securing the safety of the passerby. They can be formed by concrete, metal or mixed profiles and need to have elevation that varies between 90 and 100 cm. A concrete railing has the conveniences of more security, lower cost, less time-consuming maintenance and is not at the mercy of theft. However, they are much denser compared to a metal railing, and when it is not architectural art, they often suffer from a lack of aesthetics [16].

IV.2 SIZES OF CATS

Usually the walkways we find most on the highways of Brazil, are the concrete walkways, commonly prefabricated, have no roofs, and the method of resolving the gap is through ramps. There are other common catwalks like the metallic ones, usually have roofs, and use the ramps to overcome the unevenness.

In these works, the load level is much lower when compared to the road and rail bridges, which allows the construction of more economical, slender and flexible structures. However, safety and safety issues need to be taken into account. comfort for pedestrian movement [17].

According to [1], it is important to take into account in any dimensioning the permanent weight of the component. This load, in the case of catwalks, is established by the weight itself, the components that make up the structure and other expected overloads, such as: concrete slab, steel structures, paving, railing, signs, among others.

According to [18] it is necessary to take into account the moving loads to be used on the catwalks as the evenly distributed loads placed on the floor between the railings in the most unfavorable position, not taking into account the vertical impact coefficient. The static value of the evenly diffused moving load shall be adopted at 5.0 kN / m².

To minimize or eliminate any conflicts, [18] mentions that a 100kN point horizontal load, employed on the most disadvantageous target of the structure towards the traffic under the catwalk, must be estimated. Superstructure connections and walkway pillars must be examined for this exceptional action. The consideration does not extinguish the assumption of partial or total collapse of the structure due to the magnitude of a possible collision.

If walkways are narrow, lightweight, sensitive to wind and the dynamic action of pedestrians, they are recognized as special walkways, and should, if they are steel, mixed, suspension or cable-stayed structures, be certified for their overall stability and investigation of the various elements. through dynamic models and fatigue investigation.

As [4] mentions that pedestrian circulation can be horizontal and vertical. Vertical circulation can be affected by stairs, ramps or electromechanical equipment and is assessed as accessible when it allows at least two ways of vertical displacement.

Sizing a walkway will initially need to be based on the peak demand value, such as 3,500 pedestrians in 1.5 hours. From this data, the number of pedestrians per minute is calculated:

$$nº \text{ users /min} = \frac{3.500}{1{,}5 * 60 \text{ min}} = 39 \text{ pedestrians /min} \quad \text{(Eq. 1)}$$

Working with 40 pedestrians entering the walkway per minute, the desired level of service should be chosen to meet the peak demand period. The option will have a significant influence on the subsequent sizing steps.

After examining the different levels of service and their distinctions, it can be scaled to a level of service C at its peak hours, considering a space for each pedestrian equal to 2.5m2. By achieving these values, it is possible to determine the required footbridge area to accommodate new pedestrians:

$$\text{Area} = 40 * 2{,}5 = 100 m^2 / \text{min} \quad \text{(Eq. 2)}$$

Thus, in order to reach the required width in order to withstand peak hour demand with maintenance of the service situation never below level C, knowledge of the average pedestrian speed is indispensable. Based on the Highway Capacity Manual, it can be seen that for a population (which will make use of the walkway) composed of a maximum of 20% of people over the age of 65, an average value for speed can be considered. Developed equal to 1.2 m / s. You can proceed with calculating a user's average speed:

$$V_{average} = 1{,}2 * 60 = 72 m / \text{min} \quad \text{(Eq. 3)}$$

From this data, together with the previously calculated required area per minute, an initial estimate of the required width is possible:

$$L = \frac{100}{72} = 1{,}39m \quad \text{(Eq. 4)}$$

However, if the maximum demand is expected to occur in both directions at peak hours, the width should be doubled, resulting in:

$$L = 2 * 1{,}39 = 2{,}78m \quad \text{(Eq. 5)}$$

Paying attention to the suggestion of pedestrians' proximity to the catwalk ends - an additional 50 cm at both ends is indicated for pedestrians to feel comfortable about the height - the final width equal to:

$$L\text{final} = 0{,}5 + 2{,}78 + 0{,}5 = 3{,}78m \quad \text{(Eq. 7)}$$

Therefore, the minimum width required to meet peak hour demand conditions of 3,500 pedestrians in 1.5 hours and offering a service level greater than or equal to C is equal to 3.78 meters.

After evaluating all previous calculations, a width of 4.00 meters is adopted. This figure follows the action planned for a 20-year horizon, respects the desired level of service and allows stability and slimness to the structure to be achieved due to the existence of relatively large spans, estimated in principle at approximately 80 meters.

For simplicity, it is considered that disabled traffic will not significantly change the flow at peak time. This consideration is reasonable since sizing predicts a higher percentage of older people than expected, given the composition by age of expected demand.

V. RESULTS AND DISCUSSIONS

Due to the occurrence of several factors in construction, the study of pathologies in buildings has reached remarkable levels. Until recently it was thought that concrete structures would last forever. For a structure to achieve a satisfactory service life, it must have regular monitoring and maintenance.

When so much scientific knowledge was not yet available, the constructions were executed with very high dimension, thus causing works resistant to certain degrees of considerable pathologies without impairing their integrity.

However, nowadays, the advent of technologies has enabled improvements in both calculations and materials knowledge, works are built with more slenderness, more precisely and therefore require more care.

According to [19], the area of engineering that deals with pathologies is understood as the part of engineering that studies the systems, mechanisms, causes and origins of defects in civil works, i.e., it is the study of the parts that make up the diagnosis of the problem.

The structural pathologies found in bridges and walkways vary in intensity and incidence, often generating high cost for their restoration. In this respect there may be compromised aesthetics and sometimes reduced strength, and some may generate the best solution such as partial or total demolition of the structure.

Detailed analysis of the problem, identification and description of causes, forms of manifestation, mechanisms of occurrence, prophylaxis and structural maintenance are guidelines considered in the study of structural pathologies. The main foundation of the pathology of constructions is "to evaluate a structure that in a given period of its life presented inadequate performance, since the framework presented by it does not necessarily characterize condemnation" [20].

After considering the items in the previous paragraph, the professional will be able to diagnose cases correctly, possibly determining the usual therapeutic measures.

According to [19], it is necessary to study the correction and solution of these pathological problems. For the correct choice and application of therapy, a detailed study that presents the true diagnosis of the origin of the pathology is important.

The choice of either therapy is almost always related to economic or technical factors when a therapy cannot be used in a particular setting or is difficult to perform. When the structure does not have a pathological condition, a program of interventions to extend the structural life should be implemented. In other words, it is a periodic maintenance program.

The nature of concrete becomes unstable over time, due to its physical and chemical characteristics altered due to its

components and their responses to the impositions made by the environment where the structure performs its functions. Concerns about the performance of a building often focus only on its mechanical strength, suppressing one of the key factors that is durability [21].

According to [22] most of the technical standards regarding concrete in the most varied regions of the world only concern themselves with the issue of mechanical strength without paying due attention to environmental actions, which directly influence durability, as well as other factors such as minimum concrete strength and maximum water / cement ratio (a / c).

In Brazil, the penultimate version of NBR-6118/03 did not highlight the issue of environmental aggressiveness, minimum cement consumption, maximum water / cement ratio, and being condescending with small coverings. These items are directly linked to the durability of reinforced concrete structures.

The main factors that cause effects on reinforced concrete influencing its behavior are: quality of materials; water / cement ratio; environment; actions and quality in the construction process.

Engineering quality must be objective and not subjective, and the quality of a given product should be verified by adjusting it to the relevant standards. The water / cement ratio refers to the ratio between the amount of cement and water used to form the concrete. The amount of water used to promote the hydration reactions of cement compounds and give workability to the mass will indicate characteristics such as density, compactness, permeability, capillarity and the cracking itself, regardless of mechanical strength.

The excessive use of water causes voids and capillaries in the concrete, thus facilitating the transport of harmful fluids from the environment to the interior of the part, causing the carbonation of the concrete and corrosion of the reinforcement.

The environment affects the concrete through the release of gases and liquids that contain some type of aggressive chemical agent, these are introduced concrete by porosity and capillary network. As a result of industrialization, atmospheric aggressiveness has greatly increased, imposing a regime of behavioral changes and material variations, thus resulting in the effects of early corrosion and accelerated carbonation [21].

Unforeseen structural design overloads can cause many cracks, eventually collapsing. Such overloads may have been considered in the structural design, in which case the failure results from the execution of the part or the use of it [23].

The construction process can be divided into three parts: conception or planning, execution and maintenance. The three phases are subject to failure occurrences [22].

Understanding the pathological causes is essential to determine the correct treatment, so it is necessary to ensure that after the procedure of restoration of the building no new pathologies will occur. According to Souza; [22] The causes of structural deterioration can be divided into two major groups, intrinsic and extrinsic causes. Intrinsic causes are the causes of deterioration inherent in the structure itself. They come from the materials and components of the structure.

These causes are generated by human failures in the execution or use phase and by external natural agents such as chemical attacks and even accidents. Already the extrinsic causes, are those that are independent of the structure itself, as well as its composition or failures arising from the implementation. They can be understood as factors that attack structures “from the outside” in the process of conception, execution or its useful life.

Table 4: Intrinsic causes of pathologies in reinforced concrete structures.

Human failures during construction	
Concrete deficiencies	Transport, release, concreting joints, thickening, curing.
Inadequate shoring and forms	
Armor deficiencies	Misinterpretation of projects Armor Insufficiency Bad positioning of the reinforcement Insufficient concrete cover Improper bar bending Anchor deficiencies Deficiencies in amendments Misuse of Anticorrosive
Misuse of building materials	Fck less than specified Steel other than specified Soil with different characteristics Use of reactive aggregate Inappropriate use of additives Inadequate dosing of concrete
No quality control	
Human failures during use (no maintenance)	
Natural causes	
Causes proper to the porous structure of concrete	
Chemical causes	Internal reactions to concrete, expandability of certain cement constituents, presence of chlorides, presence of acids and salts, presence of carbon dioxide, presence of water, increase of internal temperature of concrete.
Physical causes	Temperature variation, heat stroke, wind, water
Biological causes	

Source: [22].

Table 5: Extrinsic causes of pathologies in reinforced concrete structures.

Human failures during construction	
Human failures during the project	Inadequate structure modeling, poor load evaluation, incorrect or insufficient detailing, environmental inadequacy, incorrect soil-structure interaction, incorrect consideration of expansion joints.
Human failures during use	Structural change Exaggerated Overloads Change in the conditions of the foundation ground.
Mechanical actions	Vehicle crashes, foundation failure, accidents (unpredictable actions).
Physical actions	Temperature variation, heat stroke, water performance.
Chemical actions	
Biological actions	

Source: [22].

VI. CONCLUSION

The design of a catwalk, no matter how small, has surprising implications that can have very positive or tremendously negative impacts on users, the media, society and the city as a whole. A walkway can reduce the movement of passers-by in the

other people traffic options and provide them with a faster or shorter course.

The demographic explosion in many countries calls for caution about many urban traffic variables that civil engineering professionals need to be prepared to avoid pandemonium and disruption in transportation strategies and logistics. Therefore, it is essential that the professional is aware of the importance of ordering and fluency of traffic, so as to make it as continuous and safe as possible in facing the progressive demands for accessibility, fluency and speed in the busy life of large cities.

Often, in order to build a masterpiece and make its name prominent among other professionals in the field of construction, the engineer or designer neglects a serious and detailed research of the surroundings, and also not giving due value to the study of Current intersections.

The design of a metal frame or reinforced concrete work requires dimensional refinement, without neglecting to comply with multiple safety factors, avoiding disasters, accidents or misfortunes.

It has been found that it is important to consider the permanent load of the element.

In the case of catwalks, the load must be established in addition to its own weight, by variables that are part of the physical framework itself, other fixed overloads, such as: concrete slab, steel structures, paving, railing, signs, among others. . As for pathologies, it was concluded that the best option to prevent pathological conditions is prevention. Prevention is generated not only by a project or execution within the quality parameters, but mainly by a structural maintenance program. These programs play an important role in any structure, facilitating the verification of structural deterioration states and favoring the reduction of treatment costs.

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RESEARCH ARTICLE OPEN ACCESS

APPLICATION OF WORK SAFETY STANDARDS FOR SLAB CONSTRUCTION

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ABSTRACT

The slabs, as it is a project above 2 meters must be aligned with the NRs, so that no accidents occur with workers during the execution of the project. Given the above, this research aims to: Analyze the Work Safety Standards for Slab Execution and as specific objectives: Contextualize civil construction; To show the problems of construction with respect to safety at work; Highlight work safety standards for slab execution. It was found that the use of NRs in the Lajes construction process is important, so that no accidents occur in the work environment, as well as during the entire construction process. In the construction process as a whole. The use of IPEs is proven to be highly relevant to avoid work accidents, as well as the lectures and guidance given by professionals to civil construction workers.

Keywords: Construction; Regulatory Standards; Slabs.

I. INTRODUTION

Civil construction is one of the fastest growing sectors and with this growth arise the respective problems: how the use of Regulatory Standards (NR) in the construction site and its supervision and implementation by professionals.

Thus, for [1] "construction, with the warming of the national economy, is one of the fastest growing sectors in the whole country. Along with the highlight that this sector has been presenting ", according to the author, there is also the concern with their respective problems, such as environmental degradation, waste of raw material, lack of qualification of professionals, scarcity of labor , the Work Safety Regulatory Standards (NR) that need to be enforced, especially in the execution of slabs.

The design of a slab to be reclaimed must be in accordance with NR 6, where it requires construction companies to distribute Personal Protective Equipment (PPE) to construction workers. Also, in accordance with NR 35, it establishes the requirements for the safety of activities performed at heights - that is, those performed above two meters above ground level, where there is a risk of falling.

The slabs, as it is a project above 2 meters, must be aligned with the NRs, so that no accidents occur with the workers during the project execution, as well as any other occupational accident related disorder.

Given the above, this research aims to: Analyze the Work Safety Standards for Slab Execution and as specific objectives: Contextualize civil construction; Show the problems of construction, regarding safety at work; Highlight work safety standards for slab execution.

This is a bibliographic research based on studies in books, articles and magazines already published, which portray this theme.

Therefore, its relevance to academia is an outline that will serve and contribute to new questions and studies aimed at this context. For the professional, the importance of being in the execution of the NRs, as well as the knowledge of them to put into practice when working with the Lajes project. For society, to be in the context of a work constructed safely and enlightened about the real NRs of the worker, because it needs to have knowledge for the construction of slabs.

II LITERATURE REVIEW

II. 1 THE CIVIL CONSTRUCTION INDUSTRY

The construction industry has had a strong growth in recent years, in this sense in the studies by [1], "signaling the strong growth of the construction industry in recent years has caused a mismatch between supply and demand for skilled workers".

According to [2], "civil construction is an activity that involves a large number of variables, being developed in a particularly dynamic and changing environment, which makes managing a work a complex work". In this sense, civil construction is an activity developed in a dynamic and changing environment, which is of high complexity.

For [3] the construction industry is one of the most suitable sectors to help combat unemployment that plagues the country. According to the authors, this is because it employs people with low level of Education and training, making use of their physical capacity, allowing access to the labor market of workers completely disqualified very quickly.

The construction industry sector creates jobs directly or indirectly, which favor the country's economy According to [1], "construction is an industry sector that absorbs a significant number of workers through direct or indirect jobs. , having fundamental importance for the economy of the country ".

In Brazil there has been a growth in the area of construction, According to sources from the Brazilian government the construction sector in Brazil showed a growth of 11.60% in 2010 and it is expected that in 2011 we will have a growth approximately 6%, among which we can mention the creation of the Growth Acceleration Program (PAC) [4]. This was due to sporting events such as the World Cup Olympics, increased purchasing power of the Brazilian population, improved infrastructure of cities and many others.

This increase and / or growth is occurring due to the warming of the sector caused by several factors, according to [5]. was able to supply this offer ". In this sense, growth in the area of construction However, the demand is failing to meet the need for hiring its employees.

For [6], "Currently, in the northern region of Brazil, there are on average 10,949 contracted enterprises. In addition to this volume of works, specific characteristics of the State of Pará justify this research ", according to the authors, namely a large territorial extension; limited use of modes of transport; long distances between supplier and consumer centers; and the scarcity of resources (labor and materials) in the civil construction segment. Companies in this segment have strong investments.

Companies have opportunities to invest in business planning, not just in the planning of works. The adoption of integrated management and decision making models that help define and monitor business indicators, productivity and risks [7]. Thus, such approaches also help to reduce operating costs and optimize resources. The adoption of new management methods is also considered a priority for the company.

There are major changes in this segment, however this sector was built by hand as indicated by [8], "the Brazilian civil construction sector was built by the hands of mostly illiterate and unskilled workers, now the sector pays price of years without investments in staff training ". In this sense, it is clear that the lack of responsibility regarding the commitment stems from several factors, as it is up to the workers the duty not to miss work, as well as to try to do it professionally, so that the work is delivered on time. requested and planned.

II.2 PROBLEMS THAT ARE COMMON IN CIVIL CONSTRUCTION

Construction methods that do not keep up with technological development, is the biggest problem of civil construction According to [9], "says that the biggest problem of construction in Brazil is that construction methods did not keep up with the technological development of the area".

The difficulty in getting new quality workers generates a problem that affects the construction industry, for [10], "the problem that affects the construction industry is the difficulty of attracting new workers in quantity and quality, a study carried out to The Construction Industry Institute, Texas USA "asked students about to graduate from high school, which career path they would like to pursue, 250 job options were presented, and working on a construction site was ranked 248.

According to [11], "currently one of the main bottlenecks present in the construction companies has been the lack of qualified manpower to perform the various services performed at different stages of the works".

In studies by [12], "the difficulties encountered in the design phase can cause irreparable damage to both the designer and the builder, so understanding between the parties involved is important," in this case, project team and team According to the author, the phase of construction projects is a fundamental part of the development of a project and mitigating such problems is important to everyone.

Good management in project design, manpower, project execution, construction logistics, and others, helps to avoid problems, as in the Construction sector, it is not uncommon to identify expenses above budget, late deliveries, conflicts with customers and suppliers [10]. In most of these enterprises, the problem is only identified during the execution, but it originated during the planning phase, but it was not possible to notice.

Good management avoids several problems in the realization of the construction project, as [10] points out., "Good management of the supply sector is critical to controlling the quality of materials and avoiding delays in procurement and delivery."

For [10], "a material purchase planning, availability studies, pre-order strategy, requisition processing / control, relationship between various sectors and functions, receipt control, guarantee of deadlines for all supply management activities are essential."

Concerning the electrical, hydraulic, fire and gas installation projects, [13] "says that this construction process suffers a great interference from other subsystems such as masonry, electrical installations, air conditioning and even the structure itself". The author also points out that in addition, there are problems related to misuse after occupation and problems inherent in the material used.

II.3 SAFETY AT WORK: A CHALLENGE IN CIVIL CONSTRUCTION

Execution failures due to plant incompatibilities are the other problem generator and can cause serious delays in the work, with a high degree of rework and design changes already in progress. In order to avoid these failures, several strategies and new methodologies are needed in the civil construction segment, as this is the only way for the company to succeed in its projects. Also, the issue of occupational safety can present difficulties during the construction process as indicated by [14]:

It can also be seen that many of the requirements of NR-18 are met due to action planning and awareness of its importance. Another important finding concerns the standardization of safety in construction companies, showing that the degree of concern about safety issues is related to the individual attitude of workers, as well as a well-executed safety policy (p.6).

Thus, standardization with regard to work safety is very important, as it highlights the company's great concern regarding the safety of workers during the construction of projects as a whole.

The team that makes up the Specialized Service in Safety Engineering and Occupational Medicine (SESMT), aware of this issue, should develop measures to protect and promote the health and well-being of all workers [15]. Through lectures and educational campaigns, addressing occupational hazards inherent in the work task and the correct use of personal protective equipment (PPE), they can avoid these minor problems.

According to [16], construction is one of the most dynamic sectors of the Brazilian economy, employing a considerable amount of labor in the metropolitan regions of the country, and presenting major challenges for public health, specifically in the field of occupational health. . In this sense, the issue of occupational safety can be a major problem, especially with regard to accidents at work.

The civil construction sector has sought to rationalize and standardize its production processes, which, through quality and productivity programs, achieve satisfactory results that lead to the elimination or minimization of problems encountered during project execution [17]. Thus, the production process needs quality programs to carry out its projects efficiently, that is, minimizing the problems encountered in the works.

The construction industry grows significantly and thus increases the demand for cement products, resulting in increased production in the concrete artifact industries that are not always prepared in the same proportion structurally and managerially to provide adequate conditions for the worker. health, safety and work environment [18]. In this sense, the need for the introduction and use of tools that help in the prevention of work accidents needs to be seen very rigorously in the works, as well as in the construction of slabs.

According to [19] “Brazil still remains one of the countries with one of the highest rates of occupational accidents in the world”. According to the Statistical Yearbook of the International Labor Organization [20], Brazil occupies the eighth position in number of accidents and the fourth position in relation to accidents with death. In several ILO participating countries, construction, among all human activities, appears to have a self-reported degree of occupational accidents.

Due to the great risk that the construction industry brings to the worker, some protective measures will have to be taken, especially regarding the use of adequate equipment with regard to occupational safety [21].

According to [19], it indicates that NR 6 requires construction companies to distribute Personal Protective Equipment (PPE) to construction workers. The goal is to safeguard the physical health and integrity of employees.

Thus, it is the obligation of the worker to use the equipment correctly throughout the work period, and to ensure its maintenance.

The Standard also specifies the types of PPE that should be used to prevent various accidents and impacts on the eyes, ears, trunk, head, upper limbs, lower limbs and respiratory tract [19]. Especially prevents when work is performed on slab construction or heights above 2 meters.

Civil construction in general has been improving in relation to safety management standards and systems, but it is necessary to implement, comply with the rules, train, raise awareness and seek better results in relation to accidents in this sector [18]. Thus, the investment in safety and health of the worker of this industrialization does not grow at the same speed as the technological advance, but there have been improvements in the construction sector with regard to safety management.

For [19] NR 8 establishes the minimum technical requirements that must be present in buildings, aiming to ensure the safety and comfort of those who are working in construction. Thus, for floors, stairs, ramps and work place passages, for example, non-slip materials or processes should be used.

The documents required by NR-18 in item 18.3.4 referring to falls from a height are: project to implement collective protections in accordance with the stages of execution of the work and technical specification of collective and individual protections to be used [22].

NR 35 establishes the requirements for the safety of activities performed at heights - that is, those performed above two meters above ground level, where there is a risk of falling [19]. The author also points to NR 18 which is one of the main standards of construction. It establishes administrative, planning and organizational guidelines for the implementation and control of security systems.

For [23], the concreting of a slab with supply of machined concrete. In this activity, in addition to exposure to weather, there is the danger of working at heights on an uneven surface and the use of concrete pumping equipment (hose) .The assembly of precast slabs comprises the danger of handling the joists and working at heights. . Mounting the shoring mainly involves the hazards associated with carpentry.

According to [24], he points out that the most commonly used Personal Protective Equipment (PPE) is helmets and gloves, leaving behind ear and face protectors, seat belts and special shoes. However, it is mandatory for construction workers, as well as for works such as slabs under construction, thus avoiding accidents with the worker.

III. MATERIAL AND METHODS

Literature review was conducted from June 2019 to September 2019, which addressed the theme: Application of Occupational Safety Standards in Lajes Construction.

The search was carried out in the following databases: Virtual Electronic Scientific Library (SCIELO), academic websites, as well as books and magazines that portray this theme. To refine the search, the following keywords were used to search the sites: NR; Construction; Slabs.

The inclusion criterion was based on the abstract literature to classify the eligible articles, where only proposed to analyze the theme as broadly as possible, free articles were found 23, and 4 were excluded because they had similar data and information, in Portuguese and / or Spanish. Also, in this stage, 13 articles in limited languages were excluded such as: (Russian, Hebrew, among others) and those with paid access.

The application of the research study will be presented through photos, as well as the data found in the literature review. The results will be presented based on the findings of the application.

IV. STUDY APPLICATION

Brazil has a very worrying rate of occupational accidents, as it is in the eighth position according to the International Labor Organization (ILO). In several ILO participating countries, construction, among all human activities, appears to have a self-reported degree of occupational accidents.

The need to use tools that help in the prevention of work accidents needs to be seen very rigorously in the works, as well as in the construction of slabs.

The NRs require construction companies to use the PPE, the workers, so that they can be protected from future accidents, as well as their physical integrity as a whole. Thus, it is the obligation of the worker to use the equipment correctly throughout the work period, and take care of their equipment.

Floors above 2 meters require workers to be equipped with adequate PPE to avoid impact should an accident occur. as shown in (Figure 1).

Figure 1: Construction of Slabs.
Source: Authors, (2019).

NR 35 establishes that above 2 meters the proper equipment must be used due to the height of the work environment, NR 18 which is one of the main Building Standards, establishes administrative, planning and organizational guidelines for the implementation and control of security systems as a whole, as shown in (figure 2).

Figure 2: Slabs in Construction Process.
Source: Authors, (2019).

Thus, the standard aims to prevent accidents and falls from requirements such as: Training and qualification; Personal protective equipment, accessories and anchor systems; Emergency team Including slab design executions, as these are works above two meters above ground level.

The assembly of precast slabs requires carpenters to be equipped with their proper equipment so that no accidents occur in the slab carpentry process, as shown in (Figure 3).

Figure 3: Slab Shoring Assembly.
Source: Authors, (2019).

Disassembly also presents the risk of collapse of the slab or part of it and the fall of other materials used. Sometimes causing an accident if workers do not have adequate PPE. In these cases, the use of PPE is very important, such as helmets and gloves, ear and face protectors, seat belts and special shoes.

V. RESULTS AND DISCUSSION

The contractors have invested heavily in the safety of workers, but it is observed that sometimes the owners themselves do not value such investment, as they sometimes stop using the equipment and end up exposing themselves to accidents, due to the non-use of PPE. Continued use of PPE makes professionals safer in performing the activities they are performing.

Companies are responsible for ongoing oversight so that workers are properly using PPE in the workplace, especially in high places.

With the use of these protective equipment, the rate of accidents on the construction site decreases, as well as the leaves, since workers are able to perform their work more safely. In this sense, both the workers and the person in charge of the construction work gain, since accidents only delay construction work.

The use of NRs guarantees the worker safety, as well as guarantees the delivery of construction that can be slabs, among others, on time, so that companies have more success and more contracts, as well as jobs, moving the economy of the labor market. country in this sector.

VI. FINAL CONSIDERATIONS

The study showed the growth of the construction industry in recent years in Brazil, but also noted that the problems regarding worker safety also increased.

With regard to accidents at the construction work environment, he noted that this is due to employers' negligence in providing unsafe working conditions and the neglect and inattention of employees who commit unsafe acts.

With regard to the existing standards that protect the worker, this needs to be encouraged, as well as perform training, and require the sector supervisor to use PPE in all sectors in the construction of the work, and especially works at heights, i.e. in slabs.

Regarding the Lajes constructions, he observed that the standards exist, but noted that sometimes the workers themselves do not use PPE, leaving them vulnerable to accidents in the workplace.

The study presented is very relevant and can be used for future scientific research, as well as contributing to new discoveries in academia.

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RESEARCH ARTICLE OPEN ACCESS

OCCUPATIONAL STRESS AND ITS INFLUENCE ON LABOR PERFORMANCE: A CASE STUDY ON ECOART STRUCTURE AND PRODUCTION

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ABSTRACT

This work is scoped to perform field work in Ecoart Structure and Production company to identify the factors that contribute to stress at work, and way to solve it. In this context the study notes that occupational stress can be caused by several factors present daily in organizations, damaging the working environment, productivity and so the company's profit. Stress index refers to the control of absences at times when workers are the scheduled time of the workday. The concept can also be better understood by the sum of the periods in which employees of a given organization absent from the work, including delays within their normal working hours. The method adopted for the realization of the research was descriptive. The typology of the adopted research covered three aspects: on the objectives treated is a deductive research; as the problem of approach was qualitative and quantitative; on the technical procedures, was literature. Through the survey it was observed that the valuation of intellectual capital can be a proposal for the reduction of occupational stress, as the successful application of this theory for the treatment of stress is to assimilate possible decision-making for managers of the resource area humans. At the end of this research are addressed recommendations that may be in guidelines for the management of people in organizations for the effective management of the causes and consequences of occupational stress, through the enhancement of intellectual capital.

Keywords: People Management. Occupational stress. Human capital.

I. INTRODUTION

The present study has as its central theme: “Occupational stress and its influence on workers' work performance: a case study in the company Ecoart structure and production”, in this regard, it is noted that in recent years organizations in general They are going through an intense process of competition between customers and markets, where one of the differentials may be human talent.

Therefore, this “new” employee has been required to have a series of new skills and abilities, and how this relates in their work environment. The development of these criteria for the reduction of health ills in companies is directly related to the area of Human Resources that has gone from a simple personnel department to an agent of transformations in the organization [1].

Based on this concern, stress can be considered as the disease of the century, because this pathology can affect three areas of human life: physical, psychic and professional. From this context, the problem of this study focuses on the question: What is the influence of occupational stress on the work performance of workers in the company Ecoart Structure and Production. To answer this question, the general objective was to identify which factors contribute to stress at work.

This in turn divided into specifics: (1) Describe about the people management process; (2) list the main difficulties encountered by the Human Resources sector for managing stress at work; (3) identify the main factors that contribute to the development of work stress at Ecoart.

The present study is justified by the fact that occupational stress in the administrative area of the company Ecoart Structure and Production has become a major source of concern and is recognized as posing serious risks to workers' psychosocial well-being. Because workers spend much more time in their work environment each day than even with their families or doing

activities of their own, the stress factor is becoming increasingly common among organizations.

However, it is noteworthy that despite maintaining a good work environment, with people willing to help each other, without strands, often the professional ends up frustrated, because his work is not recognized. Therefore, the lack of incentive and motivation combined with unsatisfactory wages are extremely important factors for occupational stress.

With this information, this work intends to be a contribution to the professionals of the administrative area, and organization as a whole, in order to awaken new stimuli to the development of works that aim to improve workers' health specifically regarding work stress.

From this perspective, it is hoped that this study will contribute to the discussion of this theme in the area of management knowledge as a support for effective prevention of stress at work, it is also believed that this research will serve as a contribution to future investigations necessary for the theme approach.

II BIBLIOGRAPHIC REFERENCE

II.1 PEOPLE MANAGEMENT

The new perception of work relationship, people are partners of organizations which implies that each person is perceived as a microenvironment has specific goals and seeks in the organization their satisfaction [2].

According to [3] The People Management Process is a very important activity to be limited to only one corporate body. People management is a strategic issue for organizations. This role of managing people and competencies should be decentralized from just one department.

Each and every organization depends to a greater or lesser extent on human performance for success. For this reason, it develops and organizes a form of action on behavior that is conventionally called the people management model. Such a model is determined by factors internal and external to the organization itself, what distinguishes one model from another are the characteristics of its constituent elements and their ability to interfere in organizational life by giving it its own identity [4].

As studies of [3] various changes take place throughout the history of mankind, it can be said that throughout the twentieth century there were three distinct organizational ages (Table 01):

Table 1: Organizational Ages.

INDICATORS	CONSEQUENCE
Classical Industrial Era	Period after the Industrial Revolution where companies began to adopt the bureaucratic organizational structure, with emphasis on functional departmentalization.
Neoclassical Industrial Era	Period extending from 1950 to 1990. The bureaucratic model was resized by the structuralist theory, when the classical theory was replaced by neoclassical theory.
Information Era	Period that began in the 1990s to the present day. The main characteristic of the Information Age is change, which has become rapid, unforeseen, turbulent and unexpected.

Source: Adapted from [3].

Faced with this scenario it can be observed that the organizational culture suffered a strong impact and during the historical process were privileged changes and innovations focused on the future. The changes are now fast and without continuity with the past. This brought an environmental context of turbulence and unpredictability.

In the studies of [6] People Management, however, it still constitutes a tendency that manifests itself more in the academic environment than in companies, since the most evident expression of its existence has been given by the revisions of the works related to human resources management and the courses being offered by specialized institutions.

People management should take place from the integrated view of people and key issues such as expectations about working relationships, the psychological contract between what people want from the company and what the employee wants [6]. Corroborating this context [7] developed an organization chart where Personnel Management performs the function of staff, that is, it now provides consulting, advisory and support services in the organizational structure (fig.01).

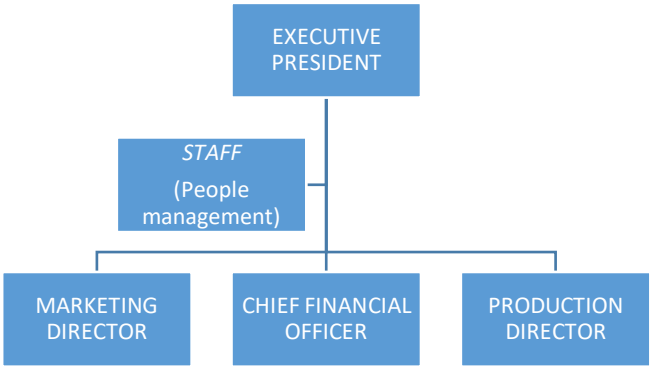

Figure 1: Functional organization chart of a company.
Source: [7].

From this organization chart it is observed that there is an imperative need to adapt organizations to changes in the context in which they operate, considering that the topic is of great interest to contemporary managers. This adaptation imposes on the manager knowledge and the search for an understanding of nature, aspects that directly influence the organization such as the environment, existing resistances, communication processes and inserted cultural factors.

That is, the function of managing people and competencies should be directed to the other departments, since it has direct influence on the employee. Everything the company offers will be useless if this manager does not perform his role efficiently, if he does not understand that the job is primarily dealing with people [8].

II.1 OCCUPATIONAL STRESS

However, the process of managing people is a very important activity to be limited to only one body of the company. People management is a strategic issue for organizations, and it is these strategies that can somewhat interfere with the challenges of Human Resource Management.

In this sense, it is appropriate to conceptualize the word stress, so it is pointed out in this study that this word is derived from the term stress (English), which means a set of reactions of the body to various aggressions of origin, the root of the word stress comes from Latin stringers and is meant to squeeze.

Once the meaning of the word has been punctuated, it is noteworthy that nowadays organizations are intensifying competition among themselves for customers and markets, and also competing for the most important resource: human talent. Given this scenario, workers have been required new skills and abilities, as well as different ways of producing and relating to work, associating the important value for health [9].

Selye was the precursor in stress-related studies. In her studies, she observed that stress produced defense and adaptation reactions to the stressor. These reactions have three phases or stages, as follows:

I. Alarm phase: consists of a very rapid phase of orientation and hazard identification, preparing the body for the reaction itself, i.e. the resistance phase. Many times, these feelings do not identify as stress, which is why many do not realize that they are in this state;

II. Resistance phase: It is a phase that can last for years. It is the way the body adapts to the new situation. It is part of the individual's total stress and proceeds in two basic ways: synoxic (tolerance and acceptance) and catotoxic (counter, non-acceptance). This occurs when the person tries to adapt to the new situation by restoring the internal balance; and,

III. Exhaustion phase: consists of an extinction of resistance, either by the disappearance of the stressor, the aggressor, or by the tiredness of the resistance mechanisms. So, it is in this case that the result will be the disease or even a breakdown.

Thus, stress can be understood as the point at which the individual cannot control their internal conflicts, generating an excess of energy, resulting, consequently, fatigue, tiredness, sadness, euphoria; its organic complex undergoes changes in the face of chemical transformations that occur before this emotional state [10].

Stress manifests itself in two ways: distress, or stress of defeat, which is stress as we know it on its negative side; and eustress, considered positive stress. Contributing in this context [11] teach that, in the sense of understanding the stress arising from work situations, which is called by the author as occupational stress. It is a reaction of the individual to his work environment that somehow affects him. These threats can be understood as stressors that characterize an unproductive relationship between the structure of the individual and his occupational environment, demonstrating that excessive changes are being directed at the worker and that he is not psychologically prepared to internalize. them positively.

Within this context [12] describe that they define occupational stress as an unpleasant emotional state, due to tension, frustration, anxiety, emotional exhaustion due to aspects of work defined by individuals as threatening. Occupational stress can be defined from the focus on organizational stressors that allow us to differentiate between two types of study: occupational stress and stress in general.

According to [10] sources of stress are termed as stressors, and can be defined as any event that confuses, frightens or excites the individual, which in turn can be of internal and / or external origin.

Based on this context it is observed that the association between stressors will determine whether he will develop excessive stress or not.

III. MATERIALS AND METHODS

In general, this work can be classified as applied research, as it is based on the application of theory already elaborated. To obtain the purposes foreseen in this research, the investigation procedure employed in this study was the qualitative-quantitative research, which according to [13] allows to obtain information of greater depth and at the same time greater amplitude of the investigated problem.

In this article, we used the descriptive method where [14] state that: “Descriptive reasoning has the characteristics of observing, recording, analyzing, describing and correlating facts or phenomena without manipulating them, trying to find out precisely how often a phenomenon occurs and its relation to other factors”.

As for the technical procedures used for the formation of this work, the bibliographic research was used. For [14], the bibliographic research "aims to collect information and prior knowledge about a problem for which an answer is sought or about a hypothesis that one wants to experiment". It was also necessary to use a field research, as [13], “is characterized by investigations in which, in addition to bibliographic and / or documentary research, data are collected from people using different types of information. search".

IV. STUDY APPLICATION

Data collection occurred through field research, applying a questionnaire with clear and objective questions to 10 employees of the administrative sector of the company Ecoart Structure and Production in the city of Manaus. The invitation to participate in the study will be made by the researcher in that company for each individual who fulfills the inclusion criteria.

Only the researcher will be responsible for listing the names of possible participants, so that it is guaranteed that each individual participates only once in the research, thus not generating duplicate data.

Subsequently, participants will be identified by numeric codes to ensure that each participant's identity is preserved. This relationship will be destroyed shortly after the database has been assembled, so that its analysis is processed only with the numeric code of the participants.

For the application of the questionnaires, the following criteria were taken into account: being an employee of a particular company and developing its activities for at least one year. The collected data will be passed to Excel for tabulation, analysis and verification of the results.

Participation in the study was voluntary, leaving the participant free if they do not want to answer any questions. The study participant is guaranteed the right to withdraw from participation in the research at any time, including during the completion of the research instrument. It is of great importance to clarify to the participant about his anonymity in the referred study. Professionals will be informed about the conduct of this research and the study will not interfere with the routines and operational and administrative activities of the company (data collection).

V. RESULTS / DISCUSSIONS

The company Ecoart Structure and Production Ltda., Founded in 04/04/2010, has as founding partner Mr. Jorcenês Batalha Marinho. The company grows in the market, this can be observed, as it began its activities as a choice of Simples Nacional, and nowadays it becomes Presumed Profit, in a limited legal form. Ecoart entered the market with the mission of sophistication and improvement in the aluminum structure assembly business to achieve full satisfaction of its customers, fully meeting their needs and expectations through the supply of products and services in the assembly area. event productions, aiming at the search for better results. Among its main products are the lighting fixtures for shows

and spaces, with moving's, acl's and others, as well as aluminum structures in various sizes that enable their applications in various uses.

Ecoart's functional organization chart is classified as vertical because it represents the organs and lines that make the hierarchical and communication link between the sectors of the enterprise.

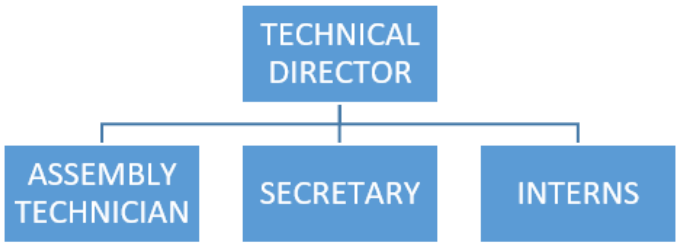

Figure 2: Ecoart Functional Organization Chart.
Source: Authors, (2019).

Regarding the level of education of employees, it was identified that only 20% (n = 2) of their staff have completed higher education and 70% (n = 7), opens a caveat that the rest who are attending higher education (Fig. 3-5). This data was provided by company management.

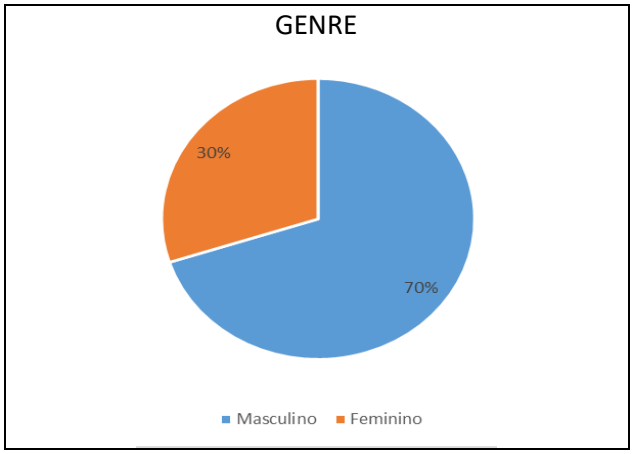

Figure 3: Genre.
Source: Authors, (2019).

Through this graph it is observed that the functions that require rationality and strength are preferably performed by the male gender, however, the employees of the company perform the functions that require greater organization, special care, obedience and servility, thus legitimizing a thought historically crystallized by society.

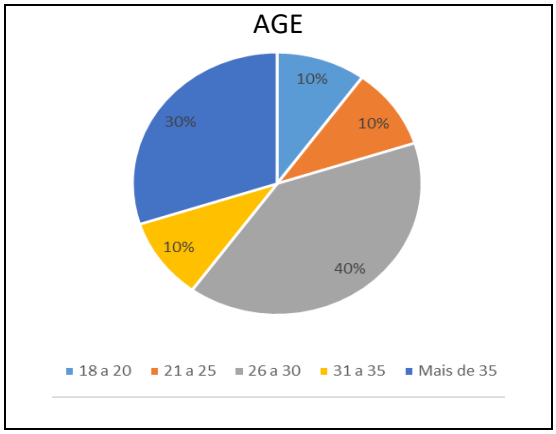

Figure 4: Age.
Source: Authors, (2019).

Companies noted that the important competitive differential in the organizations market is people, which is like human capital. According to [7] capital is mobile, but once the organization has acquired it and may have invested in it, it will want to secure it.

In agreement with this argument [8], when analyzing the organizational reality more closely, we verified our tendency to consider, as fair and adequate, differentiation criteria that indicate the level of value addition from the person to the company. By explaining more naturally and spontaneously in our society the people who are most capable of contributing to us or our organization are most valued.

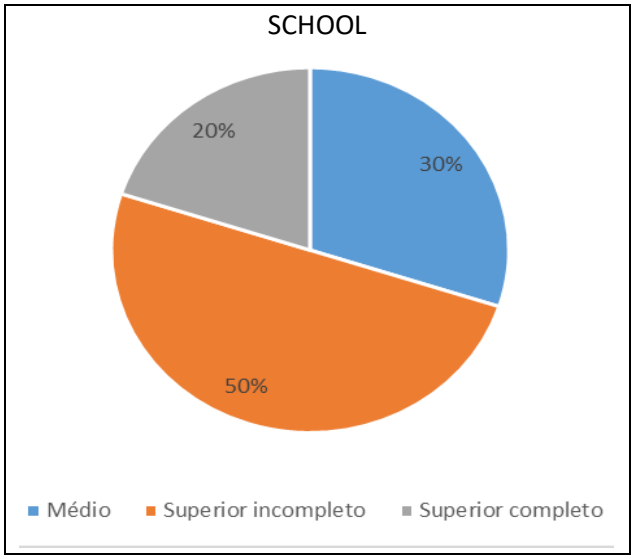

Figure 5: Schooling.
Source: Authors, (2019).

In this sense Ecoart is looking for people who have the skills, competencies to reach the competitive market and show the difference with their ideas creating and recreating in order to acquire profit and be the reference in the organizational economy. But in order to achieve all the goals and make your business unique, companies must invest and recognize the value people get.

Figure 5 shows that education is the engine of growth and productivity and unfortunately in Brazil it is a deficient, bureaucratic process that needs to be improved to the needs of those who need to study. Ecoart believes that acting together with its partners in education and qualification will achieve better results and become a better company. Within this context, it is observed that most of Ecoart's employees are male, with an average age of 26 to 30 years, and have completed higher education.

According to Ecoart, stress concerns have been increasing, as this fact has been playing an important role in the work development process, which can lead to the incapacity and death of employees.

Thus, it is understood that occupational stress management programs can be developed by Ecoart focusing on the organization of work and / or worker. According to [10], intervention measures can be described as follows (Table 2).

Table 2. Intervention measures.

RELATIONSHIP	ACTION
Workers	- To seek leisure and fulfillment at work, in personal and social life, with the awareness that such pursuit is fundamental for coping and overcoming stress; - Developing physical activities regularly, controlling food, resting and maintaining social activities are some of the factors suggested by several authors as supporting in controlling and coping with stress; - Understand that human beings act, think and feel differently from each other, that crises drive important achievements and changes in people's lives, thereby investing in personal skills and abilities, strengthening themselves physically, psychically and socially. and allowing yourself a better quality of life.
Teams	- Conduct interviews with employees in order to know the causes of job satisfaction and dissatisfaction; - Create institutional spaces to support members of multidisciplinary teams, providing greater interaction and interaction between people, creating discussion groups and updating references that involve the theme of interpersonal relationships in the workplace, to provide support to the worker; - Encourage the relationship between the manager and other team members, understanding that when the worker is heard and respected, the tasks within his / her competence are performed with greater involvement, responsibility and satisfaction, consequently, with less physical and mental stress.
Organizations	- Immediate hiring of human resources to reduce the amount of service performed by each employee. In this way the professional will perform his / her function more easily and certainly the quality of the service will be superior; - Accompany and guide the professionals, clarifying the objectives, the philosophy, the dynamics and the functioning of the Basic Health Units, Hospitals and other workplaces; - Develop interdisciplinary support and stress prevention programs to improve the quality of life of health workers by establishing strategies that minimize the problems highlighted by these professionals. Such programs should preferably be conducted in the environments and times of job; - Implement a stress control program, informing, training and teaching people how to deal with stressful situations, focusing on interacting with events; - Create continuing education programs, aimed at technical training and the development of critical, ethical, political sense and generating motivation for greater integration and division of responsibilities and difficulties in the service; and, - Make workers aware of the importance of leisure and social support in coping and overcoming stress.

Source: Authors, (2019).

Against this background Ecoart can make use of these strategies, thereby increasing the frequency and intensity of positive emotional states. However, it is noteworthy that occupational stress can be linked to the work environment in which the individual is inserted. Environment means not only ergonomic or spatial aspects, but mainly issues related to work and organizational characteristics.

VI. FINAL CONSIDERATIONS

With this research can be said that occupational stress is based on the identification of various causes present within an organization, which are related to the external world of the employee. Even at this juncture, the term stress emerges as a managerial issue that should be addressed by the People Management area. Faced with this scenario the role of managers needs to be at the center of the change process, actively participating as generators of the successful company.

In order to contain occupational stress in companies, it is necessary for the organization to have a Human Resources administration, to invest in social benefits plans for workers, in order to provide another way of compensation to them, also reaching other types of compensation. benefits.

It is noteworthy that the results can only be maximized if such suggestions are used in a manner compatible with the reality of the company, considering the characteristics of the structure, processes and culture. Given this line of thought, it is considered that one of the relevant contributions intended by this work is to glimpse the appreciation of human potential within organizations.

For the academic, the study about occupational stress becomes important, mainly, because the national marketing scenario is increasingly demanding and lacking qualified professionals, research can also contribute to the generation of information-based research sources. collected in current articles and works published with the purpose of informing the real practice of people management and the importance of valuing human capital.

Finally, it is important to recommend that people management professionals be vigilant at the first signs of excessive tension among workers. In order to keep the work environment in balance, it is also important to identify and control practices that are known to be obsessive-compulsive, which are often even encouraged by organizations.

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RESEARCH ARTICLE OPEN ACCESS

EMERGENCY ROUTES IN ONE SHED IN CASE OF SINISTER

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ABSTRACT

The escape route is used to indicate the emergency exit, leading to the exit, stairs, fire doors and not obstructing them. In all companies there is a use of signs that indicate an escape route in emergencies. These plates are made of special materials that allow the visualization of the same case of power failure. The batteries contain a special ink or film that is being charged by ambient light. The values are varied from material to material and should be analyzed according to a demand definition.

Keywords: Escape route, signaling; emergency.

I. INTRODUTION

The escape route is the route to be followed in case of urgent need to evacuate a site due to fire, landslides or other emergencies. For all workers or visitors to a particular location to feel safe in an emergency, it is important to know the escape route. Knowing the way forward at critical moments makes it easy for everyone to get out and save.

This paper will show an example of escape routes for a new shed, planning it. Many consider the planning of escape routes unnecessary because they claim that it is only leaving the entrances or exits of buildings, but all planning in a project is essential for the perfect functioning of an entire set.

Currently, companies, especially from the industrial hub, are investing considerably in security. And including in this context are the escape routes. Which assist in the removal, evacuation, of people within an establishment, so that there are no deaths in a claim.

The overall objective of this paper is to propose emergency signaling in a new warehouse in a district factory. Specifically, corridors and shed access areas will be checked to report key risk areas and demonstrate possible escape routes.

II. LITERATURE REVISION

II.1 THE IMPORTANCE OF ESCAPE ROUTES

Fire safety measures, as well as any other safety measures, may be preventive or protective. [1] defines these measures as follows:

Fire prevention measures are those associated with the fire prevention precaution and are intended solely to prevent the onset of fire, i.e. to control the risk of fire onset.

Fire protection measures are those designed to protect human life and property from the harmful effects of the fire already developing in the building. They are necessary for the overall fire safety system as the preventive measures fail to allow the fire to arise. These measures comprise the following elements of the overall system: limitation of fire growth; initial fire extinguishing; fire propagation limitation; precaution against propagation between buildings; safe evacuation of the building; precaution against structural collapse; and speed, efficiency and safety of combat and rescue operations [2].

Escape routes are the routes people should follow in case of accidents requiring evacuation. More than having signposts, a company must follow the requirements so that instructions are clearly and easily understood.

To put it clearly, we cite the example of the Kiss nightclub, which for lack of clarity in escape routes, many people rushed to locked doors [3]. In short, escape routes are the planned, mapped, and detailed way for people to leave safely, quickly, and with good flow.

That's why it's important to keep your entire system up to date and have high performance devices. Thus, the combination of these methods and practices are really significant for protecting lives, buildings and heritage.

A fire prevention system is made up of a number of important equipment and devices predetermined by law [4]. But in order for it to prove useful, it must also have another indispensable element.

Escape routes are sometimes overlooked as many people find that the material part of the system is sufficient [5]. However, it is vital for saving lives and making the firefighting process faster and more efficient.

In a fire situation, it is normal for panic to spread. Therefore, when using escape routes, it is essential to try to use them in the correct way so as not to harm others who also need to pass them.

The emergency exit is the properly protected path, part of the escape route, to be traveled by the user of a building in case of fire, until reaching the public road or open space protected in communication with it [6].

The lack of evacuation route indicators may lead to panic situations in emergencies, where the tranquility factor is paramount for the prevention of major accidents.

The planning of the Escape Route should be well elaborated, taking into consideration: The MTB NR-23 guidelines; NBR 9077 and 13434; State Code for Fire Prevention; others that will make it easier for individuals to leave the affected places.

"The reliability of this element must necessarily be higher than that of the other system elements, since in the event of a fire occurring, endangering the safety of building users, meaning that other system elements have failed, the safe evacuation of the building will not may fail. It is therefore the most important element and most directly associated with the safety of human life in the event of fire" [7].

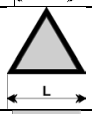
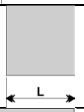
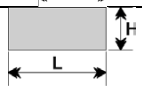
II.2 SIGNALING WAYS

Illustrated and [8] and can be seen in table 01.

Circular: Used to deploy prohibition and command action symbols; Triangular: Used to deploy warning symbols; Square and Rectangular: Used to deploy guidance, distress, emergency and identification symbols for firefighting and alarm equipment;

Security Colors: The security color must cover at least 50% of the symbol area, except for the prohibition symbol, where this value must be at least 35%; Red: Used for prohibition and identification symbols for firefighting and alarm equipment; Green: Used for guidance and distress symbols; Black: Used for warning symbols and danger signs; Contrast Colors: Contrast colors are white or yellow for prohibition and alert signaling respectively. Contrast colors shall be photoluminescent for orientation and equipment signaling.

Table 1: Signpost Dimensions 1.

Signal	Geometric form	Share mm	Maximum distance of visibility m										
			4	6	8	10	12	14	16	18	20	24	28
Prohibition		D	101	151	202	252	303	353	404	454	505	606	706
Alert		L	136	204	272	340	408	476	544	612	680	816	951
Guidance, Rescue and Equipment		L	89	134	179	224	268	313	358	402	447	537	626
		H (L=2H)	63	95	126	158	190	221	253	285	316	379	443
1) The dimensions (dimensions) shown are minimum reference values for the given distances.													

Source: Adapted from [8].

Table 2: Minimum height of letters on signposts as a function of reading distance.

Minimum height mm	High impact reading distance (m)	Minimum height (mm)	High impact reading distance (m)
30	4	300	36
50	6	350	42
65	8	400	48
75	9	500	60
85	10	600	72
100	12	700	84
135	16	750	90
150	18	800	96
200	24	900	108
210	25	1000	120

Source: Adapted from [8].

II.2.1 SIGNALING WAYS

Orientation signs shall be as follows:
a) shape: square or rectangular;
b) background color (safety color): green;
c) symbol color (contrast color): photoluminescent;
d) margin (optional): photoluminescent.

II.3 SIGNALING SYMBOLS

The symbols adopted by this part of [8] for fire and panic signaling are presented in 3, accompanied by application examples.

Table 3: Guidance and rescue signs.

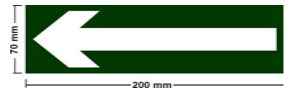
Code	Symbol	Meaning	Shape and color	Application
12		Emergency Exit.	Symbol: Rectangular Background: Green Pictogram: photoluminescent.	Indication of the direction (left or right) of an emergency exit, especially for fixing to columns. Minimum dimensions: L = 1,5H.
13				Indication of the direction (left or right) of an output of emergency Minimum dimensions: L = 2,0 H.
14				Indication of an emergency exit to be affixed above the door to indicate access.
Code	Symbol	Meaning	Shape and color	Application
15		Emergency Exit.	Symbol: Rectangular Background: Green Pictogram: photoluminescent.	a) indication of the direction of access to an outlet that is not apparent. b) indication of the direction of a ramp exit. c) indication of the direction of exit in the vertical direction (rising or falling). NOTE - The Indicative Arrow should be positioned according to the meaning be flagged.
16		Emergency Exit.	Symbol: Rectangular Background: Green Pictogram: photoluminescent.	Indication of escape direction inside stairs Indicates right or left down or up The indicative drawing must be positioned in the direction to be indicated.
			Symbol: Rectangular Background: Green "EXIT" message and or pictogram and or directional arrow: photoluminescent, always with letter height > 50 mm.	Indication of emergency exit, used as a complement to the photoluminescent pictogram (arrow or image, or both).
17	Example 1: 	Emergency Exit.		
	Example 2: 			
Code	Symbol	Meaning	Shape and color	Application
18	Example 1:  Example 2: 	Emergency Exit.	Symbol: Rectangular Background: Green "OUTPUT" message:photolumin escent, always with letter height > 50 mm.	Indication of emergency exit, used as a complement to the photoluminescent pictogram (arrow or image, or both).

Source: Adapted from [8].

II.3.1 CONTINUED INDICATION OF ESCAPE ROUTES

Continued indication of escape routes shall be carried out by means of indicative arrows in accordance with the criteria specified in ABNT NBR 13434-1, installed in the direction of exit, with the following minimum shape, size and color specifications:

Table 4: Direction of exit route.

Code	Symbol	Meaning	Shape and color
28		Direction of exit route.	Symbol: Rectangular Background: Green Pictogram: photoluminescent.

Source: Adapted from [8].

Emergency exits consist of doors, corridors, stairs, ramps or combinations of these elements, aiming at the safe escape of people from a building in the event of fire to the outside, as well as facilitating access by the Fire Department to the building. firefighting and rescue actions.

III MATERIALS AND METHODS

The methodology used was through a work safety engineering project with the decision to develop a map of escape routes in case of emergency or accident in a warehouse in the motorcycle factory of the industrial hub of Manaus, with the purpose of to create escape routes correctly thus improving the evacuation of people from inside the shed and minimizing the risk of death or accident in case of emergency.

IV STUDY APPLICATION

IV.1 LOCATION CHOICE

For this work safety engineering project will be studied the new warehouse of a company of the industrial center of the city of Manaus - AM. The construction of this warehouse is due to the need to expand the factory, because it felt the need to increase its trade, thus having the reduced capacity to meet the production of parts.

The shed was built in a new area purchased by the company. It was done since its earthwork until the survey of the structure. Because it is a new sector. All security must therefore be done, including escape routes in case of emergency.

Looking at the industry floor plan to get an idea of where all signs should be placed. The idea of safety of the place is of great importance to the company, which invests heavily for the good of the employees and for the good of the company itself.

IV.2 STUDY AREA LOCATION

The area chosen for this study St. Jutaí 44569075-130, located in the city of Manaus Amazonas. Industrial District II, figure 1.

The area was from another company and was purchased by this company in 2017, and since then, the shed was planned and started for its construction. Several companies are responsible for surveying the structure.

Figure 1: Area of study chosen.
Source: [9].

From the outset the terrain was good, but for the dimensions of the project, it was necessary to make changes to the terrain to achieve satisfactory results.

Currently, the building is in the process of being completed, it was during this period that it was necessary to think about safety means for this area. As one of the key assets are employees, schemes and strategies have been put in place to keep safety in the first place. The escape routes are just a shame part of the great work ahead.

IV.3 STUDY SITE IDENTIFICATION

The study site chosen was fine in the city of Manaus - AM and it was from observations made about places that there is viability to take the route. After days of observation I could see the possible places where there is need and also it is feasible to put the safety signs.

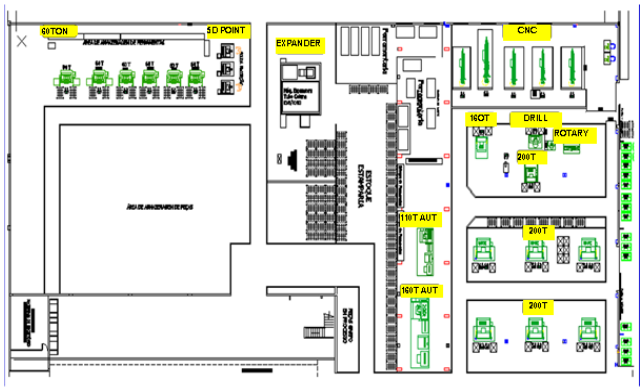


Figure 2: Plant image of the new shed being built.
Source: Authors, (2019).

V RESULTS AND DISCUSSIONS

We had a lot of debate about the escape route suggestions. Two of these suggestions were not welcomed by professionals in the area, below we can see:

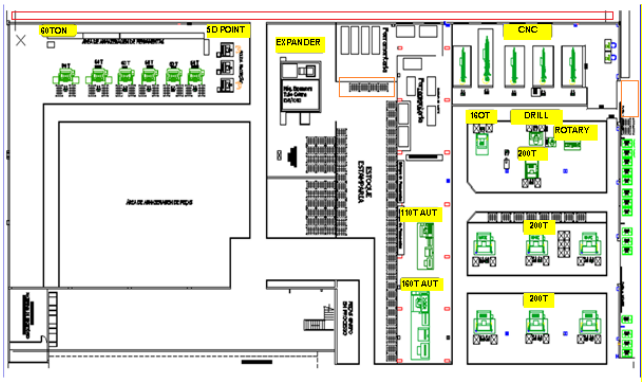


Figure 3. Shed image with demarcated locations.
Source: Authors, (2019).

In the area marked in red it was not possible to make the project because this site will be made available for gas and water pipes, so it would be very dangerous to make the route in this area, as it would have a high risk of explosion.

On the other hand, the orange areas are not viable as it is intended for deposits of parts and equipment of the sector, therefore, the place will be obstructed thus preventing the traffic of people in the place.

V.1 VERIFICATION OF THE VIABILITY OF THE SIGNS TO BE PUT

After much study, we obtained the verdict of the speeches, see below how it looked:

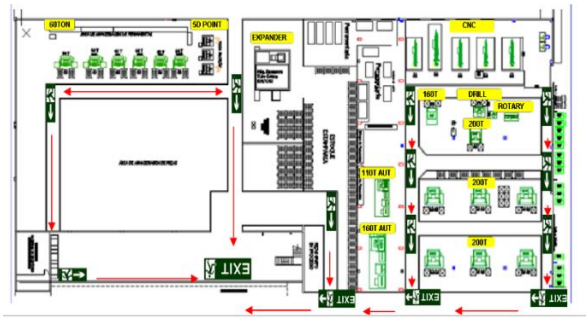


Figure 4: Result of escape route signs in the shed.
Source: Authors, (2019).

We demonstrated the route that people will use in case of emergencies. We use the main corridors in the sector as there is a greater possibility of mobility, therefore, free of obstacles or obstructions in the path of the emergency route.

VI CONCLUSIONS

Escape routes play a very important role in any building as they are directly linked to the safety of the site, and hence of the individuals within the site.

Most of the companies in the Manaus Industrial Pole are investing a lot in security, which is why this type of project has grown considerably. Maintaining a safe environment considerably influences the credibility of the company. Having visibility of the direction indicator plates is indispensable, because if it is not in visible conditions, it is a design irregularity, thus having no functionality in the work environment.

Safety always comes first, and having safe evacuation sites is one of those principles.

VII ACKNOWLEDGMENT

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RESEARCH ARTICLE OPEN ACCESS

WORK SAFETY AND THE RELEVANCE OF TRAINING OF PERSONAL PROTECTIVE EQUIPMENT (PPE) IN THE CIVIL CONSTRUCTION INDUSTRY (CCI)

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ABSTRACT

The Civil Construction is one of the sectors of economic activity that most absorbs accidents at work and where the risk of accidents is higher. The theme of safety and health in construction is relevant not only because it is a dangerous activity, but also, above all, because the prevention of work-related accidents requires specific focus, both by the particular nature of construction work and by the temporary character of the work centers (works). The purpose of this study is to present this topic in such a way as to highlight its contributions to the Management of Safety and Health. The data collection was made through a bibliographical review, from which it was possible to study all outstanding prominences in NR 18, noting that this subject is highly favored in terms of providing the human well, both internally and externally to society, as acting in the project phase, providing for security measures in the post, where audits, performance indicators and contractual clauses on safety and health should be provided. I work in relation to the companies that act on the work.

Keywords: Safety; Job; Construction; Legislation.

I. INTRODUTION

In the history of injury accidents in the construction industry, sub-sector and buildings, it is often argued that injuries are largely due to the injured person's lack of knowledge or skills to perform his or her function safely. Although it is a fact, it is necessary to analyze the environment in which this worker performs his tasks, where in most cases are unhealthy environments, in the presence of all risk agents, from mechanical to biological, as well as the training offered to these workers for the development of their tasks.

It is important that the employee has an integral view of the work in which he participates, the risks involved and the means at his disposal to face them. In Civil Construction, this perception seems even more incomprehensible, since in this sector there is no "defined form of work organization based on models and / or concepts, prevailing a traditional manufacturing-based organization, characterized by using an intermittent production system. on demand, with positional physical arrangement, where, at the time of construction, the construction site is the company itself" [1].

Each work is a particular product, varying in size, amount of labor, equipment, materials, capital invested, content and complexity of the others. The use of workers occurs according to the stages of construction and it is not possible to fix them on the work during its entire execution. Within this context the problem of this study consists of the following question: What is the importance of the training of PPE in a construction site.

In order to answer this question, this study assumes the objective of evaluating the importance of training of PPE in a construction site. In recent years efforts have been made to introduce into the construction industry the Total Quality Management (TQM) that already prevails in other industrial branches. In civil construction, the first moves towards a broad approach to quality control emerged in a more organized way in the early 1990s, due to studies focused on each stage of the design process [1]. The present research intends to highlight the human factor in this system and shows the concern of the worker of the protective measures their physical and mental integrity and how they aggregate in the work organization.

With the progressive increase in population, there is a need for more housing, more workers will be recruited for building

construction. In proportion to this, the risks arising from the construction made quickly to meet the need are multiplied. This is confirmed by the research of [1], who says that "the task has to be done", having to eliminate any object of interference in productivity.

In most cases of accidents at work, it is observed that the employee is not to blame, and in other cases, there is the fault of the employees, when they do not use the equipment provided to them or when they take certain risks to produce fast, contrary to the employer's safety recommendations.

The research will also contribute to the generation of research sources based on data collected in current articles and published works in order to inform the real practice of this venture at a time when many people have only a vague, sometimes negative idea. which means the importance of job security on a construction site.

II. BIBLIOGRAPHIC REFERENCE

The Construction Industry is a representative segment and has a great importance in the Brazilian economy. It differs from other sectors by having particular characteristics, standing out for the amount of activities in its production process [2].

The concept of civil construction, according to [3], is extensive, ranging from soil preparation (earthmoving, soil clearing, rock removal, well drilling, etc.) to final cleaning of the work after its completion. Therefore, it includes: the actual construction, demolition, foundations, painting, coatings, expansion, renovation, restoration and, in some cases, the conservation of the property itself, complementary works and any improvements added to the soil or subsoil.

The Construction Industry plays an important role in the Brazilian economy, as it is one of the major generators of labor [4]. This is a characteristic of this sector, as it always makes up the intense need for labor and, therefore, gains its importance from the social point of view, making it an important source of employment.

For many employees, the construction site is the place of learning of the craft (i.e. many of these workers are in the first job phase) since the construction worker is trained inside the work itself, thus there is a direct relationship between officer and assistant, which brings us back to the dawn of civilization (the craftsman and the apprentice).

Not until the thirteenth century did we find a record on occupational safety, with the Libro del Consulado Del Mar, which issued instructions and rules on accidents with maritime workers. Subsequently, occupational accident standards were developed, especially in Spain, and concern about occupational accidents gradually crossed borders.

Work safety can be defined as a set of diversified measures, especially engineering measures, suitable for the prevention of occupational accidents and used for recognition and control of risks associated with the workplace and the production process [5]. Occupational health, on the other hand, is no longer seen as a simple state of absence of diseases, but as the promotion of a well-being environment generating factors that motivate company employees [6].

[7] clarify that, at first, any element that participates in the work process is potentially a generator of dysfunctions, thus being the causes of accidents, among which we can highlight:

- Unsafe acts: the personal factor of insecurity;
- Unsafe conditions: the environmental condition of insecurity due to materials, equipment, facilities, methods and work organization, among others.

With the arrival of the twentieth century there was a great evolution of the TQM, a true revolution in its considerations, moving from the concept of injuries of the beginning of the century, to the concept of accident losses as pointed out below [7]:

- Interventions about man through medical surveillance;
- Corrective interventions on the material components of the work, i.e. at work sites and equipment.;
- Worker's PPE Interventions.

Currently, a systemic approach to occupational safety and health actions has been sought, integrating it into the overall management of the Construction Industry, which translates into an integrated intervention of workers, all sectors and all dimensions of the workforce. company are involved in the process.

With regard to occupational safety and health, the Construction Industry is still characterized as one of the most problematic sectors of activity due to the high rates of accidents.

III. MATERIALS AND METHODS

To choose the theme, it was observed the need for a contextualization about the relevance of training in the family business.

In this work, the deductive method was used, which aims to help the formulation of the guiding questions and their confirmation. The set of systematic and rational activities that, with greater security and economy, allows to achieve the goal - valid and true knowledge - tracing the way to be followed, detecting errors and helping the scientist's decisions.

It is well known that the purpose of exploratory research is to become familiar with a subject that is still little known, little explored. According to [8], the research is exploratory, because "it is performed in an area where there is little accumulated and systematized knowledge". Still, according to the retro author, this is also a bibliographic research because it relies on publications available in the literature on the subject. To confirm the guiding hypotheses presented on the subject, previous academic studies pertinent to the bibliographic review which [9] names a bibliographic research were defined, defining it as:

Still within the methodological context the principle of this study was qualitative research, since it will work predominantly with qualitative data. smaller in the analysis" [10]. It was also necessary to use a case study, which, according to [11], "is characterized by the deep and exhaustive study of one or a few objects, in such a way as to allow their broad and detailed knowledge".

IV. STUDY APPLICATION

For the application of the study, the documentary analysis and an interview were used. It is noteworthy that the documentary research conducted analyzing the material that was not edited, such as company reports, sector evaluations, Payroll, among others.

In this stage of elaboration and application of the interview about the relevance of training in the Construction Industry (ICC), the exploratory research typology was used, where [12] link to the type of research in which there is little knowledge and literature about the researched theme.

It is noteworthy that the interview used by the author consisted of 10 informal questions where the head of the company is at ease for their answers, data collection took place in March and April 2019, and the treatment of the result was qualitative. .

1. What is the economic branch of the company?
2. What are the main products / services offered?
3. How many employees does the company have?
4. What are the main customers?

5. What are the main suppliers?
6. How is the selection / recruitment process for new employees?
7. Does the company have training programs?
8. What reasons lead employees to participate in training?
9. How often do company training take place?
10. Does the company have a specific place for training?

To mitigate this stage, it was decided to perform three phases: determination of the company's needs, preparation and evaluation of the interview, and finally, application of the interview with the company manager.

In the first part of the interview, a deductive analysis was carried out, where [13] describes that it is a method that "starts from principles recognized as true and indisputable and makes it possible to reach conclusions in a purely formal manner, that is, solely by virtue of their logic" The other steps were elaborated on site.

The author praised the act of not using very specific questions, always having ethics as a differential factor in the research performance, the questions have a neutral character, as a way of not influencing the answers.

V. RESULTS AND DISCUSSIONS

C M Construções was founded in 2010 by Mr. Israel Carvalho Martins, who started working with a makeshift repair and refurbishment workshop for general construction and residential and industrial plumbing, electrical services, painting and restoration.

For this, it has partnership with highly regarded suppliers in the domestic market. The result of this, five years of work and dedication to our customers is our personal satisfaction and the honor of being a reference today in the segment in which we operate. C M Construções has a team of contractors that specializes in the following construction, hydraulic, electrical and fine workmanship, professionals capable of solving most of the problems related to the part of renovations in general. Services are being sold and are also starting in the field of fine finishing construction products such as: Metals (simple to the most sophisticated taps and showers), Bathroom Dishes such as sinks, toilets, bathroom accessories, bathtubs of various sizes. and types, Miscellaneous Paints, Floors and Coatings, Electrical Boards, Cabling, Miscellaneous Tools.

In celebration of its five years in the Manaus market, they come with changes in their facilities and a wider and well located area, and also a new feature: equipment rental, to better meet and meet the needs of their customers.

The company has employees specialized in various areas of activity, being only hired as service providers, also has reliable and quality suppliers to ensure the efficiency and effectiveness of its services.

Currently, the staff of C M Construções is composed of only one permanent employee, being Mr. Israel Carvalho Martins, with the function of owner and manager, the other employees are temporary, specialists in various areas of construction.

Regarding management, the radar chart shows strengths in general management of decision-making processes, innovation process, loyal customers, good relationship, financial management and excellent relationship with suppliers. It should be noted that improvements should be made in the use of technologies and information systems, as well as in the strategic means to be adopted for the company, besides that there is no relationship with the government, regarding bidding processes, as it tends to become a very strong point, if the part that will be properly worked out corrected.

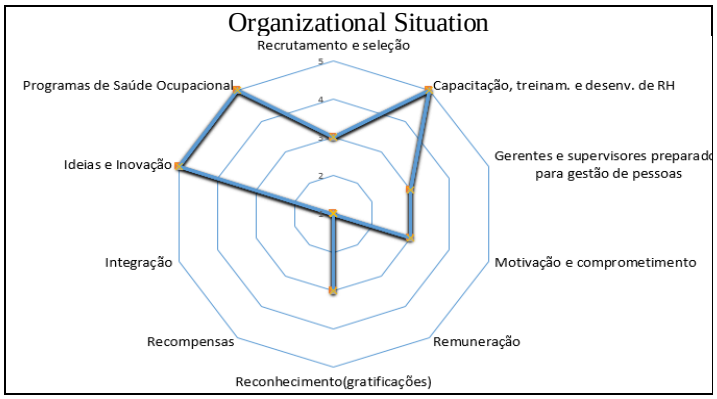

Figure 1: Organizational Situation.
Source: Authors, (2019).

Regarding the HR sector the company has only two employees, the company has the good collaboration of its already qualified outsourced employees, because the company does not have training and HR development courses, we also saw that there are no plans, nor incentives to innovation and occupational health programs, considering that we have only outsourced workers.

Through the radar chart, you can have a more detailed view as in a radiograph of the organization, enabling comparative analysis across sectors and showing the evolution of internal development of the organization as those in which they need to be improved, requiring more attention or the one to keep. The simplified way to represent the result of the organization's internal analysis, the radar chart points out ten internal areas of analysis known as 10 M's of self-diagnosis, allowing to visualize the comparative situation between them.

To prepare the Radar chart, it is necessary to point out the ten internal areas of the 10-M's self-diagnostics exploring the strengths, weaknesses and points for improvement of the company C M Construções, as shown in the following chart:

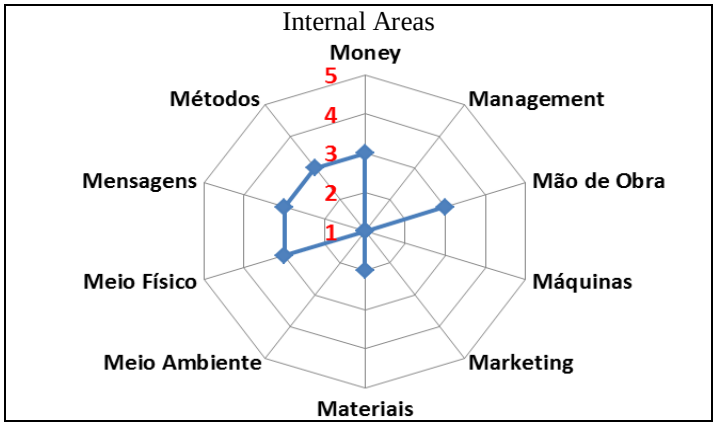

Figure 2: Internal Areas.
Source: Authors, (2019).

Through the radar chart, it can be seen that one of the main problems of the studied organization is the lack of effective manpower, in the case of CM Constructions, as previously mentioned, it works with outsourced workers, so there are no people committed to the progress. of the company and employees dedicated solely to its stability.

It can be noted that the rating chart shows weaknesses in the finance, media, communication, procedures and labor sectors, however, a greater focus will be on labor, the others vary for improvement or strengths.

One of the main advances of the new text of the NR-18 is the obligation of elaboration by the companies of PCMAT. Its implementation allows effective management of the work environment, the production process and worker orientation, reducing the sharp number of work accidents and occupational diseases [14].

In general, safety programs in this industrial sector have as a priority the prevention of serious and related fatal accidents.

In addition to the Program documents provided for in the NR-18 legislation, it is recommended that the program planning should be based on the main development stages of the project, from projects to final services, considering the risk of accidents and diseases. and the professional category active in each stage.

In the recognition of risks that cause occupational diseases, in addition to physical, chemical and biological agents, we must consider the working conditions at the site due to environmental factors such as rain, humidity, wind speed and height, it is emphasized that all PCMAT It will only be legally valid if it is registered through an ART.

It is ART that must ensure traceability efficiently and effectively, but it is where we most want it in day-to-day practice in engineering works and services. Traceability is the guarantee for the developer, the contracting government and society.

VI. FINAL CONSIDERATIONS

Since the reformulation of NR-18 in July 1995, which can be considered a milestone in the adoption of the process of reformulation of regulatory standards and policy of action of the MTE, issues related to occupational safety and health in industry. of construction in Brazil have had significant improvements resulting from the parties' involvement and commitment in tripartite discussions.

With this research it can be pointed out that the relationship between safety and health, where occupational safety is defined as a set of diversified measures, while occupational health is the promotion of a well-being environment in the company. The last decades of the twentieth century were of great evolution of occupational health and safety management. There has been a real revolution in its concepts. From the concept of early-century injuries to the concept of accident loss.

Construction workers are usually made up of groups of people who perform their work in an unhealthy environment, the fact that work accidents in many cases is possibly also due to misinformation of workers. The programs established by the MTE must be implemented and respected in order to minimize the risks inherent in this sector. PPRA aims to detect risks and inadequate conditions in the workplace that affect workers' health.

The PCMAT at ICC aims to plan the safety and protection actions to be adopted in each phase of the construction project, while the PCMSO aims to perform workers' admission, periodic and dismissal examinations.

Among the determinations of NR-18 combined with resolution 437/99 is worker training prior to commencing work on a site. This is a six-hour admission training. During the course, workers learn safety standards and learn about the company's way of working, as well as the specific laws for the safety and health of workers.

It is also noteworthy that the implementation of the training program or implementation of results depends on some factors, such as: adequacy of the program to the needs of the organization and the participants; quality of the material presented; cooperation of company managers and directors; trainee motivation to learn; trainee learning ability; practical application and time to assimilate what has been learned; preparation of the training material, which should be significant, among others, all these methods must be varied, innovative and transferable to the work.

Finally, it is emphasized that all employees involved should be aware of the importance of PPE, regardless of the hierarchy established at the construction site, as good work in this direction will result in the reduction of work accidents.

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ANALYSIS OF ACCERTABILITY OF PUBLIC WORKS BUDGETS: CASE STUDY

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ABSTRACT

In Brazil, the state is responsible for investing 5% of its gross domestic product in public works, from various sectors, from infrastructure to health unit reforms. In theory, this investment should warm the market and ensure an adequate infrastructure, but what happens is a slow market and a high index of works not completed, abandoned or delivered in disagreement with the minimum conditions of use. This work aims, through the analysis of three budgets, to check within this limited cut, the quality and feasibility of budgets pre-arranged for the execution of works. After analyzing the cases presented, it was possible to conclude that there is a divergence between the market value and the budgeted value, due to the absence of compositions necessary for the proper execution of the service, it was also observed the absence of compensatory mechanisms of the natural lag of base prices of the budgets and the values of inputs when the work is carried out.

Keywords: Public Constructions, Budgets.

I. INTRODUTION

In the private sector, every investment stops by a feasibility study, besides defining its financial return, it is necessary to estimate its cost beforehand. Such estimation is made through budgeting. In the traditional public administration model, bidding is a sine qua non for public works contracting. According to article 7 of Law 8.666 / 93 works and services can only be bid if there is a basic project and detailed budget in spreadsheets that express the composition of all its unit costs [1].

At the present time in Brazil, according to the Industry Strategic Map, there is a total of 10 billion losses in standstill works across the country, and it is a challenge for project management to define more effective methodologies for resource allocation.
These works, which are currently at a standstill, had a focus, and were the object of a national strategy, aimed at the public good within their deadlines and the final values of their contracts. Many of these, according to the Industry Strategic Map, still had aspects that conditioned their non-completion, either due to a project not so well interpreted or lack of information defined in it.

Legally, according to the Arts. 7th, 8th, 13th, 14th and 15th of Federal Law No. 5,194 / 66, the ESTIMATIVE BUDGET of the body accompanying the bidding notice, provided for in paragraph II, Paragraph 2, item 17 of Article 40 of Law No. 8.666 / 93, You must have your authorship duly identified in the document, with the full name of the budgets, profession of civil engineer or architect and the registration number in CREA.

As a result of this legal duty, analyzing the budgets of projects from the aspect of planning, cost sizing, and forecasting revenues for the execution of works, within the stipulated time frame is of vital importance for the correct management of public funds.

In this context, this article aims to evaluate under technical and economic aspects the feasibility and feasibility of public works budget cases.

II. BIBLIOGRAPHIC REFERENCE

II.1 DETAILS OF BUDGET DETAIL

Whether in the public sector or in the private sector, before the detailed development of an executive project there is already a concern of the manager to have a sense of the cost of the budget. This is a very understandable concern, because it is from this prior assessment that he will choose to continue the project, or increase it in scope, or cut parts, or reduce the finishing pattern, or even abort it if it comes to. conclusion that it does not have the necessary resources to carry out the work [2].

Depending on how detailed the budget is, it can be defined as Cost Estimate, Preliminary Budget, or Analytical or Detailed Budget.

a. Cost Estimate: Expedited appraisal based on historical costs and comparison with similar projects. It gives a rough idea of the order of magnitude of the cost of the venture.
b. Preliminary Budget: There is more detail than the estimate of costs presupposes the survey of quantities and requires proper price research.
c. Analytical Budget: Prepared Through Cost Compounding and Extensive Price Research, it is through this budget that a public works bid is held.

II.2 EXECUTIVE BUDGET

Unlike the conventional budget that sees the work as done, the executive budget is concerned with all the details of how the work will be built. The executive budget responds to the need to model costs according to how they incur on the site over time [3].

The executive budget consists essentially of matching the information provided by the budget to the data obtained on site according to a concept of operation, that is, the task must be the executive budget is closely linked to the time the activities are performed on the site [4].

The executive budget has as its budgeted parameter the activity. In this context, the planning of the work is carried out through work packages following the project execution strategy [5].

The advantages of using the executive budget are several and essentially linked to the transparency in which the work is exposed, thus increasing the power of decision once considered cost and time. The budgeted parameters are closely related to the moment of execution, enabling the balancing of work teams, including considering the unproductive times of certain operations, and, in addition, the supply sector is optimized, as the cadence of employees becomes transparent. necessary materials. These attitudes enable the budget as a source of rationalization of construction management [6].

II.3 PUBLIC BIDS

II.3.1 PUBLIC WORKS

According to [7], the Public Works may be performed directly or indirectly, and may be performed directly, when the work is done by the Administration's own body or entity, by its own means, or indirect, when the work is contracted by third parties through bidding.

Every Public Work that passes its execution to third parties, must contract them through bidding. In order to start bidding for a Public Work, a preliminary study must be done, aiming to identify the needs and resources to be used that wisely meet the analyzed project, thus avoiding the waste of public spending. In the preliminary bidding phase, a needs program, a feasibility study and a preliminary draft should be followed.

So, with a preliminary study well done can move to the new phase of bidding and start preparations for hiring competitors that will give the best proposal for Administration.

According to Law No. 8,666 / 1993, the bidding process begins with the opening of an administrative proceeding, duly assessed, filed and numbered, which contains the respective authorization, the brief indication of its object and the origin of the own resource for the expense.

In this phase, all the documents that were predisposed in the bidding process and according to the case law of TCU (2014) should be added. Figure 1.

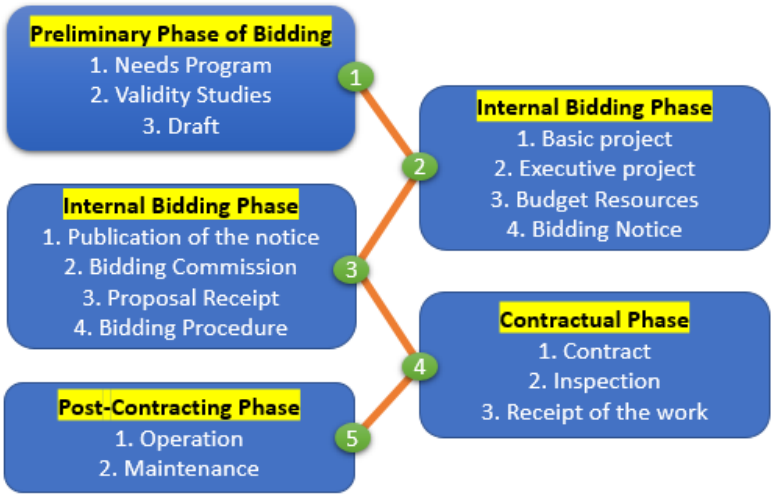

Figure 1: Bidding Steps.
Source: [7].

II.3.2 MAJOR IRREGULARITIES IN PUBLIC WORKS

Regarding the bidding procedure, [7] discriminates as factors of irregularities: Unnecessary restrictive requirements in the notice, especially regarding the technical qualification of the company's technical and operational technicians; Lack of global and unit price acceptability criteria in the bidding notice; Inadequate or incomplete basic project, without the necessary and sufficient elements to characterize the work, not approved by the competent authority, and / or prepared after the bidding process; Incompatible bidding method; • work not divided into parcels with a view to making better use of available market resources and increasing competitiveness;

II.3.3 BONUSES AND INDIRECT EXPENSES

According to [8], BDI is a rate that is added to the cost of a work to cover the builder's indirect expenses, plus the venture's risk, the financial expenses incurred, the taxes on the operation, any selling expenses, the entrepreneur's profit and its result is the result

of a mathematical operation based on objective data involved in each work.

In public or private tenders, the company may use historical data from the financial statements regarding the expenses of its headquarters as the closest parameter to reality for the calculation of the BDI rate, choosing to include or exclude certain expenses according to the evaluation of risks of the venture in which it will participate and taking into account the strategic interests of your company when presenting a particular business proposal.

In establishing the rates corresponding to each of the components of BDI, Management has a duty to justify their origin according to the different types and sizes of works and to analyze the qualification and structure of the companies participating in a bidding process.

The BDI adopted by the Administration for the calculation of the estimated budget should be considered only as an evaluation parameter to obtain the reference value for judging the bid by the Bid Judging Committee.

III. MATERIALS AND METHODS

For the elaboration of these articles, two distinct public works budgets will be evaluated, performing an analysis of the methodology used in its budget, and evaluating wrong elements in the budget and their possible consequences.

For the analysis of each of the two works, we evaluated the budget spreadsheet provided by the agency, with the respective quantities, prices and cost reference date, and compared the difficulties encountered in the execution, the actual cost spreadsheet, and to visible design failures, listing and, through corrective calculations, set the ideal bid price for the venture.

IV. RESULTS

IV.1 WORK 01: CONSTRUCTION OF THE BRAZILIAN NAVY OPERATIONS CENTER IN CARAUARI, RORAIMA.

Job Description: Work in Simple Structure of Reinforced Concrete and Fence in Masonry, totaling 186 square meters of built area, built in the municipality of Carauarí, Roraima state.

Budget Reference Technical Date: November 2018.

Expected Time: 90 Days

At the Basic Unit Cost for the delivery period, a preliminary cost estimate would have been made, considering the project as R$ 11,737.54 Standard Residential Standard.

The total value, considering the built area for the execution of the work, is **R$ 338.820,30**.

The budget presented by the public administration was R$ 242,975.99, considering a BDI of 28.35%.

Of course, in order for the bidder to be competitive in bidding, a discount must be provided.

Table 01 below provides elements necessary for the proper execution of the project, but were not included in the initial version of the budget.

Considering that this is a budget prepared by a corps of naval officers, a considerable degree of technical support is assumed by the budget team, however, a requirement present in the edict was not included in the worksheet: a Civil Engineer and a Contractor Hired by the Company in compliance with the SINAPI price for the period, there is the following table of complements:

Table 1: Carauari Synthetic Budget Worksheet.

Item	Code	Bank	Description	Unt	Amou.	Value Unit	Value Unit BDI	Total
1			**WORK ADMINISTRATION**					**77.968,32**
1.1	93565	SINAPI	JUNIOR CIVIL ENGINEER WITH ADDITIONAL CHARGES	MES	3	14.038,25	17.676,96	53.030,88
1.2	94295	SINAPI	MASTER WORKS WITH ADDITIONAL CHARGES	MES	3	6.601,40	8.312,48	24.937,44
3			**ROOF**					**543,87**
3.1	94231	SINAPI	RUFO IN GALVANIZED STEEL PLATE NUMBER 24, 25 CM CUT, INCLUDED VERTICAL TRANSPORT. AF_06 / 2016	M	16,75	25,79	32,47	543,87
					Total without BDI			**62.350,93**
					BDI Total			**16.161,26**
					Grand total			**78.512,19**

Source: Authors, (2019).

This total of R $ 78,512.19 is not included in the amount offered to bidders, negatively impacting the final profitability of the work, or making the project unfeasible.

For this venture, there was also a considerable financial gap, as there was a delay in on lending for the beginning of the work, only allowing it to be completed in July 2019.

The National Index of Civil Construction allows to evaluate the evolution or reduction of the base costs for construction, allowing to determine financial losses resulting from the late delivery of works. For the period, between November 2018 and June 2019, there is an accumulated cost growth of 2.19%.

Thus, the analysis showed that the venture, unless the necessary additives are made to compensate the administrative costs, is in a state of economic unfeasibility.

IV.2 WORK 02: CONSTRUCTION OF SUPPORT POINT FOR MOTOTAXISTS IN THE CITY OF CAREIRO CASTANHO, AMAZONAS.

Job Description: mixed use building construction, The work comprises the construction of masonry building, having a total area of 416.95m², having the following characteristics: Built area of 195.00m²; in masonry with ceramic block and cover with aluminum tiles, featuring 221.95 m² of parking.

Budget Reference Technical Date: October 2018.

Expected Time: 150 Days.

At the Basic Unit Cost for the period, a preliminary cost estimate would have been considered, considering the project as R$ 1 Standard Residential, R$ 1,875.02/m².

The total amount, considering the constructed area for the execution of the work, is R$ 348,753.72.

The budget presented by the public administration was R$ 273,028.80, considering a BDI of 25.92%. Table 02 below shows items required by the basic project not included in the quantitative worksheet provided by the municipal administration.

Table 2: Careiro Brown Synthetic Budget Worksheet.

Item	Code	Bank	Description	Unt	Amou.	Value Unit	Value Unit BDI	Total
1			**WORK ADMINISTRATION**					**141.619,45**
1.1	93565	SINAPI	JUNIOR CIVIL ENGINEER WITH ADDITIONAL CHARGES	MONTH	5	14.725,12	18.899,69	94.498,45
1.2	94295	SINAPI	MASTER WORKS WITH ADDITIONAL CHARGES	MONTH	5	7.342,58	9.424,20	47.121,00
4			**ROOF**					**11.209,84**
4.1	94213	SINAPI	STEEL / ALUMINUM TILE ROOF E = 0.5 MM, WITH UP TO 2 WATERS, INCLUDING LIFTING. AF_06 / 2016	m²	197,6	44,20	56,73	11.209,84
9			**PAINTING**					**5.789,52**
9.1	88497	SINAPI	LAX MASS APPLICATION AND SANDING ON WALLS, TWO HANDS. AF_06 / 2014	m²	452,66	9,97	12,79	5.789,52
					Total without BDI			**123.585,44**
					BDI Total			**35.033,37**
					Grand total			**158.618,81**

Source: Authors, (2019).

In this particular budget, there have been considerable budget failures. In addition to the local administration, ignored in the spreadsheet, services such as Roofing and Wall Cracking were not contemplated. Thus, the work is already partially unfeasible, if there is not an additive of the services and a revision of the bid scope.

In relation to the National Index of Construction, the loss rate due to monetary inflation is 2.19%.

V. FINAL CONSIDERATIONS

Within the scope and initial premise of the paper, to observe possible budget failures pointed out by the public administration in two case studies, it was possible to verify a considerable lag in the presented budget.

In relation to the work 01, it was possible to observe a disagreement between the requirements of public notice, that demanded a constant presence of the local administration, and the one presented in the spreadsheet.

Work 01 also presented a financial gap, as the delay in the transfers between the government and the construction company causes financial loss to the bidder due to the increase in the base price of the inputs.

In practice, construction companies do not hire their engineers under the CREA wage floor, nor do they bear their labor costs, so that the cost presented in this work can be mistakenly ignored by both the bidder and a colluding public administration.

Work 02 presented the same flaw in not considering the costs of local administration, and also presented several flaws in scope by not including in the budget mask services necessary for the execution of the project.

By analyzing both cases, it was possible to verify the lack of adequacy of the budget spreadsheet to the scope demanded by the edict through the basic project presented. No compensation mechanisms were identified for financial loss due to delays in management transfers, and these elements strongly indicate the lack of technical quality and the correctness of budgets provided by the government.

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RESEARCH ARTICLE OPEN ACCESS

MATERIAL TRANSPORT TO MICROWAVE OVEN LAMP ASSEMBLY

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ABSTRACT

The purpose of this work is to develop an Automated Guided Vehicle (AGV) for the transport of microwave oven bulbs for white-line companies. In order to do so, it is proposed to project and implement a mobile reactive robot that transports light bulb boxes with of defined weights, this robot being a line follower with built in sensors to move, making use of the computational tool Autodesk Inventor for drawing and mechanical tests and the development of the software in a language based on C/C ++, called Wiring. The assembly of the robot began with the creation of the mechanical design with the intention of assisting in the management and supply of the white lines providing a simple and fluid management delivering the bulbs on the depot path to the production lines not requiring the employee to leave the working environment. avoiding losses such as time and work accident while loading the product. The results obtained in the experiments performed during the research showed that the system performed the movement in a stable and correct way, that is, following the line until finding the requested position.

Keywords: Automation. Transport. Vehicle.

I. INTRODUTION

The standalone mobile robot has a line of applications for the future, even today with its focus on performing everyday tasks indoors. In some of these applications, platforms must be able to navigate and avoid obstacles. Regarding the line following robots, it can be inferred that a robotic system requires a map, where it should add the line in the real environment, then define its trajectory and then perform navigation [1]. Based on these applications, the idea of the reactive robot is to be a machine that needs human drives to do any preprogrammed action, being composed of peripheral devices that receive them and transfer them to the machine to perform accordingly. Thus, their actions need humans to be executed. This project aims to design a reactive mobile robot that transports microwave oven lamp boxes, being a line follower composed of sensors for locomotion, having devices for human activation, developed using an Autodesk Inventor design and simulation platform. ® and software development in a C / C ++ -based language, called Wiring, utilizing technical safety standards in every mechanical design, moving robot techniques, and human drive. Currently in the production lines of companies in the "White Line" segment of the Manaus Industrial Pole, they carry out the lamp feeding process manually, with one operator pulling parts in boxes, and taking to the line supplying their need for parts. that the process leaves room for loss of production efficiency, part deviation and mishandling of transported material.

Thus, an opportunity for improvement is needed, and it is possible to develop and implement a mobile robot that carries parts containing a human push button, and can be guided by a line sensor for path identification, monitored by software. supervisory, with a set of impact safety devices, all controlled by a microcontroller. As all automation requires structural adjustment by the company to be applied, however, any change becomes subjective since the layout of the feeder industry interface and production lines are different from company to company, as well as the layout Automation by companies is also different depending on the view of top management. Considering also that every change generates

resistance, this same resistance becomes greater and evident when it comes to something that not all companies are used to, and this work tends to overcome this resistance.

II. LITERATURE REVISION

Robotics have the ability to act in various fields ranging from industrial use with AGV's and handlers to robots used in surgical medicine. It is treated as a set of applied theories, comprising various branches of engineering, such as mechanical, electrical and electronic, computing and cognitive sciences, such as biology. However, robots alone constitute only part of a robotic system [2].

According to [2], there is a relationship between the state of the industry with technological advancement imputed to robotics. The revolution in numerical and computational control and command of machines, the development of human-machine interfaces are factors that evidenced the need for automatic devices to perform activities.

The mobile robot has great difficulties operating in large unstructured environments and may have significant uncertainties in the position and identification of objects. Moving from point A to point B has an uncertainty along this path, which is a risky operation for a mobile robot. Operations have different indices that are measured by the uncertainty and precision required of the mobile robot, with priority being given to sensing and reasoning areas for it [3].

Since the model suitable for an application is more complex the greater the irregularities and uncertainties about the physical environment in which the robot will be inserted, as well as the higher the level of precision required. Thus, the controllers found in the literature are divided into three approaches: kinematic model, dynamic model or union of the two models [4].

The kinematic model treats robot movement as a function of its speed, while the dynamic model takes into account the motor torque and other forces involved in the system [5].

An Automated Guided Vehicle (AGV) is a mobile robot containing a series of sensors and communication circuits that make it autonomous, i.e. independent of humans.

AGV-based systems can be used for a variety of purposes, whether performing industrial or domestic tasks. These systems are most commonly used in warehouses and industrial plants, but can be found in cargo transportation systems, such as ports, or even in personal transport [6].

[7] says that with larger and more complex projects led to the search for tools that could help in planning, decision making and control of different activities. Changes in this environment began to take place during World War II with the creation, by the US Department of Defense (DoD), of a group of scholars analyzing the diversity between production line management and exclusive unemployment management. Efforts like these show the importance in particular approaches to project management.

Unique characteristics of the projects cause uncertainties regarding their results. [8] highlights the relevance of complex and uncertain factors in project production, [9] highlights that projects operate in almost all areas of knowledge. Thus, the activities to be performed require planning and engagement from all organizational parts, as the project may involve different professionals, units or organizations. At the beginning of the project, uncertainties, largely due to the influence of stakeholders on changing end products, are of a high degree, but they tend to decrease during development as knowledge increases and also because the cost to implement changes.

Project management is recognized as employing the knowledge, skills, tools and techniques to plan, schedule, execute and control project activities. It occurs by the proper application and integration of processes and their logical groupings. This makes it possible to achieve the objectives of a project. The most important objectives to be achieved include performance, cost and duration goals, while controlling or ensuring the scope of the project [10].

For [11], projects are characterized as an initiative with identifiable objectives, which consume resources and act under time, cost and quality pressures. Also, according to this author, the projects are increasing in size and complexity being perceived as a multifunctional activity. As a result, the challenge is not simply management of recursive activities based on standards of other projects, but mainly of managing activities that have not yet been performed and that may not be repeated in other projects.

III. MATERIALS AND METHODS

III.1 ELECTRONIC PROJECT

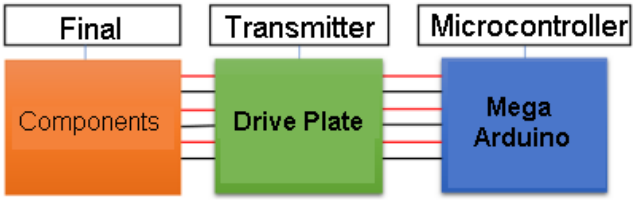

Figure 1: Control system.
Source: Authors, (2019).

Control System: The robot control architecture is presented in Figure 1, consisting of a microcontroller and its cable connection board.

Figure 2: Mega Arduino.
Source: Authors, (2019).

Arduino Mega: The microcontroller used to process and control the entire Robot is Arduino Mega for its simple C / C ++ programming mode.

Figure 3: Power connectors.
Source: Authors, (2019).

In the robot it is necessary to have an autonomous power supply, not needing external sources to perform its functions. With that we have to power the Arduino through its power connectors, illustrated in Figure 3.

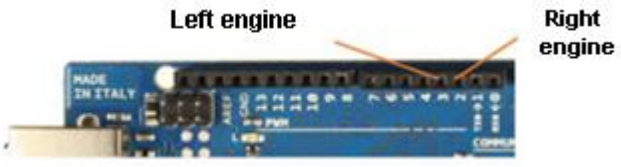

Figure 4: Control doors.
Source: Authors, (2019).

The microcontroller uses PWM ports to drive motors, which are ports to control the active cycle of a signal in order to control power. Basically, we will have a digital signal that oscillates between 0V and 5V with certain frequency. Figure 4 shows the Arduino Mega PWM ports and the motor driver, left motor on pin 3, and right motor on pin 2 connections.

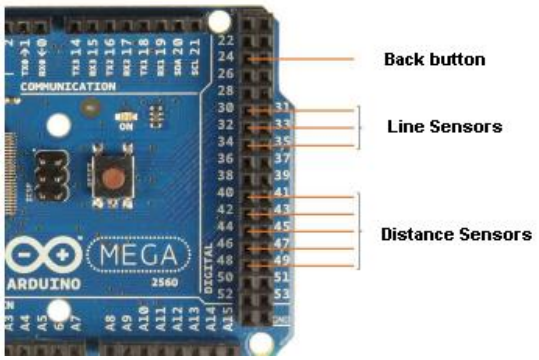

Figure 5: Digital ports.
Source: Authors, (2019).

The other devices are connected to the digital and analog ports, connected to the Arduino Mega digital ports, ten devices in all, as shown in Figure 5.

Figure 6: Programming.
Source: Authors, (2019).

Arduino itself has software where the programming will be done, illustrated in figure 6.

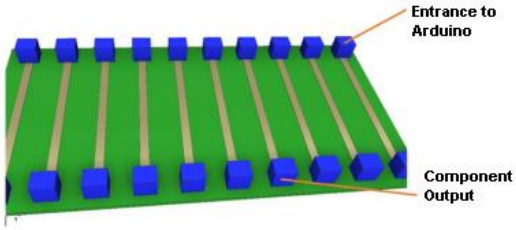

Figure 7: Drive plate.
Source: Authors, (2019).

Drive Board: The drive board of the devices is required to have the organized branching of the cables, being a transmission for all devices, consisting of:

• Two DC Motor Drivers;
• Three distance sensors;
• Three Line sensors; Being eight devices connected by this board, illustrated in Figure 7. Using this board as a connection broker, containing sockets that aims to prevent short circuits and mismatch between the Arduino and the device. So, this "cable" board leaves the microcontroller at the terminals, and the components at the serial terminals.

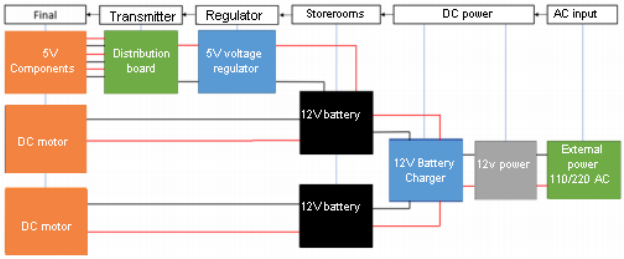

Figure 8: Electronic architecture.
Source: Authors, (2019).

Electronic architecture of the Robot as illustrated in figure 8.

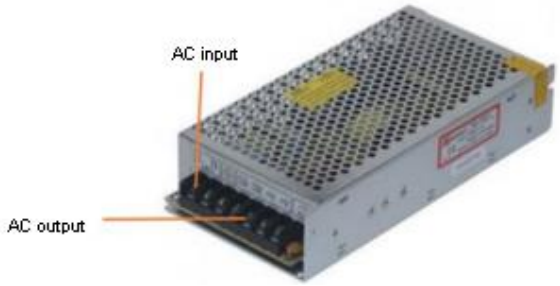

Figure 9: Battery source.
Source: Authors, (2019).

Battery Charging System: Using a Sready Power source, 100W power, 12 volts output, supporting 8.5A at full capacity, illustrated in Figure 9.

Figure 10: Strain gauge.
Source: Authors, (2019).

Charging the batteries requires a device that also measures and controls their charging. Controlled Module 12-24V battery charge control protection switch was used. This module has an input voltage of 10-30 VDC, and it is possible to choose the final voltage to be charged, with control knobs so you can choose this output voltage, illustrated in Figure 10.

Figure 11: Battery.
Source: Authors, (2019).

There is a need to add the input voltage from the external source by pressing the Start button for this function. After that, the Stop button is pressed to set the desired Battery charge voltage. To "reset" the settings, press the two buttons together to return to the factory setting using a 12v battery using the sealed battery model shown in figure 11.

Figure 12: Regulator.
Source: Authors, (2019).

The batteries are connected separately so that one powers the motors and the other powers the other devices. But to be charged, it has the connection together being placed in parallel in order to facilitate simultaneous charging.

5v Regulator: The voltage regulator has a potentiometer that regulates the voltage and shows on the display which voltage is helping to adjust the voltage through the potentiometer. The input of this module is connected to 12V battery, but is set to 5V which is the voltage of the components and the microcontroller, illustrated in figure 12.

Power board: The device power board is to ensure the organized branching of the cables, where there is a 5V voltage distribution for all devices, which are:

• One Mega Arduino;
• Six distance sensors;
• Three line sensors; Being ten devices powered by this board.

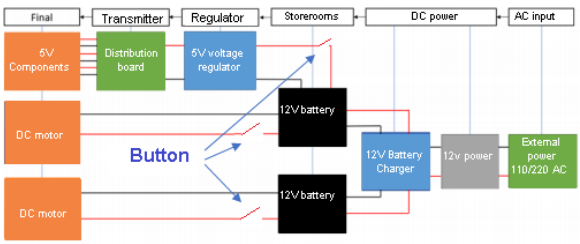

Figure 13: Electronic operation.
Source: Authors, (2019).

Electric operation: Containing two main systems in operation, one for charging the batteries and one for autonomous operation of the robot and in figure 13 we have the battery charging system, and we will have buttons to disable all devices of the batteries, with this we can charge the batteries safely.

Figure 14: Optical sensor.
Source: Authors, (2019).

Sensors: The line sensor of choice was the TCRT500 Optical Sensor Module, which operates in an infrared frequency range consisting of two LEDs, an emitter and an infrared receiver, illustrated in Figure 14.

Figure 15: Distance sensor.
Source: Authors, (2019).

Distance Sensor: HC-SR04 Ultrasonic Sensor, illustrated in Figure 15, capable of measuring distances from 2cm to 4m with great accuracy, six (6) of the same model around the robot were used for safety.

III.2 ACTUATION SYSTEM

Figure 16: 2D engine.
Source: Authors, (2019).

Figure 17: 3D engine.
Source: Authors, (2019).

DC Motor: Gear Motor PG45775, illustrated in 2D in Figure 16 and Figure 17 in 3D, 12V power supply, 500 revolutions per minute, having a reducer coupled to its mechanism to increase its torque and 32kg / cm maximum power.

Figure 18: Motor Drive.
Source: Authors, (2019).

DC Motor Drive: Pololu High Power, Looking at Figure 18, adds the battery power to the driver's 12V input terminal, along with the cooler power. Connecting the motor to the 12V output terminal of the driver, containing inputs that establish the microcontroller PWM connections, causing this driver to have the functionality LED, which when connected is lit permanently, if it is in operation, the LED starts flashing continuously. the pulses generated from the control.

IV. STUDY APPLICATION

IV.1 MECHANICAL DESIGN ASSEMBLY

Figure 19: Wheel.
Source: Authors, (2019).

Wheels: The wheels should have as much friction as possible with the ground, so the fixed wheels with tire (tire) were chosen as illustrated in Figure 19 with pressure of 36 PSI, diameter 150 mm and load up to 80kg.

Figure 20: Silly wheel.
Source: Authors, (2019).

The choice of the dumb wheel is due to not having friction with the ground but resistance to the load applied on it, so as to have a structure that allocates weight on it, with allocation of weight not centered on the structure, for its stability and By the allocation of the wheels, in Figure 20 the illustrative 3D drawing, we have the chosen industrial caster which is made of polypropylene plate, supporting up to 90kg with 100 mm height.

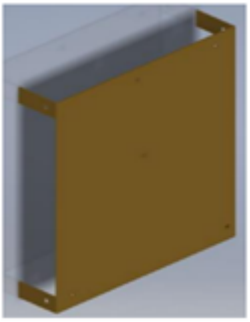

Figure 21: Robot Structure.
Source: Authors, (2019).

Robot Structures: Defining the size of the robot base by designing it in the Autodesk Inventor program, making it easy to add calculations to your measurements, as illustrated in Figure 21.

Figure 22: Aluminum sheet.
Source: Authors, (2019).

Using a mechanically deformed Aluminum plate 331, which is the bending of it by hardening, for one side of this plate to be coupled to the motor and the other upper one to be fixed to the plate. Figure 22 illustrates that the shaft passes through the plate.

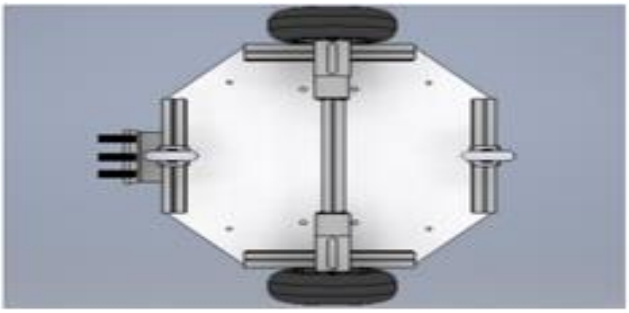

Figure 23: Base.
Source: Authors, (2019).

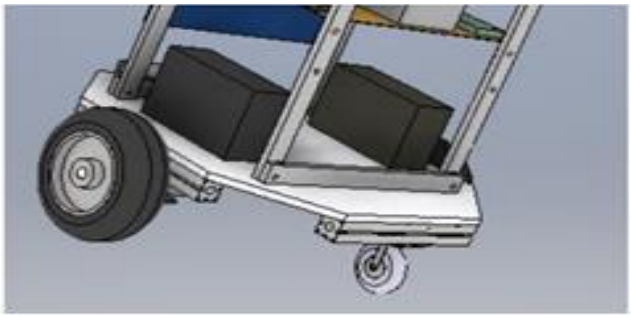

Figure 24: Base with batteries.
Source: Authors, (2019).

The mechanical base was structured with the wheels and motors, but the mounting of the support profile, allocated in a

projected way. Figure 23 shows the assembled base. After the mechanical base, the components in the base, such as batteries and motor drivers, were allocated, illustrated in Figure 24, applying the weight of the batteries to the silly wheel, and installing the drivers next to the motors.

Figure 25: Base with the components.
Source: Authors, (2019).

Soon after the base with components, the support structure of the electronic panel was added. Placing a Bosch profile 40x40 mm perpendicular to the base, 640mm long, used as a column, supporting the board with all components. As illustrated in Figure 25, finally, the sensing structures, consisting of the line sensor and distance sensor, were added.

IV.2 ARDUINO ROBOT CONTROL ALGORITHM

Figure 26: Programming Platform.
Source: Authors, (2019).

The software used for programming is from the Arduino microcontroller company itself, illustrated in figure 2, just go to the company's website <https://www.arduino.cc/> and download the platform using the C language / C ++ will be able to apply it so that the robot works autonomously, sending the programming directly to the mega Arduino that is allocated in the robot.

V. RESULTS AND DISCUSSIONS

The line follower has a simple but important behavior that allows the use of mobile robots in structured environments such as industry. By going through pre-established paths, marked on the floor by a line, making several practical processes to be automated.

Figure 27: Demarcation for the robot to follow.
Source: Authors, (2019).

The first test of the line follower, has the construction of the circuit in the ground, with curves at an angle of 20 degrees according to the track, illustrated in figure 27. The implemented project had as improvement the supply performance of the white line. From microwave oven making management easier for the employee and line manager, team was meticulously deity in field testing and data collection for possible improvement if the project generates interest in some manufacturing institution.

VI. CONCLUSION

This work aims to develop an Automated Guided Vehicle (AVG) to transport microwave lamps from white line companies. Thus, it was proposed to build an electromechanical structure that moves and maintains safety for the people around. The results obtained in the experiments carried out during the research, with varied locations and trajectories, showed that the proposed methodology is effective, but it has not been applied yet in the white line companies due to the property security policies as well as the unwillingness on the part of the companies to do so. Invest time to conduct tests on either normal production or production simulations on microwave oven lines or even making adjustments to the physical structure of the unit to be implemented. It is also noteworthy that the implementation of this work intends precisely what is the essence of Control and Automation Engineering: the control and automation of processes; processes whose merits exemplify eliminating the need for wage and overtime payments, hazardous and unhealthy, monthly and extra benefits, excluding the risks of accidents occurring without and with leaves, unsafe conditions or behavior, economic risks associated with the process applied besides offering the possibility of working in different conditions.

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RESEARCH ARTICLE OPEN ACCESS

APPLICATION OF AGROTOXICS IN THE RURAL AREA OF PARA

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ABSTRACT

The pesticide has been used over time to optimize agricultural production and prevent certain types of unwanted fungi or herbs in its production with certain pesticides making it harmful to health both by consuming and especially by creating a direct contact, using as base the work safety standards imposed by federal law. 7,802, July 11, 1989 and Decree 4,074, January 4, 2002, NR15 and NR31 aiming at the correct application of pesticides and better storage using the field research methodology, photographic records and questionnaires with the rural worker, resulting in non-compliance with the same already mentioned for lack of correct use of PPE during the application and lack of MSDS (Chemical Safety Data Sheet) at the storage site, however in view of the information presented, attention is needed with the rural worker and his quality of work.

Keywords: Pesticide; Methodology; Safety.

I. INTRODUTION

Pesticides emerged in World War II for the purpose of functioning as a chemical weapon. After the war, the product was used as a pesticide, becoming also known as pesticide, pesticide or phytosanitary product. In Brazilian law, the term used is pesticide, despite attempts to change it.

Since the 1950s, with the so-called "Green Revolution", agricultural production has undergone many changes. The agricultural process has been modernized through seed research, soil fertilization and field machinery. All this to boost productivity. Much of this technology also involved the widespread use of pesticides in order to control pests so as not to have losses in the agricultural process, since pesticides have the function of altering the composition of fauna and flora.

According to [1] Law No. 7802/89, "pesticides are chemicals intended for use in the production, storage and processing of agricultural products, pastures, protection of native or implanted forests, and other ecosystems. and also, of urban, water and industrial environments, whose purpose is to change the composition of fauna or flora, in order to preserve them from the harmful action of living beings considered harmful, as well as substances and products used as defoliants, desiccants, stimulants and inhibitors. of growth ". Growth regulators are also considered agricultural defensives.

II. BIBLIOGRAPHIC REFERENCE

According to [2] there are 20,000 deaths / year as a result of pesticide manipulation, inhalation and direct consumption in developing countries such as Brazil. Organophosphate pesticides including tamoron basically cause three types of neurological sequelae after acute intoxication due to chronic exposure: delayed plineuropathy (progressive weakness and ataxia of the legs, which may progress to flaccid paralysis), intermediate syndrome (paralysis that mainly affects the neck flexor muscles, leg and respiratory muscles, and intensive diarrhea) and behavioral effects (insomnia or disturbed sleep, anxiety, delayed reactions, difficulty concentrating, and a variety of psychiatric sequelae: apathy, irritability, schizophrenia, difficulty in thinking, failures memory and depression) [3].

His work [4] states that the regulation provided by Law No. 7,802 / 89 emphasizes the importance of controlling the use of pesticides, since there is an excessive and improper use of these substances mainly motivated by the misinformation of their real dangers.

The correct use of phytosanitary products required the correct use of protective equipment (PPE). The current recommendations for the use of PPE are quite generic and standardized, not considering important variables such as the type of equipment used in the operation, the actual exposure levels and even the environmental and crop characteristics where the product

will be applied. These variables often result in unnecessary spending, inappropriate recommendations, and may increase workers' risks rather than decrease them [5].

Depending on the type of product used and triangulating a parameter such as exposure time, a type of degree of health, minimum, medium and maximum can be defined, to be cautious before the worker directly influencing their salary [6].

Qualification programs developed by official rural extension agencies and services, middle and higher education institutions in agricultural sciences and the National Rural Learning Service (SENAR), trade unions, rural producers' associations, agricultural production cooperatives or forestry and professional associations, provided that the criteria established by this standard are met, ensuring the free choice of any of these by the employer [7].

The impact of pesticide use on human health has been addressed as one of the top priorities of the entire scientific community around the planet, particularly in developing countries where these chemicals are widely used in agricultural production. Developing countries account for 30% of the global pesticide consumer market, with Brazil being the largest single consumer market among these countries, equivalent to half of all consumption in the Latin American region [8].

This publication presents contributions from some research groups that have been dealing with the challenges presented here in Brazil and Latin America in the last two decades. It is a sample of the growing scientific output on the health and environmental effects of pesticide use in rural activities and is part of the efforts of the Oswaldo Cruz Foundation and Mount Sinai School of Medicine to bring together professionals from across the Latin region. -American project with a main objective: to narrow the gap between the environmental and health sciences and thus contribute to the promotion of a better quality of life and work for all rural workers in Latin America [9].

The idea of "taking it" that emerges in the analysis shows that individuals are facing a knowledge that imposes a type of behavior and says that there are no alternatives. Acting differently, i.e. adopting new behaviors, such as using PPE and following expertly established standards of protection, could be for this group at odds with the common sense that fatality should be accepted and at odds with the "rule". that it is normal not to protect oneself [10].

Pesticides can be seen as a necessary input to the viability of most rural production systems, since many of these rural production systems would only be sustained due to the use of pesticides to compensate for their lost productivity. In many cases the use of pesticides could be considered as a matter of survival. For most farmers and rural workers, an agricultural crop without pesticides would not be a viable alternative [11].

The use of pesticides seemed in most cases to try to maximize economic efficiency and increase rural productivity, bringing additional socioeconomic benefits. However, assuming the inverse relationship between economic efficiency and socio-environmental justice as true, it would be necessary for some communities to accept (willingness to accept) a certain amount of additional socio-environmental risk caused by the use of pesticides [11].

III. MATERIAL AND METHODS

The field research was carried out with activities developed with the community object of the study, through direct visits to the properties to collect specific information directed to the theme addressed, that is, related to the way in which the farmer acquires and uses pesticides. in the development of rural activities, and how this affects their health, their way of life and the environment.

III.1 RESEARCH PLACE

The research was developed in the locality called barrier road towards legal Brasilia, near the municipality of Itaituba state of Pará, this region has as one of its main sources of income agriculture and livestock, the pesticides have as aid in the production of this source of income. so present in the region.

IV. TYPE OF RESEARCH

The work carried out is based [12], according to him the field research modality, uses the method called Descriptive Research where it was prioritized to observe, register, correlate and describe facts and phenomena of a reality of a community without causing changes or manipulations in the middle.

Following the line of reasoning of [12] was made use of the technique of data patterns applied through a questionnaire observing the sitmatic of the present study site.

IV.1 DATA COLLECTION INSTRUMENTS

The collected data was generated through visits to the locality observing the local worker site before the application of the pesticide, during and after the application and then observing the use of PPE during the entire process and storage sites of Epi and agrotoxic agents, the photos of rescues during application were taken from a distance considered safe by the researcher of this article himself, such action was taken as there was no PPE.

IV.2 RESEARCH FORM

Table 1: Questionnaire.

1. Do you use pesticides to control pests and unwanted herbs?	( ) Yes ( ) No
2. How often do you use the pesticide	( ) Daily
	( ) Weekly
	( ) Monthly
	( ) Others
3. Where is it from get from pesticide	( ) Farm Shop
	( ) Online platform
	( ) Unknown "Street Vendors"
4. Do you receive professional guidance from the area?	( ) Agronomist Engineer
	( ) Agricultural store clerk
	( ) Neighbors of the region
	( ) Does not receive guidance
5. Can you identify the toxicological classification when purchasing the pesticides class 1- extremely class 2- highly toxic class 3- medium toxic class 4 - little toxic	( ) Yes ( ) No
	( ) By band color
	( ) Reading the label and / or the package leaflet
	( ) Other.....
6. Uses PPE's for pesticide application	( ) Yes, Full
	( ) Yes, Partial
	( ) Not use

Source: Authors, (2019).

IV.3. STANDARDS APPROVED FOR WORK

NR 15 - Unhealthy Activities and Operations Annex No. 13 - List of activities and operations involving chemical agents considered unhealthy due to workplace inspection. Excluding basket activities or operations with constant chemical agents, the rural worker who works exposed to contact with chemical agents and pesticides has the right to unhealthy work from 1973, when Law No. 5,589 / 73 came into force. , which regulates rural activity.

Following the above NR context, the level of healthiness in the workplace in this proposed article is medium level.

NR 31 - The purpose of this Regulatory Standard is to establish the precepts to be observed in the organization and in the work environment, so as to make the planning and development of the activities of agriculture, livestock, forestry, logging and aquaculture compatible with safety and occupational health and environment.

Number of workers	Work safety engineer	Occupational Physician	Occupational Safety Technician	Work nurse	Nursing assistant
51 to 150			1		1
151 to 300			1		1
301 to 500		1	2		1
501 to 1000	1	1	2	1	1
Over 1000	1	1	3	1	2

Figure 1: Table of professionals by number of employees in the company.
Source: [7].In the table above we have the occupational safety professional (s) corresponding to the number of employees in the workplace and around.

V. RESULTS AND DISCUSSION

Figure 2: Rural worker.
Source: Authors, (2019).

After surveying the analysis of occupational safety standards NR15, NR31 and decrees such as "DECREE No. 4,074, JANUARY 4, 2002", it was concluded, as illustrated in Figure 2, that the current employee is not in debt. protected for their duties in applying the pesticide pesticide weekly, lacking the use of appropriate PPE's such as gloves, mask, protective hat and clothing that prevent the product from penetrating your skin, all for the sake of safe work aiming to have no worrying symptoms in the future. Your health.

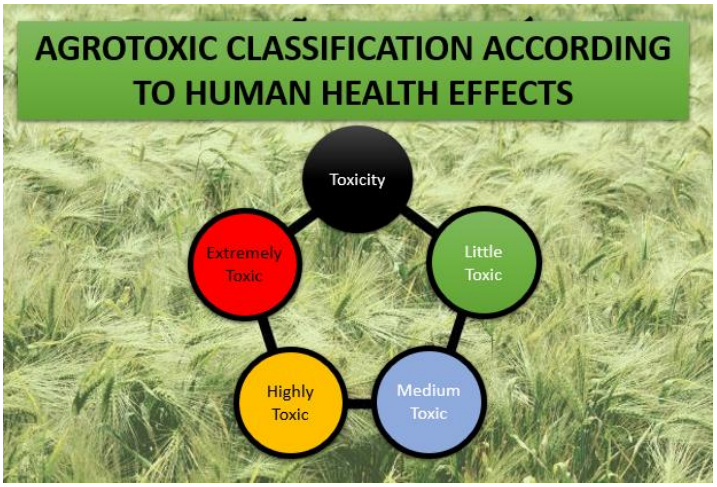

Figure 3: Color toxicity illustration.
Source: [13].

Toxicological class, band color on the product label and lethal dose 50 (DL50), thus making it easy for the worker to know the degree of danger of the product being handled.

Toxicological class		Band Color	Lethal Dose (LD50)
Class I	Extremely Toxic	Red	< 5mg/kg
Class II	Highly toxic	Yellow	5 - 50mg/kg
Class III	Toxic Medium	Blue	50 - 500mg/kg
Class IV	Toxic	Green	

Figure 4: Dose in mg of lethality.
Source: [14].

As has already been identified in Figure 4 the degree of hazardousness being identified by color, going deeper here in Figure 5 identifies the lethality dose in mg / kg and an illustrative idea as 1 teaspoon for the lethal dose.

Table 2: Table of confirmed cases.

Epidemiological Indicators	**YEAR 2007 TO 2017**
confirmed cases	40,000 (forty thousand)
death toll	1,900 (nineteen hundred)
Pesticide consumption in 2017 in Brazil	500 thousand tons

Source: [13].

In Table 2 we see the cases of people affected by the pesticide within 10 years showing all concern with those who have direct contact with these products.

VI. FINAL CONSIDERATIONS

The objective of this work was to work on safety standards focused on the use of pesticides from storage to direct application, showing in various views the negative effects of direct contact and their precautions always based on safety standards. as NR15 annex 13 and NR 31 showing the need and attention to the rural worker and applying due healthiness to the rural worker salary, in order to reach this conclusion field surveys were conducted based on a questionnaire and photographic records for a test. More concrete need for the application of occupational safety standards, bringing the purpose of this article to comply with the rules keeping the

work safe and healthy avoiding that the company responsible has no problems with processes or even compensation reducing risks for both parties.

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EDUCATIONAL SOFTWARE DEVELOPMENT PROJECT - EDUCATIONAL PORTAL

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ABSTRACT

This project intends to elaborate a computer program that will constitute the results of research and the educational difficulty level of the riverside population of Paraná, in the Municipality of Careiro da Várzea, advising the teachers and students with a regional language and easy to know, highlighting traditional learning in a participatory way. With a perception of construction management, the techniques used in the activities will be used to manage the stages based on knowledge of PMBoK v4.

Keywords: project management; riverside population; computer software.

I. INTRODUTION

At present, there are changes in various aspects in the individual's life such as cultural, technological, political, economic, social, etc., they are occurring at increasing speed. According to [1], in general, we often associate significant changes with project outcomes. Secondly [2], as a consequence, managing projects efficiently in this age of great change is one of the great challenges of the executive of modern times.

In the context mentioned above, this study will constitute a research project as the main guide the development of an Educational Software - computer program, to support teachers and students in all teaching subjects. This software aims to assist the teaching and practices in a participatory way, providing the conquest of knowledge. Overcoming this challenge is being willing to manage projects in a planned and professional manner.

Today education does not reach the villages of this region despite the existence of Distance Education (ODL). In this segment, this software can be an incentive for teaching and extracurricular activities contributing to the formation of the "man" as a citizen. The execution of this project is relevant for both technology and education. The Portal do Ensino educational software development project will assist in learning and address the imperfections processed during this study.

The integration of the computer with the community is necessary in the educational process, as students can learn to use the computer with the visuals that the software will present, making learning much more interesting in a positive and effective way. This study is conducted to investigate the following research question: How the educational software development project can assist in improving the educational teaching process in Distance Education (ODL).

This article exposes what the researcher intends to accomplish during the study, where he develops an educational software project Portal do Ensino assisting in the action of knowledge and providing the failures that happened during this learning. The main objective is to facilitate the understanding of the subjects, helping teachers and students in the performance of teaching.

II. BIBLIOGRAPHIC REFERENCE

II.1 PROJECT MANAGEMENT

Project management experience is increasingly being revealed and demanded by companies to employees, where today there are few companies that do not use "Project Management" and can make positive conclusions without wasting time and money. Learning the techniques and best practice in PMBOK bundled with the project management tool is an implementation designed to meet the attribute of the company's projects achieving quality assurance. Proper project management ensures customer satisfaction by meeting the scope, time and cost of the project making projects profitable.

According to [3], the joint venture has a smaller difference compared to a company that has a degree of excellence in project management in the way that the stages of growth and balance of the project management life cycle are put into practice. It is at this point that the application of concepts has its greatest impact on project management.

Project management is a set of management tools that enable a company to develop a set of skills, including individual knowledge and capabilities, for controlling unique, complex non-repetitive events within a predetermined time, cost and quality scenario. [4]

In August 1987, PMI published a document called The Project Management Body of Knowledge, which was revised and reissued in 1996 under the name of A Guide to the Project Management Body of Knowledge (PMBOK) and was updated in 2000. 2004 and 2008.

The project comprises the gathering of information where the main control of activities takes place using PMBOK best practices and its processes, bringing the development of educational software to support the subjects, as well as: Portuguese, mathematics, science, history, geography, reciprocal way supporting learning in ODL.

[5] recommends which processes need to be executed throughout project management execution in the areas of scope, time, cost, human resources, communications, risk, and procurement. For this purpose, a project management knowledge guide (PMBOK Guide) was created, identifying its usual elements where they are divided as follows: Project management processes are: Start, Planning, Execution, Monitoring and Control, Closure.

Project management is comprised of such areas as Integration Management, Scope Management, Time Management, Cost Management, Quality Management, Human Resource Management, Communications Management, Risk Management, Procurement Management.

Project management brings a unique focus laid out by the objectives, resources and schedule of each project and is true to its rapid growth, as people have been practicing and studying Project Management in the most diverse areas, such as aerospace, automotive, administration, construction. , engineering, financial services, information technology, pharmaceuticals and telecommunications. All knowledge gained is reaffirmed and not only limited to traditional practices, but also innovative and advanced.

The PMBOK is constantly evolving and as a result has several published materials, as well as several updated magazine editions.

According to [6] Project Management is the "application of knowledge, skills, tools and techniques to project activities, with a view to meeting the requirements in question". [5] provides that Project Management is the art of coordinating activities aimed at meeting the expectations of individuals and organizations directly involved in the project or those whose interests may be positively or negatively affected during or after the project. your conclusion.

In the "Construction Glossary" of the International Association for Professional Management of Construction [7], the following definition for project management "addresses the overall planning and coordination of a project from beginning to end, aimed at identifying requirements. and completion, ensuring compliance with schedule, costs and quality standards."

Integrated processes refer to the integration of project management with other administrative processes, such as Total Quality Management (TQM), concurrent engineering, reengineering, change management, risk management, among others [8].

With respect to culture, every organization looks for one that is capable of rapidly changing according to the needs of each project and adapting equally quickly to a constantly changing dynamic environment. It is imperative that the culture of each organization underpins the core values of project management, such as cooperation, teamwork, trust and more efficient communications.

According to [8] "visible and indispensable managerial support for the continuity of the project management culture". However, many companies understand that the failure of a project is mainly due to discouragement among employees, negative interpersonal relationships, lack of commitment to project objectives, causing the manager to become a conflict manager.

III. MATERIAL AND METHODS

In the study, it was necessary to use the software support tool Open Project, to organize the proper information collected in the development of all project management. The PMBOK® Guide PMI 4th Edition, which guides you on the right track of best practices for project management, as well as the organization of the entire project, is also a guide. Within the Guide.

IV. STUDY APPLICATION

Project quality management was performed based on ISO 9001: 2008, as it acts in accordance with it in all its processes. Check applications for software: Time of handling a request for change in service levels; Customer satisfaction survey frequency; Time taken to raise issues related to service levels and Impact of quality of additional financial resources to meet defined service level.

Quality metrics allow us to indicate the level of software response to explicit and implicit customer requirements, which we define through quality management which are:

- Correctitude: The program must operate correctly, otherwise it will have little value to its users.
- Maintainability: The ease with which the program can be fixed if an error occurs.
- Integrity: Attribute that measures the ability of the software to withstand attacks on its integrity such as data and documents.
- Usability: If a program is not easy and user-friendly to use, it will not succeed even if the functions it performs are perfect.

All claims made, as well as products and / or deliveries that do not comply with the Scope Statement, should be treated as corrective measures in the quality management plan, after CCM assessment. And any changes in quality requirements initially anticipated for the project must be evaluated and classified within the quality change control system (SCMQ).

Changes in quality standards will be considered only as corrective measures which, if influencing the success of the project, should be integrated into the plan. Innovations and new levels of quality will not be considered by quality management. All quality change requests must be made in writing or by email as described in the project communications plan.

V. RESULTS / DISCUSSIONS

With the help of the PMBOK4 guide you do not have to apply all the best practices but check which ones are necessary to fit the process. The 4th edition of the PMBOK Guide says that the project is unique and temporary, because each time it is executed it will have a difference in the context, because it will be the different people who will practice the project, such as suppliers, deadlines, values, different circumstances causing this. make it different from the previous one. The guide is made up of good practices designed to create a unique product or service. It is understood that a project has a very definite beginning and end having a precise domain and as the rules are planned, executed and controlled.

According to [9], project management, among other actions, identifies requirements, supports the different needs, concerns and expectations of stakeholders, as well as pursues the balance of conflicting constraints that involve scope, quality, schedule, budget, resources and risks. The contained management processes are linked in the initiation, planning, execution, monitoring and control, and closure phases - which constitute the life cycle of a project.

In this context, special attention should be given to the set of risks inherent in a project. Project management should contribute to the risk of failure as low as necessary. According to [9], risk is an uncertain event or condition that may belong to one or more project objectives such as scope, schedule, cost and quality.

Communications management costs will be considered as basic project costs. For priority needs that are beyond the scope of the project manager's competence, or when there is no more managerial reserve available, it will apply to the sponsor trigger, and as the project manager has no autonomy necessary to decide to use the project manager reserve. risk contingency in communications management. Regarding the costs, we have the following survey:

Table 1: Project Collaborating Costs.

Nº	Professional	R$/h	Amount	Unit of measurement	Total
1	Project Manager	80,00	140	Hours	R$ 11.200,00
2	Systems Analyst	50,00	200	Hours	R$ 10.000,00
3	Developer and Programmer	60,00	210	Hours	R$ 12.600,00
	TOTAL				R$ 33.800,00

Source: Authors, (2019).

Table 2: Extra Costs.

Nº	ACTIVITY	TOTAL
1	Data Collection - Amazon Terms Search	900,00
2	Search Difficulties	2.000,00
3	Software Development	3.200,00
4	Infrastructure and Human Resources Request	10.000,00
5	Software Testing & Training	500,00
6	Software Implementation	800,00
TOTAL		17.900,00

Source: Authors, (2019).

Table 3: Summary of Costs.

Nº	ITEMS	TOTAL (R$)
1	Project Human Resource Cost	32.500,00
2	Extra Costs	10.000,00
TOTAL		42.500,00

Source: Authors, (2019).

Table 4: Cash Flow.

N°	ATIVIDADE	TOTAL
1.1	Check Amazon Terms	500,00
1.2	Understand and replace words according to meanings	500,00
2.1	Evaluate teachers	1.000,00
2.1.1	Search for teaching difficulties	500,00
2.1.2	Search themes and content	500,00
2.2	Evaluate students	500,00
2.2.1	Search for learning disabilities	250,00
2.2.2	Search for topics and content needed to make learning easier	250,00
3.1	Check Search	250,00
3.1.1	Search Technical Terms and Amazon Terms	250,00
3.2	Raise content related to each subject	250,00
3.2.1	Select these contents according to the difficulties	250,00
3.3	Collect information and images for the software	750,00
3.3.1	Select images for software	250,00
3.4	Develop	1.500,00
3.4.1	Select the language that the software will be developed	1.000,00
4.1	Order machinery and equipment	5.000,00
4.1.1	Check Software Compatible Settings	200,00
4.2	Request IT Infrastructure	250,00
4.2.1	Check the number of machines, equipment and software needed to run the educational software.	200,00
4.3	Request Human Resources	300,00
4.3.1	Hire teachers and monitors for the computer lab	4.050,00
5.1	Run tests with teachers	200,00
5.2	Run tests with students	200,00
5.3	Train teachers and monitors	200,00
6.1	Implement the software in schools in riverside communities	900,00
TOTAL		20.000,00

Source: Authors, (2019).

There is another important presentation of project management that talks about time, scope, cost and quality constraints, these are interdependent elements that face the success of a project for a good result. Thus, when there is any change in any of them, the others are impacted.

Project management and management have become very important in the organization, as the manager can strategically reconcile information from other sectors throughout the project.

Training and teaching are useful for those interested in supporting project management as a profession. Quality of training and development, along with executive support, are the two most important factors for organizations to achieve successful Project Management and therefore excellence.

Informal project management is based on four basic elements: trust, communication, cooperation, and teamwork. Formality is represented by policies and procedures and informality is represented by checklists. That is, informality does not eliminate all documentation but reduces it to minimally acceptable levels. Therefore, the larger the company size, the greater the tendency to use formal project management [10].

VI. FINAL CONSIDERATIONS

This research presented the project management study, highlighting the development of the analytical structure, with defined and structured processes. It showed in a simple and objective way that Project Management is a strategic tool to be used in the business plan of organizations, because the results show a path that aims at better quality and productivity conditions in project companies, besides improving the final product.

The integration of the computer with the community is necessary for the educational process where students can learn to handle the computer and still learn by "playing" with the visuals that the software presents, making learning much more interesting in a positive and effective way. The software may be used as a source of research or any other complementary activity. For a better integration of the activities between the subjects, the teachers must architect the approach of the subject as a complement of the discipline taught in the classroom.

The training was necessary by qualifying the teachers, who should be the facilitators in this process, taking into account the integration between their teaching proposal and the informatics, where they should be willing to clarify all doubts and should encourage the use of this new program. It is also noted that a good knowledge in project management is not enough to succeed in an enterprise. There are external factors that can directly influence the entire process of development and execution.

In this way, it is possible to confirm how much it is necessary to have a well-defined analytical structure in your activities, because once defined, these will be allocated in the project schedule, defining times, resources and project completion. It is not just about theories, but about finding from the research done, which are extremely important to the success of a project.

The success of a Project Management becomes essential so that in future negotiations, organizations can act strategically, highlighting cost reduction as well as meeting deadlines with quality, obtaining advantages in the effective relationship with those involved in the project, known as stakeholders.

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RESEARCH ARTICLE OPEN ACCESS

THE FEASIBILITY OF IMPLEMENTATION OF RECRUITMENT AND SELECTION TECHNIQUES IN A CIVIL CONSTRUCTION COMPANY MANAUS - AM

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ABSTRACT

Recruiting a recruitment and selection that points the interests of companies and values the process with feedback directed to the candidate is the new practice of many companies seeking to reach the human side. The aim of this study is to discuss the importance of the Recruitment and Internal Selection process in the P&S Enterprise by using a case study as a research method to analyses the organizational results. In this way, it is concluded that the company correctly uses its career plan, giving due importance to the institution's recruitment and internal selection process. In order to enhance the knowledge of the managers who act in this process of employee review, the company could provide specific courses for their managers when they will enhance their knowledge in planning, recruiting and empowering the individual to suit the organization's organizational system.

Keywords: Recruitment; Process; Selection of people.

I. INTRODUTION

A company that selects candidates using the recruitment and personnel selection tool has been winning for both the company itself and the candidates. According to [1], recruitment is a set of techniques and procedures aimed at attracting potentially qualified candidates capable of holding positions within the organization.

Some institutions find it difficult to fill their staffing needs. These needs, if incorrectly planned, could cause serious problems. Given the above, the objective of this paper is to discuss the importance of the Recruitment and Internal Selection process at P&S Company, which operates in the Civil Construction branch, being located in the city of Manaus in the State. do Amazonas at Av. Cascavel, 46 - Cidade Nova 01, using a case study as a research method to analyze the organizational results expected by these institutions.

The methodology adopted was based on descriptive research through review, documentary and bibliographical analysis, seeking to systematize the subject developed by other authors in order to achieve the proposed objectives. Regarding the means of investigation, the questionnaire was chosen. This type of research aims to analyze or explain a particular problem in the light of the existing theoretical framework. In order to improve the knowledge of managers working in this process of employee analysis.

II. BIBLIOGRAPHIC REFERENCE

Recruitment is the set of procedures aimed at attracting potentially qualified candidates able to fill positions within the organization [2]. It is through the recruitment and selection process that the manager can effectively verify if or not an applicant has the profile needed to fill a job opening in the company.

We also emphasize that it is a constant challenge for companies to get candidates for vacancies. Hiring qualified people requires the organization to have a large number of potential employees in order to be able to choose the best one [3].

There are three types of recruitment: internal, external and mixed. [4] argues that:

Internal recruitment is used to fill vacancies by relocating existing staff in the organization. “As its name implies, internal recruitment seeks candidates for the existing job within the company. To be successful in this process, the integration of the manager with the other sectors as well as intense and continuous communication between the areas are fundamental factors” [5].

This is not a common practice in all companies, many claimthat internal recruitment creates competition among employees, frustrating those who have not been selected. But there is also a positive side to professional career development for employees, “taking advantage of company staff has the following advantages: it motivates all employees, signaling the willingness to promote the “silver of the house “and create career prospects” [6].

External recruitment is used to attract candidates who are outside the institution, i.e. it is the search for professionals not linked to the company directly or indirectly, either in the job market from some specific sources, for example, state or private employment agency. . The advantages of external recruitment are lower than internal recruitment, because the cost of outsourcing logistics is much more costly for the organization, but one must take into account the context in which the company is currently located is not always possible. find what you are looking for within the organization.

External recruitment seeks potential candidates to fill existing vacancies through external means such as: posters, advertisements, employment agencies, among others [7]. The organization's people manager is responsible for filling vacancies always looking for a better profile and so that organization can save resources and improve results.

However, external recruitment can discourage company employees who, when filling a vacancy, seek recognition and career path. In certain situations, there is no way to place an internal contributor when desired profile is not found.

Mixed recruitment can be adopted in three system alternatives [8]:

I. External recruitment, followed by internal recruitment, if it does not yield desirable results;

II. Internal Recruitment, followed by External Recruitment, the organization prioritizes its employees in disputing existing opportunities; and,

III. External recruitment and internal recruitment, concomitantly, is the case when the organization is most concerned with filling an existing vacancy. Staff recruitment consists of a set of technical and administrative procedures designed to attract potentially qualified candidates who are able to fill existing or future positions within an organization. This search is not randomized, but is based on personnel requirements, taking into account the selection criteria adopted by the organization's personnel policies. To be effective, recruitment must attract a contingent of people large enough to adequately supply the selection process, in which the competitor's knowledge, skills and attitudes that compete with each other in terms of qualifications are assessed. This is because the larger the number of candidates, the greater the probability of success of the selection process [9].

Recruitment sources are the areas of the human resources market that are exploited by human resource capture mechanisms. In other words, the human resources market has diverse sources of candidates that must be diagnosed and localized by the influencing organization through a variety of fundraising techniques to attract human resources to meet their needs.

In his work [10] he points out that the sources of human resources capture are configured in places where, potentially, the recruiter can find the professionals that the organization needs. These recruitment sources can be classified as internal or external.

Internal sources - Under this heading are grouped the human resources that make up the organization's staff. This is in principle the closest source and the best data you provide about the professional you are looking for. Through the results obtained in the different types of evaluations to which the organization's staff was submitted, it is possible to detect the performance of each one, potentially capable of performing the desired function, and forward to the selection sector that will appoint the most apt to occupy the organization. Function. Using this type of source for recruitment can offer both advantages and disadvantages, and it is up to the recruiter to know which one is most important and which best suits the organization's interests at the time of recruitment. Internal sources can be advantageous because it is the least expensive, dismissing the work of employment agencies, and stimulating workers to greater organizational commitment and self-development as they can be promoted (vertical movement), transferred from functions (horizontal movement) or even promoted with transfer (diagonal movement).

External sources - refers specifically to contingents that do not maintain ties with the company. In external recruitment, one can resort to candidates with or without experience, with advantage in both cases. For experienced applicants we can consider the likelihood of increased productivity and security in choosing. With regard to candidates without experience we can consider the possibility of remuneration more compatible with those desired by the organization. As also, the easiest to instill methods and work habits in this worker.

III. MATERIALS AND METHODS

In general, this work can be classified as applied research, as it is based on the application of theory already elaborated, i.e., it does not aim to discover theory.

In this paper, we will use the deductive method where [11] state that: the deductive reasoning aims to explain the content of the premises. Through a descending chain of reasoning from general to particular analysis, it comes to a conclusion. It uses syllogism, a logical construct to, from two premises, draw a third logically derived from the first two, called completion.

This study can be considered qualitative because it has no interest in measuring variables, as its objective is related to the understanding and interpretation of the process, and the use of statistics is not necessary.

As for the technical procedures used for the formation of this work, the bibliographic research was used. For [12], the bibliographic research “aims to collect information and prior knowledge about a problem for which an answer is sought or about a hypothesis that one wants to try out” In this research was also applied a questionnaire, which [13] clarifies that: “The survey, in a survey, is an instrument or data collection program. If it is made by the researcher, it is completed by the informant. The language used in the questionnaire should be simple and straightforward for respondents to clearly understand what is being asked. The use of slang is not recommended, unless it is necessary due to the need of language characteristics of the group (surfers’ group, for example. Within this perspective the subjects were selected by homogeneity criteria chosen by the researcher, with a closed number of 10 informants, “which resembles simple sampling and should be applied only in cases where it is possible to identify in advance the position of each element in an ordered population” [14].

IV. STUDY APPLICATION

For the execution of the study, the documentary analysis was followed by an interview. Regarding the documentary analysis, it is considered very similar to the bibliographic one. The difference is in the nature of the sources, because this form uses materials that have not yet received analytical treatment, or that can still be reworked according to the research objects.

According to [15], the interviews can be classified as: informal, focused, by agenda and formalized, as listed below:

- Informal Interview: It is the least structured possible and only distinguishes itself from simple conversation because it has as its basic objective the collection of data. It is recommended in exploratory studies, which aim to address realities little known by the researcher, or offer an approximate view of the researched problem;

- Focused interview: is as free as the previous one; However, it focuses on a very specific theme when the interviewee is allowed to speak freely about the subject, but with the interviewer's effort to regain the same focus as he begins to deviate;

- By guidelines: presents a certain degree of structuring, as it is guided by a list of points of interest that the interviewer explores throughout his course. The guidelines must be ordered and have a certain relationship with each other. The interviewer asks few direct questions and lets the interviewee speak freely as he or she reports on marked agendas; and,

- Structured or formalized: develops from a fixed list of questions, whose order and wording remain invariable for all respondents who are usually in large numbers. Because it enables the quantitative treatment of data, this type of interview becomes the most appropriate for the development of social surveys.

In this stage of elaboration and application of the interview about the relevance of training in the Construction Industry (ICC), the exploratory research typology was used, where [12] link to the type of research in which there is little knowledge and literature about the researched theme.

I. Determination of company needs;

II. Preparation and evaluation of the interview; and finally;

III. Application of interview with company manager.

In the first part of the interview elaborated, a deductive analysis was carried out, where [15] describes that it is a method that "starts from principles recognized as true and indisputable and makes it possible to reach conclusions in a purely formal manner, that is, solely by virtue of their logic. " The other steps were worked on site.

The author chose not to use very specific questions, always having ethics as a distinguishing factor in the research performance, the questions being neutral in nature, as a way of not inducing the answers.

V. RESULTS / DISCUSSIONS

The P&S Company operates in the Civil Construction Branch is located in the city of Manaus in the State of Amazonas at Av. Cascavel, 46 - Cidade Nova 01, it is seeking to adapt to the changes that the market requires, so that it can achieve its major objective. which is to reduce staff instability, and to decrease the turnover rate that is a problem today, generating considerable losses.

The development of this process in the HR sector is very important, it is known that the return will be low turnover and increased quality in production and final product, generating significant improvements for the company, improving its processes and optimizing its results.

The Company's segment is Civil Construction in which it outsources labor for the Engineering of the same Branch. With an abundant supply market, P&S seeks to provide quality services with a competitive edge. One of the challenges faced by the company is the recruitment and selection process that through it will hire qualified labor to perform the activities offered by the open position. Recruitment is based on data on the organization's present and future human resource needs.

It is important to note that motivation will generate positive results, if only if applied in a way that can move employees positively. This attention is due to the fact that motivation is a process that requires care in its application, because individuals are different from each other, and each has its own way of being motivated.

Through recruitment and internal selection, employees are selected to occupy a certain position and, according to it, their competencies will be assigned according to each sector, aiming at the company's policies and culture. P&S has a market differential created to minimize the difficulty of providing executive or managerial positions and specialized technicians in more competitive and cost of living squares.]

Regarding the profile of employees, the following results were obtained:

Table 1: Interview Age Range.

AGE RANGE	QUANT	%
A. 25 to 30 years old	1	10%
B. 31 to 35 years old	3	30%
C. From 37 to 39 years old	3	30%
D. 40 to 45 years old	2	20%
E. Up to 50 years	1	10%
TOTAL	**10**	100%

Source: Authors, (2019).

In view of motivation, P&S favors the acquisition of important knowledge for its professional training as a bricklayer; guiding your professional development, pointing out what are the fundamental knowledge for the functions you want to occupy. Profiles are established to identify employees who have the potential to take on segment roles in relation to professional competencies in the exercise of their duties.

We can see that most of the employees are adults between 26 and 50 years old, that is, still young but "mature" (original emphasis of the authors).

Table 2: Level of School Interviewer.

DEGREE OF SCHOOL	QUANT	%
A Illiterate	0	0%
B Incomplete Elementary School	3	30%
C Complete primary education	2	20%
D Incomplete high school	3	30%
E Complete high school	2	20%
TOTAL	**10**	**100%**

Source: Authors, (2019).

These data indicate that there is a huge opportunity in the company that are the workers with low education (30% not completed elementary school).

Table 3: Service Time.

CIVIL CONSTRUCTION SERVICE TIME	QUANT	%
A. Up to 3 months	1	10%
B. Less than 05 years	2	20%
C. From 5 to 10 years	2	20%
D. From 10 to 15 yeas	3	30%
E. Over 15 years	2	20%
TOTAL	**10**	**100%**

Source: Authors, (2019).

The graph (03) shows us that 30% of employees work between 10 and 15 years in the construction industry. The measures for making vacancies available are based on the company's People Management proposals, which, in a joint effort with the directors, seek to faithfully translate the wishes of the network's employees, effectively facilitating their work.

Once the main sources of Recruitment have been analyzed, and decided on what is most convenient in the face of what is intended, the recruiter must decide how to achieve it. For this he can use different procedures[9]. In order for staff recruitment to reach its goal, it is important that HR professionals choose well the ways to disclose open positions. In fact, there is no rule about which tool to use in each case, it will all depend on the need of the recruiter. and of the possibilities that a given environment may generate, among the most used we can mention: internet, newspaper, internal and external indications, private employment agencies and public employment agencies.

Private Employment Agencies - These bring to the organization the advantage of a pre-selection of professionals. The organization establishes with the agencies the characteristics and requirements that professionals need to fulfill, and it is then up to them to indicate a list of professionals most suitable for the postulation of the position. Despite the somewhat simplistic placement of the role of employment agencies, the important thing to note is the dispersion of information that causes the organization's indirect contact with the professional. The inclusion of an intermediary in this contact masks sometimes quite significant aspects in the professional organization relationship [9].

Public Employment Agencies - Today, employment agencies have lost ground to human resources consultancies, which have the advantage of making a first selection, although sometimes for business reasons it is poorly judged.

VI. FINAL CONSIDERATIONS

As we conclude this study, we can see that a few decades ago it was thought that technology could replace man over time. It is in need of more and more capable people.

It is clear that recruitment and its forms guarantee business success and the search for people who are increasingly committed to the organization and who make up the right profile should start at the recruitment stage of the company.

Based on research conducted with P&S employees, along with the conversation with Personnel Management, we can see that the Internal Recruitment and Company Selection process uses daily tools for job availability and application of its employees, when they have access to information about the vacancy available and can view the positions, their competencies and profile, making the candidates motivate themselves to improve their knowledge and skills to win the vacant position.

The institution follows the vision of aligning its interests with the interests of its employees, thus conducting an internal recruitment process and effective and efficient selection would limit the likelihood of process failure, being the same an organized and effective process.

Analyzing P&S internal recruitment and selection process, it was observed that P&S has an external selection process. However, the Company has institutional rules and a structured career plan that aims at the development of its professionals, in the continuous search for the improvement of their skills, knowledge and attitudes.

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RESEARCH ARTICLE OPEN ACCESS

MANAGEMENT MODEL AND HUMAN RESOURCE MANAGEMENT MODEL OF VIA SATELLITE COMMUNICATIONS LTDA

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ABSTRACT

This article will evaluate the human resources and materials management of Via satellite communications LTDA. In business management, Materials and Personnel Resources are used to size inventory, distribute jobs and activities, define the appropriate physical structure of the enterprise, and others. Therefore, a study was conducted to evaluate the management of these resources. To perform the work, a photographic report was generated and a questionnaire was answered by the interviewee, a floor plan of the place was generated and the flow of materials from inside the store was determined, a flow chart of positions and description of activities performed was also prepared. The company has a good division of functions, material handling control, and adequate structure for the activity developed. It was suggested greater stock organization and workers' awareness of the internal material processing.

Keywords: Management model; Material resource; Human resources; Company object of study.

I. INTRODUTION

Resource management is a very relevant concern for the most diverse backgrounds, such as engineers, administrators, managers and virtually everyone who is directly or indirectly linked to the activity. Resource management is very broad and can be divided into several strands, each with professionals and their own training area, being the subdivision: material resource management, patrimonial resource, capital, human and technological. This work will focus mainly on materials and human resources management.A definition of material resource is prescribed in Decree No. 99.658 / 1990 art.3 which defines as material the generic designation of equipment, components, spare parts, accessories, vehicles in general, raw materials and other items employed or subject to employment in the activity of federal public bodies and entities, regardless of any factor. But for management purposes it can be subdivided into material resource in the strict sense and non-patrimonial resource which is, succinctly, the first: all physical good that has non-permanent nature and the second: those of permanent nature, and for the purposes of this research material resources will be analyzed in the strict sense or non-permanent ones.Regarding human resources management, Ivancevich defines "the standard or plan that integrates the main objectives, policies and procedures forming a united and coherent company", so a well-designed strategic human resources management helps the company to determine its points. strong and weak, assists in leasing investments, anticipating occurrences among others, always aiming to form a single and coherent company.The object of study of this research is the company Via Satélite Communication LTDA, which has its physical unit located in the state of Pará, is a small company, has a staff of eight (8) employees and works primarily with three segments, which are: Pay TV, satellite internet and electronic security. This research delimited the pay TV aspect as the focus of the study, as it is the most lucrative and most controlled segment of the company.

In this segment will be analyzed personnel management in order to survey the activity performed, the working hours employed, the hierarchical level, the educational level of the workers and the workplace, will also be analyzed the management of materials in order to determine all material in this activity, its in-store processing, the disposition of the material within the company, the time for the material to reach and leave the customer, and the mode of inventory control.

II. BIBLIOGRAPHIC REFERENCE

II.1 TOOLS AND BASIC DEFINITIONS FOR ANALYSIS OF MATERIAL RESOURCES AND HUMAN RESOURCES

Material resource management ranges from the beginning of the choice of the supplier, through the purchase of the good, the receipt, the internal transportation and its storage, until its distribution to the final consumer [1]. The work in question will analyze only the internal transport part as outlined in figure 1.

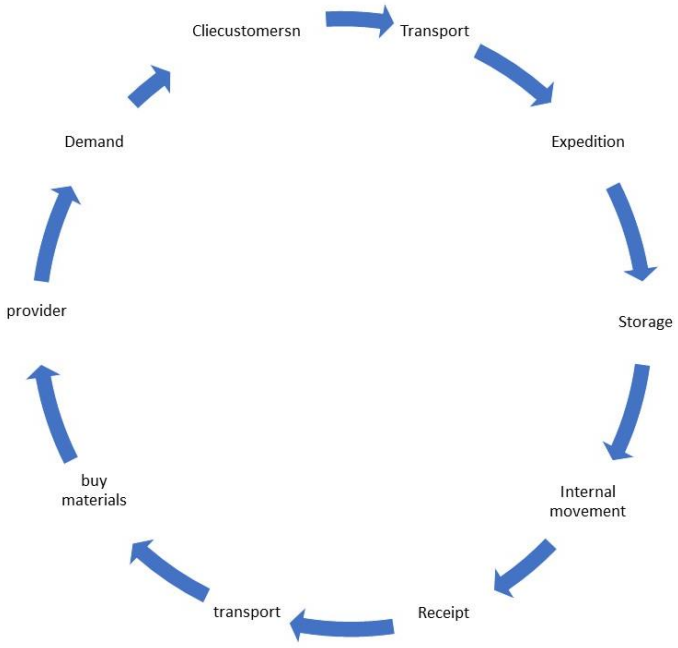

Figure 1: Matrix Flow.
Source: [2].

Material management is studied by [3] which states that 16% of production cannot be executed due to lack of tool for production, 20% of workers' time is wasted looking for tools, reaching three weeks of work. lost per year, among other statistics, thus showing the importance of this theme.

Human resource management [4] includes a number of activities, including: Compliance with legislation, job analysis, resource planning, recruitment, selection, motivation and orientation of employees, performance evaluation, training, security and others. . It also lists several steps for efficient HR management, such as focusing on actions rather than maintaining records, procedures or standards; treat each employee as unique by offering services to meet their individual needs; help achieve future goals, long term management and other indications, emphasizing the importance of this strand of study.

For the elaboration of the research was used, besides bibliographic revision, a questionnaire answered by the owner and also the company manager, shown in table 1.

Table 1: Questionnaire addressing resource utilization.

How is the material flow inside the company?
How does inventory control occur?
What are the possible types of materials worked by the company?
What are the activities designed by each employee?
How many workers does the company have?
What is the work schedule of each employee?
What is the level of education of employees?
How long is the input process until the material is output?

Source: Authors, (2019).

The questionnaire was answered verbally and all answers limited only to the segment studied, being one of the ways to generate a material flow map and flow chart of the workers hierarchy.

Regarding the hierarchy, it was used to divide the employees and the organizational levels, being strategic level that is composed of directors, partners and president of the company, the tactical level formed by managers and coordinators of the company and the operational level that is formed by professionals of technical nature that are part of the organization's structure.

II.2 HUMAN RESOURCE MANAGEMENT RESEARCH

There are other related researches Resource Management [5] in his master's thesis analyzed the relationship between human resource management system, economic performance and productivity of companies, was analyzed 63 companies. In order to collect the information, a questionnaire and database analysis were made in 5 years, after statistical treatments I concluded that there is a relationship between the parameters mentioned and that the positive influence when there is an efficient management.

In a less complex analysis [6] compared 100 companies from the region of São Paulo as well as the ideas of 14 specialists about human resources in order to verify if there is a difference between theory and practice, the result was that there is a great heterogeneity. In practice and theory concerning human resources management. When material resource management [7] reflected on material resource forecasting practices in the units of a university hospital in Rio de Janeiro, at critical times. Interviews with 21 nurses were conducted and the result was a conflicting reality: the forecasting of material resources is not made by the criterion of necessity, so it suggests the restructuring of the strategy.

III. MATERIAL AND METHODS

The methodological procedures applied to this research start from a bibliographical review and empirical knowledge

acquired with the work experience in the studied company. Due to the characteristic of the study, the research was initially developed by technical visit to the company Via Satelite, which is the object of the study. It was aimed at verifying the company's structure, as well as its stock, its reception or waiting area, attendance, material sampling panel, work tools area, material disposal for reuse, garbage deposit and architectural characteristics and was later asked to prepare a photographic record of the environments previously observed from the technical visit.

After this step, data were recorded regarding the function of the employees, taking into consideration the exact activity developed, working hours, level of education and place of performance. It was also recorded about the material that was referred to this topic. arrival procedure, internal procedure, exit and inventory control. It is worth mentioning that for each segment of the company different procedures are required and this research was limited to the analysis of pay TV.

Thus, in possession of the photographic record, the information gathered in the questions and information gathered during the technical visit, it was possible to elaborate a flowchart for the disposition of the employees and description of activities and other information such as working hours and others, a flowchart was also generated. designed to trace the path of the material inside the store, after that a floor plan was generated with the AutoCAD software, which could be used to simulate the location of the workers and the location of the materials and thus to come up with stimulating conclusions such as the time it takes. material is in stock, if the structure is sufficient, if the number of employees is sufficient, if the physical size is adequate and if the activities are well defined.

IV. STUDY APPLICATION

The elaboration of a staff-related flowchart, as shown in figure 2, and the description of their activities was the result of the study of human resources analysis, as the material resource analysis was the result of a flowchart of activities performed, observed in figure 3, by the studied company and the demonstration of the material flow, seen in figure 4.

IV.1 HUMAN RESOURCE APPLICATION OF STUDY

The manager is the store owner, composes the strategic level post in the organization, he is responsible for coordinating the activities, setting guidelines and making long term plans, since it is a small business it was found that he also occupies the tactical level by also having a medium-term focus and defining the main actions of the department. The so-called administrator does most of his work inside the store and works abroad when it is to conduct negotiations, resolve technical deadlocks or attend meetings, has a level of technical education, his working time is 8 (eight) hours per day and It takes extra work home, its internal activity the store varies in making sales, serving after sales customer and others, but the main activity is managing the activity of other workers.

The secretariat post1 makes up the operational-level post because it has a vision of routine tasks, has a short-term focus and defines specific objectives and results. The Secretariat1 performs its work inside the store full time, has an average level of education, its working hours is 8 (eight) hours per day, its internal activity of the store is to sell products, pass activities to employees through a computer system that tells you what to do, write off services, serve customers, and make sales.

The secretariat post 2 composes the operational level post. The Secretariat 2 does most of its work outside the store, has a higher level of education, its working hours are 8 hours a day and its time is more flexible because it deals with bureaucratic matters such as financial transactions, employee pay and others, therefore. a job the runtime may vary.

The Employee post, all perform installation and maintenance work, most of the time is outside the store, have an average level of education, work 8 (eight) hours a day and are divided into two groups, one of them for activities Pay TV and other for other activities.

Below is illustrated with flowchart with the disposition of workers as well as their hierarchical level.

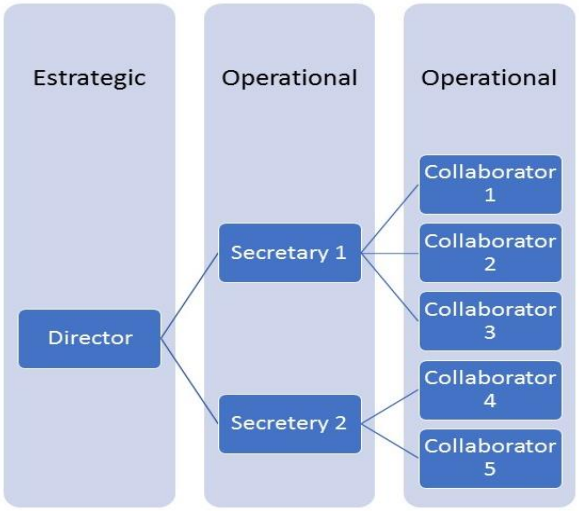

Figure 2: Distribution at organizational levels.
Source: Authors, (2019).

IV.2 MATERIAL RESOURCE

Regarding materials management, a flowchart was observed, as shown in figure 3, which shows the activities developed by the firm and the materials generated.

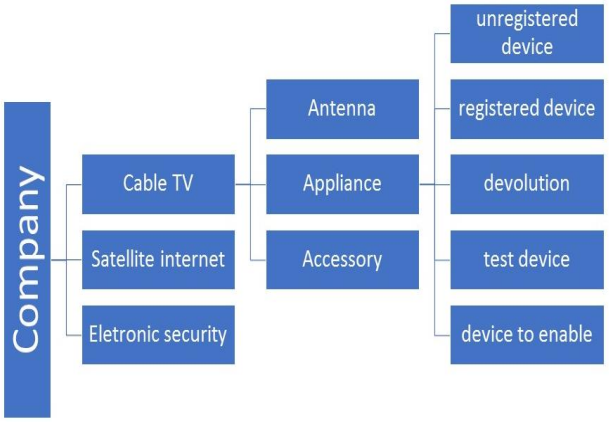

Figure 3: Study object workflow flowchart.
Source: Authors, (2019).

As specified, the research as well as the flowchart was directed to the pay-tv segment and such activity has as antenna material, which would be basin and fixation base; Despite having the same physical composition has different status due to its operation, it is noteworthy that it was not addressed the different physical models of devices that would be portable, internal HD and others, because they have the same procedure in relation to the procedure.

In possession of the flowchart, shown in figure 3, with the information acquired in the interview, in table 1, and with the

photographic report was generated a floor plan, observed in figure 4, which determines the storage of each material.

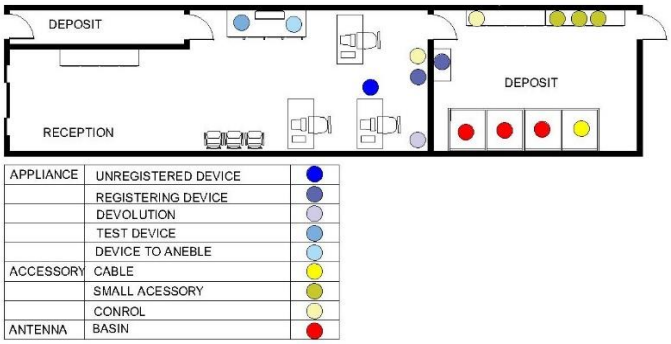

Figure 4: Internal material flow map.
Source: Authors, (2019).

Relating the floor plan to the board you can see an order to establish a flow, which would be: first the material arrives from the distributor together, the antenna that would be basin and base are taken to stock, as well as the small accessories that would be few screws and others, the devices are brought to the desk side of the desk 2 which inserts into an inventory control spreadsheet, then are brought to a glass shelf behind the desk, later brought to the desk as they go being sold, which has a TV to enable the equipment is then given by the secretary1 to collaborator 1 and 2 (who are responsible for pay TV) who will perform the installation, if the defective device returns to the store with test status on the table with the TV to be evaluated, if the customer after a certain period returns the device, since the material and lending, he returns with the status of returned fic I walk in a box behind the desk to be sent to the distributor for recycling.

V. RESULTS AND DISCUSSION

With the application of the study, it was possible, with the help of the Material Flow Map, to inform all employees about the correct material deposition sites, of the pay TV segment, as well as to standardize internal flow procedures, as much as this flow already occurred it was not common knowledge of all employees to flow macro-wise and sometimes the mixing materials were lost. With the support of Flow Map, the process is more organized, faster and with fewer failures.

In relation to the Human Resource research, the employee flowchart and the exact description of its activities will help the manager to lay down his duties and also help in the sizing of the staff. With this macro perception it is possible to notice idleness and even an overload of activities.

VI. FINAL CONSIDERATIONS

The research found several factors, such as an estimated period of 7 days from the arrival of the material until its departure from the store; activities to be heard well defined, without overlapping; level of education compatible with the respective positions, working hours according to the hiring regime (CLT), adequate physical dimension for carrying out the proposed activities, well sized inventory for the flow of materials, sufficient numbers of workers, so that no There is excessive idleness or service overload and efficient inventory control.

The unique suggested identification of the places where the materials are quartered was made so that, with the aid of the Flow Map, the organization can be preserved.

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RESEARCH ARTICLE OPEN ACCESS

RISK MAP AND FIRE FIGHTING PROJECT OF VIA SATELLITE COMMUNICATIONS LTDA

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ABSTRACT

This article will evaluate in the context of occupational safety. The disposition of risks within the company Via Sat élite communications LTDA. To perform the work at first, a technical visit was made to the company, a photographic report was generated and a questionnaire was answered by the workers. Afterwards, with these data, a floor plan of the site was generated and the risks were identified according to the environments, generating the risk map, taking advantage of the information and based on specific laws and regulations, was prepared the fire-fighting project. It was observed that the company has fire-fighting equipment with proper use conditions and correctly quantified and leased, also noted a greater predominance of ergonomic risk in return for the company's great concern with employee safety.

Keywords: Risk map; Firefighting project; Safety.

I. INTRODUTION

The risk map is a graphical representation of factors that make up the work environment, being able to cause damage to the workers' health. These elements can be related to the process as: facilities, machines, supplies or the form of organization as: arrangement. physical, work rate, work method, work shifts and others.

The risk map is regulated in NR 5 Annex IV by Ordinance No. 25 of December 29, 1994 and originated in Italy through trade union movements in the late 1960s and early 1970s.

The purpose of the map is to gather information necessary to enable safety and health to workers. Its elaboration as suggested by NR 5 is attributed to the Internal Accident Preservation Commission (CIPA), thus influencing the exchange of information between workers and making them participatory agents in the prevention activity.

As for its elaboration, it consists of circular indications overlapping the floor plan of the analyzed place, and larger circles indicate more intense dangers and lesser dangers of less intensity. The circles are divided into colors to discriminate the risk, being the division: Physical Risk represented by the green color; Chemical Risk by the color red; Biological Risk by brown; Ergonomic Risk by Yellow and Mechanical or Accident Risk by Blue, these relationships are defined according to NR 32 as well as their respective definitions.

The firefighting project is also an indicative graphic of safety measures, its execution consists of inserting in the floor plan firefighting elements at its inception, fire protection elements and quick withdrawals as foreseen by NR 23. Also highlighted is the need for people with equipment handling skills. The equipment is quantified in relation to a specific decree that must be used according to the state to be executed the project, in the insertion in the project it is necessary a study of work safety norms along with fireman's manuals and several others. bibliographic bases, therefore the need for qualified professional to perform the work.

This work consists of preparing a risk map and a fire project of the company Via Satélite de Comunicações LTDA. It aims to identify the risks and map them also quantify the safety equipment and map them thus assist in the safety of the company object of study.

II. BIBLIOGRAPHIC REFERENCE

II.1 BASIC RULES FOR IMPLEMENTATION OF RISK MAP

All risks are normative based and have influence on the elaboration of several programs such as PPRA, PCMSO and others [1]. The NR 17 refers to ergonomics, risk distinguished by the yellow color, aims to establish parameters that allow the adaptation of working conditions to the workers' psychological characteristics. Other risks, with the exception of accident risk, are defined by NR 9 [2]. The Physical Agent is described as the various forms of energy to which workers may be exposed, such as: noise, vibration, normal pressures, external temperature, and others, the Biological as: bacteria, fungi, bacilli, parasites, protozoa, viruses, and others, Chemicals such as: substances, compounds or products that may enter the body through the air, in the form of dust, fumes, mists, haze and Accident is defined as all factors that endanger the worker or affect their physical or moral integrity, this definition is bibliographic has no norm-specific definition but is widely addressed. Having as baseline parameters the risks it is possible to elaborate the risk map, observed in figure 3, it is necessary in all companies but, according to the Ordinance No. 5 of 17/08/92 of the National Department of Safety and Health of the Worker of the Ministry of Labor, it is mandatory only for those who have CIPA - Internal Accident Prevention Commission which in turn its obligation is regulated by NR 5 [3].

The risk map must be prepared by CIPA in order to encourage employee participation with the work safety planning in the company and for this participation to take place the following questionnaire was prepared.

Table 1: Questionnaire conducted with workers.

Do you feel any discomfort when performing daily work activities such as handling the keyboard and keyboard or affecting material transportation?
Do you feel the need for some personal or collective protective equipment such as gloves, belts, glasses or helmets?
Do you feel exposed to discomfort, noise, heat, pressure, humidity, cold, radiation or other such agents?
Do you feel exposed to dust, mist, mist, gases, vapors, chemicals and the like?
Do you suggest any improvements in work structure or work habits that could prevent workers?
Do you feel exposed to various bacteria, fungi or other agents that may be harmful to health?
Do you consider improper physical arrangement, improper storage and lighting or other agents in this regard?

Source: Authors, (2019).

The questionnaires seen in table 1 were answered by eight store employees, who were discursive. It is worth mentioning that the questions were limited to the activities that take place within the analyzed company and that they were all asked for each analyzed environment, thus gathering an amount of 24 (twenty four) answers from each employee.

The choice of the risk map was based on: 1) the legal basis for using the risk map as a risk identification method; 2) the apparent simplicity of the method; 3) the possibility of active involvement of workers.

II.2 RISK MAP RELATED WORKS

Some studies have already researched about the risk map [4] presented a reflection on the experience of building the risk map in a public hospital, was analyzed from the workers' awareness stage until the discussion about preventive measures. The elaboration of the Serbian map as an educational process and generated practical consequences regarding the intervention in the work environment.

Similarly [5] the objective was to bring questions regarding environmental risk to an Intensive Care Unit, a methodology was elaborated in which workers described the existing environmental risks and it was proved the existence of biological, physical, chemical, ergonomic and accident-like map was drawn up.

II.3 BASIC RULES FOR DESIGNING A FIRE PROJECT

Regarding the fire-fighting project, DECREE N °. 24.054 of March 1, 2004 where with Table 2, reproduced from the Decree, it was possible to dimension the necessary compaction devices.

Table 2: Analyzed Location Group Definition.

Group	Occupation / Use	Division	Description	Examples
B	Hosting Service	B-1	Hotel and similar	Hotels, motels, guesthouses, guesthouses, inns, hostels, rooms and rooms with more than 16 beds. And similar
		B-2	Residential Hotel	Hotels and similar with own kitchen in the apartments (including apart hotels, residential hotels) and similar
C	Commercial	C-1	Fire-Low Trade	Haberdashery, tobacconists, grocery stores, fruit trees, boutiques and others
		C-2	Commerce medium and high fire load	Shop buildings departments, magazines, department stores, general supermarkets, markets and other
		C-3	Malls Centers	General Shopping Center (Shopping Malls)

Source: Authors, (2019).

The object of study falls into category C-3. And to determine the height, which is also relevant to the dimensioning, is used the table 3, also reproduced from the Decree no. 24,054.

Table 3: Set height of the analyzed site.

Type I	Denomination	Height
I	Ground Building	A floor
II	Low building	H=<6,00m
III	Low-Medium Height Building	6,00m < H <= 12,00m
IV	High medium building	12,00m< H <= 30,00 m
V	Medium High Building	21,00 m < H <= 30,00 m
VI	High building	Above 30,00 m

Source: Authors, (2019).

The object of study fits in type I, called Terrea Building, after these times was used the table 4 partially shown below to measure the necessary security measures.

Table 1: To define project components.

Fire Safety Measures	C	
Finishing Material Control		
Emergency Exit	X	
Emergency lights	X	Only for buildings higher than 5m
Emergency Signaling	X	
Fire extinguishers	X	

Source: Authors, (2019).

The object of study will require Emergency Exit, emergency signaling and extinguishers, Emergency Lighting will not be required. It was also used as theoretical base the Technical Standard 14 for signaling and the NR 23 to execute the project.

II.4 FIRE PROJECT RELATED WORKS

Some work has already addressed the subject of Fire Design, [6] has addressed fire safety as an objective that must be pursued during all phases of the construction process and demonstrates for each architectural design provision considerations to be met.

Similarly [7] and [8] aimed to establish safety design guidelines involving practical and conceptual aspects, concepts were clarified so that designers could discuss and contribute to improving safety measures.

III. MATERIAL AND METHODS

The methodological procedures applied to this research start from a bibliographical review that are mainly NR 32 [9] and NR 5 [10], which standardize the execution of the risk map and the identification of risks respectively and empirical knowledge acquired with the experience of. I work at the company studied. The research was initially developed with a technical visit to the company Via Satelite. The objective of this research was to verify the structure of the company, as well as its physical dimension, the materials that made up its structure as ceiling and divisions, the internal furniture that involves the evaluation of dimensioning and level, the type of product stored in stock, the type of waste disposal, the type of waste generated, the work tools of the staff, the electrical and hydraulic installations, air cooler arrangement, internal temperature, sanitation, personal protection used by employees, the trajectory of these products internally and the form of storage. After this step a photographic record of the environments analyzed during the visit was requested and in possession of all requested information together with the photographic report, it was possible, through the Autocad software, to carry out the risk map and the fire-fighting project of the studied company.

IV. STUDY APPLICATION

Based on DECREE N °. 24.054 of March 1, 2004, the company Via Satélite, object of study, was classified as group "C", which refers to the type of occupation and division C-1 which refers to activity performed at the site. According to Table 1 partially reproduced in the bibliographic reference. After this, the height was classified as "land building" taking into account table 2 of the decree also set out in the bibliographic reference. With this information is possible relationalas and determine the items that must have the fire project. After gathering such information it was determined that for the object studied will be necessary Emergency Exits, Emergency Signs and Fire Extinguishers, Emergency Lighting will not be necessary because the building is only 3 meters high.

Thus, the project presented in figure 1 was elaborated.

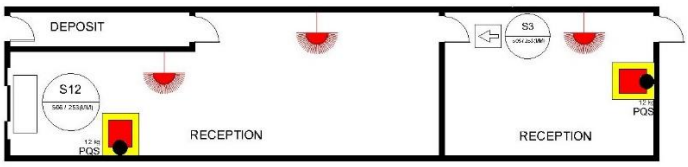

Figure 1: Fire Fighting Project.
Source: Authors, (2019).

Although the standard does not determine the need for emergency lamp, it was chosen to add them due to the amount of furniture and the presence of perforating materials, which may cause accidents. Regarding emergency exit and signaling, the symbols were based on Technical Standard 20 of 2014. As for the fire extinguisher NR 23 establishes the need for one every 25 meters radius which would result in the need for only one fire extinguisher. The plant analyzed, however as the site has two entrances and also two different environments in search of greater safety was opted for two extinguishers.

Below is shown the risk map produced by the company via Satellite reproduced in figure 2.

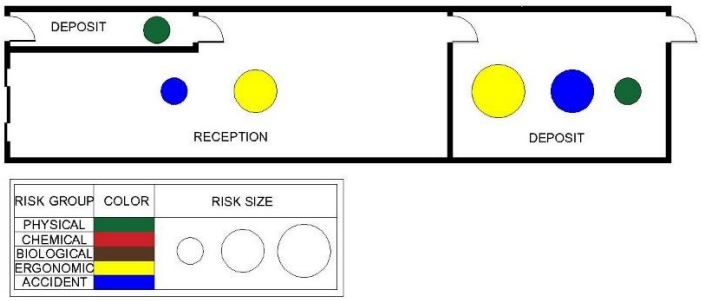

Figure 1: Risk map.
Source: Authors, (2019).

For the elaboration of the map it was observed the items listed in the methodology reaching the conclusion exposed in the map. At the reception was identified a small risk of accident, with the blue circle, because there is a transition of material from the store to the exit of the store, which is the sliding door, so that client and furniture employees end up occupying at the same time a common environment, Such material is sometimes large as antennas and electric fence rollers or small but heavy as cable boxes. The risk was classified as small because this transition is infrequent and when it occurs, the movement of people is low, usually at the beginning or end of work and the size of the reception is considerably large, 6 meters wide by 15 meters long. decreases the likelihood of an accident.

Also at the reception was indicated a high ergonomic risk since at least 2 workers spend full time sitting, being 4 hours before lunch from 7 to 12 and 4 hours after 14 to 18, these times are within the norm but if chairs are not If they are in the proper position, the computer is not at eye level, the mouse has no wrist support, employees who do not perform elaborate gymnastics can lead to occupational illness.

Regarding the deposit, three risks were identified, the ergonomic was classified as high because it is in the deposit that is stored the materials, being often heavy, the storage place is not always adequate, as when the stock is full and has to support the antenna on the floor, and employees who are not craft carriers do not wear ergonomic protective gear that would be a strap. As for the risk of accident classified as medium is related to the weight of the materials, the deposit also contains perforating materials such as screwdrivers, pliers, saws, drills, drills and others where their location is not identified. As for the small physical risk is related to temperature, it is not possible to see on the map but there is an air cooler in the reception and it releases hot air to the deposit, it also drips water bringing moisture to the environment, because it is a deposit, there is dust and although it is often clean it is not a healthy environment, but it was classified as small because there is little traffic of people on site and as there are two doors and frequent cleaning reduces the risk.

As for the front tank it is located under a ladder where cleaning materials and others are located, the low intensity physical risk is in relation to the temperature justified by the environment being small and not having ventilation.

V. RESULTS AND DISCUSSION

The Risk Map made it possible for employees to be aware of the agents that cause occupational accidents and illnesses, as their answers were the basis for the map's execution. SIPA, and is not even required to have, so the safety of work in such cases is often overlooked. It is also useful for alerting visitors and staff alike of the possible risks they face, thus facilitating prevention.

Regarding the fire project, even though it was carried out after the necessary appliances were already installed, it was important to check if their sizing and quantification were adequate, if they were properly indicated and also in good use.

VI. FINAL CONSIDERATIONS

Therefore, there was a considerable concern with safety in the company studied, there were personal protective equipment such as boots, gloves, uniforms, belts (for work at height) and others, the tables, chairs and computers are adjusted and have accessories suitable for workers. Regarding fire fighting the company has valid fire extinguishers, positioned and identified according to the standard, also has emergency lamps and qualified personnel for fire fighting if necessary.

As improvements can be cited the identification of the materials of the deposit, the suitability of the location of the deposit of material, which is not large enough and not suitable height for loading and unloading.

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RESEARCH ARTICLE OPEN ACCESS

HEALTH DAMAGE TO CIVIL CONSTRUCTION WORKERS DUE TO USE AND EXPOSURE TO CEMENT

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ABSTRACT

Civil construction has great representation for the socioeconomic development of our country. However, it is an activity that, if not carried out within the safety standards required by our labor legislation, provides great trends for labor incidents. The present work aims to address the risks inherent to the misuse of cement in the construction industry for the health of workers, having seen, because cement is a chemical agent that can be inhaled through the respiratory tract or, due to direct contact. with the skin and mucous membranes, and also, by oral intake, provides the severe emergence of pathologies in the health of workers submitted to continuous contact with it. Initially, it will be presented characteristics of this material, as well as some examples of pathologies associated with the use of the product and, finally, emphasize the importance of the use of safety and prevention measures capable of avoiding the referred damages to the workers' health. For this, we used the methodology of bibliographic research in scientific sources already consecrated referring to the theme dissertated here that allow to prove the theme treated here. Thus, with the conclusion of the subject, it is concluded that it is necessary to use all necessary safety measures to ensure the development of the activity, but especially to ensure the integrity and health of workers who are in continuous contact with the cement.

Keywords: Civil Construction; Cement; Worker's health.

I. INTRODUTION

In the preparation of the plans for the construction of buildings, it is of fundamental importance that, in addition to complying with all applicable laws and technical standards, special attention should also be paid to the correct use of cement.

As it has been seen, it is a material with large scale of use, not only in Brazil, but throughout the world, it must be handled properly, in order to satisfactorily meet the production of the product (building), both in the technical part. (safety, comfort, use, etc.), as well as, as regards the health of employees directly or indirectly involved in its use throughout the construction chain, from cement manufacture to finalization and delivery of the building. Referring to the importance of the construction industry for the economy of a nation.

The area of Civil Construction covers all activities of production of works, including activities from the planning and project functions to the execution, maintenance and restoration of works in different segments: civil construction - relating to buildings for housing purposes, commerce and other services. ; and heavy construction - related to the construction of roads, bridges, viaducts, tunnels, ports, airports, navigation channels, sanitation works, hydroelectric works and other infrastructure works.

In addressing the safety and health of professionals directly involved in the production of concrete for construction, refurbishment and maintenance of buildings, it is necessary that the managers of the projects (small, medium and large) of construction, are committed to the development of techniques. and processes that enable the proper development of the activity, without harming the health and safety of its employees.

This paper aims to discuss the damage caused to the health of construction workers due to the use and exposure to cement, as well as addresses issues related to the harmful consequences and occupational diseases that may happen to workers' health, if not. Protective measures should be taken in accordance with regulations regarding the proper use of cement.

II. BIBLIOGRAPHIC REFERENCE

II.1 CONCRETE

Material widely used for buildings (residential, commercial, industrial, etc.) and works of art (bridges, viaducts, tunnels, etc.) is defined as a composite material consisting of a continuous agglomerating medium in which they are submerged. coarse aggregate particles (gravel, with particles larger than 4.8 mm) and fine aggregates (basically sand) [1].

Concrete is also known as a mixture of mortar and coarse aggregate where chemical additives are added to it that modify some characteristics of the concrete to facilitate application and improve its workability. However, the concrete composites, both small particles and chemical additives, make it possible to damage workers' health [2].

II.2 BINDERS

Binder and pulverulent material that promotes the union between the grains of the coarse and fine aggregates where they are used to obtain pastes, mortars and concretes. They are in powder form and, when mixed with water, form pastes which harden upon drying as a result of chemical reactions and after drying adhere to the surfaces with which they have been brought into contact.

They are active products used for the production of mortars and concrete, the main ones being cement, lime, hydraulic lime and plaster. Where in concrete, cement is used that reacts with water and hardens over time. On this subject, [3] states that the binders, such as lime, plaster and cement, are products used for grouting masonry or for the execution of coatings and structural parts. They are in powdery form and when mixed with water form a paste capable of hardening by simple drying as a result of chemical reactions.

II.3 BINDER PRODUCTION PROCESS

II.3.1 WHITEWASH

It is the product obtained by the calcination, at the high temperature of a species of raw material, limestone ($CaCO_3$) or magnesian rock ($MgCO_3$), which are as sources of the oxides that form lime. This calcination is done among other forms in intermittent furnaces, built with refractory brick masonry. There are two types of constructions under construction: hydrated (aerial) and hydraulic [4].

II.3.2 HYDRATED WHITEWASH (AERIAL)

Hydrated whitewash, common or air is a binder that hardens by reaction with CO_2 in the air, unlike hydraulics, which requires contact with water. From the "burning" of limestone rock in kilns, calcination at 900º C, "quicklime" or "virgin lime" is obtained [5].

II.3.3 HYDRAULIC WHITEWASH

Binder obtained by the calcination of limestone rocks, which naturally or artificially contain a considerable amount of clay materials. It has the property of hardening under water, although it is also hardened by the action of CO_2 from the air. Hydraulic lime production consists of limestone rock fragmentation followed by calcination and hydration [6].

II.3.3 PLASTER

Obtained from total or partial dehydration of gypsum ($CaSO_4.2H_2O$), natural material found in nature with some impurity content such as silica (SiO_2), alumina (Al_2O_3), iron oxide (FeO), and carbonate ($CaCO_3$), the maximum impurity content being limited to 6%. Gypsum is the most commonly used structural type of plaster in the cement industry. It is found in its natural state in large sedimentary deposits geologically.

II.4 CEMENT

It is estimated that 11 billion tons of concrete are consumed annually which, according to the Federación lberoamericana de Hormigón Premesclado (FIHP), corresponds approximately to an average consumption of 1.9 tons of concrete per inhabitant per year, lower than the water consumption alone. [7].

One of the most commonly used raw materials in building construction, and one of the major sources of environmental contamination, is a chemical that can be inhaled by breathing, direct contact with skin and mucous membranes or even by ingestion by where it provides risks to workers' health through their use and exposure. Regarding the production process and existing compounds in cement, [3] points out that Cement is the result of a product called clinker, obtained by cooking until the incipient melting of a mixture of limestone and clay conveniently dosed and homogenized, such that all lime combines with the clay compounds without damaging the free lime after cooking. After firing, a small addition of calcium sulphate is made so that the SO3 content does not exceed 3.0% in order to regulate the onset time of binder reactions with water.

Still on cement, [8] points out that cement has been present on the planet for over twelve million years, arose thanks to intense geological changes and spontaneous combustion processes that caused chemical reactions in limestone and shale deposits. It was this natural cement that was first used by man in Assyrian, Babylonian, Egyptian, and Greek constructions.

Regarding the industrial production of Portland cement in Brazil, [9] states that production began on an industrial scale from 1926 and, in the 1970s, it grew dramatically, which in the early 1980s exceeded 25 million. tons, reaching 40 million tons per year in 2000 and, in 2010, production was 59.2 million tons per year.

II.4.1 RAW MATERIALS AND CEMENT CHARACTERIZATION

The production process of cement processing depends mainly on the following mineral products Limestone ($CaCO_3$) which is naturally present with impurities such as magnesium oxides (MgO). Knowing that lime, which is truly the raw material that goes into the manufacture of cement. Dolomite provides only 30.4% of CaO not used in cement manufacturing [4].

Also, according to the author, the clay employed in the manufacture of cement is essentially constituted of a hydrated aluminum silicate, usually containing iron and other minerals, in smaller proportions. The clay provides the SiO_2, Al_2O_3 and Fe_2O_3 oxides required for the cement manufacturing process.

Gypsum is the final addition product in the cement manufacturing process, with the purpose of regulating the setting time during the sulfate hydration reactions. It is found in the form of gypsum ($CaSO_4.2H_2O$), hemidrate or basanite ($CaSO_4.0,5H_2O$) and anhydrite ($CaSO_4$) [4].

Regarding the form of the worker contamination risk, cement can be characterized as a chemical risk agent, due to the substances, compounds or products that may penetrate the worker organism, either through inhalation, through the airways or under dust, fumes, gas, mist, mists or vapors, by dermal absorption (through the skin) or by ingestion.

According to [10] these agents can generate mutagenic, carcinogenic, teratogenic, organotoxic and immunotoxic effects in the body.

As a chemical agent, cement is classified as inert dust. Its color is gray and, when handled (deposited in concrete mixers), disperses a large amount of dust in the air. The moment dispersion occurs, the largest the risk is the particle size (which can be inhaled) and its composition skin contact).

Basically, the material is formed by alkalis, i.e. a mixture of clay and limestone (calcium carbonate rock), also known as flour. More specifically, in the composition of the most common cements contains Calcium Oxide (CaO), Silica (SiO_2), Alumina (Al_2O_3), Ferric Oxide (Fe_2O_3), Sulfuric Anhydride (SO_3), Magnesium Oxide (MgO), Potassium Oxide (K_2O), Sodium oxide (Na_2O) and Chlorine (Cl).

Still on the composition of cement, [11] are categorical in stating that the main component of cement is limestone that, after being extracted and ground, is mixed with other minerals such as clay, iron oxide and aluminum oxide. This mixture, called raw flour, is sent to the ovens and calcined at high temperatures.

However, as [12] the main cement compounds are lime, silica, alumina and iron oxide are the essential components of Portland cement and constituents, generally 95 to 96% of the total in oxide analysis. Magnesia is usually present at 2 to 3%.

II.5 OCCUPATIONAL DISEASES

During the time of the development of the work activities developed by the company's employees, it is important that all necessary measures are taken to ensure the safety and health of the workers, so that they are guaranteed favorable conditions for the fulfillment of their activities;

In this way, they are assured that even during the period in which they perform their activities, they do not acquire the diseases that come from the bad conditions of the workplace, commonly called occupational or occupational diseases. Regarding the definition of occupational diseases at work, [13] are unanimous in stating that It is the diseases acquired during the exercise of work in the service of the company, causing bodily injury or functional disturbance that causes the death or loss or permanent reduction or temporary capacity for work.

II.6 DANGERS AND IMMINENT RISKS IN CONSTRUCTION

It is notorious that the work activities performed in the construction industry produce dangers and risks for employees, especially those directly involved in the construction process of the works. In dealing with dangers and risks, [14] state that danger is understood to mean a circumstance that foretells harm to someone or something, state, or situation that inspires caution in offering risks. The term risk may be defined as a combination of the likelihood of a hazardous event occurring with the severity of the injury, illness or loss that may be caused by the event.

II.7 RISKS DUE TO CONTACT OF CEMENT ON THE EMPLOYEE'S SKIN

According to [15], occupational risk is the likelihood of an adverse effect on the individual or the population by exposure to a specific concentration or dose of a hazardous agent. This definition encompasses two dimensions: the possibility that there is a negative result; and the uncertainty about the appearance, duration and magnitude of the adverse outcome.

Because workers are exposed to contact with cement for prolonged periods, they are exposed to the risks of contamination that cause severe damage to their health, such as: Damage to the cardiovascular, respiratory, renal, neurological, skin and others.

Because it is a pulverulent material, cement attacks the oral route and can develop stomach cancer, as well as, through the airway, also causes damage to the lung by inhalation of harmful substances to workers' health.

Therefore, it is of utmost importance that in the use of cement, the safety procedures that ensure employees do not acquire occupational diseases due to handling and contact with the cement are met.

Therefore, it is necessary to use adequate protective equipment to avoid causing damage to the health of the worker because cement is classified as an irritant material, i.e., reagent material in contact with the skin, eyes and respiratory tract. enable the emergence of damage to the health of employees. In this context, regarding the imminent risks to the workers' health caused by cement contact, [16] contributes to affirm that to better understand, cement reacts in contact with the epidermis due to its moisture (body perspiration), after prolonged contact. . The release of heat, by reaction in contact with liquid surface, causes injuries ranging from burns to contact dermatitis. It is common to observe the alkaline action of cement on the surface of the skin (especially hands and feet) in construction workers. Cement exerts an abrasive effect on the horny layer of the skin. The lesions are clearly visible: redness (erythema), swelling (edema), eczema, blisters, fissures and tissue necrosis.

II.8 DISEASES FROM IMPROPER USE OF CEMENT

II.8.1 OCCUPATIONAL ACNE

According to [17] occupational dermatosis is the alteration of mucous membranes, skin and its attachments that is directly or indirectly caused, conditioned, maintained or aggravated by agents present in occupational activity or in the workplace.

However, according to [18] the hygroscopic properties of cement and the presence of complex metal compounds are responsible for the sensitivity manifestations on the skin of some workers.

Also, according to the author, the frequent contact of cement with the skin can cause some kind of skin lesion in some of them, from skin dryness, irritation or chafing of the hands, feet or any place where the cement based product.

Figure 1: Worker with chronic allergic eczema caused by contact with cement.
Source: [19].

Figure 2: Worker with eczema and foot infection caused by direct contact with cement.
Source: [19].

II.8.2 IRRITATIVE CONTACT DERMATITIS BY CEMENT

As [20] cement is very irritating to the skin, its alkalinity often reaches a pH close to 14.1 For this reason, cement should be handled with hygienic care and personal protection. Several dermatoses can occur after cement contact with workers' skin.

According to [21] occupational dermatosis comprises all skin diseases directly or indirectly related to work and contact dermatitis is the most common and frequent, representing about 80% of existing dermatoses in workers in general.

II.8.3 PNEUMUCOSES CAUSED BY CEMENT MISUSE

Pneumoconiosis are occupational chronic diseases caused by the slow, repeated and durable action of inhaled or aspirated dust particles or powders.

According to [22] they are occupational or occupational diseases that have a high rate of morbidity, disability and mortality of the working population in the period of higher productivity.

According to [17], pneumopathies related to inhalation of chemical dust in the workplace are called pneumoconiosis, which are inhalation diseases of substances that the body can little fight with its immune defense mechanisms.

As [19] the symptoms of pneumoconiosis are shortness of breath and cough and if suspected, tests should be performed to confirm changes in the lungs.

II.8.4 SILICOSIS

For [17] silicosis is the most prevalent pneumoconiosis in Brazil, where all silica exposure situations where there is a risk of silicosis are verified, as well as peculiar exposure situations.

Second [22] is a chronic pathological condition of the lungs due to inhalation of particles containing free or non-combined silicon oxide (SiO_2), is recognized in Brazilian law as "occupational disease", thus covered by the legal concept of "work accident".

Figure 3: Worker with advanced stage silicosis.
Source: [19].

Because silicosis is a slowly developing disease and can progress independently of continued exposure, most cases will only be diagnosed years after the worker has been removed from exposure [17].

II.9 SECURITY MEASURES

In order to regulate the work safety in the construction industry in Brazil, regulatory standards were elaborated, among them, the Regulatory Standard (NR) 18 - Conditions and Environment of the Work in the Construction Industry, which has as main objective, to establish administrative, planning and organizational guidelines that aim to implement control measures and preventive safety systems in the processes, conditions and work environment in the Construction Industry.

As well as, not only NR-18, but other NRs, pursue the same objectives, among them, NR-6 that deals with personal protective equipment, device or product, of individual use used by the worker, intended for the protection of risks likely to threaten safety and health at work.

III. MATERIALS AND METHODS

For the development of this work and to achieve the proposed objectives, the present work was based on bibliographical research related to the subject here addressed, as well as, after obtaining and cataloging the content and scientific sources of research, the organization and contextualization was developed. of the theme discussed here.

Thus, after the development of the subject, we seek to present and discuss about the results from the theme addressed here.

IV. RESULTS AND DISCUSSION

With the completion of this work, it is found that cement is a material that is highly harmful to workers' health. This is observed in the damage it can cause to the health of workers who are continuously subjected to contact with the cement.

These damages are proven through diseases already known and scientifically cataloged, such as Dermatoses, Dermatitis, Pneumoconiosis, Silicosis and others.

Therefore, it is not necessary to address that all possible measures should be adopted to ensure the integrity of the health of workers in the construction industry who are in direct and continuous contact with Portland cement.

V. FINAL CONSIDERATIONS

After analyzing the subject here, it is observed that the improper use, the neglect of the use of protective equipment and the lack of control and safety measures in the activities that involve the continuous use of cement, causes great damages and, in irreversible to workers' health.

In addition, the lack of use of PPE - Personal Protective Equipment greatly aggravates the quality of health of workers because, often, they develop their activities with slippers, sandals or shorts, as well as the lack of training causes that the vast majority do not wear a protective mask, goggles or gloves on site, regardless of their size.

Thus, it is of fundamental importance to make everyone aware, not only of workers, but especially of managers, developers, builders, customers and, all involved in the construction industry, about preserving the health of workers who are involved daily. and

continuously in direct contact with the cement. For only in this way is the evolution of progress possible, but by guaranteeing the integrity of human life.

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RESEARCH ARTICLE OPEN ACCESS

PLANNING AND BUDGET AS A WORK AND PROJECT CONTROL TOOL: CASE STUDY OF THE INTERNAL SYSTEM OF A CENTRAL CONSTRUCTION SITE IN MANAUS

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ABSTRACT

Planning is an administrative tool that makes it possible to perceive reality, evaluate paths, build a future framework, structure the appropriate process and reassess the entire process for which it is intended. The budget derives from the management planning process. Planning is therefore the rational side of action. This research presents a study regarding budget errors due to the lack of prior planning through comparative analysis by observing case studies and identifying good procedures to be replicated, and suggesting recommendations to be adopted by organizations that are adopting or intending to adopt a process. Implementation of planning and budget management of works. Among the main errors are the lack of parameterization of budget items and the failure to follow up on field activities. It is up to the engineering professional to pay attention to the correct execution of the monitoring and planning process so that he gets the success of his work.

Keywords: Planning, monitoring, control.

I. INTRODUTION

With the great competition in the construction sector, construction companies are looking for new technologies that can influence their construction processes, influencing mainly with the increase of productivity, and the reduction of waste in general.

Within this context, studying labor productivity becomes vital to the survival of a construction company. This physical resource represents a significant portion of the total cost and mainly influences the execution time of the works. According to [1], improving labor productivity is a relevant path as its costs represent a significant portion of the total burden on production.

According to [2], important questions must be asked, such as: Can you do it? Is it worth doing? Who does? How to do well? It works?

Without these it is not possible to start a planning that has as its concept the premise of where you want to go, so that it will be defined how it will arrive and what is the most efficient way possible to achieve this goal.

The planning and control process now plays a fundamental role in companies, as it has a strong impact on production performance [3].

With the great need to increase their productivity, as well as increase their competitiveness in the market, construction companies seek to complete their projects in the short term. This is not always a positive factor as it leads to planning and control shortcomings.

Studies to improve productivity in a short time already exist. The fact is to put "planning" into practice, predicting the time and time to complete, provisioning for delays and unforeseen events. Construction companies are detecting some issues that affect the entire process:

Errors in budgets, as they do not foresee the work in its entirety;

Lack of specific planning for completion of works;

Incompatibility with the reality of the market in which the enterprise is located;

Civil construction that plays an important role in the world economy and has been seeking to rationalize the executive process in general. Cost and quality reduction of the final product must be in accordance with the needs that the market demands.

Through this study we can have a better field of view of the various services performed on the construction site, and can more easily organize the tasks. Well-designed project planning is the fundamental activity for the success of any project, be it infrastructure, education, housing, transportation or industry, both at the competition stage and at the beginning and throughout the construction period. Assuring based on assumptions assumed, a favorable probability with respect to expected results. Through planning, it will be possible to foresee not only the resources needed to achieve the goals set, but also to prevent problems and unforeseen events that may occur.

Planning and control now play a key role in the development of the enterprise. Deficiencies in planning and control are among the main causes of the low productivity of the sector, its high losses and the low quality of its products, but few are the companies in which this process is well structured, that is, they are prepared to meet the needs. Competently meet the competition.

The objective is to present the importance of the planning and monitoring sector within a project, to present technical background on planning works, to analyze the planning system, to analyze the problems caused by the lack of proper planning and to analyze the problems caused by the lack of control in the projects. Construction sites and propose solutions to these failures.

II. BIBLIOGRAPHIC REFERENCE

The planning and control process now plays a fundamental role in companies, as it has a strong impact on production performance. Studies conducted in Brazil and abroad prove this fact, indicating that deficiencies in planning and control are among the main causes of the low productivity of the sector, its high losses and the low quality of its products [4].

When planning a work, the manager acquires a high degree of knowledge of the project, allowing greater efficiency in conducting the work. It is difficult to finish a project as planned. Problems, failures and deviations occur during execution. It is not always the culprit that is the organization or company that is executing the project, but external factors are thus beyond the control of management, but can be mitigated with effective planning.

Planning allows us to increase knowledge about the business / project and its market potential.

The main benefits of planning are:

a) Full knowledge of the work: the elaboration of the planning requires the professional to study the projects, the analysis of the construction method, the identification of the productivities provided for in the budget, the determination of the workable period in each front or type of service;

b) Unfavorable Situation Detection: Often, due to lack of planning and control, the construction team fails to take action when the delay is already irreversible. Adopt preventive and corrective measures, and try to minimize impacts on cost and time;

c) Agility of decisions: A planned and controlled work allows a real view of the whole enterprise, making a reliable and agile basis in management decisions;

d) Relationship with the budget: By relating the budget to the planning, it becomes possible to evaluate inadequacies and identify opportunities for improvement;

e) Resource allocation optimization: Allocating resources is studying activity backlash and making important decisions such as analyzing planning, resource leveling, delaying the allocation of certain equipment;

f) Reference for follow-up: The schedule is a very important tool for the follow-up of the work, as it allows a comparison of the predicted as the accomplished;

g) Standardization: planning disciplines and unifies the team's understanding, making the work's attack plan consensual and improving communication;

h) Goal benchmarking: Goal program and deadline bonus can easily be instituted because there is well-built referential planning on which goals can be set;

II.1 PLANNING TYPES

As the planning of the work is complex and covers its entire duration - which may be months or years - the overall schedule is not a tool for immediate communication with the performing teams. If a work is expected to last for three years, it is impracticable for people to manipulate gigantic schedules on a daily basis, with activities that will only be done one or two years later. Therefore, it appeals to programming, which contains only the set of activities that will be performed over a specific period of time, such as a week or a fortnight [5].

It can be said that programming consists of applying a filter to the overall schedule to show only the activities of a given "window" of time in order to more objectively transfer what should be done in the next week or fortnight. The planner filters out the portion of the entire schedule for a small future period. It is like zooming in on a given time interval.

The programming has the function of being the communication tool of the planning sector with the production sector of the work. The programming serves as the project's agenda, and must be strictly followed. It is recommended that the weekly (or biweekly) meetings of the work be guided by the schedule, as it defines exactly who will do what and what are the expected start and end dates of each activity of that period.

Programming transforms the network of activities into a roadmap for field staff, so that workers and supervisors can perform their tasks within an executive sequence compatible with the overall planning of the work, with a sense of time and a systemic vision of the project.

In short, programming is the translation of global (macro) planning into time-constrained (micro) horizons, with a view to the effective allocation of manpower and equipment, procurement of materials, designation of officers, administrative arrangements, detection of deviations and conducting coordination meetings.

II.2 LONG TERM PROGRAMMING (PLP)

In long-term programming, the horizons of the plans cover the entire construction period and have as their main objective the definition of the rhythms of the activities which constitute the major stages and their constructive processes of the enterprise.

Planning can be done at various levels of detail and scope, each aimed at one type of decision making and appreciation by different levels of management. As it is intuitive to realize, for the same venture the look of the construction company's board is one, the work manager's is another and the master's is another.

Long-term scheduling consists of the first level of planning detail. It has a more generic character, suited to the highest levels of management (board). Contains few items, usually presented in months. Long-term scheduling (also called the master plan) is basically for the general visualization of the stages of the

work, explanation of the most important milestones and preliminary identification of resources [6].

For a building, for example, long-term programming would generate a schedule with sub-items:

Preliminary Services; Foundations; Structure; Masonry; Coating.

Due to its remarkably generic character and low degree of detail, long-term programming is not suitable for the daily conduct of the work. Its usefulness is in the visualization of the work as a whole, in the quick identification of the time of operation of each phase of the work, the milestones and the rhythm in which the main production processes should be executed [6].

II.3 MEDIUM TERM SCHEDULE (MTS)

Second [7], medium-term programming consists of the second level of planning detail. Its basic function is to enable the preparation of a material and equipment purchase plan, identify the need for new resources, train the workforce in a timely manner and anticipate interference. More detailed than the long-term, this schedule serves the site managers well.

Its range is usually between 5 weeks and 3 months, with monthly or biweekly review and update. For the same building as before, the medium term programming would include the following items [7].

1 floor structure; 2nd floor structure; 1st floor masonry; 2 floor masonry.

II.4 SHORT TERM SCHEDULE (STS)

Short-term scheduling consists of the third level of planning detail. It is the operational-level programming made for field engineers, masters, and contractors. Its scope is weekly or biweekly and its function is to establish clear and immediate guidelines. The short term programming is the "agenda" of the work [3].

According to the aforementioned author, this programming should be done in conjunction with the masters and supervisors and should seek continuity of activities. Surveys conducted in developed countries have shown that the most productive teams are precisely those who devote the most time to understanding and commenting on programming, as they commit more, better manage resources, dialogue with engineers more objectively, in short, acquire a more realistic view. And overall of the work.

The degree of detail of the schedule increases as the activity begins to approach. Short-term scheduling is ideal for identifying the reasons why the tasks of the week were delayed or did not start as planned. This type of programming is the best tool for monitoring the work and providing a "radiograph" of progress continuously.

Also according to previous author, in the foreign literature expression last planner system has been gaining strength to designate the short term plan. The last planners are those in charge and field supervisors who also participate in the planning process, assessing the appropriateness of programming and proposing solutions for interference, conflict and constraints in the field [8].

II.5 PROJECT PHASES

They are divided into phases containing one or more achievable procedures and verifiable results. These phases are commonly arranged in a logical sequence to ensure greater understanding in the process.

Each phase of management is responsible for a specific outcome that necessarily needs to be achieved for project success.

II.6 PROJECT LIFE CYCLE

An important and relevant aspect of a project is its life cycle, as, as mentioned in the previous topic, each phase has an activity and, as a project has as characteristics the time for its execution, therefore it necessarily has a certain cycle of life. The life cycle typically defines which techniques will be employed in each phase and who will be involved in performing the tasks in each phase of the project.

Taking an engineering reading, we can understand as project duration, which by definition means the amount of time, in days, weeks, months, hours or minutes, required to perform the activity, ie is the amount of work periods required to perform the activity [8].

Project management can be essentially useful for two types of organizations [9]:

. Organizations that base their revenues on projects developed for other companies - architectural, engineering, consulting firms. Public works contractors etc.

. Organizations that adopt project management as a corporate management tool.

For the effective operationalization of project management, information technology is indispensable. Project management information systems are great allies in the planning and control of projects in these organizations. As an example of the benefit of this integrated environment for the company, the highlights include cost and personnel systems. Cost systems can interact with project management systems by assigning cost centers to various departments involved in multiple projects, controlling disbursement and measuring the outcome of capital employed. Personnel systems can be integrated with project management systems, allowing the manager to be able to verify the performance of each individual involved in each of the organization's projects.

Many modern organizations are hybrid structured in functional aspects, respecting the hierarchy and responsibility of their functional managers, but also with project-oriented aspects, where project managers have the exclusive dedication and due authority to perform their duties, especially in critical projects. For important projects. But not so critical, companies present an intermediate variant of organizational structure, the matrix structure. This structure comes in three forms, as in an evolutionary process [9].

II.7 PLANNING AND PRODUCTION CONTROL

The planning and control of production aims to ensure that a product can be produced or performed a certain service in a way that obtains efficiency and effectiveness in the processes, however, to achieve this it is necessary that the resources and materials considered raw materials are available, meeting the appropriate quality parameters; The activities of the CFP can be divided into: Strategic Level; Tactical level; Operational Level.

At the strategic level, production plans are developed, which are long term for the company's system. At the tactical level, medium-term plans are developed and the Master Production Plan (PMP) is established. At the operational level, short-term programs are prepared, including inventory management, production sequencing and issuance of purchase and production orders at this stage.

III. MATERIAL AND METHODS

For the case study, the monitoring of the elaboration of a system to create a planning of the managerial execution of a project was carried out.

Implementation studies of the quantitative survey system were also carried out to determine the actual input quantities for purchase and use.

For this, processes were developed so that these surveys were standardized within the company.

To enable the receipt of information for budget preparation in other areas of the company, reports were developed with assumptions aligned with those that should be sent via e-mail to those responsible at the beginning of the conception of the work after organizing the folders. The forwarded collections are described below.

IV. STUDY APPLICATION

IV.1 PROJECT COST COLLECTION

List of all projects that are normally contracted for settlement by the Executive Projects team. Forwarded via email shortly after the folder was assembled, with a return date expected at most 10 business days before the budget was completed. When a project is not yet contracted, the responsible area should estimate the cost of its responsibility. If the need for other projects not listed is verified, the Executive Projects area should add them, as well as their respective costs.

IV.2 COLLECTION OF SALARIES AND BENEFITS

Report with all the functions of the employees of the construction site for the appropriation of salary by the human resources team, as well as the unit cost of all benefits and expenses with occupational health and safety. Forwarded via email shortly after the folder was assembled, with a return date expected at most 10 business days before the budget was completed.

IV.3 IT COST COLLECTION

It aims to collect quantities and costs of temporary computer facilities at the construction site. Forwarded via email shortly after the folder was assembled, with a return date scheduled for a maximum of 5 business days prior to budget completion.

IV.4 HEAVY EQUIPMENT COST COLLECTION

Based on the equipment histogram and regionalized price spreadsheet provided by the equipment area, with their respective complementary costs, such as mobilization and demobilization, freight, corrective and preventive maintenance, consumption and productivity, the cost collection will be assembled. In case it is necessary to use equipment not included in the spreadsheet, the report will be sent via e-mail with expected return no later than five business days before completion.

IV.5 INPUT COST COLLECTIONS

They will be provided by the supply area by making available specific target price spreadsheets for each microregion. Since all purchases made in the company use an Enterprise Resource Planning (ERP), the other unit costs of the inputs are collected through the Purchase Feed Back. Specific items that may not be in the regional catalog or system will be budgeted directly from accredited suppliers.

Calculating quantities is one of the most important steps in the budget process. The surveyor should responsibly observe all criteria, spreadsheets and conferences upon completion to avoid any errors.

The quantity survey must be performed according to the available designs and specifications, using the standard area forms and the CAD (technical design software) tool, always observing the area measurement criteria.

IV.6 SURVEY DIVISION DIAGRAM

To facilitate understanding of the main subdivisions of the parts of the surveys and, consequently, of the budget spreadsheets, below is a graphical presentation of the most common situations.

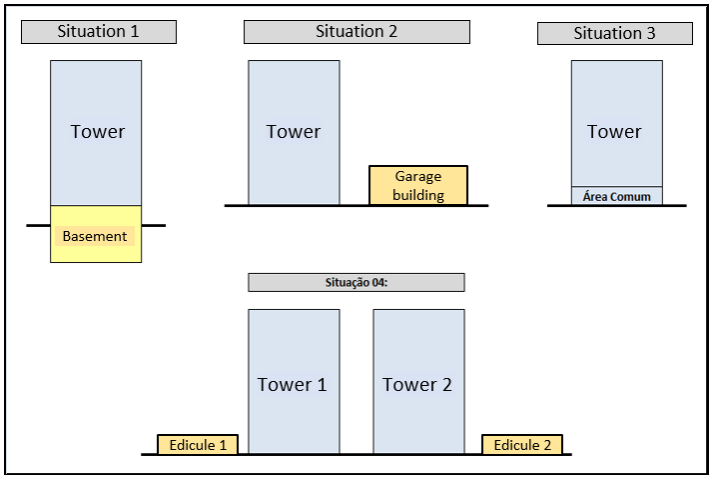

Figure 1: Tower Survey Diagram.
Source: Authors, (2019).

Looking at the diagram, we can see four different situations:

• Situation 01: The surveys will have two sets of spreadsheets: one for the towers and one for the basement;

• Situation 02: The surveys will also have two sets of spreadsheets: one for the towers and one for the garage building;

• Situation 03: The surveys will have a set of spreadsheets, observing the separation of the finishes of the apartments and common area, including the rooms;

• Situation 04: The surveys will have three sets of spreadsheets: one for tower 01, one for tower 02, and one for the educts.

IV.7 MEASUREMENT AND SURVEY CRITERIA

All quantity withdrawals will be in accordance with the measurement criteria below. Services that are not discriminated against can be checked in the "Budget Survey Criteria" document available in the Budget Book. Those not mentioned in this procedure or in the document itself will be performed according to PINI criteria [10].

IV.8 MAIN CRITERIA

• Masonry: Survey of the elevation area discounting all the spans according to the architectural project;

• External Cladding (Chapisco, Plastering, Plastering, Ceramics and Stones): Only discount spans above 2.00 m², and

only those exceeding 2.00 m² (eg, for 2.52 m² spans, discount only 0.52 m²) m²);

• Exterior painting (Acrylic, Latex, Graphite, Textured, etc.): Do not discount window and doorways.

• Interior finishes: Discard all wooden frame gaps and discard any other gaps above 2.00 m², but only in excess.

• Skirting boards: Discard all doorways.

• Painting wooden doors: Consider the door area multiplied three times (2 door faces + frame).

• Painting of metal frames: Consider the area, multiplied twice.

• Excavation of blocks and straps: If using form, consider the actual width + 40 cm and the actual length block by block. The depth will be the actual plus five centimeters depending on the execution of the ballast. For executions in which the use of shapes will not be necessary, we will follow the same criterion, but without adding 40 cm in width.

• Construction lease: The construction perimeter plus 1.50 m on each edge is considered.

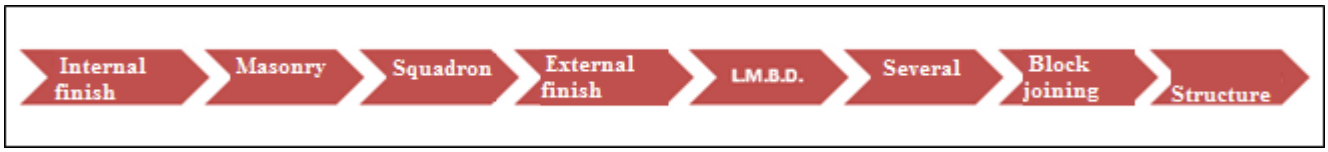

Figure 2: Steps for preparing surveys.
Source: Authors, (2019).

IV.9 ENGINEERING TECHNICAL INDEX COMPARATIVES

After the quantity survey has been closed, a comparison should be made against standard technical index sheets for pre-approval of the respective quantities.

It is important to highlight that this comparative aims at the elaboration of assertive budgets based on the operational efficiency of the company, since the standard indices represent the best practices of accomplished projects.

Remaining the deviations found, the Coordination and Management of the budget area should evaluate the data together with the responsible for the elaboration. The project area should then be informed, and the budget area will proactively indicate the project's poor performance.

IV.10 CRITICAL ANALYSIS AND ABC CURVES

Standard curves are spreadsheets with the percentage distribution of incidence of inputs or services of works separated by types (horizontal and vertical structural masonry buildings, conventional reinforced concrete structure buildings and concrete wall system), in which a pattern is observed. According to the implementation methodology. In the evaluation stage, the Intelligent ABC curve should be generated, that is, by accumulating the similar items, verifying, according to the type of project in question, whether the generated percentages are in accordance with the standards. Otherwise, any discrepancies must be justified, or even revised costs and quantities again. A detailed reading of the ABC Curves for Services, Inputs and Spreadsheets should be made after the budget has been finalized by the Coordinator, asking the responsible person about any distortions of costs and quantities identified. The critical judgment conference may also be held by another budget expert who has not participated in the process, favoring the “impersonality” factor and allowing a second opinion.

V. RESULTS AND DISCUSSION

Among the problems encountered due to the failure of planning and management of resources within the enterprise are the lack of control of executive processes.

These processes involve the steps from the receipt of the material to the purchased broom for cleaning the finished apartments.

What often happens is that many contributors believe that the planning and budgeting sector is a mere environment where calculations are made about the work, calculations that do not work.

That is not true. The industry when conducting surveys needs full attention from all service fronts. If you do not get this support, you will:

- Quantitative failures;
- Failures in physical advances;
- Overflow in project costs;
- Lack of process reliability;
- Leftover materials.

When these problems were detected within the enterprise, they required extra attention regarding the execution of a new survey.

All problems related to the failure to perform the survey procedure within the project imply the final value of the work. Over-buying makes the works more expensive, as they will be left with an absurd amount of materials.

In the case of works where there is a large number of repeatability, this failure is even worse, since the error factor is multiplied by the total number of housing units.

VI. FINAL CONSIDERATIONS

Looking at all the problems encountered by the lack of planning within a venture, it is clear that this process is essential.

The whole organization aims at profitability, good data collection, real results, and for this to be obtained, the monitoring must always be at the side of the execution of the work, with the disposition of the resources employed, demonstration and clarity in the explanation of the indices and data collection for future budgets.

It is the planning that prevents the company, within a construction site, end up spending more than necessary, since it is this procedure that dictates what to do, when to do and how much to spend for this accomplishment, and control is responsible for not let the situation go astray, dictating the rules of resource use and making the appropriate appropriation of general inputs.

Full control of processes and systems ends up bringing many benefits to enterprises in their construction phase. It is known that the amounts invested in the construction of any projects are high, as the inputs commonly employed have high value.

Having the data of the enterprise in hand one can have an overview of the work. The act of planning gives the developer the

basic notions which are: estimated cost, initial deadline and final deadline for execution. These factors make the building options viable.

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RESEARCH ARTICLE OPEN ACCESS

ELABORATION OF A FIRE PREVENTION AND FIRE FIGHTING PROJECT IN THE MANAUS-AMAZONAS CITY

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ABSTRACT

There is a known shortage in the technical literature regarding fire prevention and fire fighting, which is often not even a constant subject in the curriculum of engineering courses. In Manaus, fire projects are regulated by the Fire Brigade Technical Standards, so there is often a technical deficiency in the preparation of these projects. In this context this work is inserted, aiming to provide a logical and normative roadmap for the correct design of fire prevention and fire prevention facilities. The object of study adopted is a Shed of 2,112.00 square meters, located in the West Zone of Manaus. The design determined a mixed fire fighting system between extinguishers and fire hydrants, requiring the adoption of elevated reservoir systems and fire pumps.

Keywords: Prevention, Fire, Water Pumps.

I. INTRODUTION

There is a close relationship between the discovery of fire, its use as a tool and the beginning of technological advances in the early Paleolithic period. Once under control, man used fire in exquisite innovations and gained the primacy and control under his surroundings to begin to develop the first great civilizations.

However, historically the use of fire has had consequences, such as the 64 AD fire in Rome, which devastated the metropolis and the 1666 AD fire in London. This history of major fires has led to a natural evolution in fire fighting systems.

In Brazil, it was no different, with outdated legislation behind the rest of the world, it was only after the Joelma Building fire [1] in 1975 that modern prevention techniques were developed, with prior control of projects, and supervision of normative criteria by the Fire Department, the Table below shows the history of large fires in Brazil.

Table 1: Fires in Brazil.

Fires and Tragedies in Brazil		
Gran Circo Norte Americano (1961)	RJ	500 dead and 800 injured[2]
Edificio Andraus (1972)	SP	16 dead and 332 injured
Edifício Joelma (1974)	SP	179 dead and 320 injured
Edifício Grande Avenida (1981)	SP	17 dead and 53 injured
Pojuca (1983)	BA	100 dead and 200 injured
Vila Socó (1984)	SP	500 dead[2]
Osasco Plaza (1996)	SP	45 dead and 482 injured
Boate Kiss (2013)	RS	242 dead and 680 injured

Source: [2].

1. Some images in this manual were obtained from the internet.
2. Approximate or estimated values.

In fact, Brazil has an unfortunate history of fires, resulting from the negligence of engineering professionals with the necessary regulations for the approval of the Fire Department, a fact that often occurs due to ignorance of people.

In this context, this course completion work is a means of disseminating, by practical example, the application of technical standards and analysis and design tools for firefighting installations.

II. LITERATURE REVISION

II.1 FIRE THEORY

Humankind incorporated fire into its routine thousands of years ago, and over time it has been establishing better ways to control and deal with it in ways that compromise its integrity less and less. However, one of the remaining challenges is full control of fire. Equipment has been developed and strategies designed to prevent the unbridled spread of the flames, but eventually they get out of control, and this episode we call Fire (Conflagration) [3].

Fire is a chemical reaction that occurs with the rapid oxidation of combustible material with air by a heat source that generates flame, releases heat, emits smoke, gases and other debris [4]. Fire can also be called combustion, which is the exothermic reaction that consists of combining combustible material with oxidizer (oxygen from the air), which initiates a chemical reaction when in contact with air [5].

A [6] conceptualizes fire as a combustion process characterized by the emission of light and heat. According to [7], fire can also be called combustion, which is an exothermic reaction, and for the phenomenon of fire to occur, there must be the simultaneous occurrence of four essential elements, which are:

- fuel; Oxidant (oxygen); Heat; Chain reaction.

Fuels are the materials susceptible to burning, that is, what will be consumed by the flames, can be solid, liquid or gaseous.

Comburent is the chemical agent that activates and conserves combustion, combining with fuel gases or vapors to form a flammable mixture. In other words, oxidizer is considered the oxygen present in atmospheric air. To maintain the occurrence of fire, the percentage of oxygen present in the environment cannot be less than 14% by volume. [2], Oxygen is the most common of oxidants, since its constant presence in the atmosphere (21% in air) allows the burning to develop quickly and completely. However, in environments where oxygen supply is reduced or consumed during combustion a combustion depletion is observed, with less enthusiastic flames and a predominant presence of embers when the concentration is between 15% and 9% and finally with combustion termination occurring in environments where oxygen supply in the air is less than 9%.

Heat is the energy that initiates, maintains and encourages the spread of fire. It is the causative agent of the chemical reaction of the flammable mixture from the combustion of fuel and oxidizer.

Chain Reaction is a heat transfer from one molecule of the combustion material to the still intact neighboring molecule, which will heat and ignite, successively, until all material is in combustion.

Combustion then is nothing more than the reaction involving these four elements, didactically represented by the fire tetrahedron:

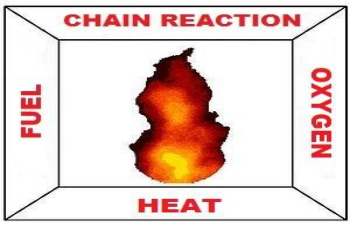

Figure 1: Fire Tetrahedron.
Source: [2].

II.2 FIRE THEORY (CONFLAGRATION)

For [8] fires are classified according to combustible material, and can be described in six different classes, which are: A, B, C, D, K and I.

This classification was prepared by NFPA - National Fire Protection Association / USA, and adopted by the following institutions: IFSTA - International Fire Service Training Association/ USA: ABNT - Associação Brasileira de Normas Técnicas e Corpo de Bombeiros (Brazilian Association of Technical Standards and Fire Departments) / BR.

- Class "A": fire in solid fuels such as wood, paper, fabric, rubber, etc. These materials burn at surface and depth and, because of their volume, leave residues after combustion such as ashes and embers. The best method of extinction is cooling, mainly by the action of water, which is the most effective extinguishing agent, and by muffling, as a secondary action.

- Class "B": fire in flammable liquids and gases or solid fuels such as gasoline, oil, kerosene, liquefied petroleum gas (LPG), etc. It is characterized by leaving no residue and burning only on the exposed surface. The best extinguishing method is by muffling, by breaking the chemical chain reaction, and the best extinguishing agent for this case is the mechanical foam, and may also use dry chemical powder and gases.

- Class "C": fire in energized materials and equipment, such as motors, transformers, generators, electrical panels, etc. For extinguishing fires of this class clean agents should be used and carbon dioxide (CO_2) the best agents for this class of fire.

- Class "D": fire in combustible metals such as magnesium, selenium, antimony, lithium, potassium, fragmented aluminum, zinc, titanium, sodium and zirconium and etc. It is characterized by burning at high temperatures and reacting with common fire extinguishers agents, especially if it contains water. To extinguish this type of fire, special dry chemical powder extinguishing technique, equipment and agents are required.

- Class "K": fire involving vegetable oil and animal fat, either in solid or liquid state, with commercial or industrial kitchens as an example of environments. This class is still little known in Brazil, and for the extinguishing of this type of fire, extinguishing agents are required to provide excellent coverage in the form of a muffled sheet.

- Class "I": fire involving radioactive and chemical materials in large proportions, requiring highly trained equipment and teams. There is not enough technical literature to safeguard this fire class.

The fire presents a phase of evolution, as stated by [9], the phases of the fire can be simplified between Ascending and Descending.

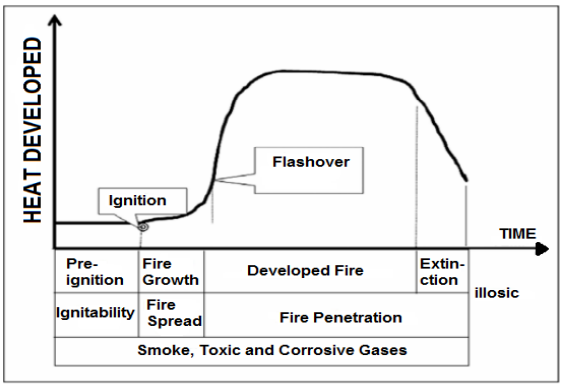

Figure 2: Fire Evolution.
Source: [9].

III. MATERIALS AND METHODS

For the elaboration of this article, an evaluation was first made about the place to be dimensioned and its surroundings. After this, we sought in the technical-normative references the practical criteria to define the fire fighting techniques to be adopted.

III.1 DESCRIPTION OF THE COMPANY EVALUATED

Figure 3: Company Location.
Source: Authors, (2019).

Address: José Tadros Street, Neighborhood: Santo Antônio - Manaus, AM.

Construction Type: Industrial Shed.

Total Area: 2,747.00 m^2

Constructed Area: 2.112,00 m^2

The venture was intended to act as a commercial deposit, of inputs brought upon importation, with medium flammability potential.

It has a medium construction standard, with galvanized roofing, structured under metal profiles, concrete block masonry walls and reinforced concrete floor.

Figure 4: Company Interior.
Source: Authors, (2019).

IV. RESULTS

IV.1 BUILDING FRAMEWORK

According to the characteristics of the project, the framework will be defined, which will define specific dimensioning issues.

Building Height 7,0 m - Classification II (According to Table below):

Table 2: Height Classification.

Type	Height
I	Ground Floor
II	H ≤ 6,00 m
III	6,00 m < H ≤ 12,00 m
IV	12,00 m < H ≤ 23,00 m
V	23,00 m < H ≤ 30,00 m
VI	Above de 30,00 m

Source: [10].

Occupation: Flammable Potential Material Storage Area between 300 MJ / M² to 600 MJ / M².

Risk: Risk defined as Medium Risk, according to Table 3.

Table 3: Risk Rating.

Risk	Fire charge MJ/m²
Low	Up to 300MJ/m²
Medium	Between 300 and 1.200MJ/m²
High	Over 1.200MJ/m²

Source: [10].

Protected Area: 2,112.00 m².

According to NT 01/2014, the project falls into category J - 3.

IV.2 EXTINGUISHER SIZING

In line with current NT, the number of extinguishers has been sized so that they are located no more than 5 meters away from access doors and stairs.

Since the building is considered as Medium Risk, the extinguishers obey the spacing within a radius of 20 meters, as shown in the tables below.

Table 4: Fire Hazard Classification.

Domain Area	Fire Hazard	Maximum distance to be traveled
500 m²	Small (Class A)	20 m
250 m²	Medium (Class B)	10 m
150 m²	Large (Class C)	10 m

Source: [11].

Table 5: Structure Risk classification.

Structure fire hazard	Distance to be traveled
Small (Class A)	25m
Medium (Class B)	20m
Large (Class C)	15m

Source: [11].

Were dimensioned for the project 18 standard ABC Fire extinguishers of 6.0 KG.

In the case of extinguishers, regarding the execution, the technical norm will be obeyed: The extinguishers must be sealed, with due pressure and have a seal of conformity granted by a body accredited by the Brazilian Certification System (Inmetro). For inspection by the Fire Department, the expiry date of the charge and the operation guarantee of the extinguishers shall be as set by the manufacturer, if new, or by the Inmetro-certified maintenance company if it is recharged.

The extinguisher will be demarcated under the pavement with the following pattern:

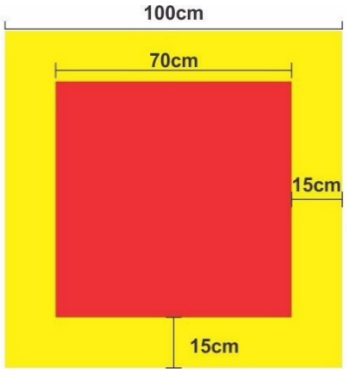

Figure 5: Fire Extinguisher Demarcation.
Source: [11].

IV.3 HYDRANT SIZING

The sizing took place in accordance with the technical norms, so that criteria were obeyed:

In any building, sizing shall consist in determining the necessary and sufficient piping, diameters, fittings and supports to ensure the operation of the systems provided for in this Standard.

Fire hydrants or mangotinhos should be distributed in such a way that any point in the area to be protected is reached by one (type 1 system) or two (type 2 and 3 systems) nozzles, considering the length of the hose (s) and its actual path and disregarding the range of the water jet.

For sizing, it should be considered the simultaneous use of the two water jets most unfavorable hydraulically, for any type of system specified, considering at least the flows obtained according to table 1 and conditions.

The system must be dimensioned so that the dynamic pressures on the inputs of the squirts do not exceed twice that obtained in the most unfavorable squirt hydraulically. You can use any pressure reduction devices, provided that you have proven your technical adjustments.

It is recommended that the system be dimensioned so that the maximum working pressure, at any point in the system, does not exceed 1 000 kPa. Situations that require pressures exceeding the stipulated will be accepted, provided that the technical adequacy of the components employed and fulfilled the requirement specified in.

The hydraulic calculation of the pipes must be performed by methods suitable for this purpose, and the results achieved must satisfy one of the following equations:

$$h_f = f \cdot \frac{L \cdot v^2}{D \cdot 2 \cdot g}$$

Figure 6: A) Colebrook ("universal formula").
Source: [12].

Where: hf is the load loss, in meters of water column; f is the friction factor; L is the virtual length of the pipe (pipes + fittings), in meters; D is the inner diameter, in meters; v is the velocity of the fluid, in meters per second; g is the acceleration of gravity, in meters per second, per second;

$$J = 605 \times Q^{1,85} \times C^{-1,85} \times D^{-4,87} \times 10^4$$

Figure 7: B) Hazen Williams.
Source: [12].

Where: J is the loss of friction load, in kilopascals per metre; Q is the flow rate, in liters per minute; C is the factor of Hazen Williams (see table 3); D is the inner diameter of the tube, in millimeters.

The water velocity in the suction tube of the fire pumps should not be more than 5 m/s, which should be calculated by the equation: A Q V =; For the area should be considered the internal diameter of the pipe where: V is the water velocity, in meters per second; Q is the water flow, in cubic meters per second; A is the inner area of the pipe, in square meters.

The maximum water speed in the pipe shall not exceed 5 m/s, which shall be calculated according to the equation indicated; The calculation of the load loss factor occurs according to the option of the material and the query to the table:

Table 6: Roughness factor.

Tube type	Factor "C "
Cast iron or ductile without internal coating	100
Black steel (dry tube system)	100
Black steel (wet tube system)	120
Galvanized	120
Plastic	150
Cast iron or ductile without internal cement coating	140
Copper	150

Source: [13].

IV.4 HYDRANT POSITIONING

The water outlets must be positioned:

(a) in the vicinity of external doors and/or accesses to the area to be protected, not more than 5 m;

(b) in central positions in protected areas;

(c) outside of the stairs or smoke antechambers;

(d) from 1.0 m to 1.5 m from the floor.

In external hydrants, when they are removed at least 15 m or 1.5 times the height of the external wall of the building to be protected, can be used up to 60 m of hose (preferably in bids of 15 m), provided that properly dimensioned hydraulically. It is recommended to use 65 mm diameter hoses to reduce the system load loss and the last bid of 40 mm to facilitate handling.

The use of the system should not compromise the escape of the occupants of the building; Therefore, it must be designed in such a way that it gives protection throughout the building, without the need to enter the stairs, antechambers or other places determined exclusively to serve as an escape route for the occupants.

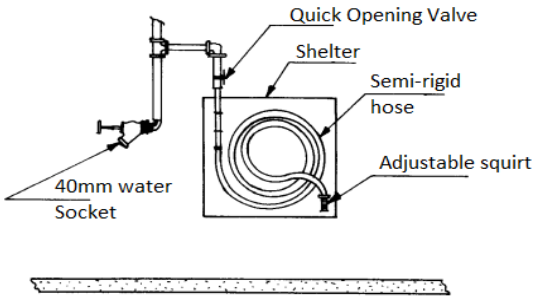

Figure 8: System model.
Source: [13].

All hydrant or mangotinhos points must be signalling according to NBR 13435, in order to allow their quick location.

IV.5 RESERVOIR SIZING

According to [4] the reservoirs can be classified as upper or lower and the volume is defined by the flow of the type of hydrant indicated by the 13714/2011 standard and the operating time which is 1 hours for types 1 and 2:30 hour for type 3. For type 2 hydrants with a flow rate of 300l/min The Minimum Fire Technical Reserve (RTI) should be 36000l. It is important to emphasize that the standard determines the simultaneous use of at least two hydrants and that the minimum flow rate should meet the hydrants or mangotinhos less Favorable, those with lower pressure.

According to [12] of the São Paulo Fire Department, one can admit to the undertaking a fire technical reserve of 12,000 liters.

Table 7 – Reservoir Sizing.

AREAS OF BUILDINGS AND AREAS OF RISK	CLASSIFICATION OF BUILDINGS AND AREAS OF RISK				
	A-2, A-3; C-1; D-1 e D-3 (up to 300 MJ/m²); D-2 e D-4; E-1, E-2, E-3, E-4, E-5, E-6; F-1 (up to 300 MJ/m²); F-2, F-3, F-4, F-8; G-1, G-2, G-3, G-4; H1, H-2, H-3, H-5, H-6; I-1; J-1, J-2; M-3.		B-1, B-2; C-2 (above 300 até 1000 MJ/m²); C-3; D-1 (above 300 MJ/m²); D-3 (above 300 MJ/m²); F-1 (above 300 MJ/m²); F-5, F-6, F-7, F-9, F-10; H-4; I-2 (above 300 up to 800 MJ/m²); J-3 (above 300 up to 800 MJ/m²).	C-2 (above 1000 MJ/m²); I-2 (above 800 MJ/m²); J-3 (above 800 MJ/m²); L-1; M-1 e M-10.	G-5, G-6; I-3; J-4; L-2 e L-3.
Above 2 500 m²	Type 1 RTI 5 m³	Type 2 RTI 8 m³	Type 3 RTI 12 m³	Type 4 RTI 28 m³	Type 4 RTI 32 m³
Above 2500 m² up to 5000 m²	Type 1 RTI 8 m³	Type 2 RTI 12 m³	Type 3 RTI 18 m³	Type 4 RTI 32 m³	Type 4 RTI 48 m³
Above 5000 m² up to 10000 m²	Type 1 RTI 12 m³	Type 2 RTI 18 m³	Type 3 RTI 25 m³	Type 4 RTI 48m³	Type 5 RTI 64 m³
Above 10000 m² up to 20000 m²	Type 1 RTI 18 m³	Type 2 RTI 25 m³	Type 3 RTI 35 m³	Type 4 RTI 64 m³	Type 5 RTI 96 m³
Above 20000 m² up to 50000 m²	Type 1 RTI 25 m³	Type 2 RTI 35 m³	Type 3 RTI 48 m³	Type 4 RTI 96 m³	Type 5 RTI 120 m³
Above 50000 m²	Type 1 RTI 35 m³	Type 2 RTI 48 m³	Type 3 RTI 70 m³	Type 4 RTI 120 m³	Type 5 RTI 180 m³

Source: [12].

IV.6 SIZING PIPES

The sizing of pipelines was made by tracing and calculating the lengths and differences of quota, and applications of the distributed load loss, inserting the values in the table below:

Table 8: Conductos dimensioning.

Stretch	Flow	P Valve	Load loss (piping)						Elevation	v	P amount
	lpm	Mca	D (mm)	L_{real}	$L_{virtual}$	L_{total}	J_{unit}	J_{total}	m	(m/s)	mca
BI – HA	200,0	40,01	65	34,20	11,50	45,70	0,032	1,48	0,60	1,005	42,09
BI – HB	200,0	42,09	65	120,87	7,20	128,07	0,032	4,14	0,60	1,005	46,83
BI-RI	400,0	46,83	65	4,95	5,20	10,15	0,117	1,18	0,00	2,009	48,01

Source: Authors, (2019).

Table 9: Fire Pump Sizing.

Fire Pump and RTI			
H_{man} = 48 mca	Fire Technical Reserve		
Flow = 400 l/min	(24,0 m³/h)	(X) High	Volume: 12 m³
Pot = 9,5 cv		( ) Underground	
		( ) Ground level	

Source: Authors, (2019).

V. FINAL CONSIDERATIONS

As demonstrated, there is a logical sequence for sizing, where normative criteria often merge into different technical norms, treating each fire-fighting device differently, which may cause some difficulty the designer at the time of dimensioning.

Within the scope and initial premise, a step-by-step was elaborated, collecting didactic and expository tables along different technical norms, between NBRs, NT's and memorials, in order to expose a clear relationship between that required by law and what options Available to the designer.

For the analyzed undertaking, a system with the use of a hydrant was defined, with a technical reserve of 12,000 liters and a fire pump of 9.5 CV, with the hand of spreadsheets to assist with the various calculations preposed by NBR 13,475, in order to facilitate the Sizing process.

Finally, the work concludes a normative roadmap that can help other designers in the analysis and sizing of prevention and fire-fighting projects, in order to disseminate the technical knowledge and collaborate with the current literature in this area.

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RESEARCH ARTICLE OPEN ACCESS

ANALYSIS OF THE USE OF PERSONAL PROTECTIVE EQUIPMENT BY SMALL CONSTRUCTION WORKERS IN THE MUNICIPALITY OF PRESIDENTE FIGUEIREDO

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ABSTRACT

The uses of Individual Protection Equipment is fundamental to guarantee the professional safety, the objective of this work was to analyze how the small construction companies has been handling this subject in Amazonas, specifically in the Municipality of Presidente Figueiredo, where the research was carried out. A questionnaire was applied addressing topics of simple understanding for a better understanding of the interviewees. With the results of the research, comparative charts were elaborated. The research results reveal that employees have knowledge about the use of PPE, but there is a great lack of supervision and management of work safety in the participating companies.

Keywords: Personal Protection Equipment, Questionnaire, Professionals.

I. INTRODUTION

Work accident is not only the 21ST century, since antiquity is already heard in accidents and diseases caused by lack of good working conditions, the theme gained more repercussion after the industrial reform, because it was when it was observed the need for Require better conditions and study a way to prevent the occurrence of occupational accidents and illnesses. It is important to mention that accidents and occupational diseases have a socio-environmental, economic and political reflex for the whole of society and for the countries [1].

Even though it is a topic discussed for many years, it still needs more attention and study focused on prevention and care, there are some steps that should be considered for further investigation in situations with greater potential for danger, example This is a greater perception in industrial equipment, in the planning of actions and even in the training and information of workers regarding the tasks that will be entrusted to them and the technical means to accomplish them [2].

A fundamental strategy in the prevention action is the use of personal protective equipment. The famous EPIs, can minimize the risks and even prevent accidents from taking larger proportions. But the secret is the supervision and training of how to use and use the equipment properly. This item is seen as some irrelevant to small and medium sized companies, because some of them believe that only the fact of delivering the PPE is enough, they do only for table fulfillment, without the real concern of raising awareness and keeping their Employees.

This research has as main objective to understand how the safety of work is applied in municipalities of Amazonas, places where the surveillance is less active and for this will be applied a questionnaire about the use of Ppe and cases of occupational accidents and Later, comparative charts and interpretations are presented. Finally, the author's conclusion on the topic approached.

II. LITERATURE REVISION

To better understand the subject to be addressed, it is necessary to deepen the themes related to the content of the research, thus clarifying any doubts about the topic approached.

II.1 HYGIENE AND OCCUPATIONAL SAFETY

For [3] occupational safety can be understood as the Union of linked methodologies to minimize work accidents, with the main objective being the identification of risks in the work environment.

Already for [4] The safety of work is the study of the possible chances of accident in the workplace, and its greatest commitment is prevention, as many accidents as occupational diseases.

Occupational safety is nothing more than the Union of Science and technology, with the aim of preventing and protecting employees in their workplace, seeking to reduce and avoid occupational accidents.

II.1.1 HISTORY OF HYGIENE AND OCCUPATIONAL SAFETY

The concern with the safety of work is not recent, in Deuteronomy, Chapter 8, verse 22, says: "(...) When you build a new house, you'll make a balustrade around the ceiling, so you don't spill blood on your house, if someone came to fall from above".

In the years 1700. The physician Bernadino Ramazzini, published a book called "Morbis Artificum Diatriba (occupational diseases)", this book gained repercussions for describing several diseases caused by the professions of the time, becoming known as the "Father" of Medicine of the Work.

II.1.2 THE HISTORY OF OCCUPATIONAL SAFETY IN THE INDUSTRIAL REVOLUTION

The Industrial Revolution burst in England around 1760 and 1830, with this brought great advancement, the emergence of powerful machines of spinning and weaving caused great technological impressions and also the substitution of man by the machine, but if we stopped to Analyze, the whole picture took on serious situations, the worker had no human respect, all worked, men, women and children, employers did not give any work conditions, much less security and accidents were common, In this period of inactivity, the worker did not receive a salary and there were no laws that would stop him. Not only did accidents happen, but also typical illnesses or worsened by the professional environment [5].

The workers tired of the poor working conditions, began to organize in unions in an attempt to claim better conditions, thus emerging the first movements against the terrible working conditions and unhealthy environments.

II.1.3 THE HISTORY OF OCCUPATIONAL SAFETY IN THE PRESENT DAY

With the passing of time, the creation of trade unions and the evolution of the market the safety of work was undergoing relevant changes. More developed countries were giving more importance to life, and thus was emerging better conditions in the working environments [6].

The first laws emerged in Brazil in 1919, but only in 1972 that the history of occupational safety has changed considerably, with the emergence of Ordinance No. 3,237, where it was established the mandatory services specialized in safety, hygiene and Work medicine in companies.

Many other ordinances were created from this, but the most important and outstanding current: The one of June 8, 1978, of No. 3,214, because the regulatory norms, NR's, of chapter V of the CLT were approved. Currently we have 37 active regulatory standards, much still needs to be done and supervised to, thus obtaining better results in relation to the safety of the worker in our country, because the accidents still happen alarmingly!

II.2 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment-PPE is of paramount importance to ensure the protection and health of the employee, decreasing the risk in cases of accidents at work, because used correctly ensured that the professional does not be exposed to occupational illnesses, which Can compromise your entire life [7].

When it comes to safety and health at Work (OSH), the priority is to map any and all potentially dangerous risks, which put the life and health of the employee at risk, and eliminate at the origin, but not all risks can be premeditated and therefore the use of PPE is essential [8].

II.3 CONSTRUCTION SUPERVISION

The supervision of the use of PPE is the responsibility of the company, but not only of it because there is law and bodies responsible for inspecting companies as to the length of the law and ensuring that each company fulfils its role to safeguard and protect the health of its Employees

Thus, it is important to emphasize that the objective responsibility comes from a lawful act and that it is independent of the existence of guilt, that is, it will be necessary to prove the existence of the damage and the causal link, as the art. 927, single paragraph of the Civil code, in the following terms: ART. 927. He who, by illicit act (arts. 186 and 187), deals damage to others, is obliged to repair it. Single paragraph. There will be an obligation to repair the damage, regardless of guilt, in the cases specified in law, or when the activity normally developed by the offender implies, by its nature, risk to the rights of others.

The law is clear in stating that at the time the company causes some damage to the employee, has a duty to repair it, ie the employer has obligation to care and accompany if the employee is using the EPIs that keeps his safe every day and this comes through the tax To have in the workplace a technical responsible to supervise and study ways to reduce any risk is of paramount importance to the development of the company, because a safe environment generates a productive and healthy environment [9].

II.4 WORK IN HEIGHT AND NR 35

Among the most common accidents in civil construction, this related to falls, and cause most of the time is due to lack of adequate safety equipment and lack of training for workers who perform services at height [10].

The NR 35 [11] is a norm for the management of safety and health at work at height, aims to establish conditions for the protection of employees to the risks of falling, each situation or better each level, has aspects of prevention. Depending on the complexity of the risk, the employer must adopt measures

Complementary inherent to these activities, there is a universe of control measures and preventive systems, possible of application, and that, consequently, there is much more to be studied, planned and implemented [12].

All work at height had to be planned and studied, in order to reduce the possible risks that the collaborator will be subjected to, this analysis done with antecedance, seeks to minimize the risks of falling and plan calmly or even reduce its Consequences, the risk of falling with differences in levels cannot be avoided. By using the methodology of risk analysis, some measures can be taken with preconditions and the regulatory norms may note the elaboration of these measures [12].

II.4.1 NBR 6494 – SAFETY STANDARD IN SCAFFOLDING

According to [13] NBR 6494, in item 2.1, scaffolding is defined as: "Platforms necessary for the execution of jobs in high places, where they cannot be executed under safety conditions from the floor." They are widely used.

In amusement services of renovation, painting, construction, cleaning, maintenance and demolition. Its production is common with metal tubes of pre-established sections with diagonal latuses that form gantry structures with possibility of multiple regulation. For each type of service the standard standardizes a specific type of scaffold.

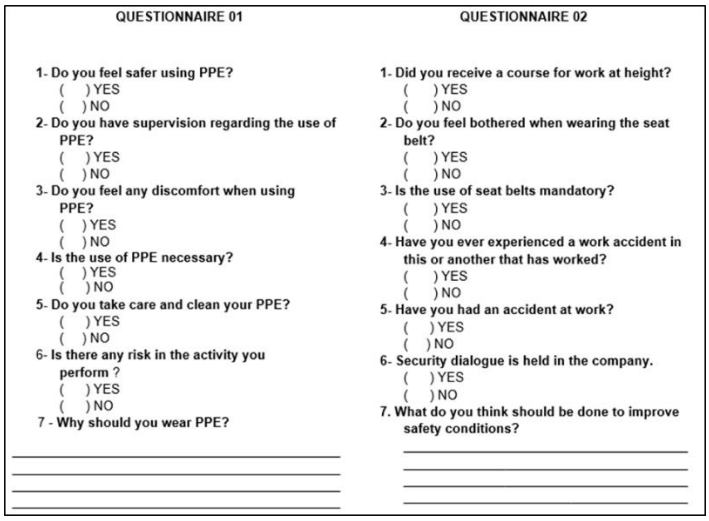
III. MATERIAL AND METHODS

The research was conducted in the municipality of Presidente Figueiredo, interior of Amazonas, 107 km away from the capital, with 2 different engineering companies that are working in the municipality, small companies, with variations of 25 employees per bed, This study was divided into 3 stages, the first being a bibliographical survey, for a better understanding of the subject to be analyzed, the second, a field research, hearing and experiencing the reality of the collaborators in the day-to-day and the third was the conclusion of Comparison of the data obtained.

We will not cite the names of companies, so as not to have any discomfort, but (no need to justify the quotation of companies-can delete) they have something in common, both are performing services in the heights, with the aid of scaffolding, example of source Potential accidents.

With the variation in the number of employees of the companies, it was pre-defined that it would be interviewed 15 employees of each company, being a random choice and voluntarily, the questions were elaborated in analyzing the previous visits, as to the Questioning the non-use of PPE personal protective equipment, all questions had theoretical foundations, the questionnaire counted on questions as shown in Figure 01.

The questionnaire was carried out during the working day, being performed individually, without the presence of the employer, to not compromise the results of the research, the collaborators were informed that the information is of academic use and that their answers did not Be disclosed, to ensure the identity of the volunteers and thus obtain the maximum utilization.



QUESTIONNAIRE 01

1- Do you feel safer using PPE?
( ) YES
( ) NO
2- Do you have supervision regarding the use of PPE?
( ) YES
( ) NO
3- Do you feel any discomfort when using PPE?
( ) YES
( ) NO
4- Is the use of PPE necessary?
( ) YES
( ) NO
5- Do you take care and clean your PPE?
( ) YES
( ) NO
6- Is there any risk in the activity you perform ?
( ) YES
( ) NO
7 - Why should you wear PPE?

QUESTIONNAIRE 02

1- Did you receive a course for work at height?
( ) YES
( ) NO
2- Do you feel bothered when wearing the seat belt?
( ) YES
( ) NO
3- Is the use of seat belts mandatory?
( ) YES
( ) NO
4- Have you ever experienced a work accident in this or another that has worked?
( ) YES
( ) NO
5- Have you had an accident at work?
( ) YES
( ) NO
6- Security dialogue is held in the company.
( ) YES
( ) NO
7. What do you think should be done to improve safety conditions?

Figure 1: Questionnaire, applied to collaborators for data collection.
Source: Authors, (2019).

IV. RESULTS AND DISCUSSION

With the results obtained it was possible to create a database, the same were analyzed, counted and posted in a spreadsheet in Excel, being generated comparative charts, the employees were evaluated in their functions, as there was a diversity of Activities enriched the research and obtained more accurate results, due to the variation of the activities.

The questionnaire was divided into two stages, in the first, questions of basic PPE, used in all and any services and the second with questions but specific about the use of safety and PPE in height services with the use of scaffolds, because During the on-site visit, it was observed that both builders used scaffolds in their daily services, with expressive heights, as shown in Figure 2 and 3.

Figure 2: Services in height, with scaffolding.
Source: Authors, (2019).

Figure 3: Services in height, with scaffolding and without the use of seat belts.
Source: Authors, (2019).

For some builders the use of safety equipment is necessary only when it will have supervision, it was detected that it was common to perform such services without the PPE, S, as we can see in Figure 3, the collaborator is without belt Safety, no helmet, no mask and no goggles. The tables that are on the scaffolds are placed improvised, putting the life of the collaborator at risk.

IV.1 PERSONAL PROTECTIVE EQUIPMENT

The questions that encompass this first stage, were about the basic PPE, the comparative charts bring us clearly the data obtained.

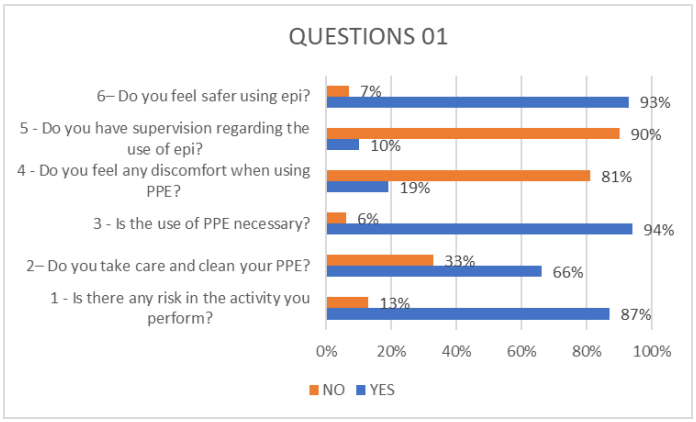


Figure 4: Graph, result of the 1st part of the questionnaire.
Source: Authors, (2019).

According to the graph, the first question asked if the collaborators felt safer when using PPE, we obtained 93% of affirmation, already the 7% reported that they used only by obligation, in the second question we asked whether there was Supervision regarding the use of PPE, 90% said they did not have a monitoring that accompanies, causing a certain relaxation in the use of EPIs, in the third question we asked if the use of safety equipment caused some discomfort, and 19% stated that they did not Like to use PPE, because it warms, bothers, and hinders the realization of activities, already in the fourth question we emphasize the importance of using PPE, s and 94% affirmed to be aware of the importance of using PPE, S, in the fifth question we ask On hygiene and 66% affirmed to care and sanitize equipment, in the last question of the first part we seek to understand if they were conscious if the activity they exercised was generating risk for their health and safety, and 87% of respondents Affirmed that they are conscious, but need the work and perform the activities without proper care and PPE, S.

IV.2 GUIDELINES FOR THE REALIZATION OF THE ACTIVITY

It is not enough just to deliver the Ppe, it is necessary to orient, promote courses and supervise this use, but as the graph is low, small companies are not paying much attention to this issue.

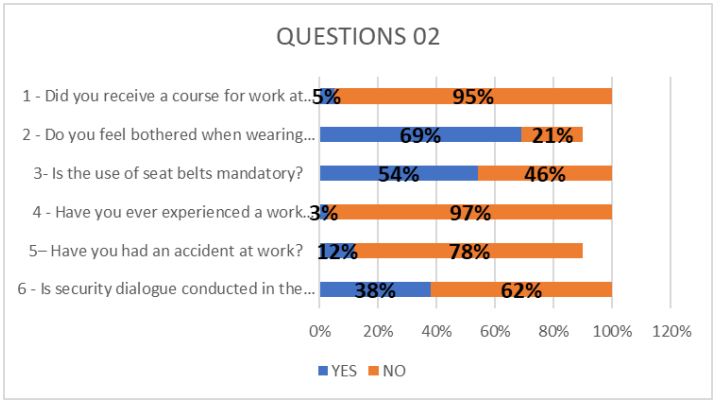


Figure 5: Graph, result of the 2nd part of the questionnaire.
Source: Authors, (2019).

Some activities are carried out in height, and according to employees ' statement 95% never received a course for work at height, the use of the seat belt is 54% mandatory, but without any guidance. It is important to mention that only 3% has suffered work accident, accidents that were not recorded because they did not have a greater severity.

IV.3 OPINION OF THE INTERVIEWEE

The part where employees should transcribe their opinion was of great relevance because they were asked what in their opinion should be done to improve security conditions. As a final answer we obtained that it is necessary to signal with information boards about the risks they run, to make them aware, through lectures showing the consequences of the non-use and the benefits of use, in a more colloquial language and with the use of Pictures. It was also identified that the employees want EPIs of better quality and incredible that it seems they cited the importance of surveillance.

V. CONCLUSIONS

After the application of the questionnaires in the companies, it was observed that many collaborators claimed to know the risks that were exposed, but in fact, were unaware of all the risks, for example, during the research it was observed that some of them that Worked directly in the concrete mixer inhaling the "powder" of the cement, and did not use a mask for protection, at the risk of future health problems, another item observed is that they work at heights of 8 to 10 m and wore the belt only of embellishment, because the same was not fixed in anything that ensured its safety in the event of an accident, still at that point the scaffolds are under bricks at risk of bursting and causing the accident, as shown in the picture 6.

Figure 6: Demonstration.
Source: Authors, (2019).

We can conclude that the research accomplished succeeded in its goal that was to show how the small and medias companies of the interior of the Amazonas were dealing with work safety theme. There is a major flaw in the organization of the management of occupational safety in companies, especially in small companies where occupational safety is left aside and often being the responsibility of the human resources sector. It is not up to the companies to accuse employees of not using the necessary equipment, if it is the principal responsible for security does not give necessary conditions.

It is also noteworthy that they will have an expressive result if there was a union of the employer with the employee, because a good conversation, listening to the employees and together adapt the situations, would have a minimization of risks.

The responsibility for the health and safety of the work, is not exclusive to one person and nobody talks that alone will have such a result, in this field the Union and the involvement of all is of paramount importance to the prevention of the team.

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RESEARCH ARTICLE OPEN ACCESS

CONSEQUENCE OF LACK OF WORK SAFETY MANAGEMENT IN SMALL CONSTRUCTORS COMPANIES IN THE CITY OF PRESIDENTE FIGUEIREDO

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ABSTRACT

The lack of project management in the municipality of Presidente Figueiredo has consequences for work safety, which has been a notorious case of inapplicability of engineering sector norms, causing risk to the operation being performed as well as to all involved. Therefore, this article proposes the search to detect errors and thus improve efficiency through indicators that can be followed by companies, since it is common knowledge that management still presents itself erroneously in the civil sector.

Keywords: Companies; Management, Work Safety.

I. INTRODUTION

The civil industry in Brazil is still closely linked to labor, workers in this area play a fundamental role, but many of them still suffer from the negligence of everyday life, and end up being disobedient, inattentive or even disinterested by the practices of safety. However, according to [1] they are deprived of the correct teaching, as well as materials, or even of good conditions necessary to carry them out, being in some cases a cultural problem, caused as indicated by studies such as insufficient planning and in some cases. cases the lack thereof.

Although [2] establishes the administrative conduct, planning and organization, as well as the health and safety conditions of workers, providing the creation of a safe flowerbed. It, like the other standards, does not ensure productivity or good management, making it necessary to adjust bibliographic guidelines to pre-established logical guidance.

In general, it is noticeable that site planning has still been viewed in the wrong way, it must be an essential part of site management, although it is seen as an isolated part, it is necessary to integrate the hierarchical levels of planning, especially due to constant programming changes and the distance between headquarters [3]. Another factor linked to this is that it has been learned to perform the activity only empirically, something rudimentary as trial and error over the years, by managers [4]. In his work [5] he analogously notes the absence of method, and that common sense and experience are most used.

The development of the method or any planning of this area involves the analysis of enterprise data, such as its logistics, as well as the logical sequence of construction and how financial resources can be used at a given time [6]. In his work [7] confirms by stating that the logistics of temporary facilities, security, material handling and storage system, should involve the physical arrangement of workers, materials, equipment, work areas and storage.

But it is important to know that when talking about the physical arrangement of workers, they are talking about their management. [8] defines as the set of integrated decisions about

employment relationships that influence the effectiveness of employees and organizations.

It is also clear that there must be implementation through the organization of information in computational tools, low cost software that enables the association and description of costs and tasks, as well as the time they should be performed, making the analysis easy to distribute. of resources [9].

II. BIBLIOGRAPHIC REFERENCE

For a better understanding of the subject to be addressed it is necessary to delve into the topics related to the research content, thus clarifying any doubts about the topic addressed..

II.1 OBJECTIVES AND PRINCIPLES OF OCCUPATIONAL SAFETY

Occupational Safety is nothing more than the union of science and technology, with the aim of preventing and protecting employees in their workplace, seeking to reduce and prevent occupational accidents.

The main objective of occupational safety is to ensure that work activities are carried out more safely, occurring without danger to workers, to reduce risks, to analyze the factors that may lead employees to suffer accidents and to generate occupational diseases over time.

By understanding what occupational safety is all about, we can analyze safety management in a more practical way and better understand the union and results of these tools.

According to [10], the work accident has negative points in all areas, be they human, social and economic aspects. Also according to [11], accidents will only be really avoided, when the causes are given real importance and generate them, this analysis is in-depth studies of how the risks arise, and only then will start a survey of preventive measures that prevent or at least reduce the high rates of accidents and occupational diseases. With the awareness of the companies, the proper training of them and their employees, and a good planning of the working environment conditions, the tendency of these numbers is to decrease.

By understanding what occupational safety is all about, we can analyze safety management in a more practical way and better understand the union and results of these tools.

II.2 NR 18.

A few years ago, with the considerable increase in work accidents, and the poor working conditions that many employees were undergoing, reaching high levels of loss of life due to lack of control and supervision of the beds, the authorities began to intensify their work. concern with this cause, where it was decided to establish administrative guidelines, which aims to control and create preventive safety systems, in working conditions, in the environment that the individual acts, in order to reduce the accident rates and occupational diseases, the government created the occupational health and safety regulations (NR) on June 8, 1978, through Ordinance No. 3,214 [10].

With the inclusion of the NR 18 guidelines and the Construction Industry Working Conditions and Environment Program, it was believed that it would reduce accidents and give a new face to this much-asked subject. But the difficulties in applying the norm are still great, because there is a lack of knowledge of the agents involved, within the construction companies and construction industries, as well as not an active supervision in the fulfillment of the same, leaving to be desired in the effectiveness of it.

II.2.1 NEW FROM NR 18.

- The purpose of the new version of NR 18 is expressed in item 18.1.1 ”... ... to establish administrative, organizational planning guidelines that aim at the implementation of control measures and preventive safety systems in the processes, conditions and in the Work Environment in the Construction Industry ”[12], these changes seek to address issues not previously mentioned in NR. [12] comments on some changes:
- • The creation of committees, in order to generate more participation from all stakeholders, was created the CPN and CPR (National and Regional Standing Committees), and its purpose is to evaluate, amend and fight for the updating of the standard.
- • In some countries, there is a code of practice that seeks to create means to facilitate compliance with the rules contained therein. To this end, RTP (Technical Procedural Recommendations) has been created to find ways to show that compliance is not impossible. of the norm.

III. MATERIAL AND METHODS

The research was divided into three stages: literature review, data collection and data analysis. Firstly, a bibliographic review was conducted to guide data collection and analysis. Soon after, a city of Amazonas was chosen to be applied to the study. To support the content, a checklist was prepared, it was applied and recorded with the photographic report. With the results obtained, the results were analyzed and the most relevant items were classified, taking into consideration the region and its constructive peculiarities. Results were discussed, data were tabulated in the graphs and the research conclusions were concluded.

III.1 DATA COLLECT

III.1.1. SELECTION OF MUNICIPALITIES AND COMPANIES INVOLVED IN THE RESEARCH.

By defining this study, it was understood that for a better initial explanation, it would be necessary to focus on only one Municipality, as we are from the Northern region and we want to understand how these tools can help us improve the results in our region, and for Logistics issues, the chosen municipality was, Presidente Figueiredo, located in the interior of the Amazon, 107 km away from the capital. For the selection of the companies we could not put up the garments, because currently the municipality has very few companies operating in the field of construction, but we sought the builders who welcomed us and accepted the invitation to participate in the study. We will apply the analysis to two separate engineering companies, small businesses, with variations of 25 employees per site.

IV STUDY APPLICATION

IV.1 PREPARATION OF THE CHECKLIST.

After a cursory analysis in the flowerbeds, we selected the checklist as a study tool. It was chosen because it is easy to analyze and allows us a broad source of information in the short term.

To build the first version of the checklist, it was necessary to perform an analysis on NR18 standard in order to identify

criteria to be followed in the application of the tool. The criteria analyzed were:

The points addressed were those that could be identified in just one visit to the site, seeking a centralized and directed observation, taking into account the compliance with the NR18 topics. So some items were not entered in the checklist.

With the definition of items that would be part of the list, it is now for the next step, using the same parameters as [13], adopted in the definition of guidelines, ie, for each item presented would have three options to be chosen "YES" , "NO" and "NOT APPLICABLE". Answers that are "YES" portray the good qualities of the flowerbed, always based on NR 18, the answers presented as "NO" refer to the non-compliance with the guidelines presented in the standard, while those selected as "NOT APPLICABLE" implies that this item It is not mandatory because the jobsite stage does not meet the standard requirements, so it is not up to the jobsite to be evaluated.

As shown in Table 1, the checklist excerpts are presented in a practical way, with a current language, seeking to simplify and obtain a more accurate result.

Table 1: Excerpt from the checklist.

ORDER AND CLEANING	YES	NO	NOT APPLICABLE
- The site is clean, without spreading, so that the safety and movement of materials and people are not compromised.			
- The rubble has a specific deposit site (delimited site); - The rubble is transported to ground floor by closed trough (truck).			

Source: Authors, (2019).

At the end of each topic on the list was left a space for notes to analyze the observations of the members of the site.

IV.1 CHECKLIST APPLICATION AND PHOTOGRAPHIC RECORD

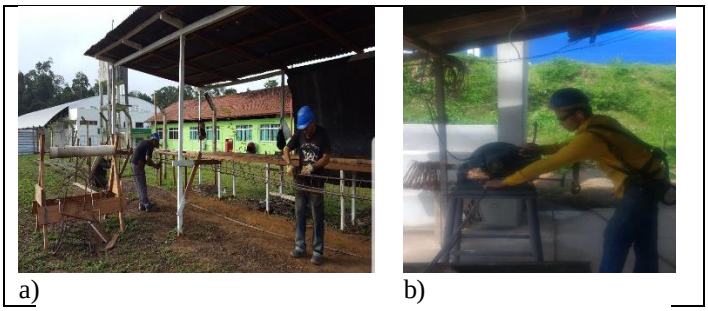
After defining the companies that participated in the study and the checklist items, the application started, each verification lasted approximately one hour, because an initial visit was already made, when the first contact was made, the collaborators were more comfortable with our presence.

It was observed that items such as, for example, place of meals had, but not in their entirety as predicted by the norm, and as the list requested the length according to NR 18, we chose to only classify as "YES" the item with all elements attended.

Initially there was a request inviting companies to participate in the survey, but it was not advised the exact day that would occur to avoid any data manipulation, for example, tidying up the site and distributing the PPE, just for the visit.

During the visit, we recorded some images, in order to enrich the research and generate a photographic report. Some points were selected in particular to be observed and recorded.

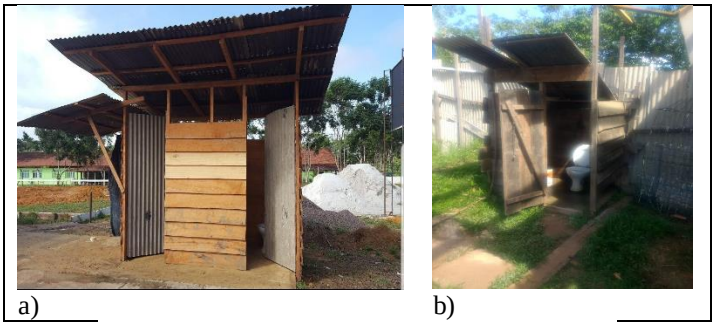
Figure 1 shows us the site conditions in a hardware area where activities analyzed by NR 18 are developed.



a) b)

Figure 1: Area, destined to hardware and policing machine.
Source: Authors, (2019).

Figure 2 allows us to make a comparison of the sanitary facilities of both companies, clearly showing the difficulties faced by professionals from the municipality.



a) b)

Figure 2: Bathroom, company sanitary facilities.
Source: Authors, (2019).

The images, therefore, show the practices and behaviors adopted by companies, which sometimes escape the requirements and adjustments of NR18, bringing disruptions to the health and safety of employees.

IV.2 DATA TABULATION

At this stage, we deal only with the data obtained in the research. The scoring method followed was [13], the final result of a flowerbed, in a given item or topic, matches the ratio between the total number of "YES" items and the total points achieved. (Summing "YES" with "NO") multiplies the result by ten and gets the final grade, ranging from 0 to ten.

$$N_{nr18} = \text{“SIM”} \times 10 / (\text{“YES”} + \text{“NO”})$$

Figure 3: NR 18 compliance calculation formula.
Source: Authors, (2019).

This method of data tabulation is able to evaluate in general and divided by topics or items, providing a complete analysis of the results throughout the research.

The flowerbed behavior indicator can be obtained through the tabulation result, but this grade cannot be classified as the only quality and safety variable of the flowerbed, as there are several other points to be studied and evaluated.

V. RESULTS AND DISCUSSION

At this stage we achieved the results and analyzed the information obtained through the lists applied, the visits made and the support of the photographic report.

V.1 ANALYSIS OF RESULTS

The objective of the research is to guide a profile for the construction companies of the city of Presidente Figueiredo, analyzing if they comply with the provisions of NR 18. To this end we highlight the analysis and diagnosis of compliance with NR, we also seek to understand why the non-compliance by parts of companies.

The data obtained indicate a median condition where some points are executed, but not in their entirety and others of paramount importance such as signaling, fire fighting and protection platform does not exist, leaving something to be desired in safety items.

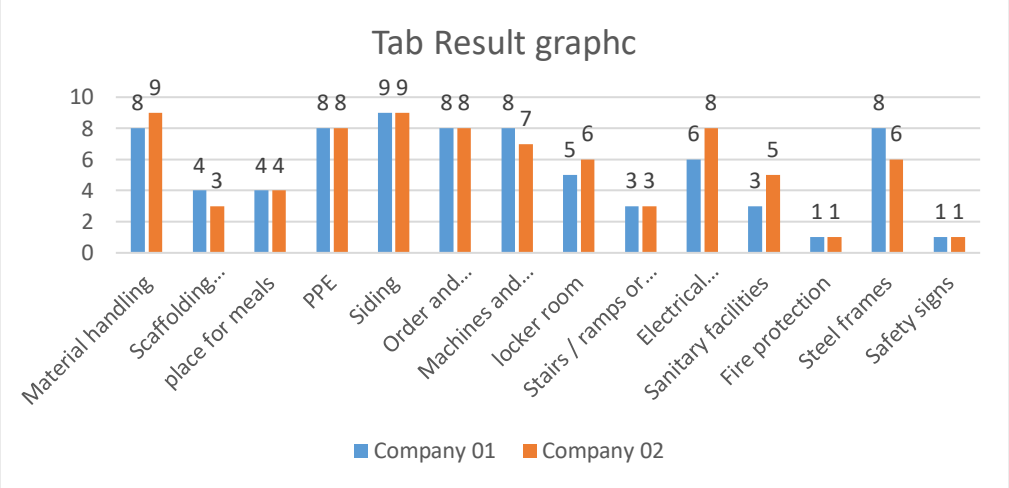


Figure 4: NR 18 compliance chart result list.
Source: Authors, (2019).

By comparing notes and analyzing the results, we will explain the need for the negligence presented by each company:

- Material storage: for companies this item is essential as it ensures the safety of the purchased material, and the care for loss and consequently loss of profit, both companies take care of this item and obtained maximum marks.
- Suspended scaffolding: Both companies use scaffolding with heights ranging from 8m to 10m, we found that they do not support this item, because the fact of having the material does not suffice if it has irregularities and lack of training, NR 35 advises on the training of employees in high-level services, but the companies in question do not comply with this item, their grades did not reset because there are scaffolding and seat belts but there are still items that need to be reviewed and adjusted..
- Meal location: this point is evidenced in NR 18, but in the companies interviewed, employees enjoy two hours of lunch, since both do not offer lunch, there is a clean area with very few chairs (in reality they are benches, apparently made by employees themselves), where those who bring their lunch, eat their meals, the ratings for this item is reasonably low, as it does not meet the standard requirements.
- PPE: Item of the utmost importance and apparently the most performed by the companies, we even concluded for them that the availability of PPE is already sufficient to guarantee the safety and comfort of their employees. high grades.
- Siding: Both companies use siding to protect their building areas, which is complied with according to the standard.
- Order and Cleanliness: On the day of the visit, the flowerbeds were clean and well organized, getting relevant grades.
- Machinery and Equipment: Both use machines such as; Makita, saw bench, concrete mixer and these equipments were all accompanied by safety elements as required by standard.
- Cloakroom: The available cloakrooms are a little out of the ordinary, well improvised and uncomfortable for employees, but we can not completely reset because they exist, but need repairs and adjustments.
- Stairs / ramps and walkways: an item not obeyed by the builders, the stairs were improvised and the ones being executed had no railing, leaving something to be desired in this requirement.
- Electrical installations: The item is obeyed by both builders, both need to adjust details such as wire passage and height, but existing installations do not endanger the safety of employees.
- Sanitary facilities: The two companies in question meet the requirements within their clear limitations, but still must seek improvements.
- Fire protection: a point of great relevance in any work, and this item is disregarded by both companies interviewed, not providing at least one extinguisher for an emergency, this item as a risk minimizer was discussed in the act. interview, and the two companies did not obtain any arguments.
- Safety signs: Another point neglected by the builders is safety signs, both sites do not have any signs, in breach of NR 18.

With the points analyzed and discussed, we move to the tabulation phase of the average of companies in each item, as the following graph presents.

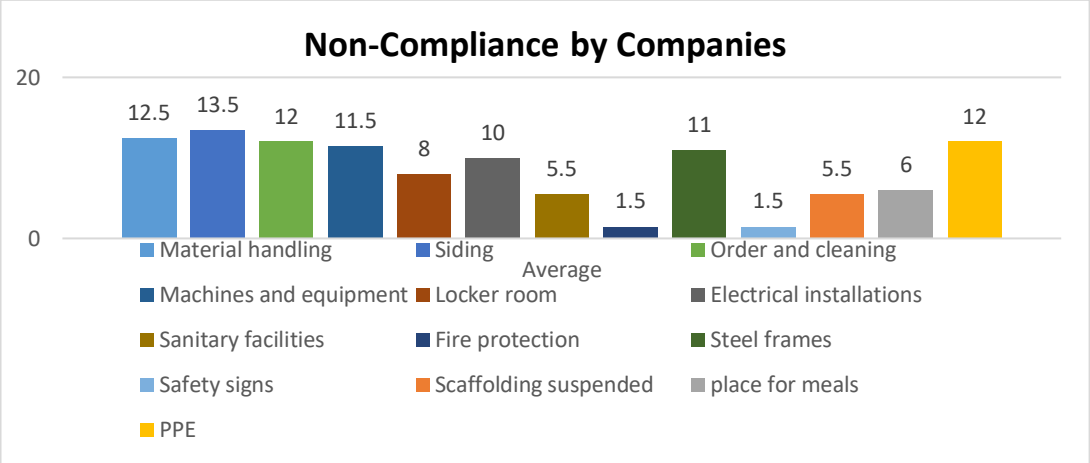


Figure 5: Graph, result of the average of the analyzed companies.
Source: Authors, (2019).

Finally, the results presented express the degree of noncompliance of the companies in accordance with the norm, leading the companies to obtain a lower than average tabulation grade.

VI. FINAL CONSIDERATIONS

The study aimed to simply and practically present the results obtained, the fact that there are few construction companies operating in the city did not contribute to obtain more accurate results.

Finally, it is concluded that there is a need for development in the workplace, it is believed that the lack of information about NR 18 contributes to such mismatches, factors such as lack of supervision, lack of knowledge of professionals ahead of construction companies. lead to the permanence of this picture of neglect.

Another observation with the development of the work is that there is a lack of a work safety model to be followed by the builders, because the fact of delivering some PPE, if not investing in safety management does not minimize the risks, is to cover the sun with the sieve, Because the obvious risks remain present day by day, companies need to have the vision that money spent safely, is not waste but benefit to itself.

VII. SUGGESTIONS

We suggest that further research be carried out in a year or two, believing that there will be more development, that the municipality seeks to invest in the construction market, because it generates local workability, income and dignity for its residents, and implement together the works secretariat is in compliance with NR 18, and there is a union of the private sector with the public in search of better working conditions.

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RESEARCH ARTICLE OPEN ACCESS

THE IMPORTANCE OF PPE USE IN CIVIL CONSTRUCTION: CASE STUDY

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ABSTRACT

This work of completion aimed to demonstrate the importance of the use of PPE in construction with awareness and guiding the use of personal protective equipment at the construction site area. It is estimated that the construction activity is responsible for many accidents, by requiring its employees to expose themselves to environmental hazards, such as: physical, chemical, biological, ergonomic and accidents. Considering that the Personal Protective Equipment PPE are important security items from working, since, in construction using the same becomes sporadic or non-existent on the part of service providers and employees, even if they have knowledge of the law and standards. During the study we can observe and note that the use of PPE is very important and essential in reducing the risks of accidents during the execution of the activities and their functionality, because the protection of the physical integrity and health of the employee is not isolated behavior, and these must have training and technical guidance on the appropriate use of personal protective equipment. It is understood that the lack of planning of a competent security system can cause occurrences of accidents, causing losses for low productivity and increased costs. Thus, it is evident the importance and prominence that has gained the use of PPE in construction, because this is a topic that has been evolving and requires continuous recycling of professionals in this area.

Keywords: Use of PPE; Safety; construction and accident prevention.

I. INTRODUTION

Construction, according to the Social Security, is the second sector with the highest number of deaths in work accidents in the country, second only to the area of Road Freight Transport.

Personal protective equipment (PPE) is an important work safety item, and sometimes in civil construction its use becomes commonplace and is not used due to the unwillingness of service providers and employees even though they are aware of the rules and legislation. Many of the labor contractors place little value on the investment and are unaware of the importance of the complexity of choosing appropriate PPE. It also highlights the issues of acceptance, education and awareness of the great importance of safe use and good performance of employee roles, as well as training and the correct instructions for use. This paper aims to demonstrate the importance of using personal protective equipment on the construction site during the execution of activities and their respective functionalities; demonstrating the legal aspects in relation to the worker and the awareness measures that can be used for the best performance of the equipment together with the employee.

Construction companies require their employees to expose themselves to weather and risk factors such as height, drop and projection of materials, repetitive efforts, electricity, heat, often in inappropriate circumstances, without breaks and / or in minimal conditions. work, she becomes responsible for much of the existing accidents.

The research aimed to identify the importance of the use of personal protective equipment in the area of construction because it has a reputation for having a high rate of occupational accidents

in relation to other areas, as well as to analyze all existing risks and factors. so that there can be prevention and thus map out all existing risk factors so as to be able to take appropriate measures as to the presence of such risks and to minimize or even eliminate or preserve the physical integrity of the employee regarding his activity.

Construction activity is responsible for many work-related injuries as it requires workers to be exposed to weather and risk factors such as height, drop and projection of materials, repetitive stresses, electricity, heat, often in inappropriate circumstances or in poor working conditions.

II. BIBLIOGRAPHIC REFERENCE

The concept defined by Social Security Law 8.213 of July 24, 1991 states, in Chapter II, Section I, Article 19:

Accident at Work is what occurs in the exercise of work in the service of the company, or in the work of the insured persons referred to in item VII of article 11 of this Law, causing bodily injury or functional disturbance that causes death or loss or permanent reduction. or temporal ability to work.

According to [1] the concept of occupational accident can be approached both in the legal as well as preventive technique.

Accident at work in the legal sphere is the one that occurs by the exercise of work, or in the service of the company, causing personal injury, functional disturbance or illness, which causes death or loss, or permanent or temporary reduction of work ability. The injury is characterized by physical-anatomical or even psychic damage. Functional disturbance causes not always visible physiological or psychic damage related to specific organs or functions. Already the disease is characterized by the morbid state of disturbance of physical or mental health, with specific symptoms in each case.

An incident can be defined as an unwanted or unplanned event that will deteriorate or decrease the company's operational efficiency. From a preventive technical standpoint, an accident is an unwanted event that results in an injury or illness to a worker or damage to property.

By taking the necessary steps to prevent and control incidents, we are protecting the physical safety of employees, equipment, materials and the environment.

Risk and danger are also other concepts that should be fixed in the existing relationship the direct definition between risk and danger when talking about safety and health at work. So we can define:

Risk is the combination of the probability and the consequence (s) of the occurrence of a particular hazardous event (represents the probability of the hazard materializing). This probability, which gives the risk a dynamic character, can be:

- High: damage will always or almost always occur;
- Average: damage will occur on some occasions;
- Low: Damage will occur rarely.

The concept of risk includes the probability of occurrence of a natural event and the appreciation by man of the causes from their harmful effects.

Hazard is a Source or situation with the potential for harm in terms of injury or injury to the human body or damage to health, property, the workplace environment, or a combination of the two. In other words, every risk is an uncontrolled danger.

II.1 CAUSE OF WORK ACCIDENTS

To avoid accidents we must know the causes that occur by the occurrence of the sum of unsafe acts and unsafe conditions in the environment. In most accidents at work, it happens due to the influence of men's behavior, social environment, personality, education, among other characteristics. According to [2] everything originates from man and the environment.

For decades, the cause of accidents has been grouped into two basic categories: Unsafe conditions and unsafe acts. However, such grouping has relevance for didactic purposes, given the processes too simple and, therefore, insufficient for the effective perception of the problem.

Unsafe workplace conditions according to [2] are those that compromise safety, ie failures, defects, technical irregularities, lack of safety device, clutter, etc. that endangers the physical integrity or health of the worker.

Unsafe conditions at workplaces are those that include worker safety. It is the failures, defects, technical irregularities and lack of safety devices that endanger the physical integrity and health of people and the safety of installations and equipment. It should be borne in mind that these should not be confused with the risks inherent in certain industrial operations. For example: Electric current is an inherent risk for work involving electricity, electrical appliances, or electrical installations. Electricity cannot be considered an unsafe condition because it is dangerous. Poorly made or improvised installations, exposed wires, etc., are unsafe conditions, electricity itself, not some examples of better known unsafe conditions; Lack of protection in machinery and equipment; Deficiency of machinery and tooling; Dangerous passages; Inadequate or defective protections; Poor housekeeping / lack of cleanliness; Defects in buildings; Inadequate lighting; Damaged floor; Risk of fire or explosion; Improper or defective electrical installations; Lack of personal protective equipment; High noise level.

In order to avoid unsafe workplace conditions the company plays a very important role as it is through the safety technicians, caregivers and supervisors who should analyze these conditions before the accident occurs and take the appropriate actions to correct it.

Through these indicators, companies can take various steps to avoid unsafe workplace conditions. These are quick and easy actions that will lead to reduced accidents.

It is the way people consciously or unconsciously expose themselves to accident risks. These are the acts responsible for many of the accidents at work and are present in most cases where someone is injured.

It is noted that in accident investigations, some unsafe acts stand out among the cataloged as frequent, although this greater evidence varies from company to company. It is noteworthy that an untrained employee who is unaware of the risks inherent in a particular activity should not be classified as an unsafe act, but rather as an unsafe condition, examples of more well-known unsafe acts: Being with or under suspended loads, Using machines without enable or allow, Lubricate, adjust and clean moving machine. Disable safety devices. Use of inappropriate clothing. Carry or stack unsafe. Try to save time Expose body parts to moving parts of machinery or equipment. Print speeding. Improvise or misuse the required task. Do not use PPE. Improper handling of chemicals. Smoking in a forbidden place. Consume drugs or alcohol during the workday.

Accident prevention are techniques to prevent them, which should not only be observed after the accident aiming at the consequences and not the causes of the accident, because more than 96% of accidents are caused by misbehavior, thus being the largest The concern should be the worker, so when the accident prevention program is applied in the company, it is exclusively for the reduction of accidents and to anticipate the action. No need to wait for the accident to occur first and then take appropriate action, as it can lead many workers to die.

Among the main causes of occupational accidents in the country are: the lack of awareness among entrepreneurs and workers about the importance of preventing work misfortunes; extended working hours; inadequate vocational training; long periods of cumbersome and stressful transportation; improper and insufficient nutrition; provision of unhealthy service on working hours intended for normal activities; large numbers of workers without proper registration as employees; high labor turnover and abuse in outsourcing services [3].

[4] understands that the best way to prevent accidents is to eliminate unsafe acts and conditions in the workplace. Preventive measures suggested by [5] include: eliminating unsafe acts through professional selection, appropriate medical examinations, training, internal communication, and positive reinforcement; and eliminate unsafe conditions by mapping hazardous areas, in-depth accident analysis and unrestricted senior management support. The legislation also lists several programs related to accident prevention, among them:

• SSP (Social Security Profile) – which contains all the functional history, the description of the activities performed, the risks involved, the protective equipment offered by the company, etc. Its completion and delivery are mandatory at the time of the employee's dismissal from the company.

• WECP – Work Environment Control Program, must comply with the requirements contained in [10] NR 9 - Industrial Risk Prevention Program "), methods and techniques are applied to recognize, assess and control the risks encountered in this work activity. measures to eliminate or minimize and control these risks through collective or individual protection measures.

• RPP – Respiratory Protection Programs. Implementation and mandatory maintenance according to Mte Normative Instruction 01/94.

• OHMCP (Occupational Health Medical Control Program) – Regulatory Standard 7 establishes the objective of the Occupational Medical Control Program (PCMO) as the objective of "promoting and preserving the health of all its workers".

• ERP - Environmental Risk Prevention Program was established by the Occupational Safety and Health Secretariat, of the Ministry of Labor, through Regulatory Standard NR 9, Ordinance 3214/78, with the purpose of defining a methodology of action to ensure the preservation of workers' health and integrity in the face of risks in the workplace. According to NR-09 of Ordinance 3.214 / 78, it is established the obligation of elaboration and implementation by all employees and institutions that admit workers as employees, of PPRA, which aims at preserving workers' health and integrity, through the anticipation, recognition, assessment and consequent control of the occurrence of environmental risks existing or that may exist in the workplace, taking into account the protection of the environment and natural resources. According to [7] NR-05 of Ordinance 3.214 / 78, the survey of environmental risks (physical, chemical, biological, ergonomic and accidents) should be performed, and these are represented in floor plan.

• HCP – Hearing Conservation Programs. According to [6] NR-01 of Ordinance 3.214 / 78, it is up to the employer to take measures to eliminate or neutralize unhealthy and unsafe working conditions, from action levels in accordance with NR-09, levels of exposure according to [11] Annex I to NR-15 and assessment parameters according to [9] Annex I to NR-07.

• LPCP - Loss Prevention and Control Programs. Therefore, it is observed that the legislation presents programs that aim at the prevention of occupational accidents, as well as establishing norms and techniques related to occupational hygiene and safety, which must be applied with the primary purpose of protecting life.

This is not a very common practice in the construction industry, as prevention needs investment, of course it will have a very large return on reducing the accident, and when we talk about investment in construction safety entrepreneurs and building owners They often try to circumvent legislation and not follow safety standards and the way it is meant to be done.

With the techniques and studies being prepared about accident prevention, its application becomes easier. Some techniques may be applied such as near miss, task risk analysis (ART), training, safe service permit (PSS), occupational safety instruction (IST), daily safety dialogue (DDS), risk observation in the workplace. work (ORT).

These types of tools are applied in many companies, but in construction are still little used and consequently is reflected in the increased number of accidents. When entrepreneurs and builders apply these tools, accidents tend to be reduced as they require training for all employees.

On the other hand, in many cases, there is a lack of interest from the entrepreneur and builder in the application of occupational health and safety programs, which makes employees not develop the culture of accident prevention.

For Torreira (1999) it is necessary to follow the following measures for the prevention of accidents:

a) Replace certain materials with others that may be less hazardous;

b) Effectively train the worker regarding safety procedures and practices;

c) Teach and insist on how best to do the job safely;

d) Establish rules of use and care that must be followed when using a certain product with the corresponding safety.;

e) Educate people about the dangers that may arise from improper use of a product, process or activity, and how to take appropriate protective action;

f) Train employees on recognition, hazard assessment and compliance with safety and legal liability laws;

g) Motivate people to cooperate with life-saving safety programs through effective participation.

III. MATERIAL AND METHODS

Occupational safety is a set of sciences and technologies that aims to promote the protection of workers in their workplace, aiming at reducing work accidents and occupational diseases. It is one of the areas of occupational safety and health whose objective is to identify, assess and control risk situations, providing a safer and healthier work environment for people.

Work safety should always be very important to companies, whether small, medium or large, because the size of the company cannot influence the importance of safety. This importance must be considered because behind any machine there is a working man, so the employee's safety is not only linked to the injuries he may be subjected to, but there are many other factors that influence the man with the unsafe aspect. social, economic and human aspects.

Even with a low price to pay for security with training in the use of EPC, PPE, prevention techniques and the provision of the best EPC's and EPI's, there are still companies that do not give due importance, besides these companies enter the factor. employees who are not interested in their own safety and health. In the present day many of the thoughts now are others, where safety comes first, far above even production. Advantages for the company that adopts a model in Health and Safety at Work. Prevents and reduces accidents and diseases; Protects the physical and mental integrity of workers; Educates for the adoption of preventive practices; Avoids medication and prosthesis costs; Decreases absenteeism; Continuously improves work environments; Prevents damage to the company's image; Eliminates property damage; Avoids the payment of expertise, fees and legal compensation; Potentiates interpersonal relationships; Optimizes the organizational climate; Meets the requirements of the legislation; Increases productivity Increases the competitiveness of the company; Expand Your Market.

In most construction companies the safety of construction work is of little importance as they believe it is unnecessary to invest heavily. Thus the company and the employee are harmed, because there is an increase in accidents resulting in the removal of the employee who is out of work, may even become invalid or in the worst case lose his life.

There is a great difficulty in implementing work safety, especially from the employee's perception, who often do not consider safety instructions as important, do not understand the procedures given, find it uncomfortable and not very important not to follow the instructions. safety standards, the use of PPE, and therefore disrespect them, thus contributing to the increase in the number of accidents.

In order to reduce this accident it is necessary to carry out an education and training work with the collaborator regarding its safety. This education is delivered through lectures, training, and awareness, but these presentations cannot be done irrepressibly, not as an obligation to safety, but as awareness for the employee. This way the employee will feel safer with the information and not treating security as a burden.

Social factors should also be considered as low wages, which lead employees to eat poorly, facilitating the contagion and contamination of occupational diseases. Often public transport is inadequate, or even the distance from the workplace makes the employee have to wake up early to commute to work.

There are many inputs that expose employees to the risks of accidents such as: Lack of personal protective equipment or misuse of them; Lack of collective protection equipment; Long working hours; Lack of training; Inadequate installations; There is a profile of insensitivity to occupational hygiene and safety. The most infringed items - sanitary conditions and PPE - are those with the highest number of irregularities, so they are items that everyone knows about and do not depend on any deeper technical knowledge.

According to the Ministry of Labor (MTE), in [8] NR 6 of Ordinance 3.215 defines Personal Protective Equipment - PPE any device of individual use, domestic or foreign, designed to protect the health and physical integrity of the worker.

PPE is equipment for personal and personal use and represents a resource when a more effective control that would lead to the elimination of risks to occupational accidents is impossible [13].

For [13] PPE should only be used in the following cases:

- In an emergency, when the work routine is broken by any abnormality;
- In periods of non-routine repair, maintenance or installation;
- When the worker is directly exposed to a risk that cannot be controlled by technical safety devices.;
- When risk exposure is only partially controllable.

In accordance with NR 6, the company is required to provide employees with risk-free PPE free of charge, in perfect repair and operation, under the following circumstances:

a) where collective protection measures are technically infeasible or do not offer complete protection against the risks of occupational accidents and / or occupational and occupational diseases.;

b) While collective protection measures are being implemented;

c) to respond to emergency situations.

Personal protective equipment of national or imported manufacture may only be offered for sale or used with the indication of the Certificate of Approval (CA) issued by the National Agency for Safety and Health at Work of the MTE.

There are some myths that no longer serve as an excuse not to wear PPE's, they are uncomfortable, really PPE's were very uncomfortable in the past, but nowadays there are PPE made of light and comfortable materials. The feeling of discomfort is associated with factors such as lack of training and misuse, the employee does not “like” to wear PPE. The worker refuses to use PPE only when he is not aware of the risk and the importance of protecting his health. . The professional requires the PPE's to work. Eg in the 1980s almost nobody wore seat belts in cars, today most drivers wear and recognize the importance.

This disinterest or refusal occurs mainly when the worker only receives personal protective equipment without any instruction on how and why to use it.

Sometimes PPE becomes uncomfortable when worn or the work pace is slowed by the use of protective equipment. It also happens that the immediate bosses turn a blind eye and even encourage work without the use of personal protective equipment, thinking only about the importance of production, without worrying about the considerable risks or occupational diseases associated with the worker. In fact most of the time these people have no knowledge about the paramount importance of using PPE and act this way.

IV. STUDY APPLICATION

For this phase of the work was visited a construction in Manacapuru metropolitan region of Manaus. With site visit and inspection with visual assessment, annotations, photographic report, questionnaire applied to workers.

During the visits, certain personal protective equipment was considered, the ones most used and mentioned by the workers. For example: safety helmet which is a rigid device used to protect the head or parts of it from impact; hearing protector that protects against high noise levels; safety gloves that protect against cuts, electric shocks, radiation, etc .; safety goggles and face shields that are intended to protect the eyes and faces against miscellaneous particles, light, solar radiation, etc .; safety boots for the protection of feet and legs against sharps, moisture from water operations; and seat belts to prevent falls from working at heights.

The workers approached showed willingness to answer the questions of the questionnaire, even not knowing the answer most of the time sought to justify them. No rejection was noticed because of the quality of the PPE, but because of the type of discomfort caused by: helmets heat the head; gloves slip, belt restrains movement, boots make feet sweat, among others, causing justified withdrawal in some circumstances.

Table 1: Summary of the questionnaire applied according to Workers answers.

Knowledge	100% know what PPE is
Importance	100% know the importance of using PPE
Required use	80% know PPE's are mandatory for their
Orientation / Training	70% say they do not use for lack of training and have no education to use
Utilization	75% say they stop using somewhere time
Accidents at work	90% never had accidents
Prevention	100% consider PPE as a form of Prevention
Nuisance	85% say that the PPE Nuisance
Correct form of use	55% say their peers don't use it Correct
PPE Quality	45% say they need to improve the material of the

Source: Authors, (2019).

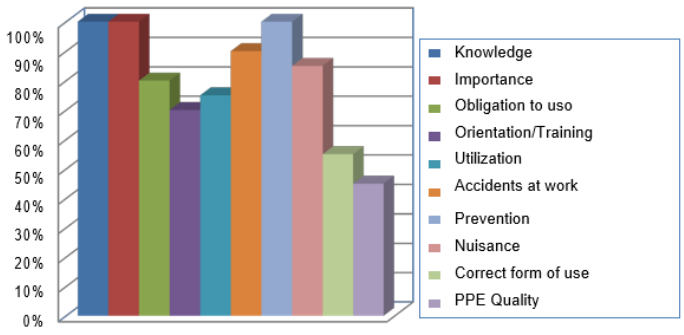

Figure 1: Graph of questionnaire summary applied according to Workers' answers.
Source: Authors, (2019).

During the visit, 25 workers were approached, such as: construction worker, sharpener, bricklayer, carpenter, janitor, welder, warehouse worker, electrical technician, noting whether or not they were using their personal protective equipment correctly, passing Thus the interview based on the questionnaire that prioritized the following questions: mandatory use, knowledge, importance, orientation, use, work accidents, training, discomfort and quality of personal protective equipment.

V. RESULTS AND DISCUSSION

The workers consulted presented factors that contribute favorably or unfavorably to the proper use of PPE at the construction site.

Not all workers interviewed use the provided PPEs correctly, but remove them on occasions that they should not, because they are uncomfortable and there is no initial awareness or lack of constant surveillance during work on the jobsite. With the misuse and poor hygiene of PPE some equipment that would still have a considerable useful life is destroyed before time, and when they take off they do not know where they put it.

It is worrying to know that 70% do not use personal protective equipment because they do not have this habit and safety education, either by forgetfulness or because it bothers figure 2.

Figure 2: Use of PPE.
Source: Authors, (2019).

From this percentage it can be observed that there is no constant supervision of the competent bodies and due collection by the company with workers when the proper use of PPE's this fact has contributed to the lack of habit of the correct use of some equipment, which take the PPE with a few hours of work and only miss hours later.

When the PPE withdrawal occurs at any time, an unforeseen accident can occur with serious consequences for the employee or others. However, by reducing these unsafe attitudes with training and lectures, the likelihood of unsafe attitudes was minimized and the safety of all was increased.

There is widespread concern that 85% of respondents say that personal protective equipment bothers and irritates causing irritation and discomfort which is why the personal protective equipment is removed. Once again demonstrates the need for greater and better enforcement.

VI. FINAL CONSIDERATIONS

Protecting the employee's physical integrity and health is not isolated behavior. It involves the perception of the environmental risks of work, a process of constant training, education and awareness, with investments in material resources and people, a strategic planning to make more effective preventive actions. It also involves the participation and especially the commitment of the workers, essential elements for the success of this great responsibility of the parties, where all aspects related to PPE are highly relevant.

Simply providing personal protective equipment will never be able to protect the health of the worker and prevent contamination. Incorrectly used PPE can further compromise worker safety. Developing risk perception combined with a set of safety information and ground rules is believed to be the most important tools to prevent exposure and to ensure the success of individual worker health protection measures.

The correct use of PPE is a rapidly evolving topic and requires continuous retraining of occupational safety professionals through training and access to up-to-date information.

Based on the answers obtained from the questionnaire applied to workers, it can be seen that the lack of safety information and awareness and the ergonomics of personal protective equipment are the main reasons for resistance to its proper use, which causes non-use. Or withdrawal at some point from work. This unsafe act can cause accidents, serious or not, but accidents that generate inconvenience to all.

Therefore, it found some efficient measures that can be taken to avoid or decrease the rates of accidents in the construction industry, such as: lectures and training, aiming to raise workers' awareness of the importance and correct use of PPE, thus reducing the likelihood of occurrence. Accidents and consequently increasing the safety of all.

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RESEARCH ARTICLE OPEN ACCESS

THE NEED FOR EMOTIONAL INTELLIGENT LEADERS IN BUSINESS MANAGEMENT

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ABSTRACT

This article is about the behavior of leaders in business management, showing the need for good leaders in today's world, their characteristics, skills and competences. This literature review seeks to find a model, a leader that best suits in different situations for the XXI century proposing that the appointment of leaders in companies be made through this analysis of criteria, not only in function of IQ or the function they occupy, but because of their true ability to influence people. Good leaders can hardly lose control, are confident, and can handle different styles of people. For leadership positions it has been proven through research that you need to have E.Q, emotional quotient, plus strategic vision.

Keywords: Leadership, emotional, skills.

I. INTRODUTION

How does a good leader behave in different situations? Is it necessary to have a high Q.I to excel in good management? What are the features that stand out? What are the different types of leadership?

Good leaders hardly lose control, are confident, and know how to handle different styles of people. For leadership positions it has been proven through research that you need to have Q.E, emotional quotient, managers with high emotional intelligence have surpassed 20 times other managers, are four characteristics that stand out, among them, self-awareness, self-management, empathy and skill.

Understanding the best leadership style is one of society's main pursuits. Everything is intertwined with the ability to manage a family, a business, a country, among others. It is true that there are people who are born with more leadership skills, but none of this also prevents them from developing this ability. Most mergers require a sensitive negotiator in the direction, while many twists require more vigorous authority. But I've found that the most effective leaders are similar in one crucial respect: They all have a high degree of what has come to be known as emotional intelligence[1].

Increasingly, the marketplace needs skilled managers who can transform the team, encourage their employees, drive good change because the level of global competition between companies requires it. There are some features that stand out among great leaders, such as: Influencing Your Team;

Whenever an individual seeks to influence the behavior of others, individually or in groups, leadership occurs [2]. Do not be afraid of exposure to others; have initiative; high communication skills; be a good listener and help others; be accessible; be multitasking; always looking for news, and new technologies;

It is by stimulating innovation that the leader contributes to the development of new concepts and the use of new technologies necessary for the organization. [3].

- Know how to look for solutions to unexpected problems.;
- Know how to say no when needed
- Be authentic, have charisma, and can delegate and demand results without being hostile.

But many of these techniques are intertwined with the emotional quotient, other researchers have confirmed that

emotional intelligence not only distinguishes exceptional leaders, but may also be associated with high performance [1].

Therefore, the purpose of this article was to analyze the behavior of leaders that provide conditions for the leaders to reach their interests, according to their perception. As specific objectives, we sought to identify the attributes of leaders and their skills for the exercise of leadership; talk about the various types of leaders; identify the most effective leader for the best development of a group within a company.

II. BIBLIOGRAPHIC REFERENCE

More effective leaders are similar in one crucial respect: Everyone has a high degree of what has come to be known as emotional intelligence. “Leadership is almost just emotional intelligence, especially when it comes to discerning what managers do and what leaders do, in things like taking a stand, knowing what's important to you, and pursuing your goals in partnership with others. people” [1].

A great leader is one who has this ability day after day, year after year in a wide variety of situations [4]. Leadership is the activity of influencing people by voluntarily engaging in group goals [5]. Terry). For [6], leadership is essentially the process of helping to change some key aspects to take advantage of changing economic and market conditions.

Leadership, viewed as a process, often affiliates with the direction in which the organization should go, the creation of a future, the ability to inspire employees and other key players to accept new principles and implement them, and to create strategies. , make people willing to follow, encourage and direct people so that the vision comes true despite all the obstacles [7]. It is also associated with the transfer of power to people so that they can make things happen. [8] complements that leadership is communicating the value and potential of people so clearly that they come to see it in themselves, and secondly, [5] leadership is like beauty: hard to define but easy to recognize.

According to [9], Donuts, which is a company that specializes in customer relationship and loyalty solutions, self-awareness, or emotional awareness, is the first component of emotional intelligence is deep understanding of one's emotions, weaknesses, strengths, impulses. Leaders who have this trait are more likely to realize when pride or other emotions are influencing, allowing them to be more rational and unbiased, and neither too critical nor too hopeful. People who know their limitations and strengths can hear and talk about them, interpreting as constructive criticism, people with low interpret them as a threat or sign of failure.

Self-management, people with a lot of self-control have a bad mood and impulses like everyone else, but the difference is that they can control them. Leaders with well-developed emotional intelligence don't make hasty or emotional decisions, many problems in companies arise from impulsive behaviors [10].

Empathy when a person has this trait makes it much easier to communicate assertively. A leader draws the employee's attention in a way that will not hurt the employee's feelings, facilitating understanding through constructive criticism.

Social ability involves the ability of one person to relate to another, as there is the awareness that nothing important is accomplished on its own. Teams that communicate well are teams that produce in sync.

In the development and its sub-items, we discuss the issue involved in the theme, using the theoretical references raised during the research. This is the main "body" of the article. It addresses the issue or problem that is mainly addressed through indirect citations, comprehensively and objectively, albeit with relatively small extension. It is used in literature reviews.

For [1], most leaders are classified into six types, according to the Emotional Intelligence book on forming a successful leader, but generally the first four that deliver a good result: Visionary Leader; Leader coach; Affective leader; Democratic leader; Modeling Leader; Coercive Leader.

II.1 THE VISIONARY STYLE

Through various surveys, he has come to the visionary leader, who stands out the most, as he is the most effective, so that he improves even the work climate. This style motivates people because it makes it clear how their work will fit into a promising future, so they understand that their effort is needed, as well as maximizing commitment to goals and strategies.

According to [11] through lean inceptions, which is the name given to the collaborative workshop to align a group of people on the minimum viable product to be built, the visionary leader sets standards that revolve around this future venture, after which he will have feedbacks, so that as many employees participate as everyone can see the good and bad as well as the rewards.

Visionary leader gives people freedom to design their own means; Freedom to innovate, experiment and take calculated risks;

This style works in almost every business, especially when it is under development. The approach when a leader is working with a team of experts or colleagues who are more experienced gift him. They may see the leader as pretentious or out of step. Another limitation: If a leader who tries to be visionary becomes dominant, he can destroy the egalitarian spirit of an effective team. Even with these risks, however, leaders would do well to resort to the visionary club with some frequency. It may not guarantee a hit on the first shot, but it certainly helps.

II.2 THE TRAINER STYLE

Para [1], líderes treinadores ajudam funcionários a identificarem forças e fraquezas e as vinculam às suas aspirações pessoais e profissionais. Encorajam os funcionários a criarem metas de desenvolvimento de longo prazo e os ajudam a conceber um plano para atingi-las. Fazem acordos com seus funcionários sobre seus papéis e suas responsabilidades em cumprir planos de desenvolvimento e dão instruções e feedback abundantes. O líder treinador se distingue em delegar. Dão aos funcionários tarefas desafiadoras. Em outras palavras, esses líderes estão dispostos a suportar o fracasso a curto prazo se isso estimula o aprendizado a longo prazo.

Dos seis estilos, nossa pesquisa constatou que o líder treinador é usado com menos frequência. Muitos líderes nos contaram que não têm tempo, nesta economia de alta pressão, para o trabalho lento e tedioso de ensinar as pessoas e ajudá-las a crescerem. Líderes que ignoram esse estilo estão abrindo mão de uma ferramenta poderosa. Seu impacto sobre o clima e o desempenho é notoriamente positivo.

Por outro lado, o estilo treinador faz pouco sentido quando os funcionários, por algum motivo, são resistentes ao aprendizado ou a mudar seus hábitos.

II.3 THE AFFECTIVE STYLE

If the visionary leader encourages "Come with me," the affective leader says, "People come first." This leadership style revolves around people — its proponents value individuals and

their emotions more than tasks and goals. The affective leader strives to keep employees happy and create harmony among them. The affective leader provides ample positive feedback, providing a sense of recognition and reward for a job well done.

For [12], despite its benefits, affective style should not be used alone. Your unique focus on praise can prevent poor performance from being corrected. Employees may realize that mediocrity is tolerated. And because affective leaders rarely offer constructive advice on how to improve, employees need to figure it out on their own. When people need clear guidelines for navigating complex changes, affective style drifts them. In fact, if you trust him too much, this style can lead a group to failure. Perhaps this is why many affective leaders use this style in conjunction with the visionary style. Visionary leaders set a vision, set standards, and inform people how their work is promoting the group's goals. Alternate that with the affective leader's compassionate, protective approach, and you'll have a powerful combination.

II.4 THE DEMOCRATIC STYLE

By letting workers intervene in decisions that affect their determinations, the democratic leader increases flexibility and accountability. And by worrying about listening to the team's concerns, the democratic leader learns what to do to keep morale high, according to [1]. Finally, because they have an influence in setting their goals and standards for measuring success, people in a democratic system tend to be very realistic about what can and cannot be achieved.

However, the democratic style has its drawbacks, so its impact on the organizational climate becomes not as good as some of the other styles. One of its most exasperating results may be incessant meetings in which ideas are brooded, consensus remains vague, and the only visible result is the appointment of new meetings. And even if a leader has a strong vision, democratic style works well to generate new ideas to carry out that vision. Of course, the democratic style makes much less sense when employees are not competent or knowledgeable enough to offer sensible advice.

II.5 THE MODELING STYLE

The modeling style has its place in the leader's repertoire, but must be used with control. The leader preaches extremely high performance standards and personally exemplifies them to [1]. He is obsessed with doing things better and faster, and asks the same about everyone around him. Quickly points out poor performance and asks more of employees. If they do not live up to expectations, they are replaced by others because everyone is considered replaceable. The approach works well when all employees are motivated, highly competent, and need limited guidance or coordination - for example, it can work with leaders of highly qualified and motivated professionals, such as R&D groups or advocacy teams. And, given a talented team to lead, pacemaking does just that: ensures work gets done on time or even sooner. But like any leadership style, the modeler should never be used alone.

II.6 THE COERCIVE STYLE

According to [13], understanding is accessible because, of all leadership styles, coercive is the least convenient in most situations. Consider what style does for an organization's climate. Flexibility is the hardest hit. Extreme decision-making by the top-down leader kills new ideas at the root. Similarly, people's sense of duty or obligation evaporates: unable to act on their own, the spirit of participation disappears and they feel little responsible for their performance.

Coercive leadership also has a detrimental effect on the reward system. Most high performing employees are encouraged for more than money - they seek job satisfaction well done. Coercive style destroys this pride. And finally, style undermines one of the leader's key tools: motivating people by showing how their work fits into the larger shared mission.

III. MATERIAL AND METHODS

The method used was the case study, because there are several characteristics within companies that classify the styles of leaders, where the objective is to get a comprehensive view of the problem under study.

With this work will be done a survey of the data, and will show what is the best style to use in a management.

IV. RESULTS AND DISCUSSION

The data were analyzed by tabulating research collected from various authors regarding the different company leaders of the century XXI.

The research results are described below and also represented by graphs, aiming to provide clarity in the visualization and interpretation of the answers.

According to studies by teachers Jack Zenger and Joseph Folkman interviewing 300,000 CEOs and executives, successful leaders need to master a variety of skills, the most cited being.

Figure 1: Leader Styles and Their Roles.
Source: Authors, (2019).

As we can see, even the fourth style is the most positive leader, and the visionary style and the coach deserve special mention because of their positive repercussions. Since the most outstanding skills among them are:

Figure 2: Distribution of Essential Skills of Leaders.
Source: Authors, (2019).

A Hay / Mcber Consulting survey, based on a random sample of 3781 executives selected from a database of more than 20,000 executives worldwide, eliminates much of the mystery of effective leadership. The research focused on the six styles previously mentioned, but as for the style analyzed separately, which brings more results for companies, are:

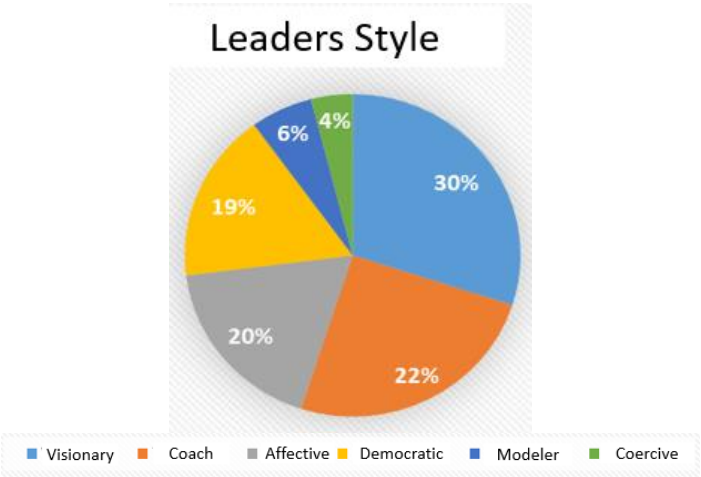

Figure 3: Most Effective Leader Styles.
Source: Authors, (2019).

Then we can compare Figure 1 and Figure 2, and confirm that the visionary and the coach bring more positive results for companies.

V. FINAL CONSIDERATIONS

After studies, including this one, it can be seen through the descriptions and graphs that the most positive styles are the first two (visionary and coach), but in FIgure 3, it can be seen that people's inspiration and motivation, resolution, Problem analysis and good driving are repercussions, or attitudes, of visionary, coaching, affective, and democratic leaders. In other words, leaders who master four or more styles achieve the best climate and business performance.

The most effective leaders flexibly switch leadership styles as needed. To do this, leaders must first understand which emotional intelligence competencies underpin leadership styles they lack. They can then work assiduously to increase the degree of each. For example, an affective leader is strong in three emotional intelligence skills: empathy, relationship building, and communication. Empathy allows the affective leader to react to employees in a way that is highly consistent with that person's emotions, which ensures rapport. This leader also has a natural ease in developing affective bonds, mastering the art of interpersonal communication. As another example, a visionary leader who wants to add democratic style to his repertoire will need to train communication skills.

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RESEARCH ARTICLE OPEN ACCESS

OCCUPATIONAL RISK ANALYSIS IN AN ELECTRONIC TRADE

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ABSTRACT

The study of occupational risk analysis is a technique that has been gaining ground among companies that care about the health and safety of their employees. This study has as its main objective to identify and analyze the probable risks in a trade in the Center of Manaus, in order to prevent accidents and propose improvements to make the work environment adequate for the activities. This study basically consists of three steps: visual description where it was observed through site visit; Risk identification and proposed improvements to address the problem. As a result, it was found that commerce has ergonomic and accident risks. And it was proposed safety measures and use of PPE to prevent occupational accidents.

Keywords: Scratchs; Commerce; Prevent accidents.

I. INTRODUCTION

The development and updating of risk analysis techniques contributes to the evolution of safety engineering history. Innovation brings a different view on the application of these techniques, always aiming to detect potential risks to reduce and eliminate occupational accidents, occupational diseases and environmental impacts, seeking to improve the quality of life of people at work [1].

The retailer sector is known for its high employee turnover and exhaustive workload, and few small and medium-sized establishments have a culture of caring about the health and safety of their employees. Thus, it is critical for management to manage the risks that workers are exposed to, often making improvements to the work environment and keeping track of employee health and safety. As a result, the quality and well-being of the workplace is improved, increasing productivity and reducing staff dropout.

Thus, over the course of the years, the concern with the well-being and physical integrity of employees has become a prominent element in the management of a business. An understanding has developed that people involved in work are the most valuable asset for a well-done activity that makes it possible to make a business organization socially competitive and successful [2]. Risk analysis is a technique that has been gaining ground among companies that care about the safety and health of their employees, and aims to identify possible risks and prevent accidents, making the work environment appropriate for the activities. Investing in Security Increases Employee Awareness.

A work environment without proper ergonomic planning offers numerous risks to workers whether due to the imminence of accidents or the possibility of injury from overexertion. With an average of 8 hours a day dedicated to business activities, workers need to find ways to ensure a more appropriate and comfortable posture that avoids injury.

Thus, with organizations putting the health and safety of their employees first, various strategies and programs have been implemented with positive results in reducing workplace accidents. At the company, it is up to everyone to be zealous for a safer and healthier environment, but the employer is fully responsible for adopting safety and health preservation measures for its employees. Work safety values are increasingly aligned with the creation of an environment where all employees are motivated to achieve safety excellence, developing a concept in which concern over not only employee attitudes but also towards the consequences of these attitudes.

One way to prevent accidents and improve workers' health and safety is to carry out an analysis of existing risks. Due to the lack of culture, knowledge and regulation, small and medium businesses do not prevent themselves in situations of possible accidents and end up drafting their safety plans only when they are

notified in an inspection. In this context, the present study aims to evaluate the working conditions of a small retailer and wholesaler store, located in Manaus city center, in order to verify and evaluate the main risks workers are exposed and to propose improvements.

II. BIBLIOGRAPHIC REFERENCE

II.1 THE IMPORTANCE OF A RISK ASSESSMENT

The quality of life at work, in particular that favored by occupational safety, hygiene and health conditions, contributes not only to increased competitiveness. But also for the reduction of accidents, which is essential in any occupational risk prevention program [3].

Risk assessment is one of the most important, if not the most important aspects of any safety study. In the risk assessment it is essential to accurately identify potential hazards in the workplace [4].

Regardless of the method used to perform the risk analysis, it is necessary to follow a sequence in the study environment, such as: hazard identification and hazard identification based on hazard recognition.

Such data collection can be performed through field observations, interviews with collaborators who perform activities at the analysis site checklists, preliminary risk analysis and satisfaction surveys [5].

Risk assessment involves assessment, classification of assessed risks and classification of risk acceptability. This is an essentially descriptive step on the elements and work processes and aims to understand the professional activity performed.

It is important to create incentives and incentives to motivate the participation of workers, in order to enable them to identify with the security applied to the various risk situations that they face when performing work. Concerns about workers' health and safety can be eased if they have access to information about their legal rights and mechanisms to address workplace hazards [6].

II.2 WORK SAFETY

The occupational environment where the individual spends most of his or her life is a place that can present potentially harmful health risks due to the processes and activities that are performed. On many occasions, harmful chemical, physical, and biological agents that are part of the work have also impacted the community through pollution of water, air, soil, leading in some cases to problems of discomfort and public health. Therefore, the State has a duty to establish policies to ensure safety, occupational health, environmental protection and social responsibility, charging and supervising establishments to ensure compliance with current legislation [7].

According to [7], the right to decent, safe and healthy and environmentally sustainable work has not always had a systemic and strategic vision, within public and organizational policies. These aspects are recent achievements and have become more important with the establishment of the ILO. Through the ILO, the United Nations (UN) has promoted a series of awareness-raising actions among countries on the need to integrate various areas of knowledge in order to adapt work to man, through some basic principles:

- Preserve worker health by applying the principles of preventive, emergency and rehabilitation medicine;
- Promote worker interaction with their work by applying the principles of human behavior;
- Assess worker social, economic, psychological and administrative needs and responsibilities;
- Promote and maintain to the highest degree the physical, mental and social well-being of workers in all occupations;
- Protect and prevent occupational diseases caused by exposure to environmental hazards;
- Keep workers in occupational environments adapted to their physiological and psychological skills;
- Create technical alternatives to minimize and / or eliminate worker exposure to environmental hazards and potential hazardous situations;
- Implement a management system aimed at identifying risks, planning preventive and / or corrective actions, assessing the effectiveness of controls and monitoring the work environment.

II.3 RISK MANAGEMENT

Risk management is a dynamic process, including all aspects such as risk identification, analysis, assessment and control. Aiming at reducing the inherent in the process or equipment to fit it into an acceptable level of exposure. Thus, this management process meets the occupational safety requirements, as it manages the risks by identifying the vulnerabilities of the system under analysis [8].

Through risk management techniques it is possible to achieve the goal of accident prevention as well as cost reduction involved in work accidents within the work environment. For this reflects the concept of organizational culture, which is formed by external and internal agents, being variable depending on changes that may occur within the organization or even political and economic factors.

Taking this into account, it is important for companies to have this broad and systematic view of a risk management system, building a predictive environment and using interpersonal relationships as an instrument to build a healthy working environment [9].

The [10] Institute of Risk Management integrates the various internal and external factors into the organization and the key natures of risk that deserve attention in designing a risk management program (financial, strategic, operational, and security) for enterprises across a variety of industries. And its operations.

II.4 WORK ACCIDENT

The Brazilian Association of Technical Standards (ABNT) has the following definition for occupational accident “occupational accident is the unforeseen and undesirable occurrence, instantaneous or not, related to the exercise of work that causes personal injury or is due to near or remote risk. of this injury” [11].

Brazilian labor law (Law No. 8213) defines a work accident as that which results from the exercise of work in the service of the company, causing bodily injury or functional disturbance, which causes the death, or permanent or temporary loss or reduction of capacity for work.

According to [12] the worker suffers an accident at work when one of the three situations described below is verified:

- You are the victim of an accident that occurs as a result of the characteristics of your professional activity (typical accident);
- You are the victim of an accident on the commute between home and work (commuting accident);

- You are the victim of an accident caused by any type of occupational disease, due to the exercise of the specific work performed, or a work illness acquired or triggered due to the special conditions in which the work is performed and directly related to it.

The work accident, according to [13], begins to happen when some element of the work process stops working as planned, that is, when it presents a dysfunction. This dysfunction indicates loss of system reliability as they degrade the work as a whole, requiring greater actions throughout the work environment. The accident can have serious economic or social consequences and result in personal injury or property damage.

III. MATERIAL AND METHODS

III.1 PROJECT DESCRIPTION

The trade analyzed is a small wholesale and retail store located in downtown Manaus. It is a general merchandise trade, predominantly in electronics, equipment and personal articles, distributed in an area of 60.0 m² with 12 employees.

According to the National Classification of Economic Activities (CNAE), Table I, NR-4 Specialized Services in Safety Engineering and Occupational Medicine - SESMT, the establishment has activity code: 46.49-4 Wholesale trade of equipment and articles of personal and domestic use - hazard degree 2.

According to NR-4, risk grade 2 establishments require SESMT professionals from 501 employees.

III.2 SEARCH RANK

The methodology used for the development of this work was a case study in a store located in the downtown district, south zone of Manaus.

The case study is a detailed research that studies a phenomenon within its real context, based on sources of evidence to support the development of theoretical assumptions leading to the collection and analysis of data and to conduct a A quality case study provides six sources of evidence: a) documentation, b) archival records, c) interviews, d) direct observation, e) participant observation, and f) physical artifacts [14].

III.3 SURVEY AND BIBLIOGRAPHIC STUDY

The bibliographic survey consisted of the study of theoretical bases to facilitate the understanding on the studied subject as theses, dissertations, monographs, articles, books, among other sources that provided the basis for the work. Collecting this material, the bibliographies obtained were read, aiming to capture definitions and terminologies necessary for the elaboration of this work.

III.4 DATA COLLECTION AND INTERPRETATION PROCEDURE

The survey of the place where the case study was conducted was made by collecting data through the photographic survey of the place, pointing out the possible risks of the trade. Some data were collected through verbal survey with employees and owner.

The risks detected were studied considering the most frequent occurrences. All carefully scrutinized to make a diagnosis that should underlie future risk analysis in the trade.

IV. STUDY APPLICATION

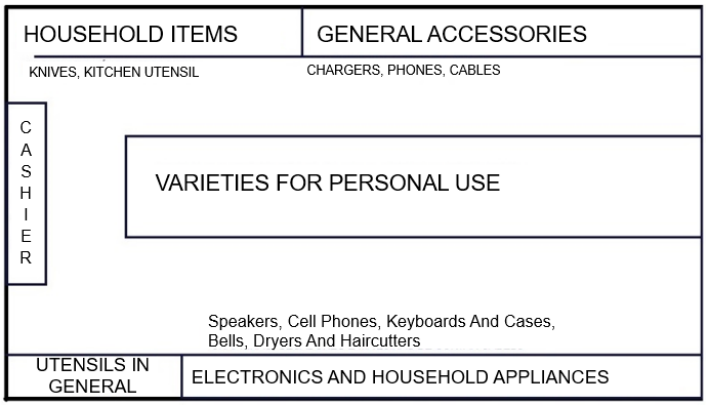

Figure 1: Thematic map of the store.
Source: Authors, (2019).

The store has two shopping aisles, with serpentine-shaped luminaires that span the length of the aisles. The environment still has natural light near the entrance.

Figure 2: Example of corridors.
Source: Authors, (2019).

Each corridor has 1 meter free, on busy days, customers and employees have difficulty in transit and makes it difficult to attend.

Figure 3: Workers without protective equipment.
Source: Authors, (2019).

The working hours of employees at the store are from Monday to Friday from 8:30 to 17:30 and on Saturday from 8:30 to 17:00 hours. Employees feel free to dress and put on as they please.

Figure 4: Intervals and rests.
Source: Authors, (2019).

Workers have an hour break and rest in periods with little movement in the establishment, during which time they are sitting on benches.

Figure 5 - Lack of security to pick up products
Source: The Author (2019)

Figure 5 aims to present the lack of security in reaching the top products.

V. FINAL CONSIDERATIONS

There were three visits to the store, two during the week and one visit on a Saturday morning and due to the location of the store being in the city center, there were many people in the place, making it impossible for all products to be visible in a conversation with the customer. The owner was informed that they recently moved to this location that the old store was smaller, because they work a lot with wholesale have several products, and the new store is still small, this ends up affecting retail sales that not everyone likes to enter small places. And crowded.

Figure 3 shows us that employees work with shoes that are unsuitable for a daily standing routine, according to one employee, the employer does not require wearing specific shoes, each wearing what feels best. And in figure 5 shows us an ergonomic risk in the inadequate posture of employees at rest times, employees do not have chairs for breaks. NR 17 which deals with ergonomics specifies in item 17.3.5. For activities in which work is to be performed standing, rest seats shall be provided where all workers may use them during breaks.

In all figures that show employees we can observe a wrong posture, both at work and at rest times. Figure 6 noted the risk of an employee accident when using a ladder to pick up a product on high, which is repeated several times during the day.

Commerce is also vulnerable to burglary due to lack of security on site, the store has an employee to observe the flow within the store, but on days with high flow is unable to monitor all trade. The work environment analyzed presented several risks and it is evident the need for a risk analysis in these sectors, so that they can be avoided. It is important to emphasize that workers have the right to perform the service safely in increasingly safe environments. Initially, it is proposed that the employer adopt minimum safety precautionary measures, such as the use of PPE, such as safety shoes, which should be worn throughout the day to prevent occupational diseases, none of the employees. Was suitable for daily service.

Thus, the elimination of risks is essential for worker safety. Risk analysis helped to identify the risks studied and preventive and control measures were proposed to avoid occupational accidents and diseases, it is up to the employer to promote improvements and workers to be aware of the prevention of accidents that may occur.

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RESEARCH ARTICLE OPEN ACCESS

ANALYSIS OF HISTORICAL SERIES OF MAMIRAUÁ LAKE LEVEL (PRELIMINARY STUDY)

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ABSTRACT

Amazonian floodplains can be defined as areas bathed by white or muddy rivers; Its main feature is the amount of suspended materials that are transported during the flood and drought dynamics of the rivers and lakes in the region. The objective of this work was to analyze the historical water level series of Mamirauá Lake. We used 25 years of data from the lake performed by the Mamirauá Institute Fluviometric Monitoring since 1990. The descriptive statistics technique was used for the maximum, minimum and average quotas of the monitoring years, as it sought to verify the level relationship. of the lake with the occurrence of extreme events that have happened over the years. The results obtained were: the lowest level of the data series, with a value of 21.7 m.a.n.m was recorded in 1995 and the highest in 1999 was 38.6 m.a.n.m., that year the Amazon basin suffered one of the largest floods related to the La Niña phenomenon. Given the results analyzed, the research concluded that the water level of Mamirauá Lake did not change in years of occurrence of extreme events, as was verified in the years of extreme drought (2005 and 2010).

Keywords: Extreme event, severe droughts, climate change, Amazon floodplain.

I. INTRODUTION

The Amazon is known for its vast territorial extension and large interannual rainfall variability that directly affect the hydrological dynamics of one of the largest rivers in the world, the Amazon River. Due to this high rainfall and seasonal distribution, periodic floods occur every year and are known as: flood and ebb periods [1] [2] [3]. Wetlands or wetlands are periodically flooded aquatic environments with plant and animal communities that adapt to this dynamic [4].

In the context of national territory, wetlands are mainly studied in the Pantanal region, in the states of Mato Grosso and Mato Grosso do Sul, as it is one of the largest floodplains in the world [5]; [6]; [7]; [8].

Due to the hydrological dynamics (flood and dry), the rivers and lakes of the Amazon region carry large amounts of sediments, which are rich in nutrients and supply the entire ecological functioning of floodplains known as floodplains. Amazonian floodplains are of great importance to both the biota and the periodic flood pulse of flooded forests [9].

The Mamirauá Sustainable Development Reserve is considered one of the largest wetlands with Amazonian floodplain forests. In the Amazon, because it is a tropical and humid area, extreme weather conditions cause a decrease in rainfall, as well as a reduction in river levels and navigability. In recent years, increased floods and prolonged droughts have become more frequent [5]; [10].

Hydrological studies to understand the functioning of the Amazon basin and the dynamics of rivers and floodplain lakes make use of mathematical models [11]; [12], which can represent the dynamics of individual lakes and large basins as well as the inclusion of water balance.

However, information from the literature indicates that [13];[14];[15];[16] water dynamics has been increasingly affected by so-called extreme events (events that anomalously affect river dynamics as well as temperature and precipitation in these regions). More recent studies [17];[15];[18]; [19] conclude that since the great drought of 2005, caused by anomalous sea temperature warming in the ocean peaceful, these events have become more frequent (Fig.2).

Thus, studying how such events affect the dynamics of the Amazonian floodplain lakes and river is necessary, since with more frequent events of severe floods and droughts the life of the local population, the economy and the aquatic life of the forest are affected. Extreme droughts cause navigational difficulties and fish mortality [17], while floods and repiquetes (rapid floods) cause crop loss at times of the year when planting would be essential for subsistence [19].

Given the above, this study aims to evaluate the effect of extreme events on the hydrological regime of the floodplain of Mamirauá from the analysis of historical series of the lake.

II. MATERIALS AND METHODS

Mamirauá Lake (03 ° 06'55 "S and 64 ° 47'50" W) is located within the Mamirauá Sustainable Development Reserve (RDSM) in the Midwest of Amazonas State which has an area of 1,240,000 ha. of floodplain forests that are annually flooded and bounded by the Solimões, Japurá and Auati-Paraná rivers [20].

This study aims to discuss the behavior of Mamirauá Lake (Fig. 1) under the effect of hydrological regime with water level measurements (quotas) monitored by the Mamirauá Institute since 1990 (https://mamiraua.org.br/pt-br/pesquisa-e-monitoramento/monitoramento/fluviometrico/) [21]. It should be noted that this is a preliminary study.

A 25-year series of lake level measurement (1992-2017) was used in this study. The technique of descriptive statistics of maximum, minimum and average quotas of the years of fluviometric monitoring was used, since it seeks to verify the lake level relationship with the occurrence of extreme events that happened over the years.

Figure 1: Mamirauá Lake (drought of 2010).
Source: [21].

Figure 2: Extreme events in the municipality of Tefé-AM. The left the extreme drought event in 2010 and the right the severe flood event in 2012.

III. RESULTS AND DISCUSSION

Results are shown in the figures below.

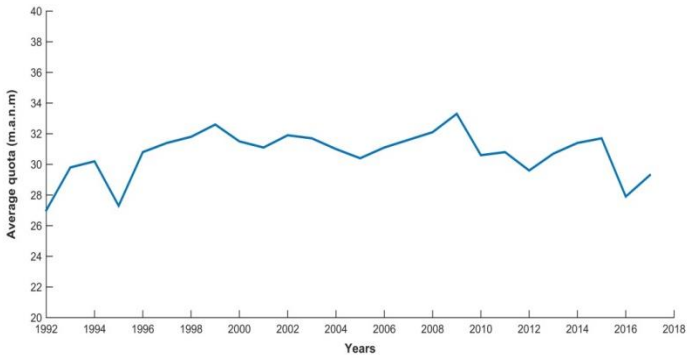

Figure 3: Quotas of the historical series.
Source: Authors, (2019).

The results presented in Figure 3 show that the average level of Mamirauá lake was 30.7 m.a.n.m. The years with the lowest shares were 1995, 2012 and 2017; in 1995 the quota was the lowest in the entire data series, with a value of 21.7 m.a.n.m (meters above sea level). In 2012 the minimum quota was 22 m.a.n.m and in 2017 it was 22.4 m.a.n.m.

The highest quota years in the data series were 1999, 2009 and 2011. The highest quota was 38.6 m.a.n.m. in 1999 which was one of the record floods of the Amazon River related to the La Niña event (heavy rain in the Amazon region); in 2009 it had a quota of 38.3 m.a.n.m and 2011 it had a quota of 37.4 m.a.n.m.

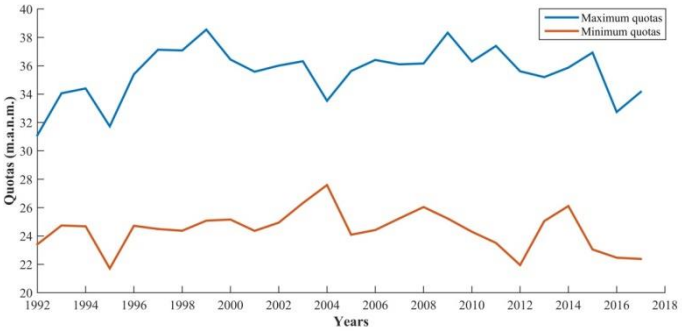

Figure 4: Maximum and minimum quotas of Mamirauá Lake.
Source: Authors, (2019).

The relationships of minimum and maximum quotas with extreme events have been verified in more recent literature studies in floodplain rivers and lakes. With the analysis of the data of this study it was observed that in 1999 (severe flood in the Amazon basin) the water level of the lake was above the average of the years in which there were no extreme events (the lake level in that year may have been influenced by the main river, Solimões river). In 2005, when the Amazon basin suffered from one of the most severe droughts related to the rise in surface temperature of the North Tropical Atlantic Ocean, the minimum quota in Mamirauá Lake was 24.1 m.a.n.m. and the maximum was 35.6 m.a.n.m and was therefore not severely affected. Already in 2010, when there was an extreme drought driven by the rising temperature of the Atlantic Ocean and the El Niño event (event that causes periods of less precipitation in the central Amazon region), the minimum quota was 24.3 m.a.n.m. and the maximum 36.3. m.a.n.m. (Fig.4). According to literature studies, extreme drought events in the Amazon are strongly related to El Niño.

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IV. CONCLUSION

From the results described above, it can be concluded that the water level of Mamirauá lake did not change in years of occurrence of extreme events, this could be verified in the years 2005 and 2010 (extreme droughts), the years that presented The lowest water levels were those of 1995, 2012 and 2017 (drought events). Already the highest quotas were observed in the years 1999, 2009 and 2011 (flood events). New analysis questions can be raised with this study as: 1) The duration of floods has increased in recent years; 2) There are differences between the hydrological dynamics of floodplain lakes in the years of extreme events; and 3) Seasonal variation between flood and ebb has increased in recent decades. To refute the study further, a detailed analysis of the quotas and comparison with data from other floodplain lakes with characteristics similar to Mamirauá floodplain is suggested. In this sense, it is noteworthy that this work is part of a preliminary study that aims to analyze the effects of extreme events on the dynamics of lakes and rivers of the Amazon floodplain in which the Mamirauá lake monitoring data are inserted. More research is expected to be conducted within the theme, as the investigation of extreme events with the potential relationship of climate change can be of great contribution to society.

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RESEARCH ARTICLE OPEN ACCESS

INDEPENDENT AUDIT: HOW TO DEAL WITH ERRORS AND FRAUDS IN CIVIL CONSTRUCTION INDUSTRIES

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ABSTRACT

This paper aims to highlight the importance of Internal Auditing for the Treasury sector in particular for a Construction Industry, as well as to investigate whether Internal Auditing systems can be considered as a tool in the procedures. management Due to the constant growth in the last years, the Construction Industries, linked to the existence of a specific branch of the new administration, reflected in the main objective of this work that focuses on proposing an Independent Audit work in the financial sector with the accounting sector of the company object of our study, for the purpose of ascertaining the procedures adopted organization with its customers. Regarding the methodology adopted by this research we have that the research was descriptive and bibliographic, because it was based on material published in books, newspapers, magazines, websites, among others. However, a case study carried out in the month of August/2019 in the premises of a Construction Industry that makes up the subject of this research stands out. Finally, regarding the need for transparency in the company's treasury, it was found that there are tools available to organizations for systematic use.

Keywords: audit, treasury, transparency.

I. INTRODUTION

Independent Auditing procedures appear in companies with the objective of assuring to managers the accuracy of the financial analysis of the organization, at present Internal Audit can be considered as one of the most relevant tools within Business Management, because this tends to maintain the balance between the vision and mission of the company, guiding the actions of the present.

From this context the justification of the choice of the theme was based on the assumption that the Internal Auditing procedures do not aim to punish any employee of the organization, unlike the Internal Auditing tools, has the objective of "correcting" (our emphasis) the organization's performance. , seeking the improvement and the labor development of its collaborators. Because the constant competition of the market does not allow errors, in this respect, the relevance of Internal Auditing in the organizations, as a fundamental object for the efficiency of their sectors, is pointed out. Given this context arises the question of this study which consists of the following question: What is the importance of Internal Auditing as a tool for preventing errors and fraud in the Construction Industries?

In order to respond to this study, it assumes the objective of describing through authors the importance of Internal Auditing as a tool for preventing errors and fraud in the Construction Industries. Aiming at the success of this objective, this study chose to divide it into the following specifics: (i) contextualize the origin and concept of Auditing; (ii) identify what is the difference between internal and external auditing; and (iii) list the procedures performed for a good internal Audit.

In general, this work can be classified as applied research, as it is based on the application of theory already elaborated, ie, it does not aim to discover theory. In order to obtain the purposes foreseen in this research, the investigation procedure used in this study was the qualitative-quantitative research, since it allowed to obtain information of greater depth and at the same time greater amplitude of the investigated problem [1].

To reflect the objectives of this study, it was started through a brief introduction and the theme, the problem and the objectives are being presented. After the introduction, this study presents the

theoretical framework, then presents the methodology, data analysis and final considerations, accompanied by bibliographical references.

II. DEVELOPMENT

This section presents in more detail the main concepts about Internal Auditing, as well as its relevance in the Business Management process. In this particular it clarifies that Internal Auditing is a set of procedures, technically standardized. Its operation is linked to the indirect monitoring of processes, evaluation of results and proposing corrective actions for management deviations of the Institution [2].

In this respect, it is commented that Internal Auditing's primary objective in corporations is to strengthen management and rationalize the Company's control actions, as well as to provide support to the organs of the Internal Control System of the Federal Executive Branch. This audit work is carried out within the organization, observing the relevant aspects related to the evaluation of management and government programs that affect the Company [3].

The audit was born due to the need to prove the accounting records, cause with the economic development, the large companies, constituted by third party capital, that needed to protect their assets with the confirmation of the accounting records, over time emerged the audit have no longer the function of proving the accounting records, getting a broader responsibility [4].

In this context, "stresses that the audit activity is very dynamic and constantly mutation". Briefly, it can be pointed out that the emergence of the audit was due to the need to have a greater control of companies' assets as a result of economic growth [5]. It is also said that the audit serves as a support to the accountants and owners of the company in the execution of their work, it can correct a procedure or improve something that already agrees. To ascertain the accuracy of the elements, the auditor should: review, review, evaluate and make relevant recommendations [4].

According to the above citations it is understood that Internal Auditing aims to inspect the accuracy of the administrative records that are related to the control of the company's assets, helping to ensure that its statements are in compliance with management standards and principles.

The use of Internal Auditing as an organizational resource management tool leads to improvements in the company's internal control system, and this fact can be linked to value generation.[6]. "Internal Audit's overall objective is to assist management in the efficient performance of its duties by providing it with analysis, assessments, recommendations and comments on audited activities." [7].

Small and medium-sized companies, both industry, commerce and service providers, generally do not have a reasonable internal control system or industry in charge of Internal Auditing [6]. Therefore, managers should use accounting as an internal control aid tool and depending on the size of the company, the accounting or responsible office may also become their auditing sector, but it is important to involve other qualified professionals. to develop an effective audit in all sectors of a construction company, such as accountants, engineers, architects, building technicians, quality technicians, including the jobsite where the work is being performed, and to verify that processes are being made and measurements are correct to be properly paid.

In the decision-making process, the greatest difficulty is uncertainty about the future, but it can be reduced with a good decision model in its design and implementation fed with reliable, appropriate and timely information in order to offer a favorable outcome about your decision. With the help of Internal Auditing, management feeds its decision model with appropriate and reliable information that is recognized and evaluated daily so that its decision making is as timely as possible.

It can be inferred that the internal activity within the management advisory, observing the compliance with its standards, has been contributing greatly to the achievement of the organizations results, enabling the reduction of risks and that companies are exposed in the current business scenario, adding value [8].

Internal Auditing is also concerned with making the best use of available resources as well as meeting previously set objectives, serving organizations as a whole and not just their managers. In this sense, auditing activities should be planned, programmed and developed taking into account management concerns and priorities and in line with the overall objectives, strategies and policies defined, enabling effective management to be achieved, becoming an essential function and valued for the field of management and organization in general with social responsibility.

Audit is defined as an all-encompassing scope of the construction process from solicitation of bids to final payment. It is not just looking for cost recoveries or overbillings, but also provide process improvement recommendations for the project management team

For the elaboration of a constant internal audit basic program in civil construction must have a preparation of control schedules; reconcile project expenditures; direct labor analysis; labor burden analysis; change order analysis and pricing analysis; subcontract analysis; material purchases; verification of contracted scope; equipment rental analysis; bonds and insurance analysis; quality assurance and quality control [18].

The internal auditing activity is of high strategic relevance and is a set of procedures, technically standardized, which works by following work processes, evaluating results and proposing remedial actions for possible management deviations [3].

Historically speaking, it is reported that was created in 1985 in the United States, initiated by the private sector, the National Commission on Fraudulent Financial Reporting (National Commission on Fraud in Financial Reports), also known as the Treadway Commission, the commission had objective of analyzing the causes of fraud in financial and accounting reports and developing recommendations for public companies and their independent auditors, and for educational institutions [7].

Years later the commission was transformed into a kind of Committee, which became known as The Committee of Sponsoring Organizations of the Treadway Comimission (COSO), which is characterized as a non-profit organization that brings together representatives from the private sector, and currently has the objective of ensure thought leadership by developing frameworks and guidance in enterprise risk management, internal control and fraud deterrence [8].

In this sense, this study comments that COSO aims to improve the work of Internal Auditing, having as its differential the ethics and safety of internal controls and corporate governance. According to Freitas there are two models established for Internal Control, as described below [9]:

COSO Model I: known as The COSO Report (COSO I methodology), which has become a world reference for the study and application of internal controls. The model changed the traditional concept of "internal controls" and drew attention to the fact that they had to provide risk protection because by defining risk as the possibility that an event would occur and adversely affect the achievement of the company's objectives. The entity introduced the notion that internal controls should be risk

management and monitoring tools in relation to the achievement of objectives, not only directed to risks of financial origin or linked to book-entry results. The role of internal control has thus been expanded [9].

It is also noteworthy that this model did not prevent the economic-financial and accounting scandals involving organizations of all sizes, which suddenly collapsed after its emergence, so in 2014, the Enterprise Risk Management model was published. Integrated Framework (also known as COSO ERM or COSO II), which has heightened concern about risks.[7].

The COSO II model aggregated among the objective categories the strategic and three other components, totaling eight control components (internal environment, objective setting, event identification, risk assessment, risk response, control activities, information and interconnected communications and monitoring) of enterprise risk management [9].

To describe the Internal Control Test model, this study will be guided by COSO II, as this model has broadened the scope of internal controls, as it offers a range of information that integrates risk management techniques, without forgetting the fundamentals of COSO I. In this regard we have that; "The new approach advocated by the model is that internal control must integrate risk management in order to anticipate and prevent the risks inherent in the organization's set of processes that may impede or hinder the achievement of its objectives" [9].

The fruitfulness of this perspective, this study points out that the most used techniques in internal control assessments are interview, research, direct observation and documentary examination. It is added to this comment that these techniques were used by the author of this study, for the realization of a proposal to implement an Internal Auditing sector within the organization object of this study.

Following our explanation, Freitas (2013, p. 36) It is argued that "the instruments for applying the internal control techniques will be configured as: interview scripts, research questionnaires, direct observation scripts and procedures for documentary examinations" [9]. The tool called Internal Control Assessment Questionnaire (ICAQ), perhaps the most effective for use in a treasury sector, as this tool makes control tests to aid the auditor's judgment making data processing and results more objective. . There are two types of ICAQ: YES / NO (more simplified) and rating scale (likert and semantic differentiator) [4].

The main deficiency in an Internal Control is based on the assumption that it does not exist, in general, it is normal practice for auditors to highlight the existence, causes and effects of any material deficiency that is detected. Such further exploitation of identified weaknesses, coupled with the challenge of the auditee process inherent in conducting an audit, will likely minimize the importance of the risk that the auditor erroneously concludes that errors exist when in fact there are not [7].

The main risk of an Internal Audit is that the auditor may misjudge the audited management - considering inefficient management efficient, or vice versa. It is the risk of misplaced positioning: misjudgment, improper follow-up, or inadequate projection. It is also the possibility that the auditor may choose inappropriate control points for the purposes of the audit engagement, implying impertinent evaluations, follow-ups or projections, as well as the possibility of not detecting material deficiencies in the audited unit [10].

In this sense, the audit professional should consider the question regarding its existence and, in case there are internal procedures to avoid the adverse result, the reason for continuing to occur, or question the effectiveness or implementation of the procedures. The causes can be several, but the failure of the internal control system is the most important, because it allows its occurrence; unless it is remedied, it will be repeated in the future. Identifying and understanding the causes of a disability is important for the development of findings, as well as the appropriate, impartial and effective review, resulting in corrective action suggestions [9].

The Internal Control system has its limitations, because it cannot absolutely assure the objectives to be achieved by Internal Auditing, based on the concern recorded in this paragraph, it is argued that the effectiveness of internal control is subject to both implementation limitations as well as functioning, no matter how well designed, absolute safety can never be expected [9].

The same author also mentions within its studies the possible limitations existing within Internal Control, as it is highlighted: the possibility of failures; errors of judgment in decisions; the occurrence of external events beyond the interference of the administrators; collusion between employees; its transgression by the administration itself; employees have not been adequately educated regarding internal standards; negligent employees in performing their daily tasks and the cost-benefit consideration that must be done, since controls cannot cost more than what is controlled [11].

The Internal Audit activity in the treasury is of high strategic relevance and consists of a set of technically standardized procedures, which works by monitoring work processes, evaluating results and proposing remedial actions for possible management deviations, counting with the necessary multidisciplinary support of human and material resources [3].

Internal Auditing's information regarding treasury management acts should mainly meet the following attributes in accordance with CONAB:

a) Conciseness - use succinct and summarized language, giving as much information as possible briefly. Characteristic of this language is precision and accuracy;

b) Objectivity - expressing practical and positive language, demonstrating the real and material existence of information;

c) Conviction - demonstrate the certainty of the information that the communication must contain in order to persuade and convince anyone to the same conclusions, avoiding terms and expressions that may give rise to doubts;

d) Clarity - expressing intelligible and clear language in such a way as to ensure that the communication structure and terminology employed allow the understanding of the information to be evident and transparent;

e) Integrity - record all information accurately and impartially, and include in the communication all observed facts, without any omission, providing a complete view of the improprieties / dysfunctions noted, recommendations made and conclusion;

f) Opportunity - transmit the information, simultaneously, in a timely manner and with integrity so that the communications are issued immediately, with the correct extension, so that the subjects dealt with in them may be the object of appropriate measures;

g) Consistency - ensuring that the language is harmonious and concordant, so that communication is logical, corresponding to the stated objectives;

h) Presentation - to ensure that the subjects are presented in a structured sequence, free from errors or erasures that may impair the correct understanding; and,

i) Conclusive - allow the formation of opinion about the activities performed. In some identified situations, it may be specified that a conclusive statement by the Internal Auditing Unit is not appropriate, especially in cases where the examinations are of an intermediate nature [3].

"How the auditor will address these issues across areas is vital to the success of a good auditor/audited relationship, so that the doors of these areas remain open for future work. It is important that the audited ones feel in the auditors a willingness to assist them in solving their problems and forwarding them to other segments of the company." [7].

Regardless of the above, it should be noted the importance of mutual trust of auditors and managers of the treasury. However, this trust needs to be earned by the auditor, as it will be through the information provided by the auditor that managers will assess the company's cash position. The organization and planning consist of establishing in advance the actions taken within pre-established scenarios and conditions, estimating the resources to be used and assigning the responsibilities to achieve the objectives set [12].

According to the literature, Terence defines the following characteristics that form the concept of planning:

I. It is the definition of a desired future and effective means to achieve them; II. It means the development of a program for achievement of organizational objectives and goals, involving the choice of a course of action, the decision advance of what should be done and the determination of when and how the action should be performed; and, III. It is the process of establishing which objectives and means of action must be taken [12].

Planning facilitates the process of its elaboration by the company itself, and must be carried out by the areas relevant to the process. Planning is the most basic of all administrative functions, and the ability by which this function is performed determines the success of all operations. Planning can be defined as the thought process that precedes action and is directed toward making decisions in the present moment with the future in view [13].

III. MATERIALS AND METHODS

In this paper, we used the descriptive method, since it has that the descriptive reasoning has as characteristics observe, register, analyze, describe and correlate facts or phenomena without manipulating them, trying to find out precisely the frequency in which a phenomenon occurs and its occurrence relation to other factors [14].

As for the technical procedures used for the formation of this paper, we used the bibliographic research, as it aimed to "collect information and prior knowledge about a problem for which an answer is sought or about a hypothesis that one wants to try out" [15]. It was also necessary to use field research, which "is characterized by deep and comprehensive study of one or a few objects, a way that allows its broad and detailed knowledge" [16].

IV. STUDY APPLICATION

This study was conducted at the premises of a regional construction company, based on the principle of delivering valuable services to businesses, government and organizations. It has a personalized approach that combines intelligence, deep expertise and strategic alliances with economic sectors to deliver real results to customers.

With a multidisciplinary and experienced team, develops high value-added work for qualified clients installed or landing in the North and other regions of the country. Best practices in business management are used in the development of technical and economic feasibility studies, market analysis, strategic planning, organizational management, fundraising, development of structuring projects, strategic diagnostics, technical advice and guidelines for sustainable growth.

In this stage of elaboration and application of the interview about the relevance of Internal Auditing, the typology of deductive research was used. It is also noteworthy that the interview used by the author consists of 10 informal questions where the head of the treasury department, who can feel free to answer (Table 01), the data collection took place in the month of August / 2019. The other steps were worked on site.

The author praised the act of not using very specific questions, always having ethics as a differential factor in the research performance, the questions have a neutral character, as a way of not influencing the answers.

Table 1: Respondent Profile.

Interview	Office	Sector Time	Interview Mode	Interview Length
E1	Head of Treasury	7 years	Presencial	1:05:59

Source: Authors, (2019).

After collecting the articles and conducting the interview, the collected data were analyzed by combining the data from the theoretical and empirical literature along with the interview, which incorporated a wide range of purposes, including: definition of concepts, review of theories and evidence, and analysis of methodological problems. The large sample generated a consistent and comprehensible overview of the relevance of implementing an Internal Auditing sector within the Construction Industries.

V. RESULTS AND DISCUSSIONS

It was first identified the company's work method in performing their services, where in planning the owner of the work idealizes the project where the engineer or architect performs, and the owner provide resources, land for work, and requires that these resources are properly so that there is no damage, and the internal auditor should carefully check the lines of this scheme and devise ways to supervise this work.

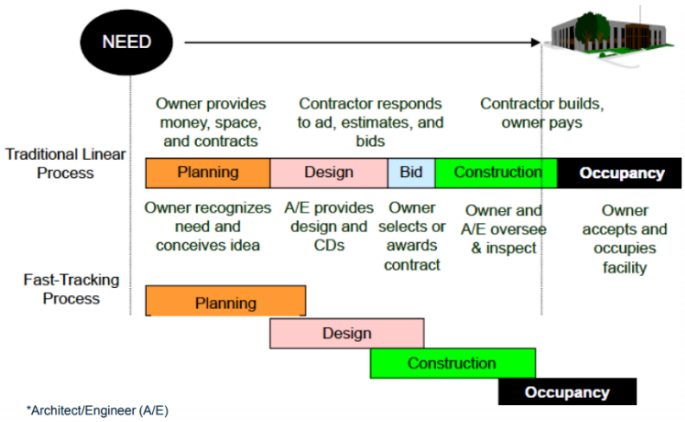

Figure 1: Process of a Construction.
Source: [19].

It is identified in the organization chart (Fig. 2) that senior management is centralized, summarizing if the General Board governed by the owner, and its subsequent departments such as the Commercial Board, Finance Department, People Management Department, Accounting Board, Consulting Board and the Tax Department as supervisors in strategically made decisions, which sectors are responsible for operationalizing the actions.

Faced with an uncertain future, in a fast-paced, changing world, organizations have to keep a close eye on their surroundings. In this sense, this study argues that treasury audit activities should be planned, programmed and developed taking into account the concerns and priorities of each client, and in line with the defined objectives, strategies and global policies, enabling the achievement of effective management become an indispensable and valued function for management and the organization in general.

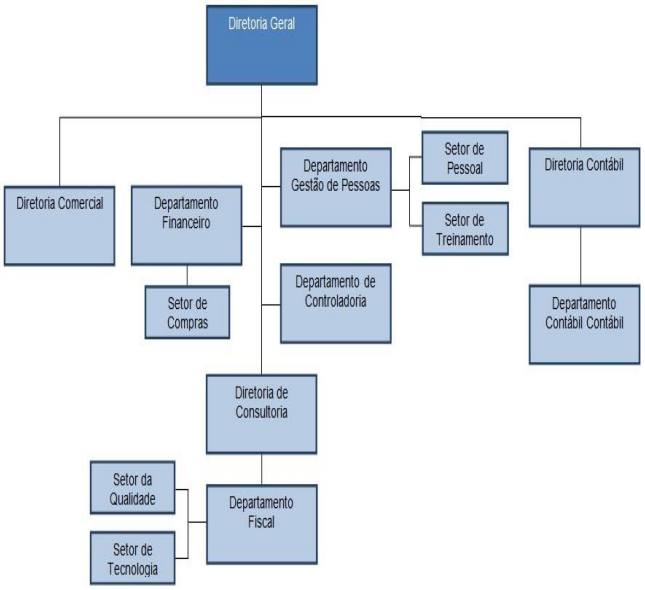

Figure 2: Company Organization Chart.
Source: Company Data, (2019).

The Auditor is responsible for observing the execution of the tasks that happened correctly, if there are excesses in procedures that burden the final value of the work, having to request adjustments of values and the work to finish with a value much higher than initially budgeted that characterizes a planning failure or misuse of resources, so according to the planning, and it is up to him, to ensure internal control, the execution of tasks, in case of errors, failures or deviations, it is up to the auditor to analyze and determine the correction of these errors, both in planning process as well as the execution process.

The audit program is basically divided into three distinct parts as described:

I. Listing of audit procedures;

II. Space for the auditor to sign or initial in order to evidence that the service was done and that it did it; and,

III. Space for comments, remarks, references among others [17].

Following these steps, the following activities were developed for the implementation of an audit program for the company (Table 2):

Table 2: Activities for the implementation of an Auditing sector.

Item	Activities	Precedents	Length	Resources
1	Promote training	None	1 day	R$ 800,00
2	Deploy an Audit Team	1	15 days	R$ 2.000,00
3	Evaluate audit work analysis	2	30 days	R$ 7.500,00
4	Hold meeting to evaluate the results by the business owner	3	1 days	R$ 0,00
5	Promote audit for maintenance	4	5 days	R$ 0,00
TOTAL				**R$ 10.300,00**

Source: Authors, (2019).

VI. CONCLUSIONS

It is noteworthy that in this stage the main observations with the accomplishment of this research where it is emphasized that the Audit is responsible for the observation of the execution of the tasks happened correctly, according to the planning, and it is up to him, control, the task of correct errors, both in the planning process as well as in the execution process, because the first step to be taken is to realize in strategic planning the variables that may influence the organization's results, which can be divided into internal variables and external variables, where they are subdivided into weaknesses, strengths, opportunities and threats.

Although an appropriate plan of organization varies with the type of company, usually a satisfactory plan needs to be simple and flexible, and should be paid to the establishment of clear lines of authority and responsibility, that is an important element in any organization plan is the structural independence of operating, custody, accounting and internal audit functions. In other words, the responsibility and the corresponding delegation of authority must be clearly defined and placed in organization charts or manuals.

Conflicting and duplicate responsibilities should be avoided, but where the work of two or more divisions is complementary, responsibility may be divided into phases, within this context this study concludes that these divisions of responsibilities are inherent in good internal auditing, which stipulates that the duties of initiating and authorizing an activity are separate from those of its accounting.

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RESEARCH ARTICLE OPEN ACCESS

EVALUATION OF MACHINING FORCES AND SURFACE INTEGRITY ON AISI 304 STEEL TOP MILLING PROCESS UNDER DIFFERENT CUTTING CONDITIONS

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ABSTRACT

Stainless steels are widely applied in corrosive environments requiring high mechanical strength. Thus, this material is applicable to the petroleum, gas and petrochemical industries in general. Because they are widely used, it is important to work these materials in a different manufacturing process, in order to reach the desired shapes and dimensions for parts and components. With regard to the behavior of this class of materials when subjected to machining processes, they are defined as low machinability and due to this characteristics, it becomes essential to determine machining forces evaluated in each process, since they define the power required for machines. In addition, it is possible to optimize cutting parameters in order to increase tool life and /or improve surface quality of the machined parts based on the cutting forces. Therefore, the purpose of this work is to analyze how different cutting parameters (cutting speed and feed per tooth), lubrication condition and tool wear might affect machining forces and surface roughness of the AISI 304 in top milling operations. The results demonstrate that the feed per tooth has a greater impact on the increase of the machining forces. In terms of lubrication, Minimum Quantity Lubrication (MQL) has shown to be the best choice upon the dry machining setup, since lower milling forces have been acquired and tool life has been expanded.

Keywords: Milling; Tool Wear; Stainless steel; Machining Forces; Surface Integrity.

I. INTRODUTION

Stainless steels have great applicability in the aeronautics, aerospace, biomedical, and mechanical industries in general. Thus, this material is widely applied under conditions requiring high mechanical strength and corrosion resistance [1]. Nevertheless, this class of material is characterized by low machinability compared to common carbon steels. Among the difficulties in machining, it can be pointed out the high rate of hardening and long chips, which accentuate tool wear [2]. Machining processes are of great importance in the industry because it is a relatively simple and versatile operation. However, in order to reach optimized cutting parameters, it is necessary to know the process variables well. The challenge is to achieve good dimensional tolerances, finish and cost reduction, according to the different combinations for the process input. Given this, the machining forces is a matter of great relevance for the industry because, in certain circumstances, machining forces define feasibility of the machining process. Many cutting parameters can influence on the cutting forces. According to [3], these forces are mainly affected by the increase of the cutting speed because the heat generated makes the material softer at the shear zone. As a consequence, lower cutting force is required for machining operations which decreases the surface roughness. Cutting forces likewise decrease at higher cutting speed due to the reduction of chip thickness resulting in lower surface roughness. [4], point out from their experiment that feed rate has a greater influence on the values for the surface roughness than the cutting speed. Another element that has great impact on the cutting forces is tool wear, which may intensify the cutting forces as tool wear progresses.

According to [5], cutting fluids (CFs) have major contribution to final product quality and tool life, as they lubricate the cutting zone and flush ships away. Nevertheless, today's manufacturing industries are paying attention to negative impacts over social, health and economic picture of society caused by machining processes, forcing industries to moderate the use of CFs.

In some machining processes, it is mandatory to use CFs, due to the amount of heat generated. Thus, Minimum Quantity Lubrication (MQL) is an alternative for cooling, flushing and lubricating, and also reducing costs associated with coolants.

[6] describe stainless steel as a material that is typically difficult to machine. This material is also described as having high tenacity and thermal intensity, which results in severe work hardening and heat. As consequence, built-up edges (BUE) are easily produced. On the other hand, conventional coolant method based on flooding system might be ineffective as the coolant often fails to penetrate into the chip interface during the machining process. That leads researches to investigate the process of machining Stainless Steel 304 under MQL. [7], point out that MQL techniques has shown superior quality over wet and dry milling in terms of tool wear on stainless steel 304.

Hence, the current work evaluates how the cutting parameters, lubrication condition and tool wear can influence the machining forces and their impact on the surface integrity of AISI 304 austenitic stainless-steel workpieces machined by top milling method.

II. EXPERIMENTAL PROCEDURE

The material analyzed in this study was a rectangular plate made of AISI 304 stainless steel. Figure 1 illustrates the workpiece with a canal on the longitudinal direction, indicating the path applied to the milling process.

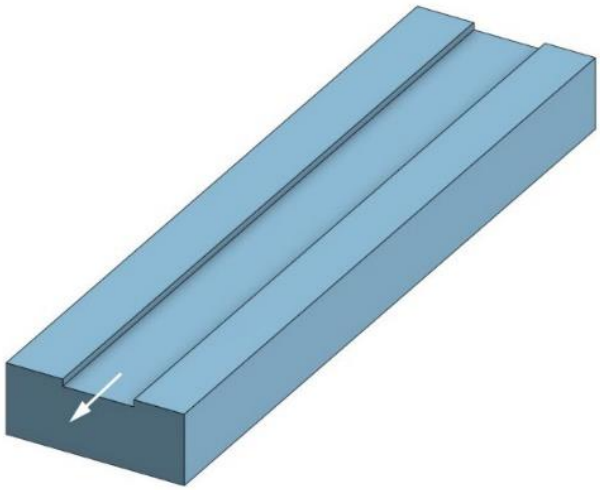


Figure 1: Workpiece illustration.
Source: Authors, (2019).

In this work two cutting parameters have been evaluated: cutting speed (v_c) and feed per tooth (f_z) under two cutting fluid application conditions: dry and MQL, totaling 8 conditions, as represented Table 1. The samples were machined through the top milling process, using a 20 mm diameter mill with two inserts, which with two cutting edges. The inserts applied to the current milling are R390-11T3 08M-PM, class 4240. Cutting speeds were set at the lower and upper limits of the cutting tool manufacturer's recommendations. Depth of cut remained constant at 0,2mm per pass. Machining forces measurements were analyzed using a dynamometer manufactured by Kistler Instrument AG, Model 30 9257 BA, coupled to the Diplomat 3001 milling machine. The acquisition rate was at 1khz and simultaneously measuring 3 orthogonal force components (F_x, F_y *e* F_z) through piezoelectric crystal plates, as observed in Figure 2.

Table 1: Cutting parameters and their conditions for milling studies.

Condition	Fluid Application Condition	v_c [m/min]	f_z [mm/tooth]
1	Dry	210	0,080
2			0,135
3		225	0,080
4			0,135
5	MQL	210	0,080
6			0,135
7		225	0,080
8			0,135

Source: Authors, (2019).

Figure 2: Dynamometer tag indicating Fx, Fy and Fz axes orientation.
Source: Authors, (2019).

Tool wear analysis were performed on the Olympus BX60M optical microscope from Laboratório de Materiais (LAMAT) located at CEFET / RJ. Flank wear were measured as a function of the machining length (L_f) under cutting parameters.

III. RESULTS AND DISCUSSION

Figure 3 indicates how Flank Wear measurements develop for Dry and MQL machining under different cutting parameters. In this circumstance, it is possible to assume that MQL has performed better to this class of material in terms of tool wear, as machining forces were lower in all parameters combination, in accordance to [7]. On the other hand, dry machining reveals an accelerated tool wear increase. Even though flank wear can be observed for all conditions, BUE has also been found mostly for dry machining at higher feed per tooth rates as a consequence of higher temperatures. Flank wear analysis demonstrate that the combination of the lowest cutting speed and highest feed per tooth are the best parameters set for both dry and MQL machining, as expected [7]. Lower cutting speeds tend to generate lower temperatures on the cutting zone, as higher cutting speed intensify frictional heat produced by the bottom of chip and at tool rake [8]. Therefore, the cutting temperature increases according to cutting speed, which may decrease tool wear. With respect to feed, higher values tend to decrease the time of contact between inserts and the workpiece, minimizing tool wear provided from friction. In this work the analysis is being made in relation to the machined length (l_f). However, for higher feed conditions, shorter machining time is required. Tools may have the same life span, but at higher feed values, tools will remove more material, making them more economically attractive machining conditions.

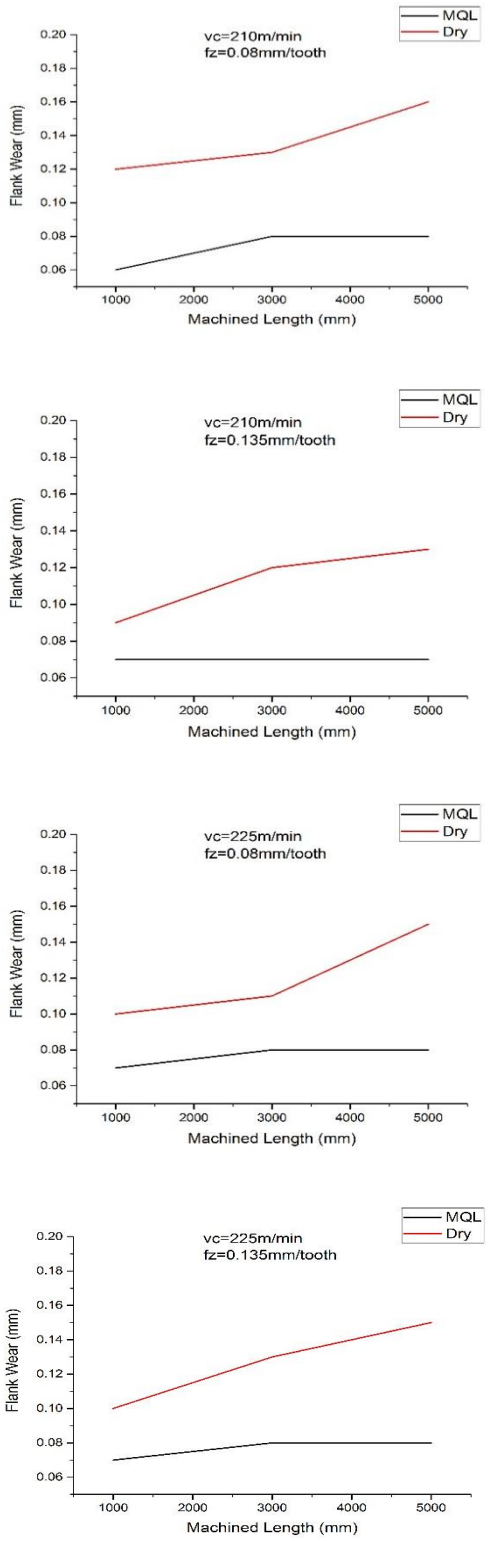
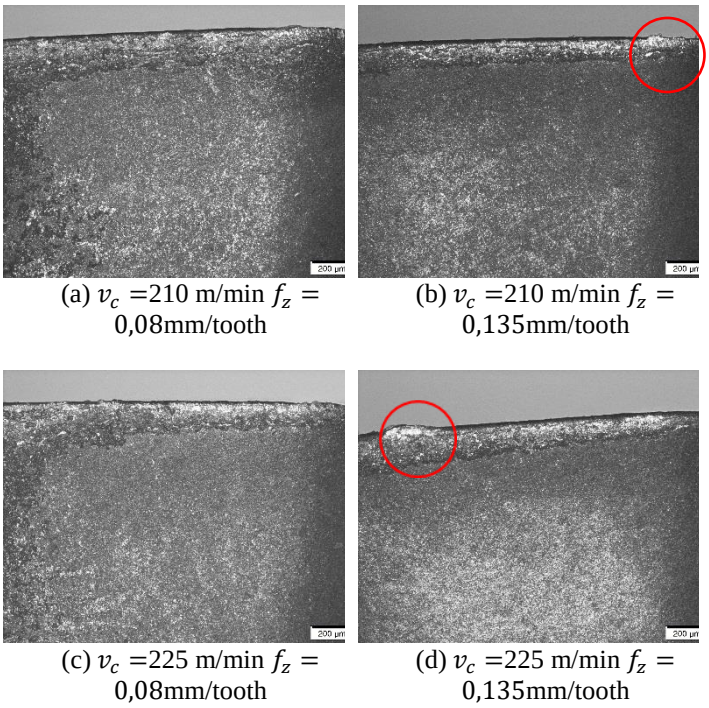


Figure 3: Flank Wear under different machining conditions.
Source: Authors, (2019).

A microscopic analysis has been performed to evaluate tool wear under different cutting speed and feed per tooth rates. Figure 4 demonstrates that Flank Wear can be observed for all conditions in dry machining at l_f=5000mm. Furthermore, it shows that higher feed per tooth resulted in BUE, shown in Fig. 4b and 4d. The results are in agreement to [6], who also machined stainless steel in their research and stated that adhesive wear was found on their tools.



(a) v_c =210 m/min f_z = 0,08mm/tooth

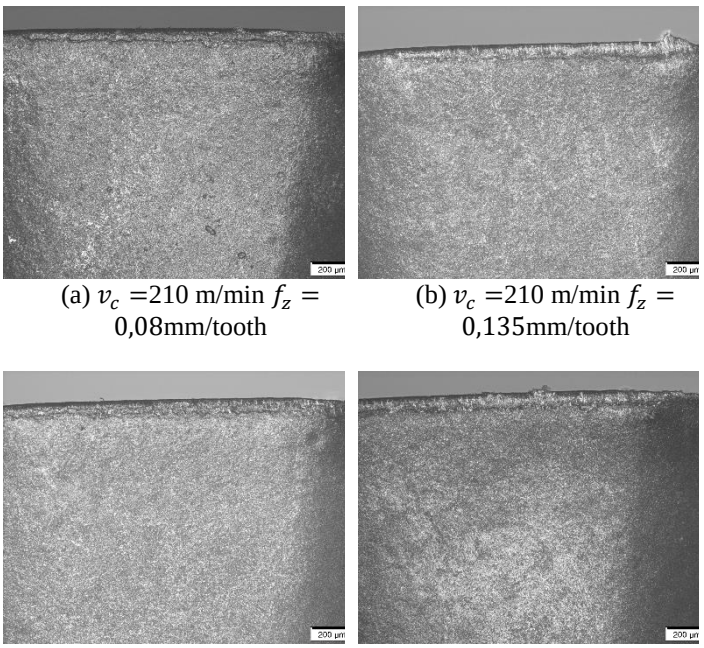
(b) v_c =210 m/min f_z = 0,135mm/tooth

(c) v_c =225 m/min f_z = 0,08mm/tooth

(d) v_c =225 m/min f_z = 0,135mm/tooth

Figure 4: Flank wear under dry machining at l_f=5000mm.
Source: Authors, (2019).

Figure 5 demonstrates the same evaluation on the microscope as the ones observed in Fig. 4, but the inserts were used for milling under MQL conditions. From the analysis, flank wear is much less evident in MQL machining, indicating that MQL has performed better in terms of tool wear.



(a) v_c =210 m/min f_z = 0,08mm/tooth

(b) v_c =210 m/min f_z = 0,135mm/tooth

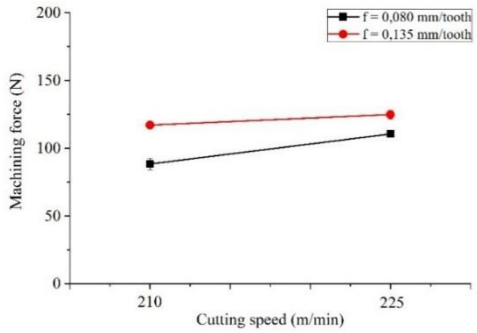
(c) v_c =225 m/min f_z = 0,08mm/tooth

(d) v_c =225 m/min f_z = 0,135mm/tooth

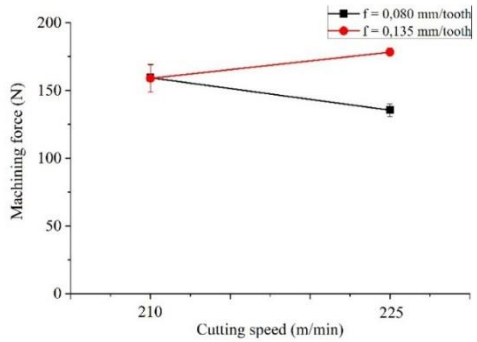
Figure 5: Flank wear under MQL at l_f=5000mm.
Source: Authors, (2019).

In order to compare machining forces generated from different cutting parameters, the resultant force applied to the dynamometer was acquired. Figure 6 reveals data collected from each parameter combination considered in dry condition. Figure

8a indicates machining forces acquired for l_f=1000mm on the workpiece, assuming least tool wear. It can be perceived that machining forces have had their highest averages as the feed per tooth increased, due to the higher removal material rates. Even though it is expected that tool wear would be more pronounced at higher feed per tooth conditions, the opposite effect was revealed. As shown in Figure 3, for the higher feed per tooth, lower flank wear values were observed. What may have occurred is that for low feed rates there is a longer contact time between the inserts and the workpiece, which may accelerate tool wear, especially due to higher temperatures reached during the cutting process. In the matter of cutting speed, there has been no significant variation for machining forces within the ranges of cutting speed analyzed. While Fig. 6b illustrates the same research on machining forces, but was measuring values after machined length l_f=5000mm on the workpieces was reached. Since cutting parameters were the same for 6a and 6b, it is conceivable that machining forces were amplified because of tool wear, which was the only alteration between these two experiments. [9] studied the relationship between cutting forces and tool wear and concluded that cutting forces variations increase during machining because cutting edges gradually lose their effectiveness and become dull. The authors also note that it is possible to estimate pretty accurately tool condition based on cutting forces as long as identical cutting conditions are being compared.



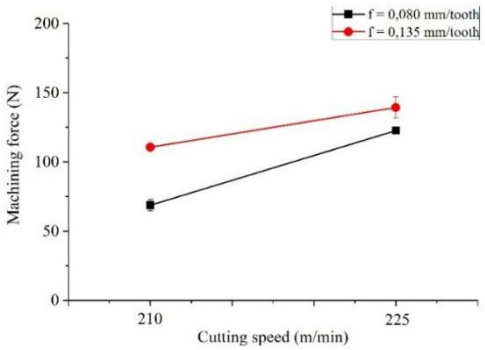
(a) l_f = 1000mm



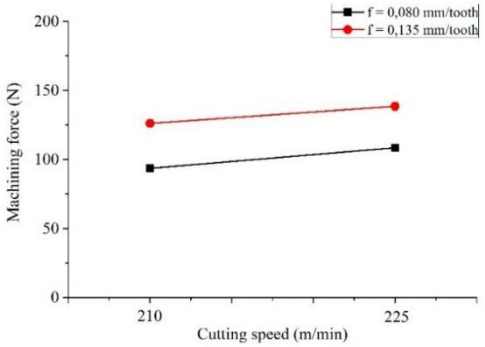
(b) l_f = 5000mm

Figure 6: Machining Forces evaluated at different machined length in dry machining.
Source: Authors, (2019).

Unlike in dry machining, MQL shows a trend on machining force values. The higher the feed per tooth and cutting speeds values, the higher the machining forces are. Figure 7a illustrates the results acquired for milling under MQL condition over l_f=1000mm, while Fig. 7b displays acquired forces for l_f=5000mm. A significant advantage of machining under MQL can be perceived from Fig. 7b, which indicates lower machining forces in comparison the ones found in Fig. 6b. These results are directly related to tool wear levels observed in dry machining conditions. Because as flank wear increases, the friction component increases as well, which may also lead to higher machining forces.



(a) l_f = 1000mm

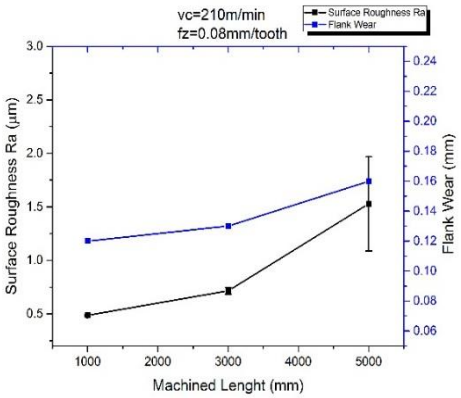


(b) l_f = 5000mm

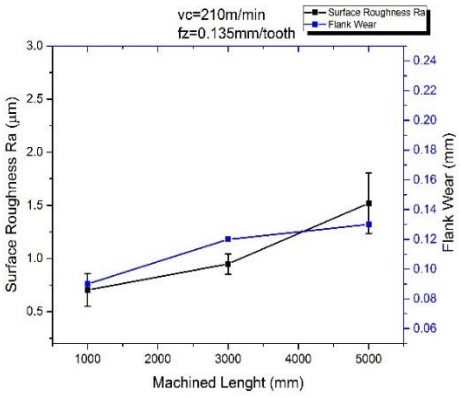
Figure 7: Machining forces evaluated at different machined length in MQL.
Source: Authors, (2019).

Surface roughness on workpieces were evaluated in order to verify a possible correlation between tool wear, machining forces and surface finishing. Figure 8 illustrates Flank Wear and Ra roughness simultaneously under different cutting parameters for dry machining. Line graphs contrast acquired roughness, considering different parameters setups. For dry machining, the best results for surface finishing occurred with parameters of high cutting speed and low feed per tooth, represented by condition 8c, as expected [10]. However, a sudden climb for the roughness values was observed after l_f = 3000mm for all conditions examined, possibly influenced by Flank Wear and Built-Up Edge.

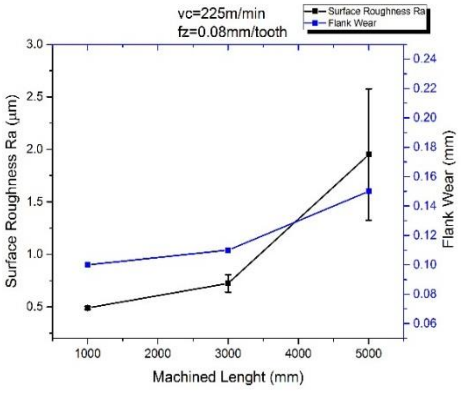
[11] indicated that Flank wear can dramatically develop cutting forces and reduce surface finishing. Figure 9 represents Flank wear and Ra roughness assessment when lubrication is applied as MQL. Charts demonstrates that roughness values are far more refined those obtained in dry machining, as predicted [7]. In fact, cutting fluid applied to machining may result in a useful combination of lubricating and cooling, which tends to flush the cutting zone and lower machining temperature. It may also improve surface quality on the workpieces. As shown in Figure 3, lower cutting tool wear levels were also obtained under MQL machining conditions. Thus, it is evident that the use of MQL generally improves surface integrity based on roughness evaluation.



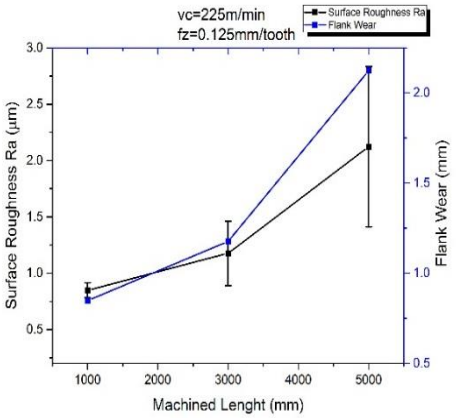
(a) v_c =210 m/min f_z = 0,08mm/tooth



(b)v_c=210 m/min f_z=0,135mm/tooth

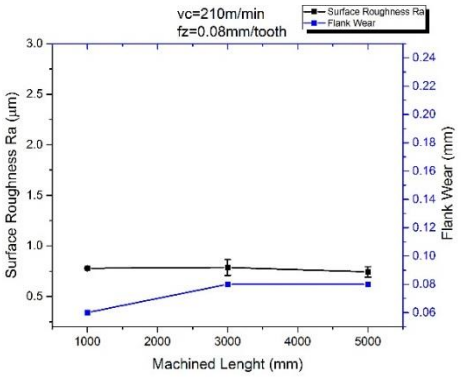


(c) v_c =225 m/min f_z = 0,08mm/tooth

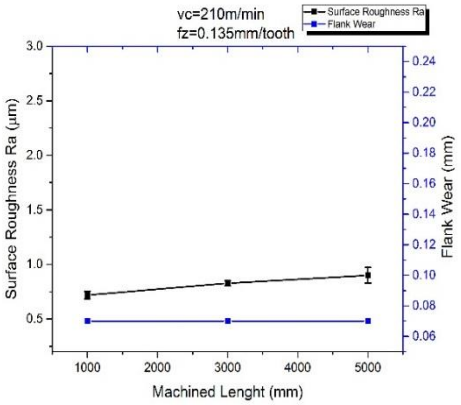


(d)v_c =225 m/min f_z = 0,135mm/tooth

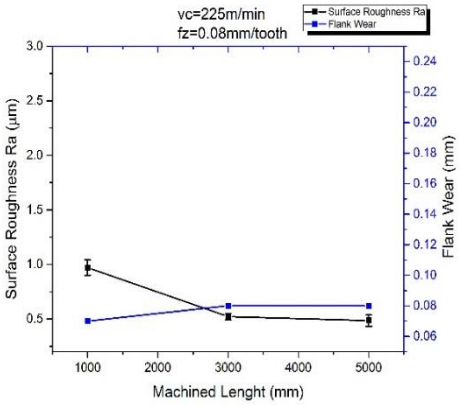
Figure 8: Flank Wear measurements for Dry.
Source: Authors, (2019).



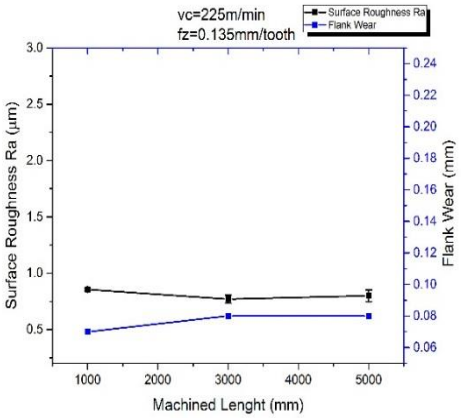
(a) v_c =210 m/min f_z = 0,08mm/tooth



(b)v_c=210 m/min f_z=0,135mm/tooth



(c) v_c =225 m/min f_z = 0,08mm/tooth



(d)v_c =225 m/min f_z = 0,135mm/tooth

Figure 9: Flank Wear measurements for MQL.
Source: Authors, (2019).

III. CONCLUSIONS

Based on the presented results it is possible to conclude that:

1. MQL system provides the best results in terms of tool wear level when machining AISI 304 stainless steel, inhibiting the formation of BUE and extending tool life.
2. The best machining condition, in relation to tool wear level, is corresponding to higher feed per tooth rates, especially for the dry machining.
3. Dry machining resulted in higher machining forces magnitudes, which is directly related to the higher tool wear levels due to higher friction in the cutting process.
4. Overall, MQL is capable of increasing industry productivity by reducing tool replacement and performs better surface quality.

IV. ACKNOWLEDGMENTS

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