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ERGONOMIC ANALYSIS OF WORK IN THE EXECUTION OF SEALING MASONRY

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Abstract

Civil construction is responsible for many occupational accidents in Brazil, due to the exposure of employees to various risk factors. The present study aims to perform an ergonomic work analysis (AET) in the execution of sealing masonry to analyze, diagnose and correct work situations that are not in accordance with NR17. The methods used for analysis were RULA and OWAS through on-site observation, it is possible to classify the postures. The results obtained showed high risk scores for certain members and acceptable for others. Through the results, it is concluded that several postures need corrections in order to ensure the health and physical integrity of the worker.

Keywords: Construction. Ergonomics. Ergonomic analysis.

1. Introduction

The rate of accidents at work in Brazil when compared to other countries remains high, especially in civil construction, which generates major economic and social problems (INSS, 2018). Brazil has 8.9% of the total accidents in the civil construction sector, of which 42.8% are caused by the construction of buildings. This index represents precarious conditions at construction sites, in relation to training, hygiene, safety, ergonomics and work environment (BRASIL, 2014).

High rates of disability, illness and deaths are due to the precariousness of the construction site. In addition, workers are exposed to high workloads, when compared to other sectors due to rework, overwork, and contracting pay for production (WINTER, et al., 2015).

Injuries caused by Repetitive Effort/Work-Related Musculoskeletal Disorders (RSI/WMSD) have been causing irreversible sequelae to workers that may result in permanent

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disability. Such sequelae can become chronic and make it impossible to carry out even the most banal activities of daily life (WENDERSON; VIRGÍLIO, 2013).

The Ergonomic Analysis of Work (AET) seeks to put into practice the theoretical knowledge of ergonomics, contributing to postures in which they must be analyzed, diagnosed, and corrected, so as not to have more harmful consequences, aiming at the physical integrity of the worker (CHO et al., 2019).

The Ergonomics Regulatory Standard (NR17) is a standard that establishes standards enabling measures to adapt working conditions, in order to provide greater comfort, safety and efficiency at work (BRASIL, 2007).

The objective of this work is to perform the ergonomic analysis of the work in the execution of sealing masonry to analyze, diagnose and correct work situations that are not in accordance with ergonomics, thus respecting the minimum conditions required by NR 17 and preserving the health of workers.

2. Theoretical framework

2.1. Accidents and risks in civil construction

Occupational accidents bring with them serious consequences for the health of the worker, resulting in the professional's disabilities, for this he must carry out training in the area in which the worker will work and be properly using individual and collective protective equipment, to preserve the accidents that are imminent in the service area (MONTEIRO; BERTAGNI, 2000).

The problems arising in civil construction occur due to the fact that the risks are submitted by the workers, risks in which they are evident in the work environment and that in the event of accidents, the companies aim to concretize and train them regarding the imminent risks in each work situation, creating alternatives to minimize accidents (VALINOTE; PACHECO; FORMIGA, 2014).

Activities aimed at civil construction are exposed to unwanted risks, which can lead to sequelae, death, or even permanent or temporary work disability. The Regulatory Standard for Specialized Services in Safety Engineering and Occupational Medicine (NR4) is essential for an organization on the part of construction sites. It is extremely important for workers to be aware of the dangers in the execution, aiming at the ability to safely deal with the service (BARBOSA FILHO, 2010).

2.2. Ergonomics

In 1940, ergonomics emerged, its origin is associated with the needs of war, linked to the construction of weapons according to the characteristics of human beings (OAQUIM, 2004).

Ergonomics is an approach aimed at a discipline structured from all perspectives of human activity. To understand what happens and can interfere with the activities performed during work, it is necessary that the approach covers the entire environment, in all aspects, both physical and cognitive, as well as social, organizational, environmental, among others (MASCULO; VIDAL, 2011).

The purpose of ergonomics is to improve and preserve the health and well-being of workers and also to ensure the optimal functioning of the technical system, aiming at both the point of view of production and safety (PATTERSON; ABRAHÃO, 2011).

Ergonomics is directly linked to the science of comfort, well-being, improvement in appropriate work activities, productivity capacity, full safety, among others. The objective, however, is to provide the worker with working conditions that are favorable, with the aim of making the activity more productive through a healthier and safer work environment, allowing for lower demands and physical exhaustion, resulting in the reduction of damage (BARBOSA FILHO, 2010).

The knowledge applied about man to problems in the man-work relationship contains several methods of study and research on the performance of man in the service, so it is understood that ergonomics is a technology, that is, a set of knowledge [13].

The focus of ergonomics is to modify the work system, effectively contributing to the worker's performance. It is a specialized process in which the ergonomist, through his knowledge and participation, seeks to implement a solution to the problem, contributing with suggestions for the improvement of the exercise of activities, bringing results of a study of the situation (MORAES; MONT'ALVÃO, 2000).

2.3. Ergonomics in construction

Civil construction has the highest rates of occupational accidents, as it offers a wide variety of risks in its stages and ergonomic methodologies are still poorly implemented in this segment (GUIMARÃES; MARTINS; BARKOKÉBAS JUNIOR, 2015).

This is due to the fact that activities are dispersed, performing several functions at the same time, and the lack of organization among workers (IIDA, 2005).

Also according to the author, civil construction activities is a sector characterized by the use of manual labor, in which there are arduous and complex tasks, through workers with insufficient or no training. The lack of companies makes inexperienced employees learn the service through the observation of other co-workers, especially the function of servant, which rarely requires complete schooling.

The activities performed by the workers are exposed to inappropriate postures, exhibiting unpleasant sensations and causing changes in the functioning of the body due to increases in fatigue. Excess load brings with it circulatory consequences and muscle fatigue resulting from the work performed (TORRES, et al., 2006).

In the construction industry, ergonomic analysis is still little applied, especially in the building sector, where manual tools and equipment used by workers are most often damaged and inadequate for the performance of a certain work area, due to the fact that companies aim at productivity rather than safety in the work environment (RAJABALI, HOSSEIN, MORTEZA, 2018).

Ergonomics is most often used as prevention, seeking to eliminate problems in different work activities. Regarding the lifting of loads, on certain occasions, it is necessary to use machines/equipment that facilitate its transport, as excessive lifting of weight can cause serious damage to the spine (IIDA, 2005).

2.4. Ergonomic Analysis Tools

The Ergonomic Work Analysis (AET) is a tool used for ergonomic knowledge, analyzing, diagnosing and correcting work situations, classifying the activities performed by individuals at work and guiding the necessary changes for better working conditions. The objective of the AET is to verify the real working conditions, the functions performed by the worker and the real conditions performed at work (FERREIRA, 2015).

NR17 contributes to ergonomics and evaluation tools in obtaining the organization of work through ergonomic principles, with the purpose of improving comfort and safety conditions (BRASIL, 2007).

There are several tools for performing an ergonomic analysis, and the choice of which tools to use should be according to the function being analyzed and the intended objectives (SAAD; XAVIER; MICHALOSKI, 2003).

Some methods used to analyze working conditions, such as ELA, are essential for the analysis and organization of work, as well as the work environment and the activity performed, making the needs of the worker adaptable (SHIDA; BENTO, 2012).

It is important to emphasize that in order to carry out an ergonomic analysis of the work, it is essential that the evaluation proposal imposed by the evaluator seeks to know the reality of the workplace (FERREIRA, 2015).

The difficulties in ergonomic analysis lie in correcting and analyzing inappropriate postures in the work environment (IIDA, 2005).

2.4.1. OWAS (Ovako Working Analysis System)

In 1977 the OWAS method was developed by a group of ergonomists, engineers and workers in Finland. From 1991 onwards, technological versions of computers emerged, in which software was developed to quickly understand ergonomic assessments and make them available to ergonomists (KONG et al. 2018).

OWAS is a method of evaluating the physical load resulting from postures during the work. This method is defined as the ability to absolutely evaluate the positions used in the performance of the task. On the other hand, it obtains evaluations that are not as precise as those mentioned above. The fact that it provides the ability to consider postures over a long period of time, makes OWAS, even though it is an old method, one of the most used in posture load assessments (LIMA, 2019).

This method is observational, that is, they are designated based on observations of the most varied types of postures adopted in the development of tasks at work. The observations of the postures are classified into 252 possible combinations according to the positions of the worker's back, arms and legs, in addition to the loads that the worker is subjected to that will define the posture adopted (GÓMEZ-GALÁN et al., 2017).

2.4.2. RULA (Rapid Upper Limb Assessment)

The RULA (*Rapid Upper Limb Assessment*) method was created in mid-1993 by McAtamney and Carlett, from the University of Nottingham (Occupational Institute of Ergonomics), in order to analyze the performance of workers on factors that lead to a high postural load and can cause disorders to the upper limbs of the body. For risk analysis, the method considers the position, duration and frequency when it is maintained (HABIBI; MOHAMMADI; SARTANG, 20017).

RULA is a method that evaluates individual positions according to the evaluated postures that are exercised in the work they are used to exercising. Suppose a higher postural load, the following will be selected, according to the duration or frequency that presents the greatest deviation from the neutral position (SOUZA; MAZINI FILHO, 2017).

The method obtains scores in which it aims at a certain level of action established in certain positions. This level of action is considered acceptable to indicate a certain position, measures of changes or necessary redesigns in the position. In short, the method allows the evaluator to observe and detect problems arising from ergonomics resulting from excessive posture loads (LIMA, 2019).

3. Methodology

For the development of this work, the following methods of Ergonomic Work Analysis were used: *Ovako Working Analysis System* (OWAS) and *Rapid Upper Limb Assessment* (RULA).

The research design characterizes an exploratory study, with a qualitative approach, assisting in the collection of data to generate accurate results. The sampling is non-probabilistic and intentional, where those evaluated are individuals who work in the sector.

The OWAS method is an assessment of the lower and upper limbs that are analysed from the posture manual. Each posture will receive a postural code consisting of 4 digits. The first digit will depend on the position of the worker's back in the posture evaluated, the second on the position of the arms, the third on the position of the legs and the fourth on the load moved. These codes are designated from tables composed of certain values that are assigned by certain postures analyzed. Unlike other postural assessment methods, OWAS is characterized by its ability to evaluate all positions adopted during the performance of the task together, as shown in Table 1.

Table 1 – Risk categories for corrective actions

Categoria	Efeito da postura	Ação corretiva
1	Postura normal e natural, sem efeitos nocivos para o sistema muscular esquelético	Nenhuma ação necessária
2	Postura com a possibilidade de causar danos ao sistema músculo esquelético	Ações corretivas são necessárias em um futuro próximo
3	Posturas com efeitos nocivos no sistema músculo esquelético	
4	A carga causada por essa postura tem efeitos de extremamente nocivos para o sistema músculo esquelético	Ações corretivas o mais rápido possível Ações corretivas é necessário imediatamente

Source: Guérin (2011)

The RULA method is divided into two groups, GROUP A: arms, forearms and wrists and GROUP B: legs, trunk and neck. Based on the method, scores are assigned to the areas analyzed and values that are represented by each group.

The scores were obtained through the angle of the posture in which the worker is. For each member, a way of measuring the angle is determined, in which the evaluator, when analyzing, will relate the angle that most resembles that of the proposed method.

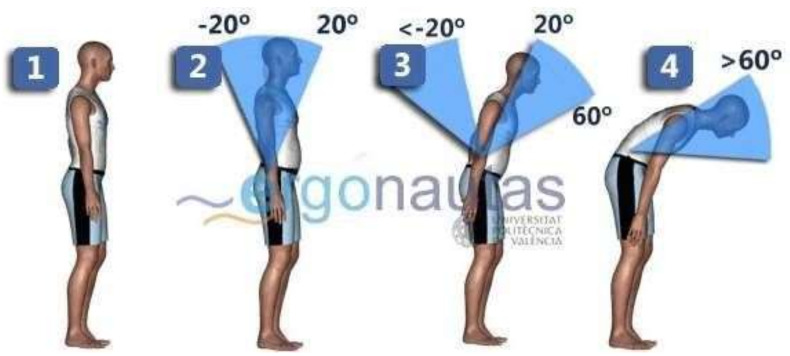
Table 2 - Analysis of the position of the Trunk

Classification according to	**m the position**
Position	**Punctuation**
Neutral Position	1
Flexion between 0° and 20°	2
Flexion> 20° and ≤60	3
Flexion> 60°	4

Source: Guérin (2011)

Subsequently, the groups present the scores in general, which consequently depending on the position analyzed in the posture the score will be increased by one point, according to each member analyzed. From this, the final score is obtained with the appropriate global values modified.

Figure 1 – Analysis of the position of the Trunk



Source: Available at: <http://www.ergonautas.upv.es/metodos/rula/rula.php>

Table 3 – Modification of the Trunk Position

Sum of points for each move	
Modification	**Punctuation**
Rotated torso	+1
Lateral sloping torso	+1

Source: Guérin (2011)

Figure 2 – Modification of the Trunk Position

Source: Available at: http://www.ergonautas.upv.es/metodos/rula/rula.php

First, two 40-minute videos were made, the worker performing the first rows and the other of the same performing the final rows. With the final value of the scores, results are obtained that are proportional to the risks involved in the execution of the task, in which values above 4 indicate a high risk of the appearance of muscle injuries. Through the final scores, the results of the analyzed members are included, and levels of actions ranging from level 1 to 4 are proposed. Level 1 predicts that the evaluated posture is acceptable, while level 4 indicates that there is an urgent need for changes in the activity. Although the method considers other factors, such as forces exerted or repetitiveness, it should only be used to assess the postural load on the upper extremities. The evaluations are individual and not in sets or sequences of postures.

Table 4 – Risk Categories with final scores

Punctuation	Level	Acting
1 or 2	1	Acceptable risk
3 or 4	2	Changes to homework may be necessary; is It is convenient to deepen the study
5 or 6	3	You need to redesign the task
7	4	Urgent changes in homework are needed

Source: Guérin (2011)

The ergonomic analysis of the work was initially carried out based on the OWAS method, which is a postural assessment. In a second moment, the method called RULA was used in order to obtain a correct evaluation of the evaluated limbs, due to the posture adopted.

4. Results and discussion

Based on the results, the following worker postures were analyzed and classified throughout the execution of sealing masonry presented in Figures 3 and 4 of each stage (lowest first rows and highest last rows) and, from the RULA and OWAS methods, the classifications and scores of the limbs were obtained (tables 5 to 11).

Figure 3 – Execution of the masonry elevation (initial rows)

Figure 3 is a representation of the wall surveying process, in which the evaluation is made only of the lower part with a height of approximately 1.20m from the masonry. In the RULA method, scores from 1 to 4 are assigned, but unlike the other method, they are analyzed together with the scores. The scores are analyses carried out from each member that is being evaluated, that is, if there is a change in any of the members, a point is added to the scores. This modification is in accordance with the tables specified by the RULA, for each member the conditions are assigned so that the point is added or even decreased by one point.

Table 5 – Classification and Score of Group A members

RULA				
Group	**Member**	**Position Description**	**Punctuation**	**Work stage**
The	Arm	Extension>20° or Flexion>20° and <45°	2	1
The	Forearm	Flexion between 60° and 100°	1 +1	1
The	Wrist	Flexion or Extension> 0° and <15°	2 +1	1

The scores obtained in Group A first performed the arm score. An analysis of the position of the worker's arms was carried out, that is, it is evaluated from the angle formed in the position of the arm, for this it is necessary a graphic representation demonstrating that the angle formed is of extension> 20 ° or flexion> 20 ° and <45 °. The score for the evaluation is 2, according to the analysis of the table and the figure that is represented. There was no addition of points, because the worker's shoulder is not elevated.

The forearm score is obtained from the angle formed in the tracing of the graphic representation of figure 3, it is evaluated as score 1 which describes that the angle is of Flexion between 60° and 100° and the modification of the forearm score to a movement of one side of the body, which is characterized as a point in the total sum of the limb. And finally, the evaluation carried out by group A is the pulse score. This analysis was made from the tilting position of the wrist. In the score it was identified that the wrist is in flexion or extension> 0 ° and <15 ° and that there is no modification of the pulse in the evaluation, but there is a score of the turn on the wrist that is described as average turn, this occurs when the worker handles the materials. Therefore, the limb is increased by one point.

Table 6 – Classification and Score of Group B members

RULA				
Group	**Member**	**Position Description**	**Punctuation**	**Work stage**
B	Neck	Flexion> 20°	3 +1	1
B	Trunk	Flexion> 60°	4 +2	1
B	Leg	Weight is not distributed symmetrically	2	1

In group B, scores are obtained from the limbs: neck, trunk and legs. First, the neck was evaluated. In this evaluation, it is important to analyze the figures in sequence to determine the angle formed by the worker when performing the service. According to the method specification, the worker's neck is flexion> 20° of inclination which is classified as score 3. This happens because the worker begins to perform the service of the first rows very close to the ground. Another 1 point is added to the modification of the neck because the worker has his neck tilted, this is due to the fact that the work requires movement in the execution of the service.

In obtaining the trunk score, it is important to analyze the position that the worker is in when performing the service. In Figure 3 it is possible that the posture exercised is with the trunk very elevated, that is, it will depend on the angle of flexion of the trunk measured from the angle measured between the axis of the trunk and the vertical, which according to the evaluation is given as a score of 4, which describes that the worker is in flexion> 60 °. In Figure 3, the worker modifies his posture during the work, because in order to pick up the materials that are behind his body, he ends up making a movement with the trunk to pick up these materials and place them in the rows that are being performed. In this case, two points will be added, one of these points is related to the trunk that receives the rotation and the other trunk with lateral inclination.

Leg scores are directly related to the influence of the worker always performing his activities in an upright position. Therefore, the appropriate score for this position in Figure 3 is assigned as 2, which describes that the worker's feet are not supported or the weight is not symmetrically distributed.

Table 7 – Classification and Scoring

Code s (OWAS)				
Back	**Arms**	**Legs**	**Strength**	**Work stage**
2	1	3	1	1

For the analysis, the members were classified separately according to the evaluation methods. Scores from 1 to 4 were assigned in the OWAS method, with evaluations made from the limbs, such as: back, arms and legs, in addition to analyzing the load that the worker handles during the work.

The sequence of evaluations carried out and the members to be analyzed is defined by the evaluator. First, the position of the back was analyzed, scores established by the OWAS method were assigned, in which the most critical position of the worker is evaluated to obtain the limb score. The worker is in a very curved position in the lumbar region. According to Table 7, the worker's position is with inclinations greater than 20º. This position is considered inappropriate in the analysis, where there is a need for postural correction, due to the worker being exposed to muscle discomfort or even compromising the musculoskeletal system.

To assess the position of the arms, an analysis was carried out from the tying of the masonry base to the height of the waist region. The scores obtained were 1, which describes that the worker's arms are located below the level of the shoulders. The position of the legs was analyzed from when he picks up the brick, applies the mortar to the fitting of the block, which is classified with 3 points. Score 3 predicts that the worker is standing with one leg stretched out and the other flexed with the weight unbalanced between the two. These conditions imposed on the choice of scores are associated with the most critical positions that the evaluator determined.

Finally, the evaluation made is the load that the worker is handling. According to the method, the results of the materials used in the work, it was determined that the load used was 4.1kg, the weight was made from the materials presented in Table 8.

Table 8 – Weight of materials used in the construction site

Materials	**Weight (Kg)**
Trowel with mortar	1,6
Ceramic Block 14x19x29	2,5
Ceramic Block 14x19x19	1
Plummet	0,63

With the weights of the respective materials, the score of the evaluation made from the postural load was 1, in which it describes that the weight handled is less than 10kg. With this information, it is possible to know what corrective measures can be applied, according to the data collected and the results obtained.

In Figure 4, the worker is in a more vertical position in the execution of the masonry, due to the walls being at a height above 1.50m. To obtain the scores of the masonry upper survey, it is necessary to analyze the positions that the worker is in the execution of his task.

Table 9 – Classification and Score of Group A members

RULA				
Group	**Member**	**Position Description**	**Punctuation**	**Work stage**
The	Arm	Flexion >90°	4	2
The	Forearm	Flexion between 60° and 100°	1 +2	2
The	Wrist	Flexion or Extension>0° and <15°	2 +2	2

Group A had the following evaluations: arm, forearm and wrist. For the evaluation of the arms, the critical position in which the worker is located was prioritized. When analyzing Figure 4, the position that was decisive for the analysis was when the worker is laying the blocks. The classified score is 4, which describes that the worker has his arms flexed > 90°. There is no change in the scores, because the worker is in a position where he does not have his shoulders elevated or his arms, the limbs are at rest during the execution of the task.

The score obtained for the forearm was determined by the position of the arms, which is measured from the angles formed from the elbows to the hands. The evaluation was carried out jointly, as the positions used by the worker during the execution change many times during the task. For this, the positions when the worker picks up the blocks with the mortar applied until they fit into the row that is being performed were taken as a basis. The score for this evaluation was 2, in which it describes that the arms are in flexion

< 60° or >100°. In this position, there are already changes in the scores. According to figure 4, the worker has the turn in two positions, both on one side of the body and across the middle line. The final score obtained will be the sum of two points, because each turn that is occurring in the execution was added one point, so as there are two movements being performed simultaneously, according to the specifications of the method, the two evaluated scores were added.

The pulse score is obtained from the angle formed in flexion or extension measured in the neutral position. In the analysis, the worker has his wrists in flexion or extension > 0° and <15°, which is classified as score 2. This happens because the worker, when placing the block with mortar on the upper row that is being performed, has his wrist tilted. The modification scores of this limb are classified as score 2, which describes that it is an extreme pronation or supination, that is, the wrists obtain rotational movements mainly in the placement of the rows. The score of this modification will be two points, because the pulse, in addition to the upward turn, has the downward turn, this is due to the fact that there are 2 turns occurring in the limb, each turn is characterized as the sum of one point.

Table 10 – Classification and Score of Group B members

RULA				
Group	**Member**	**Position Description**	**Punctuation**	**Work stage**
B	Neck	Extension in any series	4 +1	2
B	Trunk	Flexion> 60°	4 +1	2
B	Leg	Weight is not distributed symmetrically	2	2

For the evaluation of Group B: neck, trunk, legs, the following considerations were analyses based on the positions performed in Figure 4. To obtain the neck score score, it was necessary to evaluate not only the inclined position of the limb that the worker is subjected to when performing the task, but also when picking up the materials for placement in the row. According to the classification, the score for this limb is 4, which describes that the neck is in extension in any series, that is, at an angle > 0°. The modification evaluated for the neck is the sum of one point, as the worker has his head rotated at all times, because the service requires attention to all details.

The trunk score is evaluated as 4, in which it describes that the worker is subjected to a flexion > 60°. This is because the worker when handling the materials, is in an inclined position. To score the trunk modification, the analysis was performed based on the materials that are being collected, the worker is subjected to a lateral inclination in the limb evaluated, in which a point is added.

In relation to the worker's legs, classified with a score of 2. This score is directly related to the influence of the worker always standing. In which he describes that the worker's feet are not supported or the weight is not distributed symmetrically.

Table 11 – Classification and Scoring

Code (OWAS)				
Back	**Arms**	**Legs**	**Strength**	**Work stage**
4	2	3	1	2

First, the back was analyzed, and a score was assigned to the limb evaluated, which is made from the critical position exercised by the worker. According to the table, the position of the worker is in the flexion and rotation of the trunk (or inclination) simultaneously. This is due to the height of the wall that is located in the shoulder region. This relationship is associated not only with the straight position when performing the service on top, but also when you have to pick up the ceramic block together with the mortar. To obtain the score, it is relevant to analyze the position in which the worker has to handle the materials together with the position of the arms.

The position of the arms for evaluation is analyzed from the position in which the worker picks up the ceramic block and stretches the arms until the block is placed in the row where the service is being developed. The score assigned from the postural code was 2, which describes that one of the worker's arms is located below shoulder level and the other, or part of the other, is located above shoulder level, that is, when handling the materials used in the execution, which is below the waist, the worker lowers one of the arms to pick up the ceramic block and the mortar, and on the other hand, when lifting the masonry from the upper part, it is by stretching the arms for the placement of the block, in this case the most critical position of the worker was evaluated, which is the stretching of the arms in the placement of the blocks.

In the position of the legs, the analysis was made based on the weight manipulated by the worker, that is, when he picks up the brick, he applies the mortar until it fits, to an exposed load that, according to the specification of the method, is defined as score 3**,** in which it describes that the worker is standing with one leg stretched and the other flexed with the weight unbalanced between the two.

Finally, the evaluation carried out is the load that the worker is handling. According to table 8, the result of the materials used in the work was less than 4.1 kg.

5. Conclusion

From the systematic application of the RULA and OWAS methods in the execution of the elevation of the sealing masonry, it was possible to evaluate the postures that the worker is exposed to during this execution.

It was also possible to analyze and classify the postures individually, through combinations of body parts such as the arm, forearm, wrist, neck, trunk, back and legs. The OWAS and RULA method allowed to assess whether the worker performed his function in ergonomically adequate postures or not.

Through the results obtained, it is demonstrated that the limbs in which the worker is exposed to excessive efforts in the execution are considered as critical, this is due to the fact that there is a certain wear and tear on the part of the limb, and are classified as inadequate postures, due to the repetitiveness that the worker exercises in the posture evaluated. Therefore, legs, arms, forearm, back, wrist, neck and the force handled by the worker are evaluated. From these members, points are evaluated and assigned for corrective measures.

It is concluded that, according to the RULA method, changes in the execution of the task may be necessary for the limbs such as the arm, forearm, and wrist, and it is convenient to deepen the study. The trunk and neck urgently need corrections.

Regarding the OWAS method, corrections are needed in the limbs, legs and especially in the back, where it is classified as high risk. The arms and the force employed by the worker are considered to be of acceptable risk and there is no need for changes at the moment.

It is suggested that the worker use a lumbar belt when performing the initial spinning activity to reduce the risk of muscle injuries. In the final rows, it is recommended that the materials used in the task are at the height of the worker's waist so that he does not perform movements of high curvature.

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