

**ERGONOMIC EVALUATION OF JOBS BASED ON NOM-036-1-STPS-2018****Mauricio Lopez Acosta ***, Itzana Melo Flores, Jesors Gerardo Campoy Esquer, Allán Chacara Montes, José Manuel Velarde Cantú.

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DOI: 10.5281/zenodo.3548225**KEYWORDS:** Manual Handling, Evaluation, Risk, Ergonomics.**ABSTRACT**

This research was conducted in a company engaged in the assembly of automotive harnesses, which seeks to solve the problems relating to the manual handling of loads and compliance with current regulations; aiming at assessing and analyzing jobs according to the criteria of the NOM-036-1-2018, in order to keep workers safe in a risk-free environment, thereby complying with the regulations. All staff of the plant, which has a population of 2,971 employees were considered, and these were found 179 performing manual handling of loads located in 17 different positions, which made a total of 38 activities involving manual handling loads. Was obtained from the risk assessment of the 38 activities, 15 are low risk, 22 medium risk and high risk one. Based on these results the program of ergonomics for manual handling of loads, in which the description of the correct technique is presented for the activities of the positions in which manual handling of loads is done is developed, control measures to be taken and preventive actions.

INTRODUCTION

Currently, industries are engaged in a continuous process of change, which must be competitive to stay in the market, managing to comply not only with products and quality services, but also promote the care and development of their staff, (Sibaja, 2002). Due to rapid industrialization in some developing countries worldwide, accidents and occupational diseases paid annually more than 2.78 million lives and occur 374 million related to non-fatal work with more than 4 days off work injuries, this situation is considered to have an economic burden of about 3.94% of gross domestic product each year overall. (ILO, 2019). In low- and middle-income America,

The presence or absence of risk depends largely on the process or service being performed, and safety conditions and existing hygiene in the workplace, building, equipment, tools, raw materials, work in process and finished products, Ferre (2009). ILO (2019) Mexico has records which show that in 2015 there were 236 cases of fatal occupational injuries in manufacturing and 152.133 cases of nonfatal occupational injuries in manufacturing. This situation Mexico is complicated, since the data show increases in illnesses in the work, being the most common skeletal muscle diseases, followed by hearing loss.

Various releases (WHO, 2005; NOHSC, 2004; Howard, 2008; Manuele, 2008b; Creaser, 2008; Manuele, 2008a; Schulte, et al, 2008), concluded that despite significant registered security improvements and health in many parts of the world in recent decades, the global challenge of providing safety and health of workers is greater today than ever, also they argue that you would get improvements in important and lasting health if emphasis were placed on the adoption of effective policies and programs for primary prevention also selecting the appropriate means and methods to establish controls on those identified risks and hazards that could not be eliminated during the design in order to reduce their impact. Therefore, Kudo, Yamada, and Ito (2019) mention that low back pain is one of the main occupational diseases that must be addressed because it is considered that the manual lifting can increase your risk and presented in various occupational fields, hence the importance of developing this type of study using as tools for their solution; safety and industrial hygiene, anthropometry, biomechanics and ergonomics.

Because of the need to safeguard the life and health of workers, they have formulated laws and regulations on occupational health in order to dictate the laws that must meet both employers and workers for the prevention of various risks job. Current legislation in Mexico is the NOM-036-1-STPS-2018: ergonomic risk factors at work-identification, analysis, prevention and control. Part 1: Manual handling of loads, which aims to establish the elements to identify, analyze, prevent and control ergonomic risk factors in the workplace arising from the manual



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handling of loads, in order to prevent changes to health from the workers. Likewise, for compliance with this standard obligations of workers and the employer, prevention, training and development they are also established. While it is true that there are laws, regulations and standards, as well as public institutions that are responsible for implementing actions for occupational health, the reality is that these actions are not sufficient to prevent occupational hazards. To achieve this, it requires the commitment and support of workers and employers to create a culture of prevention, and thus have a healthier work environment, (Sibaja, 2002). The reality is that these actions are not sufficient to prevent occupational hazards. To achieve this, it requires the commitment and support of workers and employers to create a culture of prevention, and thus have a healthier work environment, (Sibaja, 2002). The reality is that these actions are not sufficient to prevent occupational hazards. To achieve this, it requires the commitment and support of workers and employers to create a culture of prevention, and thus have a healthier work environment, (Sibaja, 2002).

In the company under study based on the premise of meeting the ergonomic conditions of the worker is essential to ensure the safety and health of workers assessing compliance with applicable for risk assessment cargo handling regulations was conducted this because the nature of business and manufacturing activities manual handling of loads, repetitive movements and other ergonomic risk situations that have led to accidents, injuries and / or illnesses occur are presented; It is predominant falls, tendinitis, back pain, neck and shoulder pain. Faced with this situation has a program for 5 years to implement strategies such as staff turnover every 3 or 6 months in some of the places where risks are presented.

Objective

Evaluate and analyze the jobs making judgments according to the criteria of the NOM-036-1-STPS-2018, in order to keep workers safe in a risk-free environment, thereby complying with the regulations.

MATERIALS AND METHODS

This research is observational, transverse, experimental not 100% of plant operators will be EVALUATED in the process, without Considering the worker who is covering any disability, absence or illness. The following describe the procedure Carried out for the development of the research, the techniques, tools and instruments used for the collection of information.

Subject under study

The subject under study is a company dedicated to the manufacture of automotive harnesses, considering all those operators that their tasks involving manual handling of loads; It is a total of 179 people, located in 17 different positions, which made a total of 38 activities involving manual handling of loads.

Procedure

To fulfill its objectives, it is presented below in order of the steps:

Characterization System

This step is carried out the identification of activities involving ergonomic risk factors due to manual handling of loads, ie involving lifting, lowering, carrying, pushing, pulling and / or dunnage materials.

Description of activities

Make a description of the identified activities, involving exposed workers, often performing the activity and duration of the activities.

Estimation of the risk level

Estimating the level of risk due to manual handling of loads must be made for: a) activities involving lifting, lowering or transporting loads b) activities involving push and pull or drag materials, with or without the help of auxiliary equipment, must to consider:

1. Risk assessment operations manual handling of loads with a single worker.
 - a) Load weight and frequency.



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- b) horizontal distance between the hands and the lower back.
 - c) Vertical Lift region.
 - d) Lateral bending and twisting of the torso.
 - e) Postural constraints.
 - f) Hand-loaded coupling (fasteners).
 - g) Worksurface.
 - h) Other environmental factors.
2. Estimated risk of cargo transport operations.
- a) Load weight and frequency.
 - b) horizontal distance between the hands and the lower back.
 - c) asymmetric load on the torso.
 - d) Postural constraints.
 - e) Hand-loaded coupling (fasteners).
 - f) Worksurface.
 - g) Other environmental factors.
 - h) Transport distance.
 - i) Obstructions along the route.
3. Risk assessment operations manual handling of loads on equipment.
- a) Weight of the load.
 - b) horizontal distance between the hands and the lower back.
 - c) Vertical Lift region.
 - d) Lateral bending and twisting of the torso.
 - e) Postural constraints.
 - f) Hand-loaded coupling (fasteners).
 - g) Worksurface.
 - h) Other environmental factors.
 - i) Communication, coordination and control.
4. In case of activities that involve pushing or pulling loads without use of auxiliary equipment, perform risk assessment considering:
- a) Activity and load weight (kg)
 - b) Position
 - c) Hand link-load
 - d) Working standard
 - e) Travel distance
 - f) Worksurface
 - g) Obstacles along the route
 - h) other factors
5. In case of activities that involve pushing or pulling loads with the use of auxiliary equipment, perform risk assessment considering:
- a) Type of auxiliary equipment and load weight (kg)
 - b) Position
 - c) Hand link-load
 - d) Working standard
 - e) Travel distance
 - f) Condition auxiliary equipment
 - g) Worksurface
 - h) Obstacles along the route
 - i) other factors



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For any type of activity shall:

- a) Record the color value obtained in each of the analyzed factors for each type of activity.
- b) Determine the level of risk.
- c) Define the actions, according to the level of risk obtained.

Materials

For purposes of this research is needed database files data ergonomic workstations, MAC formats assessment method and NOM-036-1-STPS-2018.

RESULTS AND DISCUSSION

An example of the assessment of the risk level for activity is presented in Table 2. Table 1 a concentrate showing estimation results of the risk level grouped by type manual load handling occurs; either, lifting, lowering or transporting loads manually push and pull or drag materials without the help of auxiliary equipment, push and pull or drag material with the help of auxiliary equipment.

Table 1. Assessment of the risk level of manual loading of materials Receiver position.

AREA:	one					
MARKET STALL:	Receiver Materials (operation 1)					
Risk factor's	Lift up		Transport		Team	
	Color	Value	Color	Value	Color	Value
Weight and rise of the load / frequency transport	Orange	4	-	-	-	-
horizontal distance between the hands from the bottom of the back	Orange	3	-	-	-	-
Vertical Lift region	Red	3	-	-	-	-
Torsional and lateral flexion of the torso; asymmetric load on the torso (transport)	Orange	one	-	-	-	-
positional restrictions (awkward postures, forced or restricted)	Green	0	-	-	-	-
Hand-loaded coupling (fasteners)	Green	one	-	-	-	-
Worksurface	Green	0	-	-	-	-
Other environmental factors	Green	0	-	-	-	-
Transport distance	-	-	-	-	-	-
Obstacles on the route (only transport)	-	-	-	-	-	-
Communication, coordination and control (only manual handling of loads on equipment)	-	-	-	-	-	-
Punctuation	12					
Risk level	Possible means					

Here is a summary of the results obtained from the estimation of the risk level due to manual handling of loads, evaluated the 17 posts presented.



Table 1. General table of results of the risk levels of activities.

AREA	MARKET STALL	Manual loading			Without the use of Auxiliary Equipment			Using Auxiliary Equipment		
		Lift up	Transport	Team up	rolling	Turning on its base	Dragging or pulling	Small equipment	Medium team	team Large
one	operation 1	Means, medium	-	-	-	-	-	-	-	-
	operation 2	Tall	Means, medium	Means, medium	Low	Means, medium	Means, medium	-	-	-
2	operation 1	-	-	-	-	-	-	-	-	Means, medium
3	operation 1	Means, medium	Low	-	-	-	-	-	Low	-
	operation 2	-	-	-	-	-	-	-	Means, medium	-
4	operation 1	Means, medium	-	-	-	Low	Means, medium	-	Low	-
5	operation 1	Low	Low	-	Means, medium	-	-	-	Means, medium	-
6	operation 1	Means, medium	Low	-	-	-	-	-	-	-
	operation 2	Means, medium	-	-	-	-	-	-	-	-
7	operation 1	Means, medium	Low	-	-	-	-	-	-	-
	operation 2	Means, medium	Low	-	-	-	-	-	-	-
	Step 3	Means, medium	-	-	-	-	-	-	-	-
	Step 4	Means, medium	-	-	-	-	-	-	-	-
	Step 5	Means, medium	Means, medium	-	-	-	-	-	-	-
8	operation 1	Low	Low	-	-	-	-	-	-	-
9	operation 1	Low	Low	-	Low	-	-	-	-	-
10	operation 1	-	-	-	-	-	-	-	Means, medium	-

CONCLUSION

Positions where manual handling of loads is performed and risk assessment associated with the manual handling of loads was performed, achieving identify the number of activities that pose risks to workers were identified; based on such information and after analysis, it was concluded that the company currently does not meet all the points that the legislation assesses, however, is not far to comply with those rules because they already had a culture care worker.



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To comply with regulations, program ergonomics for manual handling of loads, in which the description of the correct technique of how to perform the activities of posts where there is manual handling of loads has been developed, measures Control to be taken and preventive actions; one of which involves modifications to the working procedures of two posts and the other involves performing a change in one of the instruments used in the post. So that the implementation of such a program in addition to comply with the regulations would benefit 179 of a total of 2,971 employees. Achieving prevention of occupational hazards, reducing physical workers, injuries, accidents and illnesses discomfort; such as tendinitis, lumbago, neck and shoulder pain that operators currently present. Which could come to represent costs for the company, for example, spinal surgeries can cost from 113.370 to 533.500 pesos representing this only medical expenses. Taking the situation of the company under study, as in the case of high risk, which is done by 26 workers; if they present spinal problems requiring surgery, you would be talking about an expenditure of at least 2,947,620 pesos. In addition, compliance with these rules would avoid the imposition of fines for non-compliance, ranging from 25.670 to 513.400 pesos (Secretariat of Labor and Social Welfare, 2017). For example, spinal surgeries can cost from 113.370 to 533.500 pesos representing this only medical expenses. Taking the situation of the company under study, as in the case of high risk, which is done by 26 workers; if they present spinal problems requiring surgery, you would be talking about an expenditure of at least 2,947,620 pesos. In addition, compliance with these rules would avoid the imposition of fines for non-compliance, ranging from 25.670 to 513.400 pesos (Secretariat of Labor and Social Welfare, 2017). For example, spinal surgeries can cost from 113.370 to 533.500 pesos representing this only medical expenses. Taking the situation of the company under study, as in the case of high risk, which is done by 26 workers; if they present spinal problems requiring surgery, you would be talking about an expenditure of at least 2,947,620 pesos. In addition, compliance with these rules would avoid the imposition of fines for non-compliance, ranging from 25.670 to 513.400 pesos (Secretariat of Labor and Social Welfare, 2017). if they present spinal problems requiring surgery, you would be talking about an expenditure of at least 2,947,620 pesos. In addition, compliance with these rules would avoid the imposition of fines for non-compliance, ranging from 25.670 to 513.400 pesos (Secretariat of Labor and Social Welfare, 2017). if they present spinal problems requiring surgery, you would be talking about an expenditure of at least 2,947,620 pesos. In addition, compliance with these rules would avoid the imposition of fines for non-compliance, ranging from 25.670 to 513.400 pesos (Secretariat of Labor and Social Welfare, 2017).

The work on the care and worker safety is not just a matter of business ethics or legal issue that directly benefits the worker, but knowing direct targets also represents a competitive application for any organization, obtaining a reduction of expenditure on health occupational, raising productivity, preventing failures, solving problems and operational efficiency, and improvement in employee commitment to the organization.

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