

Human Factors in Issues Responsible for Use or Disuse of PPE in Construction – Case Study

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Abstract:

This research aims to analyze the factors responsible for the use or disuse Personal Protective Equipment (PPE) in a construction work carried out in the city of Bauru/SP. PPE are all single use devices in order to provide protection against risks that may threaten the safety and health, and may even lead to death of the worker user. The methodology was applied in a bibliographic research approach and field research, which data collection was carried out with construction workers in the city of Bauru/SP, by applying a previously structured questionnaire. At the end of this research we reached the conclusion that the lack of effective supervision and the lack of ergonomics of the equipment are the main reasons for non-use of PPE for a small share of workers.

Keywords: *Construction, Personal Protective Equipment (PPE), Security.*

Introduction:

The construction industry is a sector of the Brazilian economy of great importance. It is linked to the industrial sector which depends almost entirely of manpower. This workforce consists, for the most part, by male contingent of economically less privileged social classes who are at risk of fatal occupational accidents and not considered fatal occupational accidents and incidents.

The incident can be defined as an unscheduled event could hinder operational efficiency on a construction site. According to Gonçalves (2003) the accident is also an unscheduled event that results in an injury or illness to one or more employees of the site. The prevention of incidents is necessary to prevent accidents at work, since every accident is an incident, however not every incident is an accident.

Pursuant to Art. 19 of Law No. 8,213, of July 24, 1991:

Art. 19 Work accident is what happens for the exercise of the company's service business or the exercise of work of the insured referred to in item VII of article 11 of this law, causing personal injury or functional disorder that causes death or loss or reduction, permanent or temporary, the ability to work. (BRAZIL, 1991).

According to the Statistical Yearbook of Industrial Accidents, in 2011 the construction had 59,808 accidents at work, while in 2012 the figure stood at 62,874. Note that each year the number of accidents increases, a fact that deserves attention.

Companies in the construction sector are aware of the negative psychological impact when accidents occur with death on construction sites. Because of this, the issue of workers' collective and individual security is becoming increasingly important in construction because it is one of the industrial sectors with the highest accident rates.

According to the Regulatory Standard 6 (RS 6), Personal Protective Equipment (PPE) is any device or product, for individual use used by the worker, for the protection of susceptible risks threaten the safety and health at work.

According to Lopes Neto and Barreto (1996) PPE should be used in specific and legally established situations such as the case where collective protection measures are not feasible, emergency or while collective protection measures are being implemented.

There are many impasses by workers regarding the use of PPE. The acceptance and awareness of the use by them is a big problem. PPE are often trivialized by its use lack of legislation, instructions and standards accessible to workers.

According to Araújo (2003), the main causes of accidents are the long working hours, night work, inadequate temporary facilities, lack of use or misuse of PPE, among other factors.

For Montenegro and Santana (2012), PPE must be practical, effective, easy to maintain and strong. So, with the most comfortable and efficient equipment, the worker will accept more readily the use of PPE. Thus, productivity is not largely affected.

PPE are divided in terms of body areas. There are equipment for head protection, eye and face, hearing, respiratory, upper limbs (hands and arms), lower limbs (feet and legs) and the trunk. There is also equipment against falls.

PPE most used in construction are related to:

- Head protection: are used skull protective helmets against impacts. They are the types front flap, overall flap or front flap with visor.



Figure 01: Helmet type front flap. Source: http://www.deltamt.com.br/prod_capacetes.php



Figure 02: Helmet type full tab. Source: <http://www.hsj.com.br/loja/produto.php?produto=129>



Figure 03: Helmet type front flap with visor. Source: <http://s-trabalho.webnode.com.br/outros/e-p-i/>

- eye and face protection: are used masks and safety glasses with clear or dark tint lenses.



Figure 04: Safety glasses. Source: <http://www.danny.com.br/oculos-de-protecao/oculos-seguranca-fenix-fume-cinza.html>

- Hearing protection: are used plugs, ear muffs or ear plugs.



Figure 05: Noise earmuffs. Source: <http://www.superepi.com.br/protetor-auditivo-s50/>



Figure 06: Ear Protector. Source: <http://www.superepi.com.br/protetor-auditivo-s50/>

- Respiratory protection: are used masks and disposable air purifying respirators and filter.
- Protection of the upper limbs: They are used protective gloves in scrapes, vaqueta or rubber. The zest of glove used for handling stressful materials such as transport concrete blocks. The vaqueta glove is suitable for electrical activity. Rubber glove is used for handling cement, mortar and products that undergo chemical reactions.



Figure 07: scrapes Glove. Source: <http://www.caepi.com.br/luva-de-raspa-cano-curto--p4023>



Figure 08: vaqueta Glove. Source: <http://www.equipamentodeprotecaoindividual.com/epi/luvas-de-protecao/luvas-de-vaqueta>



Figure 09: Rubber glove. Source: <http://segurancadotrabalhonwn.com/o-que-e-epi/>

- Protection of the lower limbs: boots are used, leather boots or long-barreled rubber boots, protecting against punctures, falling objects and slipping.
- Trunk Protection: are used aprons, jackets and pants waterproof fabric.
- Fall Protection: we use the harnesses seat belt, which is attached to the cable life by lanyard (which can be single or double). There is also the device hangs falls, catching possible falls of the professional while working at height. According to the RS 35.1.2, working at height is the work done over 2 meters high, where there is risk of falling.



Figure 10: Seat belt harnesses. Source: <http://www.equipamentodeprotecaoindividual.com/epi/cintos-de-seguranca/cinto-de-seguranca-paraquedista>



Figure 11: Lanyard. Source: http://www.as-solucoes.com.br/loja/index.php?route=product/product&product_id=273



Figure 12: fall arrest device. Source: <http://www.lojamaxipas.com.br/cat/cintos/5207.html>

Importantly, all PPE has a CA (Certificate of Approval) provided by the Ministry of Labor and Employment.

According to the legislation, together with PPE, any construction activity should also present the Collective Protection Equipment (CPE). According to the RS 10, the CPE is every device, mobile or fixed collective scope, which has the purpose to preserve the physical integrity and health of employees and contractors. Among the most common CPE include: traffic cones, warning tapes, metal grille, strobe flag¹, stool and insulating blanket. However, in practice, often only the PPE is used for security professionals, not occurring analysis of the collective environment.

¹ Flag Strobe: Service Identification, works, accidents and calls on streets and highways. Source:

<http://www.metallica.com.br/equipamento-de-protecao-coletiva-epc>



Figure 13: Signalling cones. Source:

http://maceio.tudotemos.com/market/oborrachao_VendasdeConesdesinalizacao_SegurancaeEquip_16017



Figure 14: Signal Tapes. Source:

<http://novorumosegurancadotrabalho.blogspot.com.br/2012/12/equipamento-de-protecao-coletiva-epc.html>



Figure 15: Grid. Source: <http://www.enfoquevisual.com.br/catalogo/isolamento-de-area>



Figure 16: Flag strobe. Source: <http://www.distrinox.com.br/produto/sinalizador-de-led-strobo-com-base-magnetica.html>

Among the difficulties of application of CPE, we can mention the impossibility and the technical infeasibility. The failure occurs because of the physical facilities of some works not behave such equipment. And the impossibility is related to the economic sector, because due to market forces, it is not feasible to invest in something temporary.

In construction the order of most accidents is: falls, electric shock and burials. These accidents are due to work at great heights and excavation without the use or misuse of PPE.

At construction sites is also observed absenteeism. It is characterized by the absence or delay of employees at work due to some reasons, such as illness, personal problems, transportation problems, repetitive movements, excessive workload, and poor supervision, among others. In construction, the workers' absenteeism is due to back pain and increases considerably in winter because due to the cold, workers get sick more easily.

Absenteeism leads to increased costs for businesses due to paid workers and momentary replacement contingent away. These factors affect productivity and the quality of services provided.

Objectives:

The objective of this research is to identify what are the main reasons why the construction workers, in most cases, not to use or minimize the use of Personal Protective Equipment (PPE) while conducting works.

There is also the objective of this research show awareness of measures that can be adopted to prevent and mitigate the impacts of accidents at work, seeking improvements in the safety, health and the work generating the effect of increasing worker efficiency.

The objectives will be achieved through a literature search in various information sources, and a field survey which data collection will be performed with construction workers through a previously structured questionnaire.

Methodology:

The research will be developed in two stages. The first time was the development of literature, where it identified the factors that are important for the development of research. In a second step a questionnaire was applied to the construction workers on the use of PPE in their activities at the construction site.

For the preparation of this research will use the quantitative method. They will be collected information, opinions and data with subsequent analysis by resources and statistical techniques. This collection was performed by applying the questionnaire to construction workers. The questionnaire was structured to make an assessment of whether to use of PPE in everyday activities in construction, within a daily work routine.

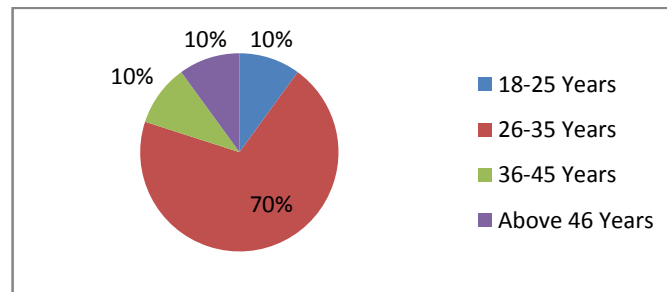
All questionnaires were analyzed and the data were divided by their contents. Ten construction workers were interviewed. The number of interviews was previously established as being 10% of the quota of the project workers. The selection of respondents was made randomly, with voluntary participation.

Results and Discussion:

This research has quantitative character, that is, beyond the bibliographical research in scholarly articles, books, databases and specialized sites, a questionnaire was applied to workers of a construction work in the city of Bauru/SP.

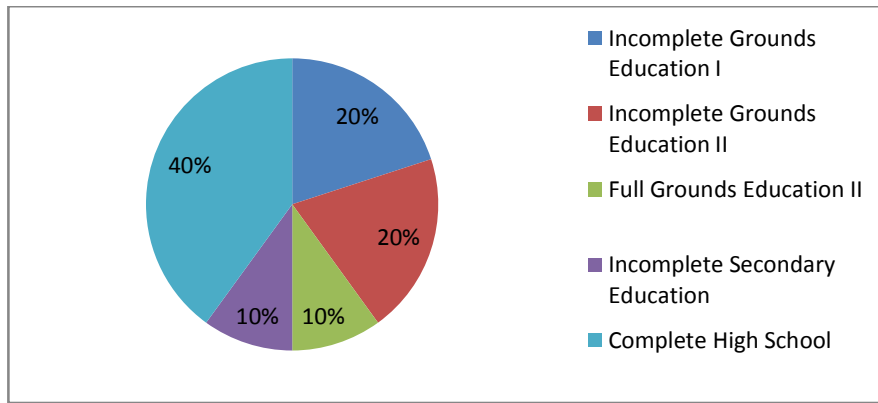
The work of this residential building is located in Garden Infante Dom Henrique neighborhood and the interview was held on November 18, 2014, between 12:30 and 13h15min with a sample of 10 employees, representing 10% of the work contingent. Thus, we obtained a construction company's profile and behavior of workers in relation to PPE.

The workers interviewed are all male, mean age 33.6 years. As the graph 01, 10% of workers are aged between 18 and 25 years, 70% between 26 and 35 years, 10% between 36 and 45 years and 10% of respondents have more than 46 years.



Graph 01: Age of workers.

The education of respondents is quite varied. According to the graph 02, 20% of workers have incomplete grounds education I, 20% have incomplete grounds education II, 10% have full grounds education II, 10% had incomplete secondary education and 40% have complete high school.

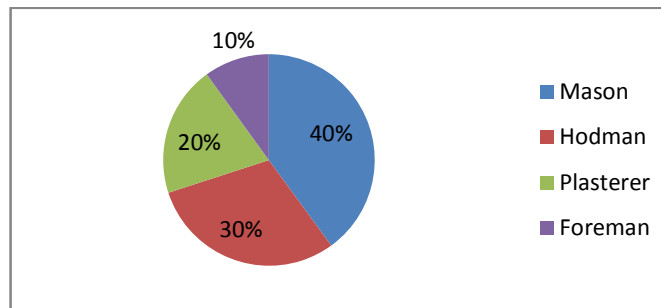


Graph 02: Education workers.

It can be concluded that the construction absorbs little skilled labor of people with low educational level. But it is observed that the higher the education level of workers, more aware of the need to use PPE they own.

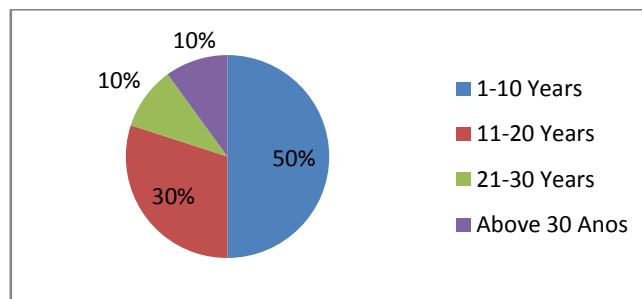
Oliveira and Pilon (2003) claim construction as the industry-absorbing labor without proper qualification. This is because the work on the construction site does not require experience, prevailing quantity over quality.

The workers interviewed have various functions in construction, among which: mason, hodman, plasterer and foreman. This variety can be seen in the graph 03.



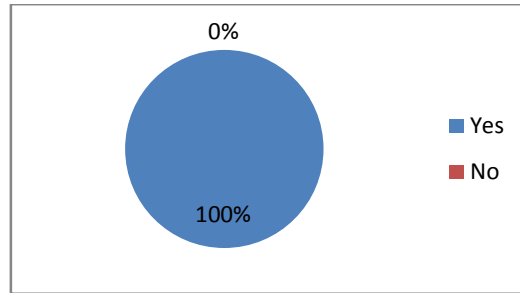
Graph 03: Function in construction.

As for the time working in construction, according to the graph 04, 50% work 1-5 years, 30% 11-20 years 10% 21-30 years and only 10% work for over 30 years in construction.



Graph 04: Switching time in construction.

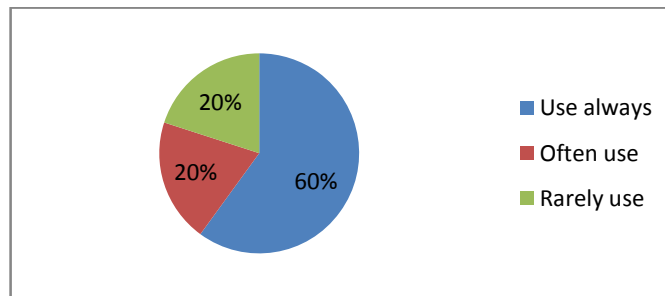
As to question 1, if the builder provides the necessary PPE, all workers said yes, according to the graph 05. As follow-up question was asked so they speak which PPE are provided. They are: ear, mask, goggles, gloves, safety belt, helmet and boots.



Graph 05: The construction company provides PPE required for its function?

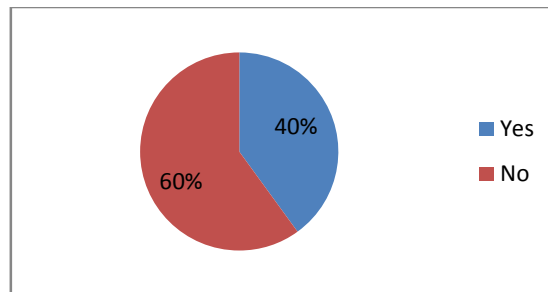
This question showed the behavior of the major construction companies in the construction industry. Due to legal regulations, provide all the necessary PPE employees, according to each function as specified by RS 6 and require their use.

Question 2 was intended to know the frequency with which workers used PPE. As the graph 06, 60% use always, 20% often use and 20% rarely use.



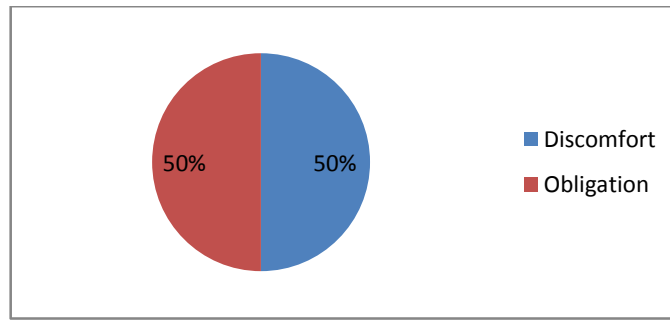
Graph 06: How often use the supplied PPE?

According to the third question, which was raised whether the workers like it or not to use PPE, it may be noted from the graph 07 that only 40% like to use them.



Graph 07: Do you like to use them?

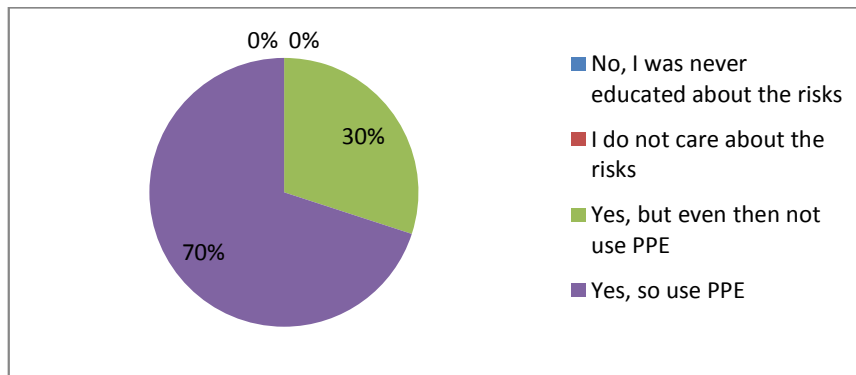
Question 4 was applied only to respondents who answered NO in the previous question. The reason for this question was to know why the workers do not like to use the PPE. The six responses (60% of the previous question) were divided equally between obligation and discomfort, as the graph 08.



Graph 08: If the answer is NO, why do not like to use them?

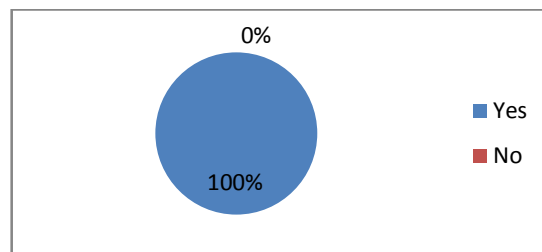
The biggest complaints about the use of PPE are linked to workers over time profession. They believe that with the experience, know the risks in the workplace and have less chances of suffering accidents, however, as a rule of construction, are required to use them.

As to question 5 on the awareness of risks of non-use of PPE, it can be seen from the graph 09 that all workers are fully aware of them.



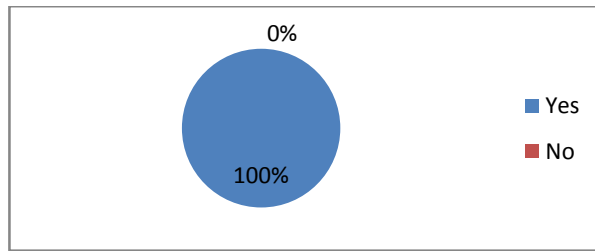
Graph 09: You are aware of no use of PPE?

To question 6, it was raised if they have had some instruction on the proper use of PPE, 100% of workers said they have had, as the graph 10.



Graph 10: Have you had any instruction on the proper use of PPE?

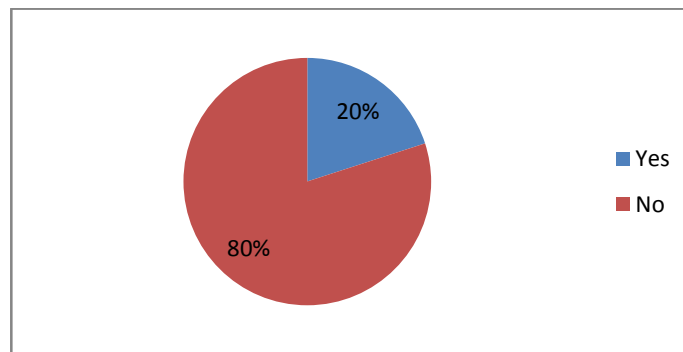
Question 7 raised if the employee finds it interesting that the construction companies to invest in education on the use of PPE. Again, all respondents find this valuable initiative, according to the graph 11.



Graph 11: Do you think the interesting construction invest in lectures and / or training on the proper use of PPE?

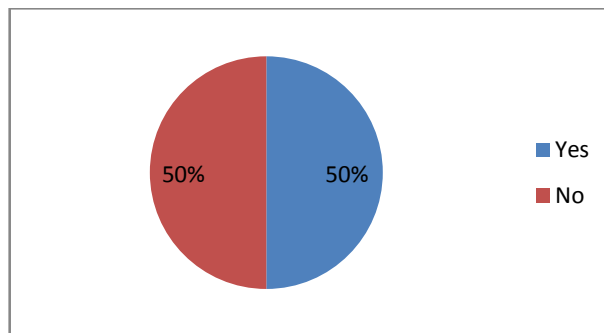
According to interviewees, the construction company to which they are providing service always promotes lectures and short courses on health and safety in the workplace. For the interview the morning, by coincidence, a lecture on hygiene at work was given.

The last two questions have more personal. Question 8 wanted to know if workers have suffered an accident at work. Only two (20%) had already suffered in the past. One of them fell off a ladder from a considerable height and the other broke his arm. The result can be seen in graph 12.



Graph 12: Have you suffered an accident at work?

Question 9 was held to just two workers who had already suffered work accident. The intention was to raise this issue if they were using or not the PPE during the accident. According to the graph 13, one used and the other does not.



Graph 13: If YES, used PPE when he suffered?

Conclusions:

According to the data obtained from the questionnaire on the use of PPE to employees working in the area of construction of a work in Bauru/SP, we can highlight the construction, which they provide service, offer and demand the use of PPE for all those who are within the limits of the work.

It's really worrying that workers over time of profession, are mostly the do not like to use the PPE, and use only under compulsion. The justification given by them is that the devices are uncomfortable and hinder the execution of certain functions, there are ergonomic problems. However, younger workers do not fail to use them because most have awareness of the risks that non-use of PPE can cause. One of the workers, during the interview, denounced that a small minority of employees that work does not use the supplied equipment. According to him, this happens by the lack of oversight by the construction company.

Importantly, all employees of that construction had instruction on the proper use of PPE, either by constant lectures or courses. All workers think it is important that action passed awareness by the construction.

The building has its own characteristics, making up almost exclusively of hand labor, which increases the risk of accidents, requiring special attention to safety, both by builders as by workers.

Importantly, the construction site must also submit the CPE, so that together with PPE can reduce the chances of accidents. The result of the awareness of workers will be observed in the long-term, favorable to both workers and construction companies that will lower costs with accidents, disability and death at the construction site.

Final Considerations:

This research sought to identify, through the use of quantitative techniques of data collection, the factors responsible for the use or misuse of PPE in a construction work carried out in the city of Bauru/SP. Data analysis showed positive and negative actions on the part of the Construction Company and workers.

The positive action of the construction refers to the fact that it offer PPE to all employees and invest in lectures and courses on health and safety at work. For workers it can be noted that many of them have awareness of the negative consequences of non-use of PPE. The negative action on the part of the construction is over there is no intense scrutiny in the use of equipment by employees. In relation to workers, some of them do not like to use and a minimum percentage of these do not use PPE even being forced by the construction.

Required by law as a way of preventing accidents, only requiring the use of PPE and simply providing not prevent accidents from happening.

At the end of this research we reached the conclusion that the lack of effective supervision and the lack of ergonomics of the equipment are the main reasons for non-use of PPE for a small share of workers. It is necessary to reassess the adaptation of the same towards people who use them, not only considering anthropometric questions, but also the quality of the materials used, so that the workplace becomes safer and more pleasant, bringing more quality life to the worker.

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