



A qualitative analysis on occupational health and safety conditions at small construction projects in the Brazilian construction sector

Haroldo Pereira Gomes ^a, Pedro Miguel Ferreira Martins Arezes ^b & Luiz Carlos Fadel de Vasconcellos ^c

^a Federal Center of Technological Education Celso Suckow da Fonseca, Rio de Janeiro, Brazil, haroldopgomes@gmail.com.

^b Center Algoritmi, University of Minho, Guimarães, Portugal, parezes@dps.uminho.pt

^c National School of Public Health-Fiocruz, Rio de Janeiro, Brazil, elfade@globo.com

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Abstract

The main objective of this study is to analyze the perception of Occupational Health and Safety in small construction projects in the Brazilian construction industry. The adopted approach is qualitative in nature and seeks to understand the character of the current practices through interviews held with 'actors' who are directly involved in small-scale building sites, as well as with others who are involved in large-scale work sites. In Brazil, there is a weakness in supervision at small construction projects. This is due to numerous factors, such as the low visibility of these types of works and short deadlines, as well as the lack of knowledge about Occupational Health and Safety. This study reinforces and illustrates the idea of the inherent dangers involved in the occupational health of workers in small construction projects. It also indicates that there is a need to put greater emphasis on compliance with Occupational Health and Safety principles, which are covered by the current Brazilian Legislation and Regulatory Standards. This should be undertaken in order to ensure that the work in small-scale building sites is more visible and, especially, to ensure acceptable health and safety conditions for construction workers.

Keywords: Occupational; Health and Safety; construction; accident prevention; small construction projects.

Un análisis cualitativo de las condiciones de salud y seguridad en el trabajo en pequeños proyectos de construcción en el sector de la construcción brasileña

Resumen

Este estudio analiza la percepción de Salud y Seguridad Ocupacional en pequeños proyectos de construcción en la industria de la construcción brasileña. El enfoque adoptado es de naturaleza cualitativa y trata de comprender el carácter de las prácticas actuales a través de entrevistas. En Brasil, hay una debilidad en la supervisión en pequeños proyectos de construcción. Esto se debe a factores como la baja visibilidad de este tipo de obras, así como la falta de conocimiento sobre la Salud y Seguridad Ocupacional. Este estudio refuerza la idea de los peligros inherentes a la salud ocupacional de los trabajadores. Hay necesidad de poner énfasis en el cumplimiento de los principios de Seguridad y Salud Ocupacional. Esto debe asegurar que el trabajo en las obras de construcción a pequeña escala sea más visible y para garantizar las condiciones de salud y seguridad aceptables para trabajadores de la construcción.

Palabras clave: Ocupacional; salud y seguridad; construction; prevención de accidentes; pequeños proyectos de construcción.

1. Introduction

The main regulatory legislation covering safety and accident prevention in the Civil Construction Industry (CCI) in Brazil is the Regulatory Standard – NR-18. This is a legal document and it provides several guidelines to ensure a good working environment and safe working conditions in construction industry workplaces.

It was established by Decree 3214 of June 8th 1978 [1]. This regulatory standard is the most important tool that focuses on measures for the prevention of accidents, as well as on Occupational Health for this business sector. Despite this, the document is only really followed by the larger companies, where contract workers are part of the formal employment market: this legally implies an employment relationship, and a formal contract.

The NR-18 requires that all kinds of construction projects, regardless of the size of the construction site, should follow the established rules [2].

The standard also states that companies with more than 20 employees must prepare a specific accident prevention program: the Program of Working Conditions and Environment (PCMAT). Therefore, in construction sites with fewer than 20 employees, there is no legal obligation to comply with these rules [3,4].

It is also necessary that all construction projects, regardless of their size, adopt the Environmental Risk Prevention Program (PPRA for its acronym in Portuguese). This is the initial reference to risk-prevention in all construction sites (provided by NR-9 and is established by the same Decree). In addition, the Program for Medical Control of Occupational Health (PCMSO for its acronym in Portuguese) aims to preserve and guarantee the workers' collective health, and the NR-35, of April 2014, deals with working at heights and the safety requirements to do so. However, in small construction projects, given their temporary and provisional character, such regulations are rarely considered, which results in the absence of the development or monitoring of any accident prevention program or workers' health promotion programs [4,5].

When trying to better define the concept of a small construction project, we assumed that it involves activities that include: repair, demolition, painting, cleaning and maintenance. Small house constructions, house renovations, painting facades, as well as small public works are generally included under this label, and many are artisanal endeavors, that are unplanned and with informal labor and temporary work.

Even if the rules and legal documents were to be adopted in the entire country, in the recent past in Brazil those small construction projects – houses, apartments or offices – were never inspected, and, therefore, there was no need for them to be supervised. To perform any residential construction work, the resident would only have to inform the condo board about the need to enter the building with construction materials, or about a possible shutdown of the water valve [2,6,7].

According to data from the Statistical Yearbook of Social Security [8], in 2012 there were 705,239 accidents, of which 62,874 were in the construction industry (CCI). These accidents are mostly caused by poor working conditions at building sites, especially due to falls, machine handling, sharp equipment and electrical installations [9].

In this context, the goal of this study is to demonstrate that the invisibility of small construction projects in the Brazilian construction industry makes them less secure, and that, coupled with the weakness in the application of Occupational Health and Safety Policies, this framework that makes these small construction projects increasingly prone to accidents [10-14].

2. Materials and methods

As the research developed, we decided to take a qualitative approach in order to analyze the knowledge and perspectives of professionals in various fields of training, as well as various performance levels in the construction industry in relation to Health and Safety Policies in small construction projects [15].

We undertook an analysis of the interviews, which were grouped by previously selected themes, to identify which looks that these respondents had on each of the topics [16].

This approach allowed us to establish a dynamic relationship between the real world and the subject, that is, an inseparable link between the objective world – where there are rules, laws and norms – and the subjectivity of the subject: what he thinks, how he sees his work environment and its relationship to his own work. As this was a study of a qualitative nature, a sample of professionals involved in building construction was selected, which was sufficiently representative of the area that was studied.

The research was conducted in three cities in the Rio de Janeiro Federal State. The cities, and their inhabitants' descriptions, according to IBGE data [17], are the following:

- the capital city, with the same name of the state – Rio de Janeiro, which has more than 6 million inhabitants;
- Niterói, which has around 500 thousand inhabitants;
- and Angra dos Reis, with 170 thousand inhabitants.

These diverse cities have allowed a more comprehensive view of the small construction projects taking place in medium and large cities in the State – in which there are many projects due to the growth of these cities, especially in the capital. Also, due to the authors' knowledge of construction work and people linked to this activity, there was an effort to diversify the categories of people interviewed as much as possible in order to obtain the widest range of opinions as possible, both about the construction sites and the occupational health of construction workers.

In general, it is very difficult to gain the trust of a worker in the lower level of the hierarchy in such a way that he/she can express his/her opinion about the reality of his/her labor. There is a frequent fear that if they express criticisms it could be used against them. It was also important to interview people who are in command and guide the works in order to gain a bigger picture of the group of people involved in a particular workplace. This was the case as the aim of this study was to find out the flaws that lead to the inherent dangers of occupational health and work injuries in construction. Thus, semi-structured interviews, with professionals from various categories were considered to be the best option to achieve the goals of this study. The interviews were carried out by following a script that served as a guide to better understand the professionals' perception about the characteristics of small construction projects. This script was previously prepared and underwent certain adjustments after a pilot test with a sample of some typical respondents. The interviews were not recorded and all respondents were previously informed of the survey's main content survey and had the guarantee that they would not be identified.

The central focus was to see how these respondents saw the differences between large and small construction projects, with emphasis on the knowledge they had on regulations: protection practices; the most commonly encountered failures; the differences between protection, inspection and surveillance in accordance with the size of the works; perception of the protective equipment; the understanding of the causality of the most frequent accidents on building sites and in the practices of prevention; as well as the role of the State in supervising working conditions and occupational safety.

The interviewees included people responsible for supervision, as well as professionals from several areas that operate in the sector or are directly involved in the processes of small construction projects, and the workers themselves. In order to draw comparisons, professionals from large-scale construction projects were also interviewed. A total of thirty-one people were interviewed:

- 2 auditors/labor inspectors: a doctor and an engineer;
- 2 Occupational Safety engineers;
- 6 civil engineers working on small construction projects;
- 3 civil engineers working on large-scale construction projects;
- 1 engineer from the Municipal Office of construction works;
- 1 architect of a large construction project;
- 1 occupational physician;
- 3 building technicians;
- 1 construction foreman;
- 2 people in charge of construction works;
- 2 site managers on small construction projects ;
- 2 trade union representatives;
- 2 bricklayers;
- 2 painters;
- 1 small-project employee

The interviews were carried out either on the construction sites or in their offices, as would be the case of an actual inspection by auditors/inspectors. During the description of the interviews we state that all the professionals were male, although there were women involved [2] as a further means of identity protection.

In this study, a sample of 31 Respondents was considered, which is broad enough to include different professionals who are rather directly or indirectly involved in the construction industry. The answers allowed us to outline an overview of the research in which “the assessment of the theoretical saturation from a sample is made by a continuous process of analysis of data, which began in the early process of collection [18]”. We arranged a comprehensive reading of the entire material, and then the most significant content from the reports was selected, which was analyzed as being relevant issues.

3. Results

Considering the size of the group interviewed, we cannot generalize the answers, but we can certainly see that these responses revealed many insights that are common to the world of construction workers.

3.1. *Different comprehensions of small work*

The conceptualization or definition of what respondents consider to be a small construction project aimed objectively at focusing on what kind of specific safety measures should be adopted by this type of project. This is an extremely controversial issue, in which the most frequent distinction was made between small or large works, depending on the number of workers involved on these sites.

For a civil engineer, “a small building site has up to 8 employees”. According to a person in charge of the works, a

small building site has “less than 50 employees”. Another engineer, from the Municipal Office of Works, said that “a small work has up to 50 employees”, while an auditor engineer believed that the small construction site “has between 100 and 200 workers”.

This divergence among respondents reveals an absence of a specific parameter based on a choice of classification criteria in the literature, as well as expressing a lack of knowledge of the rules.

3.2. *Occupational safety and health in small construction projects*

Each respondent also had a different understanding regarding safety in small construction projects, which leads to a weakness in the appreciation of the reasons for and aims of Occupational Health. In fact, most respondents expressed their understanding by making comparisons with the large-scale construction projects and gave more emphasis to the use of Personal Protective Equipment (PPE) while ignoring other forms of workplace and job safety. Either explicitly or implicitly, they stated that in a small work, there is no safety policy and attributed this deficiency to various reasons.

“The worker involved in an accident or is ill as a result of a situation in which PPE was not used, besides being at fault, is considered irresponsible, negligent etc. [19]”. Thus, there are only a few times when the many factors that limit the use of PPE and other safety items are valued. Often, the safety equipment is not provided by employers and, also, workers also neglect the use of this equipment “because rarely the technicians responsible for security matters and occupational health give them due importance. [19]”.

Based on his own experience as a civil engineer of a small construction project, the lack of safety in the small construction projects is because they are directed by supervisors and instructors who generally lack the necessary training in basic safety principles. This exposes the workers to heightened risks of accident frequency. “The fact is that, today, my main competitors are those in charge, and supervisors of constructions sites who gather a small team and do renovation work, facades, etc., without having professional qualifications to meet the safety standards and prevention of accidents at work in their small construction projects”.

Similarly, the sample building technician also attributed the lack of prevention and safety to the small construction projects’ short deadlines, while in larger projects, because they take longer to complete, health practices are applied with more vigor. “In small construction projects, the principles of prevention and safety are not accounted for”. Thus, this professional was suggesting that small work on a facade or a renovation is done over a short period, which undermines monitoring and surveillance of the workers’ health and safety and its basic principles and practices. Because these are projects that often last only a few days, in a country as large as Brazil, such supervision is hard to enforce, and all too often the owner of the property himself is unaware that these standards covering workers’ safety should be applied. This leaves their use to the workers’ discretion.

In contrast, a safety engineer thought that safety should not only be found in large-scale construction sites, because the workers' safety and health precepts should ensure everyone's mutual safety. Thus, the respondent pointed out that the application of safety standards must be present both in large and small projects: "practicing safety is just one aspect, and the target for the prevention of accidents is the human being. Thus there should not be many differences only due to the size of the work sites, since every individual should be subject to the correct (and legal) requirement of the prevention policy that is adopted at the workplace".

Another civil engineer of a small work considers that technicians and engineers must ensure accident safety and prevention, which, in his opinion, is synonymous with the use of protective equipment. According to him, "the PPE for a small or large work is the same. What differs is the equipment for collective protection. As such, in a large works, it may be necessary, for worker safety protection, to employ CPE". He then concludes that "the use of equipment is crucial for worker protection, as is the monitoring of its use by engineers and technicians, i.e. those responsible for the training and the use of safety equipment".

A trade union representative, who is also a safety technician, highlighted the crucial contribution of these professionals – the engineers and technicians. He also mentioned the need to incorporate the knowledge that comes from workers' experience as something key in creating a safety and accident prevention policy that strengthens and makes the management more efficient and resolute. According to him, "everything that may contribute to safety on the job is important, it is also important to listen to the person in charge, the workman, the bricklayer. These are all people who make a valuable contribution to safety at work". He also pointed out something else as being extremely important: "companies with fewer than 20 employees could have an environmental risk prevention program, thus the conditions of the working environment and the inherent risks could be evaluated".

In the same terms, the auditor who is a doctor pointed out that it is not about distinguishing between small or large construction sites, but about being committed to the workers' health because "it is important to have quality rather than quantity". Also, everything depends on the company's organization, and he concluded that "everything will depend on the company's focus, as for some people, safety and health are not an investment but an expense: a bureaucratic obligation".

3.3. Small construction projects versus knowledge and applicability of rules

Few respondents demonstrated a broad or even partial knowledge of the NR-18 and its applicability for small construction projects. "The implementation of the NR 18 – Working Conditions and Environment in the Construction Industry, which make it mandatory for establishments with twenty employees or more to prepare the Working Conditions and Environment in the Construction Industry – PCMAT" policy, means that even in small construction projects "it is recommended that the same concepts are

applied [3]", with the obvious necessary adaptations.

However, more than half of the respondents had no knowledge of the rules in the industry, for example the architect who said he was unaware of the NR-18 and that "all I have learned was due to practice". A construction technician also claimed to have no knowledge about the rules, saying: "I never studied them in any school or course I attended. But, if it is a standard, it applies to all works". The engineer at the Municipal Office of Works similarly declared he was unaware of the NR-18 and any safety policy and prevention of accidents: "I do not know of any safety policy and accident prevention. I do not know about the NR-18".

Other interviewees said they were partially aware or had only heard of the NR. A civil engineer said: "As I am an engineer I know them, but I do not fully know their content". A construction technician pointed out: "I have heard of the NR-18, but I do not know the norms in-depth".

Among those who knew the standard there were different opinions. For example, the auditor who is a doctor pointed out that the NR-18 resulted from Convention 167 of the International Labour Organization (ILO) and highlighted its importance as a disciplinary standard in the industry, in terms of the creation of the standard: "the development of the NR-18 is key for the CCI sector, first because it is a standard that allows the company to organize, to plan the operation of the construction site and all the inherent duties". He also stated that the rules should be applied to works of any size. The auditor who is an engineer also related the norm to the ILO Convention, saying that the NR-18 was an adaptation of International Standards. However, "there is no standard applicable if the company does not have the basic principle to apply it. However, the NR -18 is very important because it 'civilized' the world of work in the CCI, giving it direction".

However, for the auditor who is a doctor the standard is intended to standardize all situations and, given its complexity, it generates difficulty of applicability in practice. This is because it only considers, for example, accidents at work as homogeneous phenomena, "creating a standard that tries to embrace everything and ends up leaving margins for errors and failures in the rules themselves and in their applicability. Each accident at work is different from another, but the fact that the NR-18 procedures were not applied is rarely noticed". This interviewee also questioned whether the standard was flawed, in the sense that it was intended to be applied to everything, but actually, there should be different parameters for each type of work.

One of the construction technicians, who works on small construction projects, also highlighted the importance of the NR-18 for all kinds of workplaces. However, according to the definition of the auditor who is an engineer, he believes that its effective application depends on the builder's willingness to do so: "for the working masses these rules often pass by unnoticed, but if the workers were aware of the rule, it would make a serious contribution to its applicability. I consider the NR-18 fundamental as a working tool, for the construction technicians' performance of and the preservation of workers' health and lives".

Four professionals in the area of safety – two auditors, one safety technician and one safety engineer – commented on the complexity of the NR-18. They identified issues such

as the fact that the rules standardize every situation as if the accidents were always the same, most being completely preventable falls. In this sense, the safety engineer commented on the excesses of wanting to standardize the small construction site: “the big projects are well supervised and, therefore, tend to comply with the rules, and the company is required to apply all the methodologies of the NR-18. However, in the small construction projects it is almost impossible to comply with everything required by the standards”.

For one of the auditors (engineer), the standards contain some determinations that are difficult to put into practice at every site: “many measures can be implemented and others cannot, it depends on the work environment (...) the rules are applicable where appropriate, and these are work safety rules that establish universal safety links”. He also pointed out other precautions in safety policy that need to be taken into account in small construction projects: “for small construction projects, the burden is not the rules, but other needs related to the work process and to the bureaucracy. There is a need for doctors, accurate documentation, planning and various mechanisms that the small companies cannot take care of. There should be rules, even when they are small construction projects: houses, condominiums, domestic work”. The respondent concludes that, after all, there are companies that are mediocre at performing their duties; however, “since the inspection does not see them...”

It is worth mentioning the opinion working at a civil engineer of a large construction site, who said that he also knows the rules and puts them into practice with great accuracy, despite the financial burden that this might represent. However, he mentioned that it is necessary to make the requirements for small construction projects more explicit: “I believe that the standard could give greater emphasis to the smaller works, which often cannot afford to meet the demands of everything that is requested, such as changing rooms, cafeterias, etc.”.

For a civil engineer, it is necessary to educate the workers, the technicians and the employers in order to ensure that the rules are applied: “there is no difference in the applicability of the standards relating to the size of the construction site or building. Therefore, the standards must be applied and, concomitantly, the awareness of both the employee and the employer must be promoted”.

3.4. Workplace accidents and their causality

There are only a very few studies in academic literature about the percentage of workers in the construction sector who have suffered some kind of industrial accident (considering that the official data only refers, as a rule, to Employees with a formal contract in larger works as they are rare in small construction projects). One of these rare studies indicates that approximately 42% of construction workers suffer accidents [20]. Considering that this percentage represents almost half the workforce, it is worth contemplating if many of the accidents, such as falls, cuts, punctures and electrical shocks, could not have been avoided.

The auditor (engineer) notes that in Brazil the blame for the accident lies on the worker, when it should be attributed

to the working conditions and the work process itself. The same engineer compares the different rhythms imposed in the works as one of the causalities of accidents: “in other countries, the rules have a purpose. The Government states that in a given industrial sector there should be fewer than “X” accidents, while in Brazil, the blame is on the worker, who is not alone in being guilty. The main determinant for accidents is the work process”.

Thus, it is possible to state, as this respondent pointed out, that it is the job content – the pace, the production of the work – that causes the accidents. For him, “the pace of the work is different when considering small or large construction projects, and, therefore, the way of thinking is different. Serious industrial accidents usually happen in the large construction works, in which, theoretically, there is more protection”. He concluded that Companies “have to keep in mind the principle that there should be no risk at the workplace” and not that the blame must lie on the worker who committed some type of error/mistake.

The auditor (doctor) also questions the blame imposed on the employee in accidents at work, and highlights the new standard on machines as a breakthrough to overcome this viewpoint, as the underlying principle is fail safe: “the issue refers not to the worker himself, but the pace of work. That is, what is required of the employee is to understand his working condition. In the new industrial safety standard for machines there is a new principle: the fail safe concept. The concept of always putting the blame on the worker is withdrawn”. In addition, a safety engineer also criticized putting the blame on the worker, emphasizing the need to ensure the existence of prevention of accidents in the workplace, regardless of the size of the company: “safety is the main point, and the aim of accident prevention is the protection of the human being”.

3.5. Fragility of public policies

It was found that, with respect to the public policies, three of the 31 respondents raised important issues concerning supervision; all are professionals in areas directly involved with the responsibility of preventing accidents, namely the auditor (engineer), one civil engineer and one person in charge of the works. Some of the respondents pointed out the failures of the Government and of the supervisors as the main causes of the accidents that are still happening.

For the civil engineer of a small construction project, the Government is negligent and surveillance is non-existent. According to him, the supervision is merely bureaucratic and ineffective, and he associated the absence of safety policies to the absence of government effectiveness: “in my company, we are complying with all the accident prevention and safety regulations, I am the engineer responsible for the works. I believe that the entrepreneur has to do the social part, take care of workers’ safety and prevent accidents at work”. In terms of the shortcomings of surveillance, the auditor initially highlighted the lack of appropriate training of the auditors themselves in being able to fulfill their function: “currently, the auditors are not prepared for the work they do. Recently, civil service examinations have allowed people with any initial training background to apply as auditors, which

increases the gap between normative evaluation and the production of technical knowledge”. A union representative, besides highlighting once again the firm action of the union, hinted that the practice of surveillance is sufficient to solve the companies' safety issues: “although everything is notified, when the company no longer meets the NR-18 the union acts firmly in promoting an inspection, in order to maintain the required level of workers' health and safety”.

4. Discussion

The NR-18 brought important innovations; however, it is not necessary to advance the legislation, but rather with its applicability in all of the country's building Sites. The risks must be noted, and on each site a risk map must be created, which allows all workers to observe the critical points of the building site. Thus accidents can be avoided and the fundamental rights of citizens can be improved in order to preserve their health, life, safety and ensure decent work.

However, there is a large gap between what the legislation requires or recommends and how it is applied. It is true that in the larger construction sites there is a more effective obedience to the precepts of the Occupational Safety and Health standards, whereas in small construction projects, following these criteria depends on the conscience of each worker. Often, a small renewing a facade or remodeling is done without an engineer or architect's supervision, and it is not uncommon that the bricklayer decides the criteria to carry out the work. In such cases, he may even outsource to one or two assistants, but the issues of safety and health are left aside. Situations can occur, for example hanging on railings to place frames or not even wearing a mask for sanding plaster when lowering ceilings. In addition to these risks to the safety and health of the worker, there may be structural risks in the workplace. The worker himself may or may not know whether these risks exist, depending on his level of education. Very often, however, this knowledge is only acquired through practice.

Regarding the different views on small construction projects, the divergence between what the respondents interpret by small projects is very shocking. It appears that even engineers are unaware of the NR-18 criteria (describing small construction projects as those that have fewer than 20 employees, as having more personnel would mean the rules apply). They consider that a small construction site may have from 100 to 200 employees. It has been pointed out that the lack of knowledge of what constitutes a small project is very common and, in this sense, there are only few who realize that the work of remodeling a facade is considered to be a small work [2, 4]. In this sense, other researchers have shown that the rules should apply to every type and size of work, as long as they are clearly adapted according to the size. However, the lack of knowledge and doubts were clearly reflected by the respondents' answers [3].

As for Occupational Health and Safety in small construction projects, the employee who is blamed when involved in an accident or becomes ill because of a situation in which the PPE was not used, is considered negligent. However, a safety engineer commented that, “safety is paramount, and the aim of accident prevention is the human

being”. In this aspect, it does not matter whether the bricklayer works at a large construction site or performs a particular service for the owner of a residence: the differences in safety levels will certainly exist, but there is a need to educate the worker and the contractor about this need. Thus, “every individual should be subject to accident prevention in the workplace [19]”.

This indicates the need to recall the issue of the recent collapses of entire buildings in Rio de Janeiro, particularly the accident in Cinelândia, where three office buildings collapsed simultaneously. The cause was the lack of safety and supervision in the small task of remodeling of an office in the largest building (with more than 20 floors). This required the removal of the internal structure of its floor, which caused an accident that had a “domino effect”. If the workers and users of the commercial buildings had understood the rules, and the safety of the work itself, as well as necessary supervision perhaps this accident could have been avoided. The literature showed that the nomadic nature of construction workers makes it difficult to control the works and, therefore, work at small construction projects can be a real danger [21]. Another study summarizes that the very construction process leads to a weakness in the health of the worker [5].

Regarding the relationship between small-sized construction projects and the knowledge and the applicability of the rules, the result of the interviews unveiled that more than half of those interviewed were unaware of the NR-18. If engineers and employees of a Municipal Office of Works are ignoring them, how is it possible to make an individual worker with less theoretical training (such the site manager, bricklayers, and support staff, etc.) to know and make sure they comply with its principles?

The standard should be simplified in order to be applicable to small construction projects [3]. Perhaps, in this way, a handbook for contractors and employees would be a more practical way to raise awareness.

Several Researchers consider that accidents in CCI and its causes are due to the lack of notification, that is, supervision [2]. According to one respondent, an auditor who is an engineer, the cause of the high rate of accidents lies in the size of the work: major works have a higher degree of protection, while smaller works have a different pace, and the “way of thinking is different”. Therefore, it was considered that it is important to clarify to those who are self-employed or working in small construction projects the importance of equipment, safety, and protection of their own health and that of their colleagues. It is also common that many workers – regardless of the size of the work and provided there is no visible inspection – consider safety items unnecessary to prevent accidents. This is also more common in small construction projects. Therefore, promoting education, training and health are essential in this context.

Finally, concerning the fragility of the public policies, it is the Government's responsibility to ensure the Welfare of all. However, the States often fails to monitoring the construction sites and to fulfill their obligations to the construction companies [15]. Yet, for one interviewee, a civil engineer, the Government is negligent in terms of this issue and there is no effective supervision. The rules exist but are

not used, and there is a lack of supervision, creating a negative snowball effect [22].

All around the world, studies are being held on the health and safety of workers in the construction industry and. In the European Union– at every economic level– countries are seeking to adapt to new realities and advocating a greater protection for the workers in this important sector. Examples of EU countries would be the UK and France: countries with a strong economy and which have traditionally been pioneers in labor legislation. They are seeking to review accidents to improve prevention programs. Similarly, countries with economies that are still being consolidated in the EU, such as Poland and the countries that recently joined, such as the Czech Republic, Lithuania and Hungary, are still reviewing the causality of accidents in the construction industry to create or adapt good practices for safety and prevention.

Studies held in the UK in 2003 show that inspectors estimate that 50% of the accidents in the construction industry are the contractor's fault, and that the safety and health of the workers in the construction industry must be considered to be their highest priority. Thus, this study recommends a review of workers' safety and health policies, an accurate review of accidents, improvement of audit reports and consultation with workers, since they are the ones who deal with the risks on building sites every day [23].

Another study evaluates the importance of training for professional assistants in small companies in the construction industry, explaining that, in France, the small businesses are those with fewer than 20 employees. In addition, it highlights that 40% of artisanal enterprises are included in the construction sector (with about 250,000 companies). To avoid the risk of accidents, the *Organisme Professionnel de Prévention du Bâtiment et des Travaux Publics* (OPPBTP) has developed a program with the *Fédération Française du Bâtiment* (FFB) in order to develop training and promote best practices in safety and prevention [24].

Another study shows that the construction industry is characterized by the high rate of accidents and that, in Poland, in 2012; this figure reached 9.17 people per 1,000 workers. This is the highest percentage of all EU countries. In this context, the authors present three models to analyze the causes of accidents in the construction industry: the analysis of the causes of failures, the energy transfer method, and the accidents in the workplace of the European Union (Eurostat) [25].

By analyzing the use of ergonomic equipment for injury prevention in construction, Kaminskas stated that, in 2000, 43% of construction workers in the European Union believed they were at risk in their work. Furthermore, the author states that the 12 candidate countries applying to become members of the European Union at that time (Estonia, Lithuania, Latvia, Poland, Czech Republic, Slovakia, Hungary, Slovenia, Romania, Bulgaria, Cyprus and Malta) had a percentage of 42% industrial accidents, whereas the European Union had 27%[26].

With these few examples, it is possible to see that Brazil also falls within the same international context of accident prevention and evaluation of worker safety and health in the construction industry. Admittedly, in the United States and Canada, as in many European Union countries, some

problems in relation to work in the construction industry are region-specific and are not found in Brazil. For example, we can highlight the use of foreign labor, unskilled or even illegal immigrants, which is not the case in Brazil (or the problem is minimal). The international financial crisis that is affecting the construction industry worldwide is also a factor; however, this has so far not affected Brazil. What can be observed in the international literature, is that in relation to the risks of accidents at work, there is a common element, i.e., the fact that the legislation is detailed but not always observed. Good safety and prevention practices are not always applied and, finally, there is a need to review these best practices, in particular when it comes to small construction sites that are remodeling a building or perhaps repairing a facade, which worldwide, and especially in Brazil, still remain 'invisible' [23 - 26].

5. Suggestions and recommendations

The discussion, as it has been presented, had the intention to suggest the adaptation of the current standard and the creation of a specific legislation for small construction projects, emphasizing only the most important items of safety and accident prevention. The fact that the accidents are mainly falls, electrocution and perforation accidents, these three aspects should be prioritized.

It also seems clear for the authors that the Municipal Office of Works needs to have engineers and safety technicians who are responsible for certain areas of the city. These professionals would be responsible for visiting small construction projects that, under some criteria of classification and inspection, would be the responsibility of their office. Thus, simplifying does not mean diminishing the responsibility of employers, but rather helping small construction projects so that they can meet the minimum requirements regarding accident prevention

Another suggestion is the regularization of small construction projects. If these small projects, within the appropriate parameters, were officially notified, there would be a greater awareness and wider application of safety and accident prevention regulations at all building sites. It must be considered that a small project is an essential component of urban housing infrastructure. It is possible to verify by random criteria that in any block of any city in Brazil, regardless of its size, there are innumerable multitudes of small construction projects. These are both the responsibility of the Government, and of private companies, even perhaps of the ordinary citizen.

6. Conclusion

In the microcosm that is the construction site, it is evident that in large companies the safety and accident prevention regulations are practiced more regularly, either because more specialized personnel work on these projects – technicians, doctors and engineers –, or because they are more visible in terms of surveillance. This makes the company feel obliged to comply with regulations.

This situation does not occur in small construction projects when a façade is being remodeled, for example. As

several interviewees pointed out, small projects do not comply with laws, rules or knowledge about safety. And, since these projects are ephemeral, temporary and highly mobile, there is no supervision. It was also shown that the use of the seat belt, helmet, goggles, gloves and boots (all PPEs) are the maximum that most of those responsible for works actually enforce. They have little knowledge about organization, such as the work pace, requirements, training, safety devices and redundancies, and management of health and life protection.

As discussed in a recent study [2], since April 2014 it has become mandatory on a national level for interior works of any size to follow the rules of supervision and inspection that were created by the Brazilian National Standards Organization – ABNT, NBR 16280/2014 [1]. With this regulation, some preventive measures for occupational safety and health were introduced. In addition, new regulations have been implemented in some Brazilian States, for example state that was analyzed in this paper, Rio de Janeiro, the third most populous in Brazil. This state is currently going through a period of major investments in infrastructure due to previous works that were undertaken for the FIFA World Cup in 2014, as well as for the forthcoming 2016 Olympic Games. It should be noted that in this state, State Law (6,400/2013), which imposes supervision on internal or external works; and complementary State Law (126/2013), which imposes supervision every five years; as well as in the municipality of Rio de Janeiro, Decree 37426 of 2013, which establishes technical inspection, were created with a view to further supervise works. Residences with one or more families (i.e. houses or apartments), are however excluded from these regulations. This issue has become more important insofar as these laws and regulations only came into force after serious work accidents occurred in commercial or residential interiors, with the collapse of entire buildings.

However, if works with fewer employees are exempt from following safety requirements, each contractor or worker will have to consider their own safety and that of their colleagues.

In this context, it seems important to make the smaller construction projects more ‘visible’, in order to begin some practices that are increasingly oriented and focused on the promotion of the construction workers’ health and safety. Thus, the current study aimed to identify, through the opinion of people involved in construction works, the level of their knowledge about the promotion of health and safety working conditions.

Among the various types of professional occupations that were interviewed in this study, only a few knew the specific legislation. Some accused workers of trying to systematically avoid the use of safety equipment, while some workers accused employers of not informing them about the need to use of this equipment. Regardless, their reactions denote the lack of information and the negligence of the companies or contractors who do not prioritize safety. The respondents, besides revealing that they have a worrying lack of knowledge of the health and safety rules, pointed out that accident prevention is limited to the use of a few PPE, not understanding, or knowing, that there are many other measures, both personal and collective, that could be

adopted. Blaming the worker has been a constant practice, although the real cause of the accidents lies in the lack of corporate responsibility with regard to work organization.

To transform the reality of failures into safe policies and health practices for the construction worker, even in small construction projects, it is necessary to take into account some aspects, namely: awareness, learning and accumulated knowledge, motivation, supervision and surveillance, guidance, and effective accident prevention management on the construction sites. However, there is still a long way to go. There is a general recognition that the work process needs to be modified, but some important aspects are still missing, such as disseminating knowledge and good safety practices, promoting workers’ health and giving more ‘visibility’ to small construction projects, as well as ensuring safe and healthy working conditions for workers in the small construction industry in Brazil.

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References

- [1] Brasil., Ministério do Trabalho e Emprego. Associação Brasileira de Normas Técnicas – ABNT. NBR 16.280/2014. [Online]. 2015. [Date of reference January 15th of 2015]. Available at: <http://www.abntcatalogo.com.br/norma.aspx?ID=311358>.
- [2] Gomes, H.P., Arezes, P.M.F.M. and Vasconcellos, L.C.F., Environment, health and safety policy in small construction sites: An analysis of the situation in Brazil. Paper 108. SHO. U. Minho, pp.127-129, 2015.
- [3] Fleuringer, A.T.B. e Pusck, J., A execução da obra e a excelência profissional. Programa de Excelência. Projetos, execução e manutenção. Engenharia, Arquitetura, Agronomia e Geociências. CREA-PR e Entidades de Classe. Curitiba: CREA-PR, 2010.
- [4] Gomes, H.P., Construção civil e saúde do trabalhador: um olhar sobre as pequenas obras, PhD. dissertation. Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz, Rio de Janeiro, Brazil, 2011.
- [5] Dalcul, A.L.P.C., Estratégia de prevenção dos acidentes de trabalho na construção civil: Uma abordagem integrada construída a partir das perspectivas de diferentes atores sociais, PhD. dissertation. Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, [Online]. 2001. [Date of reference January 15th of 2015]. Available at: <http://hdl.handle.net/10183/1747>.
- [6] Silva, J.B.V., A falta de planejamento das pequenas empresas na construção civil. [Online]. [Date of reference January 17th of 2014]. Available at: http://www.ecivilnet.com/artigos/planejamento_pequenas_empresas_construcao_civil.htm.
- [7] Santos, A.R.M., O Ministério do Trabalho e Emprego e a saúde e segurança no trabalho. In: Chagas, A.M.R., Salim, C.A. and Servo, L. M.S. (Eds.). Saúde e segurança no trabalho no Brasil: Aspectos institucionais, sistemas de informação e indicadores. Brasília: IPEA, 2011, pp. 21-76.
- [8] Brasil., Ministério da Previdência Social. Anuário Estatístico da Previdência Social. [Online]. AEPS 2012. Brasília: Ministério da Previdência Social. [Date of reference January 15th of 2015]. Available at: http://www.previdencia.gov.br/wp-content/uploads/2013/05/AEPS_2012.pdf.

- [9] Saurin, T.A., Famá, C.C. e Formoso, C.T., Princípios para o projeto de sistemas de medição de desempenho em segurança e saúde no trabalho: A perspectiva da engenharia de resiliência. *Prod.*,23(2), pp.387-401, 2013. DOI: 10.1590/S0103-65132012005000072
- [10] Melo-Filho, E.C., Rabbani, E.R.K. and Barkokébas Jr, B., Avaliação da segurança do trabalho em obras de manutenção de edificações verticais. *Prod.*,22(4), pp.817-830, 2012. DOI: 10.1590/S0103-65132012005000024
- [11] Bridi, M.E. et al., Identificação de práticas de gestão da segurança e saúde no trabalho em obras de construção civil. *Ambient. constr.*,13(3), pp.43-58, 2013.
- [12] Costa, L.R., Subcontratação e informalidade na construção civil, no Brasil e na França. *Cad. CRH*, 24(62), pp.413-434, 2011. DOI: 10.1590/s0103-49792011000200012
- [13] Costa, L.R. e Tomasi, A.P.N., De peão a colaborador: Racionalização e subcontratação na construção civil. *Cad. CRH*, 27(71), pp.347-365, 2014. DOI: 10.1590/S0103-49792014000200009
- [14] Silva Jr., D.C. e Cambraia, F.B., Modelo do processo de ação fiscal de segurança e saúde do trabalho na construção de edificações. *Ambient. constr.*, 13(3), pp.29-41, 2013.
- [15] Taulil, R., O poder de polícia e a fiscalização municipal, [Online]. 2006. Consultor Municipal. [Date of reference January 25th of 2015] Available at: www.consultormunicipal.adv.br.
- [16] Minayo, M.C.S., O desafio do conhecimento: Pesquisa qualitativa em saúde. São Paulo: Hucitec, 2010.
- [17] Brasil. Instituto Brasileiro de Geografia e Estatística – IBGE. [Online]. [Date of reference February 07th of 2015]. Available at: www.ibge.gov.br.
- [18] Fontanella, B.J.B. et al., Amostragem por saturação em pesquisas qualitativas em Saúde. *Cad. Saúde Pública*, Rio de Janeiro, 24(1), pp. 17-27, 2008.
- [19] Vasconcellos, L.C.F., A voz do povo é a voz de deus: Provérbios da boca do povo e os riscos à saúde no trabalho. *Boletim da Saúde*, Porto Alegre, 20(1), pp. 159-168, 2006.
- [20] Carvalho, R.J.M. et al., Condições de trabalho na construção de edificações no triângulo Crajubar – CE. In: XVIII Encontro Nacional de Engenharia de Produção. Anais. Rio de Janeiro: RJ, Brasil, 1998, 6 P.
- [21] Lima, R.O., Verificação da qualidade na construção civil em um pequeno canteiro de obra de Foz do Iguaçu, uma mudança de paradigma. *Foz do Iguaçu: União Dinâmica das Faculdades Cataratas. Curso de Engenharia Civil*, 2008.
- [22] Takahashi, M.A.B.C. et al., Precarização do trabalho e risco de acidentes na construção civil: Um estudo com base na Análise Coletiva do Trabalho (ACT). *Saude Soc.*, 21(4), pp. 976-988, 2012. DOI: 10.1590/S0104-12902012000400015
- [23] Dalton, M., An examination of dutyholder responsibilities: Fatal construction accidents 1997-2002. University of Manchester, Institute of Science and Technology/ Health and Safety Authority, Manchester, U.K. 2003.
- [24] Branca, A., Prevention training for spouses and/or other assistants in very small firms (VSES) in the building industry. *Safety Science Monitor, Short Communication I-2*, 1(3), 2007.
- [25] Hola, B. and Mariusz, S., Analysis of the development of accident situations in the construction industry. *Procedia Engineering*, XXIII Science Direct. R-S-P Seminar, Theoretical Foundation of Civil Engineering, 91, pp. 429-434, 2014.
- [26] Kaminskias, K.A., The prevention of trauma by ergonomic equipment in the construction industry. *Safety Science Monitor. Article IV-4*, 1(7), 2003.
- H.P. Gomes**, has a PhD. in Public Health from the National School of Public Health- Oswaldo Cruz Foundation in Rio de Janeiro, Brazil. He is a visiting fellow on the Post Doctoral Program/University of Minho – Portugal. He is also a professor at the Federal Center of Technological Education Celso Suckow da Fonseca (CEFET-RJ, Brazil) and has experience in the areas of occupational health and construction industry. ORCID: 0000-0001-9787-7383
- P.M.F.M.Arezes**, has a PhD. in Industrial and Systems Engineering from U. Minho, in Portugal, and he is currently a full professor of Ergonomics and Human Factors at the same university. He is also a visiting faculty member at MIT's AgeLab in the USA. He leads the Human Engineering Research Group and he is also the Coordinator of the Engineering Design and Advanced Manufacturing (EDAM) focus area of the MIT Portugal Program at U. Minho, and the chair of the steering board of the "Leaders for Technical Industries (LTI)" PhD program at U. Minho, Portugal. ORCID: 0000-0001-9421-9123
- L.C.F. Vasconcellos**, has a PhD. in Public Health from the National School of Public Health - Oswaldo Cruz Foundation in Rio de Janeiro, Brazil. He is also a professor at the same school. He graduated in Medicine from the School of Medicine and Surgery. He also works as a Doctor in the Brazilian Ministry of Health at the Oswaldo Cruz Foundation. He has experience in medicine and public health, with emphasis on occupational medicine, occupational health and health policies. ORCID: 0000-0002-7679-9870



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