

Fundamental Brazilian standards for safety at work in civil construction

Abstract

Background: This article presents a review of the Brazilian norms defined by the Ministry of Labor and Employment in order to minimize accidents in civil construction that represent one of the sectors with the highest risk to workers. Through literature review, the text aims to present the specificities of construction in relation to the guidelines regarding the use of safety equipment; site design to improve the jobsite life quality and standards for complex services such as excavation, height mounting and pneumatic work. It was concluded that the improvement of safety standards has allowed the minimization of accidents and greater attention to the needs of construction workers.

Keywords: safety at work, civil construction, Brazilian standards, protective equipments

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Abbreviations: ILO, international labour organization; WHO, world health organization; CNAE, national classification of economic activities

Introduction

In Brazil, the labor safety legislation is based on the federal constitution, on the consolidation of labor laws (in Portuguese known as CLT), on the regulatory standards (in Portuguese known as NR) and other complementary laws such as ordinances, decrees and international conventions of the International Labour Organization

(ILO) and of the World Health Organization (WHO). The degree of activity risk ranges from 1 to 4, according to the National Classification of Economic Activities (CNAE). This risk increases the more dangerous the activity is considered, i.e., degree 4 is the maximum hazard. Table 1 shows that on civil construction predominates risk degree 4.¹

Brazilian ministry of labor and employment's database, divides civil construction into three groups of accidents: specialized construction services (concentrates 20.9% of sector accidents); large group civil construction (43.1%) and infrastructure works (36%).²

Table 1 Risk degree for civil construction considering Brazilian standards

Activity	Risk degree
Demolition and land preparation	4
Drilling and execution of foundations for civil construction	4
Great earth moving	4
Buildings (residential, industrial, commercial and services)- including full extension and reform)	4
Road works - including maintenance	4
Large structures and works of art (bridges, viaducts)	4
Urbanization and landscaping works	3
Industrial assemblies	4
Construction of dams and dams for the generation of electricity	4
Construction of stations and distribution networks of electricity	4
Construction of telephone stations and networks and communication	4
Electrical installations	3
Installations of air conditioning systems, ventilation and cooling	3
Hydraulic installations and natural gas, fire prevention, lightning arrestor	3
Masonry and plaster	3
Waterproofing and painting services in general	3
Construction equipment rental and demolition with workers	4

Source: ¹

Material and methods

This paper presents the regulatory standards (in Portuguese known as NR) created by the Brazilian ministry of labor and employment based on the federal constitution of 1988 which states that: the worker has the right to the protection of his health, physical and moral integrity and safety in the execution of his activities. Work must be carried out under conditions that contribute to the improvement of quality of life and personal and social fulfillment; also implying that worker safety and health are the responsibility of the employer and the professionals involved in the work environment.³

Thus, the research uses the virtual archive of the said Ministry to list the Norms referring to the construction sector.

Results

- a. Regarding the safety management groups, work environment, layout and dimensioning (of refectory, Toilets and dormitories) at the construction site, the main guidelines are:⁴

NR 4: Specialized services in safety engineering and occupational medicine (in Portuguese known as SESMT): establishes the obligation of public and private companies with to organize and maintain trained teams, for the purpose of promoting health and protecting worker integrity in the workplace.

NR 5: Internal commission for accident prevention (in Portuguese known as CIPA): similar to SESMT, this commission must present suggestions and recommendations to the employer to improve working conditions aiming to eliminate the possible causes of occupational accidents and diseases.

NR-7: Occupational health medical control program (in Portuguese known as PCMSO): corresponds to the elaboration and implementation of PCMSO by all employers and institutions that admit workers (in any industry, including civil construction).

NR 8-Buildings: Minimum technical requirements to ensure safety and comfort to workers.

NR 18: Working conditions and environment in the construction industry and NR 24 - Sanitary and comfort conditions in the workplace: both address administrative, organizational planning guidelines for the implementation of control and safety measures.

NR-18: Also establishes the PCMAT (in English, work conditions and environment program in the construction industry) with the fundamental objective of risk prevention, information and training of workers that will help reduce the chance of accidents, as well as reduce their risks.

NR 23-Fire protection: Rules for fire prevention systems during the execution of works.

- b. Regarding the maintenance of health and protection of workers, stand out the following norms:⁴

NR 6: Personal Protective Equipment (in Portuguese known as EPI): defines the types of protective equipments, companies are required to provide to their employees, whenever working conditions require, in order to safeguard the health and physical integrity of workers.

NR 9: Environmental risk prevention programs (in Portuguese known as PPRA): establishes the obligation to elaborate the program not only aiming at the workers' integrity, as well as the protection

of the environment and natural resources. This standard limits the value above which preventive actions should be initiated in order to minimize the likelihood that exposures to environmental agents will exceed exposure limits.

NR 15: Unhealthy activities and operations: this guideline defines the concept of tolerance limit: as "the concentration of maximum or minimum intensity related to the nature and time of exposure which will not cause harm to the worker health during his working life".

This standard considers several types of exposure: pressure, heat, humidity, noise, impacts, vibrations, vapors, contact with products such as the use of toxic paint and solvents, flammable, oxidizing and corrosive products, and a common example in construction: concrete blasting in tunnel construction (producing excess particulate matter) and working in improper position (such as assembling and welding of metal structures). This theme is also addressed in NR 17- Ergonomics: aiming at adapting working conditions to workers' psycho-physiological conditions.

- c. **NR 15** can be directly associated with the guidelines:⁴

NR 21:Open pit work: Preventive measures in open pit activities, such as outdoor mines and quarries;

NR 22-Underground work: excavation safety methods;

NR 33: Safety and health at work in confined spaces;

NR 35-Work at height: standard for any activity performed above two meters, where there is a risk of falling.

With a focus on civil construction, the above mentioned standards are of great importance in excavations and tunnels, sanitation networks (confined work), assembly of metal structures (height work) and foundations (open work), with emphasis on the case of compressed air tubing (underground work with presence of water).

- d. As standards regarding the organization, signaling and logistics of the site, are listed:⁴

NR 11: Transport, handling, storage and handling of materials.

NR 12: Machinery and equipment: preventive safety measures regarding the installation, operation and maintenance of machinery and equipment.

NR 26: Safety signs: through the use of hazard maps which indicate by different colors the type of danger to which a particular area of construction is exposed.

The intensity of the risks is identified by circles: large (high risk), medium (medium risks) and small (light risks).

Each type of hazard is identified by a different color: physical by green, chemical by red, ergonomic by yellow and mechanical by blue. These circles are arranged on the building plan which must be affixed in a highly visible place by the workmen's team.⁵

Discussion

It is noteworthy that in addition to the norms of the Ministry of Labor there are similar specifications of the Brazilian Association of Technical Standards (ABNT) and the Jorge Duprat Figueiredo foundation for safety and occupational medicine (Fundacentro), which deals with occupational hygiene standards (in Portuguese known as NHO).³

According to the information shown in Figure 1, however, the high turnover of the workforce; the constant need for training and awareness of workers and the supervision of companies are still determining factors for the rules presented in this article to be effective.¹

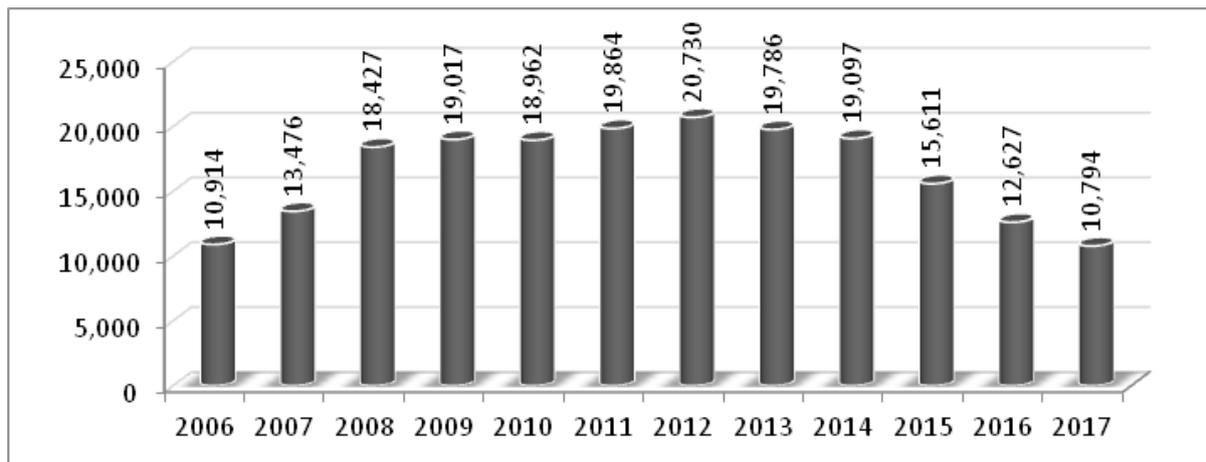


Figure 1 Accidents in Civil Construction during the period 2006–2017.¹

Conclusion

A logistics and well-organized construction site with well-sized meal and hygiene places, is the first step in regulatory for a safe and healthy work. Awareness and training through CIPA and SESMT, also result in great help in preventing accidents. The use of protective equipment, measurement of noise, vibration, humidity, pressure (among others) and medical control of exposure to risks whether ergonomic, chemical, physical or mechanical is the basis of the Brazilian standards who have over the last few years improved civil construction work conditions.

Acknowledgments

None

Conflicts of interest

The author declares that there is no conflict of interest.

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