



Comparative study of building fire safety regulations in different Brazilian states



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ABSTRACT

In the last forty years, Brazil has seen several major fires resulting in dramatic human and material losses. These led to society-driven initiatives that together with national legislation gaps caused a diversity of building fire safety regulations which were only applicable to the corresponding state. This caused an administrative and technical disarray among fire safety agents, as well as anti-economical building design and construction. This paper presents a comparative study among building fire safety regulations in different Brazilian states aiming at the development and adoption of a technical regulation at a national level. The results showed many differences in regulations on the mandatory requirements for fire protection systems; however, a similar technical base among state regulations showed that a Brazilian national-level fire safety regulation could be created.

1. Introduction

In the 1970s, Brazil has seen several fires and explosions that killed many people. This evidenced a modernization, with building complexity and city verticalization, but this also entailed several risks. Fire risk is one of these unwanted consequences of buildings during their life [1].

Unfortunately, such tragedies are common. According to the Brazilian National Secretariat for Public Defence, there was a total of over 168,000 fires in Brazil in 2008, the source of which was only investigated in about 5% of the cases. We emphasize that these figures are not accurate, because the Country does not have an integrated database for data collection and instant data retrieval, as well as a system to identify fire sources aiming at technical and scientific improvement of the national fire safety regulations [2].

Table 1 shows some of the major fires in Brazil that motivated society mobilization to create regulations which would effectively ensure both the fire safety of building users, and scientific development in this field.

With the early-2013 Kiss nightclub fire in the state of Rio Grande do Sul (Brazil), where 242 people were killed, the society realized that the importance of building fire safety was not being acknowledged enough. In the aftermath of the fire, the technical society and state regulatory agents joined their efforts to address this shortcoming, but none has produced actual results that could cover the whole national territory.

Brazil has a variety of fire safety regulations among states which were developed as a result of several tragic events. Therefore, it is extremely important to assess the possibility of creating a unique national building fire safety regulation. This paper presents the results of a comparative study among state technical building fire safety (BFS) regulations and formulates ideas for the adoption of one at national level.

2. Regulatory structure

According to the Constitution of Brazil, states can legislate in case a subject is not taken care of at a Federal level. Thus, BFS laws and regulations were edited and updated over the time in each state according to technical and knowledge progresses, whereas some were being modernized and some remained unchanged.

The legal and technical structure of Brazilian BFS regulations have similar characteristics, where the prescriptive technical details for the design and implementation of fire safety measures in buildings are set forth in regulations issued by state government decrees, or in technical regulations from state technical regulatory bodies. Fig. 1 outlines the hierarchy of BFS juridical and technical organization in Brazilian states, considering that design and construction technical requirements must be properly addressed in regulations to enable a swift adaptation to technological progresses.

The technical regulatory bodies in Brazil are the Military Fire

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Table 1

Major fires in Brazil.

Source: Alves [3], Araújo [4], Mazzoni [5], Negrisoló [6].

Place and building occupancy	State	Year	Deaths	Injured
“Norte-Americano” Grand Circus – building in canvas	Rio de Janeiro	1961	317	400
Volkswagen car factory - pavilion	São Paulo	1970	1	–
Andraus building- 31 floors - commerce and services	São Paulo	1972	16	336
“Lojas Americanas” store - commerce	Rio Grande do Sul	1973	5	*
Joelma Building - 23 floors - administrative building with offices and car parking	São Paulo	1974	179	320
“Lojas Renner” store - 7 floors - commerce	Rio Grande do Sul	1976	41	65
Museum of Modern Art	Rio de Janeiro	1978	Destruction of paintings by Pablo Picasso	
Brazilian Ministry of Housing, Urbanism and Environment - 6 floors - offices	Brasília	1988	0	*
Cine Cacique building - 26 floors - commerce, residential and public gathering (cinemas)	Rio Grande do Sul	1996	*	*
Shopping mall in Osasco city (Liquefied Petroleum Gas explosion)	São Paulo	1996	42	472
Brazilian National Institute of Social Insurance (INSS) - 9 floors - offices	Brasília	2005	0	0
“Grande Avenida” building - 23 floors - offices	São Paulo	1983	17	53

*No accurate records available in the literature.

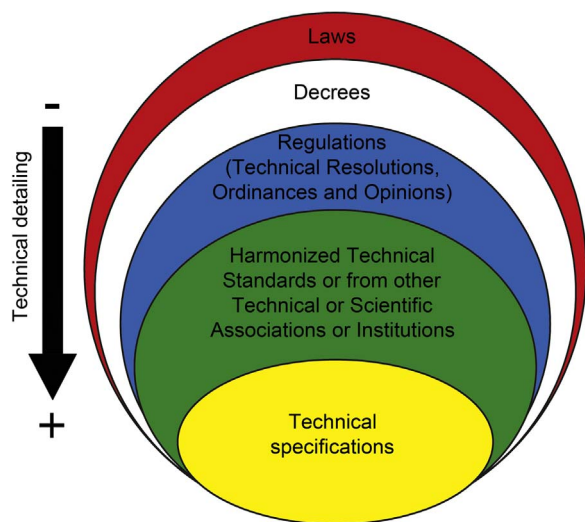


Fig. 1. – Hierarchy of Brazilian BFS regulations.

Departments that create the regulations based on existing Brazilian and international technical standards, studies, and research, as well as in experience gained from past accidents. However, such a state independence in the creation of technical fire safety regulations increases differences and leads to varying fire safety measures for similar buildings across the country.

The issue of regulation differences among states and their implication in the BFS projects is further complicated by the application of federal construction standards that may be different from state regulations, as well as by different knowledge levels of the designers.

A fire performance-based design could be an important step for the development of civil construction in Brazil. However, it would have to be harmonized with existing BFS regulations, which is impossible at the moment due to the variability of BFS regulations all over the country.

Notably, after the Kiss nightclub fire six Brazilian states totally changed and ten other updated their technical BFS regulations based only on the systems that had purportedly failed in the accident, e.g., emergency exits and people training, whereas regulations remained unchanged in the remaining states. Thus, there are currently twenty-seven sets of regulations published in a period of forty years, which is one of the major causes of different requirements for the implementation of fire safety measures in buildings. Table 2 presents the publication dates of BFS regulations currently in force in the Brazilian states.

However, despite the differences found in this study, a preliminary analysis found that technical issues and the structure of state regulations are similar because they were all based on older regulations

Table 2

Year of publication of BFS regulations in Brazilian states.

State	Year of coming into force	State	Year of coming into force
Rio Grande do Norte	1974	Goiás	2006
Rio de Janeiro	1975	Pará	2007
Acre	1994	Tocantins	2007
Pernambuco	1994	Minas Gerais	2008
Maranhão	1995	Espírito Santo	2009
Rondônia	1999	Paraíba	2011
Sergipe	1999	São Paulo	2011
Distrito Federal (Brasília)	2000	Alagoas	2013
Amazonas	2003	Bahia	2013
Amapá	2004	Mato Grosso do Sul	2013
Ceará	2004	Santa Catarina	2013
Roraima	2004	Rio Grande do Sul	2013
Mato Grosso	2005	Paraná	2014
Piauí	2005		

available at the time of their creation. Technical regulations are grouped into five groups, as follows:

- Regulations published in the 1970s and 1980s with a main emphasis on active fire protection systems, especially fire extinguishers and hydrants;
- Regulations published between 1990 and 2000 with an emphasis on emergency exits and insulation of risks;
- Regulations published in 2001 similar to the São Paulo state regulation, which added control measures for coating materials, structural fire safety, and smoke control systems;
- Regulations updated in 2011 the São Paulo state regulation;
- Regulations not resembling the São Paulo state regulation, e.g., Santa Catarina state regulation.

Cuoghi [1] and Silva et al. [7] reported that few investments have been made in the BFS field, and that few preventive information has been provided to raise awareness among users. Furthermore, legislation is not standardized, which coupled with a lack of standards and knowledge from construction and maintenance professionals results in Brazil accepting higher fire risk levels than other countries. Building design has become a very complex process involving very specialized knowledge, as well as new materials and technologies. Moreover, in most parts of the country there are no qualified professionals with a specific training in fire safety, and project approval is at the discretion of the firefighters departments, supported by expert regulation knowledge.

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