

INDEX METHOD APPLIED TO FIRE AND PANIC HAZARD ASSESSMENT IN COMMERCIAL BUILDING

Weslina Samanta Martins Pires

Bachelor in Civil Engineering from CEUMA University, Postgraduate in Occupational Health and Safety Engineering from the State University of Maranhão –UEMA

Carlos David Veiga França

Master in Dynamic Geography of Urban and Rural Space at the State University of Maranhão –UEMA, advisor and professor of the Postgraduate Program in Occupational Safety Engineering at the State University of Maranhão –UEMA. Member of AMCLAM and NUPEJI

Maria Amália Trindade de Castro

Master in Mechanical Engineering from UNICAMP, head of the Department of Mechanical Engineering DEMEC/CCT at the State University of Maranhão –UEMA

Luis Eduardo Pires

Bachelor in Mechanical Engineering from the Federal University of Campina Grande –UFCG, Post Graduate in Health and Safety Engineering from the Faculdade Atenas Maranhense –FAMA, Technologist in Business Management from the University CEUMA

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Abstract: The present study makes an analysis of the Fire and Panic Safety failures in a commercial building where this possible event is favored. The physical environment with a total area of 350 m² is irregular because it does not have Fire Extinguishers, PAE - Emergency Response Plan, Emergency Signaling, Escape Route, Emergency Lighting and Fire and Panic Fighting Project. In order to regularize the commercial building, there was a need for an intense study on the risks of fire in the place. The objective is to apply the Fire and Panic Risk Index model before the development of the intervention project and after its conclusion, to verify the percentage increase in Building Fire and Panic Safety. As methodological resources, the means of bibliographic research was used through books, Laws, NBR's, Regulatory Standard and Technical Standards. Therefore, a solution was suggested for non-existent Security systems in commercial buildings in order to develop the design and implementation of preventive and mandatory devices against Fire and Panic. Initially, the building that presented great risk obtained a satisfactory result after the intervention, coming to fit for small risk, leaving the place safer for a possible accident. **Keywords:** Fire and Panic. Fire extinguishers. Safety. Scratches. Prevention.

INTRODUCTION

In order to understand the risks of Fire and Panic in a given installation, it is necessary to know the Fire and Panic Protection devices in order to ensure that the dimensioning is adequate according to Projects prepared based on Laws and Standards. A deficient building of security devices for a possible accident event will significantly contribute to major disasters on the site, involving the security of people and property. In addition to the installation of Fire and Panic Safety devices, preventive maintenance of the systems is important, thus

ensuring their functionality. The objective is to analyze the danger of Fire and Panic present in the building and apply the Fire and Panic Risk Index model, study the Technical Standards in compliance with their specifications, carry out an Intervention Proposal, dimensioning the mandatory preventive devices against Fire and Panic so that after the assessment, risk analysis and adequacy reassess the Safety of the commercial building, verifying the evolution of Fire Protection in percentage.

After studying the Laws, books, Norms and NBR's (Brazilian Regulatory Standard), developing specific knowledge for this subject, several irregularities inherent to Regulatory Norm n° 23 (NR 23) of the Ministry of Labor and Employment (MTE) were detected and illegalities found that infringes the Fire and Panic Safety required by State Law No. 6,546/1995 for buildings located in the State of Maranhão.

Through the on-site technical analysis, insecurity was evidenced by not having the Certificate of Approval issued by the Military Fire Brigade of Maranhão through the Directorate of Technical Activities (DAT), lack of preventive devices required for this building according to the total built area of 350m² as well as Fire Extinguishers according to fire class, Emergency Lighting, Signaling and Escape Route, Emergency Response Plan (PAE) and trained Fire Brigade.

Due to non-conformities and illegalities, the environment becomes vulnerable where it is possible to expose the users of this establishment to the risks of Fire and Panic, compromising physical integrity and property.

We corroborate the understanding of França (2018) regarding the understanding that fires do not happen by chance, but by the materialization of generating agents in an environment of vulnerability. Therefore, studying the possible factors that cause fire risks and the way to prevent and fight fire and

panic, helps in the correct way to maintain the safety of the environment, bringing greater comfort and credibility to the commercial establishment.

This way, it was necessary to elaborate a project for the Fire and Panic Fighting Intervention based on the laws and norms to guarantee a safe and adequate place, not with the intention of exhausting any and all risks present there, but with the purpose of reducing risks to the minimum acceptable levels for a safe working environment.

CONCEPTUALIZATIONS OF FIRE

According to Pereira and Popovic (2007) they claim that the first scientist to study fire in which it was defined as modernly accepted, is called Lavoisier, born in Paris in 1743 and killed by guillotine during the French Revolution in 1794, being the same considered the founder of modern chemistry. The theory of fire before that was seen as a divine force and that together with Earth, water and air all the existing components of the universe were formed.

According to Anvisa (2014, p.15) apud Coté et al, (2002), "fire is rapid, self-sustaining oxidation through an exothermic reaction of a combustible substance with an oxidant, accompanied by emission of varying intensity of heat, light and smoke."

According to Brentano (2010), for the existence of fire 03 (three) are necessary, essential elements reacting simultaneously known as combustible materials, oxidizer (oxygen in the air) and a heat source in which the fire triangle forms. Figure 1 shows the representation of the combustion elements.

For fire to exist, four elements must be present simultaneously, such as: fuel, oxidizer (oxygen), heat and chain reaction that is represented by the tetrahedron (ANVISA, 2014).

Fire is the combustion of certain material in

which it gets out of control and to an unusual extent putting lives, environment and property at risk (PEREIRA; POPOVIC, 2007).

Still from a preventive perspective, COSCIP - MA (1995) in article 102 specifies 04 (four) classes of fire to follow:

- a) Class A: fire in solid combustible materials that burn in depth and extension, leaving residues, such as paper, wood, plastics, fabrics and rubbers, among others;
- b) Class B: fire in flammable liquids or gases in which they burn only on the surface, such as alcohol, paint, kerosene, fuel oils, gasoline and Liquefied Petroleum Gas (LPG), among others;
- c) Class C: fire in energized electrical equipment, such as electrical panels, motors, cables, electrical equipment, among others;
- d) Class D: fire in combustible metals or metallic alloys in pyrophoric materials such as magnesium, phosphorus, titanium, aluminum, lithium, sodium, potassium and zinc, among others.

In addition to the classes already mentioned, the literature by Brentano (2010) highlights two more classifications in which it is classified according to the combustible material, being class "K" and "I", based on the classification that was elaborated by three important regulatory entities: Brazilian Association of Technical Standards and Fire Departments of Brazil, National Association for Fire Protection (NFPA) and International Association for Firefighter Training (IFSTA) of the United States, being:

- a) Class K: fire in edible oils, animal fats in liquid state, greases, among others, used in cooking;
- b) Class I: fire with materials that are radioactive and chemical in large proportion.

According to Brentano (2010) the fire

extinguishing method works as follows:

- a) Extinction by isolation (removal of material): defined by the removal, reduction or interruption of the material in some situations;
- b) Extinguishing by smothering (removal of the oxidizer): consists of preventing the burning material from being fed by oxygen, reducing its concentration to extinguish the fire;
- c) Extinguishing by cooling (heat removal): consists of reducing the temperature of the burning material using an extinguishing agent in which it absorbs the heat of the fire and the material, the most used extinguishing agent being water. This way, the burning material reduces the ability to generate gases and vapors in an amount sufficient to mix with the oxidizer (oxygen) feeding the fuel mixture necessary to maintain the chemical chain reaction, thus controlling the fire;
- d) Chemical extinction (breaking of the chemical reaction chain): with the use of a certain extinguishing agent, its molecules dissociate through the action of heat, forming atoms and free radicals, combining with the flammable mixture, forming another non-flammable mixture being able to stop the chemical chain reaction.

The point of combustion or combustion temperature is the minimum temperature at which a combustible material emits vapors in a certain amount so as to be able to form a flammable mixture with oxygen at the surface that is ignited by a flame or spark. where it keeps burning after the heat is removed. The generation of flammable vapors is enough to maintain combustion (BRENTANO, 2010).

According to Anvisa (2014), in order to standardize the language and fire fighting solutions, especially with regard to

extinguishing the fire with the fire extinguisher, fire classes are divided by material in combustion with letters and symbols. :

Figure 2 demonstrates the symbology of fire classes fixed in fire extinguishers.

Still referring to figure 2, the images are intended to make the understanding more practical and facilitate the choice of extinguishing agent for firefighting.

MANDATORY FIRE AND PANIC PREVENTION DEVICES IN THE STATE OF MARANHÃO

In this item we will address the mandatory Fire and Panic Prevention devices required by State Law 6.546 dated 12/29/1995, as well as the classification of cases not covered by this Law through the activation of the Technical Standards issued by the Military Fire Brigade of Maranhão (CBMMA), Brazilian Regulatory Norms – NBR of ABNT – Brazilian Association of Technical Norms and Regulatory Norms of the MTE – Ministry of Labor and Employment.

FIRE EXTINGUISHERS

To frame the level of risk (low, medium and high) in the building, NT 03 (1997) is used, which has the necessary information for the dimensioning of portable fire extinguishers.

Establishments must have fire extinguisher protection systems in which the design and installation of these types of systems will follow the conditions required in this standard, as it has all the requirements for the dimensioning of fire extinguishers (NBR 12693 - ABNT, 1993).

In order to extinguish a fire, it is necessary to eliminate one of the fire elements through water or certain chemical substances, solid, liquid, or gaseous, which are called extinguishing agents that act directly on one or more elements of the fire (BRENTANO, 2010). Table 1 shows the types of fire extinguishers

suitable for extinguishing according to fire classification.

Each type of combustible material has its own characteristic of combustion, having specific ways to extinguish the fire, so the extinguishing agent to be used must be appropriate according to the classes of fire so that it has a quick action in an efficient way, avoiding damages to the fire, people's lives, materials and the building (BRENTANO, 2010).

EMERGENCY LIGHTING

In order to guarantee the luminosity of a building in a possible accident, guaranteeing the safety of the place, it is necessary to install emergency lighting in accordance with the emergency lighting system standard, which sets the minimum parameters required for the emergency lighting functions to be installed in buildings or in areas where there is no natural light. This standard includes mandatory requirements for emergency luminaires where they must be heat resistant, location to be installed, care with glare, smoke protection, type of material to be manufactured, luminaire housing, power circuit, signaling and centralized system with batteries (NBR 10898 – ABNT, 1999).

The parameter used for the dimensioning of emergency luminaires according to NBR 10898 (1999) taking into account the autonomous block batteries, its dimensioning must be 04 (four) times the installation height, being the base of the luminaire from the finished floor.

ESCAPE PATH

According to NBR 13434-1 (ABNT, 2004, p.1), "This part of ABNT NBR 13434 sets out the requirements that must be met by installing a fire and panic safety signaling system in buildings".

NBR 13434-2 (ABNT, 2004, p.1), adds that:

"This part of ABNT NBR 13434 standardizes the shapes, dimensions and colors of fire and panic safety signs used in buildings, as well as presents the adopted symbols.

The emergency exits must guarantee safety during the abandonment of the site in case of fire in order to protect the physical integrity, and must have easy access for external support (Firefighters) to enter the building to fight the fire, aid and removed from victims, and must be signaled and illuminated (NBR 9077 - ABNT, 1993).

Chapter XIX of COSCIP - MA (1995, p. 30) makes the following mention:

Art. 201 - The conventional exits referred to in this Chapter are those provided for in the legislation on works as being a continuous path from any interior point towards the free area, outside the building, in connection with the street, comprising doors, circulations and area of connection.

This quote reinforces the information that the escape route, in addition to comprising doors, circulations and connection area, aims at the destination of people to the outside of the building through the illuminated, signposted and protected path.

FIRE BRIGADE

The Fire Brigade aims to act directly in preventing and fighting the beginning of fire, abandoning first aid areas, aiming to protect the physical integrity of people and property, reducing the consequences of the accident and damage to the environment. With this, it is crucial that the Fire Brigade has a strategic plan in the Emergency Response Plan of each plant, regardless of occupation, risk, complexity and number of people involved, it must be trained and qualified (NBR 14276 - ABNT, 2006).

NT 006 (2014) deals with the design and training of the fire brigade of buildings in the Maranhense territory, in addition

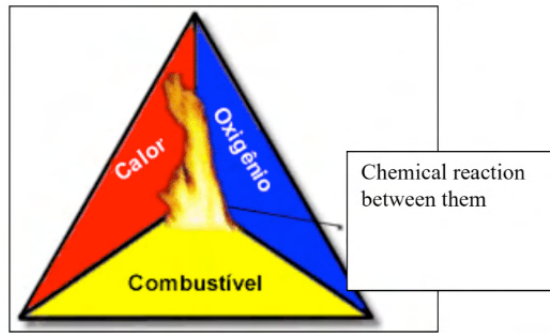


Figure 1 - Elements of combustion

Source: Seito et al (2008)



Figure 2 - Fire Classes

Source: Anvisa (2014) apud Kidde Brasil Ltda.

Class of fire	extinguishing agent						
	Water	Chemical foam ⁽³⁾	Mechanical foam	carbon dioxide (CO ₂)	Powder: B/C	Powder: A/B/C	halogenated hydrocarbons
A	(A)	(A)	(A)	(NR)	(NR)	(A)	(A)
B	(P)	(A)	(A)	(A)	(A)	(A)	(A)
C	(P)	(P)	(P)	(A)	(A)	(A)	(A)
D							

Note: (A) Suitable for fire class

(NR) Not recommended for fire class

(P) Prohibited to fire class

Table 1 - Selection of extinguishing agent according to fire classification

Source: NBR 12693 (ABNT, 1993)

to referencing the specifications of the fire brigade's actions, as described in the Emergency Action Plan (PAE).

PAE - EMERGENCY RESPONSE PLAN

According to NBR 15219 (ABNT, 2005), aiming at protecting lives, property and reducing impacts on the environment, this standard has a set of minimum requirements for the preparation, maintenance and review of the Emergency Response Plan against fires.

With the exception of buildings classified as single-family residential, the Emergency Assistance Plan must be prepared for any other plant, and it must be prepared by a qualified professional taking into account the aspects of location, construction, occupation, population, operating characteristics, people with deficiencies, other specific risks inherent to the activity, human resources and fire prevention and protection devices. After surveying the aspects, the qualified professional must carry out a risk analysis of the plant in order to minimize and/or eliminate all existing risks. (NBR 15219 - ABNT, 2005).

SAFETY LEGISLATION AGAINST FIRE AND PANIC

In Brazil, each federal state has its own Fire and Panic Safety Code or specific legislation. In Maranhão, the minimum Fire and Panic Safety guidelines are governed by Law 6.546/1995, which is the Maranhão Fire and Panic Safety Code and other provisions (COSCIP-MA), in addition to eight more Technical Standards issued by the own Military Fire Brigade of the State of Maranhão (CBMMA), Brazilian Regulatory Norms (NBR's) of the Brazilian Association of Technical Norms (ABNT) or even foreign norms duly informed to the CBMMA.

Federal Law No. 13,425 (2017) known as the Kiss Law was enacted to establish general

and complementary guidelines for safety and prevention of fire fighting as well as disasters in establishments, commercial buildings and public meeting areas, covered or uncovered, fenced or not with potential simultaneous occupancy equal to or greater than one hundred people.

In Regulatory Standard 23 (2011), it has the minimum requirements for Prevention and Protection against Fire and Panic, which emphasizes the obligation of employers to adopt safety measures in accordance with state legislation and applicable technical standards, and are used for of the Consolidation of Labor Laws.

COSCIP - MA (1995) has the minimum and indispensable requirements for the prevention and protection of people, facilities and goods against Fire and Panic. The Maranhão Military Fire Department is responsible for studying, analyzing, planning, demanding and inspecting the Fire and Panic Prevention and Fighting systems, through the parameters established in the aforementioned COSCIP - MA.

In places where the buildings are less than 750 m² (seven hundred and fifty square meters) or up to three floors if single-family residential or up to two floors if commercial buildings, a request must be submitted in the General Protocol of the Fire Department requesting a Report of Requirements, submission of an application requesting approval inspection, after meeting the requirements contained in the Report and finally receiving the respective Certificate of Approval or Dispatch (COSCIP - MA, 1995).

According to COSCIP - MA (1995), in art. 5th, before starting a construction, it is necessary to obtain the permit for construction that are issued by the Municipalities in which it will be necessary to present the Requirements Report (CAP - Certificate of Approval of Projects).

After the construction is ready, it is necessary to obtain the Operating Permit or Housing Permit issued by the Municipal Governments, requiring the presentation of the Requirements Report (CA - Certificate of Approval) that is provided by the Fire Department.

In article 1 of resolution 51 (2019), Committee for Management of the National Network for Simplification of Registration and Legalization of Companies and Businesses CGSIM No. 51 of June 11, 2019, aims to conceptually define the low risk of buildings in accordance with the National Classification of Economic Activity (CNAE), dispensing with the obligation to require public acts of release for operation or operation of economic activity, such as the Certificate of Approval issued by the CBMMA - Military Fire Brigade of Maranhão, as established in art. 3, item I, of Provisional Measure No. 881, of April 30, 2019.

Article 2 of resolution 51 (2019, p. 1) standardizes the wording and is now called by the CGSIM - Committee for Management of the National Network for the Simplification of Registration and Legalization of Companies and Businesses as:

I - low risk or "low risk A": the classification of activities for the purposes of art. 3, § 2, item II, of Provisional Measure No. 881, of April 30, 2019, whose specific and exclusive effect is to dispense with the need for all public acts to release economic activity for the full and continuous operation and functioning of the establishment.

Such information helps to understand that low-risk buildings according to the CNAE are exempt from the need for all public acts for operation and functioning, that is, it is no longer mandatory to obtain the Certificate of Approval issued by the CBMMA.

COSCIP - MA (1995) informs in art. 20 of chapter I, which will be the responsibility of the Fire Department to inspect any

property or establishment in the state, when necessary, it must issue a notification, apply a fine or penalty of interdiction, an action linked to compliance with the provisions pre-established in this law.

Therefore, COSCIP - MA (1995, p. 4), emphasizes that:

Art. 22 - When the inhabited property or establishment in operation does not have the Fire Department's Certificate of Approval and the need to adopt Fire and Panic Safety measures is verified, its owner or responsible person will be fined between the variable limits of 05 (five) to 50 (fifty) UFR and summoned to comply, within 30 (thirty) days, with the requirements that will appear in the notification.

To this end, any irregular establishment in accordance with the Fire and Panic Safety Standards imposed by COSCIP - MA, will be subject to fines and a period of (30) thirty days to regularize the non-conformities described in the notification where they were detected during the inspection of the CBMMA (Maranhão Military Fire Department).

According to COSCIP - MA (1995), Fixed and Mobile Fire and Panic Protection Devices are determined according to the classification of buildings, total built area and ceiling height, in chapter III of this code there is the classification of buildings where chapter IV determines the dimensioning and type of fixed preventive devices.

Buildings with a total constructed area of up to 750m² (seven hundred and fifty square meters) or with a maximum of 03 (three) floors are exempt from Fixed Fire and Panic Preventive Devices (COSCIP - MA, 1995).

According to COSCIP - MA (1995) in article 101, every property and/or establishment must have Fire Extinguishers even if it has other prevention devices, and they must be dimensioned according to the fire classes. Chapter XI has the classification of fire classes, type and extinguishing capacity,

number of extinguishers and the location and signaling of extinguishers needed for an establishment.

Carefully, COSCIP - MA (1995) in article 198, clarifies that the means of escape from an establishment or property is taken into consideration, the number of occupants in relation to conventional exits and complementary means of rescue.

Even so, COSCIP - MA (1995, p. 29) determines that:

Art. 199 - Buildings or establishments intended for the concentration or meeting of the public (commercial, industrial, mixed, collective and hospital) must have a Safety Manual and Escape Plan and those responsible will periodically arrange for their distribution and instruction on the same.

Such information reinforces the importance of Safety with users, employees or others about the importance of the Safety Manual and the Escape Plan for effective evacuation in a possible accident in the building.

Article 213 establishes that exits from buildings must be clearly marked with an indication of the direction (arrow) of the exit containing the word "EXIT", "ESCAPE" or "SEM EXIT" (COSCIP, 1995).

COSCIP - MA (1995, p. 32) defines that:

Art. 215 - The buildings dealt with in art. 31, except for single-family homes, shall be provided with an electrical or electronic emergency system in order to illuminate all exits, arrows and indicative plates, equipped with its own power supply and capable of going into operation immediately, as soon as there is an interruption in the power supply of the edification.

This statement helps to understand the requirement for Light Fixtures and Emergency Signaling, equipped with an independent feeder in which it starts working quickly when there is a power interruption, guaranteeing the brightness of the building

environment, contributing to the safety of the people present.

No Art. 239 All installations, types of materials and equipment required must comply with the conditions of the aforementioned code, the Standards and the Compliance Mark of the Brazilian Association of Technical Standards (ABNT) in order to be accepted by the CBMM (COSCIP, 1995).

METHODOLOGY

Usually all scientific research is born from a problem which it intends to solve, in this view Gil (2006), adopts the understanding of the problem as a question that deserves investigation. In this context, Marconi and Lakatos (2005) specify that all scientific research must have a rite, method, and adequate systematization technique to obtain results.

Furthermore, corroborating the understanding of Minayo and Miranda (2002), qualitative and quantitative procedures produce important results on social reality without prioritizing one over the other. Thus, Bauer and Gaskell (2002, p.24) confirm that "There is no quantification without qualification [and] There are no statistical analyzes without interpretation".

Still in this field, it is natural to categorize scientific research according to its objectives, in this context, Gil (1991) specifies the following classes: exploratory, explanatory and descriptive. Exploratory research presents the researcher with greater familiarity with the investigated topic, presents a case study format, and uses techniques to understand the variables and their correlations with the phenomenon in order to identify their causes. Descriptive research, on the other hand, has the purpose of describing the characteristics of an object, phenomenon or population. natural resources (GIL, 1991).

In view of the above, the research, due to the

proposed objectives, is framed as exploratory, and in the face of nature, it is classified as quantitative and qualitative arising from the identification of the risks of fire and panic in commercial buildings in a study materialized in the quantitative of the index and production of fire risk statistical data, in the same way that, through the interpretation of data and non-conformities of the cut, followed by the elaboration of the basic intervention project against Fire and Panic.

Another methodological procedure adopted was the application of the Fire Index Method developed by CEPDECMA (2018). This is composed of 13 variables, highlighting the adequacy to technical regulations, dimensioning of protective devices, existence of materialized occurrences, fire load, etc. Values and weights were assigned to each variable, on a scale of complexity and/or probability of the impact generated by the materialization of risk to users and surroundings. This allowed the creation of a risk scale determining limiting values of each risk and subsequent interventional measure.

It is worth noting that for this phase of the process, the variables and their components were tabulated in an Excel spreadsheet using conditional formulas, sum and conditional formatting, identifying the minimum and maximum value to fill in each item and their sum, which made possible a parameter scale of fire risk framework, in 3 (three) quartiles, called "R". Table 2 shows the intervals defined for the risk categorization required by the index model applied by the research.

Risk Typology	Break	Color
Small	$R \leq 7,45$	Green
Medium	$7,45 < R \leq 12,25$	Yellow
Great	$R > 12,25$	Red

Table 2 - Fire Risk Scale

Source: CEPDECMA (2018)

With the definitions of the risk intervals and their representative coloring, it was possible to classify the object considering the intervention measures to be adopted. To this end, the following intervention possibilities were listed: technical guidelines and notification, notification and fine, notification, fine, evacuation and interdiction. This way, the main methodological procedures adopted for the scope of the research follow:

- a) Bibliographic survey on the main concepts inherent to out-of-control fire and its consequences, among them the following authors stand out: Brentano (2010), Pastl (2011), Pereira and Popovic (2007), etc.;
- b) Documentary survey using ABNT law 6.546/1995, NT 03/1997/CBMMA, NT 06/2014/CBMMA, NBR's 13.434/2014, 10.898/1999 for the use of dimensioning parameters of basic Fire and Panic devices;
- c) Technical visit for cadastral survey using a 50 m GLM 50 CBOSCH laser tape to produce a sketch;
- d) Digitization of the sketch for the computational tool AutoCad educational version 2016;
- e) Elaboration of an intervention project in two thematic plants using the computer tool AutoCad educational version 2016.

CHARACTERIZATION OF THE OBJECT OF STUDY

The building under study is located in São Luís - MA which is for commercial use, consisting of ten commercial rooms, four bathrooms and a kitchen arranged on two floors, thus totaling 350 m² of total built area. It is located on Avenida dos Franceses, in the Ivar Saldanha district, with a street in front of it and on the left. On the right, it is bordered by a commercial building, and at the

back, with a single-family residential building. The surroundings of this development are characterized by the existence of a vast green area, single and multifamily residences, clubs, motels, bars and hospital and buildings with public functionality.

The building under study is located on a perimeter served by the 1st Military Fire Brigade for fire occurrences and, for clinical and trauma emergencies, by the Medical Emergency Battalion. As for specialized assistance, it was found that the hospitals closest to this property are the Marly Sarney Maternity Hospital (Cohab) and the Araçagy Emergency Care Unit (UPA-Araçagy). For more complex events, the Djalma Marques Urgency and Emergency Hospital (Socorrão I), located in the city center, and the Dr. Clemetino Moura (Socorrão II), located in Cidade Operária.

The specification of finishing and coating materials used in floors follows a determined standard for floors, ceilings and walls. The floor has ceramic coating, windows are made of anodized aluminum frames and have a mechanism to slide laterally. The doors are made of glass and the external paintwork is coated with a coat of texture diluted with sealer and two coats of acrylic texture. Regarding the internal painting, all environments are painted with water-based paint. Associated with this, the structural launch was entirely built in structural masonry. This means that the walls support the concrete slab of the lining and the roof structure (fiber cement tile).

The building does not have basic Fire Fighting and Panic facilities in place, an Emergency Action Plan and a Brigade formed. The electrical installations of this building have a circuit distribution board with thermomagnetic circuit breakers that are the safety keys of the various circuits of the property. The electrical installations project was dimensioned with a determined load for

each circuit, making the owner aware of the restrictions related to the electrical installation, in order to avoid the risk of overloads.

In this sense, it still does not have a lightning protection system, a network of nearby urban hydrants with the function of backup and assistance to specialized assistance. In short, because it is a building lacking Fire and Panic Safety, the sizing of mobile preventive devices inherent to its built area, height and use was carried out, in addition to the structural suitability of the object, regarding the adequate sizing of the routes of escape, portable fire extinguisher system, emergency signage and lighting, PAE and firefighters. Associated with this, the building has a median fire load of 800 MJ/m², in which the Intervention Project came to mitigate the risk scenario.

RESULTS AND DISCUSSIONS

In this item we address the main results obtained as a result of the methodological procedures and techniques adopted to achieve the proposed objectives. This way, after inspection of the commercial building with a total built area of 350 m², arranged on two floors, located in the urban area of the municipality of São Luis, indicators of vulnerability to fire were identified, perpetuating an active risk scenario. In this sense, the object of study does not present documents and provisions required by specific legislation in the State of Maranhão. Such information was obtained through the application of the fire and panic safety index through its variables, providing the typology of great risk with a valuation of 13.1 points.

Corroborating the above, the main variables that generated a high fire risk factor were the lack of the following elements: Project Approval Certificate (CAP), Certificate of Approval (CA), fire and panic prevention devices, Action Plan (PAE), firefighters, passive protection and urban fire

hydrants. Associated with this, the considered fire load present there, that is, 800 MJ/m², in conjunction with the lack of preventive measures, in addition to the materialization of the beginning of fire and the latent need to notify the Directorate of Technical Activities (DAT) confer the building in vogue the aforementioned risk.

Furthermore, with the aim of mitigating the risk situation highlighted, thematic plans related to the Fire and Panic Prevention Project were produced as an intervention measure. Therefore, the dimensioning of preventive and protective devices encouraged the reduction of the risk of fire present there. In this aspect, the variables subject to intervention at a project level followed by prior execution in view of the scope intended here were the sizing of mandatory basic devices such as a protection system by portable fire extinguishers, emergency lighting and signaling, elaboration of the PAE and implementation of firefighters. It is worth noting that at the educational level, the project prepared as approved by the CBMMA was considered and subsequently executed, thus following the entire rite of an intervention proposal, that is, the dialogue between theory and practice.

Therefore, the dimensioning of the Fire and Panic Safety devices was carried out following the COSCIP - MA parameters, totaling 04 (four) Dry Chemical Powder extinguishers with a load of 6 kg, 27 (twenty-seven) signage plates, 01 (a) PAE – Emergency Response Plan, a trained Emergency Brigade, providing a budget estimate in the total amount of R\$ 4,386.53, which is negligible when it comes to the preservation of life and property.

Therefore, after the “theoretical” execution, the fire risk index was reapplied, and this way, the variables liable to reduce its indicators were the presence of the following elements: CAP, CA, PAE and firefighters, associated, to the appropriate sizing of devices, absence of

occurrences after the implementation period, notification or need for technical inspection of the DAT. In this scenario, the reassessment proposed by the index conferred the risk typology of small with the attribute of 7.1 points.

Thus, there is a reduction of 04 (four) points in the scale of the index, a reduction of approximately 54% of the risk of fire in that building, in addition to promoting technical subsidies for the manager’s decision making regarding the legal regularization of this property.

CONCLUSION

Just as fire builds, it destroys, so knowing its composition and ways of fighting and controlling it is essential for emergency situations, acting in the prevention and fighting of fire, avoiding human, material and environmental damage.

After analyzing the danger of Fire and Panic present in the building, the Fire and Panic Risk Index model was applied in order to verify the level of risk. In this context, with the study of Technical Standards, laws and NBR’s, it was possible to meet their specifications.

This way, the Intervention Proposal was made, dimensioning the mandatory preventive devices against Fire and Panic where the risks were analyzed with subsequent adaptation of the commercial building. Then the safety was reassessed by applying the Fire and Panic Risk Index model of the object of study where a significant increase in fire and panic safety was found.

Initially, the building was unsafe, generating a high risk of fire and panic, giving a rating of 13.1 scalar points in the fire hazard assessment index. After the intervention project and supposed execution, it generated a subsidy to mitigate risk factors. For this scenario, the reevaluation of the index gave a value of 7.1 points. There was a change in the typology

of risk from large to small with a consequent scalar reduction of approximately 54%.

The implementation of the intervention proposal generated a cost estimate in the amount of R\$ 4,386.53, a negligible amount given the benefits generated in the adaptation of the building against the exposure of fire out of control. The costs incurred in interrupting the production chain, indemnities for human and material damages associated with the payments of social security items to employees who are incidental to permanent or temporary

absences resulting from exposure to fire are highlighted.

In a decisive way, the use of regulations, methods and techniques for the elaboration of intervention projects that guarantee the mitigation of fire and panic risks, whatever the object may be, must be seen as an investment and not as a cost, mainly due to maintenance of the safety of life, preservation of heritage assets, continuity of the production chain, and consequently, normal social dynamics.

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