Extended Abstract


This work has the proposal to present an alternative to active fire protection, which can be designed in construction projects in Brazilian buildings that are fire-fighting technology with nebulized water (Water Mist). The Water Mist technology presents itself as an alternative proposal since both have joint use of water extinguishing agent. In this context, this dissertation will make a case study in a commercial building in the city of Rio de Janeiro, which compares the volume for the water reserve for fire fighting between the Sprinkler System (Sprinklers) and Water Technology nebulized (Water Mist), and this factor one aspect of advantages recommended by manufacturers of Water Mist around the world. The Fighting existing fire system (Sprinklers) was designed, assuming the requirements of the legislation / current state code. The technology water spray (Water Mist) is scaled using the American Standard NFPA 750 (2015), with the support of technical standards and specification lists because of the absence of specific national regulation or legislation / state code.

**Introduction**

In water as one of the components of nature to it is essential for human existence and other living things today not one of the greatest challenges facing humanity. Is crucial to the preservation of its quality and abundance, in order to ensure their access to current and future generations, in the midst of crisis of natural resources, mainly in the water depletion in large urban centers, and in this sense it is important to note that water conservation programs, technological innovation and sustainable management Institute in important instruments in the quest for balance between water demand and water availability.
Thus the search for efficient protection measures in buildings, nowadays, became basic premise that aims to minimize the environmental impacts. Because of this demand for sustainable solutions to Water Mist, technology presents itself as an alternative extinguishing agent clean, reducing the volume of water of technical reserve of fire when compared to traditional automatic shower system.

This dissertation seeks to introduce Water Mist technology, highlighting its operation and reducing the volume of water used in relation to the firefighting system with automatic sprinklers, and its applicability as an alternative measure of active fire protection in new projects.

In Brazil the Water Mist technology is not yet regulated, because there is a standard that establishes the rules, code of practice and established testing protocol, also does not have parameters of design and implementation and that hinders its implementation in new projects. The present research will emphasize the comparative aspect of reducing the volume of firefighting water between Sprinkler and Water Mist technology on a floor of a commercial building in the city of Rio de Janeiro.

This essay will be developed using the following questions about using Water Mist technology:

- Water Mist technology requires the same volume of water used in automatic sprinklers (Sprinklers) in a building downtown?

- Why is there no regulation or national technical standard that treats about project parameters of Water Mist technology in urban buildings?

- Water Mist technology presents reasonable viability, cost-benefit in specific applications in fire safety projects for buildings when compared to the Sprinkler System?

This exposition will seek to introduce other concepts and active protection measures of fire safety in buildings by evaluating the applications of national and international standards, state codes and recommendations for projects and operation of the system in question. Thereby this essay aims to introduce
general Water Mist technology as a technology to combat the fire, amid the current scenario of water shortage, since the technology object of this work presents results: efficiency, economy of resources (reduction in the volume of water to fight the fire). In addition, describe the components, the positive aspects of implementation in new projects, the mechanisms of action used by the Water Mist technology, simplified composition of costs between Sprinklers and Water Mist as well as their limitations as to the use of the systems.

Finally, the specific objectives for the development of this work parallel to the achievement of the general objectives, proposed a study site, about the only scenario a pavement of the place, to design the Water Mist technology and compare technically with the existing Sprinklers system under the aspect in reducing the required volume of water from the technical reserve of fire between systems: Sprinklers and Water Mist technology in a commercial building in the city of Rio de Janeiro.

Protection fire in the building

The projects in urban buildings should be the objective premises in safeguarding the people and protect the enterprise in addition to implementing a series of security measures against the fire each time it is designed and built a building in addition to building have a fire fighting project well designed and integrated with all elements of the architectural and engineering design. In more global world it is, nowadays, sustainable solutions for the implementation of constructive elements, not seen in the highly prescribed regulations, which ultimately becomes inflexible to allow for analysis and delivery to a resolution that will contribute in an efficient and environmentally sustainable for the planet.

It is important to register that it is necessary to know the appropriate elements in the construction of a building for which these elements will not be incorporated as combustible materials, components of the enterprise, which facilitate the spread of fire.

The designs of buildings in urban centers must meet the important assumptions about security:
Location: Because advocates access and fire emergencies, safe distances of nearby buildings.

Type of occupation of the building: which deals with the nature of the activities, thermal potential and type of equipment used, because these aspects cited fall into the appropriate risks for each type of occupation as the quantity and combustibility of contents inside the building.

Classification of building: classified as their height and their constructive characteristics.

Fires

For this theme intend to introduce the skill-set of prerequisites that determine the event of combustion of a substance indispensable for understanding the principles on which is based on the science of control and extinction of fire. Is called fire, all fire anomalous, that simply manifests itself as what threatens to destroy something or whatever, not being prevented, spreads and involves all can consume. It is noteworthy that only fire when there are combustion, fire and combustion are closely linked and can be defined as: the fire is defined as a chemical-physical phenomenon where takes place a rapid oxidation reaction that generates heat, light and smoke known as combustion.

The fires are classified based on the characteristics of fuels, and this classification useful for adequacy of the extinguishing agent. Meet the fire extinguishing methods is needed as to extinguish them just remove only one of the three elements, or at least interrupt the chemical chain reaction. To achieve the Elimination of fire, in most cases, you should use water or some chemical substances, solid, liquid or gaseous, and extinguishing agents, since these have direct domain on one or more of these components. The extinguishing agent to be used should be suitable, with the objective of action quickly and efficiently, delivering minimum impact to the lives of people, content and construction. The principal extinguishing agents used are water, aqueous foam, inert gases and chemical powders besides of water be the principal agent fire extinguisher and part of the object of study of this research.
Automatic fire fighting systems

Water is the most complete of extinguishing agents. Its importance is ratified by firefighters, the fire-fighting hydraulic systems as well as the use of other extinguishing agents. Currently the automatic protection systems most used hydraulic anti-fire systems of fire hydrants and Sprinklers system mangotinhos and the Water Mist technology aiming to control, fast, efficient extinguishing a fire.

Active Sprinkler protection measure is a system of fixed automatic fire fighting composed of pipes and special devices (sprinklers and nozzles quartzóide/bulbs fuse element) that are uniformly distributed with appropriate spacing according to the type of risk class, for certain environments. When exposed to the heat released by the flames of the fire, the fuse element that previously already has a pre-established temperature, is broken and causing the release of a stream of small drops of water on the fire.

According to the National Fire Protection Association-NFPA 750 (2015) Water Mist technology is defined as a sprinkling of water for which 99% of the total volume of water discharged in droplets with a diameter of less than 1000 microns, minimum nominal operating pressure of the nebulised water spout. This definition used implies the distinction between automatic hydraulic systems (Sprinklers) and Water Mist technology, due to the sizes produced by water droplets. The propellant is essential to consolidate the Water Mist is its ability to produce small water droplets to suppress or control the fire of extremely efficient and therefore the extinction mechanism is based on the use of water to control, suppress or extinguish the fire.

Is notorious around the world, the constant apprehension with the management of the resources used within the buildings. Driven by the dynamics of technological innovations, discoveries of new elements with the optimization of resources are they: technology, system and equipment, encourage regulatory bodies of fire protection with continuous updating and adapting these new functional elements. In this context it is important to note that normalize and
certifying is a relevant process on the premise that aims to ensure the quality and performance of materials, elements and construction systems, being an effective tool in the control of fire safety in buildings. In Brazil there is still a prevailing national standard that establishes requirements for installation on construction projects in buildings for Water Mist technology.

**Study case**

As previously explained this case study of this thesis consists in the comparison of the volume of firefighting water between the system already implemented are the: Sprinklers and Water Mist technology, located in a common use of a commercial building in the city of Rio de Janeiro.

This case study will be based on existing national codes, specific technical standards, international standards and test specifications with regard both to the Sprinkler system as well as Water Mist technology, will be drawn up as follows:

- **Sprinklers:** the system will be constituted by the automatic sprinklers system designed, in construction, in accordance with the minimum requirements of design and installation of fire protection systems for automatic sprinklers recommended by ABNT NBR (Brazilian Association of Technical Standards) 10.897 (2014) and the prevailing code of CBMERJ (Fire Department of the State of Rio de Janeiro). Important to note that it was carried out an estimated calculation of the existing system, not having been supplied the memory of calculation of Sprinkler.

- **Water Mist:** At technology will be designed according to the NFPA 750 (2015) and the NBR 10.897 (2014) as support support gaps by protocols and tests, specification list for lack of national standard/regulation. Due to importance of the nozzles in the sprinklers system, since these carry out key role in the operation of Water Mist technology, in this case study was scaling the grounds of two manufacturers of the Water Mist Technology.
The design selected was a 25-story commercial building with just 19 floors of common use located in the city of Rio de Janeiro, and area with more than 20,000 m². The building is classified as: Commercial Building destined to offices, and its risk rating assessed by CBMERJ as: risk Take Office areas and ordinary risk group I in the parking areas.

The building has two water reservoirs, being an inferior and others superior, being the lower reservoir built with capacity for a volume of 517 m³, 120 m³ being intended for the technical reserve of Sprinklers and the upper reservoir system built with a capacity of 158 m³ volume, being 40 m³ intended for technical reserve of fire hydrant system.

Conclusion

Despite advances and technological innovations in construction projects around the world in the area of fire safety, note that these advances in Brazil, does not evolve in parallel with the updates of standards/codes and therefore does not contribute to dissemination of good management practices, or the optimization of cost-benefit connected to fight against fire.

Important to note that this essay the traditional automatic Sprinklers system when compared to Water Mist technology, preliminarily is the most convenient solution of fire protection, because it is an active protection system that uses water extinguisher agent, primarily for economic bias seen your low cost project in addition to being an automatic fire fighting system more known and usual for the buildings. However, when it develops a project of automatic firefighting systems must have as premise, a kind of appropriate system to the risk that intend to protect and, in this way, some factors must be assessed: the firefighting system itself, the constructive characteristics of the building, the risk class of the building, water supplies.

As seen throughout this dissertation the functional aspect of the Sprinklers system, gets featured, since it relies on automatic discharge of water through showers mainly in the form of large drops and by operating logic requires a larger
volume of water, the greater the placeholder components dedicated to this system when compared to Water Mist.

In this way, it is essential that the fire protection in buildings where it holds invaluable values for goods a city, country, as well as for humanity, projects such as: museums, art galleries, cathedrals, libraries, historic buildings, holds the alternative employment of a system whose operation is always the smallest fraction of volume of water used, least amount of damage caused by water misting the valuable goods and/or "invaluable" less space that are reserved to the elements that structure all the systemic engineering besides creating a safe environment in safeguarding people, the less impact the production process within the protected environment (MRAZEK M.; JIŘÍ, Z.; MARTIN, C; 2010 e Tomar, M.S. (2016)).

The comparison performed in this case study between the Sprinkler and Water Mist manufacturers, favorable results in the reduction of the volume of water required for the following systems: the manufacturer without SEM SAFE Danfoss is 67% reduction when compared to the manufacturer and Marioff Corporation obtained 95%.

In the final analysis, through this work was possible to present the Water Mist technology, as an alternative to building projects in specific cases, noted its comparison with the Sprinkler system be simplified cost aspects described in previous item, which presented a result of reasonable viability for the implementation of technology in this point of view, either because their performance quirks in the extinction of the fire that proved fruitful in some types of buildings/activity caused by minor damage caused with a smaller volume of water sprinkled on the moment of operation as well as a lower volume of technical reserve of fire when compared to the Sprinkler system notably observed with the results achieved in the sizing of the case study.

Keywords

Water mist; sustainable technology; water; performance; resource optimization