IMPLEMENTATION OF PROTECTION SYSTEM ON X 4-STAR HOTEL AND Y 3-STAR HOTEL IN SURABAYA

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ABSTRACT

Fires can result in loss of life, property, and materials, and the consequences of a fire include the loss of property or building value, disruption of work, and firefighting costs. Provision of an appropriate protection system, proper installation and maintenance, as well as user training. If one of these systems does not function properly, the performance of that system will decrease and errors will occur. This research aims to analyze the implementation of protection systems in 4-star and 3-star hotels in the city of Surabaya in accordance with existing regulations. This research uses a descriptive method with an observational approach. The main focus of the research is on the protection system and the planning and implementation of life-saving measures in 4-star and 3-star hotels. Data were collected through direct observation and interviews. Data analysis was conducted by assessing the results obtained and comparing them with the applicable regulations. The conclusion of this study focuses on the implementation of existing fire protection systems (as well as the planning and execution of fire prevention) in hotel X and hotel Y, which fall into the "Good" category.

***Keyword**: Protection System, Fire, Hotel.*

INSTRUCTION

Fires can result in the loss of life, property, and materials. Fires can cause death both directly and as a result of the fire. As a result of the fire, there were many losses of goods, both direct and indirect. Direct losses are caused by the loss of property or building value, while indirect losses include work disruptions, fire rescue costs, and social costs. Fires must be addressed quickly and they can also be managed with fire protection systems. The fire protection system includes a comprehensive protection framework that encompasses both manual and automatic fire alarm systems. This also includes water-based firefighting equipment, such as sprinklers and hoses, as well as chemical equipment like portable fire extinguishers, and so on. One of the fire prevention strategies is to use portable fire extinguishers, such as fire extinguishers. This device is in the form of a cylinder filled with a medium that can extinguish and put out fires as soon as they start. Each fire extinguisher has various options and contents depending on the type of fire that occurs and the fire extinguisher applied to extinguish it.

Among the many fire incidents that have occurred, the strength of hotel fires lies in high-rise buildings; although their area may be small, they often happen. Hotel fires have occurred in several hotels such as Mid Plaza Hotel in Jakarta in 2016, Novita Hotel in Jambi in 2018, Tasia Ratu Hotel in Pekanbaru in 2019, and Media Hotel in Central Jakarta in 2020. Many fire accidents are caused by electrical short circuits.

Research shows that fire-fighting facilities such as fire extinguishers have been installed in Hotel X and their quantity meets the standards set by the Minister of Manpower and Transmigration Regulation No. 4 of 1980. A different study by other researchers found that failures in the installation of fire extinguishers in several other hotel buildings were due to a lack of understanding of regulations related to life-saving facilities. Additional research reveals that Hotel "X" in Bitung has established fire emergency response procedures and developed fire control plans and procedures.

From 2014 to 2020, there were 260 fire incidents each year in hotels and motels across Indonesia, with the main causes including cooking activities (50%), the use of heating equipment (9%), and clothes dryers (8%).

METHODS

This research focuses on 4-star and 3-star hotels in the city of Surabaya, with the research population including all employees in both categories of hotels. The research will take place from February to June 2024.

The chosen method is descriptive research using observation techniques aimed at documenting in detail and systematically the implementation of protection systems in those hotels. The applied design is cross-sectional.

The variables in this study are passive protection systems, active protection systems, and the implementation of planning and execution of fire prevention.

This research procedure includes direct observation on-site, where the researcher will directly assess the condition and placement of fire extinguishers, the status of cleanliness and maintenance, as well as proper signage and available evacuation routes. In addition, the research also involved distributing questionnaires to respondents in 4-star and 3-star hotels to gather information regarding the fire management policies and practices implemented, which will then be compared with relevant standards. The instruments applied include a checklist for observation and a questionnaire for the survey.

Data collection was carried out through observation and survey techniques. The collected data will be analyzed descriptively, and the results will be matched with the standards used as references, namely PERMENAKER No. 04/MEN/1980 concerning the Maintenance and Care of Fire Extinguishers, the Minister of Public Works and Public Housing Regulation No. 26/PRT/M/2008 concerning Technical Requirements for Fire Protection Systems in Buildings and Environments, and the Minister of Public Works and Public Housing Regulation No. 14/PRT/M/2017 concerning Building Accessibility Requirements.

RESULTS

The following table below shows the distribution results in X 4-Star Hotel and Y 3-Star Hotel.

Table 1. Implementation of Passive Protection Systems for Evacuation Routes in 4-Star Hotel X and 3-Star Hotel Y.

No	Statement	4-STAR HOTEL		3-STAR HOTEL	
		PRESENT	ABSENT	PRESENT	ABSENT
1.	The hotel has safety regulations for employees	✓		✓	
2.	Safety signs exist in the workplace	✓		✓	
3.	Periodic health examinations for employees	✓		✓	
4.	There is an evacuation route in every hotel room	✓		✓	
5.	The evacuation routes applied are free from any obstructive items	✓		✓	
6.	The emergency door is made tall so that heads do not bump	✓		✓	
7.	The emergency exit is painted in a striking color (like red pr white color)	✓		✓	
8.	The emergency door can be easily opened	✓		✓	

9.	The emergency exit can open and align with the evacuation route leading to the assembly point	✓		✓	
10.	The evacuation route is permanent and integrated with the building structure	✓		✓	

As a result of the variable assessment in the observation table above, both hotels both received a total score of "YES" ten times. This means that the observational assessment of the evacuation route assessment at the two hotels is in the "Good" category.

Table 2. Implementation of Passive Protection System on Gathering Point at Hotel X Four-Star and Hotel Y Three-Star

No	Statement	4-STAR HOTEL		3-STAR HOTEL	
		PRESENT	ABSENT	PRESENT	ABSENT
1.	There is easy access to the meeting point for hotel building users and hotel guests	✓		✓	
2.	The minimum distance from the gathering point to the hotel building is 20 meters	✓		✓	
3.	The location of the gathering point does not obstruct emergency response vehicles, whether fire trucks or ambulances	✓		✓	
4.	The meeting point is located in an open area	✓		✓	
5.	There is ease of access in using the emergency stairs	✓		✓	
6.	There are evacuation route signs in every hotel room that lead directly to the assembly point	✓		✓	
7.	The evacuation routes applied are free from any obstructive items	✓		✓	
8.	The meeting point is located in an area with few electrical installations	✓		✓	
9.	The sign indicating the assembly point must be clearly visible and legible	✓		✓	
10.	The assembly point is a permanent feature that is integrated with the building structure	✓		✓	

The results from the assessment of the variables in the observation table above show that hotel X, a 4-star hotel, and hotel Y, a 3-star hotel, both received a total score of "YES" ten times. This means that the observational assessment of the gathering zone in both hotels falls into the "Good" category.

Table 3. Implementation of Active Sprinkler Protection System in 4-Star Hotel X and 3-Star Hotel Y

No	Statement	4-STAR HOTEL		3-STAR HOTEL	
		PRESENT	ABSENT	PRESENT	ABSENT
1.	Sprinklers must be installed in all areas or rooms	✓		✓	
2.	The piping system for the sprinkler is in good condition	✓		✓	
3.	The sprinkler must be corrosion-resistant	✓		✓	

4.	The sprinkler can release water at high temperatures	✓		✓	
5.	Testing of the sprinkler system should be conducted at least once a year	✓		✓	
6.	There is a sprinkler proposal	✓			✓
7.	The distance between the sprinkler and the floor is at least 2.2 meters	✓		✓	
8.	The distance between sprinklers should not be too close	✓		✓	
9.	The sprinkler head installed on the ceiling is not obstructed by any other objects	✓		✓	
10.	The supply of clean water for the sprinkler is free from mud, sand, or other contaminants	✓		✓	

The results from the assessment of the variables in the observation table above show that 4-star hotel X received a total score of "YES" 10 times. Meanwhile, 3-star hotel Y received a total score of "YES" 9 times. This means that the observation assessment on the sprinklers in both hotels falls into the "Good" category.

Table 4. Implementation of Active Fire Extinguisher Protection System in 4-Star Hotel X and 3-Star Hotel Y

Nu	Statement	4-STAR HOTEL		3-STAR HOTEL	
		PRESENT	ABSENT	PRESENT	ABSENT
1.	Fire extinguisher available in strategic locations	✓		✓	
2.	Ensure the fire extinguisher easy access and visibility for workers	✓		✓	
3.	Signs indicating the location of extinguishers must be placed at a height of 1.25 meters from the floor	✓			✓
4.	Height mark 1,25 meters from the floor surface	✓			✓
5.	Maintain adequate spacing between each fire extinguisher to prevent them from being placed too closely together	✓		✓	
6.	The fire extinguisher tank must be painted in red color	✓		✓	
7.	Fire extinguisher cylinders must not have physical defects such as holes or damage due to rust	✓		✓	
8.	The installation of fire extinguishers on the wall must be accompanied by a supporting structure to ensure stability	✓		✓	
9.	Conducting routine checks on fire extinguishers every 2 to 6 months within a year	✓		✓	
10.	The instructions for using the fire extinguisher must be clearly visible and easy to read	✓		✓	

The results from the assessment of the variables in the observation table above show that hotel X, a 4-star hotel, received a total score of "YES" 10 times. Meanwhile, hotel Y, a

3-star hotel, received a total score of "YES" 8 times. This means that the observation assessment of the fire extinguishers (APAR) in both hotels falls into the "Good" category.

Tabel 5. The Implementation of Planning and Execution at Hotel X Four Stars and Hotel Y Three Stars

Number	Category	Percentage of X 4-star Hotel	Percentage of Y 3-star Hotel
1.	Good	85%	100%
2.	Sufficient	15%	0%
3.	Deficient	0%	0%

Referring to the results above, the score from the questionnaire on the variable "Implementation of Fire Prevention Planning" at the 4-star Hotel X is 85%, which means "Good," while the 3-star Hotel Y is 100%, which also means "Good." For the "Implementation of Fire Prevention" at the 4-star Hotel X, the score is 80%, which means "Good," while the 3-star Hotel Y is 100%, which again means "Good."

DISCUSSION

The X hotel building has an evacuation route plan located in every hotel room behind the door, measuring 21 cm x 29 cm, covered with glass and with a minimum visibility distance of 50 cm, in accordance with the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 14/PRT/M/2017 concerning Building Accessibility Requirements. The applied evacuation route is free from all obstructive items (such as cardboard, brooms, and chairs), and the emergency doors are painted in bright colors (such as white and red) to be easily seen by both guests and hotel staff. The emergency doors can open and are aligned with the evacuation route leading to the assembly point. The evacuation route is permanent and integrated with the structure of the X hotel building [6].

Research indicates that the evacuation routes in every hotel must be free from any items (such as cardboard boxes, chairs, etc.) that could obstruct the evacuation process in the event of a fire emergency. In the research, emergency doors are painted in striking colors (such as white, red, and gray) so that they stand out from other doors and can be clearly seen and recognized by the human eye [7].

The X hotel building has easy access to the assembly point, which is located in an open area, and the assembly point signs must be clearly visible and legible. According to researchers, hotels must provide easy access routes to assembly points situated in spacious fields or open areas, and the assembly point signs should be clearly readable, with sign dimensions ranging from 30 cm x 40 cm, in accordance with the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 14/PRT/M/2017 concerning Building Facility Requirements [8], [9].

The Y hotel, a 3-star establishment, received a score of "Yes" for its evacuation routes and gathering points, totaling 10 points, which falls into the "Good" category. It means that the requirements have been met in accordance with the Minister of Public Works and Public Housing of the Republic of Indonesia Regulation Number 14/PRT/M/2017 concerning the Requirements for Building Facility Ease, and the Minister of Public Works Regulation Number 26/PRT/M/2008 concerning Technical Requirements for Fire Protection Systems in Buildings and Environments [10] , [11].

The three-star hotel Y has evacuation routes in every hotel room located behind the room doors. The applied evacuation routes are free from any obstructive items. The emergency doors are painted in striking colors (such as white and red) according to research

conducted (for emergency doors painted in striking colors like white, red, and gray) so that the emergency doors stand out from other doors and can be clearly seen and recognized by the human eye. The emergency doors can open in the direction of the evacuation route leading to the assembly point. The evacuation routes are permanent and integrated with the structure of the Y three-star hotel [12]. Another study states that the evacuation routes in hotels must be free from items (such as cardboard boxes, brooms, and chairs) that could obstruct the evacuation process in the event of a fire. In the same study, it is noted that emergency exits should align with the evacuation routes leading to the assembly point [13].

The Y hotel building has easy access to the assembly point, which is located in an open area, and the assembly point sign must be clearly visible and legible. According to researchers, hotels should have easy access routes to assembly points located in wide fields or open areas, and the assembly point signs should be clearly readable, with the sign size ranging from 30 cm x 40 cm, in accordance with the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 14/PRT/M/2017 concerning Building Facility Requirements [14].

The sprinklers in hotel X have a backup of at least two sprinklers, which can release water at high temperatures ranging from 56°C to 65°C, and the distance between sprinklers should not be too close, approximately 2.3 meters. According to other research, hotels should at least have backup sprinklers, which can release water at high temperatures around 55°C to 68°C, and the distance between sprinklers should not be too close, approximately 2 meters. The fire extinguisher (APAR) in this hotel building X is available, easily accessible and visible to employees, the usage instructions for the fire extinguisher can be read clearly, and there is a fire extinguisher installation sign that is 35 cm in size and shaped like an equilateral triangle. According to other research in public places, fire extinguishers should be easily accessible and visible to employees, the usage instructions for the fire extinguisher should be clearly readable, as well as the fire extinguisher certificate, and in accordance with the Minister of Manpower and Transmigration Regulation Number Per. 04/Men/1980 regarding the Requirements for Installation and Maintenance of Fire Extinguishers, the installation sign must be placed no higher than 1.25 meters above the floor surface. The sign must be in the shape of an equilateral triangle with each side measuring 35 cm and painted in bright red to ensure adequate visibility [15], [16].

At hotel Y, there is no backup sprinkler system, and when inquired, the hotel staff explained that all sprinklers have already been installed. If a fire were to occur at hotel Y, the impact would be much greater and riskier, such as material losses and threats to life safety. The sprinkler can release water at high temperatures ranging from approximately 50°C to 63°C, and the distance between sprinklers should not be too close, specifically 2.5 meters. According to research, hotels should have at least two spare sprinklers, as they can release water at high temperatures, specifically between 55°C and 68°C, and the distance between sprinklers should not be too close, around 2 meters [17]. The fire extinguishing equipment in hotel Y is available, easily accessible, and visible to employees. The instructions for using the fire extinguishers can be read clearly. However, this three-star hotel does not have signage indicating the placement of the extinguishers, and when inquired about this, the hotel staff mentioned that there are no plans regarding this matter yet. Other researchers also stated that public places such as hotels should have fire extinguishers available, that the instructions for using the extinguishers should be clearly readable, and that there should be signage indicating the placement of the extinguishers. The sign for the fire extinguisher must be installed at a maximum height of 1.25 meters from the floor, in the shape of a triangle with each side measuring 35 cm, and painted in bright red to ensure optimal readability. [18].

What distinguishes X hotel, a 4-star hotel, from Y hotel, a 3-star hotel, in terms of protective system facilities is that Y hotel does not have a backup sprinkler system, which could lead to greater dangers and impacts compared to X hotel, which does have a backup sprinkler; this means that the dangers and impacts at X hotel can be minimized.

Fire prevention planning is essential, especially in the event of a fire emergency in a hotel. According to fire procedurs, fire prevention planning includes the creation of evacuation procedures, checking fire extinguishers, maintaining firefighting equipment, training employees, and forming an emergency response team [19], [20]. The creation of evacuation procedures is carried out to ensure the safety of guests, employees, and oneself. A total evacuation in a specific public place needs to be carried out as soon as possible for various reasons, including fear, bomb threats, or gas leaks. This necessitates the concerned parties to develop an emergency evacuation plan. Research that has been conducted indicates that the creation of evacuation procedures is very important because it is aimed at preventing loss of life and material damage, as well as financial costs [21], [22].

In accordance with the Minister of Manpower and Transmigration Regulation Number Per. 04/Men/1980 regarding the Requirements for the Installation and Maintenance of Fire Extinguishers, the maintenance of fire extinguishing equipment must be carried out periodically at least every 6 to 12 months per year. This inspection aims to ensure that the fire extinguisher is in optimal operational condition for use in emergency fire situations, with inspections conducted every six months to check whether the extinguisher is still filled. Meanwhile, the inspection conducted every 12 months focuses on parts of the extinguisher such as the hose, lever, nozzle, and the condition of the cylinder to determine if there are any defects [23], [24].

The maintenance of fire extinguishing equipment involves checking and inspecting fire extinguishing devices such as portable fire extinguishers (APAR), heavy fire extinguishers (APAB), powder-type extinguishers, foam-type extinguishers, CO2 (carbon dioxide) extinguishers, hydrants, smoke detectors, etc [25].

Employee training is conducted annually so that employees can assist in the evacuation process and also use fire extinguishers and other protective system facilities. The training includes reporting a fire incident, how to use fire extinguishers, evacuation training in case of a fire, and the use of first aid kits [26].

The formation of an emergency response team to determine and address preparations for facing disasters and emergency fire incidents, and to manage the response when such disasters occur [27]. Other research indicates that hotels must also have planning and implementation of fire prevention measures to minimize the risk of fire, in order to avoid loss of life and significant material damage. Furthermore, all public places such as office buildings and hotels should have emergency fire plans to anticipate existing dangers and reduce both material and human losses. If not, it is those parties who will suffer material losses and jeopardize safety [28], [29].

Based on the table above, the realization of the planning and implementation of fire prevention that has been carried out by Hotel X and Hotel Y is as follows: The creation of evacuation procedures includes guest evacuation procedures, evacuation route maps, installation of evacuation route signs, and supporting equipment such as fire blankets, oxygen tanks, etc. The maintenance of fire extinguishers consists of checking the extinguisher cylinder, nozzle, lever, hose, and the contents of the extinguisher. Fire extinguisher maintenance does not only involve the extinguishers themselves, but other components also require maintenance, such as hydrants, smoke detectors, and so on. Then, employee training is conducted every year to anticipate the dangers of fire emergencies and to prepare the readiness of hotel staff. The formation of the emergency response team has

also been realized with the division of tasks by department in the hotel. For all public places such as office buildings and hotels, it is essential to implement emergency fire prevention planning to minimize the dangers or consequences of a fire [30].

X 4-star Hotel and Y 3-star Hotel have implemented fire prevention planning and execution in each hotel.

CONCLUSIONS

The implementation of passive protection systems in X 4-star hotel and Y 3-star hotel received a "Good" category rating. Meanwhile, the implementation of active protection systems in X 4-star hotel and Y 3-star hotel also achieved a "Good" score, meeting the requirements as the sprinklers and fire extinguishers were still rated as good, even though Y 3-star hotel did not have backup sprinklers and lacked the triangular fire extinguisher signs. The implementation of Fire Prevention Planning and Execution in X 4-star hotel is at 85%, which means "Good," while Y 3-star hotel is at 100%, also meaning "Good," indicating that it has met the requirements.

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