

Fire Protection System Evaluation in the Oncology Center Building of Hospital in Surabaya

Debora Dzahabiyah¹, Dani Nasirul Haqi², Suhariono³

¹Master of Occupational Health and Safety, Faculty of Public Health Universitas Airlangga, Indonesia

²Department of Occupational Safety and Health, Faculty of Public Health Universitas Airlangga, Indonesia

^{1,2}Campus C Mulyorejo, Surabaya, East Java, 60115 Indonesia

³Rumah Sakit Umum Daerah (RSUD) Dr. Soetomo, Surabaya, Indonesia

Mayjen Prof. Dr. Moestopo St. Gubeng, Surabaya, East Java, 60286 Indonesia

ABSTRACT

Introduction: The Oncology Center Building is the part of Hospital X Surabaya that focuses on developing cancer services. As a type A hospital, Hospital X is required to have a preparedness program in the facilities and infrastructure for fire protection and prevention. The purpose of this study was to evaluate the fire protection facilities and infrastructure in the Oncology Center Building of Hospital X Surabaya. **Methods:** This study was an observational study using a cross-sectional approach. The data analysis method used was descriptive. The primary data collection was carried out through interviews with the Hospital Occupational Safety and Health committee of Hospital X and the secondary data was in the form of profiles on Hospital X, as well as its policies, programs, guidelines, and SOPs related to fire prevention in Hospital X. **Results:** Active fire protection facilities and infrastructure in the form of fire detectors and fire alarms are in accordance with SNI 03-3985-2000. Meanwhile, other active fire protection facilities and infrastructure, such as fire extinguishers, hydrants, and sprinklers, are still not in accordance with the applicable policies because there are several elements that have not been fulfilled. The passive fire protection facilities and infrastructure are still not in accordance with existing policies because there are no walls, windows, and fireproof glass in the Oncology Center Building. **Conclusion:** The active and passive fire protection facilities and infrastructure in the Oncology Building, Hospital X still do not comply with the applicable policy because there are several elements of each fire protection facility and infrastructure that do not meet the specified standards.

Keywords: active fire protection, oncology center building, passive fire protection

Corresponding Author:

Debora Dzahabiyah

Email: deboradzah@gmail.com

Telephone: +6281216808840

INTRODUCTION

Fire can be classified as a natural disaster if it happens due to unusual activities in nature (Ministry of Emergency Management of China, 2020). Fire also can be considered a disaster caused by humans (Purnomo *et al.*, 2019). Fires can occur because of the fulfillment of three factors needed to create a fire, also known as the fire triangle. The three factors that can create a fire are fuel, oxygen, and a heat source (Pramono, Hermawan and Adiputera, 2019).

Based on the research conducted by the National Fire Protection Association (NFPA), it is stated that in the year 2020, the estimated number of fire cases in the United States was 1.4 million

fire cases. Losses from fires in 2020 in the United States were estimated to be \$21.9 billion (Ahrens and Evarts, 2021). Meanwhile, in Indonesia from 1997 to 2018, there have been as many as 2,929 fire incidents, constituting 10% of the total incidence of all disasters which has caused 12,206 cases of house building damage, 333 people who have died, and 28 health care facilities severely damaged (Indonesian National Board for Disaster Management, 2019).

One of the places that has a risk of fire is a hospital. Based on the Government Regulation No. 47 of 2021 concerning Hospital Administration, it states that "Hospitals are health service institutions that provide complete individual health services that provide inpatient, outpatient, and emergency services" (The President of Republic Indonesia, 2021). Based on data from NFPA Research, the main causes of fire in healthcare facilities in 2011 - 2015 were kitchen utensils (66%), the distribution of

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electricity and lighting equipment (6%), intentional (6%), heating device (5%), combustible materials (5%), cigarette butts (5%), and the use of heat-sourced tools (2%) (Campbell, 2017).

The high risk of fire in hospitals is very important to note so then it can be prevented and handled properly (Novrial and Novi, 2019). Therefore, the Government of the Republic of Indonesia through Minister of Health Regulation No. 66 of 2016 concerning Hospital Occupational Safety and Health requires every hospital to organize a Hospital Occupational Safety and Health Management System, one aspect of which is related to the prevention and control of fires in hospitals (Saputra, Kridawati and Wulandari, 2019).

The Occupational health and safety management system in hospitals according to Minister of Health Regulation No. 66 of 2016 concerning Hospital Occupational Safety and health is part of the overall hospital management in the context of controlling risks related to the work process activities in hospitals to create a healthy, safe, and comfortable work environment for the hospital's human resources, patients, waiting patients, visitors, and the hospital environment as a whole (Ministry of Health of Republic Indonesia, 2016).

Fire protection systems can be grouped into two parts, namely active protection systems and passive protection systems (Novrial and Novi, 2019). According to the Minister of Public Work Regulation No. 26 of 2008, an active fire protection system is a complete fire protection system consisting of manual and automatic fire detection systems, water-based fire extinguishing systems such as sprinklers, standpipes, and fire hoses, and chemical-based fire extinguishing systems, such as fire extinguishers and special extinguishers (Ministry of Public Work of Republic Indonesia, 2008). The passive fire system is a fire protection system that is formed or built through the regulation of the use of particular building structural materials and components, the compartmentalization or separation of buildings based on the level of resistance to fire, and protection against openings (Ministry of Public Work of Republic Indonesia, 2008).

There are several studies related to the evaluation of fire protection systems in hospitals which show that the results of the efforts undertaken have not been optimal. Research conducted by (Hambyah, 2016) stated that the installation and type of fire extinguisher used in the surgical building of RSUD Dr. Soetomo still does not comply with

Minister of Manpower Regulation No. 04 of 1980 concerning the Requirements for the Installation and Maintenance of Fire Extinguishers because there are still halon type fire extinguishers used in the surgical building. This is as well as the installation height of the fire extinguishers not being appropriate, the instructions for using the fire extinguisher being placed next to the fire extinguisher box, and extinguishers that have expired. Research conducted by Saputra, Kridawati and Wulandari (2019) at RS X East Jakarta stated that the fire protection management is not run optimally because the organization focuses on services and has not conducted training on patient evacuation. The fire protection system is not optimal, including inspections and the use of maintenance systems that have not been routinely carried out and special access for firefighters not yet being available due to the limited availability of land. Research conducted by Saputra, Kridawati and Wulandari (2019) also stated that RS X in East Jakarta does not yet have life-saving facilities in the form of emergency stairs, emergency doors, and ramps. In addition, the research conducted by Sholeh, Suroto and Wahyuni (2021) states that there has been a policy regarding an active fire protection system at the Dental and Oral Hospital X in Bandung City which was established by the director in 2019 but the policy has not been fully socialized to all workers.

Hospital X is a type A hospital that provides health services to the people of East Java and it is a referral center for eastern Indonesia (Hambyah, 2016). Pusat Pengembangan Layanan Kanker Building (PPLK), or the Oncology Center, is located between Instalasi Rawat Jalan Building (IRJ) and Pusat Diagnostik Terpadu Building (GPDT), and it is adjacent to the Palliative and Pain-Free Installation. As a type A hospital, Hospital X is required to have a preparedness program in the form of a fire protection and prevention system. A fire management system is needed that is expected to prevent and be able to deal with fire incidents in accordance with the applicable regulations. Based on the description above, this research is intended to evaluate the fire protection system in the Oncology Center Building.

METHOD

This study was an observational study using the cross-sectional method. In addition, based on the analytical method used, this research was a

descriptive study. This research was conducted in Hospital X Surabaya in East Java.

The data collection was carried out in the form of both primary and secondary data collection. The primary data collected in this study consisted of observations as an evaluation of the fire protection system in the Oncology Center Building of Hospital X. The secondary data in this study was the profile of Hospital X, as well as the policies, programs, guidelines, and Standard Operating Procedures (SOPs) related to fire prevention in Hospital X.

This research has been declared to have passed the ethical test by the Committee for Health Research Ethics in the Faculty of Public Health, Universitas Airlangga. This decision is stated in a Certificate of Ethical Eligibility with No.36/EA/KEPK/2021. The data that has been collected in this study has been studied for conformity in relation to what is happening in the field through observations and the predetermined standards. The data will then be processed descriptively by describing the situation systematically and factually against the target being studied.

Active Fire Protection Facilities and Infrastructure

The active fire facilities and infrastructure in the Oncology Center Building, Hospital X were examined known through observations of fire detectors based on SNI 03-3985-2000, the results of the observation of fire extinguishers based on the Minister of Public Work Regulation No. 26 of 2008 concerning Technical Requirement for Fire Protection System in the Building and Environment, the Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012, and the Minister of Manpower Regulation No. 04 of 1980 concerning Requirements for Installation and Maintenance of Fire Extinguishers. The fire alarm observations were based on SNI 03-3985-2000, the observations of the fire hydrants were based on the Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems in 2012, and the sprinkler observations were based on the Hospital Infrastructure Technical Guidelines for Active Fire Protection Systems of 2012.

Passive Fire Protection Facilities and Infrastructure

The passive fire facilities and infrastructure in the Oncology Center Building, Hospital X were examined through observations based on the Minister of Public Work Regulation No. 26 of 2008 concerning the Technical Requirement for a Fire Protection System in the Building and Environment.

RESULTS

The use of active fire protection facilities and infrastructure in the Oncology Center Building, Hospital X refers to several regulations and policies. The fire detectors in the Oncology Center Building comply with SNI 03-3985-2000. The fire extinguishers in the Oncology Center Building have not fulfilled all of the elements specified in Minister of Public Work Regulation No. 26 of 2008, Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems in 2012, and Permenaker Number Per.04/Men/1980. This is because the placement of the fire extinguishers still exceeds the maximum height that has been determined. Meanwhile, the fire alarm in the Oncology Center Building is in accordance with SNI 03-3985-2000.

The fire hydrant in the Oncology Center Building refers to the Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012 and out of the 9 elements, 7 elements are in accordance with the existing policies. The two elements that are still not suitable are due to the fact that garbage is still found between the hydrant hoses and the malfunction of the hose, hose connection, nozzle, and valve opening on the hydrant on the Ground Floor of the Oncology Center Building. The sprinklers in the Oncology Center Building are not in accordance with the existing policies because there is no connection that allows firefighters to pump water into the sprinkler system.

The passive fire protection facilities and infrastructure in the Oncology Center Building, Hospital X regarding fireproof door elements are in compliance with Minister of Public Work Regulation No. 26 of 2008, namely the emergency exit in the

Table 1. Results of the Inspection and Observation of Active Fire Protection Facilities and Infrastructure at the Oncology Center Building, Hospital X Year 2021

Active Fire Protection Facilities and Infrastructure	Basic Regulation/ Policy	Element	Actual Condition	Suitability
Fire Detector	SNI 03-3985-2000	There are fire detectors installed throughout the room.	There is a fire detector installed in the Oncology Center Building.	Appropriate
		Each detector installed is accessible for maintenance and for periodic product testing.	Every detector installed in the Oncology Center Building is accessible for maintenance and testing.	Appropriate
		The detector is protected against possible damage due to mechanical interference.	The detectors installed in the Oncology Center Building are protected against possible damage due to mechanical disturbance.	Appropriate
		Conducted an inspection, testing, and maintenance.	Inspection, testing, and maintenance has been carried out in the Oncology Center Building.	Appropriate
		Records of the results of all inspections, tests, and maintenance shall be kept for a period of 5 years.	Records of the results of all inspections, tests, and maintenance are kept for a period of 5 years.	Appropriate
		Fire extinguishers available.	The Oncology Center Building has 4 fire extinguishers on the Ground floor and 1st floor.	Appropriate
Fire Extinguisher	Minister of Public Work Regulation No. 26 of 2008 concerning the Technical Requirement for Fire Protection System in the Building and Environment;	Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012; Minister of Manpower Regulation No. 04 of 1980 concerning Requirements for Installation and Maintenance of Fire Extinguishers	The fire extinguishers in the Oncology Center Building are type CF-21 which can be used for class A, B and C fires. The condition of the Oncology Center Building fire extinguishers is in good condition.	Appropriate
		The fire extinguishers are placed in a conspicuous place (at or near the corridor or hallway leading to the EXIT) so then they are easily accessible and ready to use.	The total of 3 (three) fire extinguishers in the Oncology Center Building are placed where they are easy to see and easy to reach, but on the 1st floor, there is 1 fire extinguisher whose placement location is blocked by wall pillars so it is not too visible.	Not Appropriate
		The fire extinguishers are clearly visible and not obstructed by other objects.	The fire extinguishers in the Oncology Center Building are clearly visible and not obstructed by other objects.	Appropriate
		The fire extinguisher seals must be in good condition and the tube caps must be firmly attached.	The fire extinguisher seals in the Oncology Center Building are in good condition and the tube caps are firmly attached.	Appropriate
		The fire extinguishers are installed in such a way that the topmost part is at a maximum height of 120 cm from the floor surface, except for the CO ₂ and dry chemical powder forging types that at least 15 cm from the floor surface.	The fire extinguishers have been installed in the Oncology Center Building Ground Floor at a height of 125 cm, and on Floor 1 it is at a height of 124 cm and 126 cm from the floor surface.	Not Appropriate

Advanced Table 1. Results of the Inspection and Observation of Active Fire Protection Facilities and Infrastructure at the Oncology Center Building, Hospital X Year 2021

Active Fire Protection Facilities and Infrastructure	Basic Regulation/ Policy	Element	Actual Condition	Suitability
Fire Extinguisher	Minister of Public Work Regulation No. 26 of 2008 concerning the Technical Requirement for Fire Protection System in the Building and Environment;	The fire extinguishers (other than the wheeled fire extinguisher) are hung on the wall with a stirrup reinforcement or in a glass cabinet so then they can be used easily when needed.	The fire extinguishers in the Oncology Center Building are stored in a glass cabinet and hung on the building wall.	Appropriate
		Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012; Minister of Manpower Regulation No. 04 of 1980 concerning Requirements for Installation and Maintenance of Fire Extinguishers	There are instructions on how to operate the fire extinguishers placed on the front of the fire extinguishers and the instructions are clearly visible.	Appropriate
		The distance between fire extinguishers is no more than 15 meters.	The distance between fire extinguishers is no more than 15 meters.	Appropriate
		The placement of the fire extinguishers is paired with signs and symbols.	The placement of the fire extinguishers in the Oncology Center Building are marked with symbols above the fire extinguisher storage cabinet.	Appropriate
		The contents of the fire extinguishers are kept full, the pointers are in the 'ISI' position or green, and they can be operated.	The fire extinguishers in the Oncology Center Building are full (green) and can be operated.	Appropriate
		The fire extinguisher tubes have not passed their validity period.	The fire extinguisher tubes in the Oncology Center Building have not yet passed their validity period. The validity period of the fire extinguisher tubes is not until 2022 and 2023 respectively.	Appropriate
		The red fire extinguisher tubes are in good condition, do not rust, and do not leak	The red fire extinguisher tube in the Oncology Center Building is in good condition, does not rust, and does not leak.	Appropriate
		Each fire extinguisher has a card or label firmly placed showing the month and year the last maintenance was carried out and on the maintenance label, there is the identification of the inspecting officer.	Each fire extinguisher in the Oncology Center Building has been given a maintenance card showing the month and year of maintenance, and the identity of the fire extinguisher maintenance officer is included.	Appropriate
		The fire extinguishers are inspected at intervals of approximately 30 days.	The fire extinguishers in the Oncology Center Building are routinely inspected every 30 days.	Appropriate

Advanced Table 1. Results of the Inspection and Observation of Active Fire Protection Facilities and Infrastructure at the Oncology Center Building, Hospital X Year 2021

Active Fire Protection Facilities and Infrastructure	Basic Regulation/ Policy	Element	Actual Condition	Suitability
Fire Alarm	SNI 03-3985-2000	There is a fire alarm.	There is a fire alarm connected to the hydrant. But the cable to the fire alarm on the Ground Floor was cut off because the hydrant didn't work.	Appropriate
		The fire alarm sound signal is different from the sound signals used for other uses.	The fire alarm sound signal is different from other alarm sounds.	Appropriate
		The hydrant cabinets are only used to place fire equipment.	In the hydrant cupboard on the 1st Floor of the Oncology Center Building, trash was found between the hoses.	Not Appropriate
		Red hydrant boxes with the words "HIDRAN" written in white.	The Oncology Center Building hydrant boxes are displayed in red with the words "HYDRANT" painted on in white.	Appropriate
		The hydrant boxes are easy to open, see, and reach, and are not blocked by any objects.	The hydrant boxes in the Oncology Center Building are easy to open, see, and reach, and they are not blocked by any objects.	Appropriate
Fire Hydrant	Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012	The hydrants must have a hose, hose connection, nozzle (water transmitter), and a faucet opener.	The hydrants in the Oncology Center Building have a hose, hose connection, nozzle (water transmitter), and faucet opener. However, the hydrant on the Ground Floor cannot function because the hose size is not suitable and is currently in the process of being replaced.	Not Appropriate
		Hoses are in good condition (not twisted).	The hoses in the Oncology Center Building are in good condition (not twisted).	Appropriate
		Hose diameter for the building hydrants is 1.5 inches and for yards, 2.5 inches.	The diameter of the hoses in the Oncology Center Building are 1.5 inches.	Appropriate
		The minimum hose length is 15 meters and the maximum is 30 meters.	The length of the hydrant hoses in the Oncology Center Building are 30 meters.	Appropriate
		Good opening valves (no leak).	The hydrant opening valves are in good condition (not leaking).	Appropriate
		Nozzles have been tested and registered.	The nozzles have been tested and registered.	Appropriate
		There are automatic sprinklers.	There are automatic sprinklers in the Oncology Center Building.	Appropriate
Sprinkler	Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012	The sprinklers are not ornamented, painted, or coated.	The sprinklers are not ornamented, painted, or coated.	Appropriate
		Maximum distance of sprinkler heads from other sprinklers = 4.6 m.	The sprinkler head distance from other sprinklers = 4.6 m.	Appropriate

Advanced Table 1. Results of the Inspection and Observation of Active Fire Protection Facilities and Infrastructure at the Oncology Center Building, Hospital X Year 2021

Active Fire Protection Facilities and Infrastructure	Basic Regulation/ Policy	Element	Actual Condition	Suitability
Sprinkler	Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012	Sprinkler head maximum protection area = 20 m.	Sprinkler head maximum protection area = 20 m.	Appropriate
		The water used does not contain chemicals that can cause corrosion.	The water used for sprinklers does not contain chemicals that can cause corrosion.	Appropriate
		The water used does not contain fibers or other materials that can interfere with the functioning of the sprinkler.	The water used for the sprinklers does not contain lint or other materials that can interfere with the functioning of the sprinkler.	Appropriate
		Every automatic sprinkler system must be equipped with at least one type of water supply system that works automatically, is pressurized, has sufficient capacity, and can be relied upon at all times.	Every automatic sprinkler system is equipped with a water supply system that works automatically, is pressurized, has sufficient capacity, and can be relied on at all times.	Appropriate
		The water supply system must be under the control of the building owner.	The water supply system for the sprinklers is under the control of the Oncology Center Building owner.	Appropriate
		A connection shall be provided to allow firefighters to pump water into the sprinkler system.	There is no connection that allows firefighters to pump water into the sprinkler system because there is already a central pump for the hydrant.	Not Appropriate
		The installed sprinkler heads are a corrosion resistant sprinkler head.	There is no connection that allows firefighters to pump water into the sprinkler system because there is already a central pump for the hydrants.	Appropriate
		Spare sprinklers match both the type and temperature rating of all other sprinklers installed.	Spare sprinklers match both the type and temperature rating of all other sprinklers installed.	Appropriate
A special sprinkler lock is available.	A special sprinkler lock is available.	Appropriate		



Figure 1. Fire Detector



Figure 2. Fire Extinguisher



Figure 3. Fire Alarm



Figure 4. Fire Hydrant

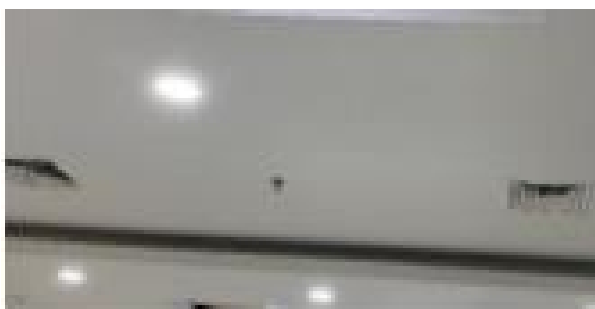


Figure 5. Sprinkler



Figure 6. Fireproof Door

Oncology Center Building is fire resistant. As for fire-resistant wall elements, the condition of the walls, windows, and glass in the Oncology Center Building are still not fire-resistant and are therefore not in accordance with the existing policies.

DISCUSSION

Active Fire Protection Facilities and Infrastructure

An active fire protection system is a complete fire protection system consisting of a manual or automatic fire detection system. Active fire protection systems are divided into water-based fire suppression systems and chemical-based fire suppression systems (Ministry of Public Work of Republic Indonesia, 2008). Tools that are often used include fire detectors, fire extinguishers, fire hydrants, fire alarms, and sprinklers (Saputra, Kridawati and Wulandari, 2019).

Fire detectors, according to SNI 03-3985-2000, are a tool that reacts to more than one phenomenon which includes heat, smoke, flame,

gas fires, and others (Hanan and Talarosha, 2020). The Oncology Center of Hospital X already has fire detectors scattered throughout the rooms. In addition, the fire detectors in the Oncology Center Building are located in easily accessible places so then the inspection, testing and maintenance of fire detectors can be carried out more effectively and efficiently. Inspection, testing and maintenance activities are important because they aim to prevent the possibility of damage to the fire detector due to mechanical disturbances (Djunaidi, Tuah and Rafifa, 2018). Thus, it can be interpreted that the use of fire detectors in the Oncology Center Building is in accordance with the applicable regulations.

Fire extinguishers are one of the active fire protection devices that must always be available in buildings, including hospitals. (Ministry of Health of Republic Indonesia, 2012). Fire extinguishers are lightweight and easy to operate individually, especially at the beginning of a fire (Setiawan, 2019). Fire extinguishers must be inspected regularly

to prevent the possibility of damage to the fire extinguishers (Wicaksono, 2020). The Oncology Center Building has 4 fire extinguishers, with each floor having 2 fire extinguishers each. The type of fire extinguisher used is CF-21 which contains liquefied gas as a substitute for Halon which can deal with class A, B and C fires, etc. The fire extinguisher is placed in a glass cabinet and then hung on the wall of the building. This shows that there is a match between the number and type of fire extinguishers used in the Oncology Center Building with the Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems in 2012. However, there is no compatibility between this policy and the requirements for the height of the fire extinguisher from the floor because the fire extinguishers are placed at a height of 125 cm, 124 cm, and 126 cm which exceeds the maximum height of 120 cm. In addition, the fire extinguishers need to be placed in a clear place, to not be obstructed by other objects, and have the instructions for use on the front of the tube. The fire extinguishers in the Oncology Center Building are also equipped with a maintenance card that shows the time of the last inspection and the fire extinguisher maintenance officer. This shows that there is a match between the requirements for placing the fire extinguisher, giving instructions for use, and having a maintenance card on the fire extinguisher in the Oncology Center Building according to Regulation of the Minister of Public Works No. 26 of 2008. However, unfortunately, there are still fire extinguishers whose placement is blocked by pillars, indicating a non-compliance with applicable regulations. The fire extinguishers in the Oncology Center Building are placed at a distance of less than 15 meters and each fire extinguisher placement is marked and symbolized. All fire extinguishers are in good condition, not crinkled and leaking. This shows that the fire extinguishers in the Oncology Center Building are in accordance with the Regulation of the Minister of Manpower and Transmigration No. 04 of 1980.

Fire alarms play a role in giving signals or signs of a fire (Kharisma and Setiyansah, 2021). The use of fire alarms refers to SNI 03-3985-2000. The fire alarms in the Oncology Center Building are directly connected to the hydrant. The existing fire alarms also have a sound signal that is different from other sounds so then it is easy to distinguish between the sound signal of a fire alarm and other sound signals. Unfortunately, the fire alarm cable on the ground floor was damaged due to the malfunctioning of

the hydrant, so it can be said that the use of the fire alarms in the Oncology Center Building is not functioning optimally.

Fire hydrants are a fire extinguishing system in the form of a pipe filled with water that can be installed permanently (Agusri and Kimi, 2018). The fire hydrant component consists of a closed cabinet, fire hose, hose rack, and nozzle (Ministry of Health of Republic Indonesia, 2012). Each fire hydrant component has certain requirements that must be met. The Oncology Center Building has two fire hydrants located on each floor of the building. The fire hydrants in the Oncology Center Building still have several shortcomings that are not in accordance with the existing policies, namely the Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems of 2012. The hydrants in the Oncology Center Building are equipped with closed cabinets but garbage was found between them. In addition, the hydrant hose located on the Ground Floor is also damaged and is in the process of being replaced. However, the hoses used have met the requirements regarding the specified diameter and length of the hydrant hose.

Sprinklers are a fire extinguishing installation that is permanently installed in a building to extinguish fires automatically (Putri, 2017). Sprinklers have the ability to extinguish fires and they are more effective when compared to other fire extinguishers. The sprinkler will automatically work by spraying water in all directions when the temperature rises to a certain point (Agusri and Kimi, 2018). The use of sprinklers in the Oncology Center Building refers to the Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems 2012. This is evidenced by the availability of sprinklers scattered throughout the building. Every sprinkler system installed in the Oncology Center Building has been equipped with an automatic, high pressure and sufficient capacity water supply system. The sprinklers were installed with a specified distance between them of 4.6 meters. Overall, the sprinklers in the Oncology Center Building are in accordance with the existing policies but there is still a need to add a connection that allows firefighters to pump water into the sprinkler system.

Passive Fire Protection Facilities and Infrastructure

A passive fire protection system, according to the Regulation of the Minister of Public Works

No. 26 of 2008, can be defined as a fire protection system formed through the regulation of the use of materials and building structural components, the compartmentalization or separation of buildings based on the level of fire resistance, and protection against openings. Passive fire protection facilities and infrastructure include fire-resistant walls, fire-resistant doors, fire-resistant windows, and fire-resistant glass (Ministry of Public Work of Republic Indonesia, 2008). A passive fire protection system means that the fire protection design is integrated into the system so then it does not need to be actively activated (Salena, Safriani and Novrizal, 2019).

The Oncology Center Building already has fire-resistant emergency exits. This condition shows that there is a match between the application of a passive fire protection system in the form of a fireproof door and the applicable regulations. Meanwhile, the Oncology Center Building still does not have fire-resistant walls, fire-resistant windows, and fire-resistant glass throughout the building. So it can be concluded that the passive fire protection system in the form of fire-resistant walls, fire-resistant windows and fire-resistant glass is still not in accordance with the Regulation of the Minister of Public Works Number 26/PRT/M/2008.

CONCLUSION

Based on the results of this study, it can be concluded that the active fire protection facilities and infrastructure, which includes the fire extinguishers, hydrants, and sprinklers in the Oncology Center Building in 2021, is still not in accordance with the applicable regulation, namely Minister of Public Work Regulation No. 26 of 2008 concerning Technical Requirement for Fire Protection System in the Building and Environment, Technical Guidelines for Hospital Infrastructure for Active Fire Protection Systems 2012, and Permenaker Number Per.04/Men/1980. This is because there are still discrepancies and damage to some components of the active fire protection equipment. Other active fire protection facilities and infrastructure, namely detectors and fire alarms, are in accordance with the existing policy, namely SNI 03-3985-2000. The passive fire protection facilities and infrastructure in the Oncology Center Building are also not in accordance with the Regulation of the Minister of Public Works Number 26/PRT/M/2008 because there are no fire-resistant walls, windows, or glass

in the Oncology Center Building of Hospital X Surabaya.

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