

FIRE PROTECTION SYSTEM ASSESSMENT OF RETER CAFÉ BUILDINGS IN YOGYAKARTA

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ABSTRACT: Fire hazard is a problem that often occurs due to lack of good facility protection. Fire incidents in commercial high-rise buildings can be used as a benchmark to reduce fire risk. A good fire system can prevent fires, reduce damage, and carry out a good evacuation. Cafe is a commercial building that has safety standards for its residents. One form of protection is to protect against fire hazards. This research was conducted at Caffé Reter which is located on Pandega Marta Street, Pogung Kidul, Sinduadi, Mlati district, Sleman Regency, Special Region of Yogyakarta. This study aims to assess the completeness of the fire protection system facilities and infrastructure available at Caffé Reter. The method used is the process of observing and evaluating 4 parameters of the reliability of the building safety system, namely site completeness, rescue equipment, active protection and passive protection with reference to the Regulation of the Minister of Public Works Number 26/PRT/M/2008. The result of the reliability of the Building Safety System is 78.05 which means the reliability value of Caffé Reter is sufficient. So, Caffé Reter needs to optimize protection against building fire hazards.

Keywords: Building Assesment, Café, Fire Safety, Fire Protection System.

INTRODUCTION

Fire is a problem that cannot be avoided by a human being. Fires can result in death or cause the collapse of structures in buildings. Fire control failures in buildings often occur due to poor building design elements (Yanto, 2019). Losses caused by fire are not only damage to buildings, but also involve the loss of morals and human souls. Fire can be a disaster that takes human casualties if the occupants trapped in the building are unable to get out in a timely and safe manner (Savitri et al., 2022). Therefore, the most effective way to minimize casualties in a fire in a building is to prepare for safe access in an emergency (Halim & Musafir, 2011). Some of the causes of fires include the lack of public awareness and vigilance of the dangers of fire, the lack of community readiness in responding to and handling fire hazards, fire management systems that have not been implemented and integrated, and inadequate infrastructure and protection systems for building fire protection facilities. The lack of community readiness in dealing with the dangers of fire and the low protection system for facilities and infrastructure are important factors in the occurrence of fires (Khairiyah, 2022). Therefore, buildings are expected to have a fire protection system in the form of fire extinguishing facilities, good evacuation facilities for building occupants and buildings are expected to be able to prevent fires and inhibit the spread of fire. Buildings should be designed to protect against fire disasters, starting with fire-resistant materials, fire-resistant doors, windows, clear evacuation routes, automatic sprinkler systems, and smoke detectors and alarms (Akhimien, 2017). There are also several factors that need to be considered in preventing fires in buildings, namely in flammable building materials such as kitchen materials and furniture in buildings. In research conducted by Putri (Amalia Putri & Joko Setyono, 2019) analysis of fire protection systems and life-saving facilities explained that a commercial building is generally equipped with partitions and furniture that fills the entire floor, therefore the amount and type of materials that are flammable has a very high intensity and is prone to the spread of fire.

Fires can be caused by various factors that trigger a fire. Fires are caused by various factors which can be caused by humans directly or indirectly or can be caused by nature (Adilla et al., 2016). The source of fire can occur due to a source that can trigger a fire. Fire that can

trigger a fire also has various sources of ignition, not only coming from direct fire sources but fire sources can be caused by various human activities that can indirectly cause fire (Rajasa et al., 2018). According to (Rohmah & Sufianto, 2018) In the event of a fire, there are four things that need to be considered, namely building occupants (humans), building contents (property), building structures and adjoining buildings. The first three are related to the fire hazard in the burning building, while the latter is a consideration for other buildings and the community environment as a whole (Hesna et al., 2019).

Preventing fires requires special attention so that the possibility of fire can be reduced or even eliminated. One of them can be risk management, because it is very important for the continuity of a business or activity in the event of a disaster such as a fire (Kuntoro, 2017). According to the Regulation of the Minister of Public Works No. 26/PRT/M/2008 concerning Technical Requirements for the Arrangement of Buildings and the Environment, explains that human safety in the building and the environment around the building is a top priority, so buildings must have a security system to prevent fires from occurring. The protection system used to detect and extinguish fires as early as possible uses manual and automatic powered equipment. One of the objectives of the cafe business standard is to provide protection for guests, hoteliers, employees and the public in terms of safety, health, comfort, security and convenience, as well as environmental protection (Suroto, 2011). Therefore, a building must have a fire protection system, both passive and active, equipped with a complete site and rescue facilities in order to realize fire safe conditions in buildings and the environment (Hidayat et al., 2017). In addition, it is necessary to implement fire safety measures that include regular electrical inspections. Such as a strict no-smoking policy, as well as proper storage and handling of flammable materials (Affan & Ahmad, 2019).

The Café Reter building in Yogyakarta was appointed as a case study in the study of Fire Protection System Studies in Commercial Buildings with a design that uses industrial concepts by considering whether Café Reter has been supported by a good fire safety system, where the fire problem as described above is a problem. One of them is in terms of the completeness and suitability of the Passive Protection System and the Active Protection System. Passive protection systems in the form of evacuation routes in buildings that are clear and unobstructed, access to fire cars, the functioning of internal communication devices such as emergency telephones while active protection for fire prevention includes fire detection and fire alarm systems, fire extinguishing systems in buildings, and control systems smoke that refers to the applicable provisions/SNI (Maharani et al., 2022). This is based on the limited firefighting and prevention facilities available at Café Reter Yogyakarta. On the 1st floor there is a parking area for motorbikes and public areas, the 2nd floor is a working space area and on the 3rd floor is an indoor smoking area which is not only intended for users who smoke. The east direction of the building is the main access to the building which has a main road that has a width of 7 meters on the road body. To the north of the building there is a lane for access to the car park which is on the west side of the building, the entrance itself is 3 meters wide and the car park is 20 x 30 meters wide. Meanwhile, on the south and north sides close to other buildings.

Fire is a serious problem that can result in loss of life, property damage, and loss of morale. Poor building design, lack of public awareness, and inadequate fire protection systems contribute to fires in buildings. To prevent fires, buildings need to have fire protection systems in place, including evacuation routes, fire detection and alarm systems, and fire extinguishing systems. The Café Reter building in Yogyakarta was studied as a case study for fire protection system studies in commercial buildings, and it was found that there were limited firefighting and prevention facilities available. Building owners and managers should prioritize the safety of occupants by implementing robust fire protection systems.

Research Question:

1. Does the Café Reter building meet the standard criteria of Minister of Public Works Regulation No. 26/PRT/M/2008 concerning Technical Requirements for the Arrangement of Buildings and the Environment?

RESEARCH METHOD

In this research, a fire safety and protection system assessment method using a facility checklist table is used in accordance with the Regulation of the Minister of Public Works No. 26/PRT/M/2008. To evaluate the reliability of the building's safety system against fire hazards, it will be based on the standards set in SNI 03-1735-2000 (Procedures for planning access to buildings and the environment to prevent fire hazards in buildings), SNI 03-1746-2000 (Procedures for planning and installing means of escape for rescue against fire hazards in buildings), and SNI 03-7012-2004 (Smoke management systems in atriums and large volume rooms). This aims to determine whether the available facilities have met the set standards or not. The study site was chosen at Café Reter, Yogyakarta because the building is frequented by many people and is located in a fairly dense area. Then, conduct a literature review and collect data from similar studies to support data analysis in this study. The data collected includes aspects of fire safety in commercial public buildings.

Data collection is done by direct observation at Café Reter. Element assessment is taken based on 4 SNI assessment criteria which include many criteria such as:

Site Completeness

1. Water Source
2. Neighborhood road
3. Distance between building
4. Yard Hydrant

Evacuation Facilities

1. Exit access
2. Exit Construction
3. Helipad

Active Protection

1. Detection and alarm
2. Slames connection
3. Light fire extinguisher
4. Building hydrant
5. Sprinkler
6. Overflow extinguishing system
7. Smoke control
8. Smoke detector
9. Smoke exhaust
10. Fire elevator
11. Emergency electricity
12. Operation control room

Passive Protection

1. Fire resistance of building structure
2. Space compartmentalization
3. Aperture protection

After all the data is collected, checklist data analysis is carried out as the next step. This analysis aims to evaluate the design level of the Café Reter building in terms of fire safety and resistance. To do this, this research uses the Fire Hazard Excel checklist tool by filling

in the assessment table based on the Indonesian National Standard (SNI), and each B, C, and K value is properly assessed based on existing context conditions.

The condition of building components must be assessed and evaluated, the value of the protection system components is divided into 3, namely:

1. Good : B (100)
2. Enough : C (80)
3. Less : K (60)

Table 1 Reliability Condition

Reliability Condition	Physical condition of fire safety components
Good (B) (80% ≤ NKS KB ≤ 100%)	All components of the fire protection system (active protection system, passive protection system, rescue advice, site) function perfectly, so that the building can be used optimally, where building users can carry out their activities by getting good fire protection
Enough (C) (60% ≤ NKS KB	All components of the fire protection system (active protection system, passive protection system, rescue advice, site) are still functioning properly, but there are utility sub-components that function imperfectly, sometimes causing disturbances or their capacity is less than specified in the design/specifications, so comfort and function of space and/or building are disturbed.
Less (K) NKS KB < 60%	All components of the fire protection system (active protection system, passive protection system, rescue advice, site) are damaged/non-functioning, and their capacity is far below the value specified in the design/specification so that the comfort and function of the room and/or building are severely disturbed or completely unusable.

Source: BalitBang PU 2005

In conducting fire safety assessments, fire hazard assessment tables can provide information and recommendations on the score and B/C/K value of the assessed building. However, there are some special circumstances that the tool cannot fully accommodate, such as unique building characteristics or different environmental factors. Therefore, direct observation and literature review can be important additions to support the analysis results.

FINDINGS AND DISCUSSION

1. Site Completeness

Site completeness can be defined as the presence and layout of building components related to the surrounding environment and related to fire hazard mitigation efforts. These components include water sources, neighborhood roads, distance between buildings, and yard hydrants, in accordance with the Minister of Public Works Regulation No. 26/KPTS/2008.

Table 2 Site Completeness

No.	KSKB / SUB KSKB	Assessment B / C / K	Point Value	Score	Component Value	Total
1	2	3	4	5	6	7
I. Site Completeness						
1	Water Source	K	60	27	4,05	25
2	Neighborhood road	B	100	25	6,25	
3	Distance between Building	B	100	23	5,75	
4	Yard Hydrant	K	60	25	3,75	
						19,80

The overall site completeness component assessment as shown in Table 2 gives a result of 19.8 with a maximum standard value of 25. The assessment that is considered lacking is the yard hydrant.

1.1. Water Source

There are no water resource surrounding the building

Nilai: Kurang.

1.2. Neighborhood Road



Figure 1 Road Pavement

According to SNI 03-1735 and 1736-2000, there are several criteria that must be met in determining building scores on neighborhood roads. One of them is that the width of the road must be at least 6 meters, and the width of the driveway must be at least 4 meters and must be paved. At the Café, the environmental road is on the west side of the building with a width of 4 m, on the south side of the building there is a parking area with an area of 22 x 21 m with pavement in the form of soil coated with gravel, and the main road with a width of 7 m and everything has been paved.

Nilai: Baik.

1.3. Distance Between Buildings



Figure 2 Location Plan



Figure 3 Left Side



Figure 4 Right Side

In an effort to protect against the spread of fire, the minimum distance between buildings is determined. The north side has no settlements/shops. The east side is still vacant land, but there are shops with one floor located in the building yard that are not directly adjacent to the building. The south side is a parking area with an area of 22 x 21 m and there are no buildings after the parking area. The west side is adjacent to the Bento Coffe café yard.

Nilai: Baik.

1.4. Yard Hydrant

Yard Hydrant is a fire extinguisher connected to a strong pressurized water source. This tool is useful for supplying water for firefighting. This building is not equipped with a Yard Hydrant.

Nilai: Kurang.

2. Evacuation Facilities

Evacuation facilities are facilities prepared for use by occupants and firefighters in order to save human life and property when a fire occurs in a building and its surroundings. These facilities include escape routes, escape route construction, and helipads.

Table 3 Evacuation Facilities

No.	KSKB / SUB KSKB	Assessment B / C / K	Point Value	Score	Component Value	Total
1	2	3	4	5	6	7
II. Evacuation Facilities						
1	Exit Access	C	80	38	7,60	25
2	Exit Construction	C	80	35	7	
3	Helipad	K	60	27	4,05	
						18,65

The overall assessment of the rescue facility component as shown in Table 3 gives a result of 18.65 with a maximum standard score of 25.

2.1 Exit Access

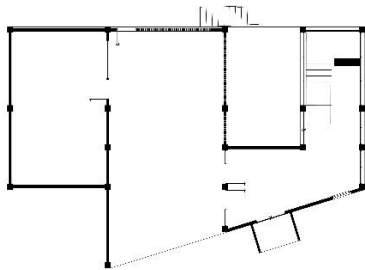


Figure 5 1st Floor Plan



Figure 6 Exit Door

Exit is a means of self-evacuation from fire hazards. At Café Reter most of the criteria have not been met, the available criteria are the distance between the exit doors no more than 6 meters and a smoke-free lobby. Exit directly to an open area, where the exit at Café Reter is located in the north and south of the building which directly leads to an open area. Travel distance is not more than 20 meters from the exit.

Nilai: Cukup.

2.2 Exit Construction



Figure 7 Exit Door



Figure 8 Indoor Parking Area

The criteria available at Café reter are structural resistance to fire spread, where the main structure of the building uses steel material with fire resistance for 1.5 hours and plaster brick walls that have fire resistance for 1.5 hours. The structure can maintain stability during a fire. There are no obstructions on the way out and has a size of 3 meters on the south side and 5 meters on the east side of the building.

Nilai: Cukup.

2.3 Helicopter Pad

A helicopter pad for the Café Reter building is not required because the requirement for a helicopter pad is only for buildings with a minimum height of 60 meters.

Nilai: Kurang.

3. Active Protection System

Active protection system is a system used to protect buildings from fire hazards by using equipment that can work automatically or manually. This system is used by occupants or firefighters in carrying out extinguishing operations and initial fire management (Trikomara et al., 2012). The active protection system includes a number of equipment such as detectors (alarms), siames connections, fire extinguishers, building hydrants, sprinklers, smoke control, smoke detection, smoke exhaust, fire elevators, emergency light, emergency electricity, and operation control rooms.

Table 4 Active Protection System

No.	KSKB / SUB KSKB	Assessment B / C / K	Point Value	Score	Component Value	Total
1	2	3	4	5	6	7
III. Active Protection						
1	Detection and Alarm	K	60	8	1,15	24
2	Slames Connection	K	60	8	1,15	
3	Light Fire Extinguishing System	C	80	8	1,53	
4	Building Hydrant	K	60	8	1,15	
5	Sprinkle	K	60	8	1,15	
6	Overflow Extinguishing System	K	60	7	1,08	
7	Smoke Control	K	60	8	1,15	
8	Smoke Detection	K	60	8	1,15	
9	Smoke Exhaust	K	60	7	1,08	
10	Fire Elevator	K	60	7	1,08	
11	Emergency Light and Direction	K	60	8	1,15	
12	Emergency Electricity	K	60	8	1,15	
13	Operation Control Room	K	60	7	1,08	
						24

The overall assessment of the active protection components as shown in Table 4 gives a result of 24 with a maximum standard value of 24.

1.1 Detection and Alarm

This Building has not detection and alarm

Grade: K

1.2 Slames Connection

This building has not slames connection

Grade: K

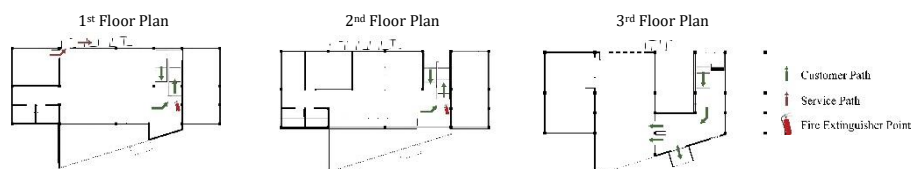


Figure 9 Floor Plan

1.3 Light Fire Extinguishing System

The Light Fire Extinguisher (APAR) used is a type of Dry Chemical Powder weighing 2.3 kg. On the 1st floor is not available. While on floors 2 and 3 there is 1 fire extinguisher type Dry Chemical Powder weighing 2.3 kg. These items are placed on each staircase.

Grade: C

1.4 Building Hydrant

This building has not building hydrant.

Grade: K

1.5 Sprinkle

This building has not sprinkle.

Grade: K

1.6 Overflow Extinguishing System

This building has not overflow extinguishing system.

Grade: K

1.7 Smoke Control

This building has not smoke control.

Grade: K

1.8 Smoke Detection

This building has not smoke detection.

Grade: K

1.9 Smoke Exhaust

This building has not smoke exhaust.

Grade: K

1.10 Fire Elevator

This building has not fire elevator.

Grade: K

1.11 Emergency Light and Directions

This building has not emergency light and direction.

Grade: K

1.12 Emergency Electricity

This building has not emergency electricity.

Grade: K

1.13 Operations Control Room

This building has not operations room control.

Grade: K

4. Passive Protection

Passive protection system is a system used to protect buildings from fire hazards by regulating building components, both in terms of architecture and building structure. Passive protection systems aim to protect occupants and objects from physical damage during a fire. Control through building design is directed at minimizing the incidence of fire

and the intensity of fire occurrence (Trikomara et al., 2012). Passive protection includes building construction, building compartmentalization, and opening protection.

Table 5 Passive Protection System

No.	KSKB / SUB KSKB	Assessment B / C / K	Point Value	Score	Component Value	Total
1	2	3	4	5	6	7
IV. Passive Protection						
1	Fire Resistance of Building Structure	K	60	36	5,61	26
2	Space Compartmentalization	K	60	32	4,99	
3	Aperture Protection	K	60	32	4,99	
						15,60

The overall assessment of passive protection components as shown in Table 5 gives a result of 21.08 with a maximum standard value of 26. The assessment that is considered lacking is in the protection of openings, this will have an impact on the difficulty of handling fires.

3.1 Fire Resistance of Building Structure

This building does not meet the standards for complying with fire resistance of building structure criteria.

Grade: K

3.2 Space Compartmentalization

This building does not meet the standards for complying with space compartmentalization criteria.

Grade: K

3.3 Aperture Protection

This building does not meet the standards for complying with aperture protection criteria.

Grade: K

CONCLUSSION

Table 6 Assessment Result

No.	Fire Hazard Parameters	Weight (%)	Score
1	Site Completeness	25	19,80
2	Evacuation Facilities	25	18,65
3	Active Protection System	24	24
4	Passive Protection System	26	15,60
		100	78,05

Based on the results of the research and discussion that has been discussed, it can be concluded as follows:

1. In café buildings, fire protection system equipment such as site completeness, evacuation facilities, active protection systems, and passive protection systems are mostly available.
2. The research results from the component value criteria at Café Reter are 78.05. This shows that fire safety protection is in the enough category. Therefore, this building needs to complete sufficient components and inspect the components of the fire protection system.
3. Based on the results of the fire safety protection assessment that Café Reter cannot be a reference for the application of fire protection systems in Cafes in Yogyakarta because there are still fire protection components not available.

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