

Systems as an effort to guarantee the safety and security of guests study of hotel building fire protection

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ABSTRACT

Hotel fires can occur at any time without knowing the season for which the hotel building must have a fire extinguishing system that can guarantee the safety of guests, the purpose of this study is to find out the equipment used in the hotel building fire extinguishing system, to assess the completeness of facilities and infrastructure of the hotel building fire protection system, know the precautions against hotel fires in an effort to guarantee the safety and security of guests in hotel. The research methods used in this study are library study methods, interview methods, observation methods, documentation methods. Assessment of the completeness and reliability of building fire protection systems against fire hazards is used the parameters of tread completeness, means of rectification, active and passive protection systems. In data collection, it was carried out on the object of the study, namely at the Sahid Jaya Solo Hotel. The results of the discussion in this study, the equipment in the research object is complete and functions well and the results of the assessment of the reliability of the fire protection system obtained results of 90.63 which means that the reliability of the building is very good. From these results, it can be used as a consideration for the hotel in improving the right fire extinguishing system in an effort to guarantee the safety and security of guests.

Keywords: studies; fire extinguishing systems, guest safety; hotels; assessment.

INTRDUCTION

The construction of high-rise buildings requires a sturdy and strong construction to support a sense of security for its residents. In addition, in building buildings, it must also pay attention to a unified system and is a must on the concept of planning and maintaining high-rise buildings, one of which is in the form of planning for fire hazards (fire protection) which at any time always threatens human life. [1]

One of the public facilities that are often found in big cities is hotels. In building a hotel to get a large area of land in a big city is very difficult, so tourism actors who are in big cities to get around the narrow and limited land, namely by building hotels with high-rise buildings with solid and strong construction. [2]

One of the cities in Indonesia is the city of Surakarta. This city has a very high economic growth and population, the number of immigrants both residents and tourists, therefore supporting facilities are needed, one of which is building temporary residences in the form of apartments or hotels.

One of the hotels that is quite famous in the city of Surakarta is the Sahid Jaya Solo Hotel which is a five-star hotel built with an 11-story high rise building which is very strategically located because it is located on Jalan Gajah Mada No. 82 Surakarta, which is close to the Mangkunegaran Surakarta Palace. The building was built in 1965 and renovated in 1992. This building is now still standing firmly and this is what makes the author want to know about fire fighting equipment as a building fire protection system so that it can ensure the safety of guests staying overnight in the event of a fire.

1. Safety System

A safety system is a form of prevention and countermeasures from various hazards including fire, earthquake and panic hazards. According to the Technical Requirements of the Fire

Protection System in Buildings and the Environment, Regulation of the Minister of Public Workers No. 26 / PRT / M / 2008 Every building must be equipped with road facilities to the outside that can be used by the occupants of the building, so that it has sufficient time to save itself safely without being hampered by things caused by emergencies. [3]

2. Building Classification

According to the Technical Requirements of the Fire Protection System in Buildings and the Environment, Regulation of the Minister of General Workers No. 26/PRT/M/2008. Building class is the division of building buildings or building parts according to the type of use of buildings. The classes of such buildings are divided into:

a. Class 1

1) Class 1a, buildings for residential in the form of:

- One residential house
- One or more residential buildings in which each building is separated by a fireproof wall, including tow houses, garden houses, town house units, and villas.

2) Class 1b, this is a dormitory/boarding house, guest house, hotel or the like with a total floor area of less than 300 m² and is not inhabited by more than 12 people permanently, and is not located above or below any other residential building or classroom building other than a private garage.

b. Class 2

This is a residential building, consisting of 2 or more residential units, each of which is a separate residence

c. Class 3

It is a residential building outside a class 1 or 2 building, which is commonly used as a long or temporary residence by a number of unrelated people, including: a. Dormitory houses, guest houses, inns; or b. a section for the residence of a hotel or motel; or c. a section for the residence of a school; or d. homes for the elderly, disabled or children; or 8 e. the part for the residence of a health care building that houses its employees.

d. Class 4

It is a mixed residential building for residences located in the building of class 5, 6, 7, 8 or 9 buildings and is a residence in the building.

e. Class 5

It is a building that is used for professional business purposes, administrative management or commercial business outside the building class 6, 7, 8, or 9.

f. Class 6

It is a shop building or other building that is used for the sale of goods at retail or services for direct needs to the community, including: a. Dining room, café, restaurant; or b. Dinner room, bar, shop or kiosk as part of a hotel; or c. Haircuts/salons, public washes; or d. Markets, sales halls, showrooms or workshops.

g. Class 7

It is a building that is used for storage, including: a. Public parking lots, b. warehouses or show offs of manufactured goods for sale or warehouse washing;

h. Class 8

It is a laboratory building and building building that is used for processing a production, assembly, alteration, repair, packing, finishing, or cleaning of production goods in the

context of trade or sale.

i. Class 9

It is a gadung building that is used to serve the needs of the community, namely: a. Class 9a, a health care building building, includes part of the building in the form of a laboratory. b. The building of the 9th grade b, the building of the meeting house, including the workshop, laboratory or the like in the elementary school or secondary school, the hall, the building of the worship building, the building of the cultural building or the like, but does not include any part of the building building that is another class.

j. Class 10

Buildings or structures that are not residential; a. Class 10a, a non-residential building that is a private garage, carport, or the like. 10 b. Class 10b, structures in the form of fences, milestones, antennas, support walls or free-standing walls, swimming pools, or the like. [4]

3. Rescue Facilities

Rescue facilities are facilities that are prepared to be used by residents and firefighters in an effort to save human lives and property in the event of fires, earthquakes, and panic hazards in a building and the environment. The security arrangements against fire, earthquake and panic hazards in buildings and the environment are intended to realize the implementation of buildings that are safe against these hazards starting from planning, implementing construction to the utilization stage so that buildings are always reliable and of high quality in accordance with their functions. [5]

High-rise buildings must also be qualified to prevent fire hazards, namely:

- a. Has the main structure and fireproof finishing materials
- b. Have free range with buildings next to it or to the environment
- c. Placing fire ladders in accordance with the requirements
- d. Have prevention of electrical systems
- e. Has prevention of lightning arrester systems
- f. Has a control device for ducting in air conditioning systems
- g. Has a detection system with an alarm system, automatic smoke system and heat ventilating
- h. Has a control tool against the elevator
- i. Communicate with the command station for the fire extinguishing system.

Buildings that are predicted to have a long life by complying with building construction regulations implemented by the government will affect the building maintenance process itself (Lutfi M, Syaifullah BN, 2020; Astoeti DR, Dwijendra NKA, 2021; Lutfi M, Mulyadi EB, 2021; Sinabarita D et.al, 2021). Good building maintenance is carried out approximately once a month. Treatment includes aspects of construction, aesthetics and aspects of supporting buildings (Lutfi M, Rusandi E, 2019; Natasasmita G et.al, 2018). These supporting buildings need to be reviewed so as not to disturb the condition of the main building. The building that separates it from the main building certainly doesn't have a significant effect, but the aesthetic aspect still needs to be questioned (Prastowo I, 2020; Aritama AAN et.al, 2022; Mahendra IGI, Putra IDGAD, 2022).

RESEARCH METHODS

1. Object of Study

This research was conducted at the Sahid Jaya Solo Hotel which is located at Jl Gajah Mada Solo. The existence of Sahid Jaya Solo Hotel is very strategic, located in the middle of Surakarta city

2. Data Collection

Data collection in this study used 2 ways, namely:

- a. Primary data
outside the hotel building, which includes the number of each type of fire extinguishing system component for the entire building, the number of each type of fire extinguishing system component at each level, as well as primary data obtained by checking and recording

the real conditions of the existing fire extinguishing system, both inside and in the number of each type of component of the fire extinguishing system that is damaged / malfunctioning

b. Secondary data

Secondary data is obtained from several documents such as building data (manual operation fire alarm and fire suppression system) and building plans.

3. Data Validation

Data validation is carried out by interviewing with the Engineering Department as an implementer in building repair and maintenance.

4. Data Processing

The data obtained from direct observation and check list in the field is then used to determine the application of building utility components to fire hazards based on the Regulation of the Minister of Public Works No:26/PRT/M/2008 [6] and to determine the reliability value of building safety systems against fire hazards based on Regulation Pd-T-11- 2005-C on Building Fire Safety Inspection.

Frame of mind:

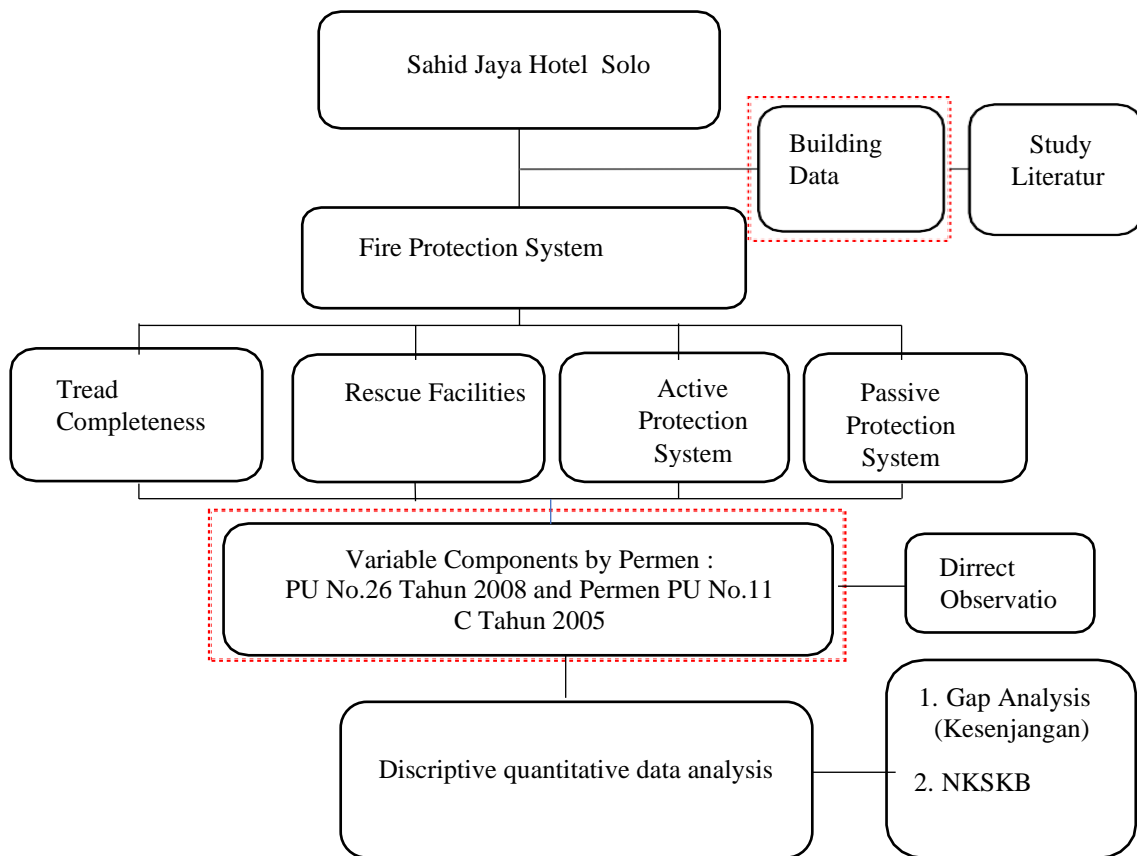


Figure 1. Data Processing flowchart

The Criteria for Assessing the Condition of each component or part of the building must be assessed and evaluated. The value of the condition of the components of building fire protection is divided into 3 levels, namely:

1. Good : "B" (with the equivalence of the value of B is 100).
2. Simply : "C" (with the equivalence of the value of C is 80).
3. or Less : "K" (with the equivalence of the value of K is 60).

The criteria in Table 1 are used as a practical reference material for the assessment of building fire protection conditions carried out by officers of the Engineering Department as building managers. The assessment is based on criteria or restrictions on the condition of building components grouped into 4 parameters of the reliability of the building safety system (KSKB), namely:

1. Assessment of the components of the completeness of the tread.
2. Assessment of the components of the means of rescue.
3. Assessment of active protection components.
4. Assessment of passive protection components.



Figure 2. Sahid Jaya Solo Hotel Plan

RESULTS AND DISCUSSION

1. Assessment of Tread Completeness Components

A thorough assessment of the components of the completeness of the site as shown in Table 2 gives a result of 22.59 with a maximum standard value of 25. The assessment that is considered sufficient is the distance between buildings.

Table 1. Fire Audit Assessment

Value	Conformity	Reliability
>80-100	As per requirements	Good (B)
60-80	Installed but a small percentage of installations that do not meet the requirements	Enough (C)
<60	Not appropriate at all	Less (K)

Table 2. Tread Component Assessment

No	KSKB/SUB KSKB	Value	Assessment Standards	Weight	Condition value	Sum of value
Tread Completeness				25		
1.	Water source	B	100	27	6,75	
2.	Neighborhood street	B	87	25	5,43	
3.	Distance between buildings	C	80	23	4,60	
4.	Page hidrant	B	93	25	5,81	
Jumlah						22,59

a. Water source

There are 2 springs from Deep Well and other sources from PDAM. To meet the main needs of water using 2 Deep Wells located on the east side of the hotel, while water from PDAM as a backup. Value: good.

b. Neighborhood street

To protect against widespread fires and facilitate extinguishing operations, in the building environment, there must be a neighborhood road with pavement that can be passed by firefighting vehicles. Sahid Jaya Solo Hotel has a neighborhood road on the west side of the building with a width of 6.5 m and an entrance road with a width of 6.5 m and everything is pavement condition. Value: good.

c. Distance between buildings

In an effort to protect against widespread fires, the minimum distance between buildings is determined. The north side is 10 m away from the village house. The east side is 3 m away from the settlement. The south side is 13 m away with the village office building. The west side is 50 m away from the Pers monument building, and the south building on the west side is adjacent to the old building. Value: sufficient.

d. Page hidrant

There are 4yard hydrant units installed with decent conditions, easy to reach and function perfectly with pressure according to requirements. Value: good.

2. Assessment of The Components of The Means of Rescue

Table 3. Assessment of the components of the means of rescue

No	KSKB/SUB KSKB	Value	Assessment Standards	Weight	Condition value	Sum of value
Rescue Facilities				25		
1.	Emergency Exit	B	90	50	11,25	
2.	Emergency Exit Construction	B	95	50	11,87	
3.	Helypad	-	-	0	-	
Sum						23,12

A thorough assessment of the components of the means of rescue as shown in Table 3 gives a result of 23.12 with a maximum standard value of 25.

a. Emergency Exit

The exit is a means of evacuation/saving oneself from the danger of fire. At The Sahid Jaya Solo Hotel, most of the criteria have been met, including 4 fire escapes on each floor. The smoke-free lobby area as per the assessment is not yet available. Value: good.

b. Emergency Exit Construction

The construction of exits and fire escapes uses refractory concrete. Emergency exit conditions (emergency stairs) are in accordance with the established standards, but there are several places, empty rooms behind the emergency exit are used to put some equipment for hotel needs. In the applicable regulations, it is stated that there are no objects that block the evacuation road in the event of a fire. Value: good.

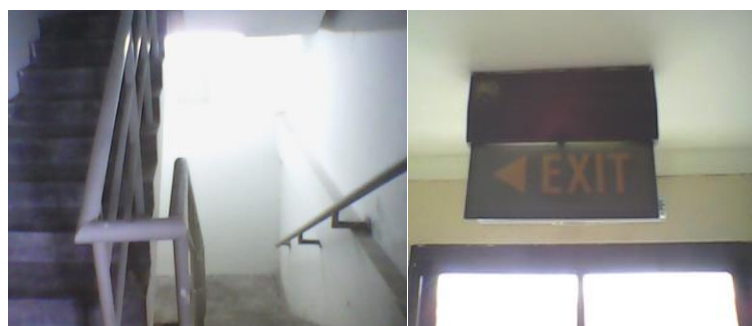


Figure 3. Building of emergency exit

c. Helicopter pad (Helypad)

Sahid Jaya Solo Hotel Building has 11 floors with a height of up to a top floor of 44 m, the helicopter runway for this building is not needed because the requirements for the helicopter

runway are only for buildings with a minimum height of 60 m. Value: no value.

3. Assessment of Active Protection Components

A thorough assessment of active protection components as shown in Table 4 yields a result of 22.07 with a maximum standard value of 24.

Table 4. Active Protection Component Assessment

No	KSKB/SUB KSKB	Value	Assessment Standards	Weight	Condition value	Sum of value
	Tread Completeness			24		
1.	Detection and alarm	B	100	8	1,92	
2.	Siames Conection	B	100	7	1,89	
3.	Fire extinguisher	B	100	8	1,92	
4.	Buiding hidrant	B	100	8	1,92	
5.	Sprinkler	B	100	8	1,92	
6.	Overflow extinguishing system	B	85	7	1,42	
7.	Smoke control	B	90	8	1,72	
8.	Smoke detector	B	86	8	1,65	
9.	Smoke removal	B	87	7	1,46	
10.	Fire elevator	B	90	8	1,72	
11.	Emergency light and directions	B	90	8	1,72	
12.	Emergency Electricity	B	100	8	1,92	
13.	Operation control room	B	100	7	1,89	
Sum						22,07

Some of the components of good value on this building in overflow extinguishing systems, smoke control, emergency light and directions and smoke removal. A good assessment of the overflow extinguishing system will have the effect of slowing the spread of the fire. A good assessment on smoke control will reduce the spread of smoke in other rooms. Good assessment of emergency light and directional directions and smoke removal will have an impact on streamlining the evacuation process and fire suppression efforts.

a. Detection and alarm

The detection and alarm of the Sahid Jaya Solo Hotel building consists of an alarm, manual alarm trigger tool, heat detector and smoke detector with placement on each floor in accordance with applicable requirements and in decent condition. Value: good.

b. Siames Conection

Siames Conection is used to supply water from fire trucks in this building. there are 2 units of machino coupling type, located in front of the north and south buildings on the edge of Jalan Gajah Mada Solo, access is very easy to reach and in decent condition. Value: good.

c. Fire Extinguisher

Light fire extinguishers use dry chemical powder type fire extinguishers with a capacity of 3.5 kg as many as 68 pieces and in each there are 4 pieces. Generally, light fire extinguishers are in a condition suitable for use, but the placement distance between fire extinguishers is not all in accordance with regulations. Value: good.

d. Building hydrants are available as many as 4 units per floor and are installed on the 1st floor as many as 4 units, the 2nd floor as many as 4 units, 4th floor as many as 4 units. 5th floor as many as 4 units. The 6th floor is 4 units to 11 units. Of all the building hydrants, all of them are in decent condition and complete with equipment in the form of nozzles and hoses along 30 m. Value: good.



Figure 4. Hydrant Drive Source and Sprinkler

- e. Sprinkler
Sprinklers are installed on each floor with a distance between sprinklers of 2 m, based on observations, all are installed in all rooms of the Sahid Jaya Solo Hotel building with placement according to requirements. Value: good.
- f. Overflow extinguishing system
This system is used for rooms / buildings that require special systems such as meeting rooms, business center rooms, power plan rooms, electronic rooms (PABX, MATV, MCFA, CCTV) and others. Special extinguishing systems can be gas, foam and dry powder. The building is equipped with an overflow extinguishing system. Value: good.
- g. Smoke control
Smoke control is a tool that functions to control the smoke contained in the room when a fire occurs. This is because the smoke can endanger the lives of people in the building. This tool is in the form of a fan that rotates after the activation of the Smoke detector. The building is equipped with smoke control. Value: good.
- h. Smoke detector
Smoke detectors (smoke detection) in the Sahid Jaya Solo Hotel Building are installed in each room with installation according to applicable conditions, place them in each room with decent conditions. Value: good.
- i. Smoke removal
Smoke removal is a useful tool to remove smoke from the room to the exit of the building when a fire occurs. In its regulations, each smoke reservoir is served by at least one piece of fan that is able to suck smoke. In addition, the fan is located inside a smoke reservoir with a height of 2m from the floor. This tool is available in the Building of Hotel Sahid Jaya Solo. Value: good.
- j. Fire elevator
The fire elevator meets the requirements because it is equipped with a fire resistance cable and there is a spare battery if the electrical energy fails. Nevertheless the Elevator is used only emergency conditions for rescue. Value: good.
- k. Emergency light and directions
This building has an emergency light and is attached to the emergency stairs, if in an emergency it can turn on automatically. Evacuation route directions are also clearly attached to the fire escape. Value: good.
- l. Emergency electricity
Emergency strong current electricity uses a generator set with a capacity of 500 KVA and can operate automatically if the power goes out with a time delay of 10 minutes. Value: good.
- m. Operation Control Room
The equipment contained in the operation control room includes CCTV (monitoring monitors), sound systems (loudspeakers), communication devices (Telephone and Handy Talky), alarm control panels (MCFA), and electrical control panels (Electric panels) that can directly monitor fire hazards that occur and are able to react quickly directly from the operation controller automatically with 24-hour supervision from technicians and security units. Value: good.

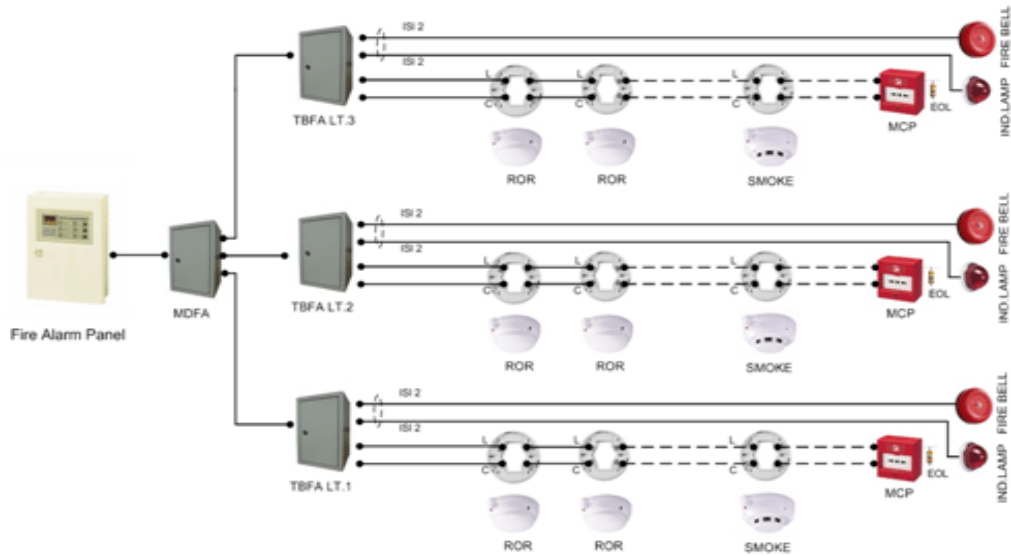


Figure 5. MCFA

4. Assessment of Passive Protection Components

A thorough assessment of the passive protection components as shown in Table 5 yields a result of 22.85 with a maximum standard value of 26. These components are all good value. This good judgment will have an impact on the ease with which firefighters can get into the building.

a. Fire resistance of building structures

The fire resistance of building structure components is in accordance with the requirements of Type A, which is a construction whose forming structure is fire resistant and able to withstand structurally the load of the building. Value: good.

b. Compartmentization of the room

Compartmentization of the room in the form of a wall that separates between hotel rooms and has been equipped with sprinklers in each room and installed a smoke exhaust system, namely an exhaust fan in this building. The neighborhood road with a width of 6.5 m is enough for fire trucks to access the site. Grades: good.

c. Aperture protection

In this building, there is an opening protection for firefighters' access, opening doors on the pipe shaft and cable installation shafts made of fireproof plywood. Value: good.

Table 5. Passive Protection Component Assessment

No	KSKB/SUB KSKB	Value	Assessment Standards	Weight	Condition value	Sum of value
Rescue Facilities				25		
1.	Durability of building structures	B	85	36	7,65	
2.	Compartmentization of space	B	100	32	8,00	
3.	Aperture protection	B	90	32	7,29	
Sum						22,85

Table 6. Components of Building Safety Systems

No	Parameters	Weight KSKB (%)	Value
1.	Completeness of the tread	25	22,59

2.	Rescue Facilities	25	23,12
3.	Active protection system	24	22,07
4.	Passive protection system	26	22,67
Sum			90,63

The results of the assessment and calculation of the components of the safety system in the Sahid Jaya Solo Hotel building can be seen in Table 6. From Table 6, a Safety System Reliability Value of 90.63 was obtained; which indicates that the overall condition of the building falls under the category of "Good". Thus, the Sahid Jaya Solo Hotel building can be used optimally and building users get good protection from building fire hazards.

CONCLUSION

The results of the calculation of the value of utility components at Sahid Jaya Solo Hotel resulted in a Building Safety System Reliability Value (NKS KB) of 90.63. It shows good value. Based on the results of the assessment that Hotel Sahid Jaya Solo can be used as a reference for the application of a fire protection system in commercial buildings in Solo because all components are present and installed.

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