

## EVALUATION OF LIFE SAFETY TECHNICAL FACILITIES FROM FIRE ON APARTEMENT

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### Article info

MODUL vol 19 no 1, issues period 2019

Doi : 10.14710/mdl.19.1.2019.50-54

Received : 22nd may 2019

Revised : 23rd may 2019

Accepted : 23rd may 2019

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### Abstract

Vertical housing of apartments have begun. Housing needs continue to increase as the availability of vacant land is increasingly limited. Occupying an apartment becomes trend and lifestyle for young people. The reason is productivity. The construction of apartments usually built close to various activity centers, both business, commercial, education, health to entertainment. The improvement of building construction is not supported by the land availability especially in the city of Jakarta. Therefore making the construction of high-rise buildings to anticipate it. The construction of multi-story buildings also increases the risk of fire. In 2018, there were at least 1,078 recorded disaster events. Head of the Jakarta Fire and Rescue Management Agency, Subedjo said that 897 buildings or tall buildings in Jakarta, 280 tall buildings had not yet accomplished the fire protection system (Dinas, 2018).

Therefore, this research purpose is to evaluate the lifesaving facilities and infrastructure in the building. The application of fire safety in buildings can be evaluated regarding to NFPA 101 (2013). Based on NFPA 101A: Guide on Alternative Approaches for Life Safety (2013), there are 12 elements of safety and Regulation of the Minister of Public Works No. 26 / PRT / M / 2008 concerning Technical Requirements of Fire Protection Systems in Building Buildings. The building that became the object of research is one of the buildings in the area of Jakarta mentioned building X and building Y. The variables that are the focus of the research are fire stairs, fire doors, and access roads.

Based on the results of the study, the level of reliability of the means of saving lives against fire hazards in building X is equal to 58% and in building Y is 65%.

**Keywords:** means of life-saving; fire protection; evaluation; apartment, Jakarta

### INTRODUCTION

Humans are racing against time, however they also need a place to just rest. Housing needs increased but the availability of land is limited. Occupying an apartment becomes a trend and lifestyle for young people to support productivity. At such ages, their demanded speed and dynamic movement. The housing far distance from the office makes their mobility declining and inefficient. For this reason, the apartment was built to facilitate the movement of its residents. Loft emerged as an interesting dwelling phenomenon in America around the 1950s and developed into a global phenomenon. The form of dwelling that starts from the conversion of industrial buildings to occupancy is considered suitable to answer the challenges of being a flexible, present-day residence. In designing tall buildings, in addition to the architectural aspects of an architect, it is required to admit several other aspects, such as structural, mechanical, electrical and building costs (Juwana, 2005). With the concept of minimizing human movement, unwittingly, buildings can create new risks that are rarely realized, namely fire (Soewarno, 2015). The fire disaster in Jakarta tended to increase. Based on data from the DKI Jakarta Provincial Fire and Disaster Management Agency in 2013, there were 997 fire incidents. In 2018 there were 951 of which were fire and disaster events due to extreme weather are at least 1,078 disasters. Of these amounts, 692 of them were fire events and 259 disasters due to extreme weather. Fire can be said to be an accident that still often occurs.

Reflecting on these cases, it is necessary to evaluate the system of life-saving facilities for building fires and continuous improvement. Randomized case studies on 2 buildings in Jakarta as part of efforts to prevent fire accidents by looking at the regulations used, namely NFPA 101A: Guide on Alternative Approaches for Life Safety (2013), with 4 of the 12 main parameters and Regulation of the Minister of Public Works No. 26 / PRT / M / 2008 concerning Technical Requirements for Fire Protection Systems in Building Constructions, focuses on fire stairs, fire doors and exit access roads.

Evaluation that researchers do is using the thought of comparison of rules and case studies in the field so that it can be categorized as semi-quantitative descriptive research. The results of this evaluation indicate that Building X and Building Y coincide the standards of Minister of Public Works Regulation No. 26 / PRT / M / 2008 concerning Technical Requirements for Building Fire Protection Systems and NFPA 101A: Guide on Alternative Approaches for Life Safety.

## METHOD

Research by design scheme can be obtained from evaluation based on regulation/literatures, and deeper study about some idea's variables (Harsritanto, 2018).. Literature study, site observation and study cases were fit on evaluation type of studies (Harsritanto et al, 2017 dan Dumanski, 1997). The literature/regulation studies will sharpen the evaluation criteria and value. Site observation to get the real value of the study objects according to the formed evaluation sheets . And last the cases studies will complete the research by heuristic study about the past, present and future conditions related to the evaluation criterias (Harsritanto, 2018).This is the research conducted using a qualitative descriptive method by means of case studies, in which the results of the study are described, analyzed and then drawn conclusions in solving them. This research was carried out on fire stairs, fire doors and exit access parameters used to refer to the Minister of Public Works Regulation No. 26 / PRT / M / 2008 concerning Technical Requirements of Fire Protection Systems in Building Constructions. There are 2 story-buildings as case studies, namely building X and building Y.

The method used in carrying out observations regarding the evaluation of the life safety system against building fires is:

1. Method of observation
2. Design Plan data
3. Literature study method.

The data analysis technique (SNI, 2015) carried out in writing this research is to compare the data in the field, namely:

1. Fire Ladder
2. Fire door
3. Exit Access

With the provisions contained in the SNI Standard 03-1736 Year 2000; Technical provisions for saving the life against fire hazards in buildings and the environment; the Decree of the Minister of Public Works No.10 / KPTS / 2000; Regulation of the Minister of Public Works No. 26 / PRT / M2008 dated 30 December 2008 concerning Technical Requirements.

## ANALYSIS AND INTERPRETATION

The Case studies carried out in Building X and Building Y are buildings that have a height of > 30 floors, and function as a place to fulfill human needs in this modern era. They are located in the city center with easy accessibility and in one environment with an advanced economic level (see figure 1 and 2).

The brief conditions of building X and Y are :

Building X is apartment with L shape and having double core on each end of sides. The core areas were assymetrical and followed the building shape.

Building Y is apartment with I shape and having double core on each end of sides. The core areas were symetrical and followed the building shape.

Both of the apartments were highrise kind of buildings, so the fire protection system as life technical facilities are a must prepared and ready to use devices.



Figure 1. Plan of 18<sup>th</sup> floor Building X

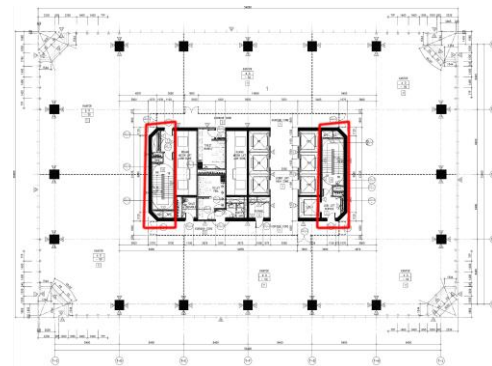


Figure 2. Plan of 18th floor Building Y

Each building has Design Development Parameter of height , number of floors, refugees and fire shaft, etc as follows on table 1 :

**Table 1.** Development Parameter Management

	Building X	Building Y
Area	1985 m2	2007m2
Height	168 m	188m
Floors	42 floor	47 floor
Refugee	4 Refugee	4 Refugee
Fire Shaft	2 Fire shaft	2 Fire Shaft
Type of Building	Apartemen	Office
Year of Project	2017	2016
Status	Awakened	Awakened

Based on the applicable regulations, the implementation of building security, especially against fire hazards, must be carried out properly. To overcome this, building X and building Y are required fire stairs, fire doors and exit access that provide a means of saving lives efficiently inside and outside the building. The evaluation of each emergency stairs can be seen as follows:

1. Wide
2. Foothold
3. Footing height
4. Handrail
5. Material
6. Finishing, and
7. Floor conditions

**Table 2.** Fire Stair Evaluation; Building X

Parameter	Standard		Study Results	Information
Fire stairs	Wide	Min. 120 cm	120 cm	fulfilled
	Foothold	Min. 27,9 cm	28,1 cm	fulfilled
	Footing Height	10,2 – 18 cm	18,2 cm	not fulfilled
	Handrail Height	90 – 105 cm	100 cm	fulfilled
	Material	Concrete	Concrete	fulfilled
	Finishing Floor	Not Slippery	Not Slippery	fulfilled

**Table 3.** Fire Stair Evaluation; Building Y

Parameter	Standard		Study Results	Information
Fire stairs	Wide	Min. 120 cm	120 cm	fulfilled
	Foothold	Min. 27,9 cm	28,1 cm	fulfilled
	Footing Height	10,2 – 18 cm	19 cm	not fulfilled
	Handrail Height	90 – 105 cm	100 cm	fulfilled
	Material	Concrete	Concrete	fulfilled
	Finishing Floor	Not Slippery	Not Slippery	fulfilled

From the evaluation on the tables 2 and 3 that the fire stairs in building X and building Y are found parts that have not fulfilled the requirements, namely the height of the footing. It is not as required so that in an emergency the stairway can be a threat.

In addition to the state of the Fire Ladder in the table above, the next parameter is the Fire Door. This door serves to protect from fire when a fire occurs, so that the humans inside the fire shaft can avoid the incoming fire. The evaluation of each Fire Door can be seen as follows:

**Table 4.** Fire Door Evaluation; Building X

Parameter	Standard		Study Results	Parameter
Fire Door	Trusht	Min. 67 N	67 N	fulfilled
	Height Panic Bar	75 cm – 110 cm from floor	75 cm	fulfilled
	Wide Opening Direction	80 cm	80 cm	fulfilled
	Exit Direction	There must be	fulfilled	fulfilled
	Material	Firerated	Firerated	fulfilled
	Finishing Door	Firerated	Firerated	fulfilled

**Table 5.** Fire Door Evaluation; Building Y

Parameter	Standard		Study Results	Parameter
Fire Door	Trusht	Min. 67 N	67 N	fulfilled
	Height	75 cm – 110 cm	75 cm	fulfilled
	Panic Bar	from floor		
	Wide Opening	80 cm	80 cm	fulfilled
	Direction			
	Exit Direction	There must be	fulfilled	fulfilled
	Material	Firerated	Firerated	fulfilled
	Finishing Door	Firerated	Firerated	fulfilled

From the evaluation on the tables 4 and 5, the fire door in building X and building Y have parts that have met the requirements, which are required so that the conditions are safe.

In addition to the state of the Fire Door in the table above, the next parameter is Exit Access, this door serves to provide instructions and directions that does not make people confused when a fire occurs and can leave the building safely. The evaluation of each Fire Exit Access can be seen as follows:

1. Ceiling height
2. Hidrant box
3. Apar sprinkler
4. Wide Opening corridor
5. Smoke stop lobby
6. Fire resistance level
7. Finishing doors condition

From the evaluation in the table 6 and 7, Some parts of Exit Access in building X and building Y do not meet the requirements. The sprinkler is one form of protection against fire hazards in buildings such as water transmitters (Fitzgerald, 2014). The system used must be in the building as required so that building X and building Y have fitted. Wide opening direction are not clearly. They are have 1,1 m for clearance. Therefore, when a fire occurs, it is very dangerous because the humans inside do not know the right path to get out.

**Table 6.** Exit Access Evaluation; Building X

Parameter	Standard		Study Results	Parameter
Exit Access	Celling Height	Min. 2.25 m	67 N	fulfilled
	Hidrant box, Apar, Sprinkler	There must be	fulfilled	fulfilled
	Wide Opening Corridor	1.20 m – 1.5 m	1.10 m	Not fulfilled
	Smoke Stop Lobby	300 cm x 200 cm	fulfilled	fulfilled
	Fire Resistaance Level	1 Hours	1 Hours	fulfilled
	Finishing Door	Firerated	Firerated	fulfilled

**Table 7.** Exit Access Evaluation Building Y

Parameter	Standard		Study Results	Parameter
Exit Access	Celling Height	Min. 2.25 m	67 N	fulfilled
	Hidrant box, Apar, Sprinkler	There must be	fulfilled	fulfilled
	Wide Opening Corridor	1.20 m – 1.5 m	1.60 m	Not fulfilled
	Smoke Stop Lobby	300 cm x 200 cm	fulfilled	fulfilled
	Fire Resistaance Level	1 Hours	1 Hours	fulfilled
	Finishing Door	Firerated	Firerated	fulfilled

## CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the research conducted, it can be concluded that the physical condition of the fire stairs in buildings X and Y does not meet the requirements, especially the height of the footing. And from the evaluation in the tables above, some parts of Exit Access in building X and building Y do not meet the requirements. Wide opening direction are not clearly. They are have 1,1 m for clearance. Therefore,

when a fire occurs, it is very dangerous because the humans inside do not know the right path to get out. But for evaluation in the tables above, some parts of fire doors in building X and building Y have met the requirements, which are required so that conditions are safe. Of the 3 that are required, 2 parameters have not fulfilled the requirements and because this research is only limited to the sample that has been mentioned so that in the future the government and the implementers of construction are more concerned and both control intensively, if not, it will be fatal in the future.

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