FIRE EMERGENCY RESPONSE PLANNING IN THE STUDIO Y AT TELEVISION STATION X WEST JAKARTA

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Abstract
As a prevention as most fires occur in building, it is important to plan a fire emergency. This study aims to make a fire emergency response plan in Studio Y at Television Station X. Data collection was carried out at Studio Y by identifying potential fire hazards and analyzing emergency response facilities and infrastructure. The results showed that Studio Y had a fairly high fire hazard potential because there were many tools and equipment that could be triggering a fire. Therefore, planning for a fire emergency was carried out according to the fire scenario and determining evacuation routes which were divided based on color zones and the number of available doors.

Keywords: *response, emergency, fire, studio, track, evacuation*

INTRODUCTION

Fire is a type of disaster. The damage that can be caused by fire such as material losses, fatalities, business interruption, social losses, and decreased productivity (Ramli, S., 2010). According to the Peraturan Pemerintah, (2012), states that companies must have procedures as an effort to deal with industrial accident and disaster emergencies. As a prevention, it is important in Departemen Pekerjaan Umum, (2009) to plan a fire emergency. Fire emergency response plan aims to ensure occupational safety and health, prevention and control of fires, and control of environmental pollution. Savitri, R.N. (2021) presents the comparation of actual condition with 11 standards for fire protection. The results of this studi founds that there is enough average percentage (73%) fullfillment of fire protection between actual condition and the standars. Sabilla, P.D., (2021) briefly describe emergency response plan design at Universitas Sriwijaya Indralaya library. Data are from interview and observation. The purpose of this study is to count the evation time based on SFPE 3rd Handbook of Fire Protection Engineering. The findings of this study are several passive fire protection is not fullfill the standars.

Permana, M.T. (2021) shows time to egress and emergency response plan based on SFPE 3rd edition. The findings of this study are several passive fire protection have fullfill the requirement in SFPE 3 ediotion and several of that have not fullfill it. Fattah,

A. A. (2020) presents the calculation improvement of the need to extinguish the T-16 storage tank at the production storage center of the oil and gas industrial company PT. X. This study found that the tank is at risk of experiencing a fire in the scenario of an unobstructed full liquid surface fire in the form of a pool fire. Dolok, R.R. (2018) was conducted to find out an overview of the implementation of the local emergency response plan management system at the BSD PT workshop. Halliburton Indonesia Tangerang Jakarta. The method used is a sampling technique. The research results show that there has been no simulation of earthquakes and flood conditions.

Syaifuddin, (2011) provides an overview of the implementation of emergency response. Based on the results of this study, procedures and infrastructure are available such as communication facilities, fire fighting equipment, exit routes, evacuation areas and emergency response teams. Amin, G.I. (2010) aims to determine the level of compliance with the fire emergency response system at the PLTU. Interviews are used to obtain research data. The research results show that the PLTU production area has class A, B, C and D fire hazards and the average level of compliance with the fire emergency response system is 81.76%. Kusnendar, Y.K. (2009) aims to find out emergency response systems and policies and how to implement emergency response operational procedures. Data was obtained through observation, interviews, reference literature books and company data. The research results show that the implementation of emergency response operational systems and procedures is carried out in accordance with company policies and commitments.

One of the buildings that requires a fire emergency planning is Studio Y. Studio Y is one of the largest studios in Asia and it is usually used to present interesting television programs that require special attention when a fire occurs due to the large number of employees and audience. From the results of observations, there are several safety regulations that are not properly implemented. For example, there are many items on the evacuation route during the event ITX at Studio Y. As stated in SNI 03 – 1746 – 2000, where evacuation routes may not be obstructed from any point (Badan Standardisasi Nasional, 2000). Cables scattered around the stage area can also cause minor accidents, such as tripping and falling. In addition, there is plastic and paper used for event purposes at the bottom of the stage which if not cleaned will be able to accelerate the spread of fire when a fire occurs. Based on the description of the problems, it can be seen that fire emergency response plan is very much needed in Studio Y because some equipments and tools can trigger a fire and many building occupants do not understand evacuation routes during an emergency. The specific purpose of this research is to assess and analyze the fire emergency preparedness and response plans in Studio Y.

RESEARCH METHOD

This research was conducted at a television station in West Jakarta. The object to be examined is Studio Y which it has two floors as can be seen from Figure 1 to Figure 2. This research used a Research and Development (R&D) methods. The selection of informants was based on several job description considerations of the informant's work and understanding the implementation of fire emergency response. This study starts by studying libraries, such as research previous journal and thesis, and regulation (SNI, lokal regulation, minister regulation, and UUD 1945). It is followed by observation in order to identify potential fire hazards. Analyzing active protection system, fire emergency response management, and soul saving facility are step taken after identify potential fire hazards. Creating a fire disaster scenario, making fire emergency response, and determining evacuation routes are the last research methodology step.

RESULT AND DISCUSSION

Studio Y is part of Television Station X and it is the largest studio in Asia. The area of this studio is 3.300 m2. The studio is surrounded by three other buildings, namely Building XY, Building YZ and Studio XX. Studio Y is used as a venue for big events with an audience capacity of approximately 2.000 people as can be seen Figure 3. Some of the events that are usually held at this studio are big concerts, awards, music auditions, and religion event, such as Christmas celebration.

Identification of Potential Fire Hazards

The potential fire hazard in the Studio Y area comes from humans, event production equipment and tools, and nature. The potential fire hazard caused by humans can come from cigarettes. The Television Station X has implemented regulations not to smoke in this studio but sometimes cigarette butts are still found. Fixtures and equipment used for the production of an event can also cause a fire. Some production equipment is made of flammable materials, such as plastic, carpet, wood, and cloth. Equipment related to electricity can also be a source of fire if it overheats or receives excessive current. However, one of the causes of fires is unsafe actions carried out by one individual or one group. Lack of knowledge about the use of equipment or equipment in the production process of an event can cause a fire.

Based on the results of hazard identification and risk assessment in the Studio Y, four activities with eleven heat sources can occur. From the eleven heat sources, a low risk level with eight sources was obtained, a high risk level with three sources, a moderate risk level and an extreme risk with zero sources as can be seen in Figure 5. Risk assessment is determined by the multiplication between likelihood or probabiliy (L) and severity or consequences (S) so as to produce a value or scale corresponding to the risk matrix.

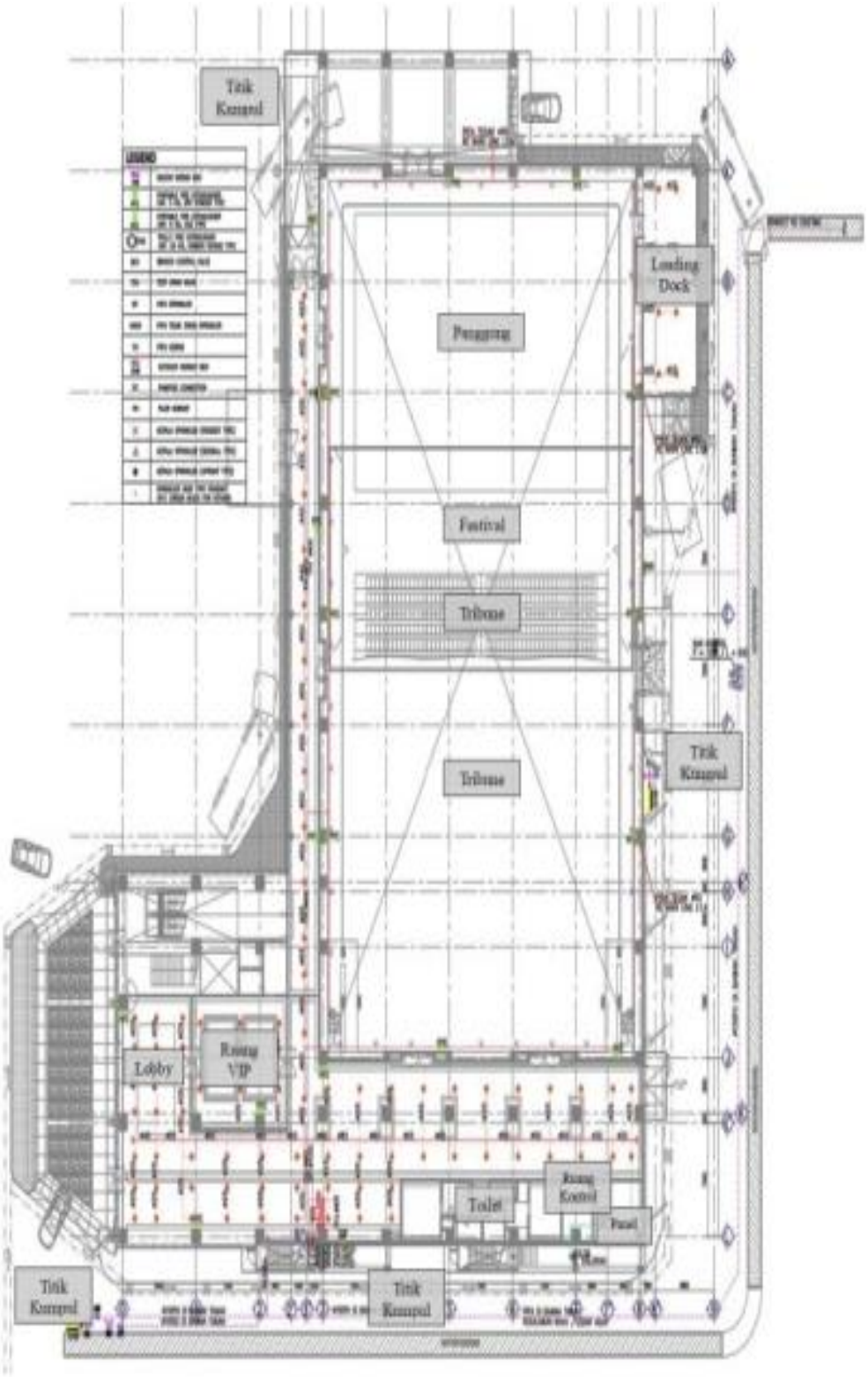

Figure 1. Layout of 1st Floor

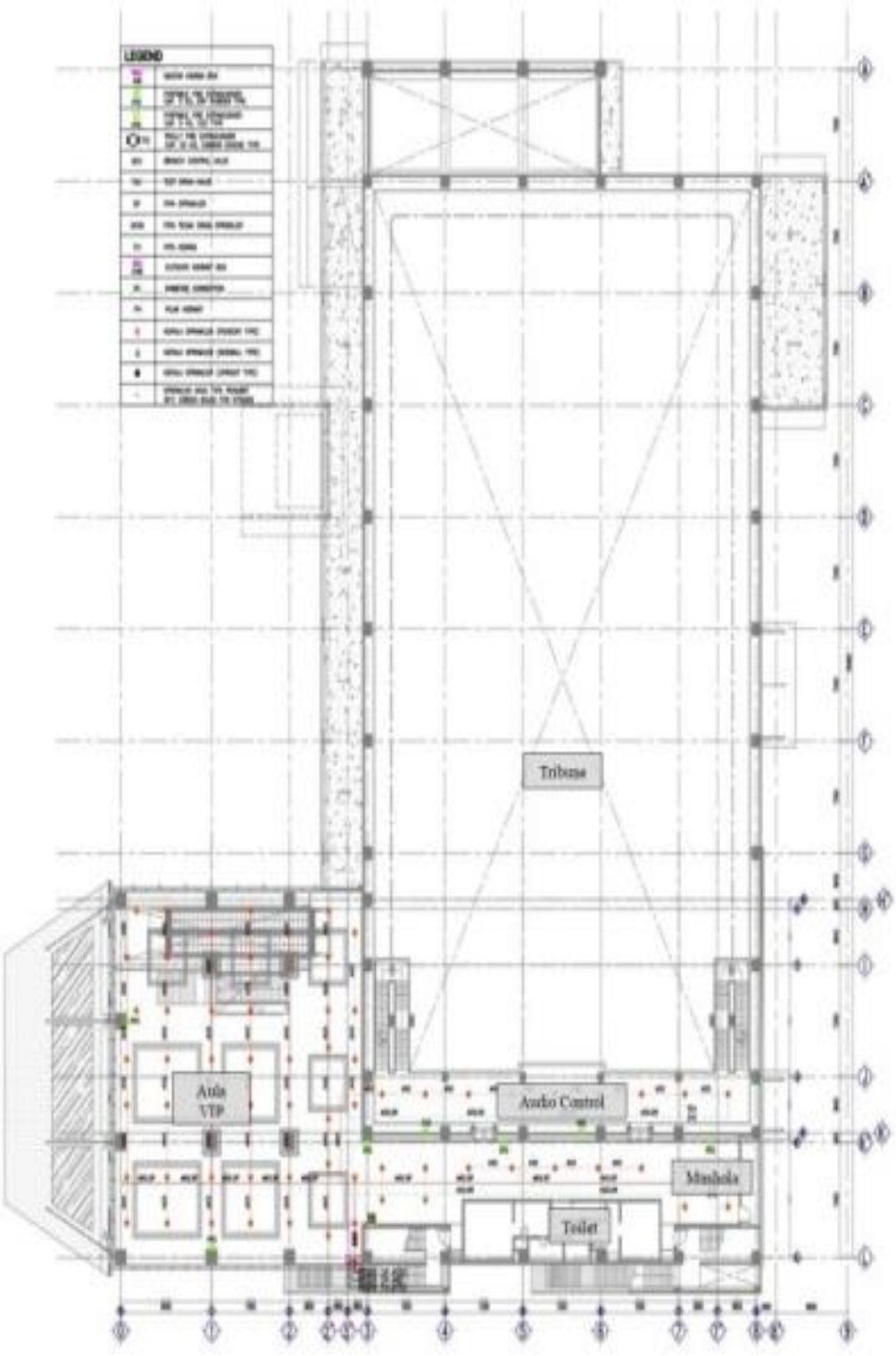

Figure 2. Layout of 2nd Floor

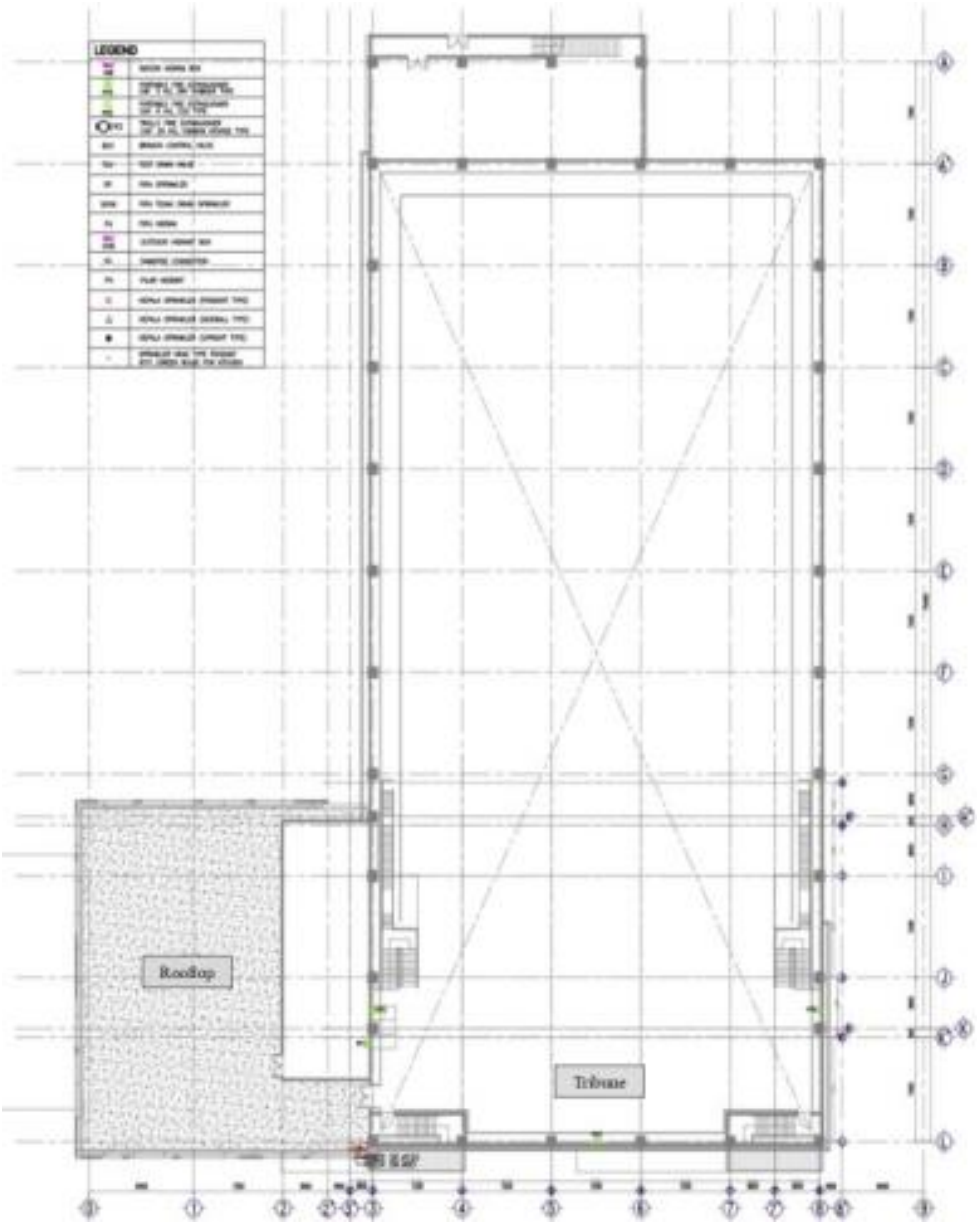

Figure 3. Layout of Mezzanine 2nd Floor

Figure 4. View of Studio Y

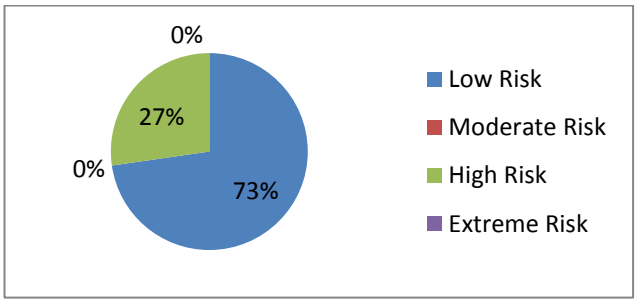

Figure 5. Risk Level Percentage

Analysis of Emergency Response Facilities and Infrastructure

Analysis of emergency response facilities and infrastructure was carried out to determine the level of fulfillment of active protection systems, emergency response management, life-saving facilities, and emergency communication facilities available at Studio Y.

Based on observations, Studio Y already has several emergency response facilities and infrastructure, such as fire extinguishers, fire alarms, sprinklers, fire detectors, hydrants, emergency exits, emergency stairs, corridors, exit directions, assembly points, emergency response team, emergency response training, and telephone. However, Studio Y still does not have a clearly written emergency response procedure.

Analysis of the active protection system score refers to the Peraturan Menteri PU no. 26 of 2008, NFPA 72, NFPA 13, and Badan Standarisasi Nasional SNI 03-3985-2000 with the compliance results listed in Table 1. In emergency response management, the score of analysis refers to the standard Peraturan Menteri Pekerjaan Umum No. 20/PRT/M/2009 and Kepmen PU No. 11/KPTS/2000 with the fulfillment results listed in Table 2. Based on the Peraturan Menteri Pekerjaan Umum No. 20/PRT/M/2009 and NFPA 101, fulfillment score of life saving facilities can be seen in Table 3. In Table 4, shows the fulfillment of emergency communication facilities based on Kepmen PU No.10/KPTS/2000.

Tabel 1. Fulfillment of Active Protection System

No.	Diameter (mm)	Score
1	Fire Extinguisher	80%
2	Fire Alarm	100%
3	Sprinkler	80%
4	Fire Detector	100%
5	Hydrant	100%

Tabel 2. Fulfillment of Emergency Response Management

No.	Emergency Response Management	Score
1	Emergency response procedures	0%
2	Emergency response team	100%
3	Hydrant	75%

Tabel 3. Fulfillment of Life Saving Facilities

No.	Life Saving Facilities	Score
1	Emergency exits	100%
2	Fire escape	80%
3	Corridor	50%
4	Exit directions	83,3%
5	Gathering point	66,66%

Tabel 4. Fulfillment of Emergency Communication Facilities

No.	Emergency Communication Facilities	Score
1	Ceiling speaker	100%
2	Telephone	100%
3	Handy talky (HT)	100%

Making a Fire Scenario

Fire is happening while the event is in progress. At first, sparks appeared from one of connector voltage holes due to overcurrent as can be seen in Figure 6. The connector voltage beside the stage is filled with cable plugs used for event purposes. The sparks started to grow so that they spread to the carpet, cloth, and wood around connector voltage. The irregular condition of the cables also accelerates the spread of fire. In the scenario, there are employees, security studio, post security , chief of security, safety staff , chief of safety, chief of mechanical electrical, first aid team, and fire brigade (Paspampi).

Creation of Fire Emergency Response Procedures

Fire emergency response procedures are urgently needed at Studio Y to anticipate and facilitate disaster management when a fire occurs so that it does not cause large losses, both material losses and casualties. In a fire emergency response procedure there are several components, such as objectives, scope, definition, regulatory references, duties and responsibilities, actions, and evacuation routes. This procedure is made based on the results of identification of potential fire hazards, fire scenarios, and available facilities and infrastructure.

Determination of Evacuation Routes

Determining evacuation routes is very important as an effort to anticipate emergencies. When there is a fire, employees and visitors can leave Studio Y following the designated evacuation route. Figure 6 shows the evacuation route. In the gray zone of Figure 7,

employees (crew) and artists will be directed to emergency exits number one and two. If the employee (crew) exits via emergency exit number two, they will be directed out of Studio Y via emergency exit number seven. While the part of the festival with a green zone will be directed out through emergency exit number six. Audience in the stands or the red zone will be directed to emergency exit number four and then proceed to emergency exit number nine.

Meanwhile, audience in the stands with yellow zones will be directed to emergency exit number five and then to emergency exit number ten. Audience in the blue zone will be directed out of the studio through emergency exit number one and then directed to emergency exit number three. While the audience in the orange zone are directed out of the studio through emergency exit number two and exit through emergency exit number four. Artists or talents will be directed out through emergency exit number one. Audience in the festival section or purple zone will be directed out through emergency exit number three and then directed out of the area through door number eight.

Audience in the blue zone will be directed out of the studio through emergency exit number one and then directed to emergency exit number three. While the audience in the orange zone are directed out of the studio through emergency exit number two and exit through emergency exit number four. In the red zone, the audience will be directed out of the studio area through emergency exit number one and audience in the yellow zone will be directed out of the studio area through emergency exit number two.

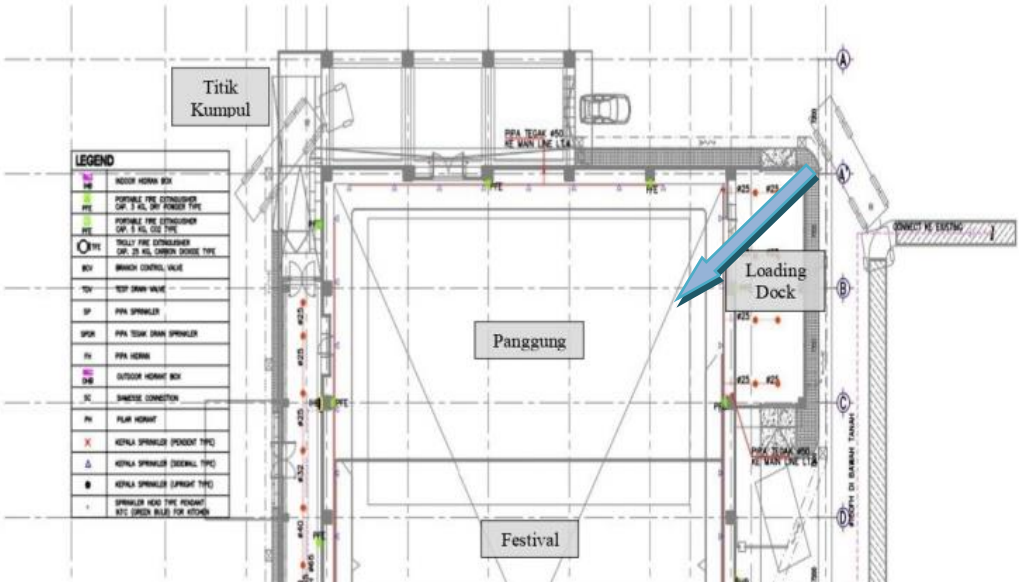

Figure 6. Location of Connector Voltage Burned

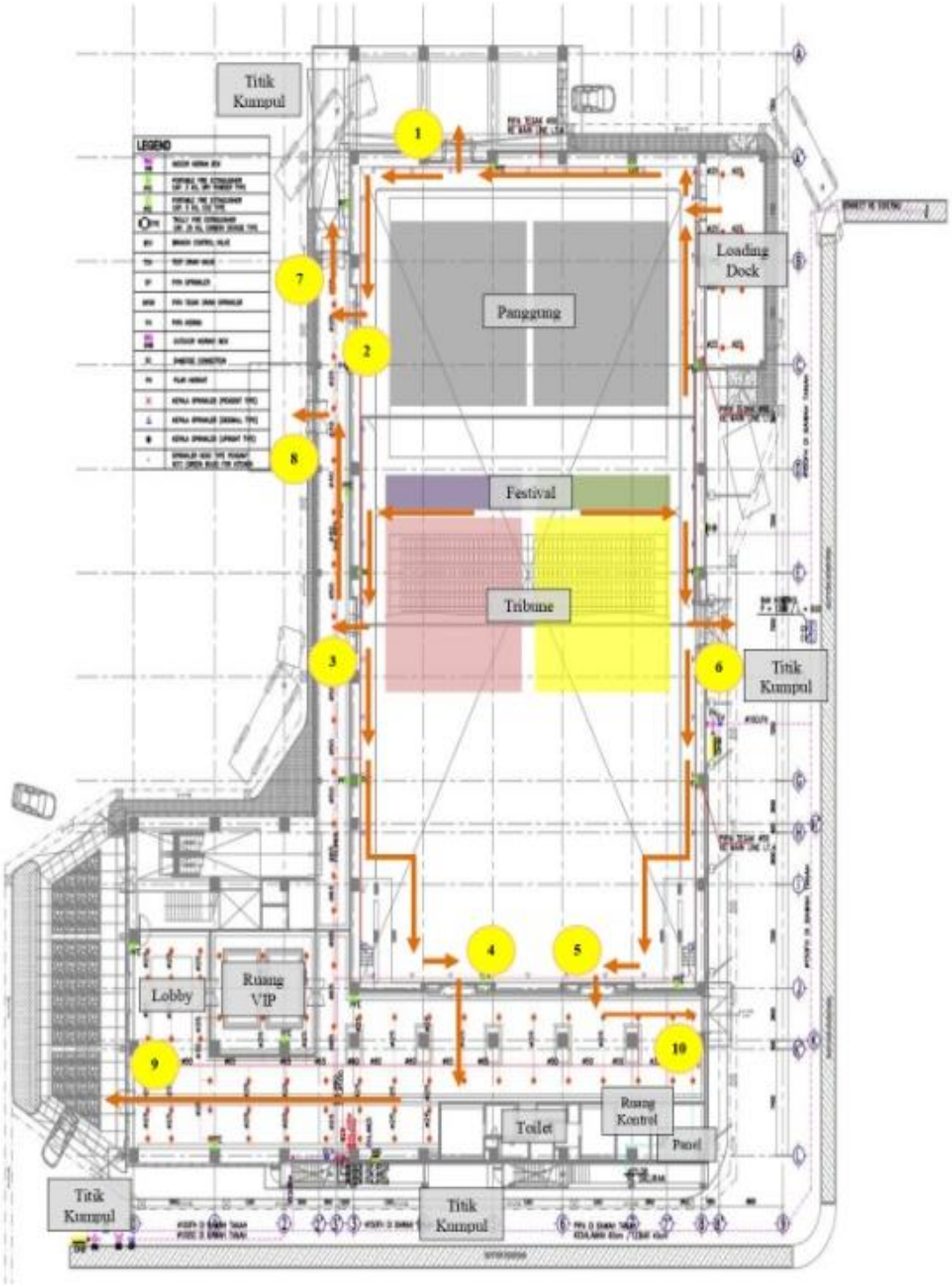

Figure 7. Evacuation Route 1st Floor Studio Y

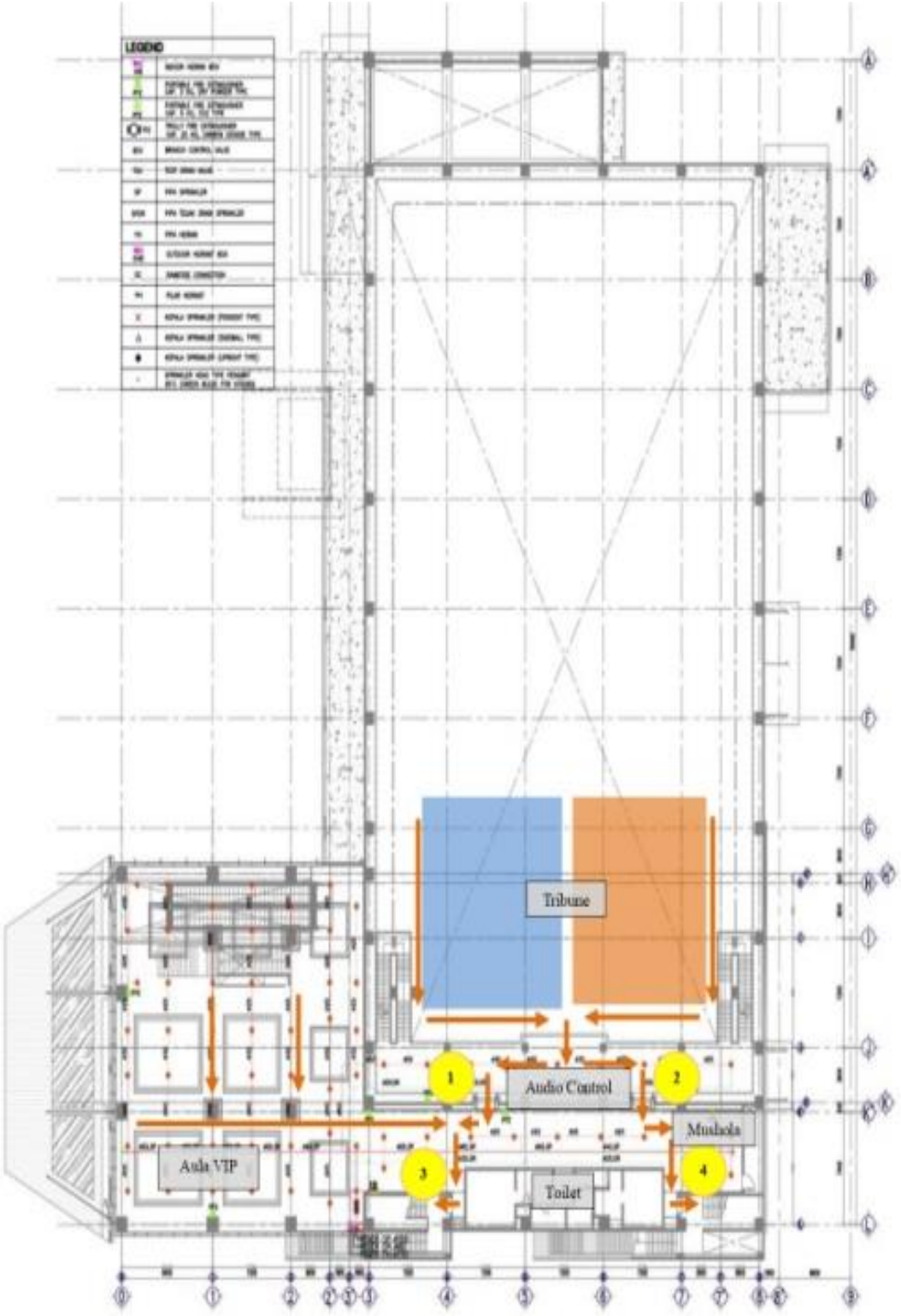

Figure 8. Evacuation Route 2nd Floor Studio Y

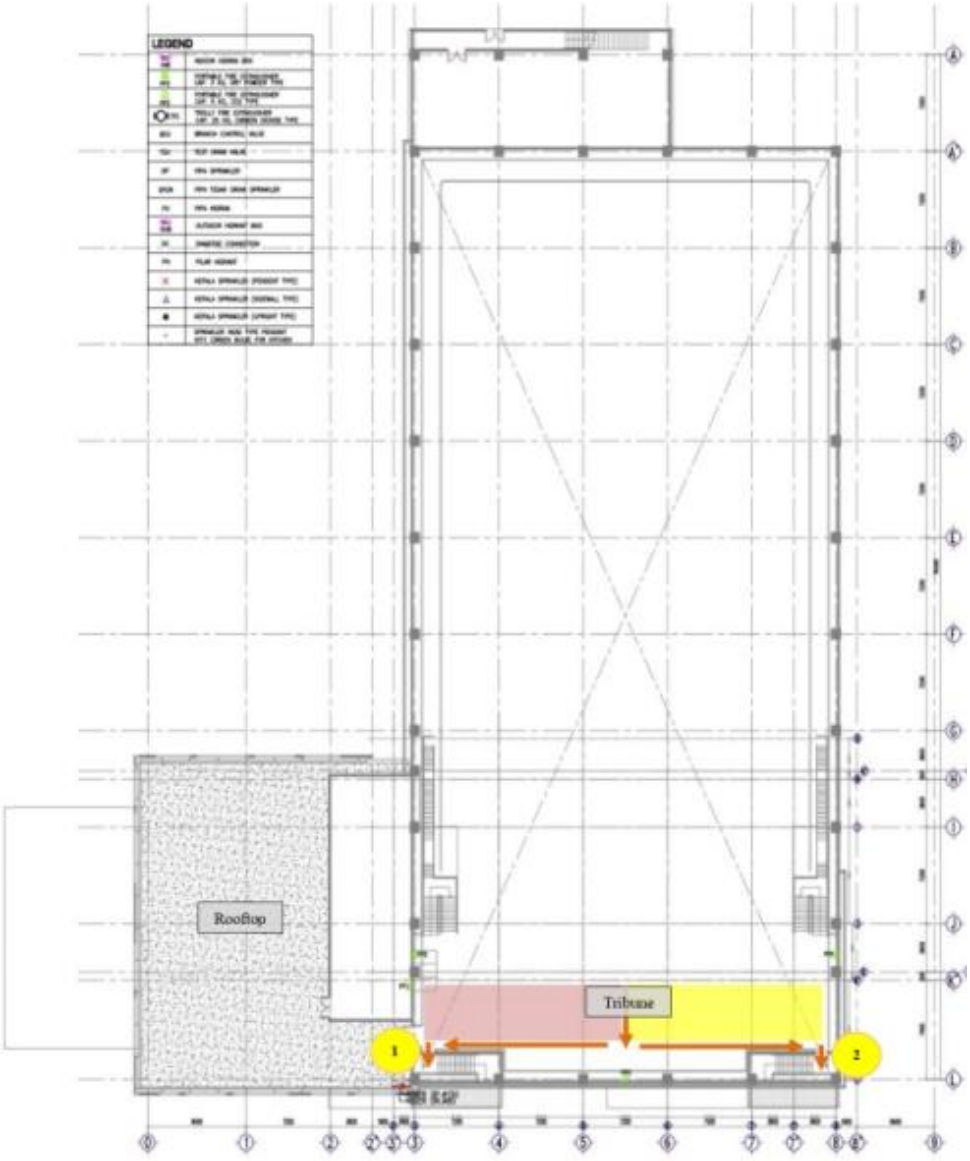

Figure 9. Evacuation Route Mezzanine 2nd Floor Studio Y

Calculation of Evacuation Time

1st Floor

a. Time calculation from the seat to the studio door
   Assuming everyone has a speed rate of 1 m/s, then :
   t = $\frac{s}{v}$ = $\frac{20\ meter}{1\ m/s}$ = 20 seconds
b. Calculation of the movement of people in the corridor
   - Occupancy density (D)
     D = $\frac{number\ of\ people}{floor\ area}$ = $\frac{1000}{3300}$ = 0,30 person/m^2
   - Speed walking in the corridor (S)
     S = k – (a × k × D) = 1,29 m/s
   - Spesific rate (Fs)
     Fs = S × D = 0,39 person/m/s
   - Effective corridor width (We)

We = corridor width – (number of *boundary layer* × *boundary layer*) = 2,79 m

- Corridor pace (Fc)
  Fc = Fs × We = 1,089 person /detik
- The number of people per door
  Number of people = $\frac{number\ of\ occupants\ per\ floor}{number\ of\ doors\ per\ floor}$
  = 167 person
- Time through the corridor (Tp)
  Tp = $\frac{number\ of\ people}{Fc}$ = $\frac{167}{1{,}089}$
  = 153,35 detik = 2 minutes 56 seconds

c. Calculation of the approximate buildup on the door
   - Effective door width (We)
     We pintu = door width - (number of *boundary layer* × *boundary layer*) = = 0,9 m
   - Door specific flow (Fc)
     Fs = Fsm = 1,3 person/s/m
     Fc of the door = Fsm × We of the door = 1,17 person /s
   - Door movement speed (S)
     S = k – (a × k × D) = 1,29 m/s

d. Calculation of the time from the mergency exit to the assembly point
   Assuming everyone has a speed rate of 1 m/s, then :
   t = $\frac{s}{v}$ = $\frac{4\ meter}{1\ m/s}$ = 4 seconds
   Total travel time on the first floor = seat + corridor + door to assembly point = 3 minutes 36 seconds

2nd Floor

a. Time calculation from the seat to the studio door
   Assuming everyone has a speed rate of 1 m/s, then :
   t = $\frac{s}{v}$ = $\frac{14\ meter}{1\ m/s}$ = 14 seconds

b. Calculation of the movement of people in the corridor
   - Occupancy density (D)
     D = $\frac{number\ of\ people}{floor\ area}$ = $\frac{500}{3300}$ = 0,15 person/m^2
   - Speed walking in the corridor (S)
     S = k – (a × k × D) = 1,34 m/s
   - Spesific rate (Fs)
     Fs = S × D = 0,20 person/m/s
   - Effective corridor width (We)
     We = corridor width – (number of *boundary layer* × *boundary layer*) = 2,79 m
   - Corridor pace (Fc)
     Fc = Fs × We = 0,20 orang/m/s × 2,79 m = 0,56 person/second
   - The number of people per door
     Number of people = $\frac{number\ of\ occupants\ per\ floor}{number\ of\ doors\ per\ floor}$
     = $\frac{500}{2}$ = 250 person
   - Time through the corridor (Tp)
     Tp = $\frac{number\ of\ people}{Fc}$ = $\frac{250}{0{,}56}$
     = 446,43 seconds = 7 minutes 45 seconds

c. Calcultion of the approximate buildup on the stairs and door
   - Effective stairs and door width (We)
     We stairs = stairs width - (number of *boundary layer* × *boundary layer*) = 1,27 m
     We door = door width - (number of *boundary layer* × *boundary layer*) = 0,9 m
   - Stairs and door specific flow (Fc)
     Fs = Fsm = 1,09 person/s/m
     Fc stairs = Fsm × We tangga = 1,4 person/s
     Fs = Fsm = 1,3 person/s/m
     Fc of the door = Fsm × We of the door =1,17 person /s
   - Door movement speed (S)
     S = k – (a × k × D) = 1,113 m/s
   - Calculating the distance between floors through the stairs (Td)
     Td = floor to floor height × cf + (2 × *landing border*) = 15,64 m
   - Travel time on the stairs
     Travel time = $\frac{\text{Td}}{S} = \frac{15{,}64\ \text{m}}{1{,}113\ m/s}$ = 14,05 seconds
   - Estimated number of people on the stairs
     Number of people = Fc × Td = 1,4 person/s × 15,64 m = 21,90 = 22 person
   - Calculation of time from the door to the assembly point
     $\frac{\text{Stair travel time}}{x} = \frac{\text{Estimated number of people}}{xmount\ per\ floor}$
     Total travel time = 319,32 seconds × two floors = 638,64 seconds = 11 minutes 4 seconds

d. Calculation of the time from the emergency exit to the assembly point
   Assuming everyone has a speed rate of 1 m/s, then :
   t = $\frac{s}{v} = \frac{4\ meter}{1\ m/s}$ = 4 seconds
   Total travel time on the first floor = seat + corridor + stairs + door to assembly point = 18 minutes 38 seconds

Mezzanine 2nd Floor

a. Time calculation from the seat to the studio door
   Assuming everyone has a speed rate of 1 m/s, then :
   t = $\frac{s}{v} = \frac{5\ meter}{1\ m/s}$ = 5 seconds

b. Calculation of the movement of people in the corridor
   - Occupancy density (D)
     D = $\frac{number\ of\ people}{floor\ area} = \frac{500}{3300}$ = 0,15 person/m^2
   - Speed walking in the corridor (S)
     S = k – (a × k × D) = 1,34 m/s
   - Spesific rate (Fs)
     Fs = S × D = 1,34 m/s × 0,15 person/m^2 = 0,20 person/m/s
   - Effective corridor width (We)
     We = corridor width – (number of *boundary layer* × *boundary layer*) = 2,5 m
   - Corridor pace (Fc)

Fc = Fs × We = 0,20 personm/s × 2,5 m = 0,5 person/ seconds

- The number of people per door
  Number of people = $\frac{number\ of\ occupants\ per\ floor}{number\ of\ doors\ per\ floor}$ = $\frac{500}{2}$ = 250 person
- Time through the corridor (Tp)
  Tp = $\frac{number\ of\ people}{Fc}$ = $\frac{250}{0,5}$ = 500 seconds = 8 minutes 3 seconds

c. Calcultion of the approximate buildup on the door
   - Effective stairs and door width (We)
     We stairs = stairs width - (number of *boundary layer* × *boundary layer*) = 157 cm – (2 × 15) = 127 cm = 1,27 m
     We door = door width - (number of *boundary layer* × *boundary layer*) = 120 cm – (2 × 15) = 90 cm = 0,9 m
   - Stairs and door specific flow (Fc)
     Fs = Fsm = 1,09 person/s/m
     Fc stairs = Fsm × We tangga = 1,09 orang/s/m × 1,27 m = 1,4 person/s
     Fs = Fsm = 1,3 person/s/m
     Fc of the door = Fsm × We of the door = 1,17 person /s
   - Door movement speed (S)
     S = k – (a × k × D) = 1,113 m/s
   - Calculating the distance between floors through the stairs (Td)
     Td = floor to floor height × cf + (2 × *landing border*) = 15,64 m
   - Travel time on the stairs
     Travel time = $\frac{\mathrm{Td}}{S}$ = $\frac{15,64\ \mathrm{m}}{1,113\ m/s}$ = 14,05 seconds
   - Estimated number of people on the stairs
     Number of people = Fc × Td = 1,4 person/s × 15,64 m = 21,90 = 22 person
   - Calculation of time from the door to the assembly point
     $\frac{\text{Stair travel time}}{x}$ = $\frac{\text{Estimated number of people}}{xmount\ per\ floor}$
     x = 5 minutes 32 seconds
     Total travel time = 319,32 seconds × three floors = 957,96 seconds = 16 minutes 37 seconds

d. Calculation of the time from the mergency exit to the assembly point
   Assuming everyone has a speed rate of 1 m/s, then :
   t = $\frac{s}{v}$ = $\frac{4\ meter}{1\ m/s}$ = 4 seconds
   Total travel time on the first floor = seat + corridor + stairs + door to assembly point = 24 minutes 45 seconds

Based on the calculation results, the evacuation time required for all residents of the Studio Y building is as follows:

Evacuation time= notification time + reaction time + activity time + travel time

= 29 minutes 56 seconds (it is save)

Making a Safety Induction

Safety induction is made to provide direction and description regarding the process and evacuation routes that have been determined. Evacuation routes are adjusted according to the number of doors and color zones in the Studio Y.

CONCLUSION

Based on the research results, the conclusion that can be drawn is that the potential fire hazard in the Studio Y area originates from humans, event production equipment and tools, and nature. However, one of the main causes of fires is unsafe action. The fire scenario is likened to happening when the event is in progress. Sparks emerged from one of the cable roll holes due to overcurrent. Fire emergency response procedures are urgently needed at Studio Y to anticipate disaster management in the event of a fire. Procedures are made based on fire scenarios and contain countermeasures and division of tasks for each division. The determination of the evacuation route is carried out as an effort to facilitate the evacuation process. Division of evacuation routes based on zones and available emergency exits.

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