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ANALYSIS OF OCCUPATIONAL SAFETY AND HEALTH RISK IN THE REHABILITATION OF BAPPEDA OFFICE BUILDING, TENGGARONG SUB-DISTRICT, KUTAI KARTANEGARA REGENCY

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ABSTRACT

Construction activities have various risks, one of which is the risk of occupational safety and health (K3).In the Rehabilitation of the Bappeda Office Building, Tenggarong sub-district, Kutai Kartanegara Regency, this is a 4-storey construction work, requires a large workforce, involves heavy equipment, so it has a potential risk of work accident hazards.The research aims to identify OHS risks and measure the level of risk.Data collection techniques include observation, questionnaires, and literature study.The method used is a description of the OHS risk level calculation using the Pearson Product Moment and Matrix.The research results show that;(1) the results of identification of risk variables are 46 risk variables consisting of 28 valid risk variables and 18 invalid risk variables;and (2) 0 variables for very high and high risk levels, 3 variables classified as low risk, and 25 variables classified as very low risk.

KEYWORDS:

Risk Identification, Risk Level

INTRODUCTION

Indonesia is a developing country that is carrying out rapid development, many construction projects are carried out both in big cities and in regions.Construction service activities have been proven to make an important contribution to the development and growth of the Indonesian economy, both those held by the government and the private sector.

The construction industry is one of the industries most at risk for worker safety.The International Labor Organization or ILO (2011) states that one in six fatal workplace accidents occur on construction sites.Furthermore no less than 60,000 fatal accidents occur at construction sites worldwide every year.Threats to worker safety include: falling from a height, being trapped under collapsed buildings, being hit by project vehicles/heavy equipment, being exposed to electricity, being hit by falling objects, exposure to fire, toxic, dangerous (Consultnet Ltd., 2011).

Risk is a threat to property life and financial benefits due to hazards that occur (Duffield &Trigunarsyah, 1999).Risk has a negative effect on the achievement of project goals/objectives in general.To reduce adverse impacts on achieving the functional objectives of a construction project, a risk management system is needed which includes identification, analysis and response to various risks that may occur during the project construction period.Due to the inherent nature of risk, if it is not managed properly it can cause various losses, especially in terms of cost, quality and time.

According to The National Institute for Occupational Safety and Health (NIOSH), construction is one of the most dangerous jobs in the world, resulting in the highest death rate of any sector.The risk of falling is the highest cause of accidents.Furthermore stated by LaMontagne et al.(2003) that the high number of accidents in the construction sector is not caused by a low level of awareness about occupational safety and health (K3) but is more related to the lack of implementation of OSH programs and systems.Thus, evaluation steps for the Implementation of the Occupational Safety and Health Management System (SMK3) to control worker safety and health are very important.

The International Labor Organization emphasizes the importance of preventing occupational accidents and occupational diseases, especially in the construction sector.In Indonesia, the basis for the implementation of occupational safety and health in construction services is as follows: Law no.18 of 1999 concerning Construction Services;Law No.1 of 1970 concerning Work Safety;Government Regulation no.29/2000 Article 30 paragraph (1), as well as the occupational safety and health management (K3) Technical Guidelines for Building Construction in the Decree of the Minister of Manpower No.1 of 1980 and Guidelines for the Implementation of K3 at Construction Activity Sites in the SKB of the Minister of Manpower and the Minister of Public Works No.174/MEN/1986 and 104/KPTS/1986.Even though laws and regulations, national and international standards regarding OSH are available, accidents in the construction sector remain high (ILO, 2005).

Occupational safety means a person's way of protecting himself or others because of the workload in the field that requires a worker to receive this protection so that they can work optimally.To deal with work accidents, companies are required to implement a good and strict work safety system, so that the Occupational Safety and Health Management System (SMK3) in a project to improve protection for workers must be implemented strictly and continuously (PP Number 50 of 2012).

In the Bappeda Office Building Rehabilitation Project, Tenggarong sub-district Kutai Kartanegara Regency, this is a job that has a high risk of work accidents with the possibility of serious work accidents.The risk is higher where the energy used is relatively low.While the causes of work accidents are caused by the human factor itself which does not use personal protective equipment (PPE), does not work according to procedures, works while joking, places tools or goods incorrectly, fatigue, boredom and so on.Apart from these factors, it is

also caused by environmental factors, in the form of unsafe environmental conditions, such as unsafe machines, working equipment that is not good but still used, weather, and noise.

In the implementation of PT.Nila Citra Persada as a company engaged in the construction sector is inseparable from the risk of work accidents, so that in implementing the development project a good management regarding occupational health and safety (K3) is needed, which is an effort to create a safe, comfortable working atmosphere and achieve the goal, namelyhighest productivity.

Occupational health and safety (K3) is very important in all fields of work, without exception in construction projects, because the application of K3 can prevent and reduce the risk of accidents or illness due to work.Ordinary work accidents also occur as a result of dangerous actions which in some cases can be motivated by a lack of knowledge and skills, bodily defects, fatigue and exhaustion, unsafe attitudes and behavior.

The aim of the study was to identify OHS risks and measure the level of risk in the Rehabilitation of the Bappeda Office Building, Tenggarong sub-district Kutai Kartanegara Regency.

RESEARCH METHODOLOGY

Location

This research is located in the Bappeda Office Building, Tenggarong sub-district Kutai Kartanegara Regency, as shown in the Figure 1 below:

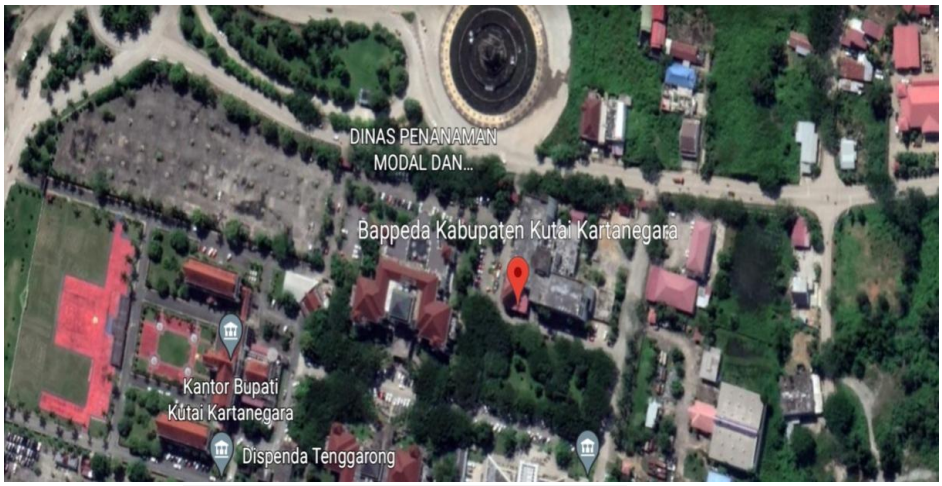

Figure 1. Map of Research Locations
Source: *Google Earth*

Population and Sample

The population in this study was the workers and stakeholders involved in the rehabilitation work for the Bappeda building.The sample is the part or number and characteristics possessed by the population.In this study, the sample to be examined was 30 respondents consisting of management staff and construction workers.

Data Collection Techniques

The data collected are as follows: (1) primary data obtained through observation and questionnaires;and (2) secondary data obtained from related research journals or literature.

Data analysis technique

Data analysis performed, namely as follows:

1. Descriptive analysis method, used to determine the percentage of the number of respondents and used in one variable that has been classified according to certain criteria so that the number and average percentage are obtained.This analysis is presented in the frequency distribution table.Descriptive formula

$$P = \frac{F}{N} x\ 100\%$$

Note:

P : Percentage

F : Frequency

N : Number of respondents

100% : Fixed number

2. Analyze the level of occupational safety and health risks in the rehabilitation project for the Bappeda Office Building in Tenggarong sub-district Kutai Kartanegara Regency.
3. Analyzing data from direct observation (observation) of OHS risks in the field.
4. Analyze the questionnaire data given to parties related to construction activities, namely the management staff and construction workers.
5. The validity test is used to measure whether the instrument used in the questionnaire is valid or not.Validity measurement can be done by performing a bivariate correlation between each indicator score and the total score of the construct.Significance test is done by using the value of r count with r table.If r count > r table with a positive value then the item or question or indicator is declared valid.
6. To determine the relationship between variables, namely simple linear correlation or Pearson product moment correlation.Simple linear correlation is a correlation method used to measure the direction and strength of the relationship between 2 variables.The general formula for simple linear correlation or Pearson product moment correlation is defined as follows:

$$\Upsilon\ count = \frac{n(\Sigma XY) - (\Sigma X).(\Sigma Y)}{\sqrt{[n\Sigma X^2 - (\Sigma X)^2].[n\Sigma Y^2 - (\Sigma Y)^2]}}$$

Note:

n = Number of respondents

X = Score variable

Y = The total score of the variables for the nth respondent

7. Apply the data that has been analyzed into methods that are in accordance with the discussion of the research conducted.

The analysis system to determine the risk of K3 is

To obtain the K3 risk level in the rehabilitation project, the method used is by multiplying the frequency value (P) with the severity/impact value of work accidents (A).

The following are some of the risk variables in the Bappeda Office Building Rehabilitation project, Tenggarong sub-district Kutai Kartanegara Regency presented in Table 1.

Table1. Variables for Analyzing Risk in the Rehabilitation Project for Bappeda Office Building, Tenggarongsub-District, KutaiKartanegara Regency.

Types of Activities and Risk Variables		
A	**Preparatory work**	
	1	Getting hit by a sharp object during measurement
B	**Excavation Work**	
	1	Landslide/collapse of side walls
	2	The worker fell into the pit
C	**Urugan Work**	
	1	The fill material gets into the eyes and interferes with breathing
D	**Foundation work**	
	1	Worker fell in dig
	2	Landslide excavation
	3	The reinforcing frame falls on the worker/facility
E	**Column Work**	
	1	The formwork and iron fell on the workers
	2	Workers fall from a height
F	**Sloof work**	
	1	Reinforcement iron for workers
	2	Bendrat wire injures workers' hands
G	**Floor Plate Work**	
	1	Hand injured during formwork assembly
	2	Plywood powder hits workers' eyes
H	**Floor Beam Work**	
	1	The formwork and iron boards fell on the workers
	2	Fall from a height
I	**Welding Work**	

	1	Welding sparks hit the body
	2	Inhale the smoke from burning welding
J	**Glass Installation Work**	
	1	Fall from a height
	2	Worker hit by broken glass
K	**Installation of Electrical / Electrical Installation**	
	1	Got electric shock
	2	Sparks cause fire
L	**Ceramic Work**	
	1	Exposed to ceramic shards (in contact with skin/eyes)
	2	Inhalation of ceramic dust
	3	Noise when cutting ceramic (Hearing loss)
	4	Got electric shock
	5	Noise when cutting ceramic (Hearing loss)
M	**Painting Work**	
	1	Fall from a height
	2	Painted eyes
	3	Inhale the smell of paint
N	**Metal cutting work**	
	1	Hand exposed to cutting iron
	2	Sparks hit the eyes
	3	Iron hurt hands
	4	Hand exposed to hot iron
O	**Plumbing work**	
	1	Workers fall from scaffolding
	2	Injured while installing the pipe
P	**Scaffolding Disassembly Work**	

	1	Scaffolding collapsed (falling on workers)
	2	Fall from a height
	3	The worker's head hit the scaffolding
	4	Scaffolding sandwiched stairs
Q	**Wall work**	
	1	Bricks fell on workers
	2	Fall from a height
R	**Plastering and plastering of walls**	
	1	Fall from a height
	2	Work equipment fell on workers below
	3	Cement dust inhalation (respiratory problems)
S	**Ceiling work**	
	1	Dust splashes in eyes
	2	Fall from a height

Source: Compilation of Authors(2021)

The next analysis is carried out by changing the risk category of each variable obtained previously with the following categories:

1. Probability category (P):

Very rarely(SJ) (0 – 20) % = 1

Rarely (J) (21 – 40) % = 2

Enough (C) (41 – 60) % = 3

Often (S) (61 – 80) % = 4

Very often (SS) (81 – 100) % = 5

2.Risk Impact Category (I):

Very low (SR) (0 – 20) % = 1

Low (R) (21 – 40) % = 2

Medium (S) (41 – 60) % = 3

High (T) (61 – 80) % = 4

Very high (ST) (81 – 100) %= 5

After the risk category is converted into the form of the number, then an analysis of the probability x impact calculation is carried out. Risk analysis is carried out by multiplying the results of the probability assessment (P) with the results of the impact assessment (I) of each risk variable (P x I).

RESULTS AND DISCUSSION

Respondent Profile

1. Profile of respondents based on age

The condition of the respondents based on age is as follows: aged 19-25 years there are 8 respondents (27%), aged 26-30 years there are 9 respondents (30%), aged 31-35 years there are 4 respondents (13%), aged 36-40 years there are 6 respondents (20%), and aged> 40 years there are 3 respondents (10%).Data on the condition of respondents by age is presented in Table 2.

Table 2. Respondents Based on Age

No	Age (years)	Frequency	Percentage (%)
1	19-25	8	27
2	26-30	9	30
3	31-35	4	13
4	36-40	6	20
5	>40	3	10
	Total	30	100

Source: Data Processing(2022).

2. Profile of Respondents Based on Time of Work Experience

The condition of the respondents based on the length of work experience is as follows: 14 respondents have worked for 1-5 years (47%), 10 respondents have worked for 6-10 years (33%), 3 respondents have worked for 11-15 years (10%), working time 16-20 years there are 2 respondents (7%), and working time >40 years there is 1 respondent (3%).Data on the respondent's condition based on the time of work experience is presented in Table 3.

Table 3. Respondents Based on Time of Work Experience

No	Work experience (Years)	Frequency	Percentage (%)
1	1-5	14	47
2	6-10	10	33
3	11-15	3	10
4	16-20	2	7
5	>20	1	3
	Total	30	100

Source: Data Processing(2022).

3. Respondent Profile Based on Job Department

The condition of the respondents based on work position is as follows: as a site engineer there is 1 respondent (3%), as a foreman there are 2 respondents (7%), as a worker there are 22 respondents (73%), as a drafter there are 2 respondents (7%),as field supervisors there were 2 respondents (7%), and as logistics there were 1 respondent (3%).Data on the condition of respondents based on work position is presented in Table 4.

Table 4.Respondent Based on Job Department

No	Job Department	Frequency	Percentage (%)
1	Site Engginer	1	3
2	Superviser	2	7
3	Worker	22	73
4	Drafter	2	7
5	Site superviser	2	7
6	Logistic	1	3
	Total	30	100

Source: Data Processing (2022).

K3 Risk Variable Assessment

The results of the study of 19 types of construction activities identified 46 risk variables.After the validity or invalidity of the risk variable is known, then proceed to analyze or assess the risk variable, the invalid variable is removed.Analysis is carried out on the probability assessment and the impact of risk on work accident aspects.The method used in analyzing or assessing risk variables uses a risk level with a formula:

TR= P XI

Note:

TR=Risk level

P=The probability of the risk occurring

I =Impact (Impact) risks that occur

Based on the risk identification results above, then proceed to calculate the value of the risk variable using the Probability Impact Matrix.The Probability Impact Matrix is an approach developed using two important criteria for measuring risk, namely: (1) the probability of an unwanted event;and (2) impact (Impact), is the level of influence or impact size (Impact) on other activities, if an unwanted event occurs (Association for Project Management, 2008).

After obtaining the categories of probability and impact, then an analysis of the risk value is carried out.The risk value is obtained by calculating the value of the risk variable into the probability and impact matrix.There are four categories of probability and impact, namely low, medium, high and very high.Matrix categories are presented in Figure 2.

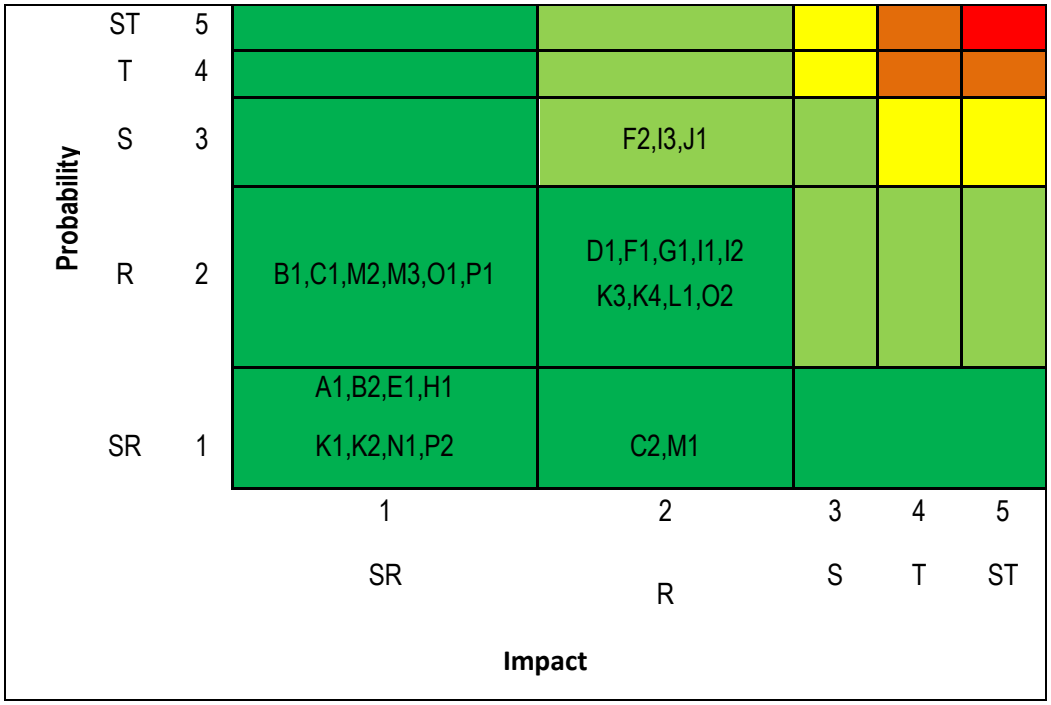

Figure 2. Matrix category

Very high level risk (ST) (21-25)

High level risk(T) (16-20)

Medium level risk(S) (11-15)

Low level risk (R) (6-10)

Very low level risk (SR) (1-5)

Return to Average Risk in the Matrix

Table of probability x impacts that have been categorized according to the terms and conditions of the Probability Impact Matrix is presented in Table5.

Table 5. Risk Level Value in the Matrix Category

	Variable		Risklevell	Note
A	**Excavation Work**			
	1	The worker fell into the pit	1	Very low
B	**Column Work**			
	1	The formwork and iron fell on the workers	2	Very low
	2	Workers fall from a height	1	Very low
C	**Foundation work**			
	1	Landslide excavation	2	Very low
	2	The reinforcing frame falls on the worker/facility	2	Very low
D	**Sloof work**			
	1	Reinforcement iron for workers	4	Very low
E	Beam Work			
	1	The formwork and iron boards fell on the workers	1	Very low
F	**Welding Work**			

	1	Welding sparks hit the body	4	Very low
	2	Inhale the smoke from burning welding	6	Low
G	**Glass Installation Work**			
	1	Worker hit by broken glass	4	Very low
H	**Installation of Electrical / Electrical Installation**			
	1	Got electric shock	1	Very low
I	**Ceramic Work**			
	1	Exposed to ceramic shards (in contact with skin/eyes)	4	Very low
	2	Inhalation of ceramic dust	4	Very low
	3	Noise when cutting ceramic (Hearing loss)	6	Low
J	**Painting Work**			
	1	Inhale the smell of paint	6	Low
K	**Metal cutting work**			
	1	Hand exposed to cutting iron	1	Very low
	2	Sparks hit the eyes	1	Very low
	3	Iron hurt hands	4	Very low
	4	Hand exposed to hot iron	4	Very low
L	**Plumbing work**			
	1	Injured while installing the pipe	4	Very low
M	**Scaffolding Disassembly Work**			
	1	Scaffolding collapsed (falling on workers)	2	Very low
	2	The worker's head hit the scaffolding	2	Very low
	3	Scaffolding sandwiched stairs	2	Very low
N	**Wall work**			
	1	Bricks fell on workers	1	Very low
O	**Plastering and plastering of walls**			
	1	Work equipment fell on workers below	2	Very low
	2	Cement dust inhalation (respiratory problems)	4	Very low
P	**Ceiling work**			
	1	Dust splashes in eyes	2	Very low
	2	Fall from a height	1	Very low

Source: Results of Data Processing (2022).

Based on the results of the analysis there are 28 risk variables consisting of 3 variables or 11% classified as low risk variables (work: welding, tile installation and painting) and 25 variables or 89% classified as very low variables (work: excavation, columns, foundations, sloof,beams, welding, glass installation, electrical installation, ceramics, metal cutting, plumbing, scaffolding, walls, plaster and plaster, and ceilings).

Furthermore, the way to deal with this risk where the risk variable can be accepted without taking steps to reduce the risk so it can be ignored (Risk Ignoring)

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. Identification of occupational safety and health risks in the Rehabilitation of Bappeda Office Building, Tenggarong sub-district Kutai Kartanegara Regency, from 19 types of construction activities, there are 46 risk variables consisting of 28 risk variables classified as valid and 18 risk variables classified as invalid.

2. Based on the results of measuring the level of Occupational Safety and Health (K3) risk in the Rehabilitation of the Bappeda Office Building, Tenggarong sub-district Kutai Kartanegara Regency, the following results were obtained:
   a. The level of risk that has very high risk and high risk amounts to 0 variables.
   b. The level of risk that has a low risk there are 3 variables
   c. There are 25 variables with a very low risk level.

Suggestion

1. Conducting routine briefings before carrying out work which reminds the importance of the attention and caution of every worker in order to avoid work accidents
2. Companies can carry out routine inspections of workers, tools and various matters relating to Occupational Health and Safety so that they always use personal protective equipment when starting work activities.
3. Employees can follow every instruction or rule set by management so that the zero accident target can be achieved.
4. And for further research, described as follows:
   a. Future research can obtain more project data so that research can be based on project data.
   b. Making risk variables in the questionnaire can be elaborated so as to get a better quality and more complete statement.
   c. Taking steps to reduce construction work accidents can be focused on the most dominant work accidents so that more concrete actions can be taken to reduce them.

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