International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048
Volume 7, Issue 4, pp 11-17, April-2023
https://doi.org/10.47001/IRJIET/2023.704003

Analysis of the Level of Occupational Safety and Health (OSH) Risk in the Surakarta Furniture Center Building Project

[1]Rafi Jati Kusuma, [2]Budi Priyanto, S.T, M.T.

[1,2]Civil Engineering Study Program, Muhammadiyah University of Surakarta, Indonesia

***Abstract* - Construction activities involve a high level of risk in many ways. The most risky aspect is Occupational Health and Safety (K3). The Surakarta Furniture IKM Sentra Building Project is a 4-storey steel structure, requiring a lot of workers and heavy equipment, so there is a potential risk of industrial accidents. Among other aspects of the implementation of occupational safety and health that must be considered, is an analysis of the level of occupational health and safety risks in such a way as to enable employers to manage or deal with existing risks in such a way. That occupational safety and health risks associated with work are minimized. This paper aims to identify and analyze the level of occupational safety and health (OSH) risks in the Surakarta Furniture IKM Center project. The research method was carried out by interviewing and distributing questionnaires to respondents, namely staff, supervisors, owners, and foremen with reference to PUPR Ministerial Regulation NO 10 of 2021. The identification results obtained 35 OHS risk variables in the Surakarta IKM Furniture Center Project. The results of the analysis of the level of occupational safety and health (OSH) risk in the Surakarta Furniture IKM Center development project obtained work with a high level of risk, namely steel work, therefore the contractor must pay attention to the Occupational Safety and Health (OSH) of the work. Starting from using PPE, reminding workers of the dangers in the event of an accident, using safety belts, installing safety lines, installing nets, and outreach about the dangers of steel work.**

Keywords: Identification, Analysis, Minister of PUPR Regulation NO 10 of 2021, Risk Level.

I. INTRODUCTION

One industry that has a high accident risk is construction services, because it is considered dangerous and can threaten human life. Occupational Safety and Health (OSH) must now be applied to every construction project, but it is still not optimal. Occupational Safety and Health (OSH) are ideas and aspirations to guarantee the wholeness and wholeness of body and soul which aims to maintain the safety and welfare of the workforce in order to achieve a high level of physical endurance, work ability and health [6]. The main objective of Occupational Safety and Health is to guarantee as much as possible safe and healthy working conditions to every worker and to protect their human resources. Thus the goals and objectives are how to act and take preventive measures to eradicate occupational diseases and accidents, how to maintain and improve nutritional health, and increase employee efficiency and effectiveness so that organizational goals are well achieved [14]. If implemented, the OSH concept has a positive impact on labor productivity and can improve the productivity of any workforce for the better. The risk of work accidents that harm the workforce and affect work productivity can be minimized if the concept of occupational safety and health is properly implemented [7].

Construction activities are associated with very high risks in many ways. The biggest risk is the aspect of occupational health and safety (OSH). According to the ILO, more than 250 million work accidents occur each year and more than 160 million workers fall ill due to workplace hazards. In addition, 1.2 million workers died from work-related accidents and diseases [2]. Based on [4], 35.2 million employees are registered as participants in August 2022. And in 2022, up to 180,000 work accidents will occur with a recovery rate of 26%, a disability rate of 3%, and a fatal accident of 3%. Guidelines for the Construction Safety Management System (SMKK) issued in 2021, a construction safety management system must be implemented in all construction projects, including construction safety risk management. The aim is to create a work environment that is safer, more efficient, smoother and free from the risk of accidents or occupational diseases. The task of building a house is complex compared to other buildings. The building consists of structural, architectural, mechanical and electrical works, plumbing, interior, landscaping and other additional works.

The construction of the Surakarta IKM Furniture Sentra Building is a 4-storey steel structure project that employs many workers with heavy equipment, so there is a potential

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risk of industrial accidents. Among other things, the aspect of OSH implementation must be considered, namely an analysis of the level of work safety risk so that employers can control or manage existing risks in this way. that occupational safety and health risks are minimized. the number of work accidents and also work can be carried out properly and in accordance with human resources (HR) and the fulfillment of work and the creation of safe and pleasant working conditions and environment.

Based on the description above, the author makes a paper to find out the results of identification and analysis of the level of risk that occurs in the Surakarta Furniture IKM Sentra Building Project with the title "Analysis of Occupational Safety and Health (OSH) Risk Levels in the Surakarta Furniture IKM Center Development Project" with uses a quantitative method which refers to Ministerial Regulation of PUPR NO 10 of 2021.

Risk identification: The first step in determining risk management is to identify potential risks. The result of the risk identification process is a list of events that can occur in the project along with their risk classification [10]. Risk identification is an important process carried out to ensure project success and meet project time, cost, quality and safety. The first place to identify risk is within the project itself. To identify risks, you can use a list of project constraints, a list of tasks, and the factors that determine the success of the project itself [11].

There are two sources of information in the risk literature. That is, a list of project risks those are similar to previous research findings and interviews with experienced practitioners and managers in the related field. Risk analysis and conclusions from previous research can be used to identify potential risks and test the suitability of the project's list of identified risks in a particular area. Project managers were interviewed to create a risk library [12]. Risk identification in this paper is carried out in two stages. First, make a list of risk factors from projects the researcher has done before. Second, we interviewed the project manager of the Surakarta IKM Furniture Center Project. This interview was conducted to clarify the risk factors included in the list of risks faced by the project. The interview also asked whether there were other risk factors that were not recorded in the risk register. The literature review and interviews with project managers identified 35 possible risk factors (Table 1). The 35 risk factors derived from the literature review and interview results add to the risk factors that have not been studied. This list of risk factors is used as the basis for making the questionnaire in this paper.

II. RESEARCH METHOD

This research uses a quantitative method which refers to Minister of Public Works and Public Housing Regulation NO 10 of 2021. To support writing and for purposes of data analysis, this research requires a number of object data to be examined, namely primary data and secondary data. Primary data was obtained by field surveys, conducting interviews, and distributing questionnaires. Secondary data is data from literature surveys and project data presented for research [5].

The location of this research is the construction project of the Surakarta IKM Furniture Center building which is located in Banjarsari District, Surakarta City, Central Java Province. In the research conducted at PT Reka Esti Utama, I only examined the analysis of the OSH risk level which included the supervisor, engineer/contractor, and owner. The aim was to find out the relevance of the OSH risk that had been previously identified using the results of interviews and questionnaire results.

Figure 1: Project Location

Research data were obtained from 15 respondents who were staff, supervisors, owners and foremen. They have various educational backgrounds, positions in companies and different work experiences (Table 1). 47% of respondents are Contractor Staff who are the most important part because they understand the most in the field. Foreman is a position held by the 27%. This is very meaningful because those who directly face risks in the field are workers / foremen. Meanwhile, 20% are supervisory staff whose role is to supervise and be involved in the field. 7% are staff owners who are part of the research. In terms of education the majority of respondents (47%) were undergraduates and 40% had high school/vocational high school backgrounds and 7% had Diploma and Masters backgrounds. A high educational background will show the respondent's ability to understand and analyze the questions posed in the questionnaire, and be able to answer correctly. The right respondent will produce accurate study data. Judging from the experience of working in housing construction projects, 79% of workers work more than 5 years, 46% of workers more than 10 years, and 33% of

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workers work more than 15 years. Sufficient project experience will lead to the realization of respondents who have sufficient ability to answer the questions in the questionnaire. So that the answer to the question will be understood and will give the correct answer.

Table 1: Respondent Background

A.	Project Parties	Rate %
	Staff Owner	7%
	Supervision Staff	20%
	Contractor staff	47%
	Foreman	27%
B.	School Background	Rate %
	High school / vocational education	40%
	Diploma	7%
	Bachelor	47%
	Master	7%
C.	Work experience	Rate %
	1-5 Year	20%
	6-10 Year	33%
	11-15 Year	13%
	>15 Year	33%

Basic Theory: The procedure for determining the K3 risk level in construction is based on the Minister of PUPR Regulation Number 10 of 2021 concerning SMK3 Guidelines in the Field of Building Construction.

The level of construction health and safety risk (TR) is obtained by multiplying the frequency of construction health and safety risks (P) with the severity obtained (A) or by the formula TR = K x A. The results of construction occupational health and safety risk calculation levels can be described in Table 2

Table 2: Construction K3 Risk Level Value

K3 Construction Risk Level		Effect				
		1	2	3	4	5
Frequency	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

Explanation:

(1-4) = Small OSH risk level
(5-12) = Medium OSH risk level
(15-25) = High OSH risk Level

III. RESULTS AND DISCUSSIONS

3.1 Risk Identification Results

The results of interviews and literature studies on Risk Variables in the construction of the Surakarta Furniture IKM Sentra Building in Table 3 are as follows:

Table 3: Types of Activities and Risk Variables in the Surakarta Furniture IKM Center Development Project

NO	Types of Activities and Risk Variable	REFERENCE
A.	**Land and Foundation Work**	
	- Landslides	Interview
	- Falling into a dug hole	Interview
	- Buried due to Excavation	Interview
	- Falling during loading and unloading of piled sand and work floors	Interview
	- Sandwiched by iron	Interview
	- Pierced by nails and hammer during formwork construction	Interview
	- Crushed by concrete during casting	Interview
	- The worker's eye was hit by splashes of concrete	Interview
B.	**Steel Work**	
	- The steel falls down (towards the Worker) during steel erection	[1]
	- Crane Collapsed	[1]
	- Sling Interrupted	[1]
	- Workers fell from a height during steel erection	Interview

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	- Crushed by material during steel erection	Interview
	- Steel wedge workers	Interview
C.	**Welding Work**	
	- Workers exposed to welding fire	[1]
	- Inhaled welding fumes	[1]
	- Eyes hit by welding sparks	Interview
	- Got electric shock	Interview
D.	**Brick Laying Work**	
	- Workers fall from a height	[1]
	- Bricks fall	[1]
E.	**Disassembling the scaffolding**	
	- Scaffolding collapses (overwrites workers)	[1]
	- Workers fall from a height	[1]
F.	**Floor slab casting**	
	- Worker slipped	[1]
	- Workers fall from a height	[1]
	- The worker is hit/dropped by material	[1]
G.	**Plastering and plastering the outer walls of the upper floors**	
	- Workers fall from a height	[1]
	- Work equipment falls on workers below	[1]
	- Inhaled cement dust (cement disorder)	[1]
H.	**Steel Painting**	
	-Workers fall from a height	[1]
	-Equipment falls down onto workers below	[1]
	-Inhale the scent of paint	[1]
I.	**Plumbing work**	
	-Workers fall from scaffolding / scaffolding	[1]
	-Injured while installing the pipe	[1]
J.	**Electrical Work**	
	- Got electric shock	Interview
	- Workers fell from the scaffolding / scaffolding	Interview

3.2 Calculation of OSH Risk Level

OSH Construction Risk Level Assessment (TR) can be calculated using the following formula:

TR = K x A

With:

K=Frequency
A=Effect
TR = Risk Level

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Table 3: Types of Activities and Risk Variables in the Surakarta Furniture IKM Center Development Project

NO	Types of Activities and Risk Variable	K	A	TR KXA	Risk Level
A.	**Land and Foundation Work**				
	- Landslides	2.1	2.9	6.09	Medium
	- Falling into a dug hole	2	2.8	5.6	Medium
	- Buried due to Excavation	1.1	3.8	4.18	Small
	- Falling during loading and unloading of piled sand and work floors	1.1	3.1	3.41	Small
	- Sandwiched by iron	2.3	3.1	7.13	Sedang
	- Pierced by nails and hammer during formwork construction	2.3	3	6.9	Sedang
	- Crushed by concrete during casting	1.4	3	4.2	Small
	- The worker's eye was hit by splashes of concrete	2.3	2.5	5.75	Medium
B.	**Steel Work**				
	- The steel falls down (towards the Worker) during steel erection	1	5	5	Medium
	- Crane Collapsed	1	5	5	Medium
	- Sling Interrupted	1	5	5	Medium
	- Workers fell from a height during steel erection	1.1	5	5.5	Medium
	- Crushed by material during steel erection	1.2	4.9	5.88	Medium
	- Steel wedge workers	3.2	4.7	15.04	High
C.	**Welding Work**				
	- Workers exposed to welding fire	1.6	3	4.8	Small
	- Inhaled welding fumes	2.8	3	8.4	Medium
	- Eyes hit by welding sparks	1.7	3.5	5.95	Medium
	- Got electric shock	1.3	3.5	4.55	Small
D.	**Brick Laying Work**				
	- Workers fall from a height	1.3	4.2	5.46	Medium
	- Bricks fall	1.8	2.9	5.22	Small
E.	**Disassembling the scaffolding**				
	- Scaffolding collapses (overwrites workers)	1.2	4.3	5.16	Medium
	- Workers fall from a height	1	4.1	4.1	Small
F.	**Floor slab casting**				
	- Worker slipped	1.6	2.8	4.48	Small
	- Workers fall from a height	1	4.3	4.3	Small
	- The worker is hit/dropped by material	1.5	3.5	5.25	Medium
G.	**Plastering and plastering the outer walls of the upper floors**				
	- Workers fall from a height	1	4.2	4.2	Small
	- Work equipment falls on workers below	2	3.3	6.6	Medium
	- Inhaled cement dust (cement disorder)	2.8	3.1	8.68	Medium
H.	**Steel Painting**				
	-Workers fall from a height	1	4.1	4.1	Small
	-Equipment falls down onto workers below	1.4	2.9	4.06	Small
	-Inhale the scent of paint	2.6	3.2	8.32	Medium
I.	**Plumbing work**				
	-Workers fall from scaffolding / scaffolding	1.1	4.4	4.84	Small

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	-Injured while installing the pipe	1.6	2.1	3.36	Small
J.	**Electrical Work**				
	- Got electric shock	1	3.7	3.7	Small
	- Workers fell from the scaffolding / scaffolding	1	4.3	4.3	Medium

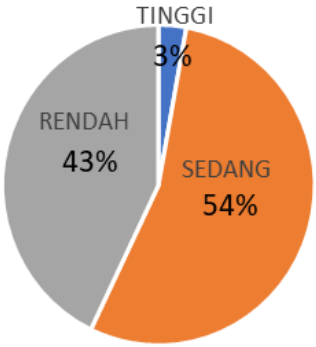

Figure 2: OSH Risk Level in the Surakarta Furniture IKM Center Project

IV. CONCLUSION

From the research results it was identified that there were 35 risk variables in the Surakarta Furniture IKM Center development project. Based on the results of an analysis of the level of occupational safety and health (OSH) risk in the Surakarta Furniture IKM Center development project, it can be concluded that work with a high level of risk is steel work; therefore contractors must pay more attention to Occupational Safety and Health (OSH) of the work. Namely starting from the use of personal protective equipment (PPE), reminding workers of the dangers in the event of an accident, and using safety belts.

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Volume 7, Issue 4, pp 11-17, April-2023
https://doi.org/10.47001/IRJIET/2023.704003

AUTHORS BIOGRAPHY

Rafi Jati Kusuma,
Bachelor Degree of Civil Engineering Student, Muhammadiyah University of Surakarta, Indonesia.

Budi Priyanto, S.T, M.T.,
Active lecturer in the civil engineering study program at the Muhammadiyah University of Surakarta, Indonesia.

Citation of this Article:

Rafi Jati Kusuma, Budi Priyanto, S.T, M.T., "Analysis of the Level of Occupational Safety and Health (OSH) Risk in the Surakarta Furniture Center Building Project" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 4, pp 11-17, April 2023. Article DOI https://doi.org/10.47001/IRJIET/2023.704003

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