

Identification and Risks Control Accidents the Implementation of Construction High Rise Buildings

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Abstract: The construction industry has unique properties and has different characteristics on each project. These properties and characteristics that make the construction industry become one of the industries that have a high level of accident risk. Based on data reports International Labor Organization (ILO) every day there are about 6,000 fatal workplace accidents in the world, so they need for identification and risk prevention. Prevention use to minimize the risk of accidents that can occur. Classification of risks that can be done based on the type of work. Data collection was done by distributing questionnaires through google form on 10 projects at PT.X. The collected data is used as primary data in this research. Based on the result of the test, 14 indicators of occupational accidents risk are found in medium level, while 47 other indicators are in low level. Risk control is performed with engineer risk control, administrative risk control, and risk control in self-protection equipment (PPE). Risk control is an effort to minimize the risk of occupational accidents, so as to reduce the level of accidents that can occur during project implementation.

Keywords: Construction industry, risk management, risk control

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I. INTRODUCTION

The construction industry is one industry that has a relatively high level of accident risk. The construction industry is unique in nature and has different types for each project including its implementation methods, project character, materials used to different application techniques for the construction industry to have a relatively high level of occupational accident risk [7]. As an illustration, the data of accident rate from PT. Jamsostek Year 2011 in Indonesia recorded 96,314 cases of work accidents, where there are 2,144 people died, 42 people with total disability. Based on data reports International Labor Organization (ILO) every day there are about 6,000 fatal workplace accidents in the world. In Indonesia accidents is experienced by 30% from every 100,000 workers [6]. Stakeholder project is an asset that must be protected in order to work properly and productively until the project is completed without any accidents. Labor needs protected from accidents and health in assurance [5]. Accident risk control is necessary to minimize the risk of accidents.

II. MATERIAL AND METHODS

A. Risk Management

• Occupational Accidents

Occupational accidents are accident related with work, that accidents occur due to work or during work, including accidents occurring on the way from home to work or vice versa [4]. From the statement there are two problems that occur that the accident is a direct result of the work, or accidents that occur while the work is being done

• Accident Classification

Occupational accidents in general can be classified which include [2]:

a. Classification of occupational accidents by accident type

1. Falling
2. Crushed falling objects
3. Pounded or exposed to objects unless objects fall
4. Squashed by objects
5. Movement beyond ability
6. Effect of extreme temperatures
7. Affected by electric current
8. Contaminated miner of hazardous substances or contain radiation

- b. Classification of occupational accidents by work environment
 - 1. Accidents that occur outside the building
 - 2. Accidents in the building
 - 3. Underground crash

A factor that poses threat to worker’s safety and healthy, it has been proposed, among other very dangerous, dangerous and impractical [1].

- **Risk Identify**

The major dimensions are the factors that exist to a level of detail and then determine the specification (potential) and its causes, through surveying and searching programs on existing issues [5]. Based on the results of research that has been done, the identification is grouped based on the causes and results of his work [3].

- **Risk Measurement**

Measurement of risk assessment is to determine the level of risk based on the result of hazard identification that has been done [5]. A risk assessment can be made of a risk assessment matrix to be classified on each identified risk.

		SEVERITY / KEPARAHAN				
		1	2	3	4	5
PROBABILITY	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

Figure no 1: OHS risk assessment matrix

Information:

- 1-4 : Low risk (L)
- 5-10 : Medium risk (M)
- 12-25 : High Risk (H)

- **Risk Control**

Risk assessment activities, the hierarchy of risk control is one of the things that must be considered. The selection of a risk hierarchy can determine the effectiveness and efficiency, so that risks can be minimized and can be a controlled in project implementation. Risk control plays a role in tackling and reducing the occurrence of risk from the lowest level to the highest level [6].

Hierarchy of risk control that is [4]:

- a. **Elimination**

The top hierarchy is eliminating a dangerous material / stage, during design, the goal is to eliminate the possibility of human error in running a system due to a lack of design.

- b. **Substitution**

This control method aims to substitute materials, processes, operations or equipment from harmful to less harmful. With this control lowers the danger and minimal risk through system design or redesign.

- c. **Enginnering Control**

This control is done formally to separate hazards with workers and to prevent humans. Teaching is done in a machine unit or equipment system.

- d. **Administratif Control**

Administrative controls are aimed at controlling from the side of the person who will do the job, with controlled working methods people expected to comply, have the ability and expertise to complete the job safety.

e. Personal Protective Equipment (PPE)

The selection and use of personal protective equipment is a matter of concern in hazard control. PPE serves to reduce the risk of hazard impact. PPE including, helmet, earplug / earmuff, gloves, mask, apron, eye protection, safety harnees, safety shoes, and face protection.

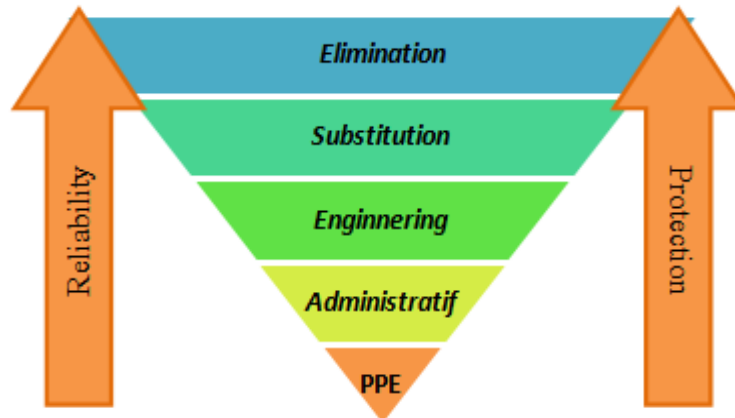


Figure no 2: The Hierarchy of Risk Control

B. Research Methods

Primary data collection through spreading questionnaire to 85 respondents at PT.X in Indonesia. Respondents in the research are Project Manager (PM), Site Manager (SM), estimator, supervisor, Quality Surveyor (QS), Quality Control (QC), and HSE division (HSE). Data analysis is done by assessing risk by means of risk assessment matrix. Then proceed with risk control in accordance with risk type and risk control hierarchy

III. RESULT

3.1. Risk Analysis

Risk analysis is done by identifying risks based on their work on project activities. The research conducted there are 60 risk indicators based on the work done. The number of risk indicators for each job will be presented in Table 1.

Table No 1: The number of risks at each job

No.	Type of work	Number of indicators
1	Saving logistics	8
2	Excavation work	7
3	foundation	5
4	Structural work	10
5	Mechanical Electrical Work	8
6	Roof Work	9
7	Architectural Work	10
8	Operational tools	5
		60

3.2. Risk Assessment

In accordance with the results of risk identification, then risk assessment is based on the chance of a risk occurring and the impact caused by an accident. Risk assessment is based on the risk assessment matrix in accordance with Figure 1. The results of the risk assessment can be seen in table 2.

Table No 2: Risk Assessment Results

Level / risk rating	Quantity
Low Risk	47
Medium Risk	14
High Risk	0

In accordance with table 2, then the risk assessment at a Medium level will be described in table 3.

Table No 3: Medium risk assessment

No.	Item			Risk Assessment
		Opportunity	Impact	
1	Tool tripped	2	3	Medium
2	Stumble Material	2	3	Medium
3	Exposed to spark during welding	3	3	Medium
4	Hands / feet punctured iron protruding	2	3	Medium
5	Hit by sparks during welding	2	3	Medium
6	Wounded by a saw when cutting a pipe	2	4	Medium
7	Hands / feet are pinched during electrical panel installation	2	3	Medium
8	Workers fall from a height	2	4	Medium
9	Scaffolding falls and affects workers	2	4	Medium
10	Falling material from altitude and overwriting workers	2	3	Medium
11	Respiratory disturbance due to exposed dust roof coverings and ceiling	2	3	Medium
12	Hearing loss when installing doors or windows	2	3	Medium
13	Hearing loss during ceramic cutting	2	3	Medium
14	Hands or feet injured by exposure to the appliance	2	3	Medium

1.3. Risk Control

Risk control will be conducted accordance to risk control hazard in figure 2. In accordance with table 2 level of risk with a medium level can be minimized by controlling the engineer, administration, and use of PPE. Such control described such as:

a. Control of the engineer

Engineer control is controlled by managing the source of danger, where the source of danger is kept to a safe extent. In this study control include by:

- Transferring dangerous materials and tools
To minimize the risk of tripping material or tools, it can be prevented by moving materials and tools to places where no workers trespassing
- Tidy up and clean the location
After work in the project side, clean up the location from materials and tools that may harm other workers required.

b. Administrative control

Administrative control with administration in minimizing the source of risk, in this case control include by:

- Provision of signs
 - In areas where the dangerous work and iron bulge exist, it can minimize the risk of work-related iron accidents.
 - In locations that workers working on the ground, so workers will be cautious as they cross the site.
- Periodic maintenance of the device
The tools used during project execution should be carried out periodically, so there is no risk of equipment damage during implementation.
- Counseling in the use of tools according to SOP
Counseling is so important that workers understand how the tool works and understand how to use it safely.
- Conducting safety induction, as well as safety talk before doing the job
- Conducting a safety meeting to prevent the occurrence of the same accidents and remedial measures

- Conducting patrol safety
It is important to improve supervision and order of workers in the use of PPE when doing field work.
 - Conduct OSH training for workers and parties involved in the project
- c. Use of PPE
The use of PPE is the latest way to minimize the risks that can occur during construction projects. Controls with PPE may include:
- Use of PPE in accordance with the work being done.
 - Workers performing welding work are required to wear face shields, so sparks do not affect the face.
 - Workers working at altitudes are required to use safety belts, that is minimizing the risk of falling from a height.
 - Workers who are doing ceramic cutting are required to use earplug to prevent hearing loss while cutting.
 - The use of masks in work can also reduce the risk of respiratory illness for workers who performing painting, cleaning and other work.
 - Workers are always required to wear safety shoes, so they can protect themselves and minimize the risk of tripping, and stabbed when they are at the project site.
 - Workers are required to use helmets while at the project site.
 - Helmets can protect the head from falling objects, knock on runs, and etc.
 - Workers are required to use a working vest, because when the construction project location is turn dark, the workers will aware with other workers at the location and they be more careful.
 - The full use of PPE.

IV. CONCLUSION

In accordance with the results of research that has been done then from 60 indicators there are 13 indicators included in the assessment of Medium risk. The risk assessment is done by means of risk assessment matrix. To mitigate risks risk control can be exercised based on the hierarchy of risk control, in which case the risks are controlled by means of complete engineer control, administration and use of PPE.

REFERENCES

- [1]. Hola,B., Nowobilski,T., Szer,I., Szer,J. Identification of Factor Affecting The Accident Rate in the Construction industry. *Procedia Engineering*. 2017: 35-42.
- [2]. International Labor Office. *Guidelines on Occupational Safety and Health Management Systems (ILO-OSH)*. 2001
- [3]. Palloan, D. Analisis Risiko Kecelakaan Kejra Pada Proyek Konstruksi Gedung Bertingkat Pada Proyek Konstruksi Gedung Bertingkat di Kota Makassar (Studi Kaus: Vida View Apartemen). 2016.
- [4]. Rawis,T.D., Tjakra,J., Arsjad,T.Tj. Perencanaan Biaya Keselamatan dan Kesehatan Kerja (K3) Pada Proyek Konstruksi bangunan (Studi Kasus: Sekolah ST. Ursula Kota Moba Gu). *Jurnal Sipil Statik*. 2016;4(4):241-252.
- [5]. Sucita, I.K., Broto, A.B. Identifikasi dan Penanganan Risiko K3 Pada Proyek Konstruksi Gedung (Studi Kasus Proyek Gedung Centro City Recidences). *Poli Teknologi*. 2011;10(1):83-92.
- [6]. Nadhila,A.N., Wisnumurti, Devia,Y.P. Analisa Manajemen Risiko Keselamatan dan Kesehatan Kerja (K3) Pada Pembangunan Gedung Fakultas Pertanian Universitas Brawijaya.*Jurnal Mahasiswa Teknik Sipil*. 2018;1(1):128-133.
- [7]. Yoon,S.J., Lin,H.K., Chen,G., Yi,S., Choi,J., Rui,Z. Effect of Occupational Health and Safety Management System on Work-Related Accident Rate and Differences of Occupational Health and Safety Management System Awareness Between Managers In South Korea's Construction Industry.*Safety and Health Work*. 2013;4:201-209.

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