

## Conference Paper

# Analysis of Work Safety and Health Risk Management Qualitatives in Reducing Construction Project Cost Overruns

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### Abstract

Occupational Health and Safety Risk Management in construction projects is still often overlooked, even though the construction service industry is one of the industrial sectors that have a high risk of workplace accidents. From the results of the risk analysis research of the AHP (Analysis Hierarchy Process) method, it was found that the application of risk management to the project from the planning process could reduce the risk of accidents which had serious consequences of 1.5%, so that cost overruns of handling work accidents in construction projects could be reduced by 7% of the project value.

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## 1. Introduction

Work accidents, especially in construction projects in Indonesia, have an increasing trend each year. In 2013, every day nine people died as a result of workplace accidents, this number increased by 50% compared to the previous year which only recorded six people died from work accidents. According to data from the International Labor Organization (ILO), in Indonesia there are an average of 99,000 cases of workplace accidents. With around 70 percent fatal, that is death and disability for life [1]

From the study results obtained the amount of the cost allocation for handling work accidents in construction projects by 37% of annual profit or 8.5% of the tender value or 5% of operational costs. The amount of the work accident cost allocation proves that the value of work accidents in the project is still high. Of the 80% of work accidents in construction projects there are 8% of accidents that have serious consequences such as serious injury or death [4, 5]

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Given the high cost allocation and frequency of workplace accidents in this construction project, it is necessary to conduct research on qualitative analysis of occupational health and safety risk management in construction projects to reduce construction project cost overrun due to work accidents. The basis for the implementation of occupational safety and health (K3) in construction services is: Law No.1 of 1970 concerning occupational safety, Law No. 18 of 1999 concerning construction services.

## 2. Methods and Equipment

### 2.1. Methods

This research method uses questionnaire and expert methods to obtain qualitative analysis so that it can be applied as a risk control measure that can reduce project costs in construction projects. Analysis of the method used is hierarchical analysis is a functional hierarchy with input mainly human perception. With a hierarchy, a complex and unstructured problem is solved into its groups. Then the group is arranged into a hierarchical form [2, 3] This method is chosen if the data to be processed is data that is not normally distributed. This method is used to see the dominant risk factors.

### 2.2. Equipment

Following are the matrices used for assessment

TABLE 1: Scale of probability and consequences on the AS / NZS 4360 standard [7].

Level	Criteria	Explanation
1	Insignifican	There are no losses, the material is very small
2	Minor	Minor injuries require p2k3 treatment to be handled directly at the scene, moderate material losses
3	Moderate	Missing workdays, requiring medical treatment, material losses are quite large
4	Major	Injuries result in defects or loss of bodily functions in total material loss
5	Catastrophic	Causing a huge disaster Material

The results of the risk assessment will be the basis for risk control. Control of hazards in the work environment are actions taken to minimize or eliminate the risk of workplace accidents through elimination, substitution of engineering control warning systems, administrative control and personal protective equipment

TABLE 2: Scale of Risk Matrik on the AS / NZS 4360 standard [7].

Probability	Consequences				
	1	2	3	4	5
5	H	H	E	E	E
4	M	H	E	E	E
3	L	M	H	E	E
2	L	L	M	H	E
1	L	L	M	H	H

### 3. Results

Data processing will be carried out by AHP (Analysis Hierarchy Process) method which consists of hazard identification, risk assessment, and risk control. Potential reduction in risk rating will be made after making risk control. The potential for decline is made as a reference or target from the results of risk control.

#### 3.1. Hazard identification

The hazard identification process is a follow-up process of identifying activities, in the process of identifying hazards the risk of each activity that has been identified will be carried out. Making elevators that do not use safety ropes or nets, burglary using makeshift attributes, wiring that is left dormant without warning posters, and various activities carried out without using a complete PPE. Infrastructure maintenance measures have at most accidents and actions that lead to actions that contain occupational hazards are always followed by the potential for workplace accidents due to lack of human attention, incorrect or improper use of equipment, use of poor personal protective equipment and other errors that occur in the workplace.

#### 3.2. Risk assessment

The hazard identification process is a follow-up process of identifying activities, in the process of identifying hazards the risk of each activity that has been identified will be carried out. Making elevators that do not use safety ropes or nets, burglary using makeshift attributes, wiring that is left dormant without warning posters, and various activities carried out without using a complete PPE. Infrastructure maintenance measures have at most accidents and actions that lead to actions that contain occupational hazards are always followed by the potential for workplace accidents due to

lack of human attention, incorrect or improper use of equipment, use of poor personal protective equipment and other errors that occur in the workplace.

### 3.3. Risk control

Risk control aims to minimize the level of risk from potential hazards. Efforts are made to reduce or reduce the level of risk to be low, namely: To be exposed to electric shock when turning on the operational panel, risk control / reduction measures can be carried out by using PPE such as safety shoes and leather gloves. This is in accordance with Law No. 1 of 1970 Article 13 concerning occupational safety, namely the obligation to enter the workplace and PerMenaker 03/MEN /1998 concerning how to report and inspect accidents and install electrical installations in accordance with Kepmenaker [6]. PerMenaker 75 / MEN / 2002 concerning the enactment (SNI) of the Indonesian national standard number 04-0225-2000 concerning the general requirements of the 2000 electricity installation (PUIL 2000) and making instructions for installation or installation work in the workplace.

For fires, risk control measures can be carried out, namely providing fire extinguishers. This is in accordance with Law No. 1 of 1970 concerning work safety, Permenaker No. 04/MEN/1980 concerning the conditions for installing and maintaining APAR, and PerMenaker. 186/ MEN/1999 concerning fire prevention units in the workplace. PerMenaker 02/Men/1983 concerning Establishment of a permit to work system includes: Determination of the protection system from the welding process and. Readiness of equipment to deal with emergency conditions and through socialization and emergency response training.

For noise, control measures are carried out using PPE in the form of earplugs and noise monitoring. This is in accordance with Law No. 1 of 1970 Article 13 concerning work safety, namely the obligation to enter the workplace and Kep. 51 / MEN / 1999 concerning the threshold value (NAB) of physical factors in the workplace.

To fall from a height, control measures are carried out using PPE namely safety belt and body harness when working at altitude and engineering or modifying the installation of hand rail This is in accordance with Law No. 1 of 1970 concerning work safety. The results of risk management to reduce cost overrun can be seen in table 4.

Assessment results based on risk assessment there are 8 hazard risk points in infrastructure development actions. Risk assessment is intended to prioritize the handling of hazards that have been identified. Control measures start from hazards that have a high risk then lower levels of danger. The value of risk that exists in infrastructure

TABLE 3: Risk Management Results that reduce cost overrun.

Activities	Risk	Cause	Impact	Risk			Cost Overrun
				Frequency	Risk Categories	Risk Level	
APD	- Stricken with Building Materials - Affected by pollution Noisy	- Lack of Worker Awareness - Weak regulations	- Mild to fatal injury - Respiratory disorders -Regular	H	M	H	4%
Fire	- The building is on fire - The tools are broken	Weak existing regulations and limited tools	- The project will be hampered - Employee injury	L	M	M	8%
Electri-city	- Short circuit - Electricity	Weak regulations		L	M	M	6%
Height	- Falling	- Inadequate tools		M	M	M	10%
<b>Avarage</b>							<b>7%</b>

development actions for most types of activities is 50% moderate risk, there is also a high risk of 25%, and a low of 25%. The priority risk that needs to be done is to minimize the risks that exist, by engineering modification, training, work instructions and the use of appropriate personal protective equipment. From the results of the study it was found that the application of risk management to the project from the planning process can reduce the level of accident risk which has a serious consequence of 1.5%, so the cost of handling workplace accidents in construction projects can be reduced by 7% of the project value.

#### 4. Discussion

The results of the study, it was found that the application of risk management to the project from the planning process could reduce the level of accident risk which had a serious consequence of 1.5%, so the cost of handling work accidents in the project construction can be reduced by 7% of the project value.

#### 5. Conclusion

The results of the identification are 8 risk danger points out of 5 activity processes and risk assessments, there are 6 risk hazards in development actions. Control starts from hazards that have a high risk then lower levels of danger so that the process becomes safe.

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## Conflict of Interest

The authors have no conflict of interest to declare.

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