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IDENTIFICATION OF HAZARDS AND ASSESSMENT OF OCCUPATIONAL SAFETY AND HEALTH (K3) RISK IN PROJECTS RUNWAY AND TAXIWAY LOLAK BOLAANG MONGONDOW AIRPORT USES THE METHOD*HIRARC*

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ABSTRACT:
The Lolak Bolaang Mongondow Airport Runway and Taxiway Project represents one of the emerging airport developments characterized by a heightened susceptibility to accidents. Occupational Safety and Health (K3), an integral component of multifaceted initiatives aimed at mitigating workplace accidents while augmenting labor productivity and efficiency, has been effectively integrated into this undertaking. Among the methodologies employed for its implementation, the Hazard Identification and Risk Assessment Risk Control (HIRARC) approach takes precedence. The primary objective of this research is to meticulously identify hazards, conduct a comprehensive analysis of workplace safety risks, and institute measures to curtail these risks within the scope of the Lolak Bolaang Mongondow Airport Runway and Taxiway project. This endeavor seeks to curtail, and ideally eliminate, workplace accidents. Data acquisition was facilitated through a combination of observational techniques and structured interviews with service providers and construction contractors, involving 63 respondents. To ascertain the categorization of risk levels, spanning from low to high, a meticulous workplace safety risk analysis was executed. The outcome of this analysis, encompassing a total of 69 sub-items of work, reveals that the highest risk level is attributed to runway construction work, accounting for 53% of the identified risks (9 out of 17). The second-highest risk category pertains to PKP-PK work, constituting 40% of the 40 identified risks, and the third-highest risk level is linked to operational road pavement construction, with a risk percentage of 31%. Subsequent to

the identification and assessment of risks, risk control measures are diligently executed. This phase signifies the culmination of data processing within the framework of the HIRARC methodology.

Keywords: *Hazard Identification,* Occupational Safety and Health (K3)*, Assessment, Control, Risk.*

INTRODUCTION

Occupational Safety and Health (K3) is part of various efforts to prevent work accidents by creating pollution-free, healthy and safe work conditions or environments, thereby also increasing labor productivity and efficiency (Gowda et al., 2022). Health and work accidents not only cause loss of life but also material losses for many parties and can disrupt the course of production, as well as cause environmental damage which will also have an impact on the wider community. OHSAS 18001 (2007) defines OHS (K3) as "all situations and elements that have the potential to influence the work environment of workers and other individuals (contractors, suppliers, guests and visitors) at the work site" (Lo et al., 2014). Therefore, it can be concluded that efforts to create work safety are a fundamental way to minimize the possibility of work accidents that cause losses such as damage, disability, death, injury, material loss, damage to the work atmosphere or environment in general, and damage to machines or equipment.

Every year, 2.78 million employees die due to industrial accidents or diseases, as reported by the International Labor Organization (ILO). In addition, approximately 374 million people are injured, sick, or even fall ill due to work accidents every year. As a result, there is a loss of working days to the global economy of more than 4% of global GDP (ILO, 2018) (Maul, 2009). The number of work accidents is increasing, as reported by the Social Security and Employment Administering Agency (BPJS). In 2017 there were 123,041, and in 2018 there were 173,105, with a total compensation cost of IDR 1.2 trillion (BPJS Employment, 2018) (Madya & Nurwahyuni, 2019).

In 2021, 234,270 accidents or incidents occurred at work sites in Indonesia, as reported by the Employment Social Security Administration (BPJS) (Wibowo & Sajiyo, 2023). This is an increase of 5.65% compared to the previous year (221,740 cases). The number of accidents or incidents while at work sites in Indonesia has continued to increase over the last five years, in line with trends (Prendanadia & Iskandar, n.d.). Since 2017, there have been 123,040 industrial accidents. In 2018, there were 173,415 instances, an increase of 40.94%. The number of work accidents grew by 5.43% to 182,835 cases a year later (Wibowo & Sajiyo, 2023). In 2020, the number of industrial accidents in Korea grew by 21.28% to 221,740. It rose once again last year. According to BPJS Employment, the majority of accidents occur at work sites. This also

happens most often in/during the morning from 06.00 to 12.00. Due to the large number of work accidents, BPJS Employment spent IDR 1.79 trillion to pay claims in 2021. The increase was 14.97% compared to previous years which amounted to IDR 1.56 trillion (Nurhasana et al., 2022).

Risk identification is a component of risk management (Zhang et al., 2015). The process of prioritizing control over the level of accident or occupational health risk is known as risk assessment (Ilbahar et al., 2018). Groups such as activities, places, regulations, functions, or manufacturing processes may initiate the hazard identification process. There are several methods that can be useful for highlighting dangerous risks in the workplace, for example through inspections, illness and absenteeism, P2K3, worker complaints, information about work accident data, reports from the K3 team, supervisors, material safety data sheets, knowledge about the industry.

Occupational Health and Safety Assessment Series 18001:2007 is part of various K3 management systems used internationally (OHSAS 18001:2007) (Jannah et al., 2020). According to OHSAS, K3 risk management is divided into three parts, namely risk assessment, risk control and hazard identification (HIRARC). This approach is one aspect of risk management and determines the direction and objectives of implementing K3 in the company. The HIRARC method is a series of processes that identify hazards that may arise during routine and non-routine activities carried out by the company and must be able to minimize risks and ensure safety, then operate a risk assessment of the identified hazards, and finally develop a risk control program to minimize the reduction rate. risks with the aim of preventing accidents within the company.

Bolaang Mongondow is a district with the potential to become the largest industrial area in North Sulawesai. Natural wealth, industry, tourism potential, local wisdom of the people, strong history and culture make Bolaang Mongondow Regency worthy of being the leading district in North Sulawesi. The construction of the New Bolaang Mongondow Airport can improve transportation accessibility and community mobility between regions and between provinces. Determining the location of the airport located in Lolak Bolaang Mongondow Village based on the results of an evaluation of the feasibility study report prepared by South Bolaang Mongondow Regency and Bolaang Mongondow Regency, it was concluded that the proposed location for South Bolaan Mongondow airport and its surrounding districts could not be processed further, among other things, because of the location plan. The proposed airport has limitations in the long-term development plan due to several operational obstacles (obstacles in the form of hills and mountains which will result in limited landing and take-off procedures in one direction only for wide bodies) as well as potential

environmental/social obstacles due to the presence of large residential areas. Is in the area that will be used as an airside facility (New Airport Feasibility Evaluation Results No: AU.101/23/DRJU.DBU-2014) (Berawi et al., 2018).

Based on technical data, the SBSN target (2022-2023) will carry out the process of building a new Bolaang Mongondow airport with a total budget of IDR. 324,832,415,000.- Construction of Runway: 1,600 m x 30 m and Taxyway: 149.5 m x 18 m which can accommodate ATR-72 (MTOW) with a contract value of Rp. 92,314,990,000.- is one part of the construction work for the new Bolaang Mongondow airport (Letter of Agreement No. PI.107/02/VII/BOI/2022) (Sumampouw, 2018).

Relevant previous research was conducted by (Aven, 2016) who explained that risk assessment and risk management were established as scientific fields and provided important contributions in supporting decision making in practice. Basic principles, theories and methods exist and are being developed. This review paper has placed its focus on recent work and advances covering the fundamental ideas and thinking on which the risk area is based.

Next is a study previously conducted by (Ilbahar et al., 2018), based on the analysis, risk control alternatives created to minimize possible health and safety risks in building accessibility and infrastructure include: preparing security officers to carry out escort duties during equipment mobilization, scheduling such mobilization as well as materials, traffic cones, road barriers, installing signs, safety barriers, as well as providing PPE (Personal Protective Equipment) for workers. Apart from that, holding outreach activities for workers to always focus and be careful when carrying out work or activities on the side of the road, around excavation holes, or at borders. Apart from that, prepare adequate lighting, prepare special parking facilities for heavy vehicles, and prepare security officers while heavy equipment is operating and also during loading and unloading of materials using*dump-truck*, and always clean materials that pollute the road area regularly.

Next is a study conducted by (Nurfajriah et al., 2015) emphasizing that the percentage of high risk ratings for each work item is as follows: earthwork (20%), structural work (30%), foundation work (25%), roof work (31%), electrical and plumbing work (12%), and finishing (25%). Meanwhile, it was revealed that 25% of the risks found had a significant risk rating, 43% had a moderate risk rating, and the remaining 32% had a low risk rating out of a total of 65 hazards found in the sub-elements of the current task.

Implementation of construction projects is an activity that often encounters obstacles due to various risk considerations. Road projects are one of those projects that often experience challenges during the construction phase because they typically feature locations that are kept active by other drivers on the road. Runway and taxiway projects are projects that often

encounter challenges during the development stage and can have various consequences. This signals a significant occupational safety hazard. As a result, an evaluation of work safety risks is needed to determine the number of work safety risks on the Lolak Bolaang Mongondow Airport runway and taxiway project using the systematic HIRARC (Hazard Identification, Risk Assessment and Risk Control) method or technique at Lolak Bolaang Mongondow Airport.

RESEARCH METHODS

The purpose of this evaluation research using qualitative methodology is to understand further what safety risks are faced by employees involved in the runway and taxiway construction project at Lolak Bolaang Mongondow Airport. HIRARC approach (*Hazard Identification Risk Assessment and Risk Control*) begins with identification, assessment and control of hazards. This approach is used to estimate the level of work safety risk. This study was conducted from November 2022 to August 2023 at Lolak Bolaang Mongondow Airport.

Primary data was obtained from a survey of workers, SHE workers for the Lolak Bolaang Mongondow Airport runway and taxiway project, and maintenance workers. Obtained from analysis of HSE documents at Lolak Bolaang Mongondow Airport, data on accident numbers, SOP (Standard operational procedures) for Lolak Bolaang Mongondow Airport runway and taxiway projects, HIRARC table).

To obtain risk values and comparisons in the evaluation phase of the amount of risk in numbers, information measurement begins by calculating the risk value obtained from the total effect, exposure and probability ranking. The results are also compared with the current criteria so that conclusions can be drawn whether the figures are still appropriate or not, and whether further treatment is needed to reduce the risk to a level that can be handled by workers.

RESULTS AND DISCUSSION

A. General description of PT. Karunia Jaya Sejati

Establishment of a limited liability company PT. Karunia Jaya Sejati which is based in the cityManado was formed on February 8 2007, based on the Decree of the Minister of Justice of the Republic of Indonesia dated September 17 1991 Number: M-125-HT.03.01-1989, with the business sectors of Development, Trade, Industry and Mining. PT. Karunia Jaya Sejati participates in many government projects such as bridge roads and the Taman Ir Soekarno Sitaro airport. As time goes by, various stages of development are often carried out to continue to grow and develop to become part of the company's dedication to the development of the nation through construction services spread across North Sulawesi. A significant development was that on October 19 2022, at the request of the directors and shareholders, there was a change in the entire articles of association

and management composition which were adjusted to Law Number 40 of 2007 concerning Limited Liability Companies to become a larger company by handling various national projects. Airside and Landside Pavement Construction Packages Volume 1 (One) Package Number: PL.107/K.PSUD/02/VII/BOL/2022. This project is a project of the Indonesian Government c.q. Ministry of Transportation c.q. Directorate of Civil Aviation with several work items such as runways, taxiways, aprons and several other pavement constructions. This project is a national project with very fast work because the target implementation time is only 522 calendar days, starting from the start date of work listed in the SPMK until the first handover date or one year and seven months.

B. General description of PT. Karunia Jaya Sejati

Establishment of a limited liability company PT. Karunia Jaya Sejati, which is domiciled in the city of Manado, was formed on February 8 2007, based on the Decree of the Minister of Justice of the Republic of Indonesia dated September 17 1991 Number: M-125-HT.03.01-1989, with the business sectors of Development, Trade, Industry and Mining. PT. Karunia Jaya Sejati participates in many government projects such as bridge roads and the Taman Ir Soekarno Sitaro airport. As time goes by, various stages of development are often carried out to continue to grow and develop to become part of the company's dedication to the development of the nation through construction services spread across North Sulawesi. A significant development was that on October 19 2022, at the request of the directors and shareholders, there was a change in the entire articles of association and management composition which were adjusted to Law Number 40 of 2007 concerning Limited Liability Companies to become a larger company by handling various national projects. Airside and Landside Pavement Construction Packages Volume 1 (One) Package Number: PL.107/K.PSUD/02/VII/BOL/2022. This project is a project of the Indonesian Government c.q. Ministry of Transportation c.q. Directorate of Civil Aviation with several work items such as runways, taxiways, aprons and several other pavement constructions. This project is a national project with very fast work because the target implementation time is only 522 calendar days, starting from the start date of work listed in the SPMK until the first handover date or one year and seven months.

C. Analyzing Job Safety Risks

After all occupational safety and health (K3) hazards and risks in the implementation of Runway and Taxiway work have been identified, a risk assessment will be carried out, which is an activity to evaluate the likelihood and severity of each work activity hazard.

Risk = Likelihood x Severity

Likelihood/Opportunity is the possibility of a danger occurring while

Severity/Consequence is the Likelihood of a danger occurring (Severity).

To determine the risk value, all work items in this project will be analyzed based on the probability of a hazard occurring and the level of severity if the hazard is present.

Table 1

Risk Level

		OPPORTUNITY				
A		1	2	3	4	5
K	1	1	2	3	4	5
I	2	2	4	6	8	10
B	3	3	6	9	12	15
A	4	4	8	12	16	20
T	5	5	10	15	20	25

Information:

	Low (Low Risk)
	Medium (Moderate Risk)
	High (High risk)

Source : (*Standards Australia/Standards New Zealand (AS/NZS 4360:2004)*)

In this research, it is known that there are 13 types of work fields, 1600 x 30 m runway pavement construction, PKP-PK road construction work and operational road pavement construction work which have the risk variables with the highest ranking as can be seen in the picture below:

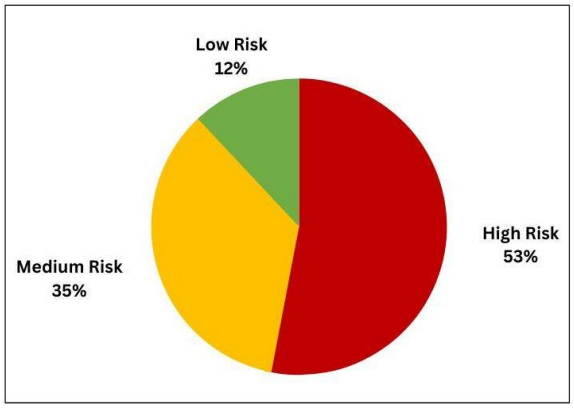

Figure 1. Risk Rating Percentage for Runway Pavement Construction Work 1600m x 30m
Source: (Analysis results, 2023)

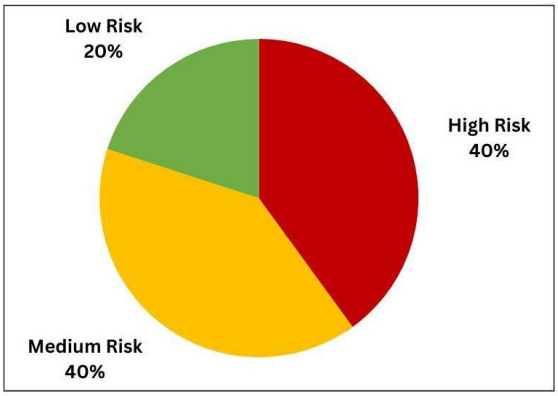

Figure 2. Presentation of Risk Rating on Road Pavement Construction work PKP-PK
Source: (Analysis results, 2023)

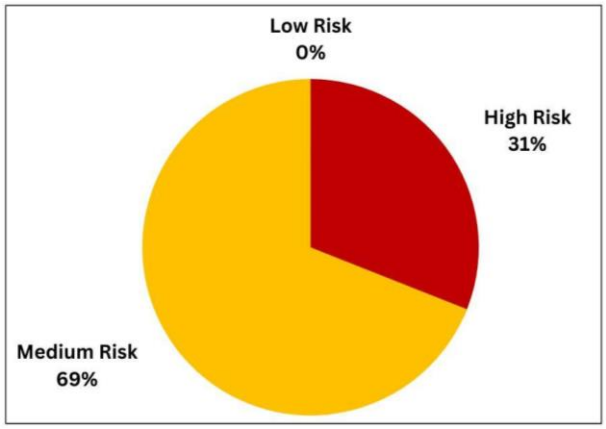

Figure 3. Operational road construction construction work
Source: (Analysis results, 2023)

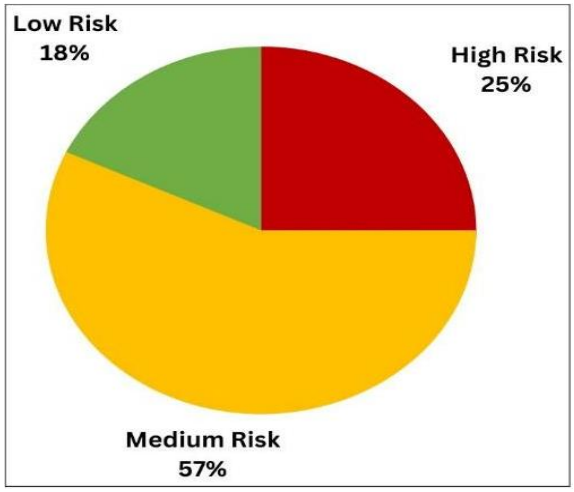

Figure 4. Percentage of Risk Rating for all Work Items
Source: (Analysis results, 2023)

From this figure it is known that the distribution of work with the highest level of risk lies in runway construction work, namely 53 percent or 9 risks out of the 17 identified risks. For PKP-PK road pavement construction work, the highest risk level presentation is 40 percent or 4 risks out of 10 risks identified, while for construction work on operational road works the highest risk is 31 percent or 4 out of 13 risks identified. For all work items, 25 percent or 38 risks were identified out of 149 risks. The total number of risks identified in this project work stage was 149 risks with the lowest risk level percentage being 18 percent, the medium risk level being 57 percent and the highest risk being 25 percent which we can see in Figure 4.12.

D. Controlling risks on runway and taxiway projects

To minimize the level of risk of existing potential dangers, risk control is carried out and this is the final stage in data management using the HIRARC method. There are risk controls including: (Elimination (Eliminating dangerous work, machines, tools and processes), Substitution (Replacing process materials and operating tools from dangerous ones to non-hazardous ones), Engineering Control (Separating hazards from workers), Warning System (Providing warnings, signs, instructions, labels regarding danger), Administrative Control (Making modifications to the work environment such as work rotation, training, SOP), and PPE, namely personal protective equipment designed to protect oneself (Suhardi et al., 2016).

CONCLUSION

Hazard identification on the Lolak Bolaang Mongondow airport runway and taxiway project totaling 149 hazards from 69 work sub-items; consisting of 8 hazards in preparatory work, 6 hazards in earthworks,

17 hazards in runway pavement construction work, 17 hazards in taxiway pavement work, 17 hazards in apron pavement construction work, 7 hazards in resa construction work, 1 hazard in marking work , 9 hazards in PKP-KP road pavement construction work, 10 hazards in GSE road pavement construction work, 13 hazards in operational road pavement construction work, 13 hazards in access road work, 13 hazards in main pavement construction work and 18 hazards in fence work airside safety.

From the results of the work safety risk analysis on the Lolak Bolaang Mongondow airport runway and taxiway project, it was concluded that the percentage of high risk ratings for each work item included preparation work 29%, earthwork 0%, runway pavement construction work 53%, construction work taxiway pavement 24%, apron pavement construction work 24%, resa construction work 14%, marking work 0%, PKP-PK road pavement construction work 40%, GSE road pavement construction work 30%, operational road pavement construction work 31%, work access road pavement construction 16%, main pavement construction work 31% and airside safety fence work 6%. Meanwhile, the total number of risks identified in this project is 149 risks with a low risk level of 18%, a medium risk level of 57% and a high risk level of 25%.

Risk control on the Lolak Bolaang Mongondow airport runway and taxiway project is obtained. After hazard identification and risk assessment are completed, this is the final stage in data processing using the method*Hazard Identification and Risk Assesment Risk Control (HIRARC)* which are carried out to eliminate or minimize accidents on the Lolak Bolaang Mongondow Airport Rundway and Taxiway project, namely; Prior to the start of all work activities, a labor briefing is carried out, security officers are prepared to accompany the mobilization of equipment, checking the suitability of equipment before carrying out work, installing K3 signs, preparing Personal Protective Equipment (PPE), providing a police line at the location of dangerous activities and preparing special Occupational Safety and Health (K3) officers.

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