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Hazard Identification and Risk Management for Occupational Safety and Health at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh

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ABSTRACT

This research aims to identify the sources of Occupational Safety and Health (OSH) hazards at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh and to control the risks of OSH hazards at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh. Focusing on power transmission, PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh is always committed to improving the quality and continuity of service to customers. However, considering the high inherent risks in electrical activities, the company realizes the importance of prioritizing safety and health at work (OSH) as an integral part of its operations. Given the high risks associated with electrical activities, this company needs to proactively identify and manage potential hazards that could threaten the safety of workers. Hazard identification, risk assessment, and determining control (HIRADC) are used to identify potential hazards, assess risks, and determine appropriate control measures for those hazards. HIRADC consists of three main stages, namely hazard identification, risk assessment, and hazard control. The results of the hazard and risk identification show that work activities at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh contain a number of significant potential hazards including the risk of electric shock, exposure to hazardous chemicals, high noise levels, the potential to be struck by equipment, the risk of leaks, and the danger of fire. The consequences of exposure to these hazards can vary, ranging from minor injuries to fatal injuries. Some control measures that can be taken include the use of appropriate Personal Protective Equipment (PPE), the installation of hazard warning signs, and the implementation of safe work procedures.

I. Introduction

Occupational Safety and Health (OSH) is a fundamental pillar in modern corporate management [1]. OSH not only protects company assets such as equipment and facilities but also safeguards the most valuable asset: human resources [2]. Workplace accidents, in addition to causing material and immaterial losses, also lead to a decrease in company productivity. In an increasingly competitive global era, OSH is not merely an obligation but also a competitive advantage for a company [3]. Intense market competition demands that companies implement high OSH standards to ensure business continuity and meet international market demands [4].

As a State-Owned Enterprise (SOE), PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh plays a central role in providing electricity for public interest [5]. Focusing on electricity transmission, PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh is always committed to improving the quality and continuity of service to customers [6]. However, considering the high inherent risks in electrical activities, the company realizes the importance of prioritizing occupational safety and health (OSH) as an integral part of its operations [7]. Given the high risks associated with electrical activities,

this company needs to proactively identify and manage potential hazards that could threaten worker safety.

Every activity carried out has the potential for both success and failure [8-9]. Risk, as a combination of the likelihood of an event occurring and the severity of the impact caused by a hazard, always accompanies every action [10]. Hazard Identification, Risk Assessment, and Determining Control (HIRADC) is a systematic method used to identify potential hazards, assess risks, and determine appropriate control measures for those hazards [11]. The HIRADC method consists of three main stages, namely hazard identification, risk assessment, and hazard control [12]. Its implementation, HIRADC has been widely used to identify hazard sources and risks, such as in building construction work [13-14], fabrication and machining [15], electrical assembly [16], steel smelting [17], steam power plant industry [18], and mold replacement processes [19].

The objective of this research is to identify Occupational Safety and Health (OSH) hazard sources at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh, and to control the risks of Occupational Safety and Health (OSH) hazards at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh.

II. Method

This research was conducted at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh, located at Jalan Meulaboh – Banda Aceh, Desa Seuneubok, Kecamatan Johan Pahlawan, Kabupaten Aceh Barat. To collect relevant data, this research employed several data collection techniques, namely:

1. Interviews. This technique involved collecting data directly through conversations with PT. PLN employees working in the field. The questions asked specifically aimed to gather information regarding the application of the HIRADC method in the context of their work.
2. Observation. Through observation, the researcher directly observed the work activities of employees in the field. This observation was conducted to obtain qualitative data on working conditions, the implementation of safety procedures, and existing potential hazards.
3. Literature Review. As a complement, this research also involved a literature review. This study was conducted to obtain a strong theoretical foundation related to the HIRADC concept, as well as the results of previous studies relevant to the research topic.

Data processing used the HIRADC method with the following stages:

1. Hazard Identification, Risk Assessment, and Control Determination.

   The initial stage involved identifying all potential hazards that could occur in the work environment. After the hazards were identified, the next step was to assess the level of risk of each hazard [20]. This risk assessment considered factors such as the likelihood of the hazard occurring, the severity of the consequences of the hazard, and the number of workers exposed [21]. Based on the results of the risk assessment, the next step was to determine effective control measures to reduce or eliminate the risk. Control measures could be in the form of hazard elimination, substitution of hazardous materials, engineering controls (e.g., using personal protective equipment), or administrative controls (e.g., safe work procedures) [22].

2. Setting Objectives, Targets, and Programs (OTP).

   This stage involved setting long-term goals related to occupational safety and health. These objectives must be specific, measurable, achievable, relevant, and time-bound (SMART) [23]. After the objectives were set, the next step was to set more specific and measurable targets to achieve those objectives. These targets must be measurable and have clear key performance indicators (KPIs) [24]. The final stage was to design and implement the programs necessary to achieve the set targets. These programs must include activities such as safety training, routine inspections, and safety audits [25].

III. Results and Discussion

The HIRADC methodology is a structured approach employed to recognize, evaluate, and mitigate hazards pertaining to occupational safety and health. This process encompasses two primary phases as outlined below.

A. Hazard Identification, Risk Assessment and Control

Every workplace has a variety of potential hazards with varying levels of risk, ranging from low to high [26-28]. Failure to carefully and comprehensively identify hazards can result in workplace accidents. In general, workplace hazards can be categorized into several types, namely mechanical, electrical, chemical, and physical hazards.

Through the application of the HIRADC method (Hazard Identification, Risk Assessment, and Risk Control), identification and risk assessment have been conducted on various potential hazards that may occur at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh. This risk analysis uses the following equation to measure the severity and likelihood of an occurrence of a hazard, and the results of the identification and risk assessment are presented in Table 1.

$$\text{Risk Level} = a \times b \quad (1)$$

where:

a = Probability

b = Severity

Table 1. Identification of hazards and Consequence

No.	Activity	Routine	Non Routine	Hazard	Consequence
1	Equipment inspection in the switchyard area	v		Electric Shock	Burns, paralysis or death
				Chemical exposure	Respiratory problems and poisoning
				Mechanical accident	Physical injury
				Noise	Hearing disorders
				Falling while reaching for high equipment	Serious injury
2	Fire extinguisher and hydrant maintenance	v		Chemical exposure	Respiratory problems and poisoning
				Leakage	Burns
				Hit by equipment	Minor injury
3	Battery room cleaning	v		Electric current leakage	Burns
				Falling, slipping or hitting a blunt object	Minor injury
4	Tower inspection	v		Electric Shock	Burns, paralysis or death
				Fall from a height	Serious injury or death
				Struck by lightning	Burns or death
				Hit by equipment	Minor injury
5	Generator maintenance	v		Electric Shock	Burns, paralysis or death
				Chemical exposure	Respiratory problems and poisoning
				Burned	Burns
				Noise	Hearing disorders

Table 2. Risk control and severity level

No.	Activity	Risk Assessment				Risk Control	Additional Controls	Risk Severity Level
		a	b	(a x b)	Risk Level			
1	Equipment inspection in the switchyard	2	3	6	Substantial risk	Use of insulating gloves and safety shoes	Putting up a hazard symbol	M

No.	Activity	Risk Assessment				Risk Control	Additional Controls	Risk Severity Level
		a	b	(a x b)	Risk Level			
	area	3	2	6	Substantial risk	Use of masks	Putting up a hazard symbol	M
		1	1	1	Trivial risk	Use of Personal Protective Equipment (PPE)	-	L
		2	1	2	Tolerable risk	Use of earplugs	Putting up a hazard symbol	M
		2	2	4	Moderate risk	Use of Personal Protective Equipment (PPE)	-	L
2	Fire extinguisher and hydrant maintenance	3	2	6	Substantial risk	Use of insulating gloves and safety shoes	Putting up a hazard symbol	M
		1	1	1	Trivial risk	Use of Personal Protective Equipment (PPE)	-	L
		1	1	1	Trivial risk	Use of Personal Protective Equipment (PPE)	-	L
3	Battery room cleaning	2	3	6	Substantial risk	Use of insulating gloves and safety shoes	Putting up a hazard symbol	M
		1	1	1	Trivial risk	Use of Personal Protective Equipment (PPE)	-	L
4	Tower inspection	2	3	6	Substantial risk	Use of insulating gloves and safety shoes	Putting up a hazard symbol	M
		2	2	4	Moderate risk	Use of Personal Protective Equipment (PPE)	Putting up a hazard symbol	M
		1	3	3	Moderate risk	Monitoring the weather	Putting up a hazard symbol	M
		2	2	4	Moderate risk	Use of Personal Protective Equipment (PPE)	-	L
5	Generator maintenance	2	2	4	Moderate risk	Use of insulating gloves and safety shoes	Putting up a hazard symbol	M
		2	2	4	Substantial risk	Use of masks	Putting up a hazard symbol	M
		1	1	1	Trivial risk	Use of Personal Protective Equipment (PPE)	-	L
		2	2	4	Moderate risk	Use of earplugs	-	L

Based on the results of the hazard and risk identification presented in Table 1, it is evident that work activities at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh involve a number of significant potential hazards. Some of the main hazards identified include the risk of electric shock, exposure to hazardous chemicals, high noise levels, the potential of being struck by equipment, the risk of leaks, and the risk of fire.

The consequences of exposure to these hazards can vary, ranging from minor injuries to fatal injuries. Therefore, risk control is a crucial aspect of maintaining worker safety and health. Some control measures that can be implemented include the use of appropriate Personal Protective Equipment (PPE), the installation of hazard warning signs, and the implementation of safe work procedures. It is important to emphasize that risk control is an ongoing process and requires regular evaluation to ensure its effectiveness.

B. Setting Objectives, Targets and Programs (OTP)

Based on the analysis of hazard identification and risk assessment in Table 1, a comprehensive range of potential hazards threatening the operations of PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh has been identified. As a preventive measure to minimize unwanted incidents, the company has established Objectives, Targets, and Programs (OTP) as a framework for risk management.

OTP, which can be interpreted as the company's strategic objectives, serves as a benchmark for the success of operational risk control. These established targets need to be reviewed periodically to ensure the effectiveness of the control measures implemented and to make adjustments if necessary. Table 2 presents a detailed description of the OTP that has been set by the company.

Table 2. Objectives, Targets and Programs (OTP)

Objectives	Targets	Programs	Execution time	Person in Charge	Media Monitoring
Reducing work accidents	1 Case/Year	OHS training and certification Provision of Personal Protective Equipment (PPE)	Every 6 months	OHS Manager Safety officer	Workplace inspection checklist Inspection and investigation reports
Reducing occupational diseases	1 Case/Year	Routine Health Check	Once a year	HRD	Health results report
Worker safety	1 Case/Year	OHS training Provision of Personal Protective Equipment (PPE) Equipment inspection and maintenance	Every 6 months	OHS Manager Safety officer Maintenance supervisor	OHS Supervision
Safe working environment	1 Case/Year	Equipment inspection and maintenance	Every 6 months	Maintenance supervisor	Inspection and audit reports

Based on the analysis of the Objectives, Targets, and Programs (OTP) presented in Table 2, it is evident that PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh has a primary objective of creating a safe working environment with the target of achieving "Zero Accident" or zero workplace accidents.

To achieve this goal, the company has designed and implemented various comprehensive programs. Some of the flagship programs that have been implemented include safety and health training and certification for all employees, the provision of Personal Protective Equipment (PPE) suitable for the type of work, as well as the implementation of regular health check-ups and equipment maintenance. The implementation of these programs is expected to effectively reduce the risk of workplace accidents and create a strong safety culture within the company.

IV. Conclusion

Based on the hazard identification and risk assessment results, it is evident that work activities at PT. PLN (Persero) Transmisi dan Gardu Induk Meulaboh involve numerous significant potential hazards. Some of the primary hazards identified include the risk of electric shock, exposure to hazardous chemicals, high noise levels, the potential of being struck by equipment, the risk of leaks, and the risk of fire. The consequences of exposure to these hazards can vary, ranging from minor injuries to fatal injuries. Therefore, risk control is a crucial aspect of maintaining worker safety and health. Some control measures that can be implemented include the use of appropriate Personal Protective Equipment (PPE), the installation of hazard warning signs, and the implementation of safe work procedures. Several flagship programs have been implemented, including safety and health training and certification for all employees, the provision of Personal Protective Equipment (PPE) suitable for the type of work, and the implementation of regular health check-ups and equipment maintenance.

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