

# **BIDANG B**

## **PENELITIAN**

**ANALYSIS OF IMPLEMENTATION OF WORK SAFETY AND HEALTH  
MANAGEMENT SYSTEM IN ACCIDENT FIELD IN JABODETABEK TOLL  
ROAD IN PT JASA MARGA (PERSERO) TBK USING HAZARD AND  
OPERABILITY METHOD**

**PERIODE SEMESTER GANJIL 2022 – 2023**

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- 1. SK. DEKAN FTI SEMESTER GANJIL 2022/2023***
- 2. Date: 20th January 2023 Subject: Acceptance Lette***
- 3. MAKALAH JURNAL***

**PROGRAM STUDI TEKNIK MESIN**  
**FAKULTAS TEKNOLOGI INDUSTRI**  
**INSTITUT SAINS DAN TEKNOLOGI NASIONAL**



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I PENDIDIKAN DAN PENGAJARAN	MENGAJAR DI KELAS (KULIAH/RESPONSI DAN LABORATORIUM)				
	1. K3 & Tek. Lingkungan	Mesin S1	10:00-11:40, Rabu	2	A / K
	2. Mekanika Kekuatan Material		10:00-12:00, Selasa	2	Reguler
	3. Perpindahan Kalor dan Mass2		08:00-09.40, Senin	3	A / K
	4. Turbin Uap Gas & Komp.(P)		13:40-16:10, Kamis	3	A / K
	5. Membimbing Kerja Praktek			1	
	6. Membimbing Tugas Akhir / Proyek Akhir			1	
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II PENELITIAN	1.Penulisan Ilmiah			1	
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IV UNSUR-UNSUR PENUNJANG	Seminar Ilmiah			1	
				16	

Kepada yang bersangkutan akan diberikan gaji/honorarium sesuai dengan peraturan penggajian yang berlaku di Institut Sains dan Teknologi Nasional. Penugasan ini berlaku tanggal 01 September 2022 sampai dengan 28 Februari 2023.

Jakarta, 01 September 2022  
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5. Arsip

  
( Musfirah Cahya F.T.Dr.M.Si.Si)

**Date: 20<sup>th</sup> January 2023**

**Subject: Acceptance Letter**

Dear,

**Razul Harfi, Muhammad Firdausi, Nino Apianto**

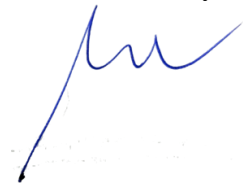
Congratulations!

We glad to inform you that your research paper entitled **“ANALYSIS OF IMPLEMENTATION OF WORK SAFETY AND HEALTH MANAGEMENT SYSTEM IN ACCIDENT FIELD IN JABODETABEK TOLL ROAD IN PT JASA MARGA (PERSERO) TBK USING HAZARD AND OPERABILITY METHOD”** has been accepted for International Journal of Advanced Multidisciplinary (IJAM) [2829-6192 (Online), 2829-6184 (Print)] and will be published on Volume 1 Issue 4 (January - March 2023).

This letter is official confirmation of acceptance of your research paper. Your Journal would be indexed in Copernicus, Google Scholar, Directory of Research Journal Indexing, Eurasian Scientific Journal Index, One Search, Directory of Open Access Scholarly Resources, and Garuda.

We look forward to receiving your subsequent research papers.

Yours Sincerely,



**Prof. Ir. M. Havidz Aima, MS., Ph.D.**

**Editor in Chief**

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## Analysis Of Implementation Of Work Safety And Health Management System In Accident Field In Jabodetabek Toll Road In PT. Jasa Marga (Persero) Tbk Using Hazard And Operability Method

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**Abstract:** PT Jasa Marga (Persero) Tbk is a company engaged in toll road management and toll road development. The method used in this study implements the Hazard and Operability method in analyzing the Occupational Safety and Health Management System with this method which can later determine the risk and level / level of the Application of Safety and Health Management Systems to accidents. And get proposed improvements to reduce existing risks. The achievement of SMK3 at PT Jasa Marga (Persero) Tbk was 74.89% in YELLOW category. This value is obtained from an average of 5 (Variables), namely K3 Commitment and Policy (76.15%), K3 Planning (72.77%), K3 Plan Implementation (75.07%), K3 Performance Evaluation and Evaluation (74 , 64%), and Review and Improvement of SMK3 Performance (75.79%). Achievement of Occupational Health and Safety Management System (SMK3) on accidents occupies level 3, namely caution. Proposed improvements to reduce the risk of potential hazards arising is to make special crossings for workers, make drainage channels in special crossing lines for workers, and require every worker to use personal protective equipment.

**Keyword:** Occupational Health and Safety System, Hazard and Operability, Risk.

## INTRODUCTION

PT Jasa Marga (Persero) Tbk is an Indonesian State-Owned Enterprise. As a company engaged in toll road management and toll road development, it has types of work that have a very high level of occupational hazard, therefore PT Jasa Marga (Persero) Tbk has implemented a Work Safety and Health Management System (SMK3) since 2007 which serves to reduce the number of work accidents that occur in the business process. However, there are still cases of vulnerable accidents in 2015 - 2017 at PT Jasa Marga (Persero) Tbk in

the Jabodetabek area with the category of minor injuries, severe injuries to death, with a high number of accident victims causing the company to experience material and non-material losses.

### **Formulation of the problem**

Based on the description of the background of the problems described above, it was concluded that there were still work accidents at PT Jasa Marga (Persero) Tbk in the Jabodetabek area, so it was necessary to evaluate and measure the implementation of the SMK3. Whereas to control the risk of hazards of work accidents in order to identify and analyze potential hazards or work accidents that occur and provide recommendations for improvements with the Hazard and Operability (HAZOP) method.

### **Scope of problem**

- 1 Accident data used in this study accident data in 2015 to 2017.
- 2 Do not discuss the cost problem.
- 3 The observed environment is at the Jabodetabek toll gate area at PT Jasa Marga (Persero) Tbk.

## **LITERATURE REVIEW**

### **Highway**

Toll road is a roadway which is an alternative to existing road crossings having freeway specifications. Toll roads are only intended for four-wheeled or more motorized vehicles that pay tolls. Inside the toll road there is a toll gate which is a place on the toll road where people make toll payment transactions.

### **Occupational Health and Safety Management System**

The Occupational Health and Safety Management System is a system used to manage Occupational Safety and Health aspects in an organization or company.

### **Accident**

According to (Heinrich, Petersen and Roos, 1990) work accidents or work-related accidents are unplanned and uncontrolled events resulting from an action or reaction of an object, material, person, or radiation that causes injury or other possible consequences.

### **Hazard and Operability Method (HAZOP)**

Hazop is one of the identification techniques used to review the hazard of a process or operation in a system in a systematic, thorough and structured manner to identify various problems that interfere with the course of processes and risks that can cause adverse risks to humans or facilities in the environment or existing system. Hazop besides showing identification of possible hazards. Hazard is a physical condition that has the potential to cause losses, accidents, to humans, and or damage to equipment, environment or buildings.

### **The purpose of HAZOP**

The purpose of using hazop includes:

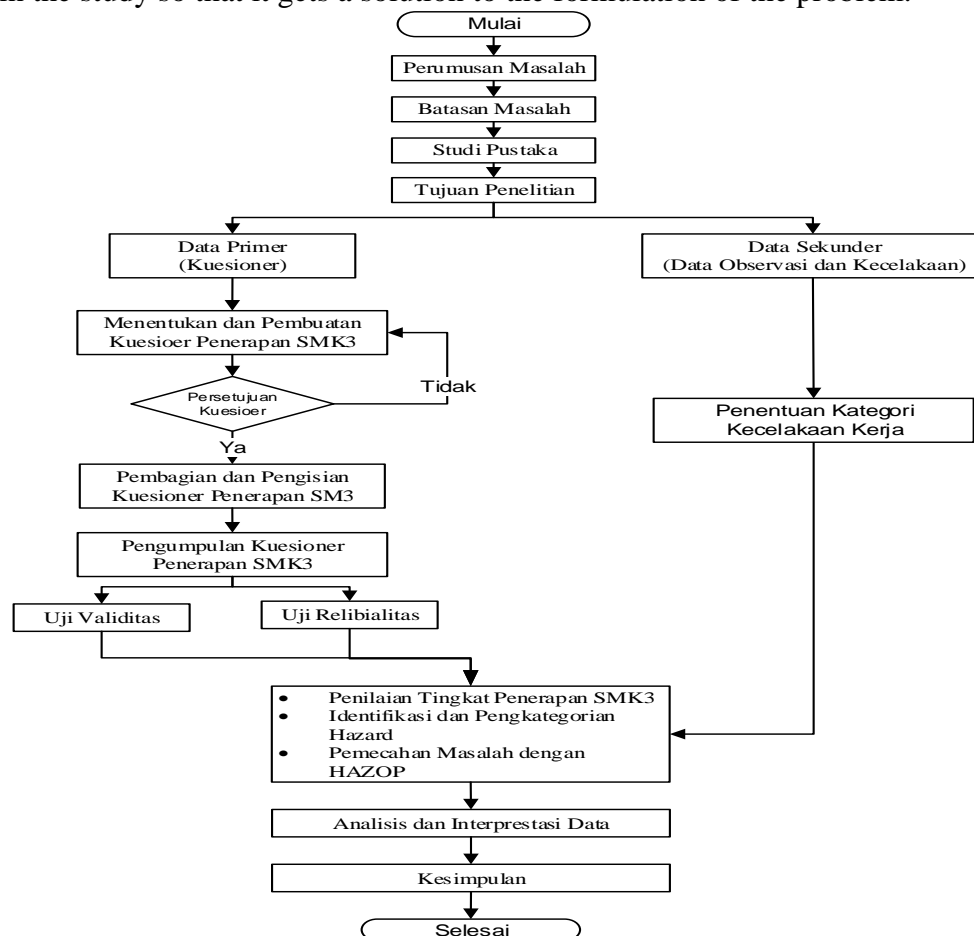
- 1 To review a process or operation on a system systematically to determine whether the deviation process can lead to an incident or accident that is not desirable.
- 2 To ensure that the security tools or systems implemented are appropriate and sufficient to help prevent an unscheduled shutdown.
- 3 Hazop also systematically identifies every possible deviation from the specified operating conditions of a plant.

- 4 To look for various causes that allow the occurrence of abnormal conditions and determine adverse consequences as a result of irregularities and provide recommendations or actions that can be done to reduce the impact of potential risks that have been identified.
- 5 For cost savings so that changes / improvisation of the process or system flow carried out in the future can be more efficient.

## METHODS

### Research procedure

Flowchart of research procedures that explains the implementation of research in order to solve a problem that is taken systematically and logically with the stages of problem solving in the study so that it gets a solution to the formulation of the problem.



### Data processing

The first step in this study is to disseminate the SMK3 questionnaire by calculating the average value using the Snorm De Boer Normalization Formula, namely

$$\text{Achievement assessment category} = \frac{(\text{actual value} - \text{minimum scale})}{(\text{maximum scale} - \text{minimum scale})} \times 100\%$$

**Tabel 1. Average Total Value and Achievement of SMK3 Implementation**

No	Category	$\sum$ Average	Achievements in Percent (%)
1	K3 Commitment and Policy	4,05	76,15%
2	K3 Planning	3,91	72,77%
3	K3 Implementation of the Plan	4,00	75,07%
4	K3 Performance	3,99	74,64%



No	Category	$\sum$ Average	Achievements in Percent (%)
	Measurement and Evaluation		
5	SMK3 Review and Performance Improvement	4,03	75,79%
$\sum$ Rata – rata			3,99
Achievements in Percent (%)			74,89%
Category			Yellow

Source: Questionnaire data processed

It can be concluded that the level / level of application of SMK3 at PT Jasa Marga (Persero) Tbk is in the "YELLOW" category in accordance with the achievement value between 60% - 84%.

The second step is the determination of the work accident category, YELLOW accident category if the accident requires incentive medical treatment (a moderate accident). So that workers must leave their regular duties for one full or more work day (resulting in missing workdays). The RED category is in the event of a serious accident that results in death or disability for life. For work accidents in the GREEN category if there is a minor accident or minor injury that does not interfere with the work day.

**Tabel 2. Work Accident Category Recapitulation**

No	Year of Genesis	Description of the occurrence of an accident	Information	Occupational Accident Category
			Luka/Cedera/Kematian	
1	2015-2017	Hit, get stuck, slip, Get stuck, and others	Minor injuries	Light (Green)
			Medium / severe injuries	Medium (Yellow)

Source: Data processed

Based on work accident data obtained from 2015 to 2017, including the YELLOW category.

## Mapping of the Level of Application of Accidental Safety and Health Safety and Health Management Systems

In accordance with the explanation in table 1, determining the level of implementation of SMK3 can be done by mapping the level of application and the level of work accidents in the table of the level of implementation of the accident and the results can be seen in the table below:

**Tabel 3. Implementation Level Map - Accident**

		TINGKAT IMPLEMENTASI			TINGKATAN PENGANTOLAN DAN KESESUAIAN PROSEDUR (SUPERVISI)
		HIJAU	KUNING	MERAH	
TINGKAT KECELAKAAN	HIJAU	Level 1 (aman & nyaman)	Level 2 (cukup aman)	Level 4 (rawan)	↑
	KUNING	Level 2 (cukup aman)	Level 3 (hati-hati)	Level 5 (berbahaya)	
	MERAH	Level 4 (rawan)	Level 5 (berbahaya)	Level 6 (sangat berbahaya)	
		PERBAIKI PROGRAM IMPLEMENTASI (PROSES)			

Source: Data processed

## Determination of Priority for Risk Management

From the Hazop Worksheet table, it can be seen that the priority of risk mitigation is based on the hazard that is in the top priority with a RAC 3 value (moderate or moderate hazard). With reference to Hazop Worksheet, hazards that have RAC 3 values are as follows:

**Tabel 4. Risk Response Priority**

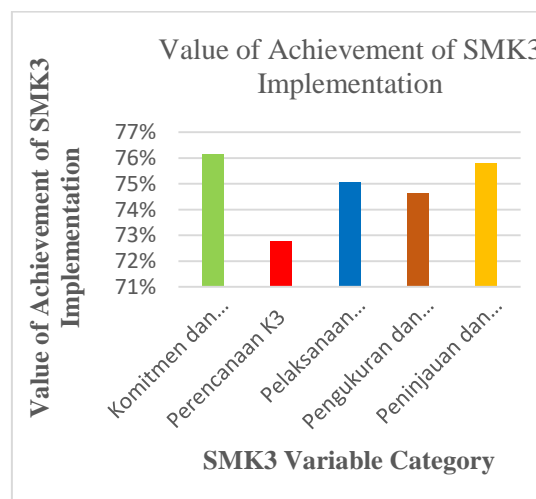
No	Deviation (Penyimpangan)	Cause (Penyebab)	Cousequences (Akibat)	RAC	Recommendation (Rekomendasi)
2	Road Access	Access roads have puddles The absence of specific crossing signs for workers	Slip / fall Tripping Being hit	3	Making crossings for workers. Wearing PPE (vest, safety shoes) Make a drain.
9	Workers do not use PPE and Signs	Low knowledge about K3	Being hit Slip / Fall Tucked away Hearing Loss Respiratory disorders	3	Workers wear PPE (helmets, vests, masks, and safety shoes) and install warning signs Conduct OSH training for workers

Source: Data processed

Of the nine irregularities, there are two deviations that get the risk assessment code 3 or moderate danger. With that, it must be a priority of improvement to reduce the risk value by providing a repairing basis.

## RESULT AND DISCUSSION

### Analysis of Calculation of SMK3 Implementation Level



K3 Commitment and Policy obtain 76.15% implementation achievement value in the yellow category, where there are still many deficiencies in each sub variable / indicator there are still many imperfect achievement values, such as company management responsible for K3 performance, the Company provides facilities and infrastructure supporting K3 programs, the Company has a written K3 policy, and the application of policies as a reference in preparing and reviewing targets and targets of work programs. Of all these variable indicators, most are only formalities and documentation, where application is still less than the SMK3 standard. A comprehensive socialization or counseling by the stakeholders of the company is needed to the workers regarding K3 Commitment and



Policy, therefore all stakeholders and workers can increase the value according to the expected target.

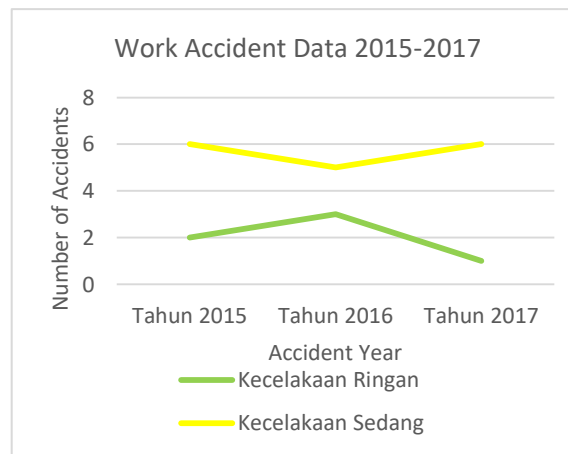
K3 planning in achieving implementation is 72.77% in the yellow category, because many workers do not understand about hazard identification, assessment and control of hazards and the goals and objectives of K3 set by the company. By making improvements to the commitment and K3 policy variables by socializing to the stakeholders of the company and the workers can improve this category.

There is still a shortage of K3 Plan implementation so that the application achievement value of 75.07% is in the yellow category, this is because such as the K3 Responsibility Unit (P2K3) that has not been maximized, the Work Procedure is only limited to documents, and K3 training is less scheduled. With the company maximizing P2K3 units and socializing work procedures and the company is obliged to carry out scheduled training to workers so that there is an increase in the achievement of the implementation of this category according to the expected target .

K3 Performance Measurement and Evaluation value of implementation is 74.64% so that there is a deficiency which results in yellow category. There is a need for improvement in terms of conducting Audit, Inspection, Environmental Testing and Supervision by the company. Whereas K3 Performance Measurement and Evaluation is one of the tasks of OHS management in maintaining the company, especially in preventing accidents and dangers that can cause casualties and losses.

Review and Improvement of SMK3 Performance obtained an achievement score of 75.79% in the yellow category. Disadvantages here are mostly a set of shortcomings in the previous category, such as the P2K3 responsible unit that is not running, internal audits that are still not optimal, and reporting on K3 is limited to formality.

### Accident Rate Calculation Analysis



Occupational accident graph data obtained during January 2015 to December 2017 are included in YELLOW category (moderate accidents occur) ie an accident requires intensive medical care.

### Repair Analysis for Road Access Problems

Improvements in overcoming the problem of road access for workers in carrying out their work in several ways to reduce the level of risk arising from such work activities, including the company immediately making special crossings for workers who carry out these work activities, requiring each worker to use protective equipment yourself when doing work, and the company makes a drainage channel on the crossing to avoid puddles

when it rains or spills liquid objects. In these ways it can reduce the value of the RAC before 3 (three) moderate hazards to 4 (four) minor hazards.

### **Analysis of Improvements to Problems Workers Do Not Use PPE and Signs**

Improvement in overcoming workers who do not use personal protective equipment and signs when on duty. Handling company disruptions requires every worker to use personal protective equipment such as masks, vests and safety shoes properly and properly using signs as needed. With these improvements it can reduce the RAC value of 3 (moderate danger) to 4 (four) small hazards and minimize work accidents that occur during handling disruptions.

### **CONCLUSION**

1. The achievement of the implementation of SMK3 at PT Jasa Marga (Persero) Tbk was 74.89% in the YELLOW category in the range (60% - 84%). This value is obtained from an average of 5 (Variables), namely K3 Commitment and Policy (76.15%), K3 Planning (72.77%), K3 Plan Implementation (75.07%), K3 Performance Evaluation and Evaluation (74, 64%), and Review and Improvement of SMK3 Performance (75.79%). Occupational Health and Safety Vocational High School Levels / Levels occupy level 3, namely caution.
2. By identifying and assessing the risk, the potential danger is found that places a RAC value of 3 (three), namely moderate danger, as follows:

- a. Road Access

- b. Workers Do Not Use PPE and Signs

Recommendations or design improvements to reduce potential hazards that arise in several ways, namely:

- a. Road Access

The design of the improvement is to make special crossing lines for workers, obliging each worker to use personal protective equipment (vests and safety shoes), and to make drainage channels on workers' special crossings.

- b. Workers Do Not Use PPE and Signs

The design of the improvement is to oblige every worker to use personal protective equipment (masks, vests and safety shoes) in carrying out the task of handling interference, and obliging each worker when handling disruptions to bring notification signs as needed.

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